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INVITATION TO BID

The City of Cambridge, Massachusetts, the Awarding Authority, invites sealed bids for the project: City of Cambridge, Massachusetts – Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project.

Nature and scope of work

The project area includes Concord Ave between Fresh Pond Parkway and Huron Avenue, Alpine Street and Chilton St between Vassal Lane and Field Street, Fayerweather Street between Saville Street and Field Street, Birch Street, Fern Street, Baystate Road, Field Street, Corporal Burns Road, Hazel Street, Ivy Street, Copley Street, Garden Street between Field Street and Walden Street, Saville Street between Fayerweather Street and Walden Street, Walden Street between Concord Ave and Garden Street, and some work within existing structures at the Concord Ave rotary.

The major components of work under Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work (see below) to be performed include, but are not limited to the following:

- A. Sewer separation and stormwater components of the work for Concord Ave Neighborhood (Contract 9) include, but are not limited to, the separation of approximately 25,000-lf of combined sewer in the CAM004 tributary area by replacement, rehabilitation, or addition of (Reinforced Concrete Pipe) RCP, (Polyvinyl Chloride) PVC, and (Ductile Iron) storm and sewer pipe between the sizes of 8-inches in diameter to 48-inches in diameter and associated manholes; replacement and addition of approximately 113 catch basins with hoods and 6-foot sumps; the removal of illicit service and inflow connections; and private inflow removal work for 31 of the buildings within the project area, and coordination with gas, electric, telecom, MBTA, and water companies for relocations and support of existing infrastructure during construction necessary to complete this work.
- B. Upon completion of sewer separation in the Concord project area, a weir and hydroslide at the intersection of Concord Ave and Birch Street shall be abandoned under Milestone 1.
- C. This sewer separation project is the last phase of the CAM 004 system. The Huron A (8A) Sewer Separation and Huron B (8B) Sewer Separation Projects are ongoing. Upon completion of the ongoing Huron A and Huron B Contract sewer separation efforts, weir and hydroslices at Lexington Ave near Worthington Street and Lakeview Ave near Fresh Pond Parkway require removal under the Concord Ave Milestone 1.
- D. At the completion of the Huron A, Huron B, and Concord Contract sewer separation efforts, modifications to the Bending Weir Structure, modifications to Drain Vault 5, and abandonment of an MWRA sewer located at the Fresh

Pond Rotary and on Wheeler Street shall be completed under Milestone 1.

The major components of work under Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work to be performed include, but are not limited to the following:

- A. Additional utility enhancements including the replacement and rehabilitation of approximately 9,700-lf of water main ranging in sizes between 6-inches and 20-inches in diameter and replacement of related fittings, valves, hydrants, and services, where these mains and appurtenances were not already replaced due to conflicts with the work in Milestone 1.
- B. Surface restoration components of work for Concord Ave Neighborhood (Contract 9) include, but are not limited to, roadway restoration of approximately 13,500-lf of roadway and sidewalks conforming to the latest MA AAB and ADA rules and regulations; full depth roadway construction; asphalt excavation by cold planer; pavement overlay; granite curbing; concrete sidewalk reconstruction; the installation of curb extensions and raised crosswalks for pedestrian safety and traffic calming; the installation of a raised multi-use path on Fern Street and other bicycle facility improvements within the project area; art coordination on Fern Street; relocation and consolidation of bus stop locations along Concord Ave; installation of a new park entrance to Danehy Park at the intersection of Garden Street and Hazel Street; and traffic signal upgrades at the intersections of Concord Ave and Alpine Street, Concord Ave and Walden Street, Concord Ave and Huron Ave, and Walden Street and Garden Street.
- C. Water quality system enhancements include, but are not limited to, the installation of approximately 4,900-lf of porous pavement and a 6-inch PVC underdrain along the gutter of roadways; installation of planting areas throughout the project area and one biobasin, at the intersection of Field Street and Fayerweather Street; and the installation of approximately 100 additional street trees with tree pits and trees on private property.

Bidding procedures shall be accordance with M.G.L. c. 30, §39M, as most recently amended, and all other applicable laws.

The estimated project value is: \$27 million dollars.

All work for the Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work shall be completed by December 31, 2015.

All work for the Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work shall be completed within 907 calendar days from the date in the "Notice to Proceed". Milestone requirements are described in Specification Section 00200 Invitation to Bid.

Plans and specifications will be available from 8:30 a.m. to 8:00 p.m. on Mondays, 8:30 a.m. to 5:00 p.m. Tuesday through Thursday and 8:30 a.m. to Noon on Fridays, at the Purchasing Department, City Hall, 795 Massachusetts Avenue, Room 303, Cambridge, MA 02139 from Wednesday, October 30, 2013 upon payment of a refundable fee of \$150.00 for each set in the form of a check made payable to the City of Cambridge. For the mailing of the plans and specifications, the bidder must prepay a mailing and handling fee of \$25.00 per set. NO PARTIAL SETS WILL BE DISTRIBUTED.

The contract documents may be examined at the Office of the Purchasing Agent, Room 303, City Hall, 795 Massachusetts Avenue, Cambridge, MA 02139 from 8:30 a.m. to 8:00 p.m. on Mondays, 8:30 a.m. to 5:00 p.m. Tuesday through Thursday and 8:30 a.m. to Noon on Fridays.

Sealed bids will be received at the Purchasing Department, City Hall, 795 Massachusetts Avenue, Room 303, Cambridge, MA 02139 until Thursday, December 5, 2013 at 2:00 PM at which time all general bids will be publicly opened and read aloud.

An original and one copy of the bid forms must be submitted.

All questions must be faxed not later than 2:00pm Tuesday, November 19, 2013 to the City of Cambridge Purchasing Department fax# 617-349-4008.

All general bids shall be accompanied by a bid deposit in the form of a certified, cashier's or treasurer's check (**NO CASH**) issued by a responsible bank or trust company made payable to the City of Cambridge or a bid bond, in an amount not less than five percent (5%) of the value of the bid.

The successful bidder will be required to furnish a Performance Bond and a Labor and Material (Payment) Bond each in the amount of one hundred percent (100%) of the contract sum. Bonds shall be obtained from a surety licensed to do business in the Commonwealth of Massachusetts and the form shall be satisfactory to the City of Cambridge.

This project is being funded in part by the Massachusetts Water Pollution Abatement Trust (the "Trust").

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

The City of Cambridge reserves the right to reject any or all general bids if it is in the public interest to do so.

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

Minimum Wage Rates as determined by the United States Department of Labor under the Davis-Bacon Act also apply to this project.

Disadvantaged Business Enterprise (DBE) goals are applicable to the total dollars paid to the construction contract. The goals for this project are a minimum of **3.40 percent D/MBE participation and 3.80 percent D/WBE participation** by certified DBEs. The bidders shall submit completed DBE forms (EEO-DEP-190 & EEO-DEP-191) with their bid. Failure to comply with the requirements of this paragraph may be deemed to render a proposal non-responsive. No waiver of any provision of this section will be granted unless approved by the Department of Environmental Protection (MassDEP).

Attention is called to the following programs and ordinances of the City of Cambridge:

1. Minority Business Enterprise Program;
2. Cambridge Employment Plan: minority/women/resident hiring ordinance.
3. Cambridge Responsible Employer Plan
4. Living Wage Ordinance
5. Occupational Safety and Health Administration (OSHA)
6. CORI City Policy

Copies of the above are bound in the bid documents and are fully integral portions of the conditions of the contract with which each contractor and sub-contractor must comply.

A pre-bid conference for all bidders will be held as follows:

Date: November 14, 2013
Time: 11:00 am
Place: Cambridge Department of Public Works
147 Hampshire Street, Cambridge, Massachusetts 02139

Cynthia H. Griffin
Purchasing Agent

SECTION 00100
INFORMATION FOR BIDDERS

INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

1. DEFINITIONS AND TERMINOLOGY

Article 1, Definitions, of the General Terms and Conditions of the Contract (“General Terms and Conditions”) included in the Project Manual are incorporated by reference as if fully rewritten herein. In the event of a conflict between the within definitions and those found in the General Terms and Conditions, the former govern for the purposes of these Instructions only. All other terms which are not herein defined have their ordinary dictionary meaning.

ADDENDUM (ADDENDA, PLURAL)–An Addendum is a document issued by the City prior to the opening of the General Bids which clarifies, amends, or modifies the Bidding Documents.

ALTERNATE BID–An Alternate Bid (or an Alternate) is an amount that is either added to or deducted from the Base Bid depending on the designation on the Bid form.

BASE BID–A Base Bid is the sum proposed by a Bidder to perform the Work and does not include any Alternate Bids.

BID–A Bid is a proposal to do the Work for a specified sum and includes accompanying forms which are required to be submitted.

BIDDER–A Bidder is a person who or an entity that submits a Bid pursuant to an entity that submits a Bid pursuant to M.G.L. c. 30, §39M or c. 30B, as the case may be. The pronouns “it” or “they” are used herein when referring to a Bidder or Bidders, respectively.

BIDDING DOCUMENTS–The Bidding Documents are comprised of the entire Project Manual, which includes, but is not limited to, the Invitation to Bid (advertisement), the Instructions to Bidders, all the forms (e.g., Bid Forms, sample Agreement form, bond forms), the wage rates, the General Terms and Condition of the Contract, any supplementary terms and conditions, thereto, the Plans, the Specifications, and all addenda.

BUSINESS DAYS–Business days are defined as all days of the week excluding Saturdays, Sundays, and those holidays for which the City offices are closed for observance.

PURCHASING DEPARTMENT–The Purchasing Department refers to the City of Cambridge Purchasing Department located at 795 Massachusetts Avenue, Third Floor, Cambridge, MA 02139.

2. COPIES OF BIDDING DOCUMENTS

A Bidder may obtain complete sets of Bidding Documents upon payment of a nonrefundable fee, the amount of which is set forth in the Invitation to Bid.

No partial sets of Bidding Documents will be issued.

It is the responsibility of the Bidder to insure that it has obtained a complete set of Bidding Documents. Complete sets of Bidding Documents shall be used in preparing Bids. Neither the City nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents in preparing the Bids.

Distribution of the Bidding Documents is for the sole purpose of obtaining Bids and does not confer a license or grant permission for any other use of the Bidding Documents.

3. PREVAILING WAGE RATE REQUIREMENTS

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

4. LAWS AND REGULATIONS

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Code of Federal Regulations and State Laws and Regulations exist, the more stringent requirement shall apply.

This project is funded in part by State Revolving Fund (SRF) Program of the Massachusetts Department of Environmental Protection (DEP). The SRF Program requires compliance with specific guidelines and requirements. The following are minimum requirements mandated by the SRF Program:

This project is subject to the requirements of the Department of Environmental Protection's Diesel Retrofit Program. Bidders must submit a signed and dated Statement of Intent to Comply form as part of their bid proposal documents.

5. HEALTH AND SAFETY REGULATIONS

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.

6. GUARANTEE

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.

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.

7. MANUFACTURER EXPERIENCE

Whenever it is written that an equipment manufacturer must have a specified period of experience with his product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide an "Efficiency Guarantee Bond" or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

8. QUESTIONS AND INTERPRETATIONS

All questions about the meaning or intent of the Bidding Documents shall be received in writing by the Purchasing Agent, Room 303, 795 Massachusetts Avenue, Cambridge MA 02139, fax no (617) 349-4008, no later than 2:00 pm on November 19, 2013. Any questions received after such time will be answered at the discretion of the City.

Written clarifications or interpretations will be issued by the Purchasing Department in the form of an Addendum. Only questions answered by an Addendum will be binding. Oral clarifications or interpretations will be without legal effect. Addenda will either be faxed or mailed to all persons having received Bidding Documents from the Purchasing Department.

Each Bidder shall be responsible for determining that it has received all Addenda issued.

9. THE BID

Bidder's Representations.

In submitting a Bid, the Bidder represents that:

- It has read and examined the Bidding Documents thoroughly;
- It understands the Bidding Documents;
- The Bid is made in accordance with the Bidding Documents;
- It has visited the site, has become familiar with the conditions of the site and the surrounding area, and has familiarized itself with local conditions that may in any manner affect cost, progress, or performance of the Work;

- It has correlated its own observations with the Bidding Documents;
- It has found no errors, conflicts, ambiguities, or omissions in the Bidding Documents, except for those that it has brought to the Purchasing Department's attention either orally at a pre-bid conference or in writing at least seven (7) calendar days prior to submitting its Bid;
- It is familiar with all of the applicable Federal, State, and City laws, rules, regulations, and procedures affecting its Bid and its Bid is in conformity with those laws, rules, regulations, and procedures; and
- The Bidder has complied with every requirement of these Instructions and that the Bidding Documents are sufficient in scope and detail to indicate and convey an understanding of all terms and conditions for the performance of the Work.

Contents of a bid.

The checklists below are included for the bidders' convenience and in no way waive or abridge the City's right to reject any or all bids.

A Bid must include:

- A completed Bid form (City of Cambridge form);
- A Bid deposit;
- MBE Forms 1 and 2 or Forms 3 and 4 (City of Cambridge form);
- General Contractor's Certification Form;
- Sub-Bidders Certification;
- Projected Workforce Certification (City of Cambridge form);
- Notarized Statement of Bidder's Qualifications (City of Cambridge form);
- Cori Compliance Form (City of Cambridge form);
- OSHA Certification Form;
- CREP General Contractor Certification Form;
- CREP Subcontractor Certification Form;
- Massachusetts Diesel Retrofit Program Statement of Intent to Comply;
- Schedule of Participation for SRF Construction Form (EEO-DEP-190C); and
- Letter(s) of Intent for SRF Construction Form (EEO-DEP-191C).

Right to Waive Informalities and Permit Curative Measures

The City reserves the right to waive any Bid informalities. The City may permit bidders who fail to include all non-statutory, City of Cambridge forms to cure such omission(s) within five days of bid opening, subject to the City's discretion.

Bid Deposits. Unless otherwise stated, every Bid must be accompanied by a Bid deposit in the form of a Bid bond, certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the City of Cambridge. The Bid bond shall be (a) in a form satisfactory to the City, (b) with a surety company qualified to do business in the Commonwealth and satisfactory to the City, and (c) conditioned upon the faithful performance

by the principal of the agreements contained in the Bid. The Bid deposit shall be no less than five percent (5%) of the value of the Bid.

Bid Forms. Each Bid shall be submitted on the Bid form included in the Project Manual. Total Bid prices shall be stated in both dollar figures and words. In the case of a conflict, written amounts shall control over numbers. All blank spaces shall be filled. Do not leave any blanks. Print "N/A" in any space not needed or used. The Bid form shall be completed in ink or by typewriter.

Acknowledgment of Addenda. Each Bidder is required to acknowledge the receipt of all Addenda (the numbers of which are to be filled in on the Bid form by the Bidder). The City, in its sole discretion, may deem a Bidder's failure to acknowledge any Addendum a minor informality.

Submission of a bid.

Prior to the deadline for receipt of Bids, each Bid must be submitted to the Purchasing Department in a sealed envelope which is plainly marked on the outside with the name and address of the Bidder, the title of the Project, and the date and time of the Bid opening. Any hand delivered Bid received after the deadline will not be accepted. Any other Bid received after the deadline will be returned to the addressee. Any Bid submitted to any other office or department of the City and received by the Purchasing Department after the deadline for receipt of Bids will not be accepted. It is the responsibility of the Bidder to ensure that its Bid is received by the Purchasing Department in a timely fashion. The deadline for receipt of Bids can be extended by Addendum only.

Bids may not be submitted orally, by facsimile, by telephone, or by any other method except for the methods described above.

Modification of a bid.

A Bid may be modified only by submitting any such modification in the form of a document executed in the same manner as a Bid, delivered in a sealed envelope in the same manner as a Bid, designated as a modification to the original Bid and submitted to the Purchasing Department prior to the time designated for the opening of Bids.

Withdrawal of a bid.

Prior to Bid Opening. A Bid may be withdrawn before the time designated for opening Bids. The Bidder requesting such withdrawal must make the request in writing and in a specific manner designated by the City if the City so requires. Withdrawal of a Bid prior to the Bid opening time will not prejudice the right of a Bidder to resubmit a Bid. A Bid cannot be withdrawn after the Bid opening time except as provided by law.

After Bid Opening. In the case of death, disability, bona fide clerical error or mechanical error of a substantial nature or other unforeseen circumstances affecting a Bidder, a Bidder may withdraw its Bid after the time designated for Bid opening, if within five (5) days of the date designated for opening its Bid, such Bidder submits a statement under the penalties of perjury

to the Purchasing Department detailing the basis for withdrawal. The City will then make a determination as to whether such Bidder has satisfied both the statutory and City requirements for such withdrawal. If the City is satisfied, the Bid Deposit will be returned to such Bidder.

Bid opening.

All Bids received prior to the date and time designated for the Bid opening will be opened publicly and read aloud at a location designated by the Purchasing Department.

Public bid review and inspection.

Upon opening, all Bids become public records except for portions thereof that are not subject to public disclosure as a matter of law.

Bids may be reviewed by the public in a manner set forth by the Purchasing Department.

Any Bidder who objects to a Bid may protest the Bid. In order to be considered, the protest must be received by the Purchasing Department within two (2) business days after the Bid opening date. The protest must be in writing, must state in detail the basis for the protest, and must be signed by the protester.

10. RESERVATION OF RIGHTS TO REJECT BIDS

The City reserves the right to reject any or all Bids, if it is in the public interest to do so.

The City reserves the right to reject any or all Bids, if it determines that the Bidder does not possess the qualifications to perform the Work specified in the Bidding Documents.

The City reserves the right to reject the Bid of any Bidder who the City has determined has not completed a prior project, whether with the City or elsewhere, because of the fault of the Bidder, its Subcontractors or employees; has been declared in default on a prior contract whether with the City or elsewhere; has failed to complete a prior project in a timely fashion whether with the City or elsewhere; based on its work record, is not capable of performing the within Contract whether due to lack of sufficient prior experience, as determined by the City, or any other reason; has a work record of its Subcontractors demanding direct payment from the City; has a work record of its Subcontractors, employees or material suppliers complaining to the City or other awarding authority regarding the Bidder's failure to pay them; has a record of complaints made to the City or other awarding authority by persons offended by the behavior of the Bidder, its Subcontractors or employees; or has a record of its failure to comply with the Commonwealth and/or City laws or requirements. "Work record" or "record" constitutes a minimum of one event in the work history of the Bidder.

The City shall reject every Bid that is not accompanied by a Bid deposit.

11. AWARD OF CONTRACT

The City shall award the contract to the lowest responsible (demonstrably possessing the skill, ability, and integrity necessary to faithfully perform the work called for by the Contract, based upon a determination of competent workmanship and financial soundness) and eligible (able to meet all requirements for Bidders set forth in the Bidding Documents) Bidder within ninety

(90) Business Days after the date of the opening of the Bids. If the Bidder selected as the contractor fails to perform its agreement to execute a contract in accordance with the terms of its Bid and furnish a performance bond and a labor and materials or payment bond, if required by the Bidding Documents, an award shall be made to the next lowest responsible and eligible Bidder. The ninety-day time limit shall not be applicable to a second or subsequent award made after the expiration of the time limit with the consent of the next lowest responsible and eligible bidder, and made because the original award made within the time limit was invalid, or because the bidder failed to execute the Agreement or to provide a performance and labor and materials or payment bond.

Any Bidder who fails to perform its agreement to execute a contract and furnish a performance bond and a labor and materials or payment bond shall forfeit its Bid deposit which shall become the property of the City, but shall not exceed the difference between its Bid price and the Bid price of the next lowest responsible and eligible bidder.

The City will notify the selected Bidder and all other Bidders of the award.

The City will submit to the selected Bidder a Notice of Award and at least four (4) unsigned copies of the Agreement between the City and the Contractor. The selected Bidder will be required to return to the Purchasing Department within ten (10) business days of the date notice of award all of the copies of the Agreement between the City and the Contractor signed, its performance bond, its labor and materials or payment bond and all required certificates of insurance. Failure of the selected Bidder to submit all of the required documents in a timely fashion may result in the withdrawal of the award. The City will return one fully signed copy of the Agreement to the Contractor. Time is of the essence in the performance of the Agreement.

12. COMPLETION TIME

Bidder must agree to commence work on or before ten (10) days following receipt of a written "Notice to Proceed" of the Owner. All work for the Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work shall be completed by December 31, 2015. All work for the Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work shall be completed within 907 calendar days from the date in the "Notice to Proceed". Milestone requirements are described in Specification Section 00200 Invitation to Bid.

Bidder must agree also to pay as liquidated damages the sum of \$5,240.00 for each consecutive calendar day after Milestone Number 1 that the work for that milestone remains unfinished. By United States federal court order, the City is required to complete the work described as Milestone Number 1 by December 31, 2015. The Bidder must agree to pay fines and penalties of approximately \$29,000/day which will be levied on the City by the EPA if this milestone is not met. These fines and penalties will be further assessed at the time they are levied against the City.

Bidder must agree also to pay as liquidated damages the sum of \$2,260.00 for each consecutive calendar day after Milestone Number 2 that the work for that milestone remains unfinished.

END OF INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

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SECTION 00210

CAMBRIDGE EMPLOYMENT PLAN MUNICIPAL ORDINANCE SECTIONS 2.66.060, ET SEQ. MINORITY/ WOMEN/ RESIDENT HIRING

HIRING REQUIREMENTS

On any construction project which is funded in whole or in part by City, State or Federal funds, or funds which the City expends or administers in accordance with a federal grant, or on any construction project for which the City is a signatory to the construction contract, the worker hours shall be performed as follows:

1. No less than TWENTY-FIVE PERCENT (25%) of the total employee worker hours shall be performed by BONA FIDE CAMBRIDGE RESIDENTS. A Cambridge resident is any person for whom the principal place where that person normally eats and sleeps and maintains his or her normal personal and household effects is within the City of Cambridge.
2. No less than TWENTY-FIVE PERCENT (25%) of the total employee worker hours shall be performed by MINORITY PERSONS. Minority persons mean and include those persons who are Black, Hispanic, Asian, Native American, or Cape Verdean.
3. No less than TEN PERCENT (10%) of the total employee worker hours shall be performed by WOMEN.

COMPLIANCE, ENFORCEMENT, SANCTIONS

1. All contractors entering into construction contracts shall:
 - a. Certify that they have read the provisions Cambridge Municipal Ordinance 2.66.060, et seq. (a copy of which follows) and that they shall comply with them;
 - b. List all job openings with Employment Resources, Inc. ("ERI") and keep accurate records as to action taken on referrals from that agency;
 - c. Maintain personnel records listing names, addresses, sex and race of their employees; and require their subcontractors to do likewise. All records required to be maintained by this section shall be made available on request to representatives of the Cambridge Community Development Department. All such records shall be maintained for the duration of the construction project and for one year thereafter.
2. Failure to comply with these requirements will result in the imposition of sanctions permitted by the Cambridge Municipal Code and any other applicable laws or provisions.
3. The following standards will be used to determine whether the Contractor has acted in good faith in attempting to meet the requirements of Cambridge Municipal Ordinance 2.66.060, et seq. for hiring residents, minorities and women:

The Contractor must demonstrate that it has done all of the following except where such requirement would conflict with a collective bargaining agreement:

- a. Prior to construction and during construction, when necessary, it posted jobs with ERI and all appropriate trade unions and requested that referrals be made in the proportions necessary to meet the CEP's employment standards;
- b. It interviewed all qualified applicants and returned completed interview forms to ERI within one week of each respective interview;
- c. It provided the City with the name and telephone number of the person designated as Compliance Officer to work directly with the City; and
- d. It has submitted to the City a projection of workforce needs over the course of construction of the project. Such submission shall reflect the needs, by trade, for each month of the construction process.

In addition, at the discretion of the City, contractors may be required to comply with the following:

- a. Place its own ads in local and local minority newspapers or tabloids;
- b. Place a State Department Employment and Training ad.

END OF SECTION 00210

SECTION 00211

CAMBRIDGE RESPONSIBLE EMPLOYER PLAN

ORDINANCE NUMBER 1260

Final Publication Number 2965. First Publication in the Chronicle on July 31, 2002.

City of Cambridge

In the Year Two Thousand and Two

AN ORDINANCE

In amendment to the Ordinance entitled “Municipal Code of the City of Cambridge”

Be it ordained by the City Council of the City of Cambridge as follows:

That Title 2 of the Municipal Code entitled “Administration and Personnel” be amended in Chapter 2.66 entitled “Cambridge Employment Plan” by striking out Section 2.66.080 entitled “Contractor qualifications and sanctions” and substituting in place thereof the following new section.

Section 2.66.080 Contractor qualifications and sanctions.

- A. All bidders and all subcontractors under the bidder for projects subject to G.L. c. 149, §44A(2) and G.L. c 30 §39M shall, as a condition for bidding, agree in writing that they shall comply with the following obligations:
1. The bidder and all subcontractors under the bidder shall comply with the Cambridge Employment Plan as it currently exists and as it may, from time to time, be amended, and specifically shall comply with the worker hours requirements of Section 2.66.060(A).
 2. The bidder and all subcontractors under the bidder must comply with the obligations established under G.L. c. 149 and G.L. c 30 §39M to pay the appropriate lawful prevailing wage rates to their employees.
 3. The bidder and all subcontractors under the bidder must maintain or participate in a bona fide apprentice training program as defined by c. 23, §§11H and 11I for each apprenticeable trade or occupation represented in their workforce that is approved by the Division of Apprentice Training of the Department of Labor and Industries and must abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract.
 4. The bidder and all subcontractors under the bidder must furnish, at their expense, hospitalization and medical benefits for all their employees employed on the project and/or coverage at least comparable in value to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by G.L. c. 149, §26 and G.L. c 30 §39M in establishing minimum wage rates.

5. The bidder and all subcontractors under the bidder must maintain appropriate industrial accident insurance coverage for all the employees employed on the project in accordance with G.L. c. 152.
 6. The bidder and all subcontractors under the bidder must properly classify employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance coverage, unemployment taxes, social security taxes and income tax withholding in accordance with G.L. c. 149, §148B and G.L. c 30 §39M.
- B. All bidders and subcontractors under the bidder who are awarded or who otherwise obtain contracts on projects subject to G.L. c. 149, §44A(2) and G.L. c 30 §39M shall comply with the obligations numbered 1 through 6 as set forth in subsection A of this section for the entire duration of their work on the project, and an officer of each such bidder or subcontractor under the bidder shall certify under oath and in writing on a weekly basis that they are in compliance with such obligations.
- C. Any bidder or subcontractor under the bidder who fails to comply with any one of obligations 1 through 6 as set forth in subsection A of this section for any period of time shall be, at the sole discretion of the City Manager, subject to one or more of the following sanctions: (1) cessation of work on the project until compliance is obtained; (2) withholding of payment due under any contract or subcontract until compliance is obtained; (3) permanent removal from any further work on the project; (4) liquidated damages payable to the City in the amount of five percent of the dollar value of the contract.
- D. In addition to the sanctions outlined in subsection C of this section, a general bidder or contractor shall be equally liable for the violations of its subcontractor with the exception of violations arising from work performed pursuant to subcontracts that are subject to G.L. c. 149, §44F and G.L. c 30 §39M. Any contractor or subcontractor who has been determined to have violated any of the obligations set forth in subsections A and B of this section shall be barred from performing any work on any future projects for six months for a first violation, for three years for a second violation, and permanently for a third violation.
- E. The provisions of this section shall not apply to construction projects for which the low general bid was less than one hundred thousand dollars or to work performed pursuant to subcontracts that are subject to G.L. c. 149, §44F and G.L. c 30 §39M and that were bid for less than twenty-five thousand dollars, or to re-bids for construction projects for which the City receives fewer than three qualified general contract bidders in the original bid. (Ord. 1162, 1995)

In City Council September 9, 2002.
Passed to be ordained.
Yeas 8; Nays 0; Absent 1.
Attest:- D. Margaret Drury, City Clerk.

A true copy;

ATTEST:-

D. Margaret Drury
City Clerk

END OF SECTION 00211

CAMBRIDGE RESPONSIBLE
EMPLOYER PLAN
00211-2

Concord
Conformed Set

Chapter 2.121

LIVING WAGE ORDINANCE

Sections:

- 2.121.010 Title and Purpose**
- 2.121.020 Definitions**
- 2.121.030 Living Wage**
- 2.121.040 Waivers and Exceptions**
- 2.121.050 Notification Requirements**
- 2.121.060 Duties of covered Employers**
- 2.121.070 Community Advisory Board**
- 2.121.080 Enforcement**
- 2.121.090 Severability**
- 2.121.100 Effective Date**

2.121.010 Title and Purpose.

This Chapter shall be known as the "Cambridge Living Wage Ordinance". The purpose of this ordinance is to assure that employees of the City of Cambridge and employees of City contractors, subcontractors and beneficiaries of tax abatements, loans, grants, subsidies and other assistance provided by the City earn an hourly wage that is needed to support a family of four.

2.121.020 Definitions.

For the purposes of this ordinance, the term:

(a) "Applicable Department" means the Personnel Department for employees of the City of Cambridge, the Purchasing Department, with the advice and assistance of the appropriate department which receives the services, for Covered Employers who contract or subcontract

with the City of Cambridge, the School Department for employees, contractors and subcontractors of the School Department, and the City Manager's Office for any other Person who is a Beneficiary of assistance other than a contract or subcontract.

(b) "Assistance" means:

(1) any grant, loan, tax incentive, bond financing, subsidy, or other form of assistance valued at least \$10,000 that an employer receives by or through the authority or approval of the City of Cambridge, including, but not limited to, c. 121A tax abatements, industrial development bonds, Community Development Block Grant (CDBG) loans and grants, Enterprise Zone designations awarded after the effective date of this Chapter, and the lease of city owned land or buildings below market value; and

(2) any service contract, as defined herein, of at least \$10,000 with the City of Cambridge that is made with an employer to provide services pursuant to G.L.c. 30B or other public procurement laws, awarded, renegotiated or renewed after the effective date of this Chapter.

(3) any service subcontract, as defined herein, of at least \$10,000.

(c) "Beneficiary" means:

(1) any person who is a recipient of Assistance;

(2) any company or person that is a tenant or sub-tenant, leaseholder or sub-leaseholder of a recipient of Assistance, provided that said company or person employs at least 25 persons and occupies property or uses equipment or property that is improved or developed as a result of Assistance, after the effective date of this Chapter; and

(d) **"Covered Employer"** means the City of Cambridge or a Beneficiary of Assistance.

(e) **"Covered Employee"** means:

(1) a person employed by the City of Cambridge except for persons in those positions listed in Section 2.121.040(j) of this ordinance; and

(2) a person employed by a Covered Employer, or a person employed by an independent contractor doing business with a Covered Employer, who would directly expend any of his or her time on the activities funded by the contract or the activities for which the Beneficiary received the Assistance, except for persons in those positions listed in Section 2.121.040(j) of this ordinance..

(f) **"Living Wage"** has the meaning stated in Section 2.121.030.

(g) **"Person"** means one or more of the following or their agents, employees, servants, representatives, and legal representatives: individuals, corporations, partnerships, joint ventures, associations, labor organizations, educational institutions, mutual companies, joint-stock companies, trusts, unincorporated organizations, trustees, trustees in bankruptcy, receivers, fiduciaries, and all other entities recognized at law by the Commonwealth of Massachusetts.

(h) **"Service Contract"** means a contract let to a contractor by the City of Cambridge for the furnishing of services, to or for the City, except contracts where services are incidental to the delivery of products, equipment or commodities. A contract for the purchase or lease of

goods, products, equipment, supplies or other property is not a "service contract" for the purposes of this definition.

(i) **"Service Subcontract"** means a subcontract primarily for the furnishing of services, to or for a recipient of Assistance, except where services are incidental to the delivery of products, equipment or commodities. A contract for the purchase or lease of goods, products, equipment, supplies or other property is not a "service subcontract" for the purposes of this definition.

2.121.030 Living Wage.

(a) **Applicability.** Covered Employers shall pay no less than the Living Wage to their employees.

(b) **Amount of wage.** The Living Wage shall be calculated on an hourly basis and shall be no less than \$10.00, subject to adjustment as provided herein. The Living Wage shall be upwardly adjusted each year no later than March first in proportion to the increase at the immediately preceding December 31 over the year earlier level of the Annual Average Consumer Price Index for All Urban Consumers (CPI -U) Boston-Lawrence-Salem, MA - NH, as published by the Bureau of Labor Statistics, United States Department of Labor applied to \$10.00.

(c) **No reduction in collective bargaining wage rates.** Nothing in this Chapter shall be read to require or authorize any beneficiary to reduce wages set by a collective bargaining agreement.

(d) Cuts in non-wage benefits prohibited. No Beneficiary will fund wage increases required by this Chapter, or otherwise respond to the provisions of this Chapter, by reducing the health, insurance, pension, vacation, or other non-wage benefits of any of its employees.

2.121.040 Waivers and Exceptions.

(a) Waivers. A Covered Employer may request that the City Manager grant a partial or whole waiver to the requirements of this Chapter.

(b) General Waivers. Waivers may be granted where application of this Chapter to a particular form of Assistance is found by the City Solicitor to violate a specific state or federal statutory, regulatory or constitutional provision or provisions, and the City Manager approves the waiver on that basis.

(c) Hardship Waivers for certain not-for-profit employers. An employer, who has a contract with the City of Cambridge which is not subject to the provisions of G.L. c. 30B, may apply to the City Manager for a specific waiver where payment of the Living Wage by a not-for-profit Covered Employer would cause a substantial hardship to the Covered Employer.

(d) Chapter 30B contract waivers. Prior to issuing an invitation for bids for a procurement contract subject to the provisions of G.L. c. 30B, any Applicable Department may apply to the City Manager for a waiver of the application of the Living Wage to the contract where payment of the Living

Wage by a Covered Employer would make it inordinately expensive for the City to contract for the services or would result in a significant loss of services, because the contracted work cannot be segregated from the other work of the Covered Employer.

(e) General Waiver Request Contents. All General Waiver requests shall include the following:

(1) The nature of the Assistance to which this Chapter applies;

(2) The specific or official name of the Assistance and Assistance program, the statutory or regulatory authority for the granting of the Assistance, and a copy of that authority;

(3) The conflicting statutory, regulatory, or constitutional provision or provisions that makes compliance with this Chapter unlawful, and a copy of each such provision; and

(4) A factual explication and legal analysis of how compliance with this Chapter would violate the cited provision or provisions, and the legal consequences that would attach if the violation were to occur.

(f) Hardship Waiver Request Contents. All Hardship Waiver requests shall include the following:

(1) The nature of the Assistance to which this Chapter applies;

(2) A detailed explanation of why payment of the Living Wage would cause a substantial hardship to the Covered Employer; and

(3) A statement of proposed wages below the Living Wage.

(g) Chapter 30B Contract Waiver Request Contents. A Chapter 30B contract waiver request shall include the following:

(1) The nature of the Assistance to which this Chapter applies;

(2) A detailed explanation of why the contracted work cannot be segregated from the other work of the bidding Covered Employers thereby making the cost of the contract with the payment of the Living Wage inordinately expensive or would result in a significant loss of services;

(h) Community Advisory Board review and recommendation regarding waiver requests. The Community Advisory Board, as described in Section 2.121.070 of this ordinance, shall consider waiver requests along with their supporting documentation and analysis, and may hold a public hearing to consider the views of the public before making a recommendation to the City Manager regarding the waiver request. For a hardship waiver, the Community Advisory Board shall offer an opportunity to be heard to employees of the Covered Employer. After reviewing the recommendation of the Community Advisory Board, the City Manager may approve and grant or deny all or part of a request. The City Manager may in his or her discretion grant a temporary hardship waiver pending the hearing before the Community Advisory Board. For Chapter 30B contract waivers, the Community Advisory Board shall make its recommendation to the City Manager no more than thirty days after it is notified of the request for a Chapter 30B contract waiver.

(i) Terms of exceptions. If an employer is subject to this Chapter as a result of its receipt of more than one kind of Assistance covered by this Chapter, and if the City Manager grants

a waiver with respect to one form of Assistance, the City Manager need not find that this Chapter is inapplicable to the employer with respect to another form of Assistance received by the employer.

(j) Exceptions. The following positions will be excepted from the requirement of the payment of the Living Wage upon certification in an affidavit in a form approved by the Applicable Department and signed by a principal officer of the Covered Employer that the positions are as follows:

(1) youth hired pursuant to a city, state, or federally funded program which employs youth as defined by city, state, or federal guidelines, during the summer, or as part of a school to work program, or in other related seasonal or part-time program;

(2) work-study or cooperative educational programs;

(3) trainees who are given a stipend or wage as part of a job training program that provides the trainees with additional services, which may include, but are not limited to, room and board, case management, or job readiness services.

(4) persons working in a recognized supported employment program that provides workers with additional services, which may include, but are not limited to, room and board, case management, counseling, or job coaching;

(5) positions where housing is provided by the employer;

(6) employees who are exempt from federal or state minimum wage requirements; and

(7) individuals employed by the City of Cambridge where the employment of such individuals is

intended primarily to provide a benefit or subsidy to such individuals, although the City is compensating them for work performed.

2.121.050 Notification Requirements.

All Applicable Departments shall provide in writing an explanation of the requirements of this ordinance in all requests for bids for service contracts and to all persons applying for Assistance as defined by this ordinance. All persons who have signed a service contract with the City of Cambridge or a contract for Assistance shall forward a copy of such requirements to any person submitting a bid for a subcontract on the Assistance contract.

2.121.060 Duties of Covered Employers.

(a) Notification Requirements. Covered employers shall provide each Covered employee with a fact sheet about this ordinance and shall post a notice about the ordinance in a conspicuous location visible to all employees. The fact sheet and poster shall be provided to the Covered Employer by the Applicable Department and shall include:

- (1) notice of the Living Wage amount;
- (2) a summary of the provisions of this ordinance;
- (3) a description of the enforcement provisions of the ordinance;
- (4) the name, address, and phone number of a person designated by the Applicable Department to whom complaints of noncompliance with this ordinance should be directed.

(b) Contract for Assistance. At the time of signing a contract for assistance with the City of Cambridge or with a Beneficiary, the contract must include the following:

- (1) the name of the program or project under which the contract or subcontract is being awarded;
- (2) a local contact name, address, and phone number for the Beneficiary;
- (3) a written commitment by the Beneficiary to pay all Covered Employees not less than the Living Wage as subject to adjustment under this ordinance and to comply with the provisions of this ordinance;
- (4) a list of Covered Employees under the contract with the employees' job titles;
- (5) a list of all subcontracts either awarded or that will be awarded to Beneficiaries with funds from the Assistance. Upon signing any subcontracts, the Covered Employer shall forward a copy of the subcontract to the Applicable Department.

(c) Maintenance of payroll records. Each Covered Employer shall maintain payrolls for all Covered Employees and basic records relating thereto and shall preserve them for a period of three years. The records shall contain the name and address of each employee, the job title and classification, the number of hours worked each day, the gross wages, deductions made, actual wages paid, and copies of social security wage and withholding reports, and evidence of payment thereof and such other data as may be required by the Applicable Department from time to time.

(d) Applicable Department duties. The Applicable Department shall cause investigations to be made as may be

necessary to determine whether there has been compliance with this Ordinance. The Applicable Department shall report the findings of all such investigations to the Community Advisory Board.

(e) Covered Employer to cooperate. The Covered Employer shall submit payroll records on request to the Applicable Department. The Covered Employer shall permit City representatives to observe work being performed upon the work site, to interview employees and to examine the books and records relating to the payrolls being investigated to determine payment of wages.

(f) City Assistance Reports. Each Applicable Department shall file a City Assistance Report with the City Manager and the Community Advisory Board by July 31 of each year. The report shall include, for each Assistance package or contract approved during the preceding fiscal year:

(1) the name of the Applicable Department (awarding agency), the name of the specific program under which the Assistance was awarded, and the origin of funds for Assistance;

(2) a description of the purpose or project for which the Assistance was awarded;

(3) the name, address, and phone number of a local contact person for the Covered Employer;

(4) the total cost to the City of Assistance provided to each Beneficiary, including both face-value of Assistance, as well as revenue not collected as a result of the Assistance.

2.121.070 Community Advisory Board.

(a) Purpose. The purpose of the Community Advisory Board shall be to review the effectiveness of this Ordinance at creating and retaining Living Wage jobs, to make recommendations to the City Manager regarding the granting of Waivers to Covered Employers, to review the implementation and enforcement of this ordinance, and to make recommendations from time to time in connection therewith.

(b) Composition. The Community Advisory Board shall be composed of nine members and shall include representatives of labor unions, community organizations and the business community. All members will be appointed by the City Manager. Members of the Board shall serve a three-year term. Whenever a vacancy shall occur the City Manager shall appoint a replacement within thirty days of said vacancy.

(c) Meetings. The Community Advisory Board shall meet quarterly and in special session as required. All meetings of the Board shall be open to the public and will allow for public testimony on the uses of the City Assistance generally, and on specific instances of Assistance or proposed Assistance as received or sought by individual enterprises.

(d) Conflict of Interest. No member of the Community Advisory Board shall participate in any proceeding concerning a Beneficiary, a Covered Employer or a Covered Employee, or applicant for waiver or exemption, if the member or any member of his or her immediate family has a direct or indirect financial

interest in the outcome of said proceeding.

2.121.080 Enforcement.

(a) Enforcement powers. In order to enforce this Chapter, the Applicable Department may, with the approval and assistance of the City Solicitor, issue subpoenas, compel the attendance and testimony of witnesses and production of books, papers, records, and documents relating to payroll records necessary for hearing, investigations, and proceedings. In case of failure to comply with a subpoena, the City may apply to a court of appropriate jurisdiction for an order requiring the attendance and testimony of witnesses and the productions of books, papers, records, and documents. Said court, in the case of a refusal to comply with any such subpoena, after notice to the person subpoenaed, and upon finding that the attendance or testimony of such witnesses or the production of such books, papers, records, and documents, as the case may be, is relevant or necessary for such hearings, investigation, or proceedings, may issue an order requiring the attendance or testimony of such witnesses or the production of such documents and any violation of the court's order may be punishable by the court as contempt thereof.

(b) Complaint procedures. An employee who believes that he or she is a Covered Employee or an applicant for a position to be filled by a Covered Employee who believes that his or her employer is not complying with requirements of this Chapter applicable to the employer may file a complaint with the Applicable Department or with the Community Advisory Board.

Complaints of alleged violations may also be filed by concerned citizens or by the City Council. Complaints of alleged violations may be made at any time, but in no event more than three years after the last date of alleged violation, and shall be investigated promptly by the Applicable Department. Statements written or oral, made by an employee, shall be treated as confidential and shall not be disclosed to the Covered Employer without the consent of the employee.

(c) Investigations and hearings. The Applicable Department shall investigate the complaint, and may, in conjunction with the City Solicitor, and in accordance with the powers herein granted, require the production by the employer of such evidence as required to determine compliance. Prior to ordering any penalty the applicable Department shall give notice to the employer and conduct a hearing. If at any time during these proceedings, the employer voluntarily makes restitution of the wages not paid to the employee making the complaint and to any similarly situated employees, by paying all back wages owed plus interest at the average prior year Massachusetts passbook savings bank rate, or otherwise remedies the violation alleged if the violation involves matters other than wages, then the Applicable Department shall thereafter dismiss the complaint against the employer.

(d) Remedies. In the event that the Applicable Department, after notice and hearing, determines that any Covered Employer has failed to pay the Living Wage rate or has otherwise violated the provisions of this Chapter, the Applicable Department may order any or all of the following penalties and relief:

(1) Fines up to the amount of \$300 for each Covered Employee for each day that the Covered Employer is in violation of this Ordinance, except if the violation was not knowing and willful, then the total fine shall not exceed the amount of back wages plus interest owed;

(2) Suspension of ongoing contract and subcontract payments;

(3) Ineligibility for future City Assistance for up to three years beginning when all penalties and restitution have been paid in full. In addition, all Covered Employers having any principal officers who were principal officers of a barred beneficiary shall be ineligible under this section; and

(4) Any other action deemed appropriate and within the discretion and authority of the city.

Remedies in this section shall also apply to the party or parties aiding and abetting in any violation of this chapter.

(e) Private right of action. Any Covered Employee, or any person who was formerly employed by a Beneficiary, may bring an action to enforce the provisions of this Chapter to recover back pay and benefits, attorneys fees and costs, by filing suit against a Beneficiary in any court of competent jurisdiction.

(f) Remedies herein non-exclusive. No remedy set forth in this Chapter is intended to be exclusive or a prerequisite for asserting a claim for relief to enforce the right granted under this Chapter in a court of law. This Chapter shall not be construed to limit an employee's right to bring a common law cause of action for wrongful termination.

(g) Retaliation and discrimination barred. A Covered Employer shall not discharge, reduce the compensation or otherwise retaliate against any employee for making a complaint to the City, otherwise asserting his or her rights under this Chapter, participating in any of its proceedings or using any civil remedies to enforce his or her rights under the Chapter. The City shall investigate allegations of retaliation or discrimination and shall, if found to be true, after notice and a hearing, order appropriate relief as set out in paragraphs (c) and (d) herein

2.121.090 Severability.

In the event any provision of this ordinance shall be held invalid or unenforceable by any court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provisions hereof.

2.121.100 Effective Date.

This law shall be effective sixty (60) after final passage.

The Living Wage Ordinance (2.121) provides, at 1.121.030(b) that the wage shall be upwardly adjusted each year no later than March 1st in proportion to the increase in the Annual Average Consumer Price Index for the prior calendar year for All Urban Consumers (CPI-U) in the Boston area, as published by the federal Bureau of Labor Statistics.

For calendar year 1999, the CPI-U increased by 2.5%. Therefore the new living wage, as of March 1, 2000 is \$10.25.

For calendar year 2000, the CPI-U increased by 4.3%. Therefore the new living wage, as of March 1, 2001 is \$ 10.68.

For calendar year 2001, the CPI-U increased by 4.3%. Therefore the new living wage, as of March 1, 2002 is \$11.11.

For calendar year 2002, the CPI-U increased by 2.6% . Therefore the new living wage, as of March 1, 2003 is \$11.37.

The City Council has voted to amend the section of the Living Wage Ordinance (1.121.030 (b) that provides the method for calculating cost of living increases each year. As a result of this change, the living wage as of March 30, 2003 is \$11.44.

For calendar year 2003, the CPI-U increased by 3.76%. Therefore the new living wage, as of March 1, 2004 is \$11.87.

For calendar year 2004, the CPI-U increased by 2.7%. Therefore the new living wage, as of March 1, 2005 is \$12.19.

For calendar year 2005, the CPI-U increased by 3.3%. Therefore the new living wage, as of March 1, 2006 is \$12.59.

For calendar year 2006 the CPI-U increased by 3.1 %. Therefore the new living wage, as of March 1, 2007 is \$12.98.

For calendar year 2007 the CPI-U increased by 1.9 %. Therefore the new living wage, as of March 1, 2008 is \$13.23.

For calendar year 2008 the CPI-U increased by 3.5 %. Therefore the new living wage, as of March 1, 2009 is \$13.69.

For calendar year 2009 the CPI-U decreased by .67 %. Therefore the new living wage, as of March 1, 2010 will remain at \$13.69.

For calendar year 2010 the CPI-U increased by 1.57%. Therefore the new living wage, as of March 1, 2011 is \$13.90.

For calendar year 2011 the CPI-U increased by 2.71%. Therefore the new living wage, as of March 1, 2012 is \$14.28.

For calendar year 2012 the CPI-U increased by 1.58%. Therefore the new living wage, as of March 1, 2013 is \$14.51.

END OF SECTION 00215

SECTION 00221
CORI CITY POLICY

City of Cambridge CORI Policy

1. Where Criminal Offender Record Information (CORI) checks are part of a general background check for employment or volunteer work, the following practices and procedures will generally be followed.
2. CORI checks will only be conducted as authorized by Criminal History Systems Board (CHSB). All applicants will be notified that a CORI check will be conducted. If requested, the applicant will be provided with a copy of the CORI policy.
3. An informed review of a criminal record requires adequate training. Accordingly, all personnel authorized to review CORI in the decision-making process will be thoroughly familiar with the educational materials made available by the CHSB.
4. Prior to initiating a CORI check, the City will review the qualifications of the applicant to determine if the applicant is otherwise qualified for the relevant position. The City will not conduct a CORI check on an applicant that is not otherwise qualified for the relevant position.
5. Unless otherwise provided by law, a criminal record will not automatically disqualify an applicant. Rather, determination of suitability based on CORI checks will be made consistent with this policy and any applicable law or regulations.
6. If a criminal record is received from CHSB, the authorized individual will closely compare the record provided by CHSB with the information on the CORI request form and any other identifying information provided by the applicant, to ensure the record relates to the applicant.
7. If, in receiving a CORI report, the City receives information it is not authorized to receive (e.g. cases with dispositions such as not guilty or dismissal, in circumstances where the City is only authorized to receive convictions or case-pending information), the City will inform the applicant and provide the applicant with a copy of the report and a copy of CHSB's *Information Concerning the Process in Correcting a Criminal Record* so that the applicant may pursue correction with the CHSB.
8. If the City of Cambridge is planning to make an adverse decision based on the results of the CORI check, the applicant will be notified immediately. The applicant shall be provided with a copy of the criminal record and the City's CORI policy, advised of the part(s) of the record that make the individual unsuitable for the position and given an opportunity to dispute the accuracy and relevance of the CORI record.

9. Applicants challenging the accuracy of the criminal record shall be provided a copy of CHSB's *Information Concerning the Process in Correcting a Criminal Record*. If the CORI record provided does not exactly match the identification information provided by the applicant, the City of Cambridge will make a determination based on a comparison of the CORI record and documents provided by the applicant. The City of Cambridge may contact CHSB and request a detailed search consistent with CHSB policy.
10. If the City of Cambridge reasonably believes the record belongs to the applicant and is accurate, then the determination of suitability for the position will be made. Unless otherwise provided by law, factors considered in determining suitability may include, but not be limited to the following:
 - (a) Relevance of the crime to the position sought;
 - (b) The nature of the work to be performed;
 - (c) Time since the conviction;
 - (d) Age of the candidate at the time of offense;
 - (e) Seriousness and specific circumstances of the offense;
 - (f) The number of offenses;
 - (g) Whether the applicant has pending charges;
 - (h) Any relevant evidence of rehabilitation or lack thereof;
 - (i) Any other relevant information, including information submitted by the candidate or requested by the City.
11. The Personnel Department will assist affected departments, in assessing the suitability of candidates in accordance with paragraph 10, a through i above, to ensure consistency, fairness, and protection of employment opportunities and the public interest.
12. The City of Cambridge will notify the applicant of the decision and the basis of the decision in a timely manner.
13. CORI information shall not be disseminated or shared with any unauthorized employees or other, but shall be maintained in confidence consistent with the obligations of law.

Revised May 5, 2007

SECTION 00222
CITY CORI ORDINANCE

ORDINANCE NUMBER 1312

Final Publication Number 3155. First Publication in the Chronicle on December 13, 2007.

City of Cambridge

In the Year Two Thousand and Eight

AN ORDINANCE

**In amendment to the Ordinance entitled
“Municipal Code of the City of Cambridge”**

Be it ordained that Cambridge Municipal Code Chapter 2.112 is hereby amended by adding a new Section 2.112.060 entitled “CORI Screening by Vendors of the City of Cambridge” as follows:

Adding after Section 2.112.050 the following new sections:

SECTION 2.112.060

CORI SCREENING BY VENDORS OF THE CITY OF CAMBRIDGE

Sections:

2.112.061 Purpose

2.112.062 Definitions

2.112.063 CORI-Related Standards of the City of Cambridge

2.112.064 Waiver

2.112.065 Applicability

2.112.061 Purpose

These sections are intended to ensure that the persons and businesses supplying goods and/or services to the City of Cambridge deploy fair policies relating to the screening and identification of persons with criminal backgrounds through the CORI system.

2.112.062 Definitions

Unless specifically indicated otherwise, these definitions shall apply and control.

Awarding Authority means the City of Cambridge Purchasing Agent or designee.

Vendor means any vendor, contractor, or supplier of goods and/or services to the City of Cambridge.

2.112.063 CORI-Related Standards of the City of Cambridge

The City of Cambridge employs CORI-related policies, practices and standards that are fair to all persons involved and seeks to do business with vendors that have substantially similar policies, practices and standards. The City of Cambridge will do business only with vendors who, when required by law to perform CORI checks, employ CORI-related policies, practices, and standards that are consistent with policies, practices and standards employed by the City of Cambridge. The awarding authority shall consider any vendor's deviation from policies, practices and standards employed by the City of Cambridge as grounds for rejection, rescission, revocation, or any other termination of the contract.

2.112.064 Waiver

The City Manager may grant a waiver to anyone who or which has submitted a request for waiver if it is objectively reasonable; and the City Manager, or a delegate, shall report promptly in writing to the City Council all action taken with respect to every request for a waiver and the reasons for the decision.

2.112.065 Applicability

If any provision of these sections imposes greater restrictions or obligations than those imposed by any other general law, special law, regulation, rule, ordinance, order, or policy then the provisions of these sections shall control.

In City Council January 28, 2008.

Passed to be ordained by a ye and nay vote:

- Yeas 9; Nays 0; Absent 0.

Attest:- D. Margaret Drury, City Clerk.

A true copy;

ATTEST:-

D. Margaret Drury
City Clerk

END OF SECTION 00222

SECTION 00300ADD1
FORM FOR GENERAL BID

To the Awarding Authority: CITY OF CAMBRIDGE, MASSACHUSETTS

A. The undersigned proposes to furnish all labor and materials required for

**Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface
Improvements Project
CWSRF-3819
CAMBRIDGE, MA**

in accordance with the accompanying plans and specifications including all Labor and Materials, for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

The bidder may utilize subcontractors' qualifications for responding to the quality requirements. However, the bidder is specifically advised that any person, firm or other party to whom it proposes to award a subcontract under the terms of this contract must be acceptable to the owner and to the Commonwealth of Massachusetts.

Bidding procedures shall be accordance with M.G.L. c. 30, §39M (a) and (c), as most recently amended, and all other applicable laws.

B. QUALITY REQUIREMENTS

The City of Cambridge will reject any bid that does not meet the quality requirements. A "no" response or a failure to adequately respond to any of the following quality requirements will result in a rejection of your bid.

- 1. Bidder has been in the business of performing reconstruction of sewers, drains, water mains, sidewalks, and roadways for municipalities or public utilities for at least ten (10) years. YES NO
- 2. Bidder has equipment and personnel available to respond within four (4) hours to emergency calls relating to work of this contract 24 hours a day, 7 days a week, throughout the contract period. YES NO

P. GIOIOSO & SONS, INC.

Bidder's Name _____

3. Bidder has evaluated its current project workload and determined that it has the capacity, through its current professional and labor workforce, to begin the contract within ten days following the date set forth in the Notice to Proceed. YES NO
4. The Bidder has reviewed the labor, equipment, and capacity requirements for its projected workload in Year(s) 2013-2016 and has determined that the Bidder has the resources to perform the work proposed in the Concord Ave Neighborhood and Surface Improvements Project. YES NO
- C. This bid includes addenda numbered 1, 2, 3
- D. The bidder hereby agrees to commence work under this Contract on or before ten (10) days following receipt of a written "Notice To Proceed", by the Owner, and to fully complete all work of Milestone 1, by December 31, 2015 and Milestone 2 within 907 calendar days from the date in the "Notice to Proceed". Milestone requirements are described in Specification Section 00200 Invitation to Bid.
- E. Liquidated damages specified in this contract are \$5,240.00 per day for each calendar day beyond the December 31, 2015 for all work described as Milestone Number 1 that remains uncompleted; and \$2,260.00 per day for each calendar day beyond the 907 calendar days from date set forth in the "Notice to Proceed" for all work described as Milestone Number 2. Fines, penalties or other such penalties that will be assessed upon the City if the work described as Milestone Number 1 is not completed by December 31, 2015 are in addition to the liquidated damages described above.
- F. Proposed **BID** Price is Twenty four million one hundred eighty - five thousand three hundred forty nine and 25/100
 (Amount in Words)
24,185,349.25
 (\$ _____).
 (Amount in Figures)
- G. The subdivision of the Proposed Contract Price is as follows: (All quantities are approximate)
- H. Items 2080.1 through 2095.10, and 2534.1 contain the minimum unit prices. The Contractor shall add to this value an adjustment to provide the final unit price bid for the respective item. The final unit price bid shall be the sum of the minimum unit price and the Bidders additional price. Insertion of 0 is allowable. In that case, the final unit cost will be the minimum unit cost.

(SEE FOLLOWING PAGES)

Bidder's Name P. GIOIOSO & SONS, INC.

SRF ELIGIBLE BID ITEMS

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
1200.1	1	Lump Sum	Temporary Utility Support and Coordination (\$ <u>350,000.00</u>) Per Lump Sum	\$ <u>350,000.00</u>
1200.2	n/a	Allowance	Survey Construction Layout and Baseline, As-builts (\$ <u>100,000.00</u>) Allowance	\$ <u>100,000.00</u>
1311.1	n/a	Allowance	Project Schedule Allowance (\$ <u>125,000.00</u>) Allowance	\$ <u>125,000.00</u>
1390.1	100	Each	Internal Preconstruction Video Building Inspection (\$ <u>Four hundred 00/100</u>) Each	\$ <u>40,000.00</u>
1400.1	n/a	Allowance	Quality Control and Testing Allowance (\$ <u>85,000.00</u>) Allowance	\$ <u>85,000.00</u>
1500.1	n/a	Allowance	CAM 004 Program Owner's Field office (\$ <u>300,000.00</u>) Allowance	\$ <u>300,000.00</u>
1505.1	1	Lump Sum	Mobilization (\$ <u>450,000.00</u>) Per Lump Sum	\$ <u>450,000.00</u>
1568.1	1	Lump Sum	Sedimentation and Erosion Control (\$ <u>25,000.00</u>) Per Lump Sum	\$ <u>25,000.00</u>
1570.1	1	Lump Sum	Traffic and Pedestrian Management (\$ <u>600,000.00</u>) Per Lump Sum	\$ <u>600,000.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-3

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
1570.2	520	Unit Week	Remote Controlled Changeable Message Board (\$ <u>50.00</u>) Per Unit Week	\$ <u>26,000.00</u>
2010.1	3	Each	Monitoring Well (\$ <u>31,000.00</u>) Per Each	\$ <u>93,000.00</u>
2010.2	4	Each	Geotechnical Boring for Traffic Signal (\$ <u>1,500.00</u>) Per Each	\$ <u>6,000.00</u>
2015.1	1	Lump Sum	Vibration Monitoring (\$ <u>69,000.00</u>) Per Lump Sum	\$ <u>69,000.00</u>
2015.2	100	Each	Building or Structure Monitoring Points (\$ <u>50.00</u>) Per Each	\$ <u>5,000.00</u>
2015.3	75	Each	Ground and Utility Monitoring Points (\$ <u>50.00</u>) Per Each	\$ <u>3,750.00</u>
2051.1	3,040	Ton	Disposal of Construction Debris as Solid Waste (\$ <u>15.00</u>) Per Ton	\$ <u>45,600.00</u>
2051.2	16,700	Ton	Disposal of Bituminous Concrete (\$ <u>0.01</u>) Per Ton	\$ <u>167.00</u>
2051.3	92	Each	Demolition or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure (\$ <u>300.00</u>) Per Each	\$ <u>27,600.00</u>
2051.4	44	Each	Abandon In Place Manhole, Catch Basin or Other Structure (\$ <u>300.00</u>) Per Each	\$ <u>13,200.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-4

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2051.5	620	Linear Foot	Abandon in Place Pipe - 15-inch Diameter Through 48-Inch Diameter (\$ <u>25.00</u>) Per Linear Foot	\$ <u>15,500.00</u>
2051.6	1,175	Linear Foot	Demolition or Removal of Pipe 15-Inch through 24-Inch Pipe Diameter (\$ <u>10.00</u>) Per Linear Foot	\$ <u>11,750.00</u>
2051.7	1,250	Linear Foot	Demolition or Removal of Pipe Greater than 24-Inch Pipe Diameter (\$ <u>10.00</u>) Per Linear Foot	\$ <u>12,500.00</u>
2051.8	1	Lump Sum	Drain Vault No. 5 Structure Modifications (\$ <u>43,000.00</u>) Per Lump Sum	\$ <u>43,000.00</u>
2051.9	3	Each	Hydroslide Removal (\$ <u>10,000.00</u>) Per Each	\$ <u>30,000.00</u>
2051.10	3	Each	Weir Removal (\$ <u>10,000.00</u>) Per Each	\$ <u>30,000.00</u>
2051.11	1	Lump Sum	MWRA Wheeler Street Structure Modifications (\$ <u>24,000.00</u>) Per Lump Sum	\$ <u>24,000.00</u>
2051.12	1	Lump Sum	Bending Weir Structure Modifications (\$ <u>10,000.00</u>) Per Lump Sum	\$ <u>10,000.00</u>
2051.13	4	Each	Masonry Plug or Bulkhead for Pipe Greater than 30-inch Diameter (\$ <u>3,000.00</u>) Per Each	\$ <u>12,000.00</u>
2051.14	1,200	Linear Foot	Modification to Existing Piles (\$ <u>35.00</u>) Per Linear Foot	\$ <u>42,000.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-5

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2051.15	1	Lump Sum	Concrete Fill Removal at 54-inch dia RCP Drain (\$ <u>19,000.00</u>) Per Lump Sum	\$ <u>19,000.00</u>
2076.1	60	Linear Foot	Excavation, Removal, and Disposal of Asbestos Cement Pipe (Up to 16" Dia) (\$ <u>45.00</u>) Per Linear Foot	\$ <u>2,700.00</u>
2080.1	1	Lump Sum	OHM - Soil and Waste Management (\$30,000 + <u>770,000.00</u> = <u>800,000.00</u>) Per Lump Sum	\$ <u>800,000.00</u>
2080.2	50	Ton	OHM - Handling Asbestos - Contaminated Soil/Fill (\$50.00 + <u>0</u> = <u>50.00</u>) Per Ton	\$ <u>2,500.00</u>
2080.3	50	Ton	OHM - Handle and Characterize Unknown Materials (\$55.00 + <u>0</u> = <u>55.00</u>) Per Ton	\$ <u>2,750.00</u>
2095.1	10,800	Ton	OHM - Disposal of Soil - Less Than RCS-1 (Class A-1 and A-2) (\$10.00 + <u>15.00</u> = <u>25.00</u>) Per Ton	\$ <u>270,000.00</u>
2095.2	24,500	Ton	OHM - Disposal of Soil - Daily Cover Unlined Landfill (Class B-1) (\$27.00 + <u>0</u> = <u>27.00</u>) Per Ton	\$ <u>661,500.00</u>
2095.3	18,000	Ton	OHM - Disposal of Soil - Daily Cover Lined Landfill (Class B-2) (\$30.00 + <u>0</u> = <u>30.00</u>) Per Ton	\$ <u>540,000.00</u>
2095.4	300	Ton	OHM - Disposal of Soil - Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) (\$32.00 + <u>0</u> = <u>32.00</u>) Per Ton	\$ <u>9,600.00</u>
2095.5	300	Ton	OHM - Disposal of Soil - Non-Hazardous Solid Waste Thermal Treatment (Class B-4) (\$40.00 + <u>0</u> = <u>40.00</u>) Per Ton	\$ <u>12,000.00</u>
2095.6	300	Ton	OHM - Disposal of Soil - Non-Hazardous Solid Waste (Class B-5) (\$50.00 + <u>0</u> = <u>50.00</u>) Per Ton	\$ <u>15,000.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADDI-6

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2095.7	300	Ton	OHM - Disposal of Soil With Debris - Non-Hazardous Solid Waste Disposal (Class B-6) (\$80.00 + <u>0 = 50.00</u>) Per Ton	\$ <u>24,000.00</u>
2095.8	2370	Ton	OHM - Disposal of Soil - Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Disposal of Soil as Non-Hazardous Waste (Class C-1) (\$80.00 + <u>0 = 80.00</u>) Per Ton	\$ <u>189,600.00</u>
2095.9	2370	Ton	OHM - Disposal of Soil - RCRA Hazardous Waste (Class C-2) (\$100.00 + <u>0 = 100.00</u>) Per Ton	\$ <u>237,000.00</u>
2095.10	300	Ton	OHM - Disposal of Special Waste (\$80.00 + <u>0 = 80.00</u>) Per Ton	\$ <u>24,000.00</u>
2100.1	1	Lump Sum	Tree Protection and Maintenance (\$ <u>123,500.00</u>) Per Lump Sum	\$ <u>123,500.00</u>
2100.2	30	Each	Tree Removal (\$ <u>600.00</u>) Per Each	\$ <u>18,000.00</u>
2100.3	11	Each	Stump Removal (\$ <u>500.00</u>) Per Each	\$ <u>5,500.00</u>
2100.4	4	Each	Back of Sidewalk Property Tree Removal (\$ <u>700.00</u>) Per Each	\$ <u>2,800.00</u>
2100.5	4	Each	Private Shrub Removal (\$ <u>300.00</u>) Per Each	\$ <u>1,200.00</u>
2140.1	400	Day	Treatment of Construction Dewatering (\$ <u>0.01</u>) Per Day	\$ <u>4.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-7

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2210.1	3,200	Cubic Yard	Test Pits (\$ <u>0,01</u>) Per Cubic Yard	\$ <u>32,00</u>
2210.2	1,500	Cubic Yard	Control Density Fill for Backfill (\$ <u>0,01</u>) Per Cubic Yard	\$ <u>15,00</u>
2210.3	14,400	Cubic Yard	Gravel Sub-base (\$ <u>0,01</u>) Per Cubic Yard	\$ <u>144,00</u>
2210.4	1,200	Cubic Yard	Overexcavation of Geotechnically Unsuitable (\$ <u>0,01</u>) Per Cubic Yard	\$ <u>12,00</u>
2210.5	14,000	Cubic Yard	Unclassified Excavation (\$ <u>0,01</u>) Per Cubic Yard	\$ <u>140,00</u>
2210.6	14,400	Cubic Yard	Roadway Earth Excavation (\$ <u>69,00</u>) Per Cubic Yard	\$ <u>993,600,00</u>
2252.1	100	Each	Type 1 - Manhole - Precast 4-Foot Diameter (\$ <u>5,000,00</u>) Per Each	\$ <u>500,000,00</u>
2252.2	5	Each	Type 1 - Manhole - Precast 5-Foot Diameter (\$ <u>11,000,00</u>) Per Each	\$ <u>55,000,00</u>
2252.3	7	Each	Type 1 - Manhole - Precast 6-Foot Diameter (\$ <u>14,000,00</u>) Per Each	\$ <u>98,000,00</u>
2252.4	2	Each	Type 3 - External Drop Manhole - Precast 4-Foot Diameter (\$ <u>6,300,00</u>) Per Each	\$ <u>12,600,00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-8

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2252.5	13	Each	Type 4 - Sump Manhole - Precast 4-Foot Diameter (\$ <u>6,500.00</u>) Per Each	\$ <u>84,500.00</u>
2252.6	1	Each	Type 4 - Sump Manhole - Precast 6-Foot Diameter (\$ <u>15,000.00</u>) Per Each	\$ <u>15,000.00</u>
2252.7	1	Each	Type 4 - Sump Manhole - Precast 8-Foot Diameter (\$ <u>25,000.00</u>) Per Each	\$ <u>25,000.00</u>
2252.8	6	Each	Type 6 - Manhole - Precast 4-Foot Manhole Over Existing Utility (\$ <u>6,500.00</u>) Per Each	\$ <u>39,000.00</u>
2252.9	9	Each	Type 7 - Square Manhole - Precast 3-Foot by 4-Foot (\$ <u>9,000.00</u>) Per Each	\$ <u>81,000.00</u>
2252.10	65	Each	Existing Drainage or Sewer Structure Adjusted (\$ <u>260.00</u>) Per Each	\$ <u>16,900.00</u>
2252.11	13	Each	Manhole - Remove and Replace Existing Frame and Cover (\$ <u>700.00</u>) Per Each	\$ <u>9,100.00</u>
2500.1	7,010	Ton	Hot Mix Asphalt Base Course - Trench Width (\$ <u>85.00</u>) Per Ton	\$ <u>595,850.00</u>
2500.2	4,800	Square Yard	Temporary 2-inch Overlay (\$ <u>10.00</u>) Per Square Yard	\$ <u>48,000.00</u>
2500.3	9,660	Ton	Hot Mix Asphalt Base Course - Full Width (\$ <u>82.00</u>) Per Ton	\$ <u>792,120.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-9

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2500.4	5,580	Ton	Hot Mix Asphalt Top Course -- Full Width (\$ <u>95.00</u>) Per Ton	\$ <u>530,100.00</u>
2500.5	100	Ton	Hand Placed Hot Mix Asphalt (\$ <u>240.00</u>) Per Ton	\$ <u>24,000.00</u>
2500.6	750	Square Yard	Cold Plane 2-inch, Full Width (\$ <u>15.00</u>) Per Square Yard	\$ <u>11,250.00</u>
2500.7	43,100	Square Yard	Final Grading Sub-base Under Roadways (\$ <u>4.00</u>) Per Square Yard	\$ <u>172,400.00</u>
2500.8	13,231	Linear Foot	Hot Poured Rubberized Asphalt Sealer (\$ <u>3.25</u>) Per Linear Foot	\$ <u>43,000.75</u>
2500.9	550	Linear Foot	Hot Mix Asphalt Infrared Pavement Sealing (\$ <u>22.00</u>) Per Linear Foot	\$ <u>12,100.00</u>
2500.10	750	Square Foot	Rubber Paving Surface (\$ <u>32.00</u>) Per Square Foot	\$ <u>24,000.00</u>
2510.1	600	Square Yard	Hot Mix Asphalt Porous Paving (36" Depth, 6' Width) (\$ <u>50.00</u>) Per Square Yard	\$ <u>30,000.00</u>
2510.2	815	Square Yard	Hot Mix Asphalt Porous Paving (36" Depth, 2' Width) (\$ <u>50.00</u>) Per Square Yard	\$ <u>40,750.00</u>
2510.3	1,425	Cubic Yard	Porous Paving Trench Excavation (\$ <u>80.00</u>) Per Cubic Yard	\$ <u>114,000.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-10

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2510.4	5	Each	Independent Laboratory Testing of Hot Mix Asphalt Porous Paving Mix (\$ <u>400.00</u>) Per Each	\$ <u>2,000.00</u>
2524.1	9,560	Square Yard	4-inch Cement Concrete Sidewalks (\$ <u>60.00</u>) Per Square Yard	\$ <u>573,600.00</u>
2524.2	5,620	Square Yard	6-inch Cement Concrete Sidewalks at Driveways (\$ <u>70.00</u>) Per Square Yard	\$ <u>393,400.00</u>
2524.3	3,820	Square Yard	6-inch Cement Concrete at Pedestrian Ramps and Intersections (\$ <u>85.00</u>) Per Square Yard	\$ <u>324,700.00</u>
2524.4	9,550	Linear Foot	Remove and Reset/Relocate Granite Curb (Straight and Curved) (\$ <u>46.00</u>) Per Linear Foot	\$ <u>439,300.00</u>
2524.5	9,400	Linear Foot	Remove and Discard Granite Curb (Straight and Curved) (\$ <u>14.00</u>) Per Linear Foot	\$ <u>131,600.00</u>
2524.6	11,370	Linear Foot	New Granite Curb Type VA 4 (Straight and Curved) (\$ <u>70.00</u>) Per Linear Foot	\$ <u>795,900.00</u>
2524.7	3,750	Linear Foot	New Granite Transition Curb for Pedestrian Ramps, Driveways (Straight and Curved) (\$ <u>75.00</u>) Per Linear Foot	\$ <u>281,250.00</u>
2524.8	1,560	Linear Foot	New Granite Curb Type VA 3 for Back of Sidewalks and Raised Crosswalks (\$ <u>70.00</u>) Per Linear Foot	\$ <u>109,200.00</u>
2524.9	200	Linear Foot	New Concrete Curb (\$ <u>65.00</u>) Per Linear Foot	\$ <u>13,000.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-11

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2524.10	52	Each	Granite Curb Corner - 2-Ft Curb Corner (\$ <u>350.00</u>) Per Each	\$ <u>15,600.00</u>
2524.11	1,900	Square Foot	Cast-in-Place Detectable Tile (\$ <u>57.00</u>) Per Square Foot	\$ <u>108,300.00</u>
2524.12	780	Square Yard	Concrete Pavers on Hot Mix Asphalt (\$ <u>240.00</u>) Per Square Yard	\$ <u>187,200.00</u>
2524.13	250	Square Yard	Hot Mix Asphalt - Multi-Use Path (\$ <u>100.00</u>) Per Square Yard	\$ <u>25,000.00</u>
2524.14	560	Square Yard	Hot Mix Asphalt - Walkway (\$ <u>80.00</u>) Per Square Yard	\$ <u>44,800.00</u>
2534.1	30	Each	Building Site Pre-Inspection (\$200.00 + <u>500.00</u>) Per Each	\$ <u>21,000.00</u>
2534.2	41	Each	Building Dye Testing (\$ <u>300.00</u>) Per Each	\$ <u>12,300.00</u>
2534.3	45	Each	Private Service Lateral Investigations (\$ <u>1,000.00</u>) Per Each	\$ <u>45,000.00</u>
2555.1	2	Each	Catch Basin Lining (\$ <u>3,500.00</u>) Per Each	\$ <u>7,000.00</u>
2577.1	16,900	Linear Foot	4-inch to 8-inch ReflectORIZED Pavement Markings - Yellow and White Thermoplastic (\$ <u>1.00</u>) Per Linear Foot	\$ <u>16,900.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADDI-12

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2577.2	75	Each	Embedded Reflectors (\$ <u>30.00</u>) Per Each	\$ <u>2,250.00</u>
2577.3	2,065	Square Foot	Pavement Arrows and Legends Refl. White (Thermoplastic) (\$ <u>6.00</u>) Per Square Foot	\$ <u>12,390.00</u>
2577.4	9,455	Square Foot	Crosswalks and Stop Lines Refl. White (Thermoplastic) (\$ <u>2.50</u>) Per Square Foot	\$ <u>23,637.50</u>
2577.5	1,570	Square Foot	High Friction Surface Treatment (\$ <u>15.00</u>) Per Square Foot	\$ <u>23,550.00</u>
2590.1	1	Each	Renew Private lateral Connection at Existing Brick Pipe (\$ <u>3,500.00</u>) Per Each	\$ <u>3,500.00</u>
2604.1	63	Each	Catch Basin - Type 1 Single Grate (4-Foot Diameter) (\$ <u>5,800.00</u>) Per Each	\$ <u>365,400.00</u>
2604.2	5	Each	Catch Basin - Type 2 Double Grate (5-Foot Diameter) (\$ <u>7,500.00</u>) Per Each	\$ <u>37,500.00</u>
2604.3	10	Each	Catch Basin - Type 3 Single Grate (3'x4' Square) (\$ <u>8,500.00</u>) Per Each	\$ <u>85,000.00</u>
2604.4	12	Each	Catch Basin - Type 4 Double Grate (3'x4' Square) (\$ <u>9,500.00</u>) Per Each	\$ <u>114,000.00</u>
2604.5	27	Each	Catch Basin - Type 5 Direct Inlet (\$ <u>2,000.00</u>) Per Each	\$ <u>54,000.00</u>
2604.6	2	Each	Catch Basin - Remove and Replace Existing Frame and Grate (\$ <u>700.00</u>) Per Each	\$ <u>1,400.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-13

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2604.7	2	Each	Private Exterior Infiltrating Drywell (\$ <u>5,000.00</u>) Per Each	\$ <u>10,000.00</u>
2604.8	1	Each	Private Exterior Trench Drain (\$ <u>3,200.00</u>) Per Each	\$ <u>3,200.00</u>
2609.1	30	Linear Foot	Pipe - RCP (Gravity) 27-inch (\$ <u>276.00</u>) Per Linear Foot	\$ <u>8,280.00</u>
2609.2	140	Linear Foot	Pipe - RCP (Gravity) 30-inch (\$ <u>352.00</u>) Per Linear Foot	\$ <u>44,280.00</u>
2609.3	340	Linear Foot	Pipe - RCP (Gravity) 36-inch (\$ <u>404.00</u>) Per Linear Foot	\$ <u>137,360.00</u>
2609.4	705	Linear Foot	Pipe - RCP (Gravity) 48-inch (\$ <u>598.00</u>) Per Linear Foot	\$ <u>421,560.00</u>
2615.1	690	Linear Foot	Pipe - DIP (Gravity) 12-inch (\$ <u>226.00</u>) Per Linear Foot	\$ <u>155,940.00</u>
2615.2	30	Linear Foot	Pipe - DIP (Gravity) 8-inch (\$ <u>234.00</u>) Per Linear Foot	\$ <u>7,020.00</u>
2622.1	4,430	Linear Foot	Pipe - PVC (Gravity) 6-inch Perforated Underdrain (\$ <u>25.00</u>) Per Linear Foot	\$ <u>110,750.00</u>
2622.2	245	Linear Foot	Pipe - PVC (Gravity) 6-inch (\$ <u>94.00</u>) Per Linear Foot	\$ <u>23,030.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-14

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2622.3	4,185	Linear Foot	Pipe - PVC (Gravity) 8-inch (\$ <u>248.00</u>) Per Linear Foot	\$ <u>1,037,880.00</u>
2622.4	605	Linear Foot	Pipe - PVC (Gravity) 10-inch (\$ <u>262.00</u>) Per Linear Foot	\$ <u>158,510.00</u>
2622.5	2,760	Linear Foot	Pipe - PVC (Gravity) 12-inch (\$ <u>276.00</u>) Per Linear Foot	\$ <u>761,760.00</u>
2622.6	5,385	Linear Foot	Pipe - PVC (Gravity) 15-inch (\$ <u>285.00</u>) Per Linear Foot	\$ <u>1,534,725.00</u>
2622.7	95	Linear Foot	Pipe - PVC (Gravity) 18-inch (\$ <u>305.00</u>) Per Linear Foot	\$ <u>28,975.00</u>
2622.8	2,240	Linear Foot	Reconnect, Repair or Relocate Existing Sanitary Sewer and Storm Drain Laterals (\$ <u>89.00</u>) Per Linear Foot	\$ <u>199,360.00</u>
2622.9	2	Each	Dig and Replace Spot Repair - 10-inch PVC Sanitary Sewer (\$ <u>8,000.00</u>) Per Each	\$ <u>16,000.00</u>
2622.10	1	Each	Dig and Replace Spot Repair - 10-inch PVC Storm Drain (\$ <u>8,000.00</u>) Per Each	\$ <u>8,000.00</u>
2622.11	715	Linear Foot	New Public Drain Lateral to Storm Drain, Capped at Property Line (\$ <u>83.00</u>) Per Linear Foot	\$ <u>59,345.00</u>
2622.12	35	Linear Foot	New Public Sanitary Lateral to Sanitary Sewer, Capped at Property Line (\$ <u>138.00</u>) Per Linear Foot	\$ <u>4,830.00</u>

P. GIOIOSO & SONS

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-15

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2622.13	925	Linear Foot	Private Exterior 6" PVC Drain or Sanitary Pipe (\$ <u>94.00</u>) Per Linear Foot	\$ <u>86990.00</u>
2622.14	326	Linear Foot	Private Exterior 8" PVC Drain or Sanitary Pipe (\$ <u>97.00</u>) Per Linear Foot	\$ <u>31622.00</u>
2622.15	60	Linear Foot	Private Exterior 10" PVC Drain or Sanitary Pipe (\$ <u>70.00</u>) Per Linear Foot	\$ <u>4200.00</u>
2622.16	13	Linear Foot	Private Exterior 12" PVC Drain or Sanitary Pipe (\$ <u>125.00</u>) Per Linear Foot	\$ <u>1625.00</u>
2622.17	1	Each	Private Exterior PVC Cleanout (\$ <u>850.00</u>) Per Each	\$ <u>850.00</u>
2622.18	9	Each	Private Exterior Downspout Disconnect/Reconnect (\$ <u>200.00</u>) Per Each	\$ <u>1800.00</u>
2630.1	25	Linear Foot	Pipe - DI (Water) 4-inch (\$ <u>90.00</u>) Per Linear Foot	\$ <u>2250.00</u>
2630.2	450	Linear Foot	Pipe - DI (Water) 6-inch (\$ <u>135.00</u>) Per Linear Foot	\$ <u>60750.00</u>
2630.3	7,770	Linear Foot	Pipe - DI (Water) 8-inch (\$ <u>184.00</u>) Per Linear Foot	\$ <u>1,429,680.00</u>
2630.4	2,075	Linear Foot	Pipe - DI (Water) 12-inch (\$ <u>250.00</u>) Per Linear Foot	\$ <u>518,750.00</u>

P. GIULIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-16

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2630.5	35	Linear Foot	Pipe - DI (Water) 20-inch (\$ <u>504.00</u>) Per Linear Foot	\$ <u>17,640.00</u>
2630.6	23,100	Pound	Fittings, Couplings, and Restraints (\$ <u>0.01</u>) Per Pound	\$ <u>231.00</u>
2640.1	10	Each	1 1/2-in to 2-in Gate Valve and Gate Box (\$ <u>350.00</u>) Per Each	\$ <u>3,500.00</u>
2640.2	1	Each	4-in Gate Valve and Gate Box (\$ <u>900.00</u>) Per Each	\$ <u>900.00</u>
2640.3	24	Each	6-in Gate Valve and Gate Box (\$ <u>1,100.00</u>) Per Each	\$ <u>26,400.00</u>
2640.4	36	Each	8-in Gate Valve and Gate Box (\$ <u>1,600.00</u>) Per Each	\$ <u>57,600.00</u>
2640.5	28	Each	12-in Gate Valve and Gate Box (\$ <u>3,000.00</u>) Per Each	\$ <u>84,000.00</u>
2645.1	24	Each	New Hydrant (\$ <u>4,000.00</u>) Per Each	\$ <u>96,000.00</u>
2645.2	22	Each	Remove and Dispose of Existing Hydrant (\$ <u>500.00</u>) Per Each	\$ <u>11,000.00</u>
2645.3	7	Each	Remove and Relocate Existing Hydrant (\$ <u>1,500.00</u>) Per Each	\$ <u>10,500.00</u>
2660.1	3,100	Linear Foot	1-in to 3-in Water Service Replacement (\$ <u>90.00</u>) Per Linear Foot	\$ <u>279,000.00</u>

Bidder's Name P. GIOIOSO & SONS, INC.

Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-17

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2660.2	20	Each	Transfer Existing Water Service to Existing Water Main (\$ <u>5,100.00</u>) Per Each	\$ <u>102,000.00</u>
2685.1	13,700	Linear Foot	Temporary Water Bypass Piping (\$ <u>15.00</u>) Per Linear Foot	\$ <u>205,500.00</u>
2711.1	800	Linear Foot	Clean and Line Exist. 20-inch Water Main (\$ <u>114.00</u>) Per Linear Foot	\$ <u>91,200.00</u>
2712.1	1	Lump Sum	Illicit Connection Survey (Entire Project Area) (\$ <u>76,000.00</u>) Per Lump Sum	\$ <u>76,000.00</u>
2760.1	1	Lump Sum	Cleaning of Drain Vault No. 5 (\$ <u>54,000.00</u>) Per Lump Sum	\$ <u>54,000.00</u>
2760.2	1	Lump Sum	Cleaning of Box Culvert Combined Sewer (\$ <u>46,000.00</u>) Per Lump Sum	\$ <u>46,000.00</u>
2761.1	1	Lump Sum	Flow Bypass (\$ <u>149,000.00</u>) Per Lump Sum	\$ <u>149,000.00</u>
2767.1	1,450	Linear Foot	Cured-in-Place Pipelining – 8-inch Sanitary Sewer (\$ <u>35.00</u>) Per Linear Foot	\$ <u>50,750.00</u>
2767.2	800	Linear Foot	Cured-in-Place Pipelining – 10-inch Sanitary Sewer (\$ <u>53.00</u>) Per Linear Foot	\$ <u>42,400.00</u>
2767.3	180	Linear Foot	Cured-in-Place Pipelining – 10-inch Storm Drain (\$ <u>70.00</u>) Per Linear Foot	\$ <u>12,600.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-18

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2767.4	460	Linear Foot	Cured-in-Place Pipelining - 15-inch Storm Drain (\$ <u>754.00</u>) Per Linear Foot	\$ <u>34,580.00</u>
2767.5	213	Linear Foot	Cured-in-Place Pipelining - 18-inch Storm Drain (\$ <u>984.00</u>) Per Linear Foot	\$ <u>20,874.00</u>
2767.6	465	Linear Foot	Cured-in-Place Pipelining - 24-inch by 26-inch Storm Drain (\$ <u>1754.00</u>) Per Linear Foot	\$ <u>81,375.00</u>
2767.7	500	Linear Foot	Cured-in-Place Pipelining - 27-inch by 29-inch Storm Drain (\$ <u>1854.00</u>) Per Linear Foot	\$ <u>92,500.00</u>
2890.1	1	Lump Sum	Traffic Signal Reconstruction - Location 1- Huron Avenue at Concord Ave (\$ <u>130,500.00</u>) Per Lump Sum	\$ <u>130,500.00</u>
2890.2	1	Lump Sum	Traffic Signal Reconstruction - Location 2- Walden Street at Concord Ave (\$ <u>98,000.00</u>) Per Lump Sum	\$ <u>98,000.00</u>
2890.3	1	Lump Sum	Traffic Signal Reconstruction - Location 3- Alpine Street at Concord Ave (\$ <u>30,000.00</u>) Per Lump Sum	\$ <u>30,000.00</u>
2890.4	1	Lump Sum	Traffic Signal Reconstruction - Location 4- Walden Street at Garden Street (\$ <u>55,000.00</u>) Per Lump Sum	\$ <u>55,000.00</u>
2890.5	10	Vertical Foot	Mast Arm Footing Cost Adjustment (\$ <u>125.00</u>) Per Vertical Foot	\$ <u>1,250.00</u>
2900.1	1	Lump Sum	Planting Area: Birch Street Area A (CL-3) (\$ <u>25,000.00</u>) Per Lump Sum	\$ <u>25,000.00</u>

P. GIOIOSO & SONS INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-19

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2900.2	1	Lump Sum	Planting Area: Birch Street Area B (CL-3) (\$ <u>2,500.00</u>) Per Lump Sum	\$ <u>2,500.00</u>
2900.3	1	Lump Sum	Planting Area: Birch Street Area C (CL-3) (\$ <u>6,200.00</u>) Per Lump Sum	\$ <u>6,200.00</u>
2900.4	1	Lump Sum	Planting Area: Birch Street Area D (CL-3) (\$ <u>6,300.00</u>) Per Lump Sum	\$ <u>6,300.00</u>
2900.5	1	Lump Sum	Planting Area: Fern Street Area A (CL-4) (\$ <u>6,400.00</u>) Per Lump Sum	\$ <u>6,400.00</u>
2900.6	1	Lump Sum	Planting Area: Fern Street Area B (CL-4) (\$ <u>2,800.00</u>) Per Lump Sum	\$ <u>2,800.00</u>
2900.7	1	Lump Sum	Planting Area: Fern Street Area C (CL-4) (\$ <u>5,500.00</u>) Per Lump Sum	\$ <u>5,500.00</u>
2900.8	1	Lump Sum	Planting Area: Corporal Burns Road Area D (CL-4) (\$ <u>6,100.00</u>) Per Lump Sum	\$ <u>6,100.00</u>
2900.9	1	Lump Sum	Planting Area: Hazel Street/Field Street Area A (CL-5) (\$ <u>6,100.00</u>) Per Lump Sum	\$ <u>6,100.00</u>
2900.10	1	Lump Sum	Planting Area: Hazel Street/Field Street Area B (CL-5) (\$ <u>4,500.00</u>) Per Lump Sum	\$ <u>4,500.00</u>

P GIOIOSO & SONS, INC.

Bidder's Name _____
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-20

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2900.11	1	Lump Sum	Planting Area: Alpine Street/ Field Street Area C (CL-5) (\$ <u>24,500.00</u>) Per Lump Sum	\$ <u>24,500.00</u>
2900.12	1	Lump Sum	Planting Area: Walden Street/ Garden Street Area A (CL-6) (\$ <u>2,500.00</u>) Per Lump Sum	\$ <u>2,500.00</u>
2900.13	1	Lump Sum	Planting Area: Walden Street/ Garden Street Area B (CL-6) (\$ <u>15,000.00</u>) Per Lump Sum	\$ <u>15,000.00</u>
2900.14	1	Lump Sum	Planting Area: Fayerweather Street/ Saville Street Area A (CL-6) (\$ <u>8,500.00</u>) Per Lump Sum	\$ <u>8,500.00</u>
2902.1	420	Cubic Yard	Structural Planting Medium (\$ <u>112.00</u>) Per Cubic Yard	\$ <u>47,040.00</u>
2905.1	1	Lump Sum	Biobasin I (\$ <u>105,000.00</u>) Per Lump Sum	\$ <u>105,000.00</u>
2910.1	69	Each	Street Tree (Type I) (\$ <u>810.00</u>) Per Each	\$ <u>55,890.00</u>
2910.2	43	Each	Street Tree (Type II) (\$ <u>800.00</u>) Per Each	\$ <u>34,400.00</u>
2910.3	44	Each	Private Back of Sidewalk Tree (\$ <u>740.00</u>) Per Each	\$ <u>32,560.00</u>
2910.4	28	Each	Private Back of Sidewalk Shrub/Bush (\$ <u>85.00</u>) Per Each	\$ <u>2,380.00</u>

P. GIOIOSO & SONS INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-21

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2950.1	270	Square Yard	Hardscape Back of Sidewalk Restoration (\$ <u>55,00</u>) Per Square Yard	\$ <u>14,850,00</u>
2950.2	1,290	Square Yard	Asphalt Back of Sidewalk Restoration (\$ <u>45,00</u>) Per Square Yard	\$ <u>58,050,00</u>
2950.3	440	Square Yard	Landscape Back of Sidewalk Restoration (\$ <u>30,00</u>) Per Square Yard	\$ <u>13,200,00</u>
2980.1	1,600	Square Foot	Warning - Regulatory and Route Marker - Aluminum Panel (Type A) (\$ <u>10,00</u>) Per Square Foot	\$ <u>16,000,00</u>
2980.2	54	Each	Street Name Sign (\$ <u>100,00</u>) Per Each	\$ <u>5,400,00</u>
2980.3	380	Each	Steel Sign Post (\$ <u>100,00</u>) Per Each	\$ <u>38,000,00</u>
2980.4	7	Each	Parking Meter Post (\$ <u>275,00</u>) Per Each	\$ <u>1,925,00</u>
2980.5	400	Linear Foot	Remove and Replace Chain Link Fence (\$ <u>25,00</u>) Per Linear Foot	\$ <u>10,000,00</u>
2980.6	320	Linear Foot	Remove and Replace Ornamental Fence (\$ <u>125,00</u>) Per Linear Foot	\$ <u>40,000,00</u>
2980.7	270	Linear Foot	Private Fence Remove and Reset (\$ <u>25,00</u>) Per Linear Foot	\$ <u>6,750,00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-22

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
2980.8	1	Lump Sum	Side Folding Gate (\$ <u>36,000.00</u>) Per Lump Sum	\$ <u>36,000.00</u>
2980.9	5	Each	Trash /Recycling Combination (\$ <u>7,000.00</u>) Per Each	\$ <u>35,000.00</u>
2980.10	4	Each	Bicycle Ring and Post (\$ <u>900.00</u>) Per Each	\$ <u>3,600.00</u>
2980.11	1	Lump Sum	Pedestrian Bus Shelter (\$ <u>14,000.00</u>) Per Lump Sum	\$ <u>14,000.00</u>
2980.12	2	Each	Bollard (\$ <u>625.00</u>) Per Each	\$ <u>1,250.00</u>
2980.13	2	Each	Removable Aluminum Bollard (\$ <u>850.00</u>) Per Each	\$ <u>1,700.00</u>
2980.14	n/a	Allowance	Fern Street Artscape Installation and Coordination (\$ <u>200,000.00</u>) Allowance	\$ <u>200,000.00</u>
3300.1	14	Each	CIP Concrete Pipe Connection Greater than 24" through 36" Diameter (CIP Field Closure) (\$ <u>8,500.00</u>) Per Each	\$ <u>119,000.00</u>
3315.1	9	Each	Private Cap Exterior Elbows (\$ <u>300.00</u>) Per Each	\$ <u>2,700.00</u>
3410.1	1	Lump Sum	Concord Ave Diversion Structure (5.5' x6.5') (\$ <u>25,000.00</u>) Per Lump Sum	\$ <u>25,000.00</u>

P. GIULIO & SONS

Bidder's Name
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-23

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Numbers	Amount
3410.2	1	Each	Precast Concrete Inlet Oil/Sediment Separator (\$ <u>12,889.00</u>) Per Each	\$ <u>12,889.00</u>
7631.1	45	Linear Foot	Private Gutter Modifications (\$ <u>50.00</u>) Per Linear Foot	\$ <u>2,250.00</u>
7631.2	17	Each	Private Exterior Downspout Cut and Splash (\$ <u>520.00</u>) Per Each	\$ <u>8,840.00</u>
7631.3	24	Linear Foot	Private Exterior New Downspout (\$ <u>80.00</u>) Per Linear Foot	\$ <u>1,920.00</u>
15150.1	1,010	Linear Foot	Building Interior Pipe and Fittings (\$ <u>94.00</u>) Per Linear Foot	\$ <u>94,940.00</u>
15150.2	30	Each	Sump Pump Disconnection/Reconnection (\$ <u>1,300.00</u>) Per Each	\$ <u>39,000.00</u>
15252.1	2	Each	Flap Gate -- 15- inch (\$ <u>9,000.00</u>) Per Each	\$ <u>18,000.00</u>
15150.3	3	Each	Install New Sump Pump (\$ <u>2,500.00</u>) Per Each	\$ <u>7,500.00</u>

P. GIOIOSO & SONS, INC.

Bidder's Name _____
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-24

total amount of **BID** items 1200.1 through 15150.3 based on Engineer's estimate of quantities:

Twenty-four million one hundred eighty-five thousand
three hundred forty-nine - 25/100
(Amount in Words)

24,185,349.25
(Amount in Figures)

Also write the amount of the BID, in words and numbers, in the spaces provided for the on Page 00300-2 of the Form for General Bid.

The Basis of Award will be to the lowest responsible and eligible bidder at the sole discretion of the City of Cambridge.

- I. The undersigned agrees if selected as General Contractor, within ten (10) working days after presentation thereof by the City, the Contractor will:
1. Execute a contract in accordance with the terms of this general bid;
 2. Furnish a performance bond and a labor and materials or payment bond;
 - a. of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the City;
 - b. in the sum of one hundred percent of the contract price;
 - c. premiums for each are to be paid by the General Contractor.
 3. provide an Insurance certificate specifying the City of Cambridge; Massachusetts Water Resources Authority; Kleinfelder; MWH Americas, Inc; HDR Engineering Inc., Bioengineering, Inc. and the owners of private properties requiring inflow removal work listed in Appendix F as **Additional Insured**, complying with the Insurance requirements set forth herein in the General Terms and Conditions of the contract, Article 8.
- J. Bidder understands that the Owner reserves the right to reject any or all bids and to waive any minor informalities in the bidding prices.
- K. Total amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.
- L. The bidder hereby certifies it shall comply with the minority workforce ratios and specific action contained in the Cambridge Employment Plan, the Cambridge Responsible Employer Plan, the Living Wage Ordinance, and the Americans with Disabilities Act. The contractor receiving the award of the contract shall be required to obtain from each of its subcontractors and submit to the contracting or administering agency prior to the performance of any work under said contract a certification by said subcontractor, regardless of tier, that it will comply with same.

Bidder's Name P. GIOIOSO & SONS, P.C.
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-25

- M. The bidder agrees that this bid shall be good and may not be withdrawn for a period of **90** days after the scheduled closing time for receiving bids.
- N. The time period for holding bids, where Federal Approval is required, is 90 days, Saturdays, Sundays and holidays excluded after Federal approval.
- O. The bid security attached in the sum of FIVE PER CENT OF BID
(\$ 5% OF BID) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.
- P. The undersigned certifies that it possesses the skill, ability and integrity necessary for the faithful performance of the work; that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; that all employees to be employed at the 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 who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and 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.
- Q. The undersigned bidder hereby certifies he/she will comply with the specific affirmative action steps contained in the EEO/AA provisions of this Contract, including compliance with the Disadvantaged Business Enterprise provisions as required under these contract provisions. The contractor receiving the award of the contract shall incorporate the EEO/AA provisions of this contract into all subcontracts and purchase orders so that such provisions will be binding upon each subcontractor or vendor.
- R. The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the "person" shall mean any natural person, joint venture, business, partnership, corporation, or other business or legal entity.
- S. Pursuant to M.G.L.c.62C, s49A, the undersigned certifies under the penalties of perjury that the said undersigned, to his/her best knowledge and belief, has filed all state tax returns, paid all State Taxes required under law, and complied with all of the laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.
- T. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth


Bidder's Name P. GIOIOSO & SONS
 Concord
 Conformed Set

FORM FOR GENERAL BID
 00300ADD1-26

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.

- U. Bidders must fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons). Contractors, subcontractors, or suppliers that appear on the Excluded Parties List System at www.epls.gov are not eligible for award of any contracts funded by the Massachusetts State Revolving Fund.

Date DEC 5, 2013

BY: 
(Signature)

P. GIOIOSO & SONS, INC.
(Name of General Bidder)

FRANCESCO GIOIOSO, CEO/TREAS.
(Title)

(Business Address) 50 SPRAGUE STREET
HYDE PARK, MA 02136

(City and State)

Bidder's Name P. GIOIOSO & SONS
Concord
Conformed Set

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Bidder's Name P GIOIOSO & SONS INC.
Concord
Conformed Set

FORM FOR GENERAL BID
00300ADD1-28

CITY OF CAMBRIDGE, MASSACHUSETTS

BID BOND

We, the undersigned P. GIOIOSO & SONS, INC. as Principal, and TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA as Surety, are hereby held and firmly bound unto the CITY OF CAMBRIDGE, a municipality in the County of Middlesex and Commonwealth of Massachusetts, in the penal sum of FIVE PERCENT OF BID Dollars (\$ 5% OF BID), for the payment of which, well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this 5th day of DEC., 2013

THE CONDITION OF THE ABOVE OBLIGATION is such that whereas the Principal has submitted to the City of Cambridge, Massachusetts, a certain bid attached hereto and hereby made a part hereof to enter into a contract in writing for the Cambridge, Massachusetts, Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project.

If the Principal fails to perform their agreement to execute a contract and furnish a performance bond and a labor and materials or payment bond as stated in their bid in accordance with the applicable state statute or fails in all other respects to perform the agreement created by the acceptance of said bid, their bid deposit shall become and be the property of the City of Cambridge as liquidated damages.

If said Bid shall be rejected because of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the Principal, their bid bond shall be returned to their.

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

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

P. GIOIOSO & SONS, INC.
CONTRACTOR AS PRINCIPAL

Francesco Gioioso
(Signature)

FRANCESCO GIOIOSO, CEO/TREAS.
Name and Title:

SEAL

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
SURETY

Kevin Raine
(Signature)

KEVIN RAINE
Name and Title: ATTORNEY IN FACT

SEAL

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SECTION 00311ADD1
MBE FORMS (CITY OF CAMBRIDGE)

MINORITY BUSINESS ENTERPRISE REQUIREMENTS

GENERAL

On June 30, 1983 the City of Cambridge put into effect a city wide Minority Business Enterprise (MBE) Program. To comply with the requirements of this program, a general contractor must submit the appropriate MBE Forms with its bid. The process is explained below. Failure to meet the requirements may result in automatic disqualification of the bidder. Upon request or upon its own initiative, the City may grant an extension of time for submission of the appropriate MBE Forms. Extensions shall be granted only upon a finding by the City that the bidder's failure to submit the appropriate MBE forms was excusable.

PROCEDURE

Steps you should take to comply with the City's MBE requirements are as follows:

1. Secure a copy of the State Office Minority and Women Business Assistance (SOMWBA) Certified Minority/Women Business Directory. Only MBE firms approved by SOMWBA will be accepted by the City of Cambridge.
2. Attempt to develop a bid that includes at least ten percent (10%) of your total bid price in the form of work subcontracted to (or materials purchased from) one or more Minority Businesses.
3. To make the attempt to secure at least 10% Minority business participation, you (the General Contractor) must contact as many of the subcontractors or suppliers in the SOMWBA directory as necessary. Please note that MBE FORM #3 – CONTRACT REQUEST-FOR-EXTENSION and MBE FORM #4 – INFORMATION ON UNSUCCESSFUL MBE CONTACT require you to provide a list of each firm contacted and other related information.
4. If you are successful in securing 10% or more Minority Businesses participation, you must:
 - A. Complete and submit MBE FORM #1 – CONTRACTOR CERTIFICATION OF COMPLIANCE.
 - B. Have your participating Minority Business each fill out MBE FORM #2 – LETTER OF INTENT TO PARTICIPATE, to be submitted with your bid.
5. If, after contacting all SOMWBA-approved firms in the trades or materials categories you should include in your bid, you have not been able to secure 10% Minority business participation, then complete and submit with your bid MBE FORM #3 – CONTRACTOR REQUEST FOR EXTENSION and MBE FORM #4 – INFORMATION ON UNSUCCESSFUL MBE CONTRACT.

If you have any questions about the above steps, please call Duane Brown, Minority Business Compliance Officer, at 617-349-4332.

MINORITY BUSINESS ENTERPRISE PROGRAM COMPLIANCE DETAILS

PERCENTAGE OF MBE PARTICIPATION - percentage of MBE participation shall be that percentage of the total bid price represented by the amount to be paid to MBE(s). The General Bidder's compliance with the percentage requirement shall continue to be determined by reference to the above-described method throughout the term of the contract, even though the actual project price may be greater or less than the bid price. The General Bidder shall submit to the Minority Business Compliance Officer signed copies of its subcontracts with all MBE's involved in meeting the percentage of Minority Business Enterprise Requirement.

ROLE OF THE MBE REVIEW COMMITTEE - The MBE Review Committee shall have referred to it by the Purchasing Agent and the Minority Business Compliance Officer all questions of interpretation of the MBE Program that arise during the Program's operation. The MBE Review Committee shall have the responsibility and authority to respond with binding answers to these questions. It also has the responsibility and authority to recommend to the City Manager whatever improvements it believes can be made in the program, based on operating experience.

CHANGES OF MBE STATUS - Any change or substitution of the officers or stockholders in a participating MBE company that reduces the minority ownership or control to less than the requisite percentage will immediately rescind the MBE designation given by SOMWBA. The General Bidder (Prime Contractor) shall immediately notify the Minority Business Compliance Officer upon learning of such a change in MBE status. In this event, the Prime Contractor shall submit to the Minority Business Compliance Officer a revised Contractor Certification of Compliance with MBE Requirements, showing how the lost MBE participation will be replaced.

SANCTIONS

- A. If the Prime Contractor does not comply with the terms of the Minority Business Enterprise requirements of the contract, the City may (1) suspend any payment for the activity that should have been performed by the MBE pursuant to the contract, or (2) require specific performance of the Prime Contractor's obligation by requiring the Prime Contractor to subcontract with any MBE for any contract or specialty item at the contract price established for that item in the proposal submitted by the Prime Contractor.
- B. To the extent that the Prime Contractor has not complied with the MBE requirements of the contract, the City may retain an amount determined by multiplying the bid price of this contract by the required percentage of MBE participation, less the amount of paid to MBEs for work performed under the contract and any payments already suspended under "A" above.
- C. In addition, or as an alternative, to the remedies under "A" and "B" above, the City may suspend, terminate or cancel this contract, in whole or in part, or may call upon the Prime Contractor's surety to perform all terms and conditions in the contract, unless the Prime Contractor is able to demonstrate its compliance with the MBE requirements, and may further deny to the Prime Contractor the right to participate in any future contracts awarded by the City for a period of up to three years.

- D. In any proceeding involving the imposition of sanctions by the City, no sanctions shall be imposed if the City finds that the Prime Contractor has taken every possible measure to comply with MBE requirements, or that some other justifiable reason exists for waiving the MBE requirements in whole or in part.
- E. Any bidder or contractor shall provide such information as is necessary in the judgment of the City to ascertain its compliance with the MBE Requirements.
- F. No sanctions shall be imposed by the City except in an adjudicatory proceeding under Chapter 30A of the General Laws.
- G. A Prime Contractor shall have the right to request suspension of any sanctions imposed by the City upon showing that it is once again in compliance with the MBE Requirements.

CONTRACTOR CERTIFICATION OF COMPLIANCE

Minority Business Enterprise Requirements

Name and Address of Participating Minority Bus. Enterprise	Name of Participant	Dollar Value
--	---------------------	--------------

1. TANGO CONST. INC LUDWIGSBURG, MA	SITWORK, MITHOLES, ETC	2,450,000.00
--	------------------------	--------------

2. HILEE, INC EVERETT, MA	TRUCKING, STONE, GRAVEL, ETC	919,600.00
------------------------------	------------------------------	------------

3.

4.

5.

6.

7. GRAND TOTAL FOR MINORITY BUSINESS COMMITMENT

\$ 3,369,600.00

8. PERCENTAGE MBE PARTICIPATION (Line 7 Divided by total bid price) 108 %

The below-signed bidder certifies that it will honor the above Minority Business Enterprise Commitment and that it understands that a breach of this commitment constitutes a breach of the contract.

Dec 5, 2013
Date

Francesco Gioioso
Authorized Signature

FRANCESCO GIOIOSO, CEO/TREAS.

P. GIOIOSO & SONS, INC

General Contractor

50 SPRAGUE STREET
HYDE PARK, MA 02136

Business Address

LETTER OF INTENT TO PARTICIPATE

FORM
2
M.B.E.

Minority Business Enterprise Requirements

TO: P. GIOIOSO : SMS INC.
(Name of General Bidder)

1. My company intends to perform work under the above-identified contract as:

- an individual
- a partnership
- a corporation
- a joint venture with _____
- other (explain) _____

2. My company has been certified by the State Office of Minority and Women Business Assistance (SOMWBA) as a Minority Business Enterprise and is listed as such in the most recently issued SOMWBA Minority/Women Business Directory. I hereby certify that my company's qualification as a Minority Business Enterprise have not changed since its application was submitted to SOMWBA. I further certify that my company will give immediate notification in writing to both SOMWBA and your Company in the event that its minority ownership, control, or management should change.

3. My company understands that if your company is awarded the contract, your company intends to enter into an agreement with my company to perform the activity described below for the prices indicated. My firm also understands that your firm, as General Bidder, will make substitutions and quantity changes only as allowed or required by the provisions of the contract with the City of Cambridge.

ITEM NO.	DESCRIPTION OF MY COMPANY'S ACTIVITY	QUANTITY	UNIT PRICE	AMOUNT
	SITING, MANIFOLDS ETC.			2,450,000.00

TOTAL AMOUNT \$ _____

* Description of activity should include notations such as "Labor Only", "Material Only", etc.

Date 12-5-13
[Signature]
MBE Authorized Signature

TANGO CONSTRUCTION INC.
MBE Name
321 WHALOM ROAD
LUNENBURG, MA. 01462
Business Address

LETTER OF INTENT TO PARTICIPATE

Minority Business Enterprise Requirements

TO: P. G. I. O. S. O. 'S.M.S., Inc.
(Name of General Bidder)

1. My company intends to perform work under the above-identified contract as:

- an individual
- a partnership
- a corporation
- a joint venture with _____
- other (explain) _____

2. My company has been certified by the State Office of Minority and Women Business Assistance (SOMWBA) as a Minority Business Enterprise and is listed as such in the most recently issued SOMWBA Minority/Women Business Directory. I hereby certify that my company's qualification as a Minority Business Enterprise have not changed since its application was submitted to SOMWBA. I further certify that my company will give immediate notification in writing to both SOMWBA and your Company in the event that its minority ownership, control, or management should change.

3. My company understands that if your company is awarded the contract, your company intends to enter into an agreement with my company to perform the activity described below for the prices indicated. My firm also understands that your firm, as General Bidder, will make substitutions and quantity changes only as allowed or required by the provisions of the contract with the City of Cambridge.

ITEM NO.	DESCRIPTION OF MY COMPANY'S ACTIVITY*	QUANTITY	UNIT PRICE	AMOUNT
	TRUCKING, STONE, GRAVEL, ETC.			919,600.00

TOTAL AMOUNT \$ 919,600.00

* Description of activity should include notations such as "Labor Only", "Material Only", etc.

Date 12/5/13
Catherine O'Connell
WBE Authorized Signature

HILBEE, INC.
WBE Name
100 PROMONT ST.
EVERETT, MA 02148
Business Address

LETTER OF INTENT TO PARTICIPATE

Minority Business Enterprise Requirements

TO: _____
(Name of General Bidder)

1. My company intends to perform work under the above-identified contract as:

- _____ an individual
- _____ a partnership
- a corporation
- _____ a joint venture with _____
- _____ other (explain) _____

2. My company has been certified by the State Office of Minority and Women Business Assistance (SOMWBA) as a Minority Business Enterprise and is listed as such in the most recently issued SOMWBA Minority/Women Business Directory. I hereby certify that my company's qualification as a Minority Business Enterprise have not changed since its application was submitted to SOMWBA. I further certify that my company will give immediate notification in writing to both SOMWBA and your Company in the event that its minority ownership, control, or management should change.

3. My company understands that if your company is awarded the contract, your company intends to enter into an agreement with my company to perform the activity described below for the prices indicated. My firm also understands that your firm, as General Bidder, will make substitutions and quantity changes only as allowed or required by the provisions of the contract with the City of Cambridge.

ITEM NO.	DESCRIPTION OF MY COMPANY'S ACTIVITY*	QUANTITY	UNIT PRICE	AMOUNT

TOTAL AMOUNT \$ _____

* Description of activity should include notations such as "Labor Only", "Material Only", etc.

Date

TANGO CONSTRUCTION, INC.
MBE Name

MBE Authorized Signature

Business Address

CONTRACTOR REQUEST FOR EXTENSION

Minority Business Enterprise Requirements

CONTRACTOR REQUEST-FOR-EXTENSION OF MINORITY BUSINESS ENTERPRISE REQUIREMENTS

The below signed General Bidder certifies that it made a good faith effort to develop the required ten percent (10%) Minority Business Enterprise participation in this contract, but was able to develop only _____%.

The below-signed General Bidder further certifies that it contacted the below-listed firms from the SOMWBA MINORITY/WOMEN BUSINESS DIRECTORY that said contacts were bona fide efforts to develop the required Minority Business Enterprise participation in the above-identified contract but were unsuccessful due to circumstances beyond the control of the General Bidder; and that the information given on the following pages about each contract has made is accurate and complete.

MBE Companies Contacted

- | | |
|----------|-----------|
| 1. _____ | 6. _____ |
| 2. _____ | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

The below-signed General Bidder therefore requests that the City of Cambridge grant an extension of ten working days in order to provide the General Bidder an opportunity to secure the required percentage of Minority Business participation.

Date

General Contractor

Authorized Signature

Business Address

**FORM
4
M.B.E.**

INFORMATION ON UNSUCCESSFUL M.B.E. CONTACT
Minority Business Enterprise Requirements

Additional copies of this information form shall be prepared by the General Bidder in the quantity necessary to comply with bidding requirements.

ITEM NUMBER ON REQUEST-FOR-EXTENSION _____

NAME OF MBE COMPANY CONTACTED _____

ADDRESS OF COMPANY CONTACTED _____

TELEPHONE NO. OF COMPANY CONTACTED _____

DATE OF INITIAL CONTACT _____

HOW WAS CONTACT MADE? (Check appropriate answer) TELEPHONE _____
IN-PERSON _____

SUB-CONTRACT WORK OFFERED TO THIS MBE COMPANY _____

RESULT OF CONTACT (check appropriate answer) MBE Firm Declined Job _____;
MBE Firm offered to do job at price of \$ _____, which was determined by our company
to be too high _____; MBE offered to do the job at a price of \$ _____, which was
satisfactory, but the MBE company was judged by our company to be unqualified for the job _____

NAME AND TITLE OF THE MBE COMPANY OFFICER WHO CAN VERIFY ABOVE
INFORMATION AS TO MBE COMPANY'S RESPONSE

It is certified herewith by the below-signed officer of the General Bidder that the above information is accurate and complete.

Date

General Contractor

Authorized Signature

Business Address

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SECTION 00312ADD1

NOTARIZED STATEMENT OF BIDDER'S QUALIFICATIONS

THIS FORM MUST BE SUBMITTED WITH YOUR BID

THIS STATEMENT MUST BE NOTARIZED

BIDDER SHALL PROVIDE CLEAR AND CONCISE RESPONSES TO ALL QUESTIONS IN THIS STATEMENT. BIDDER SHALL USE THIS FORM, OR A FORM WITH THE SAME FORMATTING AS THE CITY'S STATEMENT OF BIDDER QUALIFICATIONS.

The bidder must provide references including telephone number and contact names in response to the questions in this section. References will be used in determining the responsibility of the bidder. The city reserves the right to use itself as a reference.

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

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

IMPORTANT: Be sure residences are listed below.

Name	Title	Home Address
JOSEPH GIOIOSO, PRES.		24 CREST VIEW RD, MILTON, MA 02186
FRANCESCO GIOIOSO, CEO/TREAS.		3 DUTTON PARK, WALPOLE, MA 02081
MARCO GIOIOSO, SECR.		5 FILETTO WAY, WALPOLE, MA 02081

2. When organized.

1962

3. If a corporation, where incorporated.

MASSACHUSETTS

Bidder's Name: B. GIOIOSO & SONS, INC.

4. Indicate the general nature of work normally performed by your company.

GENERAL CONSTRUCTION SINCE 1962

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

NO

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

NO

7. Qualification Requirements – As a minimum, the Bidder must demonstrate that it is qualified to bid on this Contract by adequately providing responses to the following qualification requirements:

7A Qualification Requirement for Large Utilities in Urban Setting:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects involving, as a minimum, the construction of water mains, sanitary sewers, large diameter (48 inches or greater) storm drains, and precast concrete structures (8-ft diameter or greater), in streets and sidewalks within a crowded urban setting; including traffic and pedestrian management and utility relocation and coordination. The dollar value of one project must be at least 26 million dollars and at least 13 million dollars for the other two projects. Provide the following details.

G. GIOIOSO & SONS, INC.

Bidder's Name: _____

Project #7A-1:

Project Name: SEE HEREWITH (PROJECT REFERENCE) P, R, 1
Start date: _____ Completion date: _____
Name and address of Owner for whom the work was done: _____

Name of Owner's Representative (for Reference): _____
Owner's Representative's Current Telephone #: _____
Dollar Value of Contract: _____
Location of urban setting impacted by project: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7A-2:

Project Name: SEE HEREWITH P, R, 2
Start date: _____ Completion date: _____
Name and address of Owner for whom the work was done: _____

Name of Owner's Representative (for Reference): _____
Owner's Representative's Current Telephone #: _____
Dollar Value of Contract: _____
Location of urban setting impacted by project: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: G. GIOIOSO & SONS, INC

Project # 7A-3:

Project Name: SEE P.R. 6246 AND 10

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done: _____

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Location of urban setting impacted by project: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

7B Qualification Requirement for water mains in Urban Setting:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects involving, as a minimum, the construction of water mains at least 12-inches in size within a crowded urban setting; including traffic and pedestrian management and utility relocation and coordination. The Contractor shall show experience with deactivating, removing, constructing, pressure testing, flushing and cleaning, disinfecting and commissioning water mains. The dollar value of one project must be at least 3 million dollars and at least 1 million dollars for the other two projects. Provide the following details.

Project #7B-1:

Project Name: SEE P R 1

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done: _____

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Location of urban setting impacted by project: _____

Bidder's Name: D. GIOIOSO & SONS, INC.

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7B-2:

Project Name: SEE P.R. 2
Start date: _____ Completion date: _____
Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____
Owner's Representative's Current Telephone #: _____
Dollar Value of Contract: _____
Location of urban setting impacted by project: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7B-3:

Project Name: SEE P.R. 10
Start date: _____ Completion date: _____
Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____
Owner's Representative's Current Telephone #: _____
Dollar Value of Contract: _____
Location of urban setting impacted by project: _____

Bidder's Name: P. GIOIOSO & SONS, INC.

Description of work performed that demonstrates that the above requirements have been fulfilled:

7C Qualification Requirement for Traffic Management in Congested Urban Setting:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects involving, as a minimum, work on state/city highways in an urban setting with heavy volumes of motor vehicle, bicycle, pedestrian and handicap traffic that required rerouting of traffic and transportation and coordination with state and/or city police, fire, parking, traffic and handicap compliance departments. The dollar value of one project must have been at least 26 million dollars and at least 13 million dollars for the two projects. Provide the following details.

Project #7C-1:

Project Name: SEE PER 1

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

State/City highway and location of urban setting impacted by project:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC.

Project #7C-2:

Project Name: SEE PR 6

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

State/City highway and location of urban setting impacted by project:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7C-3:

Project Name: SEE PR 10

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

State/City highway and location of urban setting impacted by project:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC.

7D Qualification Requirement for Community Sensitivities:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects that demonstrated sensitivity to community issues, which could include but is not limited to designation of a community liaison, demonstration of work coordination with a community, and attendance and participation at community meetings. The dollar value of one project must have been at least 26 million dollars and at least 13 million dollars for the other two projects.

Project #7D-1:

Project Name: SEE P.R. 1

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project #7D-2:

Project Name: SEE P.R. 6

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC.

Project #7D-3:

Project Name: SEE PR 10

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

7E Qualification Requirement for Support of Excavations and Vibration Monitoring:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects involving, as a minimum, the design and installation of temporary earth support system similar in length, depth and method of installation to that required by this Contract as well as involving Vibration Monitoring similar to that required by this Contract. The dollar value of one project must have been at least 26 million dollars and at least 13 million dollars for the other two projects. Provide the following details.

Project #7E-1:

Project Name: SEE PR 1

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Bidder's Name: P. GIOIOSO & SONS, INC.

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project #7E-2:

Project Name: SEE PLAN 6

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project #7E-3:

Project Name: SEE PLAN 10

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC.

7-F Qualification Requirement for Reconstruction of Roadways and Sidewalks : Within the last 10 years, the Contractor must have successfully completed at least 3 projects involving, as a minimum, the reconstruction of municipal roadways and Architectural Access Board compliant sidewalks, traffic signals, street lighting, line striping, surface improvements and landscaping. The dollar value of one project must have been at least 12 million dollars and at least 6 million dollars for the other 2 projects. Provide the following details.

Project #7F-1

Project Name: SEE PR 6a/6b
Start date: _____ Completion date: _____
Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____
Owner's Representative's Current Telephone #: _____
Dollar Value of Contract: _____
State/City highway and name of location of compliant sidewalk work:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS

Project # 7F-2:

Project Name: SEE HEREWITH P.R. 10

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

State/City highway and name of location of compliant sidewalk work:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7F-3:

Project Name: SEE HEREWITH P R I

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

State/City highway and name of location of compliant sidewalk work:

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC

7-G Qualification Requirement for Pipeline Renewal:

Within the last 10 years, the Contractor must have successfully completed at least 3 projects in the United States of 15 inch diameter or greater sewer and/or drain renewal using cured-in-place pipelining of at least 1,000 continuous linear feet with factory or on-site wet out of the liner tube; and design of a 15 inch diameter or greater liner tube wall thickness based on a fully deteriorated condition.

Project #7G-1:

Project Name: SEE P.R. 3 (7 PROJECTS)

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Project # 7G-2:

Project Name: SEE P R 3

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS INC

Project # 7G-3:

Project Name: SEE P/R 3

Start date: _____ Completion date: _____

Name and address of Owner for whom the work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract: _____

Description of work performed that demonstrates that the above requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS, INC.

8. Qualification Requirement for Project Manager:

Provide the name of the Contractor's Project Manager that will be assigned to the proposed Contract. The Project Manager must have a minimum of 10 years construction experience. The Project Manager must also have demonstrated the ability to manage construction budgets, to prepare schedules, and to perform contract administration for one project of at least 26 million dollars and two projects of at least 13 million dollars.

Name: JOSEPH BETTEVOURT

Project #8-1:

Project Name: SEE ATTACHED RESUME AND P R 3

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract : _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

P GIOIOSO & SONS

Bidder's Name: _____

Project #8-2:

Project Name: SEE HEREWITH PR 4

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work is being done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract : _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

Project #8-3

Project Name: SEE HEREWITH PR, 6a/6b

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work is being done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract : _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

Bidder's Name: P. GIOIOSO & SONS INC

JOSEPH M. BETTENCOURT
67 HIGHLAND STREET
STOUGHTON, MA 02072
Telephone 781-341-2455

EDUCATION: Southeastern Massachusetts University B.S.C.E. 1970
Roger Williams College
Architectural and Construction Engineering 1972-73
Massachusetts Maritime Academy
Oceanography 1975
Eastern Mass. Association P.E. and Land Surveyor's
School of Survey, Intermediate Survey I, II 1975
Sacramento College
Operation of WWTF 1978

LICENSES: Construction Supervisors License #008272,
OSHA 40-Hour Training for Hazardous Waste Site Operations

WORK EXPERIENCE:

1984 - Present Vice President of Construction Operations/Chief Estimator/Chief Project
Manager/Project Manager / Design/Build Lead
P. GIOIOSO & SONS, INC. GENERAL CONTRACTORS

Duties include scheduling and coordination of all company construction projects, prepare and/or review all project bid and Design/Build estimates, supervise project managers and estimators, correspondence, project budgets and schedules, staff meetings, project closeouts, subcontract agreements, purchase orders, payment requisitions, formulation and preparation of claims, arbitration, mediation documentation.

As Project Engineer, I have managed, from bidding to completion, projects ranging from \$1.0 million to \$40.0 million.

Projects include utility construction, box culverts, jackings, microtunnels, tunnels, pile driving, sheeting, Support of Excavation Review, Traffic Management Planning, Community Meetings, Geotechnical Monitoring Planning, dewatering, bridges, roads, wharf facilities, water/wastewater treatment plants and pumping stations, landfill closures, solid waste transfer stations, contaminated soil and groundwater handling and disposal, etc.

7/77 - 5/84 Project Manager / Resident Engineer / Assistant Resident Engineer / Inspector
MORGENROTH AND ASSOCIATES, INC.

Duties include preparation, supervision of cost estimates, specifications, bid forms, contractor and municipal correspondence, Federal and State Grant Outlays, shop drawings, change orders, project inspections including EPA, State, Farmers Home, Town/City meetings, public hearings, bid proposals, startup and O&M training water/wastewater facilities, inflow, infiltration studies, water studies.

Projects include sewer, water, drain, water/wastewater treatment plants and pumping stations.

4/77 - 7/77 Associate Project Engineer/Crew Chief
ENVIRONMENTAL ENGINEERS, INC.

Coordinated and directed field operations for sewer evaluation studies including inflow/infiltration, smoke testing, TV inspection, dye tracing, physical inspections.

8/76 - 4/77 Field Engineer
UNITED ENGINEERS AND CONSTRUCTORS, INC.

5/75 - 8/76 Inspector
CITY OF DOVER NEW HAMPSHIRE

9/73 - 5/75 Field Engineer/Chief of Party
TIBBETTS ENGINEERING CORPPORATION

Responsible for horizontal and vertical control on surveys buildings, roads, utilities, properties, traverse computations, soils laboratory.

9/72 - 8/73 Field Engineer
CAMPANELLI, INC.

Responsible for site development on housing projects of 200 or more homes, including topographical layout, computations, material procurement.

9/7 - 9/72 Instrumentman/Inspector
GILBERT AND MALONEY ENGINEERS, INC.

5/70 - 9/70 Instrumentman
KIELY-IRZA ASSOCIATES, INC.

9. Qualification Requirement for Project Superintendent:

Provide the name of the Contractor's two (2) fulltime On-Site Superintendent that will be assigned to the proposed Contract. The Project Superintendent must have a minimum of 10 years construction experience similar in size, nature and complexity as the proposed project; demonstrated ability to manage a one project of at least 26 million dollar and the other two projects of at least 13 million dollars construction budgets, schedule, and crew coordination; have demonstrated experience in traffic management in heavily traveled streets; have experience with community relations with local businesses and residents and has coordinated with utilities. Provide details on 3 projects on which the proposed person has worked as On-Site Superintendent and that demonstrate that these requirements have been fulfilled:

Name: SAM DOOLAN AND JOHN GIOIOSO

Project #9-1:

Project Name: SEE PR 6a/6b

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract : _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

BOTH HAVE WORKED AT CITY OF
CAMBRIDGE SIMILAR PROJECTS

Project #9-2:

Project Name: SEE PR 12

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work is being done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract : _____

P. GIOIOSO & SON

Bidder's Name: _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

Project #9-3

Project Name: SEE P.R. 1

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work is being done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Telephone #: _____

Dollar Value of Contract: _____

Description of work that demonstrates minimum experience requirements have been fulfilled:

10. What project, most similar to the proposed Contract, has your present organization successfully completed? Please provide the following information:

Project #10-1:

Project Name: SEE P.R. 1, P.R. 6, PR 2, PR 12 ETC.

Start date: _____ Completion date: _____

Name and Address of Owner for Whom the Work was done:

Name of Owner's Representative (for Reference): _____

Owner's Representative's Current Telephone #: _____

Dollar Value of Contract : _____

Was work being done as contractor or sub-contractor? _____

Bidder's Name: P. GIOIOSO & SON

1984 to Present P. Gioioso & Sons, Inc. Project Superintendent

As a project superintendent for the last twenty eight years, I have managed, from start to completion projects ranging in value from \$2.0 million to \$38 million. My responsibilities included but were not limited to the following:

- Managed crews
- Managed all aspects of the projects SUCH AS Community Meetings, Support of Excavation, Environmental Protection, Traffic Management, Road Reconstruction, Landscaping, Contaminated Material and Environmental Protection Planning, Architectural Access Board Compliant Sidewalk, Geotechnical Monitoring, etc.
- Managed all OSHA inspections
- Made sure that all OSHA regulation were obeyed
- Interacted with owner's Project Engineers
- Interacted with company's Project Engineers
- Made sure that all work was done in compliance with plans and specs.
- Handled all situations that arose from time to time.

PARTIAL LIST OF MANAGED PROJECTS

- MWRA No. 6191 – Upper Neponset Valley Replacement Sewer \$37 million, sewer replacement project., etc.
- Contract Lower 006-1 & 2 – \$25 million, East Lynn CSO Design-Build, Sewer Separation, drains, water mains, etc.
- Contract No. SS-8/30 – \$6.3 million, Lynn, MA , Interceptors, lateral water mains, road reconstruction, etc.
- Contract No: 6108 - \$5.7 million, MWRA Water Transmission Main, Newton/Brookline, MA, road reconstruction, site work, etc.
- Contract No: 5073 \$10.9 million, MWRA Water Transmission Main, Malden/Stoneham, MA, road reconstruction, site work, etc.
- Contract No: 5615 \$16.1 million, MWRA Water Transmission Main, Winthrop, MA, road reconstruction, jackings, sheeting, site work, wetlands replication, etc.
- Contract No: SS-1/SS-2, \$4.5 million Lynn, MA box culverts, drainage, jackings, soldier piles and lagging, dewatering, road reconstruction, etc.
- High Service Pipeline \$4.3 million MWRA Water Transmission Main, Lynn, MA, jacking, sheeting, dewatering, road reconstruction, etc.

Education:

1978

New Hampshire College, Manchester, NH
part-time student in MBA Program
University of New Hampshire, Durham, NH
BS, Civil Engineering

JOHN GIOIOSO

1095 North Street

Walpole, MA 02081

2005 to Present P. Gioioso & Sons, Inc. Project Superintendent

As a project superintendent since 1995. I have managed, from start to completion projects ranging in value from a low \$1.0 million to a high of \$37.0 millions. My responsibilities included but were not limited to the following:

- Managed crews, all aspects of the projects such as Support of Excavation, with Steel Piling, Sheet piling and Wood Lagging, Geotechnical Monitoring, Environmental Protection, Architectural Access Board Compliant Sidewalk, Road Reconstruction, Landscaping, Contaminated Site Remediation, Fall Protection, Confined Space, QAQC, Traffic Management, Architectural Access Board Compliant Sidewalks, etc. Managed all OSHA inspections, Made sure that all OSHA regulation were obeyed, Interacted with owner's Project Engineers, Interacted with company's Project Engineers, Made sure that all work was done in compliance with plans and specs, Handled all situations that arose from time to time.

PARTIAL LIST OF MANAGED MAJOR PROJECTS

- **Cambridge Park Drainage Culvert River Restoration and Directional Drilling (\$17.0m)**
- **Chelsea Crescent Avenue Sewer Separation . Interceptor Sewer, Drainage, Water Mains, Compaction Grouting, etc. (\$3.9m)**
- **Springfield CSO, Structures, Water Main, Drains (\$11.2m) and Orchard St. Water Transmission Repair (\$3.6m).**
- **MWRA West Roxbury, Upper Neponset Valley 42" Fiberglass Replacement Sewer (Night Shift), Pipeline Sewer Replacement, including trench excavation up to 35 feet deep, jet grouting, well points, educator wells, jet grouting, support of excavation, 1000 feet of 72" jacking including in rock split face, chemical grouting, etc. (\$37.0m)**
- **BWSC Sewer Drain and Watermain Replacement, (\$2.6m)**
- **Quincy, Sewer Replacement, interceptor, lateral sewers, helical piles, road reconstruction, etc. (4.6m)**
- **Cambridge Fresh Pond Parkway, Traffic surface enhancement, box culverts, structures, drainage, sewers, water, and road reconstruction, etc. (\$17.6m)**
- **New Bedford North End/Cove Road**
Interception and later sewers, force main, water lines, jacking, etc. (\$5.4m)

Education:

University of Maine 1994

Bachelor of Science, Construction Management Technology and Associates Degree in Civil Engineering Technology

CPR/ First Aid, 10-Hour OSHA and Safety Competent Person Certified

Description of work performed that demonstrates the similarity of the project to the proposed Contract:

11. List all projects for which your organization has received a Notice of Intent to Award or a Notice to Proceed and that your organization expects to perform during Years 2013-2016. Rank the list according to decreasing dollar value of work to be done in Years 2013-2016. On the following "TABLE OF PROJECTED WORK LOAD", indicate the first 10 projects from that list and provide information on the name of the project, the type of project, owner of the project, dollar value of work, and the estimated completion date. Under Project No. 11 on the following TABLE, indicate the number of projects and the sum of the dollar value of work that you expect to perform in Years 2013-2016 for all the remaining projects in the list.

SEE ATTACHED 4.6 SCHEDULE

Bidder's Name: P. GIOIOSO & SONS, INC.

TABLE OF PROJECTED WORK LOAD

<u>Proj. No.</u>	<u>Name and Type of Project</u>	<u>Owner of Project</u>	<u>Dollar value of work to be done in YR 2013-2016</u>	<u>Estimated Completion Date of Project</u>
1				
2	SEE ATTACHED	4, 6	SCHEDULE	
3				
4				
5				
6				
7				
8				
9				
10				
11	Enter the number of remaining project>>		Enter cumulative dollar value of remaining projects:	

Bidder's Name: P. GIOIOSO & SONS, INC.

Concord
Addendum 1

STATEMENT OF BIDDER'S QUALIFICATIONS
00312 -20ADD1

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

(a) Owned

SEE ATTACHED TYPICAL WORK CREW
SCHEDULE

(b) Currently Rented

NONE

(b) To Be Rented

IF NEEDED

13. Background and experience of the principal members of your organization, including the officers.

WORKED ON SIMILAR PROJECTS SINCE 1962

P. GIOIOSO & SONS

Bidder's Name: _____

14. Give below the name and address of one or more banks which have information that would enable them to advise regarding the financial ability of your company.

Name of Bank	Address	Telephone #
<u>JOSEPH T. O'LEARY, CUSTOMER BANK</u>		
<u>BOSTON, MA, 02110</u>	<u>617-443-1121</u>	

15. Federal Identification No. and Dun and Bradstreet No.

04-2312332

16. Name, Signature, and Title of officer preparing this proposal.

Name FRANCESCO GIOIOSO, U.S.

Signature *Francesco Gioioso*

Title FRANCESCO GIOIOSO, CEO/TREAS.

Bidder's Name: P. GIOIOSO & SON

17. The undersigned hereby authorizes and requests any person, firm or corporation to furnish any information requested by the Cambridge Department of Public Works in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated at CAMBRIDGE this 5th day of DECEMBER, 2013

Francesco Gioioso

(Signature)

Tel. No. 617-364-5800

BY FRANCESCO GIOIOSO, CEO/TREAS.

Title _____

State of MASSACHUSETTS)

County of SUFFOLK)

FRANCESCO GIOIOSO, being duly sworn,

deposes and says that he/she is CEO/TREASURER of
P. GIOIOSO & SONS, INC.

(Name of Organization)

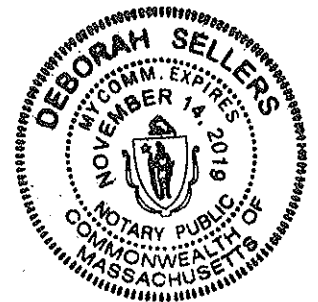
and that the answers to the foregoing questions and all statements therein contained are true and correct.

Subscribed and sworn to before me this 5th day of DEC, 2013

Deborah Sellers

(Notary Public)

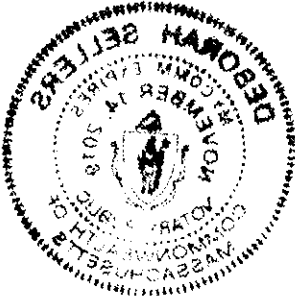
My commission expires on Nov. 14, 2019



- END OF SECTION 00312 -

Bidder's Name: P. GIOIOSO & SONS, INC.

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Bidder's Name: P. GIOIOSO & SONS, INC.

P. GIOIOSO & SONS, INC.

PROJECT REFERENCES

SUMMARY OF RECENT BOX CULVERT PROJECTS

OWNER	PROJECT	YEAR	BOX CULVERT
City of Cambridge	Fresh Pond Parkway	1999 – 2002	735lf of 4' x 6' 255 lf of 4' x 10'
City of Cambridge	Aggassiz Area Sewer & Drains	1999 – 2002	880 lf of 10' x 12'
Boston Water & Sewer Commission	Sewer & Drains 00-309-022	2001 – 2003	520 lf of 5'x12'
Boston Water & Sewer Commission	Sewer & Drains 02-309-010	2002 – 2005	1264 lf of 5' x 4'
City of Fall River (J.F. Shea, Inc.)	CSO Diversion Structure and Drop Shafts	2008 – 2009	44 lf of 4' x 4' 1020 lf of 6' x 4'
City of Cambridge	Cambridge Park Drive Drain	2011 – 2013	3,280 lf of 8' x 4'



P. Gioioso & Sons, Inc. Typical Work Crews

I. Support of Excavation

- A. Equipment
LS-138-H75 Ton Link Belt
L.B. Foster 1800 Vibro Hammer
185 Compressor
Welding and Pickup Trucks

- B. Pile Driving Crew
1 - Foreman Pile Driver
3 - Pile Drivers
2 - Operating Engineers

III. Pipeline Crew

- A. Equipment
375 L Caterpillar Backhoe
Komatsu 600, CAT 330 or equal
2-Ten Wheel Trucks
1- 185 Compressor
35kw Generator, Pumps, Hoses
WA380 Loader
1 - KHP Compactor
1 - Pickup Truck

- B. Mainline Crew
1 - Foreman
3 - Laborers
2 - Truck Drivers
2 - Operators

II Augering

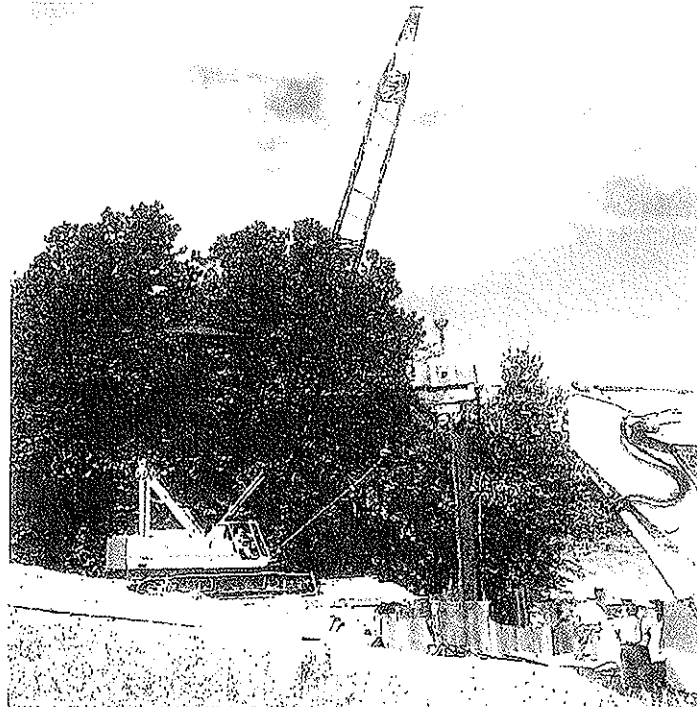
- A. Equipment
CAT 330 w/Lo Drill
CAT 312 Backhoe
6 - Wheel Truck
Welding and Pickup Trucks
185 Compressor

- B. Auger Crew
1 - Foreman Pile Driver
2 - Operators
1 - Labor Foreman
1 - Truck Driver

IV House Connection Crew

- A. Equipment
446B Backhoe
Ten Wheel Truck
Pickup Truck
185 Compressor

- B. Service Crew
1 - Foreman
1 - Operator
1 - Truck Driver



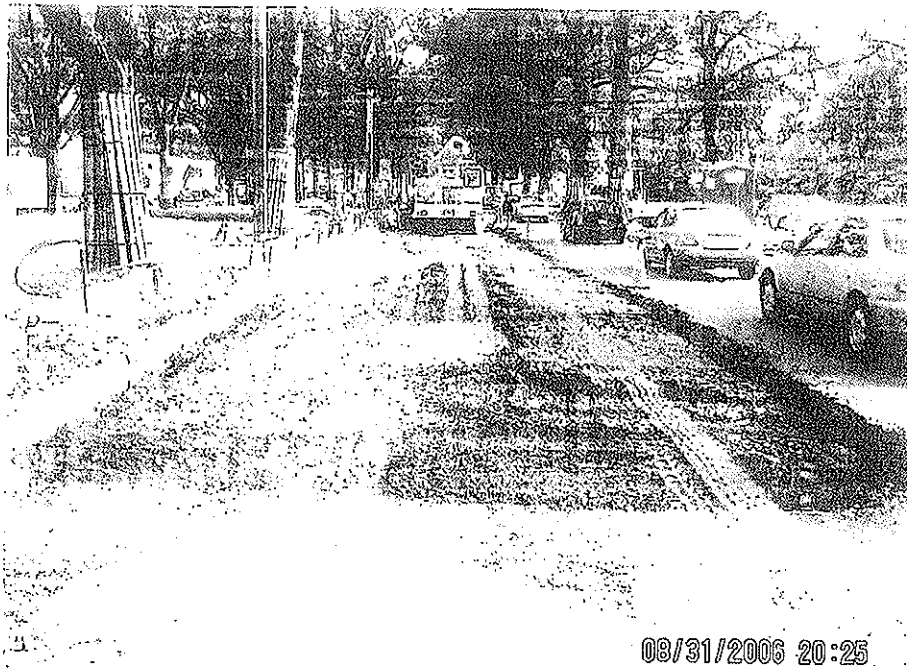
V. Trenches / Roadway / Walks Crew

A. Equipment

Gradall
Roller
Pickup
Grader / Dozer
(3) Ten Wheel Truck
185 Compressor
Blaw Knox Paver

B. Labor

Operator
Operator
Foreman
Operator
(3) Truck Drivers
Operator
(2) Laborers



4.7 P. Gioioso & Sons, Inc.

NAMES, ADDRESSES, PHONE NUMBERS & REPRESENTTIVES OF EACH FIRM

b.	(Massachusetts Highway Department) MA DOT District #4 - 519 Appleton Street, Arlington, MA Ms. Patricia Leavenworth, P.E.	781-641-8300
f., t	District #5 - 1000 County Street, Taunton, MA 02780 Ms. Mary-Joe Perry	508-824-6633
o.	District #6 - 185 Kneeland St. Boston, MA 02117 Mr. Walter Heller, P.E.	617-561-6200
a.i	MWRA Charlestown Navy Yard, 100 First Avenue, Boston, MA 02129 Mr. A. Navanadan, P.E. (Nava)	617-788-4956
g., q., r., w., y,z2	Ms. Irene McSweeney, P.E., Boston Water & Sewer Commission 980 Harrison Avenue, Boston, MA 02119	617-989-7000
c.	Alfredo Andres, Inima / Aquaria Water, LLC 170 Aquaria Drive, North Dighton, MA 02764	305-905-0181
d., l., h., m., k., u.	Kleinfelder/SEA Consultants, 485 Massachusetts Ave., Cambridge, MA John Struzziery, P.E.	617-497-7800
e.	Camp Dresser & McKee, Inc. 56 Exchange Terrace, Providence, R.I. 02903 Robert Otoski	401-457-0308
p.	Christopher Gates, P.E., Camp Dresser & McKee, Inc. Camp Dresser & McKee, Inc. 100 Great Meadow Rd, Suite 104, Whethersfield, CT 06109	860-808-2276
n.	William Skerpan., Beta Group, Inc. 6 Blackstone Valley Place, Lincoln, RI 02864	401-333-2382
j.	Jeffrey A. Murawski, P.E., Tata & Howard 67 Forest Street, Marlboro, MA 01752	508-303-9400
s., z1.	Stephen Chapman, P.E., Fay Spofford & Thorndike 5 Burlington Woods, Burlington, MA 01803	781-221-1000
z.	Thomas E. Cullen, P.E., City Engineer DPW Eng. Div., 135 Neil St., Marlboro, MA 01752	508-624-6910 Ext.7200

SECTION 00313ADD1
GENERAL CONTRACTOR'S CERTIFICATION

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

GENERAL CONTRACTOR'S CERTIFICATION

P. GIOIOSO & SONS, INC.

(General Contractor) certifies that:

1. it shall obtain from each of its subcontractors and submit to the contracting or administering agency prior to the performance of any work under said subcontract a certification by each subcontractor, regardless of tier, that it will comply with the Minority/Women/Resident workforce ratio;
2. it read, understands and shall comply with the Minority/Women/Resident hiring requirements set forth in the Cambridge Employment Plan, Cambridge Municipal Code 2.66.060, et seq.;
3. it is aware that failure to comply with the Cambridge Employment Plan will result in, at minimum, the following: 1) it will be ineligible to bid for future contracts with the City of Cambridge, and 2) the City of Cambridge will notify DCAM of such failure which may affect the contractor's future qualification to bid for public contracts throughout the Commonwealth;
4. it has read, understands and shall comply with all the pertinent provisions of the Americans with Disabilities Act and will be subject to sanctions for failure to do so;
5. it intends to use the following listed construction trades in the work under contract.

Signed under the penalties of perjury.

P. GIOIOSO & SONS, INC.
Francesco Gioioso

Signature of authorized representative of contractor

FRANCESCO GIOIOSO, CEOTREAS.

Print name of authorized representative of contractor

Dec 5, 2013
Dated

Submit this form with your bid

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SECTION 00314
SUBCONTRACTOR'S CERTIFICATION

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

SUBCONTRACTOR'S CERTIFICATION

_____ (Subcontractor) certifies that:

1. it will obtain from each of its subcontractors prior to the award of any subcontract under this subcontract the subcontractor certification required by these bid conditions;
2. it read, understands and shall comply with the Minority/Women/Resident hiring requirements set forth in Cambridge Municipal Code $\text{}\text{2.66.060}$, et seq.;
3. it is aware that failure to comply with the Cambridge Employment Plan will result in, at minimum, the following: 1) it will be ineligible to bid for future contracts with the City of Cambridge, and 2) the City of Cambridge will notify DCAM of such failure which may affect the contractor's future qualification to bid for public contracts throughout the Commonwealth;
4. it has read, understands and shall comply with all the pertinent provisions of the Americans with Disabilities Act and will be subject to sanctions for failure to do so;
5. it intends to use the following listed construction trades in the work under contract.

Signed under the penalty of perjury.

Signature of authorized representative of subcontractor

Print name of authorized representative of subcontractor

Dated

In order to ensure that the subcontractor's certification becomes part of all subcontracts under the prime contract, no subcontract shall be executed until an authorized representative of the City agency (or agencies) administering this project or the Affirmative Action Officer has determined, in writing, that the said certification has been incorporated in such subcontract, regardless of tier. Any subcontract executed without such written approval shall be void.

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SECTION 00315ADD1
PROJECTED WORKFORCE CERTIFICATION

THIS FORM MUST BE SUBMITTED WITH YOUR BID

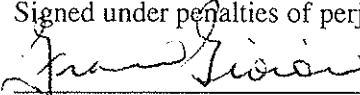
PROJECTED WORKFORCE CERTIFICATION

I, P. GIOIOSO & SONS, INC.

Certify that the following is my projected workforce for this contract:

GENERAL CONTRACTOR	ESTIMATED # OF NEW HIRES
P. GIOIOSO & SONS, INC.	1

SUBTRADE	ESTIMATED # OF NEW HIRES

P. GIOIOSO & SONS, INC.
Signed under penalties of perjury,

General Contractor
FRANCESCO GIOIOSO, CHIEF TREAS.

12-5-13

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SECTION 00316ADD1
CREP GENERAL CONTRACTOR'S CERTIFICATION FORM

CAMBRIDGE RESPONSIBLE EMPLOYER PLAN

GENERAL CONTRACTOR'S CERTIFICATION - BID FORM

P. GIOIOSO & SONS, INC hereby certifies that it, (Name of General Bidder) and all its subcontractors who are not filed sub bidders shall:

- (1) comply with the Cambridge Employment Plan as it currently exists and as it may be, from time to time, amended, and specifically shall comply with the worker hours requirements of §2.66.060(A);
- (2) comply with the obligations established under M.G.L. c.149 and G.L. c30§39M to pay the appropriate lawful prevailing wage rates to its employees;
- (3) maintain or participate in a bona fide apprentice training program as defined by c.23 §§ 11H and 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the Division of Apprentice Training of the Department of Labor and Industries and shall abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;
- (4) furnish, at its expense, hospitalization and medical benefits for all its employees employed on the project and/or coverage at least comparable in value to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by M.G.L. c.149, §26 and G.L. c30§39M in establishing minimum wage rates;
- (5) maintain appropriate industrial accident insurance coverage for all its employees employed on the project in accordance with M.G.L. c.152;
- (6) properly classify employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance, unemployment taxes, social security taxes and income tax withholding; and
- (7) certify under oath and in writing on a weekly basis for the entire duration of its work on the project, that it is in compliance with the above obligations.

Signed under the penalties of perjury. 12-5-13 (date)



Signature of authorized representative of contractor

FRANCESCO GIOIOSO, CECOTREAS.

Print name of authorized representative of contractor

P. GIOIOSO & SONS, INC

THIS CERTIFICATE APPLIES ONLY TO GENERAL BIDS OVER \$100,000 INCLUDING ALL ALTERNATES, IF ANY.

RETURN THIS FORM WITH YOUR BID

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SECTION 00317

CREP GENERAL CONTRACTOR'S CERTIFICATION – WEEKLY FORM

Project: CONCORD AVE SEWER SEP.
Contract#: 9

**CAMBRIDGE RESPONSIBLE EMPLOYER PLAN
GENERAL CONTRACTOR'S CERTIFICATION - WEEKLY CONTRACT FORM**

P. GIOIOSO & SONS, INC hereby certifies that it, (Name of General Contractor) and all its subcontractors who are not filed sub bidders:

(1) are complying with the Cambridge Employment Plan as it currently exists and as it may be, from time to time, amended, and specifically are complying with the worker hours requirements of §2.66.060(A);

(2) are complying with the obligations established under M.G.L. c.149 and G.L. c30§39M to pay the appropriate lawful prevailing wage rates to its employees;

(3) are maintaining or participating in a bona fide apprentice training program as defined by c.23 §§ 11H and 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the Division of Apprentice Training of the Department of Labor and Industries and are abiding by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;

(4) are furnishing, at its expense, hospitalization and medical benefits for all its employees employed on the project and/or coverage at least comparable in value to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by M.G.L.c.149, §26 and G.L. c30§39M in establishing minimum wage rates;

(5) are maintaining appropriate industrial accident insurance coverage for all its employees employed on the project in accordance with M.G.L. c.152; and

(6) are properly classifying employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance, unemployment taxes, social security taxes and income tax withholding.

The General Contractor certifies under oath that it is in compliance with the above obligations.

Signed under the penalties of perjury, week of: 12-5-13 (date)

Francesco Gioioso
Signature of authorized representative of contractor

P. GIOIOSO & SONS, INC

FRANCESCO GIOIOSO, CEO/TREAS.

Print name of authorized representative of contractor

**THIS FORM MUST BE SUBMITTED TO THE CITY OF CAMBRIDGE
PURCHASING DEPARTMENT ON A WEEKLY BASIS FOR THE LIFE OF THE
PROJECT**

CREP GENERAL CONTRACTOR
CERTIFICATION – WEEKLY FORM

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SECTION 00320
CREP SUBCONTRACTOR CERTIFICATION FORM

**CAMBRIDGE RESPONSIBLE EMPLOYER PLAN
NON-FILED SUB-CONTRACTOR'S CERTIFICATION - BID FORM**

_____ hereby certifies that it shall:
(Name of Sub-Contractor)

(1) comply with the Cambridge Employment Plan as it currently exists and as it may be, from time to time, amended, and specifically shall comply with the worker hours requirements of §2.66.060(A);

(2) comply with the obligations established under M.G.L. c.149 and G.L. c30§39M to pay the appropriate lawful prevailing wage rates to its employees;

(3) maintain or participate in a bona fide apprentice training program as defined by c.23 §§ 11H and 11I for each apprenticable trade or occupation represented in its workforce that is approved by the Division of Apprentice Training of the Department of Labor and Industries and shall abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;

(4) furnish, at its expense, hospitalization and medical benefits for all its employees employed on the project and/or coverage at least comparable in value to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by M.G.L. c.149, §26 and G.L. c30§39M in establishing minimum wage rates;

(5) maintain appropriate industrial accident insurance coverage for all its employees employed on the project in accordance with M.G.L. c.152;

(6) properly classify employees as employees rather than independent contractors and treat them

accordingly for purposes of workers' compensation insurance, unemployment taxes, social security taxes and income tax withholding; and

(7) certify under oath and in writing on a weekly basis for the entire duration of its work on the project, that it is in compliance with the above obligations.

Signed under the penalties of perjury. _____(date)

Signature of authorized representative of contractor

Print name of authorized representative of contractor

**THIS CERTIFICATE APPLIES ONLY TO FILED SUBBIDS \$25,000 AND OVER -
INCLUDING ALL ALTERNATES, IF ANY.**

RETURN THIS FORM WITH YOUR BID

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SECTION 00321ADD1

CREP SUBCONTRACTOR CERTIFICATION – WEEKLY FORM

Project: _____

Contract#: _____

**CAMBRIDGE RESPONSIBLE EMPLOYER PLAN
NONFILED SUBBIDDER’S CERTIFICATION - WEEKLY CONTRACT FORM**

_____ hereby certifies that it, (Name of General Contractor) and all its subcontractors who are not filed subbidders:

(1) are complying with the Cambridge Employment Plan as it currently exists and as it may be, from time to time, amended, and specifically are complying with the worker hours requirements of §2.66.060(A);

(2) are complying with the obligations established under M.G.L. c.149 and G.L. c30§39M to pay the appropriate lawful prevailing wage rates to its employees;

(3) are maintaining or participating in a bona fide apprentice training program as defined by c.23 §§ 11H and 11I for each apprenticable trade or occupation represented in its workforce that is approved by the Division of Apprentice Training of the Department of Labor and Industries and are abiding by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract;

(4) are furnishing, at its expense, hospitalization and medical benefits for all its employees employed on the project and/or coverage at least comparable in value to the hospitalization and medical benefits provided by the health and welfare plans in the applicable craft recognized by M.G.L.c.149, §26 and G.L. c30§39M in establishing minimum wage rates;

(5) are maintaining appropriate industrial accident insurance coverage for all its employees employed on the project in accordance with M.G.L. c.152; and

(6) are properly classifying employees as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance, unemployment taxes, social security taxes and income tax withholding.

The General Contractor certifies under oath that it is in compliance with the above obligations.

Signed under the penalties of perjury, week of: _____(date)

Signature of authorized representative of contractor

Print name of authorized representative of contractor

**THIS FORM MUST BE SUBMITTED TO THE CITY OF CAMBRIDGE
PURCHASING DEPARTMENT ON A WEEKLY BASIS FOR THE LIFE OF THE
PROJECT**

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SECTION 00322ADD1
CORI COMPLIANCE FORM

CORI COMPLIANCE FORM

Persons and businesses supplying goods and/or services to the City of Cambridge ("Vendors"), who are required by law to perform CORI checks, are further required by Section 2.112.060 of the Cambridge Municipal Code to employ fair policies, practices and standards relating to the screening and identification of persons with criminal backgrounds through the CORI system. Such Vendors, when entering into contracts with the City of Cambridge, must affirm that their policies, practices and standards regarding CORI information are consistent with the policies, practices and standards employed by the City of Cambridge as set forth in the City of Cambridge CORI Policy ("CORI Policy") attached hereto.

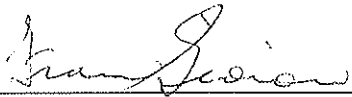
CERTIFICATION

The undersigned certifies under penalties of perjury that the Vendor employs CORI related policies, practices and standards that are consistent with the provisions of the attached CORI Policy. **All Vendors must check one of the three lines below.**

1. _____ CORI checks are not performed on any Applicants.
2. CORI checks are performed on some or all Applicants. The Vendor, by affixing a signature below, affirms under penalties of perjury that its CORI policies, practices and standards are consistent with the policies, practices and standards set forth in the attached CORI Policy.
3. _____ CORI checks are performed on some or all Applicants. The Vendor's CORI policies, practices and standards are not consistent with the attached CORI Policy. Please explain on a separate sheet of paper.

FRANCESCO GIOIOSO, CEC/TREAS.

(Typed or printed name of person signing quotation, bid or Proposal)


Signature

12-5-13

P. GIOIOSO & SONS, INC.

(Name of Business)

NOTE:

The City Manager, in his sole discretion may grant a waiver to any Vendor on a contract by contract basis.

Instructions for Completing CORI Compliance Form:

A Vendor should not check Line 1 unless it performs NO CORI checks on ANY applicant. A Vendor who checks Line 2 certifies that the Vendor's CORI policy conforms to the policies, practices and standards set forth in the City's CORI Policy. A Vendor with a CORI policy that does NOT conform to the City's CORI Policy must check Line 3 and explain the reasons for its nonconformance in writing. Vendors, who check Line 3, will not be permitted to enter into contracts with the City, absent a waiver by the City Manager.

This form must be submitted with your bid

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SECTION 00323ADD1
OSHA GENERAL CONTRACTOR CERTIFICATION FORM

Chapter 306 of the Acts of 2004
An Act Relative to the Health and Safety on Construction Projects

GENERAL CONTRACTOR'S CERTIFICATION - BID FORM
P. GIOIOSO & SONS, INC.

_____ (Name of General Bidder) hereby certifies that it, and all its subcontractors who are not filed sub bidders shall:

- (1) 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 a 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.

Signed under the penalties of perjury. 12-5-13 (date)



P. GIOIOSO & SONS, INC.

Signature of authorized representative of contractor

FRANCESCO GIOIOSO, CEO/TREAS.

Print name of authorized representative of contractor

RETURN THIS FORM WITH YOUR BID

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SECTION 00324ADD1
OSHA SUBCONTRACTOR CERTIFICATION FORM

Chapter 306 of the Acts of 2004
An Act Relative to the Health and Safety on Construction Projects

NON-FILED SUBBIDDERS CERTIFICATION - BID FORM

_____ (Name of Sub Bidder) hereby certifies that
it, and all its subcontractors who are not filed sub-bidders shall:

- (1) 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 each employee.

Signed under the penalties of perjury. _____ (date)

Signature of authorized representative of contractor

Print name of authorized representative of contractor

RETURN THIS FORM WITH YOUR BID

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SECTION 00325ADD1

AMERICANS WITH DISABILITIES ACT (42 U.S.C. 12131)
Section 504 of the Rehabilitation Act of 1973

The American with Disabilities Act ("the Act") applies to all employers of fifteen or more employees. All Contractors that are subject to the Act must comply with its provisions. In further compliance with the Act, all Contractors who enter into contracts with the City are prohibited from discrimination against the City's employees, regardless of the size of the Contractor.

The Act protects against discrimination on the basis of "disability", which is defined as a physical or mental impairment that substantially limits at least one "major life activity"; discrimination against a person having a history or has a record of such impairment; and discrimination against an individual regarded - even if inaccurately - as having such an impairment. The Act also expressly prohibits job discrimination that is based on an individual's relationship or association with a disabled person.

The bidder shall not discriminate against any qualified employee or job applicant with a disability and will make the activities, programs and services covered by any contract awarded through this procurement readily accessible to and usable by individuals with disabilities. To be qualified for a job, or to avail oneself of the bidder's services, the individual with the disability must meet the essential eligibility requirements for receipt of the bidder's services or participation in the bidder's programs or activities with or without: 1) reasonable modifications to the bidder's rules, policies and practices; 2) removal of architectural, communication, or transportation barriers; or, 3) provisions of auxiliary aids and services.

By submitting its bid, the bidder certifies to the City of Cambridge that it understands and will comply with all applicable provisions of the Act, including compliance with applicable provisions of Section 504 of the Rehabilitation Act of 1973, if the bidder is receiving federal funds.

P. GIOIOSO & SONS, INC.

Date: 12-5-13

Francesco Gioioso

(Print Name of person signing bid) FRANCESCO GIOIOSO, CEO/TREAS.
(Signature & Title)

END OF SECTION 00325

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SECTION 00326ADD1

MASSACHUSETTS DIESEL RETROFIT PROGRAM

STATEMENT OF INTENT TO COMPLY

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


Local Governmental Unit The City of Cambridge SRF Project No. CWSRF-3819

Contract No. 9 Contact Title Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project

Bidder P. GIOIOSO & SONS, INC

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

1. the Bidder shall comply with the Department of Environmental Protection's ("DEP") Diesel Retrofit Program by ensuring that all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard;
2. the Bidder shall require all Subcontractors to comply with DEP's Diesel Retrofit Program by ensuring all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract are equipped or retrofitted with a pollution control device in accordance with the Diesel Retrofit Program Standard; and
3. The Bidder shall submit and shall require each Subcontractor to submit a Diesel Retrofit Program Contractor Certification (form attached) with a Diesel Retrofit List to DEP (John Felix, 6th Floor, MassDEP, One Winter Street, Boston, MA 02108) and the Bidder within 10 days of the bidder being notified that it has been awarded the Contract. The Bidder shall require each Subcontractor to update such Certification and List within 2 days of using additional Diesel Construction Equipment on the project under the Contract.

 P. GIOIOSO & SONS, INC

12-5-13

(Signature of Bidder's Authorized Representative)

(Date)

FRANCESCO GIOIOSO, CEC/TREAS.

MASSACHUSETTS DIESEL RETROFIT PROGRAM STATEMENT OF INTENT TO COMPLY

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SECTION 00327

MASSACHUSETTS DIESEL RETROFIT PROGRAM

CONTRACTOR CERTIFICATION

Each Contractor and its Subcontractor(s) must sign and submit this form to John Felix, 6th Floor, MassDEP, One Winter Street, Boston, MA 02108 and the Municipality within 10 days after the Contractor is notified that it is awarded the Contract.

Local Governmental Unit The City of Cambridge **SRF Project No.** CWSRF-3819

Contract No. 9 **Contract Title** Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project

Contractor _____

I, _____, an authorized signatory for _____, whose principal place of business is at _____ do hereby certify that any and all diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract (hereinafter "Diesel Construction Equipment") have pollution control devices, such as oxidation catalysts or particulate filters, installed on the exhaust system side of the diesel combustion engine equipment in accordance with the Diesel Retrofit Program Standard.

I am submitting on behalf of _____ a list of all said Diesel Construction Equipment, labeled "Diesel Retrofit List," that will be used in connection with this Contract by _____. I hereby certify that the information on the attached Diesel Retrofit List is correct and accurate as of the date of signature. The List includes the following information for each piece of Diesel Construction Equipment:

1. Equipment type, make, model;
2. Vehicle Identification Number or VIN;
3. Engine model and year of manufacture;
4. Engine HP rating;
5. Emission Control Device ("ECD") type (Diesel Oxidation Catalyst or Diesel Particulate Filter);
6. ECD make, model, and manufacturer;
7. ECD EPA or CARB Verification Number or manufacturer's certification that the DOC or DPF meets or exceeds emission reductions provided by similar emission control technology verified by EPA or CARB;
8. ECD installation date;
9. Type of fuel to be used; and
10. Whether the equipment is owned or rented.

_____ shall notify DEP within 48 hours of any new Diesel Construction Equipment brought onto the Contract site. _____ shall maintain detailed records of all Diesel Construction Equipment used at the Contract site, including the dates and duration times the Diesel Construction Equipment is used at the Contract site.

_____ shall make such records available for inspection by DEP.

_____ shall ensure that the emissions control technology for each piece of Diesel Construction Equipment is operated, maintained, and serviced as recommended by the manufacturer. _____ shall retrofit prior to the end of the Contract any Diesel Construction Equipment no longer exempt from meeting the Diesel Construction Equipment Standard under exemption 3 (because it had an engine that met the EPA particulate matter (PM) Tier emission standards currently in effect at the start of the Contract for non-road diesel engines for the applicable engine power group and such emissions standards were superseded during the Contract).

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

Signature _____

Name: _____

Title: _____

SECTION 00330ADD1

SCHEDULE OF PARTICIPATION FOR SRF CONSTRUCTION

Project Title: Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project
Project Location: Cambridge, MA

Disadvantaged Minority Business Enterprise Participation in the SRF Loan Work

Name & Address of D/MBE	Nature of Participation	Dollar Value of Participation
1. TANGS CONSTR, INC LUNENBURG, MA 01462	SITE WORK, ETC	2,450,000.00
2.		
3.		
Total D/MBE Commitment:		\$
Percentage D/MBE Participation = (Total D/MBE Commitment) / (Bid Price) =		10.0 10.0%

Disadvantaged Women Business Enterprise Participation in the SRF Loan Work

Name & Address of D/WBE	Nature of Participation	Dollar Value of Participation
1. HILBE, INC. EVERETT, MA. 02149	TRUCKING, ETC	919,600.00
2.		
3.		
Total D/WBE Commitment:		\$
Percentage D/WBE Participation = (Total D/WBE Commitment) / (Bid Price) =		3.8 %

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

P. GIOIOSO & SONS, INC.

Name of Bidder:

Date: Dec 5, 2013

By:

Francesco Gioioso

Signature

FRANCESCO GIOIOSO, CEO/TREAS.

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

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SECTION 00331ADD1

LETTER OF INTENT FOR SRF CONSTRUCTION

This form is to be completed by the D/MBE and D/WBE and must be submitted by the Bidder as part of the bid. A separate form must be completed for each D/MBE and D/WBE involved in the project.

Project Title: Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project Project Location: Cambridge, MA

TO: R. GIULIOSO, SONS INC.
(Name of Bidder)

FROM: TANGO CONSTRUCTION INC.
(Please Indicate Status D/MBE or D/WBE)

I/we intend to perform work in connection with the above project as (check one):

- An individual A partnership
 A corporation A joint venture with: _____
 Other (explain): _____

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

DBE PARTICIPATION

Description of Activity	Date of Project Commencement	\$ Amount	% Bid Price
SITING WORK, MANHOLES, ETC.	PER CONTRACT	\$2,430,000	10.0 %

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

BIDDER <u>R. GIULIOSO, SONS INC.</u> <u>R. Giulioso, CEO</u> 12-5-13 (Authorized Original Signature) Date <u>50 SPRAGUE STREET</u> ADDRESS: <u>11400 PARK, MA 0213</u>	DBE <u>NALON</u> 12-5-13 (Authorized Original Signature) Date <u>321 WILKINSON ROAD</u> ADDRESS: <u>LUNenburg, MA 0146</u>
TELEPHONE #: <u>617-364-5500</u>	TELEPHONE #: <u>978-345-2570</u>
FEIN: <u>04-3212332</u>	FEIN:

ORIGINALS:

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

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

June 2012

EEO-DEP-191C

Concord
Conformed Set

LETTER OF INTENT FOR SRF CONSTRUCTION

00331ADD1-1



THE COMMONWEALTH OF MASSACHUSETTS
Executive Office for Administration and Finance
OPERATIONAL SERVICES DIVISION
One Ashburton Place, Suite 1017
Boston, MA 02108-1552

OPERATIONAL SERVICES DIVISION

SUPPLIER DIVERSITY OFFICE

Reginald Nunnally
Executive Director

Deval L. Patrick
Governor

Timothy P. Murray
Lieutenant Governor

Jay Gonzalez
Secretary

Gary J. Lambert
Assistant Secretary for
Operational Services

November 29, 2012

Mr. Grecco Alonso
Tango Construction, Inc.
321 Whalom Road
Lunenburg, MA 01462

Dear Mr. Alonso:

Congratulations on your certification! The Supplier Diversity Office (SDO) is pleased to notify you that your firm was certified as a minority-owned business enterprise (MBE) with the certified business description, CONSTRUCTION SERVICES; PAVING; CATCH BASIN & MANHOLE ADJUSTMENT; CURBING. **This letter serves as sole and exclusive proof of your firm's SDO certification.**

Your company will be listed in both the SDO Directory and in the Massachusetts Central Register, which are published at regular intervals. The SDO Directory is sent to other state agencies and private organizations that seek to fulfill MBE utilization requirements.

Furthermore, you have a continuing duty to notify SDO of a change in any information that is relevant to the firm's certification eligibility and to ensure that the information and documentation relied upon by SDO to certify or to maintain the certification of the business enterprise is accurate, complete and not misleading. You are required to notify SDO in writing of any change of such information or documentation within thirty calendar days. By way of example and not limitation, any change in ownership, control, investment, ongoing or independence may be considered material. Failure to abide by the continuing duty requirements shall constitute grounds for the business entity's decertification.

Certification is not a fixed designation and SDO reserves the right to monitor your company, do random spot checks; site visits and to conduct periodic reviews of your company's books, contracts, company structure, facilities, job locations; to seek other relevant information and documentation; and to revoke certification of your firm should this become necessary.

Your company's certification will automatically expire two years from the date of certification. If your company continues to meet all applicable certification criteria, no later than thirty (30) business days before your firm's certification renewal date of November 29, 2014, and every two years thereafter, please send SDO the following documents to renew your certification:

- 1) All company financial statements since the date of the company's then most recent SDO certification;

- 2) A signed copy of all U.S. Tax Returns and Schedules since the date of the company's then most recent SDO renewal;
- 3) Corporations must submit all Annual Reports/Letters of Good Standing filed with the Secretary of (YOUR) State since the date of the company's then most recent renewal; and

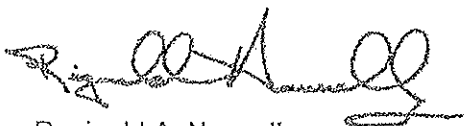
PLEASE NOTE THAT THE FOLLOWING ITEMS 4-6 CAN BE COMBINED ON ONE NOTARIZED STATEMENT:

- 4) A notarized statement that indicates:
"I certify under the pains and penalties of perjury that no significant changes affecting eligibility as a certified Minority/Minority-Women/Woman business enterprise have occurred since the date of the company's then most recent date of SDO certification as defined in State regulations 425 CMR 2.00 The Supplier Diversity Office."
- 5) A notarized statement that indicates either "A or B" as referenced below.
A. "I certify under the pains and penalties of perjury that (Insert your Company Name) has not received any contract(s) as a result of having been SDO certified."
B. "I certify under the pains and penalties of perjury that: (Insert your Company Name) has received a contract(s) as a result of having been SDO certified." List all contract names, contract amounts and the names of the agencies with which you have contracted from the date of your last SDO renewal."
- 6) A notarized statement that indicates:
"I certify under the pains and penalties of perjury that (Insert your Company Name) has (number) of employees for each year end given; include owner(s)."

Additionally, every six years, certified companies that wish to remain certified must undergo a substantive review of their certification status with a SDO certification specialist who will re-evaluate the company to determine whether it continues to meet the applicable certification criteria. If you wish to recertify your company when it becomes due for substantive review, you will need to submit the applicable recertification application and all required information and documentation to SDO no later than forty-five (45) business days prior to the date of certification expiration (i.e., the recertification date). At that time, a certification specialist will be assigned to evaluate your company and will make a report and recommendation to the Certification Committee (CC) on whether or not the company continues to meet the applicable certification criteria.

As provided above in 425 CMR 2.00, if your company has a change of company name, address or telephone number, please send a signed letter within thirty days of the change on company letterhead to notify SDO of the change. Please be sure to inform the agency or awarding authority you are contracting with of this change for proper payment.

Very truly yours,



Reginald A. Nunnally
Executive Director

SECTION 00331ADD1

LETTER OF INTENT FOR SRF CONSTRUCTION

This form is to be completed by the D/MBE and D/WBE and must be submitted by the Bidder as part of the bid. A separate form must be completed for each D/MBE and D/WBE involved in the project.

Project Title: Concord Ave Neighborhood Project Location: Cambridge, MA
 (Contract 9) Sewer Separation and
 Surface Improvements Project

TO: P. GIOIOSO & SONS, INC.
 (Name of Bidder)

FROM: HILB, INC.
 (Please Indicate Status D/MBE or D/WBE)

° I/we intend to perform work in connection with the above project as (check one):

- An individual A partnership
 A corporation A joint venture with: _____
 Other (explain): _____

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

DBE PARTICIPATION

Description of Activity	Date of Project Commencement	\$ Amount	% Bid Price
<u>TRUCKING ETC.</u>	<u>RD Commenc.</u>	<u>\$19,600.00</u>	<u>3.80 %</u>

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

BIDDER	DBE
<u>P. GIOIOSO & SONS, INC.</u> <u>Frank Gioioso CEO/PR 12-5-13</u> (Authorized Original Signature) Date	<u>Catherine C. Consalvo 12/5/13</u> (Authorized Original Signature) Date
ADDRESS: <u>50 SPRUCE STREET</u> <u>HYDE PARK MA 02136</u>	ADDRESS: <u>108 MOUNT STREET</u> <u>QUINCY MA 02148</u>
TELEPHONE #: <u>617-364-5850</u>	TELEPHONE #: <u>617-387-4001</u>
FEIN: <u>04-2312332</u>	FEIN: <u>04-2481632</u>

ORIGINALS:

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

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



THE COMMONWEALTH OF MASSACHUSETTS
Executive Office for Administration and Finance
OPERATIONAL SERVICES DIVISION
One Ashburton Place, Suite 1017
Boston, MA 02108-1552

OPERATIONAL SERVICES DIVISION

SUPPLIER DIVERSITY OFFICE

Reginald Nunnally
Executive Director

Deval L. Patrick
Governor

Glen Shor
Secretary

Gary J. Lambert
Assistant Secretary for
Operational Services

August 28, 2013

Ms. Catherine Consalvo
Hilee, Inc.
100 Tremont Street
Everett, MA 02149

Dear Ms. Consalvo:

Congratulations! The Supplier Diversity Office (SDO), on behalf of the Massachusetts Unified Certification Program (MassUCP), is pleased to notify you we have renewed your company as a disadvantaged business enterprise (DBE). Your company continues to be assigned NAICS Code(s) 532412 and 484220 with the certified business description of TRUCKING AND EQUIPMENT RENTAL, and will remain listed in our certified business directory. **This letter serves as sole and exclusive proof of your firm's DBE certification.**

As a DBE, you must inform SDO in writing of any change in circumstances affecting your ability to meet size, disadvantaged status, ownership, control requirements or any material change in the information provided in your application form. Changes in management responsibility among members of a limited liability company are covered by this requirement. You must attach supporting documentation describing in detail the nature of such changes. The notice must take the form of an affidavit sworn to by the owners of the firm before a person who is authorized by state law to administer oaths or of an un-sworn declaration executed under penalty of perjury of the laws of the United States. You must provide the written notification within 30 days of the occurrence of the change. If you fail to make timely notification of such a change, you will be deemed to have failed to cooperate under 49 CFR 26.109(c).

To renew your firm's DBE certification and if it continues to meet the applicable criteria, on or before your firm's certification anniversary date of August 16, 2014, and each year thereafter, please send SDO the following documents:

- (1) Notarized originals of No Change Affidavit
- (2) A signed copy of your company's, and all of its affiliates', U.S. Tax Returns including all schedules and attachments for the year(s) indicated.
- (3) A signed copy of your Personal Tax Returns

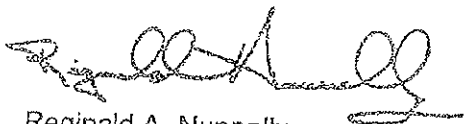
- (4) If a sole proprietor, a **signed** copy of your complete tax return including the Schedule C. for year(s) indicated.
- (5) All financial statements of your company for the year(s) indicated.
- (6) A notarized statement of the number of full- and part-time employees (including owner) for each year indicated.
- (7) Completed Personal Financial Statement and Statement of Disadvantage Forms. (see attached forms with instructions).
- (8) For out of state companies, please provide a copy of your most recent certification letter from your home state.

If you have changed your company name or address, please notify Ms. Nedra D. White, in writing on the company's letterhead in order to update your state vendor file.

SDO reserves the right to monitor, perform random spot checks, re-evaluate the firm or revoke the firm's certification if it no longer meets the certification criteria.

During the period of your certification, if you have further questions regarding annual reviews, please contact Ms. Nedra D. White, Director of Certification, at (617) 502-8852.

Very truly yours,



Reginald A. Nunnally
Executive Director

SECTION 00332

DISADVANTAGED BUSINESS ENTERPRISE PROGRAM
DBE SUBCONTRACTOR PARTICIPATION FORM

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

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

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

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

Equivalent to EPA form 6100-2

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SECTION 00333

REQUEST FOR WAIVER FOR SRF CONSTRUCTION

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

General Information

Project Title: _____ Project Location: _____

Bid Opening (time/date) _____

Bidder: _____

Mailing Address: _____

Contact Person: _____ Telephone No. () _____ Ext. _____

Minimum Requirements

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

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

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

CERTIFICATION

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

(authorized original signature)

DATE

STATE REVOLVING FUND LOAN PROGRAM – SCHEDULE OF SUBCONTRACTOR PARTICIPATION

Local Governmental Unit _____

Project Name _____

SRF Identification Number _____

General Contractor _____

Contract Value _____

The United States Environmental Protection Agency (EPA) requires that all SRF borrowers develop and maintain a list of all MBE/WBE and non MBE/WBE subcontractors on the project.

This form must be completed and returned to MassDEP within 90 days of award of the contract.

Subcontractor	Point of Contact	Mailing Address	Telephone Number	E-Mail Address	MBE	WBE	DBE	Subcontract Value

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File No. 6228

BOND # 105 999 709

**AGREEMENT BETWEEN THE CITY OF CAMBRIDGE
AND
CONTRACTOR**

The City of Cambridge ("the City"), a municipal corporation, acting through its City Manager, and

P. Gioioso & Sons, Inc ("the Contractor"),

50 Sprague Street, Hyde Park, MA 02136 (address)

agree as follows:

THE CONTRACT DOCUMENTS

The Contract Documents form the Contract between the City and the Contractor and consist only of those documents listed under the definition of "Contract Documents" in the General Terms and Conditions of the Contract. The Contract represents the entire and integrated agreement between the parties and supersedes any prior negotiations, representations, or agreements, whether oral or written.

THE WORK

The Contractor shall perform the Work as specified in the Contract Documents entitled:

Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project

CONTRACT TIME

All work for the Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work shall be completed by December 31, 2015. All work for the Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work shall be completed within 907 calendar days from the date in the "Notice to Proceed". Milestone requirements are described in Specification Section 00200 Invitation to Bid.

The Contractor agrees that the Work shall be prosecuted regularly, diligently, uninterruptedly and at such rate of progress as will insure full completion thereof within the Contract Time. It is expressly understood and agreed that the Contract Time is reasonable for the completion of the Work including the Work associated with the selected bid alternates, taking all factors into consideration.

Bidder's Name: P. Gioioso & Sons, Inc.

Concord Ave
Conformed Set

AGREEMENT
00500-1

CONTRACT SUM

The City will pay the Contractor for performance of the Work in accordance with the Contract Documents the sum of \$ 24,185,349.25 as set forth on the Contractor's bid form.

The City shall not be liable for any claims or requests for payment by the Contractor which would cause the total claims or payments under this Contract to exceed by the City Auditor as being appropriated for this contract.

LIQUIDATED DAMAGES

The City and the Contractor recognize that time is of the essence of this Contract and that the City will suffer financial loss if the Work is not completed within the Contract Time plus any authorized extensions. They also recognize the delay, expense, and difficulty involved in proving the actual loss suffered by the City if the Work is not completed within the Contract Time. Accordingly, instead of requiring any such proof, the City and the Contractor agree that the Contractor shall pay to the City as liquidated damages, not as a penalty, the sum of \$5,240.00 for each consecutive calendar plus any fines and penalties of approximately \$29,000/day which will be levied on the City by the EPA if this United States federal court-ordered milestone is not met. These fines and penalties will be further assessed at the time they are levied against the City.

The City and the Contractor agree that the Contractor shall pay to the City as liquidated damages, not as a penalty, the sum of \$2,260.00 for each consecutive calendar day after Milestone Number 2 that the work for that milestone remains unfinished. The Contractor agrees to allow the City to deduct any such amounts from progress payments and retainage.

ADDITIONAL SRF REQUIREMENTS

The fair share goals for disadvantaged business enterprise (DBE) participation for this contract are a minimum of 3.40 percent Disadvantaged Minority Business Enterprise (D/MBE) participation and 3.80 percent Disadvantaged Women Business Enterprise (D/WBE) participation, applicable to the total dollar amount paid for the construction contract. The Contractor shall take all affirmative steps necessary to achieve this goal, and shall provide reports documenting the portion of contract and subcontract dollars paid to DBEs, and its efforts to achieve the goals, with each invoice submitted or at such greater intervals as specified by the City. The Contractor shall require similar reports from its subcontractors.

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

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during

Bidder's Name: P. Gioioso & Sons, Inc.

Concord Ave
Conformed Set

AGREEMENT
00500-2

employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

2. The Contractor will, in all solicitations or advancements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders. Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

6. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States." [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970].

The Contractor shall not participate in or cooperate with an international boycott, as defined

Bidder's Name: P. Gioioso & Sons, Inc.

in Section 999 (b)(3) and (4) of the Internal Revenue code 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

The Contractor agrees that it will fully comply with Subpart C of 2 CFR Part 180 and 2 CFR Part 1532, entitled Responsibilities of Participants Regarding Transactions (Doing Business with Other Persons). The Contractor shall not award any subcontracts or purchase any materials from suppliers that appear on the Excluded Parties List System. The Contractor shall include this requirement in each subcontract and require it to be included in all subcontracts regardless of tier. The Contractor shall maintain reasonable records to demonstrate compliance with these requirements.

As per DEP's Policy Memorandum #10 – the agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be twenty percent.

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

This Contract is effective as of 2/10/2014.

THE CITY OF CAMBRIDGE

Richard C Rossi

Richard C. Rossi, City Manager

THE CONTRACTOR

P. Gioioso & Sons, Inc.

Signature

BY: Francesco Gioioso

Print Name and Title

Francesco Gioioso, CEO/Treasurer

(Corporate Seal)

APPROVED AS TO FORM:

[Signature]

Nancy E. Glowa, City Solicitor

APPROVED AS TO THE AVAILABILITY OF APPROPRIATION OF FUNDS:

Budget Code: [Signature]

James D. Monagle, City Auditor

[Signature]

Michele Kincaid, Acting Purchasing Agent

Bidder's Name: P. Gioioso & Sons, Inc.

Concord Ave
Conformed Set

AGREEMENT
00500-4

MWRA: \$5,757,106.00
Budget Code: 58920-32300-470101-PW14602
City: \$18,428,243.25
58801-32300-470101-PW13588

SECTION 00550
NOTICE OF AWARD

TO: _____

PROJECT DESCRIPTION: Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project

The Owner has considered the Proposal submitted by you for the above described Work on _____ 20__ in response to its Advertisement for Bids and Instructions to Bidders.

You are hereby notified that your Proposal has been accepted for Items totalling the amount of \$_____.

You are required by the Instructions to Bidders to execute the Contract Agreement and furnish the required Contractor's Performance Bond, Payment Bond and certificates of insurance within ten (10) days from the date of this Notice of Award.

If you fail to execute said Agreement and to furnish said Bonds and Insurance within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Proposal as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice Of Award to the Owner.

Dated this _____ day of _____, 20_____.

(Owner)
By _____
Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged, this the _____ day of _____, 20_____.

By _____
Title _____

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SECTION 00560

NOTICE TO PROCEED

To: P. Gioioso & Sons, Inc. Date: February 11, 2014
(Contractor)

Project: Concord Ave Neighborhood
(Contract 9) Sewer Separation
and Surface Improvements Project

You are hereby notified to commence the Work in accordance with the Agreement dated February 10, 2014, on or before February 21, 2014, and you are to complete all work for the Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work shall be completed by December 31, 2015. All work for the Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work shall be completed within 907 calendar days. The date of completion of all work is therefore, August 5, 2016.

City of Cambridge
(Owner)

By Karl W...

Title Acting City Engineer

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged, this the 11th
day of February, 2014.

By [Signature]

Title Secretary

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SECTION 00610
PERFORMANCE BOND

#105999709

We, the undersigned, P. Gioioso & Sons, Inc.

(Name of Contractor)

50 Sprague Street, Hyde Park, Massachusetts 02136

(Address of Contractor)

a Corporation (Corporation, Partnership, or Individual), hereinafter called

Principal,

and

Travelers Casualty and Surety Company of America

(Name of Surety)

350 Granite Street, Suite 1201, Braintree, Massachusetts 02184-3905

(Address of Surety) hereinafter called Surety, are held and firmly bound unto the CITY OF

CAMBRIDGE, 795 Massachusetts Avenue, Cambridge, MA 02139, hereinafter called Owner, in
the penal sum of ~~thousand three hundred forty-nine-25~~ ^{twenty-four million one hundred eighty-five} Dollars (\$ 24,185,349.25)

¹⁰⁰
in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.


The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the ____ day of _____, 2014, a copy of which is attached hereto and made a part hereof, for the project known as "CONCORD AVE NEIGHBORHOOD (CONTRACT 9) SEWER SEPERATION AND SURFACE IMPROVEMENTS PROJECT," and the Principal and Surety bind themselves to the Owner for the performance of the contract.

Now, therefore, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during the guaranty period set forth in the contract, and if it shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner, its officers and agents from any and all costs and damages which it may suffer by a reason of failure to

do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this bond shall remain in full force and effect; provided, further, that the said Surety for value received hereby agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder of the Specifications accompanying the same shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications. Provided, further, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed on this ____ day of _____, 2014.

P. Gioioso & Sons, Inc.
CONTRACTOR AS PRINCIPAL



(Signature)
Name and Title:
Francesco Gioioso, CEO/Treasurer
SEAL

Travelers Casualty and Surety Company of America
SURETY



(Signature)
Name and Title:
Kevin Racine, Attorney-in-Fact
SEAL

12 Gill Street, Suite 5500
Address
Woburn, Ma. 01801

800-842-2838
Telephone No.
781-376-5035

Fax No.

SECTION 00620
PAYMENT BOND

105999709

We, the undersigned, P. Gioioso & Sons, Inc.

(Name of Contractor)

50 Sprague Street, Hyde Park, Massachusetts 02136

(Address of Contractor)

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

Travelers Casualty and Surety Company of America

(Name of Surety)

350 Granite Street, Suite 1201, Braintree, Massachusetts 02184-3905

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the CITY OF CAMBRIDGE, 795
Massachusetts Avenue, Cambridge, MA 02139, hereinafter called Owner, in the penal sum of
Twenty-four million one hundred eighty-five thousand
three hundred forty-nine--25/100 Dollars (\$ 24,185,349.25) in lawful money
of the United States, for the payment of which sum well and truly to be made. We hereby jointly and
severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with
the Owner, dated the ____ day of _____ 2014, a copy of which is attached hereto and
made a part hereof, for the project known as "CONCORD AVE NEIGHBORHOOD
(CONTRACT 9) SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT"

Now, therefore, if the Principal shall promptly make payment to all persons, firms,
subcontractors, and corporations furnishing materials for or performing labor in the prosecution of
the work provided for in such contract, and any authorized extension or modification thereof,
including all amounts due for all materials used in connection with the work, and all insurance
premiums on said work, and for all labor performed in such work whether by subcontractor or
otherwise, then this obligation shall be void; otherwise this bond is to remain in full force and effect.

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

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

IN WITNESS WHEREOF, this instrument is executed on this ___ day of _____, 2014.

P. Gioioso & Sons, Inc.
CONTRACTOR AS PRINCIPAL



(Signature)
Name and Title:

Francesco Gioioso, CEO/Treasurer
SEAL

Travelers Casualty and Surety Company of America
SURETY



(Signature)
Name and Title:

Kevin Racine, Attorney-in-Fact
SEAL

12 Gill Street, Suite 5500

Address
Woburn, Ma. 01801

800-842-2838

Telephone No.
781-376-5035

Fax No.

SECTION 00630
CERTIFICATE OF AUTHORITY

MEETING OF THE BOARD OF DIRECTORS

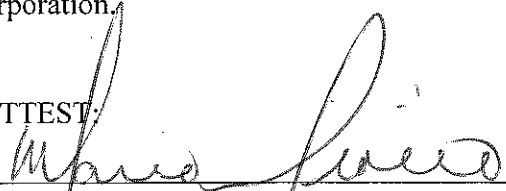
CERTIFICATE OF AUTHORITY

At a meeting of the Directors of the P. Gioioso & Sons, Inc.

_____ duly called and
held at Hyde Park on the 5th day of
December 2013, at which a quorum was present and acting, it was VOICED
THAT Francesco Gioioso the
CEO/Treasurer of this corporation is hereby authorized and
empowered to make, enter into, sign, seal and deliver, in behalf of this corporation, a Contract for
Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvement
Project File No. 6228)
with the City of Cambridge, and performance and payment bonds (each in the full amount of the
Contract) in connection with such Contract.

I DO HEREBY CERTIFY that the above is a true and correct copy of the record, that said
vote has not been amended or repealed and is in full force and effect on this date, and that
Francesco Gioioso is duly elected
CEO/Treasurer of this corporation.

ATTEST


Marco Gioioso
~~Clerk~~ Secretary of the Corporation

(Affix Corporate Seal Here)

Marco Gioioso

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SECTION 00670

DIVISION OF LABOR AND WAGE RATES

Prevailing wage rates to be applied for work performed under this Contract are shown on the following pages.



DEVAL L. PATRICK
Governor
TIMOTHY P. MURRAY
Lt. Governor

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

Prevailing Wage Rates

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

JOANNE F. GOLDSTEIN
Secretary
HEATHER E. ROWE
Director

Awarding Authority: City of Cambridge Purchasing Department
Contract Number: 6228 **City/Town:** CAMBRIDGE
Description of Work: Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements
Job Location: Various Locations

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.
- Awarding authorities 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.
- 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. Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project. The wage schedule must be posted in a conspicuous place at the work site during 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 regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Training (DAT). Apprentices must keep his/her apprentice identification card on his/her person during all work hours on the project. If an apprentice rate is listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAT, the apprentice must be paid the journeyworker’s rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. 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 directly to the awarding authority and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.55	\$8.91	\$8.00	\$0.00	\$48.46
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.62	\$8.91	\$8.00	\$0.00	\$48.53
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.74	\$8.91	\$8.00	\$0.00	\$48.65
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2013	\$84.21	\$9.80	\$18.17	\$0.00	\$112.18
	08/01/2014	\$87.36	\$9.80	\$18.17	\$0.00	\$115.33
	08/01/2015	\$90.51	\$9.80	\$18.17	\$0.00	\$118.48
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
	12/01/2016	\$39.30	\$7.10	\$12.45	\$0.00	\$58.85
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	06/01/2013	\$29.88	\$10.40	\$5.95	\$0.00	\$46.23
	12/01/2013	\$30.68	\$10.40	\$5.95	\$0.00	\$47.03
	06/01/2014	\$31.58	\$10.40	\$5.95	\$0.00	\$47.93
	12/01/2014	\$32.48	\$10.40	\$5.95	\$0.00	\$48.83
	06/01/2015	\$33.43	\$10.40	\$5.95	\$0.00	\$49.78
	12/01/2015	\$34.38	\$10.40	\$5.95	\$0.00	\$50.73
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
	12/01/2016	\$39.30	\$7.10	\$12.45	\$0.00	\$58.85

For apprentice rates see "Apprentice- LABORER"

BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2010	\$37.70	\$6.97	\$11.18	\$0.00	\$55.85
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Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2010

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

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	08/01/2013	\$48.06	\$10.18	\$18.15	\$0.00	\$76.39
	02/01/2014	\$48.62	\$10.18	\$18.15	\$0.00	\$76.95
	08/01/2014	\$49.52	\$10.18	\$18.22	\$0.00	\$77.92
	02/01/2015	\$50.08	\$10.18	\$18.22	\$0.00	\$78.48
	08/01/2015	\$50.98	\$10.18	\$18.29	\$0.00	\$79.45
	02/01/2016	\$51.55	\$10.18	\$18.29	\$0.00	\$80.02
	08/01/2016	\$52.45	\$10.18	\$18.37	\$0.00	\$81.00
	02/01/2017	\$53.02	\$10.18	\$18.37	\$0.00	\$81.57

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

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

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.03	\$10.18	\$18.15	\$0.00	\$52.36
2	60	\$28.84	\$10.18	\$18.15	\$0.00	\$57.17
3	70	\$33.64	\$10.18	\$18.15	\$0.00	\$61.97
4	80	\$38.45	\$10.18	\$18.15	\$0.00	\$66.78
5	90	\$43.25	\$10.18	\$18.15	\$0.00	\$71.58

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.31	\$10.18	\$18.15	\$0.00	\$52.64
2	60	\$29.17	\$10.18	\$18.15	\$0.00	\$57.50
3	70	\$34.03	\$10.18	\$18.15	\$0.00	\$62.36
4	80	\$38.90	\$10.18	\$18.15	\$0.00	\$67.23
5	90	\$43.76	\$10.18	\$18.15	\$0.00	\$72.09

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
OPERATING ENGINEERS LOCAL 4	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN	06/01/2013	\$34.20	\$7.10	\$12.60	\$0.00	\$53.90
LABORERS - FOUNDATION AND MARINE	12/01/2013	\$34.95	\$7.10	\$12.60	\$0.00	\$54.65
	06/01/2014	\$35.70	\$7.10	\$12.60	\$0.00	\$55.40
	12/01/2014	\$36.45	\$7.10	\$12.60	\$0.00	\$56.15
	06/01/2015	\$37.20	\$7.10	\$12.60	\$0.00	\$56.90
	12/01/2015	\$37.95	\$7.10	\$12.60	\$0.00	\$57.65
	06/01/2016	\$38.70	\$7.10	\$12.60	\$0.00	\$58.40
	12/01/2016	\$39.70	\$7.10	\$12.60	\$0.00	\$59.40

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
LABORERS - FOUNDATION AND MARINE	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 1 (Metro Boston)</i>	09/01/2013	\$40.35	\$9.80	\$15.61	\$0.00	\$65.76
	03/01/2014	\$41.18	\$9.80	\$15.61	\$0.00	\$66.59
	09/01/2014	\$42.20	\$9.80	\$15.61	\$0.00	\$67.61
	03/01/2015	\$43.22	\$9.80	\$15.61	\$0.00	\$68.63

Apprentice - CARPENTER - Zone 1 Metro Boston

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.18	\$9.80	\$1.57	\$0.00	\$31.55
2	60	\$24.21	\$9.80	\$1.57	\$0.00	\$35.58
3	70	\$28.25	\$9.80	\$10.90	\$0.00	\$48.95
4	75	\$30.26	\$9.80	\$10.90	\$0.00	\$50.96
5	80	\$32.28	\$9.80	\$12.47	\$0.00	\$54.55
6	80	\$32.28	\$9.80	\$12.47	\$0.00	\$54.55
7	90	\$36.32	\$9.80	\$14.04	\$0.00	\$60.16
8	90	\$36.32	\$9.80	\$14.04	\$0.00	\$60.16

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.59	\$9.80	\$1.57	\$0.00	\$31.96
2	60	\$24.71	\$9.80	\$1.57	\$0.00	\$36.08
3	70	\$28.83	\$9.80	\$10.90	\$0.00	\$49.53
4	75	\$30.89	\$9.80	\$10.90	\$0.00	\$51.59
5	80	\$32.94	\$9.80	\$12.47	\$0.00	\$55.21
6	80	\$32.94	\$9.80	\$12.47	\$0.00	\$55.21
7	90	\$37.06	\$9.80	\$14.04	\$0.00	\$60.90
8	90	\$37.06	\$9.80	\$14.04	\$0.00	\$60.90

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING	07/01/2013	\$42.68	\$10.90	\$18.71	\$1.30	\$73.59
BRICKLAYERS LOCAL 3 (BOSTON)	01/01/2014	\$43.60	\$10.90	\$18.71	\$1.30	\$74.51
	07/01/2014	\$44.20	\$10.90	\$18.71	\$1.30	\$75.11
	01/01/2015	\$45.14	\$10.90	\$18.71	\$1.30	\$76.05
	07/01/2015	\$45.72	\$10.90	\$18.71	\$1.30	\$76.63
	01/01/2016	\$46.64	\$10.90	\$18.71	\$1.30	\$77.55

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.34	\$10.90	\$12.21	\$1.30	\$45.75
2	60	\$25.61	\$10.90	\$13.71	\$1.30	\$51.52
3	65	\$27.74	\$10.90	\$14.71	\$1.30	\$54.65
4	70	\$29.88	\$10.90	\$15.71	\$1.30	\$57.79
5	75	\$32.01	\$10.90	\$16.71	\$1.30	\$60.92
6	80	\$34.14	\$10.90	\$17.71	\$1.30	\$64.05
7	90	\$38.41	\$10.90	\$18.71	\$1.30	\$69.32

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.80	\$10.90	\$12.21	\$1.30	\$46.21
2	60	\$26.16	\$10.90	\$13.71	\$1.30	\$52.07
3	65	\$28.34	\$10.90	\$14.71	\$1.30	\$55.25
4	70	\$30.52	\$10.90	\$15.71	\$1.30	\$58.43
5	75	\$32.70	\$10.90	\$16.71	\$1.30	\$61.61
6	80	\$34.88	\$10.90	\$17.71	\$1.30	\$64.79
7	90	\$39.24	\$10.90	\$18.71	\$1.30	\$70.15

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
LABORERS - ZONE 1	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	06/01/2013	\$41.34	\$10.00	\$13.55	\$0.00	\$64.89
OPERATING ENGINEERS LOCAL 4	12/01/2013	\$42.12	\$10.00	\$13.55	\$0.00	\$65.67

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

COMPRESSOR OPERATOR	06/01/2013	\$28.19	\$10.00	\$13.55	\$0.00	\$51.74
OPERATING ENGINEERS LOCAL 4	12/01/2013	\$28.74	\$10.00	\$13.55	\$0.00	\$52.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 1</i>	07/01/2013	\$45.41	\$7.85	\$15.85	\$0.00	\$69.11
	01/01/2014	\$45.91	\$7.85	\$16.10	\$0.00	\$69.86
	07/01/2014	\$46.76	\$7.85	\$16.10	\$0.00	\$70.71
	01/01/2015	\$47.66	\$7.85	\$16.10	\$0.00	\$71.61
	07/01/2015	\$48.56	\$7.85	\$16.10	\$0.00	\$72.51
	01/01/2016	\$49.51	\$7.85	\$16.10	\$0.00	\$73.46
	07/01/2016	\$50.46	\$7.85	\$16.10	\$0.00	\$74.41
	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.71	\$7.85	\$0.00	\$0.00	\$30.56
2	55	\$24.98	\$7.85	\$3.58	\$0.00	\$36.41
3	60	\$27.25	\$7.85	\$3.90	\$0.00	\$39.00
4	65	\$29.52	\$7.85	\$4.23	\$0.00	\$41.60
5	70	\$31.79	\$7.85	\$13.90	\$0.00	\$53.54
6	75	\$34.06	\$7.85	\$14.23	\$0.00	\$56.14
7	80	\$36.33	\$7.85	\$14.55	\$0.00	\$58.73
8	90	\$40.87	\$7.85	\$15.20	\$0.00	\$63.92

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.96	\$7.85	\$0.00	\$0.00	\$30.81
2	55	\$25.25	\$7.85	\$3.66	\$0.00	\$36.76
3	60	\$27.55	\$7.85	\$3.99	\$0.00	\$39.39
4	65	\$29.84	\$7.85	\$4.32	\$0.00	\$42.01
5	70	\$32.14	\$7.85	\$14.11	\$0.00	\$54.10
6	75	\$34.43	\$7.85	\$14.44	\$0.00	\$56.72
7	80	\$36.73	\$7.85	\$14.77	\$0.00	\$59.35
8	90	\$41.32	\$7.85	\$15.44	\$0.00	\$64.61

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN <i>LABORERS - ZONE 1</i>	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2011	\$32.80	\$7.10	\$12.45	\$0.00	\$52.35
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS <i>LABORERS - ZONE 1</i>	12/01/2011	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 1</i>	12/01/2011	\$32.80	\$7.10	\$12.45	\$0.00	\$52.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2011	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 1</i>	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
	08/01/2013	\$56.14	\$9.80	\$18.17	\$0.00	\$84.11
	08/01/2014	\$58.24	\$9.80	\$18.17	\$0.00	\$86.21
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$60.34	\$9.80	\$18.17	\$0.00	\$88.31
	08/01/2013	\$40.10	\$9.80	\$18.17	\$0.00	\$68.07
	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07
	08/01/2013	\$60.15	\$9.80	\$18.17	\$0.00	\$88.12
	08/01/2014	\$62.40	\$9.80	\$18.17	\$0.00	\$90.37
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2015	\$64.65	\$9.80	\$18.17	\$0.00	\$92.62
	08/01/2013	\$84.21	\$9.80	\$18.17	\$0.00	\$112.18
	08/01/2014	\$87.36	\$9.80	\$18.17	\$0.00	\$115.33
DRAWBRIDGE OPERATOR (Construction) <i>ELECTRICIANS LOCAL 103</i>	08/01/2015	\$90.51	\$9.80	\$18.17	\$0.00	\$118.48
	09/01/2013	\$43.96	\$13.00	\$14.42	\$0.00	\$71.38
	03/01/2014	\$44.45	\$13.00	\$14.68	\$0.00	\$72.13
	09/01/2014	\$45.12	\$13.00	\$14.70	\$0.00	\$72.82
	03/01/2015	\$45.84	\$13.00	\$14.72	\$0.00	\$73.56
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2015	\$46.80	\$13.00	\$14.75	\$0.00	\$74.55
	03/01/2016	\$47.75	\$13.00	\$14.78	\$0.00	\$75.53
	09/01/2013	\$43.96	\$13.00	\$14.42	\$0.00	\$71.38
	03/01/2014	\$44.45	\$13.00	\$14.68	\$0.00	\$72.13
	09/01/2014	\$45.12	\$13.00	\$14.70	\$0.00	\$72.82
03/01/2015	\$45.84	\$13.00	\$14.72	\$0.00	\$73.56	
09/01/2015	\$46.80	\$13.00	\$14.75	\$0.00	\$74.55	
03/01/2016	\$47.75	\$13.00	\$14.78	\$0.00	\$75.53	

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - ELECTRICIAN - Local 103

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.58	\$13.00	\$0.53	\$0.00	\$31.11
2	40	\$17.58	\$13.00	\$0.53	\$0.00	\$31.11
3	45	\$19.78	\$13.00	\$10.78	\$0.00	\$43.56
4	45	\$19.78	\$13.00	\$10.78	\$0.00	\$43.56
5	50	\$21.98	\$13.00	\$11.11	\$0.00	\$46.09
6	55	\$24.18	\$13.00	\$11.45	\$0.00	\$48.63
7	60	\$26.38	\$13.00	\$11.77	\$0.00	\$51.15
8	65	\$28.57	\$13.00	\$12.11	\$0.00	\$53.68
9	70	\$30.77	\$13.00	\$12.43	\$0.00	\$56.20
10	75	\$32.97	\$13.00	\$12.77	\$0.00	\$58.74

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.78	\$13.00	\$0.53	\$0.00	\$31.31
2	40	\$17.78	\$13.00	\$0.53	\$0.00	\$31.31
3	45	\$20.00	\$13.00	\$11.04	\$0.00	\$44.04
4	45	\$20.00	\$13.00	\$11.04	\$0.00	\$44.04
5	50	\$22.23	\$13.00	\$11.37	\$0.00	\$46.60
6	55	\$24.45	\$13.00	\$11.70	\$0.00	\$49.15
7	60	\$26.67	\$13.00	\$12.03	\$0.00	\$51.70
8	65	\$28.89	\$13.00	\$12.37	\$0.00	\$54.26
9	70	\$31.12	\$13.00	\$12.69	\$0.00	\$56.81
10	75	\$33.34	\$13.00	\$13.03	\$0.00	\$59.37

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	01/01/2012	\$52.45	\$8.78	\$6.96	\$0.00	\$68.19
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.23	\$8.78	\$0.00	\$0.00	\$35.01
2	55	\$28.85	\$8.78	\$6.96	\$0.00	\$44.59
3	65	\$34.09	\$8.78	\$6.96	\$0.00	\$49.83
4	70	\$36.72	\$8.78	\$6.96	\$0.00	\$52.46
5	80	\$41.96	\$8.78	\$6.96	\$0.00	\$57.70

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2012	\$38.59	\$8.78	\$6.96	\$0.00	\$54.33
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For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2013	\$38.50	\$10.00	\$13.02	\$0.00	\$61.52
	11/01/2013	\$38.73	\$10.00	\$13.55	\$0.00	\$62.28
	05/01/2014	\$39.50	\$10.00	\$13.55	\$0.00	\$63.05

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2013	\$39.91	\$10.00	\$13.02	\$0.00	\$62.93
	11/01/2013	\$40.15	\$10.00	\$13.55	\$0.00	\$63.70
	05/01/2014	\$40.92	\$10.00	\$13.55	\$0.00	\$64.47

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	05/01/2013	\$21.17	\$10.00	\$13.02	\$0.00	\$44.19
	11/01/2013	\$21.10	\$10.00	\$13.55	\$0.00	\$44.65
	05/01/2014	\$21.55	\$10.00	\$13.55	\$0.00	\$45.10

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	09/01/2013	\$43.96	\$13.00	\$14.42	\$0.00	\$71.38
	03/01/2014	\$44.45	\$13.00	\$14.68	\$0.00	\$72.13
	09/01/2014	\$45.12	\$13.00	\$14.70	\$0.00	\$72.82
	03/01/2015	\$45.84	\$13.00	\$14.72	\$0.00	\$73.56
	09/01/2015	\$46.80	\$13.00	\$14.75	\$0.00	\$74.55
	03/01/2016	\$47.75	\$13.00	\$14.78	\$0.00	\$75.53

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM REPAIR / MAINTENANCE	09/01/2013	\$32.97	\$13.00	\$12.77	\$0.00	\$58.74
LOCAL 103 / COMMISSIONING <i>ELECTRICIANS</i>	03/01/2014	\$33.44	\$13.00	\$13.03	\$0.00	\$59.47
	09/01/2014	\$33.84	\$13.00	\$13.05	\$0.00	\$59.89
	03/01/2015	\$34.38	\$13.00	\$13.06	\$0.00	\$60.44
	09/01/2015	\$35.10	\$13.00	\$13.08	\$0.00	\$61.18
	03/01/2016	\$35.81	\$13.00	\$13.10	\$0.00	\$61.91
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER)	06/01/2013	\$33.73	\$10.00	\$13.55	\$0.00	\$57.28
OPERATING ENGINEERS LOCAL 4	12/01/2013	\$34.39	\$10.00	\$13.55	\$0.00	\$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER	06/01/2013	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
LABORERS - ZONE 1	12/01/2013	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2014	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2014	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2015	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2015	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2016	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2016	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER	09/01/2013	\$38.61	\$9.80	\$16.71	\$0.00	\$65.12
FLOORCOVERERS LOCAL 2168 ZONE 1	03/01/2014	\$38.61	\$9.80	\$16.71	\$0.00	\$65.12

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.31	\$9.80	\$1.79	\$0.00	\$30.90
2	55	\$21.24	\$9.80	\$1.79	\$0.00	\$32.83
3	60	\$23.17	\$9.80	\$11.34	\$0.00	\$44.31
4	65	\$25.10	\$9.80	\$11.34	\$0.00	\$46.24
5	70	\$27.03	\$9.80	\$13.13	\$0.00	\$49.96
6	75	\$28.96	\$9.80	\$13.13	\$0.00	\$51.89
7	80	\$30.89	\$9.80	\$14.92	\$0.00	\$55.61
8	85	\$32.82	\$9.80	\$14.92	\$0.00	\$57.54

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.31	\$9.80	\$1.79	\$0.00	\$30.90
2	55	\$21.24	\$9.80	\$1.79	\$0.00	\$32.83
3	60	\$23.17	\$9.80	\$11.34	\$0.00	\$44.31
4	65	\$25.10	\$9.80	\$11.34	\$0.00	\$46.24
5	70	\$27.03	\$9.80	\$13.13	\$0.00	\$49.96
6	75	\$28.96	\$9.80	\$13.13	\$0.00	\$51.89
7	80	\$30.89	\$9.80	\$14.92	\$0.00	\$55.61
8	85	\$32.82	\$9.80	\$14.92	\$0.00	\$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$28.19	\$10.00	\$13.55	\$0.00	\$51.74
	12/01/2013	\$28.74	\$10.00	\$13.55	\$0.00	\$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 1)</i>	07/01/2013	\$40.70	\$7.85	\$15.85	\$0.00	\$64.40
	01/01/2014	\$41.20	\$7.85	\$16.10	\$0.00	\$65.15
	07/01/2014	\$42.05	\$7.85	\$16.10	\$0.00	\$66.00
	01/01/2015	\$42.95	\$7.85	\$16.10	\$0.00	\$66.90
	07/01/2015	\$43.85	\$7.85	\$16.10	\$0.00	\$67.80
	01/01/2016	\$44.80	\$7.85	\$16.10	\$0.00	\$68.75
	07/01/2016	\$45.75	\$7.85	\$16.10	\$0.00	\$69.70
	01/01/2017	\$46.70	\$7.85	\$16.10	\$0.00	\$70.65

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - GLAZIER - Local 35 Zone 1

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.35	\$7.85	\$0.00	\$0.00	\$28.20
2	55	\$22.39	\$7.85	\$3.58	\$0.00	\$33.82
3	60	\$24.42	\$7.85	\$3.90	\$0.00	\$36.17
4	65	\$26.46	\$7.85	\$4.23	\$0.00	\$38.54
5	70	\$28.49	\$7.85	\$13.90	\$0.00	\$50.24
6	75	\$30.53	\$7.85	\$14.23	\$0.00	\$52.61
7	80	\$32.56	\$7.85	\$14.55	\$0.00	\$54.96
8	90	\$36.63	\$7.85	\$15.20	\$0.00	\$59.68

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.60	\$7.85	\$0.00	\$0.00	\$28.45
2	55	\$22.66	\$7.85	\$3.66	\$0.00	\$34.17
3	60	\$24.72	\$7.85	\$3.99	\$0.00	\$36.56
4	65	\$26.78	\$7.85	\$4.32	\$0.00	\$38.95
5	70	\$28.84	\$7.85	\$14.11	\$0.00	\$50.80
6	75	\$30.90	\$7.85	\$14.44	\$0.00	\$53.19
7	80	\$32.96	\$7.85	\$14.77	\$0.00	\$55.58
8	90	\$37.08	\$7.85	\$15.44	\$0.00	\$60.37

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
OPERATING ENGINEERS LOCAL 4	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - OPERATING ENGINEERS - Local 4

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.19	\$10.00	\$0.00	\$0.00	\$32.19
2	60	\$24.20	\$10.00	\$13.55	\$0.00	\$47.75
3	65	\$26.22	\$10.00	\$13.55	\$0.00	\$49.77
4	70	\$28.24	\$10.00	\$13.55	\$0.00	\$51.79
5	75	\$30.26	\$10.00	\$13.55	\$0.00	\$53.81
6	80	\$32.27	\$10.00	\$13.55	\$0.00	\$55.82
7	85	\$34.29	\$10.00	\$13.55	\$0.00	\$57.84
8	90	\$36.31	\$10.00	\$13.55	\$0.00	\$59.86

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.62	\$10.00	\$0.00	\$0.00	\$32.62
2	60	\$24.67	\$10.00	\$13.55	\$0.00	\$48.22
3	65	\$26.73	\$10.00	\$13.55	\$0.00	\$50.28
4	70	\$28.78	\$10.00	\$13.55	\$0.00	\$52.33
5	75	\$30.84	\$10.00	\$13.55	\$0.00	\$54.39
6	80	\$32.90	\$10.00	\$13.55	\$0.00	\$56.45
7	85	\$34.95	\$10.00	\$13.55	\$0.00	\$58.50
8	90	\$37.01	\$10.00	\$13.55	\$0.00	\$60.56

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	09/01/2013	\$42.35	\$9.82	\$19.08	\$2.14	\$73.39
	02/01/2014	\$43.20	\$9.82	\$19.08	\$2.14	\$74.24
	08/01/2014	\$44.05	\$9.82	\$19.08	\$2.14	\$75.09
	02/01/2015	\$44.95	\$9.82	\$19.08	\$2.14	\$75.99
	08/01/2015	\$45.95	\$9.82	\$19.08	\$2.14	\$76.99
	02/01/2016	\$46.95	\$9.82	\$19.08	\$2.14	\$77.99
	08/01/2016	\$48.10	\$9.82	\$19.08	\$2.14	\$79.14
	02/01/2017	\$49.20	\$9.82	\$19.08	\$2.14	\$80.24
	08/01/2017	\$50.30	\$9.82	\$19.08	\$2.14	\$81.34
	02/01/2018	\$51.45	\$9.82	\$19.08	\$2.14	\$82.49

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	09/01/2013	\$43.96	\$13.00	\$14.42	\$0.00	\$71.38
	03/01/2014	\$44.45	\$13.00	\$14.68	\$0.00	\$72.13
	09/01/2014	\$45.12	\$13.00	\$14.70	\$0.00	\$72.82
	03/01/2015	\$45.84	\$13.00	\$14.72	\$0.00	\$73.56
	09/01/2015	\$46.80	\$13.00	\$14.75	\$0.00	\$74.55
	03/01/2016	\$47.75	\$13.00	\$14.78	\$0.00	\$75.53

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	09/01/2013	\$42.35	\$9.82	\$19.08	\$2.14	\$73.39
	02/01/2014	\$43.20	\$9.82	\$19.08	\$2.14	\$74.24
	08/01/2014	\$44.05	\$9.82	\$19.08	\$2.14	\$75.09
	02/01/2015	\$44.95	\$9.82	\$19.08	\$2.14	\$75.99
	08/01/2015	\$45.95	\$9.82	\$19.08	\$2.14	\$76.99
	02/01/2016	\$46.95	\$9.82	\$19.08	\$2.14	\$77.99
	08/01/2016	\$48.10	\$9.82	\$19.08	\$2.14	\$79.14
	02/01/2017	\$49.20	\$9.82	\$19.08	\$2.14	\$80.24
	08/01/2017	\$50.30	\$9.82	\$19.08	\$2.14	\$81.34
	02/01/2018	\$51.45	\$9.82	\$19.08	\$2.14	\$82.49
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
	12/01/2016	\$39.30	\$7.10	\$12.45	\$0.00	\$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2013	\$42.11	\$10.95	\$12.10	\$0.00	\$65.16
	09/01/2014	\$44.11	\$10.95	\$12.10	\$0.00	\$67.16

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

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

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.06	\$10.95	\$9.00	\$0.00	\$41.01
2	60	\$25.27	\$10.95	\$9.62	\$0.00	\$45.84
3	70	\$29.48	\$10.95	\$10.24	\$0.00	\$50.67
4	80	\$33.69	\$10.95	\$10.86	\$0.00	\$55.50

Effective Date - 09/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.06	\$10.95	\$9.00	\$0.00	\$42.01
2	60	\$26.47	\$10.95	\$9.62	\$0.00	\$47.04
3	70	\$30.88	\$10.95	\$10.24	\$0.00	\$52.07
4	80	\$35.29	\$10.95	\$10.86	\$0.00	\$57.10

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 7 (BOSTON AREA)	09/16/2013	\$40.85	\$7.70	\$18.60	\$0.00	\$67.15
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Apprentice - IRONWORKER - Local 7 Boston

Effective Date - 09/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$24.51	\$7.70	\$18.60	\$0.00	\$50.81
2	70	\$28.60	\$7.70	\$18.60	\$0.00	\$54.90
3	75	\$30.64	\$7.70	\$18.60	\$0.00	\$56.94
4	80	\$32.68	\$7.70	\$18.60	\$0.00	\$58.98
5	85	\$34.72	\$7.70	\$18.60	\$0.00	\$61.02
6	90	\$36.77	\$7.70	\$18.60	\$0.00	\$63.07

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 1	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER LABORERS - ZONE 1	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

Apprentice - LABORER - Zone 1

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.83	\$7.10	\$12.45	\$0.00	\$39.38
2	70	\$23.14	\$7.10	\$12.45	\$0.00	\$42.69
3	80	\$26.44	\$7.10	\$12.45	\$0.00	\$45.99
4	90	\$29.75	\$7.10	\$12.45	\$0.00	\$49.30

Effective Date - 12/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$20.28	\$7.10	\$12.45	\$0.00	\$39.83
2	70	\$23.66	\$7.10	\$12.45	\$0.00	\$43.21
3	80	\$27.04	\$7.10	\$12.45	\$0.00	\$46.59
4	90	\$30.42	\$7.10	\$12.45	\$0.00	\$49.97

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER LABORERS - ZONE 1	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For apprentice rates see "Apprentice- LABORER"

LABORER: CEMENT FINISHER TENDER LABORERS - ZONE 1	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 1</i>	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2013	\$36.66	\$10.18	\$16.83	\$0.00	\$63.67
	02/01/2014	\$37.11	\$10.18	\$16.83	\$0.00	\$64.12
	08/01/2014	\$37.82	\$10.18	\$16.90	\$0.00	\$64.90
	02/01/2015	\$38.27	\$10.18	\$16.90	\$0.00	\$65.35
	08/01/2015	\$38.98	\$10.18	\$16.97	\$0.00	\$66.13
	02/01/2016	\$39.43	\$10.18	\$16.97	\$0.00	\$66.58
	08/01/2016	\$40.13	\$10.18	\$17.05	\$0.00	\$67.36
	02/01/2017	\$40.59	\$10.18	\$17.05	\$0.00	\$67.82

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

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.33	\$10.18	\$16.83	\$0.00	\$45.34
2	60	\$22.00	\$10.18	\$16.83	\$0.00	\$49.01
3	70	\$25.66	\$10.18	\$16.83	\$0.00	\$52.67
4	80	\$29.33	\$10.18	\$16.83	\$0.00	\$56.34
5	90	\$32.99	\$10.18	\$16.83	\$0.00	\$60.00

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.56	\$10.18	\$16.83	\$0.00	\$45.57
2	60	\$22.27	\$10.18	\$16.83	\$0.00	\$49.28
3	70	\$25.98	\$10.18	\$16.83	\$0.00	\$52.99
4	80	\$29.69	\$10.18	\$16.83	\$0.00	\$56.70
5	90	\$33.40	\$10.18	\$16.83	\$0.00	\$60.41

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2013	\$48.10	\$10.18	\$18.15	\$0.00	\$76.43
	02/01/2014	\$48.66	\$10.18	\$18.15	\$0.00	\$76.99
	08/01/2014	\$49.56	\$10.18	\$18.22	\$0.00	\$77.96
	02/01/2015	\$50.12	\$10.18	\$18.22	\$0.00	\$78.52
	08/01/2015	\$51.02	\$10.18	\$18.29	\$0.00	\$79.49
	02/01/2016	\$51.59	\$10.18	\$18.29	\$0.00	\$80.06
	08/01/2016	\$52.49	\$10.18	\$18.37	\$0.00	\$81.04
	02/01/2017	\$53.06	\$10.18	\$18.37	\$0.00	\$81.61

Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.05	\$10.18	\$18.15	\$0.00	\$52.38
2	60	\$28.86	\$10.18	\$18.15	\$0.00	\$57.19
3	70	\$33.67	\$10.18	\$18.15	\$0.00	\$62.00
4	80	\$38.48	\$10.18	\$18.15	\$0.00	\$66.81
5	90	\$43.29	\$10.18	\$18.15	\$0.00	\$71.62

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.33	\$10.18	\$18.15	\$0.00	\$52.66
2	60	\$29.20	\$10.18	\$18.15	\$0.00	\$57.53
3	70	\$34.06	\$10.18	\$18.15	\$0.00	\$62.39
4	80	\$38.93	\$10.18	\$18.15	\$0.00	\$67.26
5	90	\$43.79	\$10.18	\$18.15	\$0.00	\$72.12

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	10/01/2013	\$35.45	\$9.80	\$15.76	\$0.00	\$61.01
	04/01/2014	\$36.23	\$9.80	\$15.76	\$0.00	\$61.79
	10/01/2014	\$37.18	\$9.80	\$15.76	\$0.00	\$62.74
	04/01/2015	\$38.14	\$9.80	\$15.76	\$0.00	\$63.70

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - MILLWRIGHT - Local 1121 Zone 1

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$19.50	\$9.80	\$4.32	\$0.00	\$33.62
2	65	\$23.04	\$9.80	\$13.01	\$0.00	\$45.85
3	75	\$26.59	\$9.80	\$13.80	\$0.00	\$50.19
4	85	\$30.13	\$9.80	\$14.58	\$0.00	\$54.51

Effective Date - 04/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$19.93	\$9.80	\$4.32	\$0.00	\$34.05
2	65	\$23.55	\$9.80	\$13.01	\$0.00	\$46.36
3	75	\$27.17	\$9.80	\$13.80	\$0.00	\$50.77
4	85	\$30.80	\$9.80	\$14.58	\$0.00	\$55.18

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER
LABORERS - ZONE 1

06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS)
OPERATING ENGINEERS LOCAL 4

06/01/2013	\$21.17	\$10.00	\$13.55	\$0.00	\$44.72
12/01/2013	\$21.59	\$10.00	\$13.55	\$0.00	\$45.14

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS)
OPERATING ENGINEERS LOCAL 4

06/01/2013	\$24.57	\$10.00	\$13.55	\$0.00	\$48.12
12/01/2013	\$25.06	\$10.00	\$13.55	\$0.00	\$48.61

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II
OPERATING ENGINEERS LOCAL 4

06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS)
PAINTERS LOCAL 35 - ZONE 1

07/01/2013	\$45.41	\$7.85	\$15.85	\$0.00	\$69.11
01/01/2014	\$45.91	\$7.85	\$16.10	\$0.00	\$69.86
07/01/2014	\$46.76	\$7.85	\$16.10	\$0.00	\$70.71
01/01/2015	\$47.66	\$7.85	\$16.10	\$0.00	\$71.61
07/01/2015	\$48.56	\$7.85	\$16.10	\$0.00	\$72.51
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 - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.71	\$7.85	\$0.00	\$0.00	\$30.56
2	55	\$24.98	\$7.85	\$3.58	\$0.00	\$36.41
3	60	\$27.25	\$7.85	\$3.90	\$0.00	\$39.00
4	65	\$29.52	\$7.85	\$4.23	\$0.00	\$41.60
5	70	\$31.79	\$7.85	\$13.90	\$0.00	\$53.54
6	75	\$34.06	\$7.85	\$14.23	\$0.00	\$56.14
7	80	\$36.33	\$7.85	\$14.55	\$0.00	\$58.73
8	90	\$40.87	\$7.85	\$15.20	\$0.00	\$63.92

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.96	\$7.85	\$0.00	\$0.00	\$30.81
2	55	\$25.25	\$7.85	\$3.66	\$0.00	\$36.76
3	60	\$27.55	\$7.85	\$3.99	\$0.00	\$39.39
4	65	\$29.84	\$7.85	\$4.32	\$0.00	\$42.01
5	70	\$32.14	\$7.85	\$14.11	\$0.00	\$54.10
6	75	\$34.43	\$7.85	\$14.44	\$0.00	\$56.72
7	80	\$36.73	\$7.85	\$14.77	\$0.00	\$59.35
8	90	\$41.32	\$7.85	\$15.44	\$0.00	\$64.61

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2013	\$42.10	\$7.85	\$15.85	\$0.00	\$65.80
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	01/01/2014	\$42.60	\$7.85	\$16.10	\$0.00	\$66.55
	07/01/2014	\$43.45	\$7.85	\$16.10	\$0.00	\$67.40
	01/01/2015	\$44.35	\$7.85	\$16.10	\$0.00	\$68.30
	07/01/2015	\$45.25	\$7.85	\$16.10	\$0.00	\$69.20
	01/01/2016	\$46.20	\$7.85	\$16.10	\$0.00	\$70.15
	07/01/2016	\$47.15	\$7.85	\$16.10	\$0.00	\$71.10
	01/01/2017	\$48.10	\$7.85	\$16.10	\$0.00	\$72.05

Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - New

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.05	\$7.85	\$0.00	\$0.00	\$28.90
2	55	\$23.16	\$7.85	\$3.58	\$0.00	\$34.59
3	60	\$25.26	\$7.85	\$3.90	\$0.00	\$37.01
4	65	\$27.37	\$7.85	\$4.23	\$0.00	\$39.45
5	70	\$29.47	\$7.85	\$13.90	\$0.00	\$51.22
6	75	\$31.58	\$7.85	\$14.23	\$0.00	\$53.66
7	80	\$33.68	\$7.85	\$14.55	\$0.00	\$56.08
8	90	\$37.89	\$7.85	\$15.20	\$0.00	\$60.94

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.30	\$7.85	\$0.00	\$0.00	\$29.15
2	55	\$23.43	\$7.85	\$3.66	\$0.00	\$34.94
3	60	\$25.56	\$7.85	\$3.99	\$0.00	\$37.40
4	65	\$27.69	\$7.85	\$4.32	\$0.00	\$39.86
5	70	\$29.82	\$7.85	\$14.11	\$0.00	\$51.78
6	75	\$31.95	\$7.85	\$14.44	\$0.00	\$54.24
7	80	\$34.08	\$7.85	\$14.77	\$0.00	\$56.70
8	90	\$38.34	\$7.85	\$15.44	\$0.00	\$61.63

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2013	\$40.16	\$7.85	\$15.85	\$0.00	\$63.86
PAINTERS LOCAL 35 - ZONE 1	01/01/2014	\$40.66	\$7.85	\$16.10	\$0.00	\$64.61
	07/01/2014	\$41.51	\$7.85	\$16.10	\$0.00	\$65.46
	01/01/2015	\$42.41	\$7.85	\$16.10	\$0.00	\$66.36
	07/01/2015	\$43.31	\$7.85	\$16.10	\$0.00	\$67.26
	01/01/2016	\$44.26	\$7.85	\$16.10	\$0.00	\$68.21
	07/01/2016	\$45.21	\$7.85	\$16.10	\$0.00	\$69.16
	01/01/2017	\$46.16	\$7.85	\$16.10	\$0.00	\$70.11

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.08	\$7.85	\$0.00	\$0.00	\$27.93
2	55	\$22.09	\$7.85	\$3.58	\$0.00	\$33.52
3	60	\$24.10	\$7.85	\$3.90	\$0.00	\$35.85
4	65	\$26.10	\$7.85	\$4.23	\$0.00	\$38.18
5	70	\$28.11	\$7.85	\$13.90	\$0.00	\$49.86
6	75	\$30.12	\$7.85	\$14.23	\$0.00	\$52.20
7	80	\$32.13	\$7.85	\$14.55	\$0.00	\$54.53
8	90	\$36.14	\$7.85	\$15.20	\$0.00	\$59.19

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.33	\$7.85	\$0.00	\$0.00	\$28.18
2	55	\$22.36	\$7.85	\$3.66	\$0.00	\$33.87
3	60	\$24.40	\$7.85	\$3.99	\$0.00	\$36.24
4	65	\$26.43	\$7.85	\$4.32	\$0.00	\$38.60
5	70	\$28.46	\$7.85	\$14.11	\$0.00	\$50.42
6	75	\$30.50	\$7.85	\$14.44	\$0.00	\$52.79
7	80	\$32.53	\$7.85	\$14.77	\$0.00	\$55.15
8	90	\$36.59	\$7.85	\$15.44	\$0.00	\$59.88

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) LABORERS - ZONE 1	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) *	07/01/2013	\$40.70	\$7.85	\$15.85	\$0.00	\$64.40
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	01/01/2014	\$41.20	\$7.85	\$16.10	\$0.00	\$65.15
	07/01/2014	\$42.05	\$7.85	\$16.10	\$0.00	\$66.00
	01/01/2015	\$42.95	\$7.85	\$16.10	\$0.00	\$66.90
	07/01/2015	\$43.85	\$7.85	\$16.10	\$0.00	\$67.80
	01/01/2016	\$44.80	\$7.85	\$16.10	\$0.00	\$68.75
	07/01/2016	\$45.75	\$7.85	\$16.10	\$0.00	\$69.70
	01/01/2017	\$46.70	\$7.85	\$16.10	\$0.00	\$70.65

Apprentice - PAINTER - Local 35 Zone 1 - BRUSH NEW

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.35	\$7.85	\$0.00	\$0.00	\$28.20
2	55	\$22.39	\$7.85	\$3.58	\$0.00	\$33.82
3	60	\$24.42	\$7.85	\$3.90	\$0.00	\$36.17
4	65	\$26.46	\$7.85	\$4.23	\$0.00	\$38.54
5	70	\$28.49	\$7.85	\$13.90	\$0.00	\$50.24
6	75	\$30.53	\$7.85	\$14.23	\$0.00	\$52.61
7	80	\$32.56	\$7.85	\$14.55	\$0.00	\$54.96
8	90	\$36.63	\$7.85	\$15.20	\$0.00	\$59.68

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.60	\$7.85	\$0.00	\$0.00	\$28.45
2	55	\$22.66	\$7.85	\$3.66	\$0.00	\$34.17
3	60	\$24.72	\$7.85	\$3.99	\$0.00	\$36.56
4	65	\$26.78	\$7.85	\$4.32	\$0.00	\$38.95
5	70	\$28.84	\$7.85	\$14.11	\$0.00	\$50.80
6	75	\$30.90	\$7.85	\$14.44	\$0.00	\$53.19
7	80	\$32.96	\$7.85	\$14.77	\$0.00	\$55.58
8	90	\$37.08	\$7.85	\$15.44	\$0.00	\$60.37

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2013	\$38.76	\$7.85	\$15.85	\$0.00	\$62.46
PAINTERS LOCAL 35 - ZONE 1	01/01/2014	\$39.26	\$7.85	\$16.10	\$0.00	\$63.21
	07/01/2014	\$40.11	\$7.85	\$16.10	\$0.00	\$64.06
	01/01/2015	\$41.01	\$7.85	\$16.10	\$0.00	\$64.96
	07/01/2015	\$41.91	\$7.85	\$16.10	\$0.00	\$65.86
	01/01/2016	\$42.86	\$7.85	\$16.10	\$0.00	\$66.81
	07/01/2016	\$43.81	\$7.85	\$16.10	\$0.00	\$67.76
	01/01/2017	\$44.76	\$7.85	\$16.10	\$0.00	\$68.71

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 1 - BRUSH REPAINT

Effective Date - 07/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.38	\$7.85	\$0.00	\$0.00	\$27.23
2	55	\$21.32	\$7.85	\$3.58	\$0.00	\$32.75
3	60	\$23.26	\$7.85	\$3.90	\$0.00	\$35.01
4	65	\$25.19	\$7.85	\$4.23	\$0.00	\$37.27
5	70	\$27.13	\$7.85	\$13.90	\$0.00	\$48.88
6	75	\$29.07	\$7.85	\$14.23	\$0.00	\$51.15
7	80	\$31.01	\$7.85	\$14.55	\$0.00	\$53.41
8	90	\$34.88	\$7.85	\$15.20	\$0.00	\$57.93

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.63	\$7.85	\$0.00	\$0.00	\$27.48
2	55	\$21.59	\$7.85	\$3.66	\$0.00	\$33.10
3	60	\$23.56	\$7.85	\$3.99	\$0.00	\$35.40
4	65	\$25.52	\$7.85	\$4.32	\$0.00	\$37.69
5	70	\$27.48	\$7.85	\$14.11	\$0.00	\$49.44
6	75	\$29.45	\$7.85	\$14.44	\$0.00	\$51.74
7	80	\$31.41	\$7.85	\$14.77	\$0.00	\$54.03
8	90	\$35.33	\$7.85	\$15.44	\$0.00	\$58.62

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.38	\$8.91	\$8.00	\$0.00	\$48.29
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2013	\$40.10	\$9.80	\$18.17	\$0.00	\$68.07
	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2013	\$40.10	\$9.80	\$18.17	\$0.00	\$68.07
	08/01/2014	\$41.60	\$9.80	\$18.17	\$0.00	\$69.57
	08/01/2015	\$43.10	\$9.80	\$18.17	\$0.00	\$71.07

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.05	\$9.80	\$18.17	\$0.00	\$48.02
2	60	\$24.06	\$9.80	\$18.17	\$0.00	\$52.03
3	70	\$28.07	\$9.80	\$18.17	\$0.00	\$56.04
4	75	\$30.08	\$9.80	\$18.17	\$0.00	\$58.05
5	80	\$32.08	\$9.80	\$18.17	\$0.00	\$60.05
6	80	\$32.08	\$9.80	\$18.17	\$0.00	\$60.05
7	90	\$36.09	\$9.80	\$18.17	\$0.00	\$64.06
8	90	\$36.09	\$9.80	\$18.17	\$0.00	\$64.06

Effective Date - 08/01/2014

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

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER PIPEFITTERS LOCAL 537	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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Apprentice - PIPEFITTER - Local 537

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.74	\$8.75	\$6.50	\$0.00	\$34.99
2	45	\$22.20	\$8.75	\$14.39	\$0.00	\$45.34
3	60	\$29.60	\$8.75	\$14.39	\$0.00	\$52.74
4	70	\$34.54	\$8.75	\$14.39	\$0.00	\$57.68
5	80	\$39.47	\$8.75	\$14.39	\$0.00	\$62.61

Notes:
 ** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
 Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

PLUMBERS & GASFITTERS <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2013	\$49.31	\$9.32	\$13.29	\$0.00	\$71.92
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Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.26	\$9.32	\$4.97	\$0.00	\$31.55
2	40	\$19.72	\$9.32	\$5.61	\$0.00	\$34.65
3	55	\$27.12	\$9.32	\$7.53	\$0.00	\$43.97
4	65	\$32.05	\$9.32	\$8.81	\$0.00	\$50.18
5	75	\$36.98	\$9.32	\$10.09	\$0.00	\$56.39

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$53.29 Step5 with lic\$59.49

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	06/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	12/01/2013	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	06/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	12/01/2014	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	06/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	12/01/2015	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	06/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
	12/01/2016	\$39.55	\$7.10	\$12.45	\$0.00	\$59.10

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$28.19	\$10.00	\$13.55	\$0.00	\$51.74
	12/01/2013	\$28.74	\$10.00	\$13.55	\$0.00	\$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 25a</i>	05/01/2011	\$29.99	\$7.75	\$5.91	\$0.00	\$43.65
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) <i>CARPENTERS -ZONE 1 (Residential Wood)</i>	04/01/2011	\$37.25	\$8.67	\$15.51	\$0.00	\$61.43
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. <i>CARPENTERS -ZONE 1 (Residential Wood)</i>	05/01/2011	\$27.49	\$6.34	\$6.23	\$0.00	\$40.06

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 1

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.49	\$6.34	\$0.00	\$0.00	\$22.83
2	60	\$16.49	\$6.34	\$6.23	\$0.00	\$29.06
3	65	\$17.87	\$6.34	\$6.23	\$0.00	\$30.44
4	70	\$19.24	\$6.34	\$6.23	\$0.00	\$31.81
5	75	\$20.62	\$6.34	\$6.23	\$0.00	\$33.19
6	80	\$21.99	\$6.34	\$6.23	\$0.00	\$34.56
7	85	\$23.37	\$6.34	\$6.23	\$0.00	\$35.94
8	90	\$24.74	\$6.34	\$6.23	\$0.00	\$37.31

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) <i>ROOFERS LOCAL 33</i>	08/01/2013	\$38.31	\$10.50	\$10.70	\$0.00	\$59.51
	02/01/2014	\$39.21	\$10.50	\$10.70	\$0.00	\$60.41
	08/01/2014	\$40.11	\$10.50	\$10.70	\$0.00	\$61.31
	02/01/2015	\$41.01	\$10.50	\$10.70	\$0.00	\$62.21
	08/01/2015	\$41.91	\$10.50	\$10.70	\$0.00	\$63.11
	02/01/2016	\$42.81	\$10.50	\$10.70	\$0.00	\$64.01

Apprentice - ROOFER - Local 33

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.16	\$10.50	\$3.38	\$0.00	\$33.04
2	60	\$22.99	\$10.50	\$10.70	\$0.00	\$44.19
3	65	\$24.90	\$10.50	\$10.70	\$0.00	\$46.10
4	75	\$28.73	\$10.50	\$10.70	\$0.00	\$49.93
5	85	\$32.56	\$10.50	\$10.70	\$0.00	\$53.76

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.61	\$10.50	\$3.38	\$0.00	\$33.49
2	60	\$23.53	\$10.50	\$10.70	\$0.00	\$44.73
3	65	\$25.49	\$10.50	\$10.70	\$0.00	\$46.69
4	75	\$29.41	\$10.50	\$10.70	\$0.00	\$50.61
5	85	\$33.33	\$10.50	\$10.70	\$0.00	\$54.53

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 <i>ROOFERS LOCAL 33</i>	08/01/2013	\$38.56	\$10.50	\$10.70	\$0.00	\$59.76
	02/01/2014	\$39.46	\$10.50	\$10.70	\$0.00	\$60.66
	08/01/2014	\$40.36	\$10.50	\$10.70	\$0.00	\$61.56
	02/01/2015	\$41.26	\$10.50	\$10.70	\$0.00	\$62.46
	08/01/2015	\$42.16	\$10.50	\$10.70	\$0.00	\$63.36
	02/01/2016	\$43.06	\$10.50	\$10.70	\$0.00	\$64.26

For apprentice rates see "Apprentice- ROOFER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	09/01/2013	\$42.35	\$9.82	\$19.08	\$2.14	\$73.39
	02/01/2014	\$43.20	\$9.82	\$19.08	\$2.14	\$74.24
	08/01/2014	\$44.05	\$9.82	\$19.08	\$2.14	\$75.09
	02/01/2015	\$44.95	\$9.82	\$19.08	\$2.14	\$75.99
	08/01/2015	\$45.95	\$9.82	\$19.08	\$2.14	\$76.99
	02/01/2016	\$46.95	\$9.82	\$19.08	\$2.14	\$77.99
	08/01/2016	\$48.10	\$9.82	\$19.08	\$2.14	\$79.14
	02/01/2017	\$49.20	\$9.82	\$19.08	\$2.14	\$80.24
	08/01/2017	\$50.30	\$9.82	\$19.08	\$2.14	\$81.34
	02/01/2018	\$51.45	\$9.82	\$19.08	\$2.14	\$82.49

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$16.94	\$9.82	\$4.82	\$0.00	\$31.58
2	40	\$16.94	\$9.82	\$4.82	\$0.00	\$31.58
3	45	\$19.06	\$9.82	\$8.45	\$1.12	\$38.45
4	45	\$19.06	\$9.82	\$8.45	\$1.12	\$38.45
5	50	\$21.18	\$9.82	\$9.24	\$1.21	\$41.45
6	50	\$21.18	\$9.82	\$9.49	\$1.21	\$41.70
7	60	\$25.41	\$9.82	\$10.80	\$1.38	\$47.41
8	65	\$27.53	\$9.82	\$11.59	\$1.47	\$50.41
9	75	\$31.76	\$9.82	\$13.16	\$1.64	\$56.38
10	85	\$36.00	\$9.82	\$14.23	\$1.80	\$61.85

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.28	\$9.82	\$4.82	\$0.00	\$31.92
2	40	\$17.28	\$9.82	\$4.82	\$0.00	\$31.92
3	45	\$19.44	\$9.82	\$8.45	\$1.12	\$38.83
4	45	\$19.44	\$9.82	\$8.45	\$1.12	\$38.83
5	50	\$21.60	\$9.82	\$9.24	\$1.21	\$41.87
6	50	\$21.60	\$9.82	\$9.49	\$1.21	\$42.12
7	60	\$25.92	\$9.82	\$10.80	\$1.38	\$47.92
8	65	\$28.08	\$9.82	\$11.59	\$1.47	\$50.96
9	75	\$32.40	\$9.82	\$13.16	\$1.64	\$57.02
10	85	\$36.72	\$9.82	\$14.23	\$1.80	\$62.57

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR <i>PAINTERS LOCAL 35 - ZONE 1</i>	06/01/2013	\$25.81	\$7.07	\$7.05	\$0.00	\$39.93
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SIGN ERECTOR - Local 35 Zone 1

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 <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.84	\$8.91	\$8.00	\$0.00	\$48.75
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$32.13	\$8.91	\$8.00	\$0.00	\$49.04
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 1</i>	10/01/2013	\$53.58	\$8.42	\$12.60	\$0.00	\$74.60
	01/01/2014	\$53.33	\$8.42	\$12.85	\$0.00	\$74.60
	03/01/2014	\$54.58	\$8.42	\$12.85	\$0.00	\$75.85
	10/01/2014	\$55.73	\$8.42	\$12.85	\$0.00	\$77.00
	01/01/2015	\$55.73	\$8.42	\$13.00	\$0.00	\$77.15
	03/01/2015	\$56.73	\$8.42	\$13.00	\$0.00	\$78.15
	10/01/2015	\$57.88	\$8.42	\$13.00	\$0.00	\$79.30
	01/01/2016	\$57.88	\$8.67	\$13.15	\$0.00	\$79.70
	03/01/2016	\$58.88	\$8.67	\$13.15	\$0.00	\$80.70
	10/01/2016	\$60.03	\$8.67	\$13.15	\$0.00	\$81.85
	03/01/2017	\$61.03	\$8.67	\$13.15	\$0.00	\$82.85

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SPRINKLER FITTER - Local 550 (Section B) Zone 1

Effective Date - 10/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.43	\$8.42	\$8.00	\$0.00	\$37.85
2	45	\$24.11	\$8.42	\$8.00	\$0.00	\$40.53
3	50	\$26.79	\$8.42	\$8.00	\$0.00	\$43.21
4	55	\$29.47	\$8.42	\$8.00	\$0.00	\$45.89
5	60	\$32.15	\$8.42	\$8.00	\$0.00	\$48.57
6	65	\$34.83	\$8.42	\$8.00	\$0.00	\$51.25
7	70	\$37.51	\$8.42	\$8.00	\$0.00	\$53.93
8	75	\$40.19	\$8.42	\$8.00	\$0.00	\$56.61
9	80	\$42.86	\$8.42	\$8.00	\$0.00	\$59.28
10	85	\$45.54	\$8.42	\$8.00	\$0.00	\$61.96

Effective Date - 01/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.33	\$8.42	\$8.25	\$0.00	\$38.00
2	45	\$24.00	\$8.42	\$8.25	\$0.00	\$40.67
3	50	\$26.67	\$8.42	\$8.25	\$0.00	\$43.34
4	55	\$29.33	\$8.42	\$8.25	\$0.00	\$46.00
5	60	\$32.00	\$8.42	\$8.25	\$0.00	\$48.67
6	65	\$34.66	\$8.42	\$8.25	\$0.00	\$51.33
7	70	\$37.33	\$8.42	\$8.25	\$0.00	\$54.00
8	75	\$40.00	\$8.42	\$8.25	\$0.00	\$56.67
9	80	\$42.66	\$8.42	\$8.25	\$0.00	\$59.33
10	85	\$45.33	\$8.42	\$8.25	\$0.00	\$62.00

Notes:
 App% 9/30/10 thru 9/30/13; 35/40/45/50/55/60/65/70/75/80
 Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2013	\$32.97	\$13.00	\$12.77	\$0.00	\$58.74
	03/01/2014	\$33.44	\$13.00	\$13.03	\$0.00	\$59.47
	09/01/2014	\$33.84	\$13.00	\$13.05	\$0.00	\$59.89
	03/01/2015	\$34.38	\$13.00	\$13.06	\$0.00	\$60.44
	09/01/2015	\$35.10	\$13.00	\$13.08	\$0.00	\$61.18
	03/01/2016	\$35.81	\$13.00	\$13.10	\$0.00	\$61.91

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.19	\$13.00	\$0.40	\$0.00	\$26.59
2	40	\$13.19	\$13.00	\$0.40	\$0.00	\$26.59
3	45	\$14.84	\$13.00	\$10.04	\$0.00	\$37.88
4	45	\$14.84	\$13.00	\$10.04	\$0.00	\$37.88
5	50	\$16.49	\$13.00	\$10.29	\$0.00	\$39.78
6	55	\$18.13	\$13.00	\$10.53	\$0.00	\$41.66
7	60	\$19.78	\$13.00	\$10.78	\$0.00	\$43.56
8	65	\$21.43	\$13.00	\$11.03	\$0.00	\$45.46
9	70	\$23.08	\$13.00	\$11.28	\$0.00	\$47.36
10	75	\$24.73	\$13.00	\$11.53	\$0.00	\$49.26

Effective Date - 03/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.38	\$13.00	\$0.40	\$0.00	\$26.78
2	40	\$13.38	\$13.00	\$0.40	\$0.00	\$26.78
3	45	\$15.05	\$13.00	\$10.29	\$0.00	\$38.34
4	45	\$15.05	\$13.00	\$10.29	\$0.00	\$38.34
5	50	\$16.72	\$13.00	\$10.54	\$0.00	\$40.26
6	55	\$18.39	\$13.00	\$10.79	\$0.00	\$42.18
7	60	\$20.06	\$13.00	\$11.04	\$0.00	\$44.10
8	65	\$21.74	\$13.00	\$11.29	\$0.00	\$46.03
9	70	\$23.41	\$13.00	\$11.54	\$0.00	\$47.95
10	75	\$25.08	\$13.00	\$11.79	\$0.00	\$49.87

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	08/01/2013	\$47.00	\$10.18	\$18.15	\$0.00	\$75.33
BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2014	\$47.56	\$10.18	\$18.15	\$0.00	\$75.89
	08/01/2014	\$48.46	\$10.18	\$18.22	\$0.00	\$76.86
	02/01/2015	\$49.02	\$10.18	\$18.22	\$0.00	\$77.42
	08/01/2015	\$49.92	\$10.18	\$18.29	\$0.00	\$78.39
	02/01/2016	\$50.49	\$10.18	\$18.29	\$0.00	\$78.96
	08/01/2016	\$51.39	\$10.18	\$18.37	\$0.00	\$79.94
	02/01/2017	\$51.96	\$10.18	\$18.37	\$0.00	\$80.51

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.50	\$10.18	\$18.15	\$0.00	\$51.83
2	60	\$28.20	\$10.18	\$18.15	\$0.00	\$56.53
3	70	\$32.90	\$10.18	\$18.15	\$0.00	\$61.23
4	80	\$37.60	\$10.18	\$18.15	\$0.00	\$65.93
5	90	\$42.30	\$10.18	\$18.15	\$0.00	\$70.63

Effective Date - 02/01/2014

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.78	\$10.18	\$18.15	\$0.00	\$52.11
2	60	\$28.54	\$10.18	\$18.15	\$0.00	\$56.87
3	70	\$33.29	\$10.18	\$18.15	\$0.00	\$61.62
4	80	\$38.05	\$10.18	\$18.15	\$0.00	\$66.38
5	90	\$42.80	\$10.18	\$18.15	\$0.00	\$71.13

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2013	\$34.45	\$7.10	\$12.60	\$0.00	\$54.15
	12/01/2013	\$35.20	\$7.10	\$12.60	\$0.00	\$54.90
	06/01/2014	\$35.95	\$7.10	\$12.60	\$0.00	\$55.65
	12/01/2014	\$36.70	\$7.10	\$12.60	\$0.00	\$56.40
	06/01/2015	\$37.45	\$7.10	\$12.60	\$0.00	\$57.15
	12/01/2015	\$38.20	\$7.10	\$12.60	\$0.00	\$57.90
	06/01/2016	\$38.95	\$7.10	\$12.60	\$0.00	\$58.65
	12/01/2016	\$39.95	\$7.10	\$12.60	\$0.00	\$59.65

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2013	\$33.17	\$7.10	\$12.60	\$0.00	\$52.87
	12/01/2013	\$33.92	\$7.10	\$12.60	\$0.00	\$53.62
	06/01/2014	\$34.67	\$7.10	\$12.60	\$0.00	\$54.37
	12/01/2014	\$35.42	\$7.10	\$12.60	\$0.00	\$55.12
	06/01/2015	\$36.17	\$7.10	\$12.60	\$0.00	\$55.87
	12/01/2015	\$36.92	\$7.10	\$12.60	\$0.00	\$56.62
	06/01/2016	\$37.67	\$7.10	\$12.60	\$0.00	\$57.37
	12/01/2016	\$38.67	\$7.10	\$12.60	\$0.00	\$58.37

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$39.96	\$10.00	\$13.55	\$0.00	\$63.51
	12/01/2013	\$40.74	\$10.00	\$13.55	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$32.42	\$9.07	\$8.00	\$0.00	\$49.49
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	06/01/2013	\$45.33	\$7.10	\$13.00	\$0.00	\$65.43
	12/01/2013	\$46.08	\$7.10	\$13.00	\$0.00	\$66.18
	06/01/2014	\$46.83	\$7.10	\$13.00	\$0.00	\$66.93
	12/01/2014	\$47.58	\$7.10	\$13.00	\$0.00	\$67.68
	06/01/2015	\$48.33	\$7.10	\$13.00	\$0.00	\$68.43
	12/01/2015	\$49.08	\$7.10	\$13.00	\$0.00	\$69.18
	06/01/2016	\$49.83	\$7.10	\$13.00	\$0.00	\$69.93
	12/01/2016	\$50.83	\$7.10	\$13.00	\$0.00	\$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	06/01/2013	\$47.33	\$7.10	\$13.00	\$0.00	\$67.43
	12/01/2013	\$48.08	\$7.10	\$13.00	\$0.00	\$68.18
	06/01/2014	\$48.83	\$7.10	\$13.00	\$0.00	\$68.93
	12/01/2014	\$49.58	\$7.10	\$13.00	\$0.00	\$69.68
	06/01/2015	\$50.33	\$7.10	\$13.00	\$0.00	\$70.43
	12/01/2015	\$51.08	\$7.10	\$13.00	\$0.00	\$71.18
	06/01/2016	\$51.83	\$7.10	\$13.00	\$0.00	\$71.93
	12/01/2016	\$52.83	\$7.10	\$13.00	\$0.00	\$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2013	\$37.40	\$7.10	\$13.00	\$0.00	\$57.50
	12/01/2013	\$38.15	\$7.10	\$13.00	\$0.00	\$58.25
	06/01/2014	\$38.90	\$7.10	\$13.00	\$0.00	\$59.00
	12/01/2014	\$39.65	\$7.10	\$13.00	\$0.00	\$59.75
	06/01/2015	\$40.40	\$7.10	\$13.00	\$0.00	\$60.50
	12/01/2015	\$41.15	\$7.10	\$13.00	\$0.00	\$61.25
	06/01/2016	\$41.90	\$7.10	\$13.00	\$0.00	\$62.00
	12/01/2016	\$42.90	\$7.10	\$13.00	\$0.00	\$63.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	06/01/2013	\$39.40	\$7.10	\$13.00	\$0.00	\$59.50
	12/01/2013	\$40.15	\$7.10	\$13.00	\$0.00	\$60.25
	06/01/2014	\$40.90	\$7.10	\$13.00	\$0.00	\$61.00
	12/01/2014	\$41.65	\$7.10	\$13.00	\$0.00	\$61.75
	06/01/2015	\$42.40	\$7.10	\$13.00	\$0.00	\$62.50
	12/01/2015	\$43.15	\$7.10	\$13.00	\$0.00	\$63.25
	06/01/2016	\$43.90	\$7.10	\$13.00	\$0.00	\$64.00
	12/01/2016	\$44.90	\$7.10	\$13.00	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.84	\$8.91	\$8.00	\$0.00	\$48.75
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2013	\$40.34	\$10.00	\$13.55	\$0.00	\$63.89
	12/01/2013	\$41.12	\$10.00	\$13.55	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2013	\$49.31	\$9.32	\$13.29	\$0.00	\$71.92
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$25.66	\$8.70	\$4.48	\$0.00	\$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$36.55	\$8.70	\$6.58	\$0.00	\$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$29.94	\$8.70	\$6.05	\$0.00	\$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$23.52	\$8.70	\$5.24	\$0.00	\$37.46
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$36.35	\$8.70	\$9.43	\$0.00	\$54.48
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$32.08	\$8.70	\$6.59	\$0.00	\$47.37
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$23.52	\$8.70	\$3.72	\$0.00	\$35.94
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$19.25	\$8.70	\$2.85	\$0.00	\$30.80

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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For apprentice rates see "Apprentice- LINEMAN"

JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/01/2013	\$42.77	\$8.70	\$11.78	\$0.00	\$63.25
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Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 09/01/2013

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

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$26.33	\$4.18	\$2.79	\$0.00	\$33.30
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TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$24.78	\$4.18	\$2.74	\$0.00	\$31.70
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TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$24.78	\$4.18	\$2.74	\$0.00	\$31.70
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TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/29/2012	\$17.18	\$3.37	\$0.00	\$0.00	\$20.55
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This classification applies only to the trimming of branches on and around utility lines.

TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/29/2012	\$15.15	\$3.37	\$0.00	\$0.00	\$18.52
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This classification applies only to the trimming of branches on and around utility lines.

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) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.

** Multiple ratios are listed in the comment field.

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

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

SECTION 00671

FEDERAL DAVIS BACON WAGE RATES

Work performed under this Contract subject to the Davis Bacon wage rate requirements. Federal Davis Bacon Wage Rates are shown on the pages following this Section.

Wage Rate Requirements Under FY 2012 Appropriations Act

Preamble

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

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

I. Requirements under FY 2012 Appropriations Act For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2012 Appropriations Act with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Valerie Marshall at EPA Region 1 (617-918-1674) for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/esa/whd/recovery/>

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

Under the FY 2012 Appropriations Act, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

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

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

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

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

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

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

3. Contract and Subcontract provisions.

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

(1) Minimum wages.

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

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or

programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in §5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein:

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

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

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

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

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on

the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

(3) Payrolls and basic records.

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security

numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

(1) That the payroll for the payroll period contains the information required to be provided under

§ 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

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

(4) Apprentices and trainees--

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the

Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

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

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

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

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

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

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which

such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

- (3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.
- (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

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

5. Compliance Verification

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

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

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

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

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

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General Decision Number: MA130013 09/20/2013 MA13

Superseded General Decision Number: MA20120013

State: Massachusetts

Construction Types: Heavy (Heavy and Marine)

Counties: Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth and Suffolk Counties in Massachusetts.

HEAVY AND MARINE CONTRUCTION PROJECTS

Modification Number	Publication Date
0	01/04/2013
1	03/29/2013
2	04/05/2013
3	06/21/2013
4	07/26/2013
5	08/02/2013
6	08/09/2013
7	09/06/2013
8	09/20/2013

BOIL0029-001 10/01/2009

	Rates	Fringes
BOILERMAKER.....	\$ 38.25	17.04

BRMA0001-011 03/01/2012

FOXBORO CHAPTER

BRISTOL (Attleboro, Berkley, Dighton, Mansfield, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Taunton); NORFOLK, (Bellingham, Canton, Dedham, Foxboro, Franklin, Norfolk, Norwood, Plainville, Sharon, Walpole, Westwood, Wrentham); and PLYMOUTH (Lakeville)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 44.46	28.35

BRMA0001-012 03/01/2012

LOWELL CHAPTER

MIDDLESEX (Acton, Ashby, Ayer, Bedford, Billerica, Boxboro, Carlisle, Chemsford, Dracut, Dunstabale, Ft Devens, Groton, Littleton, Lowell, North Acton, Pepperell, Shirley, South Acton, Tewksbury, Townsend, Tyngsboro, West Acton, Westford, Wilmington)

	Rates	Fringes
BRICKLAYER.....	\$ 44.46	28.35

BRMA0001-013 03/01/2012

LOWELL CHAPTER

MIDDLESEX (Ashland, Framingham, Holliston, Hopkinton, Hudson, Maynard, Natick, Sherborn, Stow); and NORFOLK (Medfield, Medway, Millis)

	Rates	Fringes
BRICKLAYER.....	\$ 44.46	28.35

BRMA0003-001 02/01/2013

	Rates	Fringes
Marble & Tile Finisher.....	\$ 36.20	25.08
Marble, Tile & Terrazzo Workers.....	\$ 47.45	27.22
TERRAZZO FINISHER.....	\$ 46.35	26.43

BRMA0003-003 02/18/2013

BOSTON CHAPTER

MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Somerville); NORFOLK (Brookline, Milton); and SUFFOLK

	Rates	Fringes
BRICKLAYER.....	\$ 47.41	26.65

BRMA0003-011 02/01/2013

LYNN CHAPTER

ESSEX (Amesbury, Andover, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salisbury, Salem, Saugus, Swampscott, Topsfield, Wakefield, Wenham, West Newbury); and MIDDLESEX (North Reading, Reading, Wakefield)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 47.41	26.65

BRMA0003-012 02/01/2013

	Rates	Fringes
BRICKLAYER WALTHAM CHAPTER -		

MIDDLESEX (Belmont,
Burlington, Concord,
Lexington, Lincoln,
Stoneham, Sudbury,
Waltham, Watertown,
Wayland, Weston,
Winchester, Woburn).....\$ 47.41 26.65

BRMA0003-014 02/01/2013

QUINCY CHAPTER

PLYMOUTH COUNTY (Abington, Bridgewater, Brockton, Carver,
Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Hingham,
Hull, Kingston, Marshfield, Middleboro, Norwell, Pembroke,
Plymouth, Rockland, Scituate, West Bridgewater, Whitman)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 47.41	26.65

BRMA0003-025 02/01/2013

NEW BEDFORD CHAPTER

BARNSTABLE; BRISTOL (Acushnet, Darmouth, Fairhaven, Fall River,
Freetown, New Bedford, Somerset, Swansea, Westport); DUKES;
NANTUCKET; PLYMOUTH (Marion, Mattapoisett, Rochester, Wareham)

	Rates	Fringes
Bricklayer/Cement Mason.....	\$ 47.41	26.65

BRMA0003-033 02/01/2013

NEWTON CHAPTER

MIDDLESEX (Newton); NORFOLK (Dover, Needham, Wellesley)

	Rates	Fringes
Bricklayer, Plasterer.....	\$ 47.41	26.65

* CARP0026-003 09/01/2013

BRISTOL (Attleborough, North Attleborough); ESSEX; MIDDLESEX
(Except Belmont, Cambridge, Everett, Malden, Medford,
Somerville); AND NORFOLK (Bellingham, Braintree, Canton,
Cohasset, Foxboro, Franklin, Medfield, Medway, Millis,
Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole,
Wellesley, Westwood, Weymouth, Wrentham) COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 34.28	26.06

* CARP0033-003 09/01/2013

MIDDLESEX (Belmont, Cambridge, Everett, Malden, Medford, Somerville); NORFOLK (Brookline, Dedham, Milton); AND SUFFOLK COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 40.10	26.56

 CARP0056-001 08/01/2011

All of SUFFOLK COUNTY; and those areas of BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX, NORFOLK, and PLYMOUTH COUNTIES situated INSIDE Boston Beltway (I-495) and North of Cape Cod Canal. ALL of DUKES and NANTUCKET COUNTIES

	Rates	Fringes
PILEDRIVERMAN.....	\$ 38.30	27.52

 CARP0056-002 08/01/2011

The areas of BARNSTABLE, BRISTOL, PLYMOUTH, and NORFOLK COUNTIES situated OUTSIDE Boston Beltway (I-495) and South of Cape Cod Canal

	Rates	Fringes
PILEDRIVERMAN.....	\$ 38.30	27.52

 CARP0056-003 08/01/2011

Those areas of ESSEX and MIDDLESEX COUNTIES situated OUTSIDE Boston Beltway (I-495)

	Rates	Fringes
PILEDRIVERMAN.....	\$ 38.30	27.52

 CARP0056-004 08/01/2011

	Rates	Fringes
DIVER TENDER.....	\$ 38.30	27.52
DIVER.....	\$ 53.62	27.52

 * CARP0424-001 09/01/2013

NORFOLK (Braintree, Quincy, Cohasset, Weymouth, etc.) PLYMOUTH (Duxbury, Hanover, Hull, Hingham, Marshfield, Norwell, Pembroke Rockland, Scituate)

	Rates	Fringes
CARPENTER.....	\$ 34.28	26.06

 * CARP0624-002 09/01/2013

BARNSTABLE; BRISTOL (Except Attleboro & North Attleboro);
 DUKES; NANTUCKET; NORFOLK (Avon, Holbrook, Randolph,
 Stoughton); PLYMOUTH (Bridgewater, Kingston, Lakeville,
 Middleboro, Plymouth, S. Hanover, Whitman)

	Rates	Fringes
CARPENTER.....	\$ 40.10	26.56

 CARP1121-001 04/01/2013

	Rates	Fringes
MILLWRIGHT.....	\$ 34.68	26.49

 ELEC0096-001 07/01/2013

MIDDLESEX (Ashby, Ashland, Ayer, Ft. Devens, Groton, Hopkinton,
 Hudson, Marlboro, Pepperell, Shirley, Stow, Townsend)

	Rates	Fringes
ELECTRICIAN.....	\$ 37.62	11%+16.29
Teledata System Installer.....	\$ 25.86	3%+17.37

 ELEC0099-001 06/01/2013

BRISTOL (Attleboro, North Attleboro, Seekonk)

	Rates	Fringes
ELECTRICIAN.....	\$ 34.08	62.86%
Teledata System Installer.....	\$ 25.56	15.97

 * ELEC0103-002 09/01/2013

ESSEX (Amesbury, Andover, Boxford, Georgetown, Groveland,
 Haverhill, Lawrence, Merrimac, Methuen, Newbury, Newburyport,
 North Andover, Rowley, Salisbury, West Newbury); MIDDLESEX
 (Bedford, Billerica, Boxboro, Burlington, Carlisle, Chelmsford,
 Dracut, Dunstable littleton, Lowell, North Reading, Tewksbury,
 Tyngsboro, Westford, Wilmington)

	Rates	Fringes
ELECTRICIAN.....	\$ 43.96	28.04

 * ELEC0103-004 09/01/2013

ESSEX (Beverly, Danvers, Essex, Gloucester, Hamilton, Ipswich,
 Manchester, Marblehead, Middleton, Peabody, Rockport, Salem,
 Topsfield, Wenham)

	Rates	Fringes
ELECTRICIAN.....	\$ 43.96	28.04

 * ELEC0103-005 09/01/2013

ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington, Belmont, Cambridge, Concord, Everett, Framingham, Holliston, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklino, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham and Hull); SUFFOLK

	Rates	Fringes
ELECTRICIAN.....	\$ 43.96	28.04

 ELEC0104-001 09/03/2012

	Rates	Fringes
Line Construction:		
Cableman.....	\$ 41.97	19.08+A
Equipment Operator.....	\$ 35.67	17.54+A
Groundman.....	\$ 23.08	11.85+A
Lineman.....	\$ 41.97	19.08+A

A. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day and Columbus Day, provided the employee has been employed 5 working days prior to any one of the listed holidays.

 ELEC0223-002 09/01/2012

BARNSTABLE, BRISTOL (Except Attleboro, North Attleboro, Seekonk); DUKES; NANTUCKET; PLYMOUTH (Except Hingham and Hull Twps); NORFOLK (Avon, Halbrook, Randolph, Sloughton)

	Rates	Fringes
ELECTRICIAN.....	\$ 35.73	31.3%+7.95

 ENGI0004-009 06/01/2013

	Rates	Fringes
Power equipment operators:		
Group 1.....	\$ 40.34	24.39
Group 2.....	\$ 39.96	24.39
Group 3.....	\$ 28.19	24.39
Group 4.....	\$ 33.73	24.39
Group 5.....	\$ 21.17	24.39

Group 6.....\$ 24.57 24.39

HOURLY PREMIUM FOR BOOM LENGTHS (Including Jib):

Over 150 ft. +2.12
 Over 185 ft. +3.72
 Over 210 ft. +5.23
 Over 250 ft. +7.92
 Over 295 ft. +10.97
 Over 350 ft. +12.76

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

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

POWER EQUIPMENT OPERATORS CLASSIFICATIONS [HEAVY
 CONSTRUCTION]

GROUP 1: Power shovel; crane; truck crane; derrick; pile
 driver; trenching machine; mechanical hoist pavement
 breaker; cement concrete paver; dragline; hoisting engine;
 three drum machine; pumpcrete machine; loaders; shovel
 dozer; front end loader; mucking machine; shaft hoist;
 steam engine; backhoe; gradall; cable way; fork lift;
 cherry picker; boring machine; rotary drill; post hole
 hammer; post hole digger; asphalt plant on job site;
 concrete batching and/or mixing plant on job site; crusher
 plant on job site; paving concrete mixer; timber jack

GROUP 2: Sonic or vibratory hammer; grader; scraper; tandem
 scraper; bulldozer; tractor; mechanic - maintenance; York
 rake; mulching machine; paving screed machine; stationary
 steam boiler; paving concrete finishing machine; grout
 pump; portable steam boiler; portable steam generator;
 roller; spreader; asphalt paver; locomotives or machines
 used in place thereof; tamper (self propelled or
 tractor-draw); cal tracks; ballast regulator; rail anchor
 machine; switch tamper; tire truck

GROUP 3: Pumps (1-3 grouped); compressor; welding machines
 (1-3 grouped); generator; sighting plant; heaters (power
 driven, 1- 5); syphon-pulsometer; concrete mixer; valves
 controlling permanent plant air steam, conveyor, wellpoint
 system (operating)

GROUP 4: Assitant engineer (fireman)

GROUP 5: Oiler (other than truck cranes and gradalls)

GROUP 6: Oiler (on truck cranes and gradalls)

POWER EQUIPMENT OPERATORS CASSIFICATIONS [MARINE
 CONSTRUCTION]

Group 1: Shovel; crane; truck crane; cherry picker; derrick;
 pile driver; two or more drum machines; lighters; derrick
 boats; trenching machines; mechanic hoist pavement
 breakers; cement concrete pavers; draglines; hoisting
 engines; pumpcrete machines; elevating graders; shovel
 dozer; front end loader; backhoe; gradall; cable ways;

boring machine; rotary drill; post hole hammer; post hole digger; fork lift; timber jack; asphalt plant (on site); concrete batching and/or mixing plant (on site); crusher plant (on site); paving concrete mixer

Group 2: Portable steam boiler; portable steam generator; sonic or vibratory hammer; grader; scraper; tandem scraper; concrete pump; bulldozer; tractor; York rake; mulching machine; roller; spreader; tamper (self-propelled or tractor-drawn); asphalt paver; concrete mixer with side loader; mechanic - maintenance; cal tracks; ballast regulator; switch tamper; rail anchor machine; tire truck

Group 3: Pumps (1-3 grouped); compressor; welding machines (1-3 grouped); generator; lighting plant; heaters (power driven 1-5); syphon-pulsometer; concrete mixer; valves controlling permanent plant air or steam; conveyor; well point systems; auger (powered by independent engines and attached to pile drivers); hydraulic saws

Group 4: Fireman

Group 5: Assistant engineer (other than truck crane and gradall)

Group 6: Assistant engineer (on truck crane and gradall)

IRON0007-001 03/01/2013

AREA 1: BRISTOL (Easton); ESSEX (Beverly,Gloucester,Lynn, Lynnfield, Manchester,Marblehead, Nahant, Salem, Saugus, Swampscott); MIDDLESEX (Arlington, Bedford, Belmont, Burlington, Cambridge, Concord,Everett, Framingham, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Except Medway); PLYMOUTH (Abington, Bridgewater, Brocton, Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Norwell, Pembroke, Plymouth, Plympton, Rockland, Scituate, West Bridgewater, Whitman); SUFFOLK

AREA 2: ESSEX (Amesbury, Andover, Boxford, Danvers, Essex, Georgetown, Hamilton, Haverhill, Ipswich, Lawrence, Merrimac, Methuen, Newbury, Newburyport, North Andover, Rockport, Rowley, Salisbury, Topsfield, Wenham, West Newbury); MIDDLESEX (Action,Billerica, Carlisle, Chelmsford, Dracut, Dunstable, Groton, Groveland, Littleton, Lowell, Middleton, North Reading, Pepperell, Tewksbury, Tyngsboro, Westford, Wilminton)

	Rates	Fringes
IRONWORKER		
AREA 1.....	\$ 40.12	26.88
AREA 2.....	\$ 35.71	26.88

IRON0007-010 09/01/2012

MIDDLESEX (Ashby, Ashland, Ayer, Boxboro, Holliston, Hopkinton, Hudson, Marlboro, Shirley, Stow, Townsend); NORFOLK (Medway)

	Rates	Fringes
IRONWORKER.....	\$ 38.68	26.86

IRON0037-002 03/16/2013

BARNSTABLE; BRISTOL (Acushnet, Attleboro, Berkley, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, Mansfield, New Bedford, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Somerset, Swansea, Taunton, Westport); DUKES; NANTUCKET; NORFOLK (Billingham, Franklin, Plainville, Wrentham); PLYMOUTH (Lakeville, Marion, Mattapoisett, Middleboro, Rochester, Wareham)

	Rates	Fringes
IRONWORKER.....	\$ 32.81	22.22

LABO0022-006 12/01/2012

SUFFOLK COUNTY (Boston, Chelsea, Revere, Winthrop, Deer & Nut Islands); MIDDLESEX COUNTY (Arlington, Belmont, Burlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Somerville, Stoneham, Wakefield, Winchester, Winthrop and Woburn only); NORFOLK COUNTY (Brookline, Dedham, and Milton only)

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 32.30	20.40
GROUP 2.....	\$ 32.55	20.40
GROUP 3.....	\$ 33.05	20.40
GROUP 4.....	\$ 33.30	20.40
GROUP 5.....	\$ 20.50	20.40
GROUP 6.....	\$ 34.30	20.40

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tender; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operator

GROUP 3: Air track operator; block paver; rammer; curb setter

GROUP 4: Blaster; powderman

GROUP 5: Flagger

GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste

Laborers

LABO0022-012 12/01/2012

Counties of BARNSTABLE; BRISTOL; DUKES; ESSEX; NANTUCKET;
PLYMOUTH; MIDDLESEX (With the exception of Arlington, Belmont,
Burlington, Cambridge, Everett, Malden, Melrose, Reading,
Somerville, Stoneham, Wakefield, Winchester, Winthrop and
Woburn); NORFOLK (With the exception of Brookline, Dedham, and
Milton)

	Rates	Fringes
Laborers:		
GROUP 1.....	\$ 29.60	19.50
GROUP 2.....	\$ 29.85	19.50
GROUP 3.....	\$ 30.35	19.50
GROUP 4.....	\$ 30.60	19.50
GROUP 5.....	\$ 20.50	19.50
GROUP 6.....	\$ 31.60	19.50

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher
tenders

GROUP 2: Asphalt raker; fence and guard rail erector; laser
beam operator; mason tender; pipelayer; pneumatic drill
operator; pneumatic tool operator; wagon drilloperator

GROUP 3: Air track operator; block paver; rammer; curb
setter; hydraulic & similar self powere drills

GROUP 4: Blaster; powderman

GROUP 5: Flagger

GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste
Laborers

LABO0022-013 12/01/2012

	Rates	Fringes
Laborers:		
(FREE AIR OPERATION):		
SHIELD DRIVEN AND LINER		
PLATE IN FREE AIR)		
GROUP 1.....	\$ 32.90	20.30+A
GROUP 2.....	\$ 32.90	20.30+A
(OPEN AIR CASSONS,		
UNDERPINNING AND TEST		
BORING INDUSTRIES):		

TEST BORING & WELL DRILLING

Driller.....	\$ 33.70	19.85+A
Laborer.....	\$ 32.30	19.85+A

(OPEN AIR CASSONS,
UNDERPINNING AND TEST
BORING INDUSTRIES):

OPEN AIR CASSON,
UNDERPINNING WORK & BORING
CREW

Bottom man.....	\$ 33.45	19.85+A
Laborers; Top man.....	\$ 32.30	19.85+A

(TUNNELS, CAISSON &
CYLINDER WORK IN
COMPRESSED AIR)

GROUP 1.....	\$ 30.35	20.30+A
GROUP 2.....	\$ 40.83	20.30+A
GROUP 3.....	\$ 40.83	20.30+A
GROUP 4.....	\$ 40.83	20.30+A
GROUP 5.....	\$ 40.83	20.30+A
GROUP 6.....	\$ 42.83	20.30+A

CLEANING CONCRETE AND
CAULKING TUNNEL (Both New
& Existing)

GROUP 1.....	\$ 32.90	20.30+A
GROUP 2.....	\$ 32.90	20.30+A

ROCK SHAFT, CONCRETE
LINING OF SAME AND TUNNEL
IN FREE AIR

GROUP 1.....	\$ 30.35	20.30+A
GROUP 2.....	\$ 32.90	20.30+A
GROUP 3.....	\$ 32.90	20.30+A
GROUP 4.....	\$ 32.90	20.30+A
GROUP 5.....	\$ 34.90	20.30+A

LABORERS CLASSIFICATIONS for TUNNELS, CAISSON & CYLINDER WORK
IN COMPRESSED AIR

GROUP 1: Powder watchman; Top man on iron bolt; change house
attendant

GROUP 2: Brakeman; trackman; groutman; tunnel laborer;
outside lock tender; lock tender; guage tender

GROUP 3: Motorman, miner

GROUP 4: Blaster

GROUP 5: Mucking machine operator

GROUP 6: Hazardous Waste work within the "HOT" zone. (A
premium of two dollars \$2.00 per hour over the basic wage
rate.

LABORERS CLASSIFICATIONS for (FREE AIR OPERATION): SHIELD
DRIVEN AND LINER PLATE IN FREE AIR

GROUP 1: Miner; miner welder; conveyor operator; motorman;

mucking machine operator; nozzle man; grout man-; pumps, shaft and tunnel steel and rodman; shield and erector arm operators, mole nipper, outside motorman, burner, TBM operator, safety miner; laborer topside; heading motormen; erecting operators; top signal men

GROUP 2: Brakeman; trackman

LABORERS CLASSIFICATIONS FOR CLEANING CONCRETE AND CAULKING TUNNEL (Both New & Existing)

GROUP 1: Concrete workers; strippers and form movers (wood & steel), cement finisher

GROUP 2: Form erector (wood & steel and all accessories)

LABORERS CLASSIFICATIONS for ROCK SHAFT, CONCRETE LINING OF SAME AND TUNNE IN FREE AIR

GROUP 1: Change house attendants

GROUP 2: Laborers, topside, bottom men (when heading is 50 ft. from shaft) and all other laborers

GROUP 3: Brakeman; trackman; tunnel laborers; shaft laborers

GROUP 4: Miner; cage tender; bellman

GROUP 5: Hazardous Waste work within the "HOT" zone. (A premium of two dollars \$2.00 per hour over the basic wage rate)

FOOTNOTE FOR LABORERS:

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

LABO1421-001 06/01/2011

WRECKING LABORERS:

	Rates	Fringes
Laborers: (Wrecking)		
Group 1.....	\$ 31.05	19.75
Group 2.....	\$ 31.80	19.75
Group 3.....	\$ 32.05	19.75
Group 4.....	\$ 27.05	19.75
Group 5.....	\$ 30.15	19.75
Group 6.....	\$ 31.05	19.75

Group 1: Adzeman, Wrecking Laborer.

Group 2: Burners, Jackhammers.

Group 3: Small Backhoes, Loaders on tracks, Bobcat Type Loaders, Hydraulic "Brock" Type Hammer Operators, Concrete Cutting Saws.

Group 4: Yardman (Salvage Yard Only).

Group 5: Yardman, Burners, Sawyers.

Group 6: Asbestos, Lead Paint, Toxic and Hazardous Waste.

PAIN0035-001 01/01/2013

BARNSTABLE BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH
(Remainder of NORFOLK; MIDDLESEX AND SUFFOLK COUNTIES)

	Rates	Fringes
Painters:		
NEW CONSTRUCTION:		
Bridge.....	\$ 45.01	24.40
Brush, Taper.....	\$ 34.51	24.40
Spray, Sandblast.....	\$ 35.91	24.40
REPAINT:		
Bridge.....	\$ 45.01	24.40
Brush, Taper.....	\$ 32.57	24.40
Spray, Sandblast.....	\$ 33.97	24.40

PAIN0035-015 01/01/2013

MIDDLESEX (Cambridge, Everett, Malden, Medford, Somerville)
SUFFOLK COUNTY (Boston, Chelsea) NORFOLK COUNTY (Brookline)

	Rates	Fringes
Painters:		
NEW CONSTRUCTION:		
Brush, Taper.....	\$ 40.30	24.40
Spray, Sandblast.....	\$ 41.70	24.40
REPAINT:		
Bridge.....	\$ 38.36	24.40
Brush, Taper.....	\$ 38.36	24.40
Spray, Sandblast.....	\$ 39.76	24.40

PLAS0534-001 07/01/2012

ESSEX; MIDDLESEX; NORFOLK AND SUFFOLK COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 35.50	31.01

PLUM0004-001 03/01/2013

MIDDLESEX (Ashby, Ayer-West of Greenville branch of Boston and
Maine Railroad, Ft. Devens, Groton, Shirley, Townsend)

	Rates	Fringes
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Plumbers and Pipefitters.....\$ 40.01 24.21

 PLUM0012-001 03/01/2013

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)

Rates Fringes

PLUMBER.....\$ 43.98 24.56

 PLUM0012-003 03/01/2013

ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)

Rates Fringes

Plumber, Pipefitter,
 Steamfitter.....\$ 43.98 24.56

 PLUM0012-006 03/01/2013

ESSEX (Lynn, Lynnfield, Nahant, Saugus, and Swampscott);
 MIDDLESEX (Acton, Arlington, Ashland, Ayer - except W. of Greenville Branch of Boston & Maine RR, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Natick, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham, Hull, Scituate);
 SUFFOLK

Rates Fringes

PLUMBER.....\$ 48.06 24.56

 PLUM0051-005 03/01/2013

BARNSTABLE; BRISTOL; DUKES; NANTUCKET; NORFOLK (Avon, Holbrook, Randolph, Stoughton) PLYMOUTH(Remainder of County)

	Rates	Fringes
Plumbers and Pipefitters.....	\$ 34.96	27.12

 PLUM0537-001 03/01/2013

MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Wakefield, Winchester and Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton Cashasset, Dedham, Foxboro, Franklin, Millis, Milton, Sharon, Walpole, Westwood, and Wrenthan); PLYMOUTH (Hingham, Hull, Scituate); ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, West Newbury)

	Rates	Fringes
PIPEFITTER.....	\$ 48.64	24.81

 * TEAM0379-001 08/01/2013

	Rates	Fringes
Truck drivers:		
Group 1.....	\$ 30.78	18.37+A+B
Group 2.....	\$ 30.95	18.37+A+B
Group 3.....	\$ 31.02	18.37+A+B
Group 4.....	\$ 31.14	18.37+A+B
Group 5.....	\$ 31.24	18.37+A+B
Group 6.....	\$ 31.53	18.37+A+B
Group 7.....	\$ 31.82	18.37+A+B

POWER TRUCKS \$.25 DIFFERENTIAL BY AXLE
 TUNNEL WORK (UNDERGROUND ONLY) \$.40 DIFFERENTIAL BY AXLE
 HAZARDOUS MATERIALS (IN HOT ZONE ONLY) \$2.00 PREMIUM

TRUCK DRIVERS CLASSIFICATIONS

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

Group 2: Two axle equipment; & forklift operator

Group 3: Three axle equipment and tireman

Group 4: Four and Five Axle equipment

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

Group 6: Specialized earth moving equipment over 35 tons

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

FOOTNOTES:

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

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

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

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

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

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters , PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable , i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

Wage and Hour Administrator
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

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

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

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

=====

END OF GENERAL DECISION

SECTION 00680

DIVISION OF LABOR AND STATEMENT OF COMPLIANCE

The Statement of Compliance and the Weekly Payroll Report Form that are required for work performed under this Contract are included on the following pages.

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STATEMENT OF COMPLIANCE

_____, 20_____

I, _____,
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

and

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

Signature _____

Title _____

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U.S. Department of Labor
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

NAME OF CONTRACTOR OR SUBCONTRACTOR ADDRESS PROJECT AND LOCATION PROJECT OR CONTRACT NO.
OMB No.: 1215-0149 Expires: 12/31/2011

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) TYPE OF DEDUCTIONS	(3) WORK CLASSIFICATION	(4) DAY AND DATE	(5) TOTAL HOURS WORKED EACH DAY	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS			(9) NET WAGES PAID FOR WEEK	
							FICA	WITH- HOLDING TAX	OTHER		TOTAL DEDUCTIONS

While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement
We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room 39502, 200 Constitution Avenue, N.W., Washington, D.C. 20210

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

— Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE
THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.	

Date _____
 I, _____ (Name of Signatory Party) _____ (Title)
 do hereby state:

(1) That I pay or supervise the payment of the persons employed by _____ (Contractor or Subcontractor) _____ on the _____ (Building or Work) _____; that during the payroll period commencing on the _____ day of _____, and ending the _____ day of _____, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said _____ (Contractor or Subcontractor) _____ from the full weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

(2) That any payroll(s) otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That: (a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS — in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

SECTION 00681

FEDERAL DAVIS BACON ACT COMPLIANCE

The Statement of Compliance required for work performed under this Contract is included on the following pages. The Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers as described.

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**FEDERAL DAVIS BACON ACT
STATEMENT OF COMPLIANCE**

_____, 20_____

I, _____,
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

and

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

Signature _____
Title _____

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SECTION 00800
GENERAL TERMS AND CONDITIONS OF THE CONTRACT
FOR CONSTRUCTION, RECONSTRUCTION, ALTERATION,
REMODELING, OR REPAIR OF ANY
CITY OF CAMBRIDGE PUBLIC WORK
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GENERAL TERMS AND CONDITIONS OF THE CONTRACT

FOR CONSTRUCTION, RECONSTRUCTION, INSTALLATION, DEMOLITION, MAINTENANCE, OR REPAIR OF ANY CITY OF CAMBRIDGE PUBLIC WORK

ARTICLE 1 DEFINITIONS

1.1 In General

1.1.1 **Well-known meanings.** When words or phrases, which have a well-known technical or construction industry or trade meaning, are used in the Contract Documents, such words or phrases shall be interpreted in accordance with that meaning, unless otherwise stated.

1.1.2 **Capitalization.** The words and terms defined in this Article are capitalized in these General Terms and Conditions of the Contract. Other capitalized words may refer to a specific document found in the Contract Documents.

1.1.3 **Persons.** Whenever the word person or persons is used, it includes, unless otherwise stated, entity or entities, respectively, including, but not limited to, corporations, partnerships, and joint ventures.

1.1.4 **Singular and Plural.** The following terms have the meanings indicated which are applicable to both the singular and the plural thereof.

1.2. Definitions

1.2.1 **Agreement-**The Agreement is the written document between the **City** and the **Contractor** which is titled: Agreement between the City of Cambridge and the Contractor, which is the executed portion of the Contract, and which forms a part of the Contract. The Agreement also includes all documents required to be attached thereto, including, but not limited to, the performance bond, the labor and materials or payment bonds, certificates of insurance, and all Modifications of the Agreement.

1.2.2 **Change Order-**A Change Order is a document which is signed by the **Contractor**, the **Engineer**, and the **City**; which is directed to the **Contractor**; which authorizes the **Contractor** to make an addition to, a deletion from or a revision in the Work, or an adjustment in the Contract Sum or in the Contract Time; and which is issued on or after the date of the Agreement between the **Contractor** and the **City**.

1.2.3 **City-** The **City** refers to the City of Cambridge, which is the owner of the Project and is the public awarding authority with whom the **Contractor** has entered into the Contract and for whom the Work is to be provided.

1.2.4 **Claim-**A Claim is a dispute, demand, or assertion by one of the parties arising out of or relating to the Contract for which such party is seeking relief.

1.2.5 **Contract-**The Contract consists of all the Contract Documents. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification to the Contract signed by both parties.

1.2.6 **Contract Documents-**The Contract Documents consist of the Agreement; the notice of award of the Contract; the Notice to Proceed; the entire Project Manual; Change Orders; Work Change Directives; the **Contractor's** Bid and all accompanying documents accepted by the City; and the **Engineer's** written interpretations and clarifications issued on or after the issuance of the Notice to Proceed. Shop Drawing

submittals and reports or drawings utilized by the **Engineer** in preparing the Contract Documents are not Contract Documents.

1.2.7 **Contractor**-The **Contractor** is the person who is awarded the Contract for the Project herein pursuant to M.G.L. c. 39, §39M; and is identified in the Agreement as such. The term “**Contractor**” is intended to include the **Contractor** as well as its authorized representative(s).

1.2.8 **Contract Sum**-The Contract Sum is the total amount stated in the Agreement payable by the **City** to the **Contractor** for the completion of the Work in accordance with the Contract Documents.

1.2.9 **Contract Time**-Unless otherwise provided, the Contract Time is the number of days allotted in the Contract Documents or the dates stated in the Agreement, including authorized adjustments, for Substantial Completion.

1.2.10 **Coordination Drawings**-Coordination Drawings are those drawings which are prepared by the **Contractor** or a Subcontractor which show the exact alignment, physical locations, and configuration of the mechanical, electrical, and fire protection installations.

1.2.11 **Day**-The term “day” shall mean calendar day unless otherwise stated.

1.2.12 **Engineer**-The **Engineer** is the person lawfully licensed to practice engineering and has been selected by the **City** to administer the Contract. The term “**Engineer**,” while referred to in the singular, means the **Engineer** and/or the **Engineer's** representative.

1.2.13 **Field Order**-A Field Order is a written order issued by the **Engineer** which orders minor changes in the Work, but which does not involve a change in the Contract Sum or the Contract Time.

1.2.14. **Final Completion**-Final Completion is the point in time when the Engineer certifies that the Work has been fully completed in accordance with the Contract Documents. Final Completion shall be no later than thirty (30) days after Substantial Completion.

1.2.15 **General Requirements**-General Requirements refer to Sections of Division 1 of the Specifications.

1.2.16. **Modification**-A Modification is a written instrument which amends the Contract after execution of the Agreement.

1.2.17 **Notice to Proceed**-A Notice to Proceed is a written notice given by the **City**, or the **Engineer**, to the **Contractor** fixing the date on which the Contract Time will begin to run and on which the **Contractor** shall start to perform its obligations under the Contract Documents.

1.2.18 **Drawings**-The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, dimensions, scope, extent, and character of the Work to be furnished and performed by the **Contractor** and which have been prepared or approved by the **Engineer**.

1.2.19 **Product Data**-Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the General **Contractor** to illustrate materials or equipment for some portion of the Work. Product Data are not considered part of the Contract Documents.

1.2.20 **Project**-The Project is the total Work to be provided under the Contract Documents and may be the whole or a part as indicated elsewhere in the Contract Documents and may include construction by the

City or by separate contractors. The Project is the Work described in the invitation to bid (advertisement) and Specifications and illustrated by the Drawings, including any Modifications.

1.2.21. **Project Manual**-The Project Manual is the entire set of bidding documents which includes, but is not limited to, the invitation to bid (advertisement), the instructions to bidders, all of the forms, the wage rates, all City and state requirements, the General Terms and Conditions of the Contract, any supplementary conditions thereto, the Drawings, the Specifications, and all addenda.

1.2.22 **Proposed Change Order**-A Proposed Change Order is a Change Order that has been submitted by the **Contractor** to the **Engineer**, is under review, and has not been approved by the **City**.

1.2.23 **Samples**-Samples are physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged. Samples are not considered part of the Contract Documents.

1.2.24 **Shop Drawings**-Shop Drawings are all drawings, diagrams, illustrations, schedules, and other information which are specifically prepared or assembled by or for the **Contractor** and submitted by the **Contractor** to illustrate some portion of the Work. Shop Drawings are not considered part of the Contract Documents.

1.2.25 **Site**-The Site is the location of the Project and of the Work.

1.2.26 **Specifications**-Specifications are those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

1.2.27 **Subcontractor**-A Subcontractor is a person, firm or corporation who contracts directly with the **Contractor**, unless otherwise stated.

1.2.28 **Submittals**-Submittals are those Shop Drawings, Product Data, Samples, or any other required document which are provided to the Engineer for review and approval.

1.2.29 **Substantial Completion**-Substantial Completion means that the Work has been completed and the Site or the facility is opened to public use, except for minor incomplete or unsatisfactory items that do not materially impair the usefulness of the Work. The **Engineer** shall decide what constitutes “minor,” “incomplete,” “unsatisfactory,” and “materially” and the **Engineer's** decision shall be final.

1.2.30 **Sub-subcontractor**-A Sub-subcontractor is a person who has contracted directly with a Subcontractor.

1.2.31 **Supplier**-A Supplier is a manufacturer, fabricator, distributor, material, person, or vendor having a direct contract with the Contractor or with any Subcontractor to furnish materials or equipment to be incorporated into the Work by the Contractor or any Subcontractor.

1.2.32 **Work**-Work refers to the services and the entire completed construction or the various separately identifiable parts thereof required by the Contract Documents, including all labor, materials, and equipment furnished, furnished and incorporated into the Project, or to be provided by the **Contractor** to fulfill the **Contractor's** obligations. The Work may constitute the whole or a part of the Project.

1.2.33 **Work Change Directive**-A Work Change Directive is a written directive to the **Contractor** ordering an addition to, a deletion from, or a revision to the Work issued on or after the date of the Agreement, signed by the City, and recommended by the Engineer.

ARTICLE 2 ABOUT THE CONTRACT DOCUMENTS

2.1 Priority/Conflict

2.1.1 Priority Among Contract Documents. In the event of conflict among the Contract Documents, the Contract Documents shall be construed according to the following priorities “except as may otherwise be specifically stated”:

Highest Priority:	Modifications
Second Priority:	Agreement
Third Priority:	Addenda-later date to take precedence
Fourth Priority:	Supplementary General Conditions
Fifth Priority:	General Conditions
Sixth Priority:	Drawings and Specifications

2.1.1.1 If there is a conflict between the Drawings and Specifications, the figured dimensions shall govern over the scaled dimensions. Detailed Drawings shall govern over the general Drawings. Larger scale Drawings shall take precedence over smaller scale Drawings. Drawings shall govern over Shop Drawings. Whenever there is a conflict concerning quality or quantity between or among notes, specifications, dimensions, details, or schedules in the Specifications or in the Drawings, or between the Specifications and the Drawings, or in all other instances not specifically noted above, the Contractor shall provide, unless otherwise directed by a Modification of the Contract, the better quality or greater quantity of Work at no increase in the Contract Sum or in the Contract Time.

2.1.1.2 Compliance with these priority conditions shall not justify any changes in the Work or any increase in the Contract Sum or Contract Time, unless any such compliance results in Work that may not be reasonably inferred from the Contract Documents as being required to produce the intended result as determined by the Engineer.

2.1.2 Review of the Contract Documents and Field Conditions and Discovery of Conflict, Error, Ambiguity, or Discrepancy. Before starting the Work, and during the progress thereof, the Contractor shall carefully study and compare the Contract Documents with each other and with the information furnished by the City pursuant to Article 3 and shall at once report to the Engineer any error, inconsistency, or omission the Contractor may discover. Any necessary change shall be ordered as provided in Article 11, subject to the requirements of any other provisions of the Contract Documents. The Contractor shall not proceed with the Work affected thereby (except in an emergency) until a Modification has been issued. If the Contractor proceeds with the Work having discovered such errors, inconsistencies, or omissions contrary to the provisions contained herein, or if by reasonable study of the Contract Documents the Contractor could have discovered such, the Contractor shall bear all costs arising therefrom. The Contractor shall be liable to the City for failure to report any conflict, error, ambiguity, or discrepancy, of which it knew or should have known.

2.1.3 Field Measurements. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Engineer at once.

2.1.4 Statutory Provisions. The City and the Contractor recognize that other rights duties and obligations with respect to public construction contracts are provided for by statute, notwithstanding the fact that they may not be provided for in the Contract Documents. In case of conflict between the statutory

provisions and other provisions of the Contract Documents and the provisions of any applicable statute, the statutory provisions shall govern.

2.1.5 Voided or Unlawful Provisions. In the event any provision in the Contract is voided or deemed unlawful, such provision shall be deleted without affecting the remainder of the Contract.

2.2 Execution

2.2.1 Execution of the Agreement by the Contractor is a representation that the Contractor has visited the Site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

2.3 Intent

2.3.1 Entire Agreement. The Contract Documents comprise the entire agreement between the City and the Contractor concerning the Work. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary; what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others.

2.3.2 Statutory Provisions. Each and every provision of law, code, and regulation, 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.

2.3.3 Functionally Complete Project. It is the intent of the Contract Documents to describe a functionally complete Project. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. Any Work, materials, or equipment that may be reasonably inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed by the Contractor whether or not specifically called for in the Contract Documents.

2.3.4 Indications or Notations. All indications or notations which apply to one of a number of similar situations, materials, or processes shall be deemed to apply to all such situations, materials, or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

2.3.5 Standards or Quality of Materials or Workmanship. Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

2.3.6 Manufactured Products. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

2.3.7 Tests. When test boring or soil test information are included with the Contract Documents or otherwise made available to the Contractor and such test boring or soil test information was obtained by the City for use by the Engineer in the design of the Project or Work, the City does not hold out such

information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost of extension of time resulting from a reliance by the Contractor on such information shall be allowed except as otherwise provided herein. Any such reports are not part of the Contract Documents.

2.3.8 Joining Work. Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified.

2.4 Organization

2.4.1 Except as provided in M.G.L. c. 149, §44F, the organization of the Specifications into divisions, sections, and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

2.5 References

2.5.1 Where codes, manuals, specifications, standards, requirements and publications of public and private bodies are referred to in the Contract Documents whether specifically or by implication, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated. Where statutes are referred to in the Contract Documents whether specifically or by implication, references shall be understood to be to the latest revision.

2.5.2 References herein to particular paragraphs or Articles are solely to facilitate finding additional information with regard to the specific matters and are not to be construed in any way as limiting the possible paragraphs and Articles in which such matters may be found elsewhere in this document.

2.6 Reuse of Engineer's Written Instruments

2.6.1 Neither the Contractor nor any Subcontractor or Supplier shall have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents prepared by the Engineer and shall not reuse any of such Drawings, Specifications, or other documents without prior written consent of the City and the Engineer.

2.7 Written Material of the Contractor

2.7.1 All written material prepared or collected by the Contractor in the course of completing the Work shall be the exclusive property of the City and shall not be used by the Contractor for any purpose other than the purpose of this Contract.

2.8 Modifying Words

2.8.1 In the interest of simplicity, modifying words such as "all" and "any" may be omitted, but the fact that such words may be absent from one sentence and appear in another is not intended to affect the interpretation of either statement.

2.9 Use of Certain Words and Terms

2.9.1 Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the City or of the Engineer as to the Work, it is intended that such requirement, direction, review, or judgment will be solely to evaluate, in general, the completed Work

for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). As used herein, "provided" shall be understood to mean "provided complete and in place"; that is, "furnished and installed, complete."

2.9.2 The use of any such term or adjective shall not be effective to change the duties and responsibilities of the City or the Engineer from those assigned in the Contract Documents or to assign any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.

2.9.3 When the words "Contractor," "Subcontractor," "Sub-subcontractor," and "Supplier" are used, they are intended to include their employees and agents, unless otherwise specified.

2.10 Modification of the Contract Documents

2.10.1 Major Modifications. Major Modifications may affect the Contract Sum or the Contract Time. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways, all of which must contain a written endorsement by the City:

2.10.1.1 A formal written amendment;

2.10.1.2 A Change Order;

2.10.1.3 A Work Change Directive; or

2.10.1.4 The Engineer's written interpretation, clarification, or decision.

2.10.2 Minor Modifications. Minor modifications do not affect the Contract Sum or the Contract Time. The requirements of the Contract Documents may be supplemented and minor variations and deviations of the Work may be authorized in one or more of the following ways:

2.10.2.1 A Field Order; or

2.10.2.2 The Engineer's approval of a Shop Drawing or Sample.

ARTICLE 3 THE CITY

3.1 Signatory

3.1.1 All documents which require a signature or an endorsement by the City must be signed by the City Manager in order to be deemed ratified by the City.

3.2 Requirements to Provide Documents

3.2.1 To the extent they are available, the City shall furnish surveys describing physical characteristics, legal limitations, and utility locations for the site of the Project, and a legal description of the Site.

3.2.2 The City shall obtain and pay for necessary approvals, easements, assessments, and charges, which are customarily secured prior to the execution of the Contract.

3.2.3 The City shall furnish information or services required of the City hereunder with reasonable promptness after receipt from the Contractor of a written request for such information or services.

3.2.4 The City shall provide the Contractor, at no charge, such copies of the Project Manual as are reasonably necessary for the execution of the Work.

3.3 Clerk of the Works

3.3.1 The City may engage a Clerk of the Works for this Project, in which case the City shall, upon request of the Contractor, provide the Contractor with a written statement of the duties, responsibilities, and limitations of authority of such Clerk of the Works. Except as expressly set forth in such written statement, the Clerk of the Works shall have no authority to approve Work, to approve Change Orders, or to exercise any of the power and authority of the City or the Engineer. The Clerk of the Works shall observe the Contractor's operations and construction activities for compliance with the Drawings and Specifications. The Clerk of the Works shall have access to all areas of the Project at all times. The Contractor shall fully cooperate with the Clerk of the Works in the performance of the Clerk's duties.

3.4 City's Right to Perform Construction and to Award Separate Contracts.

3.4.1 The City reserves the right to perform construction or operations at the Site with its own forces or others. If the Contractor claims that a delay or additional cost is involved because of such action by the City, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

3.4.2 When the separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate City-Contractor Agreement.

3.4.3 The City shall provide for coordination of the activities of the City's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall afford each other person access to the Site and shall properly coordinate its Work with that of the persons performing other work. The Contractor shall participate with other separate contractors and the City in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedules deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors, and the City until subsequently revised.

3.5 Limitations on the City's Responsibilities

3.5.1 The City shall not supervise, direct, or have control or authority over, nor be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of the Contractor to comply with laws, codes and regulations applicable to the furnishing or performance of the Work. The City will not be responsible for the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents. The City is not responsible for the acts or omissions of the Contractor, any Subcontractor, Supplier, or anyone for whose acts the Contractor, any Subcontractor or Suppliers may be liable.

3.5.2 The City's authority to review any of the Contractor's progress schedules, or its decision to raise or not to raise any objections about such schedules shall not impose on the City any responsibility for the timing, planning, scheduling, or execution of the Work, nor in any way give rise to any duty or responsibility on the part of the City to exercise this authority for the benefit of the Contractor, any Subcontractor or Supplier or any other party.

3.5.3 The City's decision to raise or not to raise objections with regard to any aspects of the Contractor's insurance shall in no way give rise to any duty or responsibility on the part of the City to or for the benefit of the Contractor, any Subcontractor, any Supplier, or any other party.

3.6 Reservation of Rights

3.6.1 The City reserves the right to correct at any time any error in any progress payment that may have been made.

3.6.2 Should defective Work be discovered subsequent to final payment, the City reserves the right to make a claim and recover all costs and professional fees associated therewith, including the cost of removing and/or replacing the defective Work.

3.7 Waivers

3.7.1 All waivers by the City are valid only to the extent that they are signed by the City. Any such waivers pertain only to the specific matter contained in the waiver and not to any similar, subsequent matters.

ARTICLE 4 THE ENGINEER

4.1 City's Representative

4.1.1 The Engineer is the City's representative (1) during construction, (2) until final payment is due, and (3) with the City's concurrence, from time to time during the correction period described in Article 10. The Engineer will advise and consult with the City. The Engineer will have authority to act on behalf of the City only to the extent provided in the Contract Documents, unless otherwise modified by a written instrument in accordance with other provisions of the Contract.

4.1.2 The duties, responsibilities, and the limitations of authority of the Engineer as the City's representative during construction are set forth in the Contract Documents and shall not be extended without the written consent of the City and the Engineer.

4.2 Administration of the Contract

4.2.1 The Engineer will provide administration of the Contract as described in the Contract Documents, unless the City has engaged a construction manager.

4.3 Visits to the Site

4.3.1 The Engineer will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of on-site observations as an engineer, the Engineer will keep the City informed of progress of the Work in writing and will endeavor to guard the City against defects and deficiencies in the Work.

4.4 Communications Facilitating Contract Administration

4.4.1 Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the City and the Contractor shall endeavor to communicate through the Engineer. Communications by and with the Engineer's consultants shall be through the Engineer. Communications by and with Subcontractors and Suppliers shall be through the Contractor. Communications by and with City employees and separate contractors shall be through the City.

4.4.2 When it deems it necessary or expedient, the City may communicate directly with the Contractor, any Subcontractors, Suppliers, or consultants.

4.5 Certification of Applications for Payment

4.5.1 Based on the Engineer's observations and evaluations of the Contractor's applications for payment, the Engineer will review and certify the amounts due the Contractor and will issue certificates for payment in such amounts.

4.6 Rejection of Work

4.6.1 The Engineer will have authority to reject or disapprove Work which (1) does not conform to the Contract Documents; (2) which the Engineer believes to be defective; and (3) the 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. Whenever the Engineer considers it necessary or advisable for implementation of the intent of the Contract Documents, the Engineer will have authority to require additional inspection or testing of the Work in accordance with Article 9, whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Engineer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Engineer to the Contractor, Subcontractors, Suppliers, or other persons performing portions of the Work.

4.7 Review of Submittals

4.7.1 The Engineer will review or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents and only to the extent which the Engineer believes desirable to protect the City's interest. The Engineer's action will be taken with reasonable promptness, while allowing sufficient time in the Engineer's professional judgment to permit adequate review, taking into account the time periods set forth in the latest schedule prepared by the Contractor and approved by the Engineer. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Engineer's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Article 5. The Engineer's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. After the rejection of the second resubmittal of any one Submittal, the Contractor shall bear the cost of the review of each subsequent resubmittal.

4.8 Preparation of Change Orders and Work Change Directives

4.8.1 The Engineer will prepare Change Orders and Work Change Directives and may authorize minor Modifications in the Work as provided in Article 11.

4.9 Inspections

4.9.1 The Engineer will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; will receive and forward to the City for the City's review and records written warranties and related documents required by the Contract and assembled by the Contractor; and will issue a final certificate for payment upon the Contractor's compliance with all of the requirements of the Contract Documents.

4.10 Interpretations, Clarifications, and Decisions

4.10.1 The Engineer will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the City or the Contractor. The Engineer's response to such requests will be made with reasonable promptness and within the time set forth in the Agreement between the City and the Engineer. Any such written interpretations, clarifications, and decisions shall be binding on the Contractor.

4.10.2 Interpretations, clarifications, and decisions of the Engineer will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. The Engineer will not be liable to the Contractor, any Subcontractor, or Supplier for results of interpretations, clarifications, or decisions so rendered in good faith.

4.10.3 The Engineer may, as the Engineer judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work; such drawings or instructions may be effected by a Field Order or other notice to the Contractor, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without any additional cost or an extension of the Contract Time.

4.10.4 The Engineer's decisions on matters relating to aesthetic effect must be consistent with the City's and will be final.

4.11 Limitation on the Engineer's Responsibilities

4.11.1 Neither the Engineer's authority to act under the provisions of the Contract Documents nor any decision made by the Engineer in good faith to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any Supplier, any surety for any of them or any other person.

4.11.2 The Engineer will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Article 5. The Engineer will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, Suppliers, or of any other persons performing portions of the Work.

ARTICLE 5 THE CONTRACTOR

5.1 Relationship with the City

5.1.1 The Contractor is an independent contractor and not an employee of the City. The Contractor is engaged by virtue of the Contract to perform only those services contained therein. The Contractor is not authorized to contract on behalf of the City or to incur any liability on the part of the City.

5.1.2. The **City** (1) shall not enter into a contract with, and shall not approve as a subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that such corporation has complied with sections three and five of chapter one hundred and eighty-one and the date of such compliance, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth. (*Reference: M.G.L. c. 30, §39L*)

5.2 Code of Conduct

5.2.1 Chapter 2.117 of the Cambridge Municipal Code, Code of Conduct for City Officials and Employees, establishes standards of conduct for officials and employees of the City. The Contractor is subject to certain provisions contained therein. The Contractor shall familiarize itself with the ordinance and act accordingly.

5.3 Quality Assurance

5.3.1 The Contractor shall be responsible for ensuring that it, all Subcontractors, Suppliers, and all persons employed to do the Work under the Contract Documents perform in a professional manner, provide a high quality of service and Work, and perform in accordance with the Contract Documents.

5.4 Supervision

5.4.1 **Competence and Efficiency.** The Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills, attention and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

5.4.2 **Construction Means, Methods, Techniques, Etc.** The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract. Where the Contract Documents refer to particular construction means, methods, techniques, sequences, or procedures or indicate or imply that such are to be used in the Work, such mention is intended only to indicate that the operations of the Contractor shall be such as to produce at least the quality of Work implied by the operations described. The actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Engineer in writing, prior to implementation, of the actual means, methods, techniques, sequences, or procedures which will be employed on the Work, if these differ from those mentioned in the Contract Documents. All loss, damage, liability or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences, or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences, or procedures are referred to, indicated or implied by the Contract Documents, unless the Contractor has given timely notice to the City and the Engineer in writing that such means, methods, techniques, sequences, or procedures are not safe or suitable, and the City has then instructed the Contractor in writing to proceed at the City's risk.

5.4.3 **Variance between the Contract Documents and Statutes, Ordinances, Codes, Rules, and Regulations.** The Contractor shall promptly notify the Engineer and the City in writing of any variances between the Contract Documents and statutes, ordinances, codes, rules, and regulations. If the Contractor,

without written notice to the Engineer and the City, performs Work knowing that it is contrary to statutes, ordinances, codes, rules, and regulations, the Contractor shall assume full responsibility for such Work and shall bear the costs associated therewith, i.e., replacement, repairs, removal, and fines.

5.4.4 Acts and Omissions. The Contractor shall be responsible to the City for the acts and omissions of all persons performing or supplying the Work. The Contractor shall be as fully responsible to the City for the acts and omissions of the subcontractors, and of persons either directly or indirectly employed by them, as for the acts and omissions of persons directly employed by the Contractor.

5.4.5 Inspections. The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine whether such portions are in proper condition to receive subsequent Work.

5.5 Personnel

5.5.1 Suitability. The Contractor shall provide competent, properly licensed and/or certified, suitably qualified, and reliable personnel to perform the Work required by the Contract Documents. The Contractor shall enforce strict discipline and maintain good order at the site at all times. The Contractor shall not employ any Subcontractor, Supplier, or other person, whether initially or as a substitute, against whom the City may have reasonable objection. Acceptance of any Subcontractor or other person by the City shall not constitute a waiver of any right of the City to reject defective Work.

5.5.2 Sexual Harassment. The City has a policy against sexual harassment. The Contractor, Subcontractors, and all other persons responsible for any portion of the Work are subject to the City's policy. The Contractor shall be responsible for any acts of sexual harassment committed by any persons responsible for any portion of the Work. The Contractor shall take appropriate action against any such individuals. Notwithstanding any remedial action taken by the Contractor, the City reserves the right to enforce its policy.

5.5.3 Weapons and Illegal Drugs. No weapons or illegal drugs are permitted on the Site. It is the responsibility of the Contractor to ensure that no weapons or illegal drugs are brought to the Site.

5.5.4 Maximum Work Day and Work Week. (Reference: M.G.L. c. 149, §§30 and 34). No laborer, worker, mechanic, foreperson or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the Contract, shall be required or permitted to work more than eight (8) hours in any one day or more than forty-eight (48) hours in any one week, or more than six (6) days in any one week, except in cases of emergency.

5.5.5 Lodging. (Reference: M.G.L. c. 149, §25). Every employee under this Contract shall lodge, board and trade where and with whom he or she elects, and neither the Contractor nor its agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

5.5.6 Wage Rates. (Reference: M.G.L. c. 149, §27). Mechanics and apprentices, teamsters, chauffeurs and laborers performing Work shall be paid no less than the minimum rate of wages included in the Project Manual and which are made part of the Contract. They shall continue to be the minimum rate of wages for said employees during the life of the Contract. The Contractor shall keep a legible copy of the wage rates posted in a conspicuous place at the site during the life of the Contract. These rates of wages shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in M.G.L. c. 149, §26; and such payments shall be considered as payments to persons under M.G.L. c. 149, §27 performing work as therein provided. If the Contractor does not make payments

to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in the rates of wages, the Contractor shall pay the amount of said payments directly to each employee engaged in the Work. If the Contractor pays less than the rate of wages, including payments to health and welfare funds and pension funds, or the equivalent payments in wages to any person performing Work within the classifications as determined by the Commissioner of Labor and Industries, and if the Contractor takes or receives for its own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any part or portion of the wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, paid to such person for Work done or service rendered on the Project, the Contractor will be subject to the penalties set forth in M.G.L. c. 149, §27.

5.5.7 Payroll Records of Employees. (Reference: M.G.L. c. 149, §27B). The Contractor and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs, and laborers performing Work showing the name, address and occupational classification of each such employee, the hours worked by and the wages paid to all such employees. The Contractor and the Subcontractors shall submit a copy of said record to the City on a weekly basis.

5.5.7.1 (Reference: M.G.L. c. 149, §27B). The Contractor and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall preserve their payroll records for a period of three (3) years from the date of completion of the Contract.

5.5.7.2 (Reference: M.G.L. c. 149, §27B). The Contractor and all Subcontractors who are subject to M.G.L. c. 149, §§27 and 27A shall furnish to the Commissioner of Labor and Industries and the City within fifteen (15) days after completion of their portion of the Work a statement executed by the Contractor or Subcontractor or by any authorized officer or employee of the Contractor or Subcontractor who supervises the payment of wages in the form found in M.G.L. c.149, §27B.

5.6 Superintendence

5.6.1 Employment of a Superintendent. The Contractor shall employ a competent, properly licensed superintendent, reasonably acceptable to the City, and necessary assistants who shall be in attendance at the Site full time during the progress of the Work until the date of Substantial Completion and for such additional time thereafter as the Engineer or the City may determine to be necessary for the expeditious completion of the Work.

5.6.2 Removal/Replacement of a Superintendent. The Contractor shall remove the superintendent if requested to do so in writing by the City and shall promptly replace such superintendent with a competent person reasonably acceptable to the City. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall not replace the superintendent without written notice to the City and the Engineer.

5.6.3 Registered Professional Engineer or Registered Land Surveyor. The Contractor shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the Engineer, who shall establish the exterior lines and required elevations of all structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated Work such as, but not limited to, roads, utilities, and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries. See also, DWPC Construction Grants Policy Memorandum No. CG-3.

5.6.4 Building Grades, Lines, Etc. The Contractor shall establish the building grades; lines; levels; column, wall and partition lines required by the various Subcontractors in laying out their Work.

5.6.5 Coordination and Supervision. The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the City, every reasonable opportunity for the installation of Work and the storage of materials.

5.6.6 Job Meetings. There shall be job meetings held on a weekly basis, or more often if required by the City. The Contractor shall arrange for and attend weekly job meetings with the Engineer and such other persons as the Engineer may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Engineer. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, Change Orders, time schedules and workforce power. Any notices required under the Contract may be served on such representatives.

5.7 Materials, Labor, Equipment, Etc

5.7.1 Provision of. Unless otherwise provided in the Contract Documents, the Contractor shall furnish and assume full responsibility for all 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 furnishing, performance, testing, start-up, and completion of the Work. It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to protect, execute, complete, and deliver the work within the specified time.

5.7.2 Quality and Use of. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by the Engineer, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

5.7.3 Discrepancies or Defects. If the Contractor is unable to perform its Work because of discrepancies or defects in the work of the City's own forces or of a separate contractor, the Contractor shall immediately notify the Engineer and the City in writing of the conditions that render unable to so perform. Failure to notify the Engineer constitutes an acknowledgment and acceptance of the other work as being fit and proper for integration with the Contractor's Work except for latent or non-apparent defects and deficiencies in the other work.

5.8 Contractor's Management and Financial Statement Requirements (Reference: M.G.L. c. 30, §39R)

5.8.1 The words defined herein shall have the meaning stated below whenever they appear in this Paragraph:

5.8.1.1 "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to M.G.L. c.30. §39M, inclusive.

5.8.1.2 "Contract" means any contract awarded or executed pursuant to M.G.L. c. 30, §39M, which is for an amount or estimate amount that exceed the dollar amount set forth in M.G.L. c. 30, §39R.

5.8.1.3 “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.

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

5.8.1.5 “Audit,” when used in regard to financial statement, 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.

5.8.1.6 “Accountant’s Report,” when used in regard to financial statements, means a document in which an independent certified accountant indicates the scope of the audit which s/he has made and sets forth his/her opinion regarding the financial statements taken as a whole with 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 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.

5.8.1.7 “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.

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

5.8.2 The contractor shall make, and keep for at least six (6) years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

5.8.3 Until the expiration of six (6) years after final payment, the office of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the contractor or of his/her subcontractors that directly pertain to, and involve transactions relating to, the contractor or his/her subcontractors, and

5.8.4 The contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the City, including in his/her 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

5.8.5 The contractor has filed a statement of management on internal accounting controls as set forth below prior to the execution of the contract, and

5.8.6 The contractor has filed prior to the execution of the contract and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth below.

5.8.7 The contractor shall file with the City a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:

5.8.7.1 Transactions are executed in accordance with management's general and specific authorization;

5.8.7.2 Transactions are recorded as necessary

5.8.7.2.1 To permit preparation of financial statements in conformity with generally accepted accounting principles, and

5.8.7.2.2 To maintain accountability for assets;

5.8.7.3 Access to assets is permitted only in accordance with management's general or specific authorization; and

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

5.8.7.5 The contractor shall also file with the City a statement prepared and signed by an independent certified public accountant stating that s/he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

5.8.7.5.1 Whether the representation of management in response to this paragraph and paragraphs 5.8.2 through 5.8.6 above are consistent with the result of management's evaluation of the system of internal accounting controls; and

5.8.7.5.2 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.

5.8.8 The contractor shall annually file with the Commissioner of Capital Planning and Operations during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The 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 City upon request.

5.9 Taxes

The Contractor shall pay all sales, consumer, use, and other similar taxes for the Work or portions thereof which are provided by the Contractor which are legally enacted when bids are received, whether or not yet effective or merely scheduled to go into effect. However, the Contractor shall not pay, and the City shall not reimburse or pay the Contractor for, any sales taxes for building supplies or materials for which an exemption is provided in M.G.L. c. 64H, §6(f). The City's tax exemption number to be used by the Contractor in this regard is E046001383.

5.10 Permits, Licenses, and Fees COMPLIANCE WITH LAW

5.10.1 Unless otherwise provided, the Contractor shall obtain and pay the fees for all permits, licenses, and inspections which are necessary for the proper execution and completion of the Work and which are customarily secured after execution of the Contract and which are legally required. All fees for permits, licenses, and inspections required by any City department shall be waived.

5.11 Notices Required By Statutes, Ordinances, Codes, Rules, Regulations, and Orders of the City

5.11.1 The Contractor shall give notices required by statutes, ordinances, codes, rules, regulations, and orders of the City bearing on performance of the Work.

5.12 Additional Information from Engineer.

5.12.1 The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Article 4.

5.12.2 The Contractor shall give the Engineer timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

5.12.3 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Engineer as provided in the previous Paragraph. If the Contractor proceeds with such Work without obtaining further drawings, Specifications, or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

5.13 "Or equal"

5.13.1 Requirements. (Reference: M.G.L. c. 30, §39M(b)). Where products or materials are specified or described by manufacturer name, trade name, or catalog reference, the words "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the Engineer:

5.13.1.1 It is at least equal in quality, durability, appearance, strength, and design;

5.13.1.2 It performs at least equally the function imposed by the general design for the Work;

5.13.1.3 It conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications.

5.13.2 Net Savings. No proposed substitution will be permitted unless the Contractor certifies that the proposed substitution will yield a net savings to the City and will not extend the Contract Time.

5.13.3 Contractor's Expense. Any structural or mechanical changes made necessary to accommodate substituted equipment under this paragraph shall be at the expense of the Contractor or Subcontractor responsible for the Work item.

5.13.3.1 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the City or the Engineer, unless such substitution was made at the written request or direction of the City or the Engineer.

5.13.3.2 All data to be provided by the Contractor in support of any proposed "or equal" or substitute item will be at the Contractor's expense.

5.13.4 Meeting Requirements. The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Engineer may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports

of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Engineer, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.

5.13.5 Named Manufacturer's Product. In all cases in which a manufacturer's name, trade name, or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall furnish the product of the name manufacturer(s) without substitution, unless a written request for a substitute has been submitted by the Contractor and approved in writing by the Engineer as provided in the following paragraph.

5.13.6 Deviations. If the Contractor proposes to use a material which while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Engineer in writing of the nature of such deviations at the time the material is submitted for approval and shall request written approval of the deviation from the requirements of the Contract Documents.

5.13.7 Rejection of Deviations. In requesting approval of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the Engineer, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Engineer may reject such substitution or deviation without further investigation.

5.13.8 Consistent Character and Quality of Design. The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Engineer shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Engineer will not approve as equal to materials specified proposed substitutes which, in the Engineer's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Engineer, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the City.

5.13.9 Warranty. The warranties provided herein shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

5.13.10 Engineer's Approval. The Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed, or utilized without the Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. The City may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any "or equal" or substitute. The Engineer will record the time required by the Engineer and its consultants in evaluating substitutes proposed or submitted by the Contractor and in making changes in the Contract Documents (or in the provisions of any other direct contract with the City for work on the Project) occasioned thereby. Whether or not the Engineer accepts a substitute item so proposed or submitted by the Contractor, the Contractor shall reimburse the City for the charges of the Engineer and its consultants for evaluating each such proposed substitute item.

5.14 Substitute Construction Methods or Procedures

5.14.1 If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, the Contractor may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to the Engineer. The Contractor shall submit sufficient information to allow the Engineer, in the Engineer's sole discretion, to determine whether the substitute proposed is equivalent to that expressly called for by the Contract Documents.

5.15 Contractor's Progress Schedule

5.15.1 Before Starting Construction. Within ten (10) days after the date of the Notice to Proceed, the Contractor shall submit to the Engineer for review:

5.15.1.1 A preliminary progress schedule indicating the times (number of days or dates) for starting and completing the various stages of the Work;

5.15.1.2 A preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal;

5.15.1.3 A preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Sum and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include and appropriate amount of overhead and profit applicable to each item of Work.

5.15.2 Review of Progress Schedule. At least ten (10) days prior to the commencement of construction, the Engineer, the Contractor, and any other appropriate persons will meet to review and discuss the acceptability to the Engineer of the progress schedule. The Contractor will have an additional ten (10) days to make corrections and adjustments and to complete and resubmit the schedule. No progress payment shall be made to the Contractor until the schedule is submitted to and acceptable to the Engineer as provided below.

5.15.3 Acceptability of Progress Schedule. The progress schedule will be acceptable to the Engineer if, according to the Engineer, it provides an orderly progression of the Work to completion within any specified time frame, but such acceptance will neither impose on the Engineer responsibility for the sequencing, scheduling, or progress of the Work nor interfere with or relieve the Contractor from the Contractor's full responsibility therefor. The Contractor's schedule of Submittals must be acceptable to the Engineer if it provides a workable arrangement for reviewing and processing the required Submittals. The Contractor's schedule of values must be acceptable to the Engineer as to form and substance.

5.15.4 Sepia and Copies. After the Engineer has approved the schedule, the Contractor shall submit to the Engineer one (1) sepia and four (4) copies bearing the Contractor's stamp of approval as a representation to the City that the Contractor has determined or verified all data on that progress schedule and that the Contractor, the Subcontractors and Suppliers have reviewed and coordinated the sequences in that progress schedule with the requirements of the Work.

5.15.5 Adjustment of Schedule. The Contractor shall adhere to the established progress schedule which may be adjusted from time to time as follows: the Contractor shall submit to the Engineer for acceptance proposed adjustments in the progress schedule that will not change the Contract Time. Such adjustments will conform generally to the progress schedule then in effect and will comply with any provisions of the requirements applicable thereto.

5.15.6 During Construction. The Contractor shall submit monthly progress schedules to the Engineer. The schedules shall stay current with the Contractor's approach to the Work remaining.

5.15.7 Schedule of Submittals. The Contractor shall prepare and keep current, for the Engineer's approval, a schedule of Submittals which is coordinated with the Contractor's construction schedule and allows the Engineer reasonable time to review Submittals.

5.16 Project Coordination

5.16.1 In General. The Contractor shall be responsible for the proper coordination of the Work of all of the trades.

5.16.2 Coordination with Subcontractors. The Contractor shall coordinate the work of each Subcontractor with the Work of every other Subcontractor whose Work affects the other.

5.16.3 Coordination with the City's Own Forces or Separate Contractors. The Contractor shall coordinate its operations with those of the City's own forces or separate contractors. The Contractor shall provide the City's own forces and separate contractors a reasonable opportunity for the handling, unloading and storage of their materials and equipment and execution of their work. The Contractor shall connect and coordinate its Work with theirs.

5.16.4 Coordination with Utility Companies. The Contractor shall coordinate its operations with all the appropriate utility companies to assure that the utilities required on the Project are available and functioning properly pursuant to the requirements of the Contract Documents.

5.17 Project Photographs

5.17.1 In General. The Contractor shall take, at its own expense, interior and exterior photographs at the site, from different vantages as directed by the Engineer or the City, before beginning any Work and thereafter on the first work day of each month until final completion of the Work, including final Site photos. The photographs shall be taken by a skilled commercial photographer. The number of photographs required shall be at the discretion of the City or the Engineer.

5.17.2 Prints and Negatives. Within fourteen (14) days after the photographs have been taken, the Contractor shall cause prints to be made and delivered to the City and the Engineer. All photographs shall be 8" x 10". Each print shall state the date of the photograph, the name of the Project, the description of the view and the name and address of the photographer. The City shall receive all the negatives and one glossy print. The Engineer shall receive one glossy print. Photographs shall be suitably mounted and with clear acetate cover with flap for binding. Binders shall be furnished in sufficient number to bind each set of photographs. Each photograph shall have a legible description or title indicating project name, Contractor's name, location of picture, date photograph taken, and sufficient description of subject.

5.17.3 Failure to Comply. Should the Contractor fail to adhere to any requirement set forth in the previous two paragraphs, the City may have the photographs taken at the Contractor's expense or receive a set-off against the Contractor's next application for payment.

5.18 Record Documents and Samples at the Site

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

5.19 Submittals

5.19.1 Purpose. The purpose of Submittals is to demonstrate for those portions of the Work for which Submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

5.19.2 Submittal Procedure. Within 7 days from the Notice to Proceed, the Contractor shall submit to the Engineer a completed Submittals schedule. The Contractor shall review, approve, and submit to the Engineer Submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the City or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action. The schedules shall be updated and resubmitted each month. All Submittals will be identified as the Engineer may require and in the number specified in the General Requirements. The 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 the Engineer the materials and equipment that the Contractor proposes to provide and to enable the Engineer to review the information for the limited purposes stated below.

5.19.3 The Contractor shall submit promptly to the Engineer five copies of shop or setting drawings prepared in accordance with a predetermined schedule. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Engineer with five corrected copies. Regardless of corrections made in or approval given to such drawings by the Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for its conformity to the Contract Drawings and Specifications, unless he notifies the Engineer in writing of any deviations at the time he furnished such drawings.

5.19.4 Shop drawings of all fabricated work shall be submitted to the Engineer for approval and no work shall be fabricated by the Contractor save at its own risk until approval has been given.

5.19.5 **Contractor's Representations.** By approving and providing Submittals, the **Contractor** thereby represents that the **Contractor** has determined and verified all dimensions, quantities, field dimensions, relations to existing Work, coordination with Work to be installed later, coordination with information on previously accepted Submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the **Contractor**. In reviewing Submittals, the **Engineer** shall be entitled to rely upon the **Contractor's** representation that such information is correct and accurate

5.19.6 All shop drawings submitted must bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmission. If the shop drawings show variations from the requirements of the Contract Documents because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in its letter of transmittal in order that if acceptable, suitable action may be taken for proper adjustment; otherwise, the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract Documents even though such shop drawings have been approved.

5.19.7 Where shop drawings submitted by the Contractor indicate a departure from the Contract which the Engineer deems to be a minor adjustment in its interest and not involving a change in the Contract price or extension of time, the Engineer may approve the drawings, but the approval will contain in substance the following:

5.19.7.1 The modification shown on the attached drawings is approved in the interest of the City to effect an improvement for the project, and is ordered with the understanding that it does not involve any change in the Contract price or time; that it is subject generally to all Contract stipulations and covenants; and that it is without prejudice to any and all rights of the City under the Contract and Bond or Bonds; and

5.19.7.2 The approval of shop drawings will be general, and shall not relieve the Contractor from the responsibility for adherence to the Contract, nor shall it relieve the Contractor of the responsibility for any error, which may exist.

5.19.8 The Contractor agrees to hold the Engineer and the City harmless, and defend them against damages or claims for damage arising out of injury to others or property of third persons which result from errors on shop, working or setting drawings, whether or not the same have been approved by the Engineer, and/or the City.

5.19.9 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS: The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the Contract. The additional drawings and instructions thus supplied to the Contractor will be coordinated with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Owner will prepare jointly (a) a schedule fixing the dates at which special detail drawings will be required; such drawings, if any, to be furnished by the Owner in accordance with said schedule, and (b) a schedule fixing the respective dates for the submission of the work. Each such schedule shall be subject to change from time to time in accordance with the progress of the work.

5.19.10 Samples. The Contractor shall also submit Samples to the Engineer for review and approval in accordance with said accepted schedule of Submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which it is intended and otherwise as the Engineer may require to enable the Engineer to review the Submittal for the limited purposes stated below. The numbers of each Sample to be submitted will be as specified in the Specifications. Unless otherwise specified in the Specifications, three (3) specimens of each Sample shall be submitted.

5.19.10.1 The Samples shall be of sufficient size to permit proper evaluation of material. Where variations in color or other characteristics are to be expected, samples showing the minimum range of variation shall be submitted. Materials exceeding the range of variation of the approved Samples will not be approved on the Work.

5.19.10.2 All costs associated with delivery of Samples will be paid by the Contractor.

5.19.11 Contractor's Verifications. Before submitting each Submittal, the Contractor shall have determined and verified:

5.19.11.1 All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

5.19.11.2 All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

5.19.11.3 All information relative to the Contractor's sole responsibilities in respect of means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto.

5.19.12 Contractor's Representations. By approving and providing Submittals, the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions,

relations to existing Work, coordination with Work to be installed later, coordination with information on previously accepted Submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Submittals, the Engineer shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

5.19.13 Coordination. The Contractor shall also have reviewed and coordinated each Submittal with other Submittals and with the requirements of the Work and the Contract Documents.

Stamp or Specific Written Indication. Each Submittal will bear a stamp or specific written indication that the Contractor has satisfied the Contractor's obligations under the Contract Documents with respect to the Contractor's review and approval of that Submittal.

5.19.14 Written Notice of Variations. At the time of each Submittal, the Contractor shall give the Engineer specific written notice of such variations, if any, that the Submittal may have from the requirements of the Contract Documents. Such notice is to be in a written communication separate from the Submittal. Moreover, the Contractor shall make a specific notation on each Submittal to the Engineer for review and approval of each such variation.

5.19.15 Review and Approval by the Engineer. The Contractor shall perform no portion of the Work requiring a Submittal until the respective Submittal has been approved by the Engineer. Such Work shall be in accordance with approved Submittals.

5.19.16 The Engineer will review and approve Submittals in accordance with the schedule of Submittals accepted by the Engineer as required above. The 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 in the Contract Documents. The Engineer's review and approval will not extend to means, method, technique, sequences, or procedures of construction (except where a particular means, method, technique, sequences or procedures 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.

5.19.17 Deviations. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Engineer's approval of Submittals unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of Submittal and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Submittals by the Engineer's approval thereof.

5.19.18 Revisions. The Contractor shall make corrections required by the Engineer and shall return the required number of corrected copies of Submittals and submit as required new Submittals for review and approval. The Contractor shall direct specific attention, in writing or on resubmitted Submittals, to revisions other than those requested by the Engineer on previous Submittals. Unless such written notice has been given, the Engineer's approval of a resubmitted Submittal shall not constitute approval of any changes not requested on the prior Submittal.

5.19.19 Related Work. Where a Submittal is required by the Contract Documents or the schedule of Submittals accepted by the Engineer, any related Work performed prior to the Engineer's review and approval of the pertinent Submittal will be at the sole expense and responsibility of the Contractor.

5.19.20 Informational Submittals. Informational Submittals upon which the Engineer is not expected to take responsive action may be so identified in the Contract Documents.

5.19.21 Certification. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the City shall be entitled to rely upon such certifications, and neither the City nor the Engineer shall be expected to make any independent examination with respect thereto.

5.20 Continuing the Work

5.20.1 The Contractor shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with the City. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as otherwise provided herein or as the City and the Contractor may agree in writing.

5.20.2 Any work necessary to be performed after regular working hours on Saturdays, Sundays, or legal holidays, shall be performed by the Contractor without additional expense to the City.

5.21 Use of Site; Access to Work

5.21.1 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times in the City. The Contractor's right to entry and use thereof arises solely from the permission granted by the City under the Contract Documents. The Contractor shall confine the Contractor's apparatus, the storage of materials, and the operations of the Contractor's workers to limits indicated by law, ordinance, the Contract Documents and permits and/or directions of the Engineer and shall not unreasonably encumber the premises with the Contractor's materials. The City shall not be liable to the Contractor, the Subcontractors, Suppliers, or anyone else with respect to the conditions of the premises, except for a condition caused directly and solely by the negligence of the City.

5.21.2 At all times, the City and the Engineer shall have access to the Work.

5.22 Protection of Persons and Property

5.22.1 In General. The Contractor shall be responsible for initiating, maintaining, and supervising all health and safety precautions and programs in connection with the performance of the Contract. The Contractor is responsible for the implementation of all Federal, State, and local health and safety requirements.

5.22.2 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

5.22.2.1 Employees on the site and other persons who may be affected thereby;

5.22.2.2 The Work, materials, and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor, Subcontractors, or Sub-subcontractors;

5.22.2.3 Other property at the site or adjacent or in close proximity thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and

5.22.2.4 Any other property of the City, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the Contractor has access.

5.22.3 Notices and Compliance. The Contractor shall give notices and comply in all other respects with applicable laws, ordinances, rules, regulations, codes, and lawful orders of public authorities bearing on the

safety of persons or property or their protection from damage, injury, or loss. The Contractor shall notify owners of adjacent and nearby properties of underground facilities and 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.

5.22.4 Erection and Maintenance of Safeguards. The Contractor shall erect and maintain, as required by existing conditions and the terms of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent and nearby sites and utilities.

5.22.5 Hazardous Materials and Equipment. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under the supervision of properly qualified personnel.

5.22.6 Damage to Property. The Contractor shall promptly remedy damage and loss to property referred to above. If the damage or loss is due in whole or in part to the Contractor's failure to take the precautions required herein, the Contractor shall bear the cost, subject to any reimbursement to which the Contractor is entitled under property insurance required by the Contract Documents. The Contractor shall be fully and solely responsible for all Work and other operations carried out on adjacent properties. The insurance required under Article 8 shall cover such Work or operations, and the Contractor shall indemnify and defend the City, the Engineer, and the owners of such adjacent or nearby properties from and against all claims, suits, losses, or costs arising out of such Work or operations.

5.22.7 Fire Protection Equipment and Services. The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean and all combustible rubbish shall be promptly removed from the site.

5.22.8 Protection of Excavations, Trenches, Etc. The Contractor shall at all times protect excavations, trenches, buildings and materials from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping, and other equipment necessary to this end.

5.22.9 Snow and Ice Removal. The Contractor shall remove snow and ice which might result in damage or delay.

5.22.10 Safety Representative. The 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.

5.22.11 Weather Protection. (Reference: M.G.L. c. 149, §44F(1)). The Contractor shall install weather protection and furnish adequate heat in the protected area from November 1 through March 31. If in the opinion of the City any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any subcontractors so to protect their work, or otherwise damaged by the negligence of the Contractor, subcontractors, or their agents or servants, or is otherwise defective, such materials shall be removed and replaced at the expense of the Contractor.

5.22.12 Security. The Contractor shall provide, within the Contract Sum, a sufficient number of security personnel at the Site at all times when the Contractor's personnel are not present, from commencement of the Work until Substantial Completion to assure that the Site, the facility, and the Work, and all materials and equipment stored at the Site are fully and completely protected against loss or damage due to vandalism,

theft, or malicious mischief. If the Contractor elects, in addition, to use guard dogs for this purpose, each dog shall at all times be accompanied by an adult handler. If the Contractor fails to comply with the requirements of this paragraph, then the City may provide appropriate security and charge the cost thereof to the Contractor. The City's provision of such security, or failure to do so, shall not relieve the Contractor of its responsibility to pay for loss or damage due to vandalism, theft, or malicious mischief at the Site.

5.22.13 Hazard Communication Programs. The Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communications information required to be made available to or exchanged between or among employers at the site in accordance with laws, codes and regulations.

5.22.14 Noise Pollution Control. The Contractor shall comply with all applicable provisions of Cambridge Municipal Code Chapter 8.16.

5.22.15 Reporting. The Contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the City or its designated representatives in writing for information purposes only. This shall not relieve the Contractor or all subcontractors from mandatory reporting requirements, or any other requirements under the Occupational Safety and Health Act of 1970.

5.22.16 Regulations. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (Industrial Bulletin No. 12)." Contractors shall be familiar with the requirements of these regulations, and MUCTD and ADA safety requirements.

5.23 Cutting and Patching

5.23.1 In General. Unless otherwise provided in the Contract Documents, the Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, including the work of the City or of separate contractors.

5.23.2 Damage to Work of City or of Separate Contractor. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the City or separate contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the City or a separate contractor except with prior written consent of the City and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the City or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

5.23.3 Damage Caused by Contractor. Should the Contractor cause damage to the work or property of any separate contractor at the Site, or should any claim arising out of the Contractor's performance of Work at the Site be made by any separate contractor against the Contractor, the City, the Engineer, or any of the Engineer's consultants, the Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. The Contractor shall, to the fullest extent permitted by laws and regulations, indemnify and hold harmless the City, the Engineer, and the Engineer's consultants from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, Engineers, attorneys and other professionals, and court and arbitration or mediation costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate contractor against the City, the Engineer, or any of the Engineer's consultants, to the extent based on a claim arising out of the Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of the Contractor or should the performance of work by any separate contractor at the site give rise to any other claim, the Contractor shall not institute any action, legal or

equitable, against the City, the Engineer, or any of the Engineer's consultants, or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from the City, the Engineer, or any of the Engineer's consultants, on account of any such damage or claim. If the Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and the City and the Contractor are unable to agree as to the extent of any adjustment in the Contract Time attributable thereto, the Contractor may make a claim for an extension of time in accordance with Article 16. An extension of the Contract Time shall be the Contractor's exclusive remedy with respect to the City, the Engineer, and the Engineer's consultants, for any delay, disruption, interference, or hindrance caused by any separate contractor.

5.24 Cleaning Up

5.24.1 During the progress of the Work, the Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract or other debris. At the completion of the Work, the Contractor shall remove from and about the Project all waste materials, rubbish, debris, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall leave the site clean and ready for use by the City at Substantial Completion of the Work. Immediately prior to the Engineer's inspection for Substantial Completion, the Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense. The Contractor shall restore to original condition all property not designated for alteration by the Contract Documents.

5.24.2 If the Contractor fails to clean up as provided herein, the City may do so and charge the cost thereof to the Contractor.

5.25 Royalties and Patents

5.25.1 The 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. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the City and the Engineer from and against all claims, costs, losses, and damages arising out of or resulting from 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. The Contractor shall hold and save the Engineer, the City, and their officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for or on account of any patented or un-patented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the City.

5.26 Contractor's Obligation to Perform

5.26.1 The Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of the Contractor's obligation to perform the Work in accordance with the Contract Documents:

5.26.1.1 Observations by the Engineer;

5.26.1.2 Recommendation of any progress or final payment by the Engineer;

5.26.1.3 The issuance of a certificate of Substantial Completion or any payment by the City to the Contractor under the Contract Documents;

5.26.1.4 Use or occupancy of the Work, Project, or Site, or any part thereof, by the City;

5.26.1.5 Any acceptance by the City or any failure to do so;

5.26.1.6 Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptance by the Engineer;

5.26.1.7 Any inspection, test, or approval by others; or

5.26.1.8 Any correction of defective Work by the City.

5.27 Indemnification and Covenant Not To Sue

5.27.1 To the fullest extent permitted by law, the Contractor shall assume the defense of, indemnify and hold harmless the City, the Engineer, the Engineer's consultants and agents and employees of any of them from and against claims, damages, losses, and expenses, including, but not limited, to attorneys' fee, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom caused in whole or in part by alleged negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party or person described in this paragraph.

5.27.2 In claims against any person or entity indemnified under the foregoing paragraph by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under the foregoing paragraph shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under Workers' Compensation laws, disability benefit acts or other employee benefit acts.

5.27.3 The obligations of the Contractor in this Article shall not extend to the liability of the Engineer, the Engineer's consultants, and agents or employees of any of them arising out of (1) the preparation of maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications, or (2) directions or instructions given by the Engineer, the Engineer's consultants and agents or employees of any of them, provided such instructions or directions are the primary cause of the injury or damage.

5.27.4 The Contractor, or any successor, assign, or subrogate of the Contractor agrees not to bring any civil suit, action, or other proceeding in law, equity or arbitration against the Engineer, or the officers, employees, agents, or consultants of the Engineer, for the enforcement of any action which the Contractor may have arising out of or in any manner connected with the Work. The Contractor shall assure that this covenant not to sue is contained in all subcontracts and sub-subcontracts of every tier and shall assure its enforcement. The Engineer, its officers, employees, agents, and consultants are intended third-party beneficiaries of this covenant not to sue, and are entitled to enforce this covenant in law or equity.

5.28 Survival of Obligations

5.28.1 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 and termination or completion of the Contract.

5.29 Representations of Contractor

5.29.1 That the Contractor is financially solvent and that he is experienced and competent to perform the type of work or furnish the plant, material, supplies, or equipment to be performed or furnished by the Contractor; and

5.29.2 That the Contractor is familiar with all Federal, State, municipal, and department laws, O.S.H.A., safety, MUTCD, ADA, and confined space regulation, ordinances, orders, and other regulations which may in any way affect the work of those employed therein, including but not limited to any special acts relating to the work or to the project of which it is a part; and

5.29.3 That such temporary and permanent work required by the Contract Documents to be done by the Contractor can be satisfactorily constructed and used for the purpose for which it is intended, and that such construction will not injure any person or damage any property; and

5.29.4 That the Contractor has carefully examined the Drawings, Specifications, and Addendum (or Addenda) if any, and the site of the work, and that from the Contractor's own investigations is satisfied as to the nature and location of the work, the character, quality and quantity of surface and subsurface materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may in any way affect the work or its performance; and

5.29.5 That the Contractor is aware of the hazards involved in the work and the danger to life and property both evident and inherent, and that the work shall be conducted in a careful and safe manner without injury to persons or property.

ARTICLE 6 SUBCONTRACTORS

6.1 Use of Subcontractors

6.1.1 The Contractor shall use the Subcontractors named in the Contractor's Bid.

6.1.2 The Contractor may utilize the services of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

6.2 Substitution of Subcontractors

6.2.1 The Contractor shall not substitute another Subcontractor therefor without notice to the City and the City's prior written consent of such substitution.

6.3 Names of Subcontractors

6.3.1 Upon execution of the Contract with the City, the Contractor shall provide in writing to the City, through the Engineer, the names, addresses, telephone numbers, and fax numbers of all persons proposed for each principal portion of the Work.

6.4 Objections to Subcontractors

6.4.1 The Contractor shall not use any Subcontractor against whom the City has a reasonable objection. The Contractor shall not be required to contract with any person or entity against whom it has a reasonable objection.

6.5 Form of the Subcontract

6.5.1 All Work performed by a Subcontractor shall be through an appropriate subcontract. The form of subcontract shall be submitted to the Purchasing Agent for her approval, which shall not be unreasonably withheld or delayed.

6.5.2 Appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the Contract and General Conditions, and other Contract Documents insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontract that the City may exercise over the Contractor under any provision of the Contract Documents.

6.5.3 Nothing contained in this Contract shall create any contractual relation between any subcontractor and the City.

6.6 Content of the Subcontract

6.6.1 In addition to all statutorily mandated provisions and provisions required elsewhere in the Contract Documents, each subcontract shall expressly provide that:

6.6.1.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the City provided that:

6.6.1.1.1 The assignment is effective only after termination of the Contract by the City or the Contractor and only for those subcontract agreements which the City accepts by notifying the Subcontractor in writing; and

6.6.1.1.2 The assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

6.6.1.2 Each Subcontractor is bound by the requirements of the Contract Documents for the express benefit of the City.

6.6.1.3 Each Subcontractor shall assume toward the Contractor all the obligations which the Contractor assumes toward the City and the Engineer, unless otherwise provided by law.

ARTICLE 7 PERFORMANCE AND PAYMENT BONDS

7.1 Form of Bonds

7.1.1 The performance and labor and material or payment bonds shall be in the form required by the City, copies of which are included in the Project Manual. The City reserves the right to reject any bond which does not conform to the City's requirements.

7.2 Furnished by the Contractor

7.2.1 (Reference: M.G.L. c. 30, §39M(c), M.G.L. c. 149, §29). The Contractor shall furnish a performance bond and a labor and materials or payment bond, each with a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the City and each in the sum of the Contract Sum, the premiums for which are to be paid by the Contractor and are included in the Contract Sum. The bonds shall remain in effect until final payment is made. The sum of the performance bond shall increase each time the Contract Sum is increased as a result of a Change Order.

7.2.2 The Contractor shall furnish Surety Bonds (in SEXTUPLICATE) each in an amount equal to at least one hundred (100%) percent of the Contract price as security for the faithful performance of this Contract, and for the payment of all persons performing labor on the project under this Contract and furnishing materials, equipment, and all other incidentals in connection with this Contract. The Surety on such Bond shall be a duly authorized surety company satisfactory to the Owner, and the cost of same shall be paid by the Contractor. Before final acceptance, the Bonds must be approved by the City.

7.3 Submission to the City

7.3.1 The Contractor must submit the performance bond and labor and materials or payment bond to the City upon the Contractor's execution of the Agreement.

7.3.2 If at any time the City for justifiable cause shall be or become dissatisfied with the Surety or Sureties for the Performance and/or Payment Bonds, the Contractor shall within five (5) days after notice from the City to do so, substitute an acceptable bond (or bonds) in such form and sum, and signed by such other Surety or Sureties as may be satisfactory to the City. The premiums on such bond shall be paid by the Contractor. No further payments will be deemed due nor will be made until the new Surety or Sureties shall have furnished such an acceptable bond to the City.

ARTICLE 8 INSURANCE REQUIREMENTS

8.1 Worker's Compensation

8.1.1 (Reference: M.G.L. c. 149, §34A). Before commencing performance of the Contract, the Contractor shall provide by insurance for the payment of compensation and the furnishing of other benefits under M.G.L. c. 152 to all persons to be employed under the Contract, and the Contractor shall continue such insurance in full force and effect during the term of the Contract. Sufficient proof of compliance with this paragraph must be furnished at the time of execution of this Contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the Contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the City at least fifteen (15) days prior to the intended effective date thereof, which date shall be expressed in said notice.

8.2 Additional Insured

8.2.1 Each policy must list the City as an additional insured.

8.3 Insurance Rating

8.3.1 Any insurance carrier utilized to fulfill the insurance requirements of this Contract shall have a minimum A.M. Best rating of A-X.

8.4 Premiums

8.4.1 The Contractor must provide the required insurance at its own expense.

8.5 Notice of Occurrence

8.5.1 Notice of occurrence shall be given to the City Manager, City of Cambridge, City Hall, 795 Massachusetts Avenue, Cambridge, MA 02139 and, at the option of the Contractor, any other City official permitted by law to receive notice.

8.6 Waiver of Subrogation

8.6.1 The Contractor and all Subcontractors waive subrogation rights against the City for all losses.

8.7 Coverage Period

8.7.1 Each insurance policy must cover the entire contract period.

8.8 Policies and Limits

8.8.1 The insurance required shall include all major division of coverage and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), City's Protective (as a separate policy), Products and Completed Operations, and Owned, Non-owned, Leased, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or the following limits, whichever are greater:

Owner's Protective Liability (as a separate policy)	
Each Occurrence	\$1 Million
Aggregate	\$2 Million
Commercial Liability	
General Aggregate - per project	\$2 Million
Products Completed Operations	
Aggregate – per project	\$1 Million
Personal Injury and Advertising Limit	\$1 Million
Each Occurrence	\$1 Million

This policy shall include contractual liability coverage insuring the contractor's indemnity obligations under this Contract. The contractual and completed operations coverage shall be maintained on the City's and Indemnitees' behalf for a period of two (2) years after final completion and acceptance by City. If the Work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

This policy shall include City and any other party at interest requested by City as an additional insured with endorsements equivalent to ISO CG 20 10 for ongoing operations and to ISO CG 20 37 for completed operations. This policy shall be primary and non-contributory with respect to any other insurance available to an additional insured. The policy shall include endorsement equivalent to ISO CG 24 04, a Waiver of Subrogation in favor of City. The policy shall include endorsement CG 24 10, Coverage for injury to leased workers.

Railroad Protective Liability (if required by an abutter, permittee or other)

Each Occurrence	\$2 Million
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Aggregate		\$6 Million
Automotive-for all owned, non-owned, hired and leased vehicles		
Combined single limit		\$1 Million
or		
Bodily injury	- each person	\$100,000
	- each accident	\$1 Million
Property damage-each occurrence		\$1 Million

If hauling contaminants and/or pollutants, the policy shall include a CA 99 48 Broadened Pollution Endorsement. must adhere to Sections 29 and 30 of the Motor Carrier Act of 1980, which shall contain coverage Form MCS-90. The policy shall name City as an additional insured. The policy shall contain a Waiver of Subrogation in favor of City.

Builder's Risk/Installation Floater (Value of the Contract)

The **Contractor** shall be required to purchase, maintain and furnish evidence satisfactory to the **City** property insurance generally described as Builders' Risk Insurance with an "all risk" type installation floater covering loss by fire and standard extended coverage in the completed value form in the amount of the total value of structures, materials, and equipment to be built and installed under the Contract on a replacement cost basis.

This provision, with respect to Builders' Risk Insurance, shall in no way relieve the **Contractor** of his obligation of completing the Work covered by the Contract.

Contractor Pollution Liability		
Combined single limit- per occurrence		\$1 Million
Annual aggregate		\$3 Million

8.9 Excess Liability Insurance

8.9.1 The Contractor may purchase and maintain excess liability insurance in the umbrella form in order to satisfy the limits of liability required for the insurance to be purchased and maintained in accordance with the requirements set forth above. Any such amounts must be in addition to the umbrella limits required, must list all underlying policies, and must list the City as an additional insured. Evidence of such excess liability shall be delivered to the City in the same form and manner as the required insurance policies.

8.10 Amendment of Insurance Requirements

8.10.1 The City reserves the right, at its sole discretion, to amend the insurance requirements contained herein.

8.11 Occurrence Basis

8.11.1 All insurance shall be written on an occurrence basis, unless the City approves in writing coverage on a claims-made basis. Coverages whether written on an occurrence or a claims-made basis shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment.

8.12 Certificates of Insurance

8.12.1 Certificates of Insurance acceptable to the City and confirming the insurance coverage required herein are attached to the Contract. The City shall have no obligation to execute the Contract and may award the Contract to the next lowest responsible and responsive bidder, if such insurance certificates have not been provided to the City within five (5) business days after presentation of the Contract to the Contractor for execution.

8.13 Endorsements

8.13.1 The Contractor shall furnish to the City copies of any endorsements that are subsequently issued amending limits of coverage.

8.14 Property Insurance

8.14.1 The City does not intend to purchase property insurance covering the Project or the Work. The Contractor shall not be required to provide such insurance, but the Contractor may, if it so desires, procure property insurance which will protect the interests of the Contractor, Subcontractor and Sub-subcontractors in the Work. The Contractor understands that such property insurance is solely the Contractor's responsibility, and the Contractor, its Subcontractors and Sub-subcontractors shall have no claim against the City on account of the City's failure to provide such property insurance. The Contractor shall promptly replace all damaged Work in which it or its Subcontractors and Sub-subcontractors have an insurable interest, and all Work which is stolen, vandalized, or damaged due to the Contractor's failure to protect the site as required by Article 5, at no additional cost to the City, whether or not the Contractor procures property insurance with respect to such Work as hereinabove provided.

ARTICLE 9 TESTS AND INSPECTIONS

9.1 Access

9.1.1 The City, the Engineer, and all other persons designated by the City shall have access to the Work at reasonable times for observing, inspecting, and testing. The Contractor shall provide them with proper and safe conditions for such access and advise them of the Contractor's site safety procedures and programs so that they may comply therewith as applicable.

9.2 Tests and Inspections

9.2.1 The Contractor shall give the 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.

9.2.2 Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the City, or with the appropriate public authority and shall bear all related costs of tests, inspections, and approvals. If the 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, the Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith and furnish the Engineer with the required certificates of inspection, testing, or approval.

9.2.3 The Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the Engineer's acceptance of materials or

equipment to be incorporated into the Work, or of materials, mix designs, or equipment submitted for approval prior to the Contractor's purchase thereof for incorporation into the Work.

9.2.4 If any Work that is to be inspected, tested, or approved is covered by the Contractor, Subcontractor, or Sub-subcontractor without the prior written consent of the Engineer, it must be uncovered for observation, inspection, testing, or approval, if requested by the Engineer. The Contractor must recover the Work at its own expense.

9.2.5 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Engineer in the Engineer's administration of the Contract or by tests, inspections, or approvals required or performed by persons other than the Contractor.

9.2.6 All materials and workmanship shall be subject to inspection, examination, and test by the City at any and all times during manufacture and/or construction, and at any and all places where such manufacture and/or construction are carried on to establish conformance with these Specifications and suitability for uses intended. The Contractor shall furnish promptly all reasonable facilities, labor and materials necessary to make tests so required safe and convenient; he shall also furnish evidence of conformance to any mill, factory, or such other tests based on the Standards and Tentative Standards of the American Society for Testing and Materials, or other national standards as required by the City.

ARTICLE 10 UNCOVERING AND CORRECTING WORK

10.1 Uncovering Work

10.1.1 If a portion of the Work is covered contrary to the Engineer's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Engineer, be uncovered for the Engineer's observation and be replaced, both at the Contractor's expense and without change in the Contract Time.

10.1.2 If a portion of the Work has been covered which the Engineer has not specifically requested to observe prior to its being covered, the Engineer may request to see such Work, and it shall be uncovered by the Contractor. If it is found that such Work is in accordance with the Contract Documents, costs of uncovering and replacing shall, by appropriate Change Order, be charged to the City. If it is found that such Work is defective or not in accordance with the Contract Documents, the Contractor shall pay all claims, costs, losses, and damages caused by, arising out of or resulting from 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 the City shall be entitled to an appropriate decrease in the Contract Sum. The City may take such decrease by reducing the then current application for payment accordingly or subsequent applications, if necessary, until the decrease is paid in full.

10.2 Correcting Work

10.2.1 The Contractor shall promptly correct Work rejected by the Engineer or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work including additional testing and inspections and compensation for the Engineer's services and expenses made necessary thereby and any cost, loss, or damages to the City resulting from such failure or defect.

10.2.2 If, within one (1) year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established in Article 15, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the City to do so, unless the City has previously given the Contractor a written acceptance of such condition. This period of one (1) year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation to correct under this paragraph shall survive acceptance of the Work under the Contract and termination of the Contract. The City shall give such notice promptly after discovery of the condition.

10.2.3 The Contractor shall correct, remove, or replace portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the City.

10.2.4 If the Contractor fails within a reasonable time to correct nonconforming Work, or to remove and replace rejected Work, or fails to perform the Work in accordance with the Contract Documents, the City may correct it in accordance with the provisions herein. If the Contractor does not proceed with correction, removal, or replacement of such nonconforming Work within seven (7) days from the date of written notice from the Engineer, the City may correct it and store any salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of any such removal and storage within ten (10) days after written notice, the City may upon ten (10) additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Engineer's services and expenses made necessary thereby. If such proceeds of sale do not cover all the costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the City.

10.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the City or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

10.2.6 Nothing contained in this paragraph shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one (1) year as described in the above paragraph related only to the specific obligation of the Contractor to correct the Work and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

10.2.7 All work and all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be at all times and places subject to the inspection of the Engineer who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture, and methods of construction for the purposes for which they are used. Should they fail to meet the Engineer approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at the Contractor's expense. Rejected material shall immediately be removed from the site. If in the opinion of the Engineer it is undesirable to replace any defective or damaged materials, or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as in the judgment of the Engineer shall be equitable.

10.3 Acceptance of Nonconforming Work

10.3.1 If, instead of requiring correction or removal and replacement of defective or nonconforming Work, the City prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the City may do so instead of requiring its removal and correction, in which case the Contractor shall pay all claims, costs, losses, and damages attributable to the City's evaluation of and determination to accept such defective or nonconforming Work. The Contract Sum will be reduced as appropriate. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 11 CHANGES IN THE WORK

11.1 In General

11.1.1 The Contract Sum constitutes the total compensation (subject to authorized adjustments) payable to the Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the Contractor shall be at the Contractor's expense without any change in the Contract Sum.

11.1.2 Without invalidating the Contract and without notice to any surety, the City may, at any time or from time to time, order additions to, deletions from, or revisions in the Work. Such additions, deletions, or revisions will be authorized by a Change Order, a Modification or a Work Change Directive. Upon receipt of any such document, the 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).

11.1.3 The Contractor shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified, or supplemented, except as otherwise provided herein.

11.2 Change Orders

11.2.1 (Reference: M.G.L. c. 30, §39I). The Contractor shall perform all the Work required by this Contract in conformity with the Drawings and Specifications contained herein. No willful and substantial deviation from said Drawings and Specifications shall be made unless authorized in writing by the Engineer and the City in charge of the Work who is duly authorized by the City to approve such deviations. In order to avoid delays in the prosecution of the Work required by such Contract, such deviation from the Drawings or Specifications may be authorized by a written order of the City or the Engineer so authorized to approve such deviation. Within thirty (30) days thereafter, such written order shall be confirmed by a certificate of the City 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 City and the Contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the City.

11.3 Work Change Directive

11.3.1 A Work Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

11.3.2 Upon request of the City or the Engineer, the Contractor shall without cost to the City submit to the Engineer in such form as the Engineer may require, an accurate written estimate of the cost of any

proposed extra work or change. The estimate shall indicate the quantity and unit cost of each item of materials, and the number of hours of work and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of materials shall be shown if required by the Engineer. If required by the Engineer, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Engineer bona fide proposals from recognized Suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense.

11.3.3 The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra Work is ordered. The Contractor shall document, through a critical path analysis, or some other clearly delineated explanation, how the proposed change affects other aspects of the Work, and why it would require an extension of time. The Contractor shall promptly revise and resubmit such estimate if the Engineer determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors.

11.3.4 If the Work Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods, as selected by the City, selection of which does not require the consent of the Contractor:

11.3.4.1 By unit prices stated in the Contract Documents or otherwise mutually agreed upon.

11.3.4.2 By Cost and Percentages estimated by the Contractor as provided herein and accepted by the City; the Contractor's estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change.

11.3.4.3 By actual Cost determined after the Work covered by the change is completed, plus Percentage.

11.3.4.4 By submission to arbitration or a court, which shall determine the fair value of the Work covered by the change.

11.3.5 As used in this paragraph, "Cost" shall mean the estimated or actual net increase or decrease in cost to the Contractor, Subcontractor, or Sub-subcontractor for performing the Work covered by the change, including actual payments for materials, equipment rentals, expendable items, wages, and associated benefits to the workers and to supervisors employed full time at the Site, insurance, bonds, and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of supervisory personnel not assigned full time to the Site, or any amount for profit or fee to the Contractor, Subcontractor, or Sub-subcontractor.

11.3.6 "Percentage" shall mean an allowance to be added to or subtracted from the Cost in lieu of overhead and profit and of any other expense which is not included in the Cost of the Work covered by the change, as defined above. Percentage for a Sub-subcontractor shall be 8% of any net increase or decrease of Cost of any Work performed by the Sub-subcontractor's own forces plus 4% of any net increase or decrease in Cost of any Work performed for the Sub-subcontractor by lower tier Sub-subcontractors. Percentage for a Subcontractor shall be 12% of any net increase or decrease of Cost of any Work performed by the Subcontractor's own forces plus 4% of the Cost of Work performed by Sub-subcontractors. Percentage for the Contractor shall be 20% of any net increase or decrease of Cost of any Work performed by the Contractor's own forces. When the Contractor is also performing Work as a Subcontractor or Sub-subcontractor, the Contractor shall only be entitled to a total of no more than 20% of any net increase or decrease of Cost of any Work.

11.3.7 When in the reasonable judgment of the Engineer a series of Work Change Directives or Change Orders effect a single change, Percentage shall be calculated on the cumulative net increase or decrease in Cost, if any.

11.3.8 If unit prices are stated in the Contract Documents or are subsequently agreed upon, and if quantities originally contemplated are so changed in a Proposed Change Order or Work Change Directive that the application of such unit prices to quantities of Work proposed will cause substantial inequity to the City or the Contractor, the applicable unit prices shall be equitably adjusted.

11.3.9 If the City elects to determine the Cost of the Work as provided in paragraph 11.3.4.1 using unit prices stated in the Contract Documents or subsequently agreed upon, the unit prices shall be subject to the prior paragraph. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the City's option to require the Cost of any given change to be determined by one of the other methods stated in 11.3.4. If the City elected to determine the Cost of the change by unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent Work, the Contractor shall keep daily records, available at all times to the Engineer for inspection, of the actual quantities of such Work put in place, and delivery receipts or other adequate evidence, acceptable to the Engineer, indicating the quantities of materials delivered to the Site for use in such unit price Work, and distinguishing such from other similar material delivered for use in Work included in the base Contract Sum. If so required by the Engineer, materials for use in unit price Work shall be stored apart from all other materials on the Project.

11.3.10 If the City elects to determine the Cost of the Work as provided in methods 11.3.4.3. or 11.3.4.4. or if the method of determining the Cost has not been established before the Work is begun, the Contractor shall keep detailed daily records of labor and material costs applicable to the Work.

11.3.11 Upon receipt of a Work Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Engineer in writing of the Contractor's agreement or disagreement with the method, if any, provided in the Work Change Directive for determining the proposed adjustment in the Contract Time.

11.3.12 A Work Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in the Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

11.3.13 If the Engineer and the Contractor do not agree with the adjustment in the Contract Time or the method for determining it, the adjustment or the method shall be referred to the Engineer for determination.

11.4 Minor Changes in the Work

11.4.1 The Engineer has the authority to order minor changes in the Work. "Minor changes" as used in this paragraph mean changes which are so insignificant as to not affect the Contract Sum or the Contract Time and which are not inconsistent with the intent of the Contract Documents. Any minor change shall be committed to a written order which shall be binding on both the City and the Contractor and which shall be promptly carried out by the Contractor.

11.5 Certificate of Appropriations

11.5.1 (Reference: M.G.L. c. 44, §31C). This Contract shall not be deemed to have been made until the City's auditor has certified thereon that an appropriation in the amount of this Contract is available therefor and that an officer or agent of the City has been authorized to execute said Contract and approve all requisitions and change orders. No order to the Contractor for a change in or addition to the Work, whether

in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase to the Contract price, shall be deemed to be given until the auditor has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be construed as an admission by the City of its liability to pay for such work. The certificate of the auditor that an appropriation in the amount of this Contract or in the amount of such order is available shall bar any defense by the City on the grounds of insufficient appropriation.

ARTICLE 12 CHANGE IN THE CONTRACT TIME

12.1 Date of Commencement

12.1.1 The date of commencement of the Work is the date established in the Notice to Proceed. The date shall not be postponed by the failure to act of the Contractor or persons or entities for whom the Contractor is responsible.

12.2 Progress and Completion

12.2.1 Time is of the essence; all time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

12.2.2 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

12.2.3 At least ten (10) working days before the first application for payment, the Contractor shall submit to the Engineer a progress schedule showing for each class of Work included in the schedule of values, the percentage of completion to be obtained and the total dollar value of Work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of Work in place, but may include, at the Engineer's discretion, the value of materials delivered but not in place.

12.2.4 The progress schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The progress schedule will be reviewed by the Engineer for compliance with the requirements of this Article and will be accepted by the Engineer or returned to the Contractor for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the progress schedule has been approved by the Engineer. The Engineer's review of the progress schedule shall not impose any duty on the Engineer or the City with respect to the timing, planning, scheduling, or execution of the Work. In particular, if the Contractor proposes a progress schedule indicating a date of Substantial Completion which is earlier than the Contract Time, the Contractor shall not be entitled to additional payment or compensation of any kind if, for any reason, the full Contract Time is required to achieve Substantial Completion of the Work.

12.2.5 If in any Application for Payment, the total value of the completed Work in place, as certified by the Engineer, is less than 90% of the total value of the Work in place estimated in the progress schedule, the City may, at the City's option, require the Contractor to accelerate the progress of the Work without cost to the City by increasing the workforce or hours of Work or by other reasonable means approved by the Engineer.

12.2.6 If each of three successive applications, as certified by the Engineer, indicate that the actual Work completed is less than 90% of the values estimated in the progress schedule to be completed by the

respective dates, the City may at the City's option, treat the Contractor's delinquency as a default justifying the action permitted under Article 18.

12.2.7 If the Engineer has determined that the Contractor should be permitted to extend the time for completion as provided below, the calendar dates in the progress schedule shall be adjusted accordingly to retain their same relationship to the adjusted date of Substantial Completion, and the dollar value of the Work to be completed as of the first of each month shall be adjusted pro rata.

12.2.8 If the Contractor fails to submit any application for payment in any month, the Engineer shall, for the purpose of this evaluation of progress, certify separately to the actual value of the Work in place completed as of the first of the month to the best of the Engineer's knowledge.

12.2.9 Nothing herein shall limit the City's right to liquidated or other damages for delays by the Contractor or to any other remedy which the City may be entitled or may possess under other provisions of the Contract Documents or by law.

12.3 Delays and Extensions of Time

12.3.1 If the Contractor is delayed at any time in the progress of the Work by an act or neglect of the City or the Engineer, or of an employee of either, or of a separate contractor employed by the City, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes (except weather) beyond the Contractor's control, or by delay authorized by the City, or by other causes which the Engineer determines may justify delay, then the Contract Time shall be extended by Change Order or Work Change Directive for such reasonable time as the Engineer may determine.

12.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 16.

12.3.3 No claim for extension of time shall be allowed on account of failure of the Engineer to furnish Drawings, Specifications or instructions or to return Shop Drawings or Samples until fifteen (15) days after receipt by the Engineer by registered or certified mail of written demand for such instructions, Drawings, Specifications, or Samples, and then not unless such claim is reasonable.

12.3.4 No extensions of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

12.3.5 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the City or the Engineer on account of any delay in the commencement of the Work and/or any hindrance, delay, or suspension of any portion of the Work, whether such delay is caused by the City, the Engineer, or otherwise, except as and to the extent expressly provided under M.G.L. c. 30, §390, in the case of written orders by the City. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

12.3.6 (Reference: M.G.L. c. 30, §390). (a) The City may order the 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 City, provided however that if there is a suspension, delay, or interruption for fifteen (15) days or more due to a failure of the City to act within the time specified in this Contract, the City shall make an adjustment in the Contract prices for any increase in the cost of performance of this Contract but shall not include any profit to the Contractor on such increase; and provided further, that the City shall not make 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 Contractor must submit the amount of a claim under provision (a) to the City 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 City shall not approve any costs in the claim incurred more than twenty (20) days before the Contractor notified the City in writing of the act or a failure to act involved in the Claim.

In the event a suspension, delay, interruption, or failure to act of the City increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of its performance as provisions (a) and (b) give the Contractor against the City, but nothing in provisions (a) and (b) shall in any way change, modify, or alter any other rights which the Contractor or the Subcontractor may have against each other.

12.4 Liquidated Damages

12.4.1 If the Contractor shall fail to achieve Substantial Completion or Final Completion within the Contract Times, it shall be liable to pay the City the daily amount specified in the Agreement, not as a penalty, but as a fixed and agreed upon damages for breach of contract. The said amount is fixed and agreed upon because of the difficulty of ascertaining the City's actual damages. It is mutually understood that the said amount is a reasonable approximation or estimate thereof as of the date of the Agreement. The City may elect to withhold said amount from periodic or final payments due to the Contractor, in addition to retainage and other backcharges.

12.5 Changes in the Contract Time

12.5.1 How. The Contract Time may only be changed by a Change Order or a Modification. Any claim for an adjustment of the Contract Time shall be based on a written notice delivered to the party making the claim to the other party and to the Engineer promptly (but in no event later than seven (7) days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within thirty (30) days after such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the Engineer in accordance with Article 16. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this paragraph.

12.5.2 Early Completion. The Contract Time shall not be changed due to a delay in the Contractor's early completion date.

ARTICLE 13 PAYMENTS

13.1 Schedule of Values

13.1.1 The Contractor shall submit to the Engineer a schedule of values as specified in paragraph 5.15 which shall subdivide the Work into its component parts and shall include quantities, direct craft labor worker hours, labor cost and material/equipment cost. Labor cost shall include an appropriate amount of construction equipment costs, supplemental costs, administrative expenses, contingencies, and profit. The Contractor shall prepare the schedule of values in such form and supported by such data to substantiate its accuracy as the Engineer may require and shall be revised if later found by the Engineer to be inaccurate.

This schedule, unless objected to by the Engineer, shall be used as a basis for reviewing the Contractor's applications for payment.

13.2 Content and Submission of Applications for Payment

13.2.1 At least ten (10) days before the date established for each progress payment, the Contractor shall submit to the Engineer six (6) copies of an itemized application for payment for Work completed in accordance with the schedule of values. Such application shall be in a form or format established or approved by the Engineer and shall be supported by documentation substantiating the Contractor's right to payment.

13.2.2 When Work Change Directives have set forth an adjustment to the Contract Sum but have not yet been included in Change Orders, the value established by the City may be included in the application.

13.2.3 Applications covering Work of Subcontractors or Suppliers shall not include requests for payments of amounts the Contractor does not intend to pay to a Subcontractor or Supplier because of a dispute or other reason. The Contractor shall not be paid for any Work performed by a Subcontractor unless and until the City receives for that Subcontractor a certificate of insurance which conforms to the requirements of the Contract Documents.

13.2.4 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the Site for subsequent incorporation in the Work. If approved in advance by the City, payment may similarly be made for materials and equipment suitably stored off the Site at a location agreed upon in writing. Payment for materials and equipment stored on or off the Site shall be conditioned upon the application for payment being accompanied by a bill of sale, an invoice, or other documentation warranting that the City has received the materials and equipment free and clear of all liens, claims, security interests, or encumbrances, hereinafter collectively referred to as "liens," and evidence that the materials and equipment are covered by appropriate insurance and other arrangements to protect the City's interest therein.

13.2.5 Each application for payment or periodic estimate requesting payment shall be accompanied by, at the City's option, a certificate from each Subcontractor stating that the Subcontractor has been paid all amounts due the Subcontractor on the basis of the previous periodic payment to the Contractor, or else stating the amount not so paid and the reason for the discrepancy. In the event of any such discrepancy, the Contractor shall furnish the Contractor's own written explanation to the City through the Engineer. Such waiver or certificate shall be in a form acceptable to the City.

13.3 False Applications for Payment

13.3.1 (Reference: M.G.L. c. 93, §9B). Any person who shall make or cause to be made, or present or cause to be presented, for payment or approval, to or by any employee, department, or agency, any claim upon or against any department or agency, knowing such claim to be false, fictitious or fraudulent, or who, for the purpose of obtaining or aiding to obtain the payment or approval of such claim, makes, uses, or causes to be made or used, any false bill, receipt, voucher, toll, account, claim, certificate, affidavit, or deposition knowing the same to contain any fraudulent or fictitious statement or entry, shall forfeit and pay to the City the sum of two thousand dollars (\$2,000.00) and, in addition, double the amount of damages which the City may have sustained by reason of the doing or committing of such act, together with the costs of the action.

13.4 Review of Applications for Payment

13.4.1 The Engineer shall review each application for payment and will reject any application that (1) is not accompanied by the required documentation or (2) contains errors, mathematical or otherwise.

13.4.2 Within five (5) business days after receipt of an application for payment, the Engineer will either (1) return the application to the Contractor with a written explanation as to why it was rejected or (2) issue to the City a certificate for payment, with a copy to the Contractor, for such amount as the Engineer determines is properly due. In the event an application is returned to the Contractor, the date of receipt of the application shall be the date of receipt of the corrected application.

13.4.3 The Engineer or the City may make changes to any application submitted by the Contractor.

13.4.4 By recommending any payment, the Engineer will not thereby be deemed to have represented that: (1) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to the Engineer in the Contract Documents or (2) that there may not be other matters or issues between the parties that might entitle the Contractor to be paid additionally by the City or entitle the City to withhold payment to the Contractor. The Engineer's approval of the application for payment and the accompanying documentation shall indicate that to the best of the Engineer's knowledge, information, and belief, the Work has progressed to the point indicated by the Contractor, and that the quality of the Work is 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 specified in the Contract Documents, final determination of quantities and classifications for unit price work and any other qualifications so stated.

13.4.5 The Engineer's recommendation of any payment shall not mean that the Engineer is responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the Contractor to comply with laws and regulations applicable to the furnishing or performance of Work, or for any failure of the Contractor to perform or furnish Work in accordance with the Contract Documents.

13.4.6 No certificate given or payment made shall be evidence of the performance of this Contract, either wholly or in part and no payment, whether made upon the final certificate or otherwise, shall be construed as an acceptance of defective work or materials.

13.5 Decisions to Withhold Certification

13.5.1 The Engineer may refuse to recommend the whole or any part of any payment if, in the Engineer's opinion, it would be incorrect to make the representations to the City referred to above.

13.5.2 If the Contractor and the Engineer cannot agree on a revised amount, the Engineer will promptly approve a certificate for payment for the amount for which the Engineer is able to make such representations to the City. The Engineer may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a certificate for payment previously issued, to such extent as may be necessary in the Engineer's opinion to protect the City from loss because of:

13.5.2.1 Defective Work not remedied;

13.5.2.2 Third party claims filed or reasonable evidence indicating probable filing of such claims;

13.5.2.3 Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

13.5.2.4 Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

13.5.2.5 Damage to the City or another contractor;

13.5.2.6 Reasonable evidence that the Work will not be completed within the Contract Time, and that retainage currently held by the City would not be adequate to cover actual or liquidated damage for the anticipated delay;

13.5.2.7 Persistent failure to carry out the Work in accordance with the Contract Documents; or

13.5.2.8 Failure the Contractor to comply with mandatory requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Engineer before approval of the Contractor's monthly payment requisition.

13.5.3 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

13.6 Progress Payments

13.6.1 After the Engineer has issued a certificate for payment, the City shall make payment in the manner and within the time provided in the Contract Documents.

13.6.2 (Reference: M.G.L. c. 30, §39G). The City shall pay the amount due pursuant to any periodic, Substantial Completion or final estimate within thirty-five (35) days after receipt of written acceptance for such estimate from the Contractor. In the case of periodic payments, the City 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 M.G.L. c. 30, §39F and a retention to secure satisfactory performance of the contractual work, not exceeding five percent (5%) of the approved amount of any periodic payment, and the same right to retention shall apply to bonded Subcontractors entitled to direct payment under M.G.L. c. 30, §39F provided, that a five percent (5%) value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

13.6.3 No periodic, Substantial Completion or final estimate or acceptance or payment thereof shall bar the Contractor from reserving all rights to dispute the quantity and amount of, or the failure of the City to approve a quantity and amount of, all or part of any Work item or extra Work item.

13.7 Final Payment

13.7.1 After final inspection and after the Contractor has completed all the required corrections to the satisfaction of the Engineer and the City and 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, and all other documents called for in the Contract Documents, as well as any surplus materials requested by the City, the Contractor may make an application for final payment as provided below.

13.7.2 (Reference: M.G.L. c. 30, §39G). Within thirty (30) days after receipt by the City of a notice from the Contractor stating that all of the Work required by the Contract has been completed, the City 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 the Work less all payments made to date, unless the City's inspection shows

that Work required by the Contract remains incomplete or unsatisfactory, or that documentation required by the Contract has not been completed.

13.7.3 The making and acceptance of final payment will constitute a waiver of all claims by the Contractor against the City other than those previously made in writing and still unsettled.

13.8 Payments to Subcontractors

13.8.1 Neither the City nor the Engineer shall have an obligation to pay or see to the payment of money to a Subcontractor, Sub-subcontractor, or Supplier except as may otherwise be required by law.

13.8.2 (Reference: M.G.L. c. 30, §39F) (1)(a) Forthwith after the Contractor receives payment on account of a periodic estimate, the 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 Contractor.

(b) Not later than the sixty-fifth day after each Subcontractor substantially completes its Work in accordance with the Drawings and Specifications, the entire balance due under the subcontract, less amounts retained by the City as the estimated cost of completing the incomplete and unsatisfactory items of Work, shall be due the Subcontractor; and the City shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the City less any amount specified in any court proceeding barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

(c) Each payment made by the City to the Contractor pursuant to paragraphs (a) and (b) of M.G.L. c. 30, §39F(1), for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the City shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the City has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be include in a payment to the Contractor for payment to the Subcontractor as provided in paragraphs (a) and (b) of M.G.L. c. 30, §39F(1), the City shall act upon the demand as provided in M.G.L. c. 30, §39F.

(d) If, within seventy (70) days after the Subcontractor has substantially completed the subcontract Work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the City as the estimated cost of completing the incomplete and unsatisfactory items of Work, the Subcontractor may demand direct payment of that balance from the City. The demand shall be by a sworn statement delivered to or sent by certified mail to the City, and a copy shall be delivered to or sent by certified mail to the 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. [The demand letter shall indicate the certified mail number assigned by the postal service or the date of delivery to the Contractor.] 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 (10) days after the Subcontractor has delivered or so mailed the demand to the City and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the City, 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 Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

(e) Within fifteen (15) days after receipt of the demand by the City, but in no event prior to the seventieth day after substantial completion of the subcontract Work, the City 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 Contractor, less any amount (i) retained by the City 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 Contractor in the sworn reply; provided that the City 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 the previous paragraph. The City 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 paragraph.

(f) The City shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of the previous paragraph in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the City or agreed upon by the Contractor and the Subcontractor and shall notify the 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 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 the previous paragraph shall be made out of amounts payable to the 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 Contractor and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the City to the Contractor to the extent of such payment.

(h) The City shall deduct from payments to a Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to paragraph (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 Contractor.

(2) Any assignment by a Subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of M.G.L. c. 149, §29 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 City or which are on deposit pursuant to paragraph (g) 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) A Contractor or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in herein 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 paragraph (f) by a petition in equity in the superior court against the City and the 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. M.G.L. c. 231, §§59 and 59B 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 §§59 and 59B 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 Contractor are available for direct payment shall have a right to file a petition in court of equity against the City claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the City has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of paragraph (e) and in paragraph (f).

(4) 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 Contractor, reduce by the amount of any deposit of a disputed amount by the City as provided in part (iii) of paragraph (e) and in paragraph (f) any amount held under a trustee writ or pursuant to a restraining order or injunction.

ARTICLE 14 SUBSTANTIAL COMPLETION

14.1 Substantial Completion

14.1.1 Upon Substantial Completion of the Work, the Contractor shall present in writing to the City its certification that the Work has been substantially completed and include in its certification (1) a list of items to be completed or corrected, (2) all special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Engineer and (3) the permits and certificates referred to in 13.7.1., or elsewhere. The failure to include any item on the list mentioned in the preceding sentence does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Engineer on the basis of an inspection determines that the Work or designated portion thereof is substantially complete and the other conditions have been met, the Engineer will then prepare a certificate of Substantial Completion which shall establish the date of Substantial Completion, shall state the responsibilities of the City and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. The certificate of Substantial Completion shall be submitted to the City and the Contractor for their written acceptance of the responsibilities assigned to them in such certificate.

14.1.2 Within twenty-one (21) days after receipt of the certification from the Contractor, the City 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 City may include with such list a notice setting forth a reasonable time within which the Contractor must achieve Substantial Completion of the Work. If the City fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the Contractor's certification within the twenty-one (21) day period, the Contractor's certification shall take effect as the City's declaration that the Work has been substantially completed.

14.2 Partial Use or Occupancy of the Premises

14.2.1 The City may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided that the respective responsibilities of the City and the Contractor with respect to payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, insurance, correction of the Work, and warranties shall be established by agreement of the City and the Contractor or, absent such agreement, shall be determined by the Engineer subject to the right of either party to contest such determination as provided in Article 16.

14.2.2 Immediately prior to such partial occupancy or use, the City, the Contractor and the Engineer shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

14.2.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

14.2.4 (Reference: M.G.L. c. 30, §39G). Within sixty-five (65) days after the effective date of a declaration of Substantial Completion, the City shall prepare and send to the Contractor for acceptance a Substantial Completion estimate for the quantity and price of the Work done and all but one percent (1%) retainage on that Work, including the quantity, price and all but one percent (1%) retainage for the undisputed part of each item and extra work item in dispute, but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory items and less the total periodic payments made to date for the Work. The City shall also 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 M.G.L. c. 30, §39F.

14.2.5 (Reference: M.G.L. c. 30, §39G). If the City fails to prepare and send to the Contractor any Substantial Completion estimate required by the provisions herein on or before the date specified, the City 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 (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the City sends that Substantial Completion estimate to the Contractor for acceptance or to the date of payment therefor, whichever occurs first. The City shall include the amount of such interest in the Substantial Completion estimate.

14.2.6 (Reference: M.G.L. c. 30, §39G). Within fifteen (15) days after the effective date of the declaration of Substantial Completion, the City shall send to the Contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory items, and unless delayed by causes beyond its control, the Contractor shall complete all such items within forty-five (45) days after the receipt of such list or before the date for final payment and acceptance, whichever is later. If the Contractor fails to complete such Work within such time, the City may, subsequent to seven (7) days' written notice to the Contractor by certified mail, return receipt requested, terminate the Contract and complete the incomplete or unsatisfactory items and charge the cost of same to the Contractor.

14.3 Final Inspection

14.3.1 Upon written notice from the Contractor that the entire Work or an agreed portion thereof is complete, the Engineer will make a final inspection with the City and the Contractor and will notify the Contractor in writing of all particulars which this inspection reveals that the Work is incomplete or defective. The Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

ARTICLE 15 GUARANTEES AND WARRANTIES

15.1 In General

15.1.1 All guarantees and warranties specifically called for by the Specifications shall expressly run to the benefit of the City.

15.2 Warranties

15.2.1 Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof, unless otherwise provided in the certificate of Substantial Completion.

15.2.2 The Contractor warrants that the materials and equipment furnished under the Contract will be new and of recent manufacture unless otherwise specified, and that all Work will be of good quality, free from faults and defects, and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of material and equipment.

15.2.3 The Contractor warrants that title to all Work covered by an application for payment will pass to the City either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens. The Contractor further agrees that the submission of any application for payment shall conclusively be deemed to waive all liens with respect to said Work to which the Contractor may then be entitled, provided that such waiver of the lien rights shall not waive the Contractor's right to payment for such Work.

15.2.4 The 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 the City no later than the time of payment free and clear of all liens.

15.2.5 No materials or supplies for the Work shall be purchased by the 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. The Contractor warrants that it has good title to all materials and supplies used by it in the Work, free from all liens, claims and encumbrances.

15.2.6 The Contractor shall indemnify and hold the City harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workers, mechanics, material, persons, 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. The Contractor shall at the City's request, furnish satisfactory evidence that all obligations of the nature herein above designated have been paid, discharged, or waived. If the Contractor fails to do so, then the City may, after having served written notice on the Contractor either pay unpaid bills, of which the City 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 the 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 on the City to either the Contractor or its surety. In paying any unpaid bills of the Contractor, the City shall be deemed the agent of the Contractor and any payment so made by the City shall be considered as payment made under the Contract by the City to the Contractor and the City shall not be liable to the Contractor for any such payment made in good faith.

15.3 Extended Warranties and Guarantees

15.3.1 Any defective Work that is either corrected or replaced will be warranted and guaranteed for a period of one (1) year from the date of such correction or replacement.

ARTICLE 16 CLAIMS

16.1 In General

16.1.1 Written Notice. A Claim must be made by written notice to the other party.

16.1.2 Content of Notice. The notice must include all written supporting data.

16.1.3 Burden of Proof. The party making the Claim must substantiate the Claim.

16.2 Time Limits on Claims

16.2.1 Unless otherwise provided, all Claims must be made within twenty-one (21) days after the occurrence of the event giving rise to such Claim or within twenty-one (21) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Any change or addition to a previously made Claim shall be made by a written notice within the twenty-one-day period in order to be valid.

16.3 Continuing Contract Performance

16.3.1 Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the City shall continue to make payments in accordance with the Contract Documents.

16.4 Types of Claims

16.4.1 Claims for Differing Subsurface or Latent Physical Conditions. (Reference: M.G.L. c. 30, §39N). If, during the progress of the Work, the Contractor or the City discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents, either the Contractor or the City may request an equitable adjustment in the Contract Sum 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 City shall make an investigation of such physical conditions, and if they differ substantially or materially from those shown on the Drawings 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 Drawings 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 City shall make an equitable adjustment in the Contract Sum and the Contract shall be modified in writing accordingly.

16.4.2 Claims for Additional Cost. If the Contractor claims that any acts or omissions of the City or the Engineer, including any instructions or orders, whether oral, written, by drawings, or otherwise, involve extra cost or time, and the Contractor has not received a written acknowledgment by the City or the Engineer that extra payment will be made or time extended on account thereof, the Contractor shall promptly so notify the Engineer in writing of such Claim and shall proceed with the Work relating to such Claim and all rights of both parties with respect to such Claim shall be deemed to have been reserved. No Claim by the Contractor on account of such acts, omissions, instructions, or orders shall be valid unless the Contractor has so notified the Engineer before proceeding.

16.4.2.1 Under no circumstances shall a Claim be made for additional cost where adverse weather conditions are the basis for the Claim.

16.4.3 Claims for Additional Time. If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor shall have the burden of demonstrating the effect of the claimed delay on the Contract Time and shall furnish the Engineer with such documentation relating thereto as the Engineer may reasonably require. Under no circumstances shall the Contractor make a Claim for an increase in the Contract Time due to a change in the Contractor's early completion date. If the increase in the Contract Time extends beyond the Contract Time established by the City, only the time that so extends beyond the Contract Time shall be reviewed and considered. In the case of a continuing delay, only one Claim is necessary.

16.4.3.1 Under no circumstances shall a Claim be made for additional time where adverse weather conditions are the basis for the Claim.

16.4.4 Claims for Injury to Person or Damage to Property. Should either party to the Contract suffer injury to person or damage to property because of any error, omission, or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, a Claim will be made in writing to the other party within twenty-one (21) days of the occurrence of the act giving rise to the injury or damage.

16.5 Review of Claims

16.5.1 Initial Referral. All Claims, the bases of which arise prior to final payment or the earlier termination of the Contract, shall be referred initially to the Engineer for action as provided herein.

16.5.2 Time Period and Action. The Engineer shall review Claims and shall do one of the following within fourteen (14) days of receipt of the Claim:

16.5.2.1 Defer any action with respect to all or any part of a Claim for the purpose of requesting and receiving additional information from either party;

16.5.2.2 Decline in writing to render a decision for any reason which it deems appropriate (including, but not limited to, the fact that the Claim involves allegations of fault on the part of the Engineer); or

16.5.2.3 Render a decision on all or a part of the Claim.

16.5.3 If the Engineer requests additional information, the Engineer shall take action with respect to the Claim no later than fourteen (14) days after receipt of the additional information. The Engineer shall notify the parties in writing of its disposition of such Claim. If the Engineer renders a decision or declines to render a decision, either party may proceed in accordance with paragraph 16.7.

16.6 Decisions

16.6.1 Decisions by the City or the Engineer. (Reference: M.G.L. c. 30, §39P). In every case in which this Contract requires the City, any official, or its Engineer to make a decision on interpretation of the Specifications, approval of equipment, material or any other approval, or progress of the Work, the decision shall be made promptly and, in any event, no later than fourteen (14) days after the written submission for decision; but if such decision requires extended investigation and study, the City, the official, or the Engineer shall, within fourteen (14) 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.

16.6.2 When Decision of the Engineer is Final and Binding. The decision of the Engineer shall be final and binding on the parties, unless a party files suit or a demand for arbitration within thirty (30) days after the date of the decision.

16.6.3 When Decision of the Engineer is Not Final and Binding. (Reference: M.G.L. c. 30, §39J). Notwithstanding any contrary provision of this Contract, no decision by the City or by the Engineer on a dispute, whether of fact or of law, arising under said Contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

16.6.4 Resolved Claims. If a Claim is resolved, the Engineer shall obtain or prepare the appropriate documentation and provide the City and the Contractor with a copy of same.

16.7 Arbitration

16.7.1 Controversies and Claims Subject to Arbitration. Any controversy of Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies of Claims relating to aesthetic effect, subject to the provisions of paragraph 16.7.7. In any such arbitration in which the amount stated in the demand is \$100,000 or less, the American Arbitration Association shall appoint a single arbitrator in accordance with such Rules, who shall be a lawyer. In any such arbitration in which the amount stated in the demand is in excess of \$100,000, the demand shall include the name of an arbitrator appointed by the claimant. The respondent shall appoint a second arbitrator and shall notify the claimant in writing of such appointment within thirty (30) days of receipt of the demand, failing which the matter shall be decided by the arbitrator named in the claimant's demand. Within thirty (30) days after the claimant's receipt of notice of the appointment of the second arbitrator, the two arbitrators shall appoint a neutral arbitrator and shall notify the parties in writing of such appointment, failing which either party may apply to the American Arbitration Association to appoint such neutral arbitrator. If such neutral arbitrator is appointed by the American Arbitration Association, he or she shall be a lawyer.

16.7.2 Rules for Arbitration. If the neutral arbitrator is appointed by the American Arbitration Association, the said Association shall administer the arbitration and its Construction Industry Arbitration Rules shall govern all aspects of the proceeding including the enforcement of any award. If the neutral arbitrator is not appointed by the American Arbitration Association, then the panel of arbitrators shall act as the administrator of the arbitration but the Construction Industry Arbitration Rules of the Association shall nonetheless govern all aspects of the proceeding, including the enforcement of any award, provided however that the arbitration panel shall have all of the powers and duties conferred on the Association pursuant to said rules. In addition, the following rules shall govern the selection of arbitrators and the proceedings:

16.7.2.1 Neither party may appoint as arbitrator an employee or an owner of that party, nor the parent, spouse, or child of an employee or owner of that party.

16.7.2.2 After the neutral arbitrator has been appointed, neither party may engage in ex parte communication with any arbitrator.

16.7.3 When Arbitration May Be Demanded. Demand for arbitration of any Claim, the basis of which arises prior to final payment or the earlier termination of the Contract may not be made before the earlier of (1) the date on which the Engineer has rendered a written decision on the Claim or has notified the parties in writing that such decision will not be rendered or (2) forty-five (45) days following receipt by the

Engineer of a written request for a decision sent by registered or certified mail to both the Engineer and the other party to this Contract.

16.7.3.1 In no event shall a demand for arbitration be made after the date when the institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations.

16.7.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joinder or in any other manner, the Engineer, the Engineer's employees or consultants, except by written consent containing specific reference to the Contract and signed by the Engineer, the City, the Contractor, and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the City, the Contractor, a separate contractor, and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the City, the Contractor, or a separate contractor shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a dispute not described therein or with a person or entity so named or described herein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Contract shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

16.7.5 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence, or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

16.7.6 Award Final. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

16.7.7 The City's Reservation of Rights. Notwithstanding any provision contained in this Article 16 or elsewhere in the Contract Documents, the City reserves the following rights in connection with Claims between the City and the Contractor, which rights may be exercised by the City unilaterally, in the City's sole discretion, and without the consent of the Contractor:

16.7.7.1 The right to institute legal action against the Contractor in any court of competent jurisdiction in lieu of demanding arbitration, in which case the dispute or disputes which are the subject of such action shall be decided by such court, and not by arbitration;

16.7.7.2 The right to obtain from any court of competent jurisdiction a stay of any arbitration instituted by the Contractor, provided that the application for such stay is made before the appointment of the neutral arbitrator in such arbitration, in which case the dispute or disputes which are the subject of such arbitration shall be decided by such court and not by arbitration;

16.7.7.3 The right to require the Contractor to join as a party in any arbitration between the City and the Engineer relating to the Project, in which case the Contractor agrees to be bound by the decision of the arbitrator or arbitrators in such arbitration.

16.7.8 In case the City elects to proceed in accordance with 16.7.7.1. or 16.7.7.2. above, the word "litigation" shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

ARTICLE 17 EMERGENCIES

17.1 In an emergency affecting the health and safety of persons or property, the Contractor shall act to prevent threatened damage, injury, or loss.

17.2 In emergencies affecting the health, safety, or protection of persons, the Work or property at the Site or adjacent thereto, the Contractor, without special instruction or authorization from the City or the Engineer, is obligated to act to prevent threatened damage, injury, or loss. The Contractor shall give the Engineer prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the Engineer determines that a change in the Contract Documents is required because of the action taken by the Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

ARTICLE 18 TERMINATION OR SUSPENSION OF THE CONTRACT

18.1 Suspension by the City

18.1.1 At any time and without cause, the City may suspend the Work or any portion thereof for a period of not more than ninety (90) days by notice in writing to the Contractor and the Engineer which will fix the date on which Work will be resumed. The Contractor shall resume Work on the date so fixed. The Contractor shall be allowed an adjustment in the Contract Sum or an extension of the Contract Time, or both, directly attributable to any such suspension if the Contractor makes an approved Claim therefor.

18.1.2 If the Work is defective, if the Contractor fails to provide a sufficient number of skilled workers or suitable materials or equipment, or if the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the City to begin and prosecute correction of such default or neglect with diligence and promptness, the City may correct such deficiencies, without prejudice to other remedies the City may have. In such case, an appropriate Work Change Directive shall be issued deducting from payments then or thereafter due to the Contractor the cost of correcting such deficiencies including compensation for the Engineer's additional services and expenses made necessary by such default, neglect, or failure and any and all direct, indirect, or consequential costs associated with the order to stop the Work. If such payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall immediately pay the difference to the City. The Contractor shall remain responsible for maintaining progress and shall not be entitled to any increase in the Contract Time or the Contract Sum.

18.2 Termination by the Contractor

18.2.1 If, through no act or fault of the Contractor, a Subcontractor, or a Sub-subcontractor, the Work is suspended for a period of more than ninety (90) days by the City, or under an order of court or other public authority, or the Engineer fails to act on any application for payment within thirty (30) days after it is submitted in proper form and content or the City fails for thirty (30) days to pay the Contractor any sum finally determined to be due, then the Contractor may terminate the Contract upon seven (7) days' written notice to the City, provided that the City does not remedy such suspension or failure within that time.

18.3 Termination by the City

18.3.1 If the Contractor is adjudged a bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if the Contractor fails to make

prompt payment to Subcontractors or for materials or labor, or persistently disregards laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction or disregards an instruction, order, or decision of the Engineer, or otherwise is guilty of substantial violation of any provision of the Contract, then the Contractor shall be in default, and the City may, without prejudice to any other right or remedy and upon written notice to the Contractor, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the Project Site, and all materials intended for the Work, wherever stored, and, seven (7) days after such notice, may terminate the employment of the Contractor, accept assignment of any or all subcontracts pursuant to Paragraph 6.6.1.1 and finish the Work by whatever method the City may deem expedient. The City shall be entitled to collect from the Contractor all direct, indirect, and consequential damages suffered by the City on account of the Contractor's default, including without limitation additional services and expenses of the Engineer made necessary thereby. The City shall be entitled to hold all amounts due to the Contractor at the date of termination until all of the City's damages have been established, and to apply such amounts to such damages.

18.3.2 (Reference: Cambridge Municipal Code Chapter 2.117, Section 2.117.110C). In the event the Contractor or any of its agents or employees violates any provision of Cambridge Municipal Code Chapter 2.117 which is applicable to City contractors in connection with the awarding, administration, or performance of the Contract, the City may terminate the Contract.

ARTICLE 19 AMERICANS WITH DISABILITIES ACT (42 U.S. 12131)

19.1 On July 26, 1994, the Americans with Disabilities Act ("the Act") became effective for employers of fifteen or more employees.

19.2 The Act protects against discrimination on the basis of "disability," which is defined as a physical or mental impairment that substantially limits at least one "major life activity;" or discrimination against an individual who has a record of such impairment; or discrimination against an individual being regarded - even if inaccurately - as having such impairment. The Act also expressly prohibits job discrimination that is based on any individual's relationship or association with a disabled person.

19.3 If the Contractor is subject to the Act, it must comply with its provisions.

ARTICLE 20 WRITTEN NOTICE TO THE PARTIES

20.1 In General

20.1.1 All written communications from the Engineer to the Contractor shall be copied to the City. All written communications from the Contractor to the Engineer shall be copied to the City. All written communications from the Contractor to the City shall be copied to the Engineer.

20.2 Addresses

20.2.1 To the City. Written notice to the City shall be sent or hand-delivered to:

City Manager
City of Cambridge
Massachusetts Avenue
Cambridge, MA 02139

20.2.2 To the Contractor. Both the address given on the bid form upon which the Agreement is founded and the 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 the Contractor shall be certified, mailed, or delivered. Delivery of any notice, letter, or other communication to the Contractor at or depositing same in a postpaid wrapper directed to either place shall be deemed sufficient service thereof upon the Contractor. Written notice shall be deemed to have been duly served on the Contractor if it is sent or hand-delivered to any member or officer of the Contractor. The date of said service shall be the date of such delivery or mailing. The address may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor and delivered to the City and to the Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon the Contractor personally. Moreover, any notice, letter, or other communication required under the Contract may be served on the Contractor's representative at job meetings. The Contractor shall provide the City with its change of address seven (7) days prior to its effective date.

20.2.3 To the Engineer. Written notice to the Engineer shall be sent or hand-delivered to the address appearing on the Project Manual. Written notice shall be deemed to have been duly served on the Engineer if it is sent or hand-delivered to any member or officer of the Engineer.

ARTICLE 21 MISCELLANEOUS PROVISIONS

21.1 Governing Law

21.1.1 This Contract shall be governed by the laws of the Commonwealth of Massachusetts.

21.2 Venue

21.2.1 Venue for any court action or proceeding shall be Middlesex County in the Commonwealth of Massachusetts only. The Contractor, all Subcontractors, and Suppliers waive any and all jurisdictional and venue defenses.

21.3 Successors and Assigns

21.3.1 The Contractor shall not assign, in whole or in part, its rights and obligations under the Contract Documents without prior written consent of the City. An assignment without the prior written consent of the City shall not relieve the Contractor of its obligations thereunder.

21.3.2 The City and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents.

21.4 Statutory Limitation Period

21.4.1 It is expressly agreed that the obligations of the Contractor hereunder arise out of contractual duties, and that the failure of the Contractor to comply with the requirements of the Contract Documents shall constitute a breach of contract, not a tort, for the purpose of applicable statutes of limitations and repose. Any cause of action which the City may have on account of such failure shall be deemed to accrue only when the City has obtained actual knowledge of such failure, not before.

21.5 Rights and Remedies

21.5.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

21.5.2 No action or failure to act by the City, the Engineer, or the Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

THIS IS THE END OF THE GENERAL TERMS AND CONDITIONS

SECTION 00825
SUPPLEMENTAL GENERAL CONDITIONS

FOR CONSTRUCTION, RECONSTRUCTION, ALTERATION,
REMODELING, OR REPAIR OF ANY
CITY OF CAMBRIDGE PUBLIC WORK

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ARTICLE 1 - PROTECTION OF LIVES, HEALTH AND PROPERTY

1.1 The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of and will provide the necessary protection to prevent damage, injury, or loss to:

1.2 All employees on the work and other persons who may be affected thereby;

1.3 All the work and all materials or equipment to be incorporated therein, whether in storage on or off the site; and

1.4 Other existing property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

1.5 Notwithstanding any other provisions of this contract, the Contractor shall at Contractor's expense promptly restore to its prior condition all property (regardless of by whom owned or where located) damaged as a result of Contractor's operations.

1.6 The Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss. The Contractor shall erect and maintain as required by the conditions and progress of the work, all necessary safeguards for safety and protection, and in addition the Contractor shall comply with all applicable recommendations of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc. The Contractor shall notify owners of adjacent utilities when prosecution of the work may affect them. All damage, injury, or loss to any property referred to in section 1.4 or 1.5 above, caused directly or indirectly, in whole or in part by the Contractor and subcontractor, or anyone directly or indirectly employed by any of them; or anyone for whose acts any of them may be liable will be remedied by the Contractor; except damage or loss attributable to the fault of drawings or specifications, or to the acts or omissions of the Engineer, the Owner, or the Engineer, or anyone employed by either of them; or anyone for whose acts either of them may be liable and not attributable directly or indirectly in whole or in part to the fault or negligence of the Contractor.

1.7 The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent, unless otherwise designated in writing by the Contractor to the Owner.

1.8 The Contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the Owner or its designated representatives in writing for information purposes only. This shall not relieve the Contractor or all subcontractors from mandatory reporting requirements, or any other requirements under the Occupational Safety and Health Act of 1970.

1.9 This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Workforce Development, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (Industrial Bulletin No. 12)." Contractors shall be familiar with the requirements of these regulations, and MUCTD and ADA safety requirements.

ARTICLE 2 - ACCESS TO THE WORK

2.1 The Owner and agents and employees of the Owner may at all times enter upon the work and areas occupied by the Contractor, and the Contractor shall provide safe and proper facilities for such entrance and for the inspection of the work.

2.2 The Contractor shall at all times provide proper facilities for access and inspection by representatives of the Commonwealth of Massachusetts to all work under this project wherever it is in preparation or progress.

ARTICLE 3 - CONTRACTOR TO LAY OUT CONTRACTOR'S OWN WORK

3.1 The Owner will establish such general reference points for all detailed layout, staking, and grade control as in its judgment will enable the Contractor to proceed with the work. The Contractor at its own expense shall provide all materials and equipment and such qualified helpers, including a registered engineer and/or land surveyor, as the Owner may require for utilizing the general reference points, and also, protect and preserve all stakes, benches, and other markers used to identify the reference points and be responsible for the accuracy of all lines, grades, and measurements. See also, DWPC Construction Grants Policy Memorandum No. CG-3.

ARTICLE 4 - PROJECT MEETINGS

4.1 First Progress Meeting: Prior to the commencement of Work at the site, the first progress meeting will be held at a mutually agreed time at the Owner's office which shall be attended by the Contractor's Project Manager, its superintendent and CQC Manager, and its Subcontractors as the Contractor deems appropriate. Other attendees will be:

- Resident Project Representative.
- Representatives of Owner.
- Governmental representatives as appropriate.
- Others as requested by Contractor or Owner.

4.2 The Contractor shall bring to the meeting the submittals specified in the GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS AND THE SPECIAL CONDITIONS and Section 01300.

4.4 The purpose of the meeting is to designate responsible personnel and establish a Working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the Contractor prior to the meeting date. However, the Contractor should be prepared to discuss all of the items listed below.

- Contractor's tentative schedules.
- Transmittal, review, and distribution of Contractor's submittals.
- Processing applications for payment.
- Maintaining record documents.
- Critical Work sequencing.
- Field decisions and Change Orders.
- Use of project site, office and storage areas, security, housekeeping, and Owner's needs.
- Major equipment deliveries and priorities.
- Contractor's assignments for safety and first aid.

4.5 The Owner will preside at the meeting and will arrange for keeping and distributing the minutes to all persons in attendance.

4.6 The Contractor and its Subcontractors should plan on the meeting taking no less than one full Working day.

4.7 Weekly Progress Meetings: See Article 5.6.6 of the GENERAL CONDITIONS.

ARTICLE 5 - PROJECT SIGN DETAILS

5.1 The Contractor shall furnish and erect a sign at the project site at the location directed. The Contractor shall maintain the sign, including repainting, in a satisfactory condition for the life of this Contract. Upon completion of the project and when directed, the sign shall become the property of the Contractor and shall be satisfactorily removed and disposed of by the Contractor off the site. The costs of furnishing, erecting, and maintaining the project sign shall be considered to be included in the prices stipulated for the various items of work as listed in the Bid; no direct payment will be made for this work. The sign shall meet the following criteria:

¾” thick exterior high density overlay plywood

Sign shall be 8 feet wide by 4 feet high, mounted at least 4 feet above the ground

Sign shall be multi-colored and with font style and font size as directed by the Owner

Sign shall include graphic logo for the City of Cambridge, DPW’s “The Works” logo, the Engineers, and the Contractor.

The lettering on the sign shall be provided as indicated and to additional requirements as directed.

5.2 The Contractor shall furnish, erect, and maintain ten (10) signs at the project site at the locations directed to be used for community relations purposes. The Contractor shall maintain the sign in a satisfactory condition for the life of this Contract including replacement of lost signs, damaged signs, or as otherwise needed. Upon completion of the project and when directed, the sign shall become the property of the Owner. The costs of furnishing, erecting, and maintaining the project signs shall be considered to be included in the prices stipulated for the various items of work as listed in the Bid; no direct payment will be made for this work. The signs shall meet the following minimum criteria:

Signs shall be a minimum ¾” thick exterior high density overlay plywood

Signs shall be a minimum 4 feet wide by 4 feet high, mounted at least 4 feet above the ground

Sign shall be multi-colored and with font style and font size as directed by the Owner

Sign shall include graphic logo for the City of Cambridge, DPW’s “The Works” logo, the Engineers, and as may otherwise be directed.

The lettering on the sign shall be provided as indicated and to additional requirements as directed.

ARTICLE 6 - SUBSURFACE DATA

6.1 Subsurface soil and rock information and investigations have been obtained, made, and plotted for use by the Owner for the purpose of design of the project. The subsurface soils and rock data shown on the Drawings and in the Specifications are based on the geotechnical and environmental reports prepared for the work proposed. These reports, which are included in the appendices, are for the general information of bidders and the Contractor and the attention of Bidders and Contractors is directed to the fact that by reason of methods commonly used for obtaining and expressing such boring data, these information and data may be limited and subject to error or misunderstanding. The terms used to describe soils, rock, groundwater, and such other conditions are subject to local usage, and to the interpretation of the person obtaining and making the records. The borings have been made with reasonable care, substantially at the locations indicated and to the depths shown. Groundwater levels shown in the reports in Appendix C are those reported by the driller to be existing at the particular boring location at the time subsurface investigations were made, and do not necessarily represent permanent groundwater levels; it shall be the responsibility of the Contractor to determine for itself annual and seasonal variations in groundwater levels which may affect the Contractor’s work. Each bidder is expected to examine the site and the compiled record of investigations and information and then, based upon those inspections, interpretations, and such other investigations as the bidder may desire, decide the character of material to be encountered and excavated, the suitability of the materials that are to be used for backfilling and such other purposes, groundwater

conditions, difficulties, or obstacles likely to be encountered, and other conditions affecting the work. No warranty, either expressed or implied by the Owner, Engineer, or their agents, is made as to the accuracy of the subsurface information and data shown on the Drawings, and the Engineer, the Owner, together with their agents, will not assume responsibility for any consequences delays, expense, or losses which may occur or have occurred in the event that such indications shall be found to be incomplete, incorrect, or misleading; nor shall such variations or inaccuracies in the indications of subsurface information and data constitute grounds for revision in contract price or the time of completion.

ARTICLE 7 - ADDITIONAL DEFINITIONS

- 7.1 Earth – Earth, whenever used as a name of material excavated or to be excavated, shall mean all kinds of material except rock.
- 7.2 Loam – “Loam”, “Soil”, or “Top Soil” shall mean the material composing the surface layer of ground containing varying amounts of organic matter.
- 7.3 Rock – Rock, whenever used as a name of material excavated or to be excavated, shall mean the sound bedrock properly removed by blasting, wedging or barring, also such boulders as exceed one cubic yard in volume removed or to be removed from the excavation.
- 7.4 Ton – Ton shall mean 2,000 pounds.

ARTICLE 8 – INDEMFICATION PROVISIONS

- 8.1 Indemnification provision provided in Article 5.27 of Section 00800 “General Terms and Conditions” shall include the owner(s) of the properties listed in Appendix F requiring inflow removal work.

ARTICLE 9 – INSURANCE REQUIREMENTS

- 9.1 Insurance requirements provided in Article 8 of Section 00800 “General Terms and Conditions” shall include the owner(s) of the properties listed in Appendix F requiring inflow removal work as Additional Insured.
- 9.2 Engineers providing professional design services to the Contractor are required to carry Professional Liability Insurance in the amount of at least \$1,000,000, unless otherwise specified, and meeting all requirements laid out in this Section and Section 00800 “General Terms and Conditions”.

ARTICLE 10 – PAYMENTS

- 10.1 The retention deducted from periodic payments to the Contractor will be released to the Contractor by the City based on the following schedule:
- Up to half of the total amount retained to the date of completion of the Milestone Number 1 will be released to the Contractor at completion of the Milestone Number 1
 - Up to half of the total amount retained between completion of Milestone Number 1 and certification of Substantial Completion by the Engineer will be released to the Contractor at the time of Substantial Completion.
 - The remainder of the total amount retained will be released to the Contractor at the completion of Project Closeout, as defined in Section 01701 – Project Closeout.

END OF SECTION 00825

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SECTION 00825A

SPECIAL CONDITIONS

FOR CONSTRUCTION, RECONSTRUCTION, INSTALLATION,
DEMOLITION, MAINTENACE OR REPAIR OF ANY
CITY OF CAMBRIDGE PUBLIC WORK

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- APPENDED:
- Attachment I City of Cambridge Department of Public Works, Division of Urban Forestry - Tree Protection During Construction
 - Attachment II General Laws of Massachusetts – Part I – Title XIV Public Ways and Works – Chapter 82 – Section 40
 - Attachment III Ordinance Number 1329 (Dumpster Licenses)
 - Attachment IV Department of Environmental Protection Division of Municipal Services Special Provisions for Disadvantaged Business Enterprises
 - Attachment V Massachusetts Diesel Retrofit Program
 - Attachment VI Excerpts of Massachusetts General Laws

SPECIAL CONDITIONS

ARTICLE 1 - SCOPE OF THE WORK: The Contractor shall furnish all plant, labor, materials, supplies, equipment and other facilities and things necessary or proper for, or incidental to, the work contemplated by

this Contract as required by and in strict accordance with the Drawings, Specifications and Addendum (or Addenda), and/or required by, and in strict accordance with, such changes as are ordered and approved pursuant to this Contract, and the Contractor shall perform all other obligations imposed on the Contractor by this Contract. The Contractor shall be responsible for all materials delivered and work performed until completion and final acceptance. Upon completion of this Contract, the work shall be delivered complete and undamaged.

ARTICLE 2 - SPECIAL CONSIDERATIONS AND NOTICES:

- a. The Contractor shall be responsible for the control of flows in the existing sewers and drains affected by the work under this Contract. The use of stop logs, bagging, sand bags, or any other suitable method approved by the Owner may be used to interrupt flows within the work areas, provided pumping is used to maintain sewerage and drainage flows and water levels in the incoming sewer and drainage systems during construction operations. Pumped sewage and drainage shall be discharged into other sewers and drains, respectively, as approved by the Owner. The Contractor shall submit for review his proposed methods of flow controls.
- b. The Contractor shall supply the Owner, prior to the start of construction operations, with a telephone number and location of a place where he may be contacted at any time during the performance of this contract.
- c. All flows within the existing sewers shall be maintained. Existing combined sewers may flow at full capacity during storms. All plugs or similar devices used to block sewers or storm drains shall be removed at the end of each work day unless otherwise directed by the Owner due to special conditions. All plugs or similar devices to block sewers and storm drains shall be recorded as to location and time installed, and shall be recorded as to location and time removed. This accounting shall be enforced in order to avoid the potential for sewage or stormwater back-ups due to blocked pipelines. Copies of the recorded information shall be provided to the Engineer on a daily basis.
- d. All damaged areas outside the Contract work limits shall be restored to its original condition at the expense of the Contractor.
- e. Removal of portions of the existing manholes and existing storm catch basins may be required to permit construction operations. Portions of manholes and catch basins removed shall be replaced in conformance with the catch basin or manhole details contained in the Contract Drawings or shall consist of the same design as the structure removed unless otherwise specified by the Contract Documents or by the Engineer.
- f. The Contractor shall take all necessary precautions during the performance of the work to prevent causing a surcharge in the existing sewers and drains.
- g. The Contractor's attention is directed to Articles 9, 10 and 40 of these Special Conditions and Specification Section 01570, Maintenance of Traffic of the Technical Specifications.
- h. The Contractor shall contact Mr. David Lefcourt, City Arborist, at the City of Cambridge Urban Forestry Division at telephone number 617-349-6433 immediately upon notification to proceed by the City. All construction operations shall be coordinated with the Urban Forestry Division to avoid damage to existing trees. Any permitted pruning of the trees shall be accomplished with a representative of the Urban Forestry Division present at the construction site. The Contractor will need to comply with the City of Cambridge Department of Public Works Division of Urban Forestry, Tree Protection During Construction policy attached at the end of these Special Conditions.

i. The Contractor shall be made aware of the following Cambridge events scheduled for the 2014, 2015, and 2016 calendar years and beyond which may affect the Contractor's work. This partial list is provided for information purposes only and is subject to change:

Head of the Charles Regatta –October 2014, October 2015, October 2016
MIT Spring Term Final Examination Period – May 2014, 2015, and 2016
MIT graduation – June 2014, 2015, and 2016
Harvard Spring Term Final Examination Period – May 2014, 2015, and 2016
Harvard graduation – June 2014, 2015, and 2016

Contractor shall be prepared to stop work due to weather conditions, parades, and other City and local school functions at the request of either City. The stoppage will result in no payment to the Contractor until the work is resumed when notified by the City.

ARTICLE 3 - WORK TO BE ACCOMPLISHED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS: The work during its progress and at its completion, shall conform to the lines and grades shown on the drawings and to the directions given by the Owner from time to time, subject to such modifications or additions as the Owner shall determine to be necessary during the execution of the work; and in no case will any work be paid for in excess of such requirements. The work shall also be accomplished in accordance with the data in these Specifications.

ARTICLE 4 - CONTRACTOR TO CHECK DIMENSIONS AND SCHEDULES: The Contractor shall be responsible for checking all dimensions and quantities shown on the drawings or schedules given to him by the Owner, and shall notify the Owner of all errors therein which he may discover by examining and checking the same. The Contractor shall not take advantage of any error or omission in these Specifications, Drawings or schedules. The Owner will furnish all instructions should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

ARTICLE 5 - FIRST AID TO INJURED: The Contractor shall keep in its field office ready for immediate use, all articles necessary for giving first aid to injured employees. The Contractor shall also provide arrangements for the immediate removal and hospital treatment of any employee injured on the work who may require the same.

ARTICLE 6 - PROTECTION AGAINST HIGH WATER AND STORM:

a. The Contractor shall take all precautions to prevent damage to the work or equipment by flooding, high winds, high waters or by storms, including hurricanes. The Owner may prohibit the carrying out of any work at any time when in its judgement, high winds, high waters or storm conditions are unfavorable or not suitable, or at any time, regardless of the weather, when proper precautions are not being taken to safeguard previously constructed work or work in progress.

b. In case of damage caused by the failure of the Contractor to take adequate precautions, the Contractor shall repair or replace equipment damaged and shall make such repairs or rebuild such parts of the damaged work, as the Owner may require, at no additional expense to the Owner.

ARTICLE 7 - SEQUENCE OF WORK: The Contractor shall be required to prosecute the work in accordance with a schedule prepared by the Contractor and approved by the Owner and Engineer prior to commencement of the work and in accordance with the additional requirements specified herein, and approved by the Owner. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling. The CPM schedule and all reports should be prepared with Primavera P6, Release 8.2 6.2.1 software in accordance with Specification Section 01311. This schedule shall state the methods and shall forecast the times for doing each portion of the work. Before beginning

any portion of the work, the Contractor shall give the Owner advance notice and ample time for making the necessary preparations. Construction sequencing information provided in the Contract Documents are for information purposes in order to aid the Contractor in the sequencing of the work.

ARTICLE 8 - COMPETENT HELP TO BE EMPLOYED: The Contractor shall employ only experienced forepersons, craftspersons and other workers competent in the work in which they are to be engaged.

ARTICLE 9 - STREETS AND SIDEWALKS TO BE KEPT OPEN:
(See also SC Article 40 and Section 01570 of the Technical Specifications)

- a. The Contractor shall at all times keep the streets and sidewalks in which the Contractor may be at work open for pedestrian and vehicular traffic and for vehicles maintaining public services. The Contractor shall bridge or construct plank crossings over the trenches at street crossings, roads or private ways. No sidewalk shall be obstructed where it is possible to avoid it. See Article 17b for restrictions on plank or steel plate crossings in the event of snow.
- b. Having obtained approval from the Owner to close a street to traffic, the Contractor shall notify the Fire Chief and the Chief of Police of Somerville and Cambridge; then provide a system of detour signs, approved by the Owner.

ARTICLE 10 - LIGHTS, BARRIERS, WATCHMEN, AND INDEMNITY:

- a. The Contractor shall put up and maintain such barriers, barricades, fencing, lighting and warning lights, danger warning signals and signs that will prevent accidents during the construction work and protect the work and insure the safety of personnel and the public at all times and places; the Contractor shall indemnify and protect the Owner and the Engineer in every respect from any injury or damage whatsoever caused by any act or neglect of the Contractor or its subcontractors or their servants or agents.
- b. All construction warning and traffic control signs, barricades, lights, and pedestrian safety controls shall be in compliance with the Massachusetts Highway Department (MHD), Standard Specifications for Highways and Bridges, Section 850 (Traffic Controls for Construction and Maintenance Operations), latest edition; the Massachusetts Manual on Uniform Traffic Control Devices (MUTCD), Part IV, latest edition; American Disabilities Act (ADA); regulations set forth by the City of Cambridge Department of Public Works, and Section 01570 of the Technical Specifications.

Reflective sheeting for barricades and signs shall conform to Subsection M9.30.2 (Encapsulated Lens Reflective Sheeting) of the Standard Specifications for Highways and Bridges.

- c. In addition to the above, when and as necessary or when required by the Owner, the Contractor shall post signs and employ watchmen at the site for excluding unauthorized persons from the work at all times, for which the Contractor will not be paid additional compensation.
- d. All detours required for pedestrian and vehicular traffic shall be in conformance with regulations set forth by the City of Cambridge Department of Public Works (DPW) and MUTCD requirements (see also Article 40). It shall be the Contractor's responsibility to contact and make all necessary arrangements for detours with the Department of Public Works prior to the beginning of construction operations.
- e. The Contractor shall be responsible for excluding at all times from lands within easement areas, or other state or municipally owned areas, all persons not directly connected with the work or authorized by the Owner to be in the work areas.

ARTICLE 11 - WORK OUTSIDE REGULAR HOURS: Night work or work on Saturdays, Sundays, or legal holidays, requiring the presence of an engineer or inspector, will not be permissible except in case

of emergency, and only upon the approval of the Owner. Should it be desired or required by the Owner to operate an organization for continuous night work or for emergency night work, the lighting, safety and other facilities which are deemed necessary by the Owner for performing such night work shall be provided by the Contractor. For night work, work on Saturdays, Sundays or legal holidays, if any be performed, the Contractor will receive no extra payment, but compensation shall be considered as having been included in the prices stipulated for the appropriate items of work as listed in the Bid. See Section 01010 of the Technical Specifications for work hour restrictions. See notes on plans for additional restrictions.

ARTICLE 12 - PUBLIC TRANSPORTATION INTERFERENCE: Whenever it may be necessary to interfere with any public transportation systems notice shall be given to the corporation owning the same, and reasonable time shall be given to said corporation to arrange the schedule for operation of same, as may be necessary.

ARTICLE 13 - WORK IN COLD WEATHER:

a. The Owner will determine when conditions are unfavorable for work and may order the work or any portion of it suspended whenever, in his opinion, if the conditions are not such as to insure first class work. In general, work shall be prosecuted throughout the year and the Contractor will be expected to keep work going, and employment of labor as continuous as possible.

b. All methods and materials used in the performance, and for the protection of, the work in cold weather shall be subject to the approval of the Owner. The Contractor shall take necessary precautions to protect the work from damage and for removing ice and frost from materials, including heating the water, sand and coarse aggregate, and for protecting the newly laid masonry. The Contractor will be responsible for snow removal and sidewalk maintenance and de-icing at the time of a snow event within the areas of work and as required for the work to proceed. The Contractor will receive no extra payment for any labor, apparatus, tools or materials necessary to comply with the above requirements, but compensation shall be considered to be included in the prices stipulated for the appropriate items of work as listed in the Bid. Contractor will provide contact phone number to Owner and Engineer for party responsible for snow removal.

c. See Article 17b for restrictions on plank or steel plate crossings in the event of snow.

ARTICLE 14 - TUNNELING : Tunneling will not be permitted without the consent of the Owner.

ARTICLE 15 - RESERVED MATERIALS: Materials found on the work suitable for any special use in the project shall be reserved for that purpose. When approved by the Owner, the Contractor may use in the various parts of the work, without charge therefore, any suitable materials taken from the excavations.

ARTICLE 16 - DISPOSAL OF MATERIALS, ACCESS TO HYDRANTS AND GATES, AND MATERIALS TRIMMED-UP FOR CONVENIENCE OF PUBLIC TRAVEL OR ADJOINING TENANTS: The materials from trenches and other excavations and those used in the construction of the work shall be deposited in such a manner that they will not endanger the work and that free access may be had at any time to all hydrants and gates in the vicinity of the work. The materials shall be kept trimmed-up in such a manner as to be of as little inconvenience as possible to the public travel or the adjoining tenants. All suitable excavated materials not utilized as refill or backfill at the site of excavation or other locations on the project shall be removed and legally disposed of by the Contractor at no additional expense to the Owner. All unsuitable excavated material including rock shall be removed and legally disposed of by the Contractor at no additional expense to the Owner.

ARTICLE 17 - LENGTH OF TRENCH TO BE OPENED AND MAINTAINING PREMISES FREE FROM OBSTRUCTIONS:

a. The length of trench opened at any time, from point where ground is being broken to completed backfill and also the amount of space in streets or public and private lands occupied by equipment, trench and supplies, shall not exceed the length or space considered reasonably necessary and expedient by the Owner. In determining the length of open trench or spaces for equipment, materials, supplies and other necessities, the Owner will consider the nature of the lands or streets where work is being done, types and methods of construction and equipment being used, inconvenience to the public or to private parties, possible dangers and other proper matters. All work must be constructed with a minimum of inconvenience and danger to the public and all other parties concerned.

b. Whenever any trench obstructs pedestrian and vehicular traffic in or to any public way, private driveway or property entrance, or on private property, the Contractor shall take such means as may be necessary to maintain pedestrian and vehicular traffic and access in accordance with Article 10. Until such time as the work may have attained sufficient strength to support backfill, or if for any other reason it is not expedient to backfill the trench immediately, the Contractor shall construct and maintain suitable plank or steel plate crossings and bridges, as approved by the Owner, to carry essential traffic in or to the street, driveway or property in question as specified or directed. Plank or steel plate crossings will not be allowed to be used to cover open trenches or excavations in the event of snow. In this event, the trench or excavation must be backfilled immediately and temporary pavement installed.

c. Suitable signs, lights, and such items required to direct traffic shall be furnished and maintained by the Contractor in accordance with Article 10.

d. The Contractor must keep streets and premises free from unnecessary obstructions, debris and all other materials. The Owner may, at any time, order all equipment, materials, surplus from excavations, debris and all other materials lying outside that length of working space promptly removed, and should the Contractor fail to remove such material within 24 hours after notice to remove the same, the Owner may cause any part or all of such materials to be removed by such persons as it may employ, at the Contractor's expense, and may deduct the costs thereof from payments which may be or may become due to the Contractor under the Contract. In special cases, where public safety urgently demands it, the Owner may cause such materials to be removed without prior notice.

e. Storage of materials on the public way is not allowed except where placed temporarily to be used immediately in the work.

f. The Contractor shall provide storage areas off the site of the work, as required, and shall include the cost of same in the prices stipulated for the appropriate items of work as listed in the Bid.

ARTICLE 18 - INTERFERENCE WITH EXISTING STRUCTURES:

a. Whenever it may be necessary to cross or interfere with existing culverts, drains, sewers, cable television, water pipes or fixtures, guardrails, fences, gas pipes, electrical, or telephone cables or conduits, or fixtures or other structures needing special care, public or private, due notice shall be given to the owner of the aforementioned utility, and the work shall be done according to the Owner's directions. Whenever required, all objects shall be strengthened to meet any additional stress that the work herein specified may impose upon it, and any damage caused shall be thoroughly repaired. If so directed by the Owner, the locations of any existing work shall be changed to meet the requirements of the sewerage system or appurtenances or the sewerage system may be relocated, if necessary, to leave all in good working order. The entire work shall be the responsibility of the Contractor and the work shall be performed at no additional expense to the Owner.

b. The Contractor shall be responsible for any damage to all known mains or utilities encountered during the progress of the work and shall repair and be responsible for correcting all damages to such existing utilities and structures at no additional expense to the Owner. The Contractor shall contact the proper

utility or authority to correct or make any changes due to utility or other obstructions during the work of construction of the sewerage and drainage systems, but the entire responsibility and expense shall be with the Contractor.

c. All items required to be removed and replaced due to construction and all existing items damaged by the Contractor shall be replaced or repaired by the Contractor to the complete satisfaction of the property owners and/or the Owner at no additional expense to the Owner, unless otherwise specified.

ARTICLE 19 - FENCING, TURF, TOPSOIL, AND OTHER REPLACED ITEMS: Where construction is through cultivated or sodded lands, the Contractor shall save the turf and topsoil separately and replace the same after the trench is filled, leaving the land as nearly as possible in its original condition. Trees, fences, walls, grassed and landscaped areas, walks, and play and recreational areas, and such other items must be restored or repaired to the satisfaction of the Owner, if damaged by work under this Contract, at no additional expense to the Owner.

ARTICLE 20 - MATERIALS: All materials furnished and used in the completed work shall be new, of best quality workmanship and design, and recognized as standard in good sewer construction practices. Whenever a Specification number or reference is given, the subsequent amendments shall be included. The standards set forth in the selection of materials and supplies are intended to conform with those standards adopted by the Owner. Preference in manufacturer shall be given to adopted standards and the Contractor shall further familiarize himself with the requirements of the Owner when the occasion or choice of materials or supplies so demand.

ARTICLE 21 - DEFECTIVE MATERIALS, INSPECTION AND TESTING OF MATERIALS FURNISHED, SAMPLES AND ORDERING LISTS:

a. No materials shall be laid or used which are known, or may be found, to be in any way defective. Notice shall be given to the Owner of any defective or imperfect material. Defective or unfit material found to have been laid shall be removed and replaced by the Contractor with sound and unobjectionable material without additional expense to the Owner.

b. All materials furnished by the Contractor are subject to thorough inspections and tests by the Owner.

c. The Contractor shall submit samples as required by the Owner of the various materials used in the Contract for testing purposes.

d. All ordering lists shall be submitted by the Contractor to the Owner for approval and shall be approved before the ordering of the materials.

ARTICLE 22 - CONTRACTOR'S OFFICE: The Contractor shall maintain during the performance of this Contract, an office at the site of the work at which the Contractor or its authorized agent shall be present at all times while the work is in progress. The Contractor shall be responsible for equipping its office at the work with all office facilities which may be required. Instructions from the Owner left at this office shall be considered as delivered to the Contractor. Copies of the Contract, Drawings, and Specifications shall be kept at said office ready for use at any time. The obtaining of a suitable site for the location of the office shall be the responsibility of the Contractor; however, the location and site shall be subject to approval of the Owner; all costs in connection with the obtaining and use of a suitable office site shall be the responsibility of the Contractor.

ARTICLE 23 - SANITARY REGULATIONS:

a. Adequate sanitary conveniences for use of workers on the premises, properly secluded from public observation, shall be provided and maintained by the Contractor in accordance with requirements of local and State health authorities and in such manner and at such points as shall be approved, and their use shall be strictly enforced. Sanitary waste shall be treated and disposed of in a manner satisfactory to and as directed by the Owner and the local and State health authorities; under no circumstances shall sanitary wastes be allowed to flow on the surface of the ground.

b. The Contractor shall rigorously prohibit the committing of nuisances by persons connected with the work upon the lanes or right- of-way of the Owner, about the work, or upon adjacent public or private property.

c. The cost of the sanitary conveniences and maintenance of same will not be paid for separately, but compensation will be considered to be included in the prices stipulated for the appropriate items of work as listed in the Bid.

ARTICLE 24 - SPIRITUOUS LIQUORS: The Contractor shall neither permit nor suffer the introduction or use of spirituous liquors upon the work embraced in this Contract.

ARTICLE 25 - FINISHING AND CLEANING UP: In completing the backfilling of the trenches, the Contractor shall replace all surface material to the satisfaction of the Owner, and shall then immediately remove all surplus material, and all tools and other property belonging to him, leaving the entire street or surroundings free and clean and in good order at no additional expense to the Owner. The backfilling and removing of surplus materials shall follow closely upon the completion of the work. The Contractor shall exercise special care in keeping right-of-way and private and public lands, upon which work is to be performed, clean and free of debris at all times and to remove tools and other property belonging to the Contractor when they are not being used.

ARTICLE 26 - CLEAN-UP AT CONTRACTOR'S EXPENSE: In case the Contractor shall fail or neglect, after backfilling, to promptly remove all surplus materials, tools and other incidentals, or promptly do the required repaving when ordered, the Owner may after 24 hours notice, cause the work to be done, and the cost thereof shall be deducted from any monies then or thereafter due the Contractor.

ARTICLE 27 - RIGHTS OF ACCESS: Nothing herein contained or shown on the Drawings shall be construed as giving the Contractor exclusive occupancy of the work areas involved. The Owner or any other contractor employed by the Contractor, the various utilities companies, contractor or subcontractor employed by the Federal, State or local governmental agencies or other utility firms or agencies involved in the general project or upon public rights-of-way, may enter upon or cross the areas of work or occupy portions of it as directed or permitted. When the territory of one contract is the convenient means of access to the other, each contractor shall arrange its work in such manner as to permit such access to the other and prevent unnecessary delay to the work as a whole.

ARTICLE 28 - EXISTING UTILITIES OR CONNECTIONS:

a. The location of existing underground pipes, cables, conduits and structures as shown has been collected from the best available sources and the Owner together with its agents does not imply or guarantee the data and information in connection with underground pipes, cables, conduits, structures and such other parts as to their completeness nor their locations as indicated. The Contractor shall contact utility owners and request marking location of all their lines in the work areas. The Contractor shall assume that there are existing water, gas, and other utility connections to each and every building enroute, whether they appear on the Drawings or not. Any expense and/or delay occasioned by these utilities and structures or damage thereto, including those not shown, shall be the responsibility of the Contractor at no additional expense to the Owner. See General Notes on Contract Drawings.

b. Before proceeding with construction operations at any location, the Contractor shall make such supplemental investigations, including test pits, as it deems necessary and approved by the Owner to uncover and determine the exact location of utilities, structures, or other conditions, and the Contractor shall have no claims for damages due to encountering subsurface structures, utilities, or other conditions. The Contractor shall also have no claims for damages due to encountering subsurface structures, utilities or other conditions which are made known to the Contractor prior to construction operations.

ARTICLE 29 - COMPLETENESS OF WORK: In addition to the specified or described portions of work, all other work and all other materials, equipment and labor of whatever description which are necessary or required to complete the work, or for carrying out the full intent of the Drawings and Specifications, as interpreted by the Owner, shall be provided by the Contractor, and payment therefore shall be considered as having been included in the prices stipulated for the appropriate items of work as listed in the Bid.

ARTICLE 30 - PLANK CROSSINGS: As required or directed by the Owner, the Contractor shall install in selected locations suitable plank, steel plate or timber crossings substantially built and reinforced to sustain vehicular traffic across trench or other excavations. Crossings shall be constructed with wide and usable approaches for use by the traveling public, private property owners, or emergency equipment. No separate payment will be made for this work but the cost shall be included in the price the Bid. (See Article 17).

ARTICLE 31 - CLEANING FINISHED WORK: After the work is completed, the sewers, drains, manholes, catchbasins, and other structures shall be carefully cleaned free of dirt, broken masonry, mortar, construction and other debris and left in first class condition ready for use. All temporary or excess material shall be legally disposed of and the work left broom-clean to the satisfaction of the Owner.

ARTICLE 32 - DUST CONTROL: The Contractor shall exercise every precaution and means to prevent and control dust arising out of all construction operations from becoming a nuisance to abutting property owners or surrounding neighborhoods. Pavements adjoining the excavation or pipe trenches shall be kept broomed off and washed clean. The Contractor will be responsible for street sweeping within the areas of work delineated by the Contract Documents. Earth stockpiles along trenches when permitted, stockpiles, and surfaces of refilled trenches shall be kept moist at all times, as directed. No extra payment will be made for providing the dust control conforming to the requirements specified above, but compensation therefore shall be considered to be included in the prices stipulated for the appropriate items of work as listed in the Bid.

ARTICLE 33 - CARE OF THE WORK: The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all material delivered and work performed until completion and final acceptance, whether or not the same has been covered by partial payments made by the Owner.

ARTICLE 34 - INDEMNIFICATION:

a. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Engineer and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (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 the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article 34.

b. In any and all claims against the Owner, the Engineer or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Article 34 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 35 - CONSTRUCTION SCHEDULE: In addition to other requirements specified, the Contractor shall confer with the Owner for the purpose of drafting a construction schedule satisfactory to the Owner which is to include all the work of this Contract. The Contractor shall perform the work of this Contract to conform to the construction schedule as approved by the Owner, except that the Owner reserves the right to amend and alter the construction schedule as approved at any time in a manner which it deems to be in the best interest of the Owner so to do. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling. The CPM schedule and all reports should be prepared with Primavera P6, Release 8.2 software in accordance with Specification Section 01311. The Contractor shall arrange its work under this Contract to conform with the construction schedule as it may be revised from time to time by the Owner at no additional expense to the Owner. The Contractor shall notify the Owner immediately of any circumstances which affect the performance of the work in accordance with the current construction schedule.

ARTICLE 36 - WORK BY OTHERS: The Owner reserves the right to do any other work which may connect with or become a part of, or be adjacent to the work embraced by this Contract at any time by contract work or otherwise. The Contractor shall not interfere with or obstruct in any way the work of such other persons as the Owner may employ, and shall execute its own work in such manner as to aid the executing of work by others as may be required. No backfilling of trenches or excavations will be permitted until such work by the Owner is completed.

ARTICLE 37 - FIRE PREVENTION AND PROTECTION:

a. All State and municipal rules and regulations with respect to fire prevention, fire-resistant construction, and fire protection shall be strictly adhered to, and all work and facilities necessary therefore shall be provided and maintained by the Contractor in an approved manner at no expense to the Owner.

b. All fire protection equipment such as water tanks, hoses, pumps, extinguishers, and other materials and apparatus, shall be provided for the protection of the contract work, temporary work and adjacent property. Trained personnel experienced in the operation of all fire protection equipment and apparatus shall be available on the sites whenever work is in progress and at such other times as may be necessary for the safety of the public and the work at no expense to the Owner.

ARTICLE 38 - RECORD DRAWINGS:

a. The Contractor shall maintain to the satisfaction of the Engineer at the site a set of Drawings on which shall be recorded accurately as the work progresses, the actual "as built" locations and dimensions of all his work, indicating thereon all variations from the Contract Drawings. This record of "as built" conditions shall include the work of all subcontractors, and any discrepancies found in the course of the work between actual locations of existing utility lines and structures and the locations shown on the Drawings, details at test pits and all excavations that reveal existing detail, connections to existing structures and lines and their construction and conditions, buildings, services, vacant lots, etc., and shall be available at all times for inspection by the Engineer. Progress sets of "as built" drawings shall be reviewed at construction progress meetings.

b. The Contractor shall submit monthly progress red line Record Drawing updates with each Pay Application. Progress Record Drawing red lines shall show daily progress of all construction and the information required as indicated above. Pay Applications which do not have a set of Progress Record Drawing red lines attached will not be processed until which time as the Progress Record Drawing red lines have been received by the Owner and Engineer and have been approved for completeness.

c. Prior to final acceptance of the work, all recorded data as gathered above shall be submitted to the Owner by the Contractor. The final record drawings will be prepared by the Owner with the information provided by the Contractor as specified above.

d. The survey data shall be obtained by Global Positioning Survey (GPS) and certified by a Professional Land Surveyor registered in the Commonwealth of Massachusetts.

e. No separate payment will be made for this work, but compensation therefor shall be considered as having been included in the prices stipulated for the appropriate items of work as listed in the Bid.

ARTICLE 39 - CONSTRUCTION STAGING: Construction staging areas will be limited to only those areas approved by the Owner.

ARTICLE 40 - STREETS TO BE KEPT OPEN-ADDITIONAL REQUIREMENTS: Minimum requirements for keeping streets within the project areas open shall be as follows:

The Contractor shall submit for approval by the Owner, proposed traffic management and pedestrian safety plans in conformance with the requirements set forth in Section 01570 of the technical specifications. Construction will not be allowed to proceed until approval of the Contractor's proposed traffic control and pedestrian safety plans unless otherwise directed by the Owner. The Contractor shall secure and pay for all permits, fees, and bonds in connection with his operations. All streets shall be open to traffic and abutters at all times during construction of this contract. Requests by the Contractor to close or to provide one-way traffic flow in a street shall be submitted by the Contractor to the Owner a minimum of five (5) working days in advance of the Contractor's proposed construction operations affecting the street. The request for approval shall include the contractor's proposed traffic control plan and schedule. Submission of incomplete or deficient planning and schedules shall result in denial of the request. Delays or costs incurred by Contractor for failure to comply with the requirements set forth herein will be borne by the Contractor at no cost to the City. The Contractor shall furnish, provide, erect, and maintain all signs, necessary barricades, suitable and sufficient red lights, lights, reflectorized signs or signals and danger signals in accordance with Article 10 of the Special Conditions, and Section 01570 of the Technical Specifications. The Contractor shall arrange for sufficient number of police and watchpersons and take all necessary precautions for the protection of the work, control of traffic and safety of the public.

ARTICLE 41 - WORK WITHIN THE LIMITS OF PRIVATE PROPERTY:

a. Particular attention is hereby directed to the fact that some of the work included under this Contract will be done within the limits of properties that are state-owned and privately-owned. The Owner has, or will, secure the necessary limited temporary or permanent easements for construction purposes. The Contractor will be permitted to use the areas of the Owner's easements subject to all conditions and requirements applicable to the use of said easements, including restoration of grassed and landscaped areas, fences, etc., which are disturbed. The Contractor shall be responsible for determining at all times all conditions and requirements as they may affect the Contractor's operations and the work of this Contract and shall conduct its operations and activities in the performance of the work under this Contract in accordance with all such conditions and requirements and such additional requirements as may be required by the Owner. All other means and rights of ingress and egress to the work areas and all other areas required for work space, in addition to the said Owner's easements, shall be the entire responsibility of the Contractor. All costs in connection therewith shall be considered to be included in the prices stipulated for the appropriate items of work as listed in the bid. The Contractor shall neither use nor occupy public or private lands outside the

limits of the Owner's easements and rights-of-way unless permits in writing have first been obtained by the Contractor from the owners of the public and/or private land and copies of such permits filed with the Owner. The Contractor shall be responsible for cooperating with state and private property owners and for the coordination and prosecution of the work of this Contract. Any abuse to lands of state or private owners shall be immediately corrected by the Contractor at its expense to the complete satisfaction of the owners, and such precautionary or preventive measures as required by the Owner shall be taken or made to prevent further additional nuisances, interference or inconvenience to the abutting owners.

b. It shall be the Contractor's full responsibility to familiarize itself with the limitations imposed on the work of construction within the various properties of state or private ownership and rights-of-way by the existing occupancy or use. To this end, the Contractor shall be required to make every effort to fully and satisfactorily protect trees, shrubs, lawns, gardens, fences, walks, driveways, yards or structures; protect all work by the erection or placing of safety guards or barriers, lights and such other incidentals; and where required, the Contractor shall construct temporary plank crossings, steel plates or timbers to permit full use of private facilities at all times at no additional expense to the Owner. All other applicable provisions for control of work within the areas of public travel set forth elsewhere herein shall also apply to work within the limits of private ownership.

c. The Contractor shall cooperate with state and private property owners and shall also contact the Owner for additional information regarding the requested (or required) length of time needed as a notice to be given to the state and private property owners before the Contractor enters the state or privately owned property in order to start the construction work. In some cases, a certain time to start the work and a certain limited length of time may be permitted by the state and private property owners for any required shutdowns or construction operations so the work of the Contractor will not interfere with the private operations of the state or private property owners.

d. Before proceeding with construction operations, the Contractor shall provide suitable and substantial gates or other approved forms of wire gap in every existing fence within the limits of the Owner's easements and through which the Contractor intends to move or pass equipment and materials. It shall be the responsibility of the Contractor to determine with the owner of each fence all requirements, in addition to those specified above, relating to the construction of gates or other forms of wire gap; conditions to be observed in their use and for the rebuilding of fences. It shall be the responsibility of the Contractor to comply with all requirements as specified herein and as determined with the owners of the fences. Any damage to fences as a result of the Contractor's operations shall be made good by the Contractor in a manner satisfactory to the Owner.

e. No separate payment will be made for the requirements specified under "WORK WITHIN THE LIMITS OF PRIVATE PROPERTY," and all costs in connection therewith shall be included in the price of the Bid.

ARTICLE 42 - DISTURBANCE OF BOUNDS: The Contractor shall replace all bounds disturbed by his operation at his own expense. The bounds shall be reset by a land surveyor registered in the Commonwealth of Massachusetts.

ARTICLE 43 - ARCHAEOLOGICAL FINDS DURING CONSTRUCTION AND RELATED ACTIVITIES: During the life of this Contract the Contractor is herewith required to immediately notify the following organizations in the event that any articles such as "fire cracked stones," "stone flaking material," or any other such related items of historical significance are discovered.

- a. City Engineer
- b. State Archaeologist of Massachusetts

c. Resident Engineer or Inspector

ARTICLE 44 - NOT USED

ARTICLE 45 - PROSECUTION OF THE WORK-SUPPLEMENTAL REQUIREMENTS: The Contractor shall establish liaison with other contractors working in adjacent areas under other construction programs to assure that their work is closely coordinated with his work to prevent any delay in the overall program.

ARTICLE 46 - EQUIPMENT RESTRICTIONS: The sizes of equipment to be used for the construction will be restricted in certain areas, where larger equipment could cause damage to sidewalks and curbs on narrow streets, or to trees adjacent to the work and tree limbs overhanging the work. The Contractor shall submit the sizes of equipment he proposes to use on each street to the Owner for approval.

ARTICLE 47 - CONTRACTOR RECORDS: The Contractor shall comply with all applicable provisions of M.G.L., Chapter 30, Section 39R relative to Contractor's Records. 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 Contract. A complete copy of Section 39R shall be available for review at Engineer's office.

ARTICLE 48 - CONTRACT DRAWINGS: The work shall conform to the Contract Drawings, titled Endicott Street Area Drainage Improvements Project – Contract No. 1, all of which form a part of these specifications.

ARTICLE 49 - PIPE TESTING: All sewer pipe shall be tested in accordance with the Contract documents and sound engineering practice. If, after 60 days following submission of a monthly payment estimate for pipe items, the pipe for which payment is requested has not been successfully tested, the owner may withhold up to 10% of the amount requested for such pipe items until the pipe has been so tested. However, in the case of a major (pipe diameter 24 inches or greater) interceptor pipe installation, sums retained by the owner pursuant to this policy memorandum shall not exceed two per centum (2%) of the costs of such pipe items.

ARTICLE 50 - EXCAVATIONS IN PUBLIC WAYS: See Notice Requirements relative to excavations in public ways (Chapter 353 of the Acts of 1983) inserted at the end of these Special Conditions.

ARTICLE 51 - LEAKAGE TESTS:

a. The sewers and appurtenant structures connected thereto shall be made as nearly watertight as practicable. Where practical, as determined by the Owner, leakage tests will be performed for the new sewers and sewer manholes. Leakage into or from the sewers and structures will be determined by infiltration tests, exfiltration tests, or Low Pressure Air Acceptance tests as specified herein and as directed. The maximum allowable amount of infiltration into the sewers or exfiltration from the sewers, as determined respectively by the infiltration or exfiltration tests, including manholes, shall be at a rate of not greater than 125 gallons per inch of pipe diameter per mile of pipes per 24 hours, and there shall be no gushing or spurting streams of water into or from the sewers or manholes. The phrase "per mile of pipes" shall refer to the total length of sewers measured through manholes. Where the groundwater level can be maintained at a height of not less than one foot above the top of the pipe for the full length of the section of sewer pipe being tested for leakage, the leakage into the sewers and manholes shall be determined as specified under "Infiltration Tests." When the ground water cannot be maintained at a level of not less than one foot above the top of the pipe for the full length of the section of sewer being tested, the leakage from the sewers and manholes shall be determined as specified under "Exfiltration Tests."

b. Infiltration Tests. The tests shall be conducted at such times as the groundwater level is at a height of not less than one foot above the top of the pipe for the full length of the section of sewer being tested.

The groundwater leakage into the pipes will be measured by the Owner at such point or points as he may direct. The Contractor shall construct such weirs or other means of measurement as shall be required and shall do such pumping as shall be necessary to enable the tests to be satisfactorily made.

c. Exfiltration Tests. Where exfiltration tests are required, the section of the sewer to be tested shall be subjected to an internal pressure. The lower end of the section of sewer to be tested shall be closed and the entire section of the sewer, including manholes, shall be filled with clean water so as to obtain a minimum head of 2 feet above the top of the pipes; the length of the section of sewer pipeline being tested shall be such that with the head of water 2 feet above the top of pipe at the upper end of the section of pipeline being tested, the pipeline being tested will not exceed 8 feet. The rate of leakage from each section of the sewers being tested will be determined by the Owner by measuring the amount of water required to maintain the minimum head of 2 feet above the top of the pipes for the full length of each section of the sewers being tested.

d. Low Pressure Air Acceptance Test. The Contractor may perform the leakage tests using the low pressure air test where approved by the Owner. This test shall conform to Uni-Bell Plastic Pipe Association recommended practice, UNI-6, latest revision, for all PVC pipes and to the additional requirements listed herein.

1. The pipeline shall be considered acceptable if the time interval for the 1.0 psi pressure drop is not less than the holding time as calculated in accordance with UNI-6, latest revision.

e. Testing as described above cannot readily be performed on many sewers due to the presence of existing building service connections which could offset test results or surcharge during testing, resulting in basement flooding. Testing of such sewers will be limited, as determined by the Owner, to physical inspection of the pipe sections from adjacent manholes or closed circuit television inspection. Any defective pipe, joints, or other construction shall be replaced or repaired by the Contractor at no additional expense to the Owner.

f. The Contractor shall do all the work, provide all necessary weirs, gauges, or such other measuring devices as required, do all pumping and furnish all labor, equipment and materials necessary for the proper performance of leakage tests at no additional expense to the Owner. Leakage tests shall not be performed in Owner's absence.

g. Should the leakage test on any section of the sewers, including manholes, show a rate of leakage into or from the sewers exceeding the maximum allowable rate specified herein, the Contractor shall locate and repair or replace defective joints or pipe and work in a manner satisfactory to the Owner, and retest at no additional expense to the Owner until the rate of leakage from each section or joint of the sewers being tested does not exceed the rate specified herein.

h. When hydrants are used with the consent of the City, the Cambridge Water System shall be protected with backflow prevention devices per Massachusetts Department of Environmental Protection (DEP) Regulation 310 CMR 22.22 and the Cambridge Water Department Cross Connection Control Program. This includes, but is not limited to, street sweepers, sewer flushing and paving equipment, and hookups for any purpose.

ARTICLE 52 - TEST REPORTS, CERTIFICATES OF COMPLIANCE AND SHIPPING LISTS:

In addition to other requirements specified herein, the Contractor shall furnish to the Owner the materials, manufacturers notarized test reports and methods of tests to show compliance of materials furnished with all specification requirements, and manufacturer's notarized certificates of compliance stating that all materials to be furnished under these Specifications conform with all specification requirements; each shipment of materials shall be accompanied with the manufacturer's notarized certificate of conformance and a shipping

list itemizing the amounts of each item shipped. All testing of all materials furnished under these Specifications shall be provided by the Contractor at no additional expense to the Owner.

ARTICLE 53 -SERVICES OF MANUFACTURER'S REPRESENTATIVES: The Contractor shall furnish, at no additional expense to the Owner, the services of materials and manufacturer's representatives for such lengths of time as may be necessary to properly instruct the Contractor's personnel and the Owner in the proper handling and installation of the material in accordance with the manufacturer's printed recommendation.

ARTICLE 54 - NOT USED

ARTICLE 55 - SAFETY AND HEALTH REGULATIONS: This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, 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 C.M.R. 10.00 et seq.)". Contractors shall be familiar with the requirements of these regulations and the safety requirements of the MUTCD and ADA.

ARTICLE 56 - SPECIAL PROVISIONS - The Owner reserves the right to assess special penalties if the Contractor's actions during construction result in the following situations:

- a. Closing of a traffic lane or lanes not previously permitted nor approved by the Owner or Engineer in writing prior to the commencement of work
- b. Working during hours not stipulated by permit nor approved by the Owner or Engineer in writing prior to the commencement of work.
- c. Damage to Public Shade Trees: See "City of Cambridge Department of Public Works, Division of Urban Forestry Tree Protection During Construction" which is included in ATTACHMENT-I of Section-00825A Special Conditions.

Penalties shall be assessed on a per occurrence basis at \$1000 per occurrence and shall be deducted from the progress payments due to the Contractor.

ARTICLE 57 - STATE GOVERNMENT PROVISIONS:

- a. State 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 provisions of law of clause required by law to be inserted in this Contract shall be deemed to be also inserted herein in accordance with paragraph GC-2.3.2 of the General Conditions.
- b. The OWNER and CONTRACTOR also agree that the provisions of Mass General Law Chapter 82 Section 40, which are included in ATTACHMENT II of SECTION 00825A apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract.
- c. The OWNER and CONTRACTOR also agree that the provisions of Mass General Law Chapter 149 Sections 27 and 27B relating to Minimum Wage Rates 40 apply to the work to be performed under this Contract and that these provisions supersede any conflicting provisions of this Contract. Copies of minimum wage rates established for labor categories employed on this Contract are included in SECTION 00670. A copy of the required payroll reports to be submitted to the OWNER on a weekly basis is included in SECTION 00680.

ARTICLE 58 - HOMEOWNER MEETINGS: The CONTRACTOR is required to attend at least two City meetings and twelve neighborhood meetings held during working hours, at night, or on week-ends for the purpose of informing the residents about the schedule and project and answering questions. The on-site superintendent and project manager must both attend these meetings. In addition, the CONTRACTOR is required to attend meetings with the private property owners held during working hours, at night, or on week-ends for the purpose of coordinating inflow removal work on up to 31 private properties.

ARTICLE 59 – PERMITS: The CONTRACTOR shall refer to the Technical Specifications Section 01060 for a list of all permits and regulator requirements.

ARTICLE 60 – MASSACHUSETTS GENERAL LAWS: The following Massachusetts General Laws apply to the contract. The list is not meant to be all inclusive:

- **M.G.L. c.30 s39F Payment to Subcontractor (See General Conditions 13.8.2)**
- M.G.L. c.30 s39I Deviation from Plans and Specifications (See General Conditions 11.2.1)
- M.G.L. c.30 s39J No Arbitrary Decisions are Final (See General Conditions 16.6.3)
- M.G.L. c.30 s39L Construction of Work by Foreign Corporations
- M.G.L. c.30 s39M(b) Substitution of Equal Products (See General Conditions 5.13.1)
- **M.G.L. c.30 s39N Differing Site Conditions (See General Conditions 16.4.1)**
- **M.G.L. c.30 s39O Equitable Adjustment for Delays (See General Conditions 12.3.6)**
- M.G.L. c.30 s39P Decision on Interpretation of Specifications (See General Conditions 16.6.1)
- M.G.L. c.30 s39R Contractor's Records (See Special Conditions Article 47)
- M.G.L. c.149 s34 Limitations on Hours of Work (See General Conditions 5.5.4)
- M.G.L. c.149 s44J Advertising Invitations to Bid
- M.G.L. c.82 s40 Excavations; Notices; Penalties

ARTICLE 61 – MWRA REQUIREMENTS: The following MWRA requirements apply to the contract

1. The City of Cambridge agrees to routinely apprise the Massachusetts Water Resources Authority of the progress of the Project and to make the Project site and all Project records available to the MWRA for review during the course of the Project in order to enable the MWRA to routinely monitor the progress of the work. The Contractor shall cooperate with the City and the MWRA in this regard.
2. The City of Cambridge, its Consultants and its Contractors shall maintain books, records and other documents that pertain to and involve transactions related to the Financial Assistance Agreement (FAA) and Memorandum of Understanding (MOU) between the Massachusetts Water Resources Authority and the City of Cambridge. These documents shall be maintained in accordance with generally accepted professional practice and generally accepted accounting principles. The City, its Consultants and its Contractors shall also maintain the financial information and data used by the City its, its Consultants and its Contractors in the preparation or support of all invoices and progress reports. MWRA and any other duly authorized person shall have access to such books, records, documents, and other evidence of inspection, audit, and copying during normal business hours, at MWRA's expense and upon reasonable notice to the City. The City, its Consultants and its Contractors shall provide proper facilities for such access and inspection. All documents shall be kept for at least seven (7) years after either the final payment to the Consultant and/or Contractor or closeout of the Projects, whichever is later.
3. The Massachusetts Water Resources Authority shall be named as an additional insured on the policies providing coverage for general liability, automobile liability, and valuable paper

END OF SECTION 00825A - SPECIAL CONDITIONS

(ATTACHMENTS I, II, III, IV, V TO SECTION 00825A FOLLOWS)

Attachment I

City of Cambridge Department of Public Works Division of Urban Forestry Tree Protection During Construction

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CITY OF CAMBRIDGE DEPARTMENT OF PUBLIC WORKS DIVISION OF
URBAN FORESTRY

TREE PROTECTION DURING CONSTRUCTION

Public trees are protected by Massachusetts State Law Chapter 87. Section 12 states that a fine of up to five hundred dollars per incident of damage to public shade trees can be levied. Each branch broken or improperly pruned, each improper wounding of the trunks of trees and each root improperly pruned shall constitute an infraction.

During all construction projects, the utmost care shall be taken by the contractor to avoid unauthorized, unnecessary or improper wounding of public or private shade trees. Prior to construction, the contractor shall provide a tree protection plan and work schedule. A Massachusetts or International Certified Arborist shall be sub-contracted by the contractor to provide a protection plan and perform specified work. *All plans and schedules shall be subject to review and approval by the City Tree Warden.* Infraction of Massachusetts State Law Chapter 87 or failure to provide protection plan and work schedule will result in fines or the immediate cancellation of the contract.

Pre-construction tree protection measures shall include the following:

1. Wrapping the trunks of trees of a diameter at breast height (dbh) of 6" or greater with a durable material such as two by four lumber sufficient to protect tree trunks from mechanical damage. Removal of protective wrapping shall be done by the contractor after construction is complete.
2. The proper pruning (raise pruning) of low branches to a height no greater than fourteen feet above the roadway and eight feet above the sidewalk. This includes trees endangered by traffic re-routing as the result of construction operations.
3. Traffic control plans shall be designed in such a way as to direct traffic away from tree trunks and branches.
4. Tunneling shall be the preferred method of excavation adjacent to tree roots to avoid root pruning. If root pruning is unavoidable, certified personnel shall execute the operation with sufficiently sharpened hand tools and in such a fashion as to have minimum negative impact on tree health and safety.
5. Trucks and heavy equipment shall not pass over or park on roots of public shade trees. A protection zone shall be established by erecting a ridged fence outside the perimeter of the dripline of the tree. For occasional or one time access over roots, ½" plywood overlapped may be used. Permeable materials such as gravel or wood chips shall be placed over root systems of trees which are not covered by hardscape and over which trucks and heavy equipment must travel during

construction operations, when such travel is unavoidable, to prevent soil compaction and root damage. Material shall be replaced as needed.

6. All tree protection measures and operations shall be subject to review, approval or change by the City Tree Warden.

Attachment II

General Laws of Massachusetts – Part I – Title XIV Public Ways and Works – Chapter 82 – Section 40

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GENERAL LAWS OF MASSACHUSETTS

PART I.

TITLE XIV. PUBLIC WAYS AND WORKS

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

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.

Chapter 82: Section 40A Excavations; notice

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

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

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

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

Section 40B. Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as

required by this section; provided, however, that in the event that the excavator has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible.

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

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

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

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

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

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

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

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

Section 40E. Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined \$500 for the first offense and not less than \$1,000 nor more than \$5,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state

or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property.

Attachment III
Ordinance Number 1329 (Dumpster Licenses)

ORDINANCE NUMBER 1329

Final Publication Number 3203. First Publication in the Chronicle on July 30, 2009.

City of Cambridge

In the Year Two Thousand and Nine

AN ORDINANCE

In amendment to the Ordinance entitled “Municipal Code of the City of Cambridge”

Be it ordained by the City Council of Cambridge, as follows:

Cambridge Municipal Code is hereby amended by adding a new chapter 8.25 entitled Dumpster Licenses:

CHAPTER 8.25

DUMPSTER LICENSES

Sections:

Section 8.25.010 Purpose.

Because the unregulated maintenance and operation of dumpsters, including construction site dumpsters presents a threat to the public health, safety, environment, and general welfare, no person, business, or any other entity shall operate, keep, store, or maintain a Dumpster or Temporary Dumpster (defined below) without first obtaining the Dumpster License required by this chapter, and shall maintain said Dumpster in accordance with said License, this chapter, and any regulation promulgated hereunder.

Section 8.25.020 Definitions.

As used in this chapter, the following words and phrases shall have the meanings given in the following clauses. Where words and phrases are not defined in the following clauses, such words and phrases shall have their ordinarily accepted meanings such as the context implies.

A. “Dumpster” shall mean any container, receptacle, compactor unit, trailer, roll-off, or similar unit with or without wheels that is used for temporary storage, containment, or transport of refuse, debris, trash, garbage, food waste, solid waste, recyclable material, incidental demolition debris, or other discarded or like materials. It shall not apply to ordinary household trash cans of a volume of 50 gallons or less, recycling receptacles of 96 gallons or less, to plastic bags storing these materials in compliance with the regulations of the City of Cambridge, or to

solid waste disposal trucks operated by a company duly licensed by the City of Cambridge License Commission or used or operated by the City of Cambridge.

B. “Temporary Dumpster” shall mean a Dumpster that is used in connection with construction, demolition, fairs or for similar temporary needs, the Dumpster License for which shall be issued for a period not to exceed 30 days, renewable for additional 30 day periods upon application, not to exceed a total period of twelve months.

C. “Lot” shall mean a parcel of land in identical ownership throughout, bounded by other lots or by streets, which is designated by its owner to be used, developed or built upon as a unit, to which a Dumpster serves for waste disposal.

D. “Dumpster License” (also referred to hereafter as “License”) shall mean the License required by this chapter and issued by the Inspectional Services Department upon satisfactory review of the Dumpster License Application and Dumpster Plan.

E. “Dumpster Plan” shall mean an operational and maintenance plan for each Dumpster governed by this chapter. The Dumpster Plan shall also include all information included in the Dumpster License Application (defined in 8.25.040 below).

F. “Responsible Party” shall mean the owner or other person using the Dumpster with an interest in any part or parts of the Lot upon which the Dumpster is used, maintained or stored, any tenant upon the Lot, the property manager for the Lot, and/or any other users of a Dumpster on the Lot.

Section 8.25.030 Applicability.

The Dumpster Ordinance shall apply to all existing and future Dumpsters located within the City.

Section 8.25.040 Dumpster License.

A. License Required. No Dumpster, including a Temporary Dumpster, shall be used, without first obtaining a License from the Commissioner of Inspectional Services, but not including a Dumpster used for one day special events permitted by the City of Cambridge. If a Dumpster is to be located upon a public way, then a permit from the City of Cambridge Traffic, Parking and Transportation Department must also be obtained. If the Commissioner of Inspectional Services determines that a submitted Dumpster License Application is accurate and adequate to keep the site free from debris, refuse, trash, solid waste or like material that is injurious to the public health, safety, and environment, the Commissioner may issue a License for the establishment or Dumpster. Performance of the activities scheduled in the Dumpster Plan shall be a condition of the License and nonperformance of the activities scheduled in the Dumpster Plan shall be a violation of the License and conditions of this chapter.

B. Contents of License Application. A complete Application (also referred to hereafter as “Application”) consists of a completed Application form and a Dumpster Plan attached thereto. The Dumpster License Application form shall be in a form approved by the Commissioner of Inspectional Services. It shall be the responsibility of all Responsible Parties to submit and sign the Application and to take possession of and be jointly responsible for the License. In the event that a Responsible Party terminates use of the Dumpster, then the owner of the Lot shall be required to obtain a new License with any new Responsible Party. All Responsible Parties shall agree to follow the Dumpster Plan, and be jointly and severally liable with the owner of the Lot, and indemnify the City of Cambridge for any damages caused by non-compliance with the duties contained in this ordinance.

C. Dumpster Plan. A Dumpster Plan shall, at a minimum, include the following information, or other information as required by the Inspectional Services Department:

1. The address of the Lot on which the Dumpster is located;
2. The name, address, and telephone number of the owner of the Lot;
3. The name, address, and telephone number of the tenant operator(s) of the establishment(s) located on the Lot which will use the Dumpster;
4. The type of establishment(s) located on the Lot which will use the Dumpster and nature of its (or their) business;
5. A description of how employees or residents are notified about the proper use of a Dumpster and copy of all written materials given to employees or residents;
6. A plot plan accurately depicting the Lot;
7. The location of any Dumpster and associated fencing or screening on the Lot, and the location of the Dumpster in relation to all abutting property;
8. A weekly schedule detailing the times and days of the week for cleaning the Dumpster and Lot, and maintaining the Lot free of windblown litter and refuse;
9. The name of the owner of the Lot or Responsible Party or designee responsible for overseeing the cleaning and maintenance of the Lot;
10. The name, address, contact name, and telephone number of the waste hauling company responsible for servicing the establishment or Dumpster; and the name, address, contact name, and telephone number of the person or entity signing the contract with the waste hauling company;
11. The date, time, and frequency of service by the waste hauling company including proof of recycling and anticipated volume of refuse and recycling based on the previous year's invoices, if applicable;
12. Any and all permits and/or Licenses issued by the Massachusetts Department of Environmental Protection relating to the management, storage, and disposal of solid wastes and hazardous materials and hazardous wastes generated, stored, or disposed on the Lot;
13. Any and all permits and/or Licenses issued by the Cambridge Fire Department, the Inspectional Services Department, the Department of Public Works or other relevant City or governmental agencies;
14. The name, address, and phone number of the pest control company servicing the establishment or Dumpster;
15. Any other information required by the Inspectional Services Department to ensure that the Lot is maintained in a sanitary condition free of debris, refuse, trash, solid waste or like material that is injurious to the public health, safety, and environment; and
16. A copy of the contract with the waste hauling company responsible for servicing the Dumpster.

Section 8.25.050 Dumpster License Fee.

The fee for the License shall be one hundred (\$100.00) dollars. The License shall be applied for annually.

Section 8.25.060 Term of License.

The term of each License shall be one (1) year, except that a License for a Temporary Dumpster shall be for a period not to exceed 30 days, renewable for additional 30 day periods, not to exceed a total period of twelve months. Annually on a date set by the Commissioner of Inspectional Services or designee, all persons who operate or maintain Dumpsters shall file, renew, or amend a Dumpster Plan and obtain a new License.

Section 8.25.070 Location Requirements.

All Dumpsters shall be located at a distance from the Lot line, as approved by the Inspectional Services Department, so as not to interfere with the safety, convenience, or health of abutters, residents, and the public. All Dumpsters shall be placed so that any liquid or runoff from the Dumpster shall not enter any catch basins or storm drains. All Dumpsters shall be placed so as not to interfere with the physical integrity of the curb, sidewalk, and public parking. The location of all Dumpsters shall also be subject to approval by the Cambridge Fire Department and a City of Cambridge Traffic, Parking and Transportation Permit is required for any dumpster to be placed upon a public way.

Section 8.25.080 Container Requirements.

All Dumpsters shall be in new or good condition free of damage caused by wear or misuse that would allow leaks or access by rodents. All Dumpsters shall be covered and secured at all times except when being filled or emptied. Temporary Dumpsters shall be covered when not in use (including overnight) at a minimum with a tight-fitting tarp. All Dumpsters shall be deodorized and washed on a regular schedule. The Commissioner of Inspectional Services, or designee, may require more frequent cleaning, if necessary. If rodent activity or other site hygiene issues are prevalent, the Commissioner of Inspectional Services may require additional design/containment requirements utilizing best available technology.

Section 8.25.090 Screening/Fencing Requirements.

All Dumpsters governed by this ordinance shall be screened or fenced off from view from public ways, sidewalks, and adjoining properties at all sites other than construction sites, unless requirements are waived by the Commissioner of Inspectional Services.

Section 8.25.100 Posting Requirements.

The Dumpster Plan and License shall be posted in a visible location on the Lot or establishment thereon, accessible to an inspector on the premises. All Dumpsters shall display a clearly visible decal or stencil showing the name and telephone numbers of the company/contractor servicing the Dumpster.

Section 8.25.110 Other Requirements.

It is the responsibility of the owner of the Lot and/or Responsible Party to ensure that all other approvals, licenses and permits required by the City of Cambridge and Commonwealth of Massachusetts have been obtained, including but not limited to the mandatory recycling provisions of Chapter 8.24 of the Cambridge Municipal Code. The Dumpster License shall be

applicable only to the owner or tenants or establishments licensed to use the Dumpster and only to the Lot to which the Dumpster serves, and no trash or other items from any other Lots, properties, buildings or other sources may be placed in or transferred to the Dumpster in question. The issuance of this License shall under no circumstances be construed as a waiver from any other license or permit required. It is the responsibility of the owner of the Lot and/or Responsible Party to take appropriate action to immediately cause the Dumpster to be emptied of its contents when full. It is the responsibility of the owner of the Lot and/or Responsible Party to maintain the area free of odors, debris, litter, overflow, and all other nuisances including pests.

Section 8.25.120 Inspections.

A. Authority. In order to properly carry out their respective responsibilities under this Ordinance, and to ensure that the public health, safety and environment are protected from the hazards posed by unsanitary and unhealthy conditions, the Inspectional Services Department is authorized to examine and/or survey at any reasonable time all establishments and Dumpsters licensed hereunder.

B. Systematic Area Inspections. The Inspectional Services Department is authorized to develop and adopt plans and regulations for systematic, periodic area-wide inspections of Dumpsters and establishments required to obtain a License.

C. Interference with Inspection. If any owner, occupant, or other person refuses, impedes, inhibits, interferes with, restricts, or obstructs entry and free access to the Lot, operation, or premises where inspection is authorized by this chapter, the Inspectional Services Department may seek in a court of competent jurisdiction an inspection warrant that allows for the inspection of the Lot and appraises the owner of the Lot and/or Responsible Party concerning the nature of the inspection, the scope of the inspection, and justification for it and may seek the assistance of the Police Department in presenting said warrant.

Section 8.25.130 Violation.

A. The operation or maintenance of any Dumpster governed by this chapter without a License; the failure to operate or maintain the same in accordance with a validly issued License; the interference with an inspection, including inspections conducted pursuant to a validly issued inspection warrant; and/or any other violations of the terms of this ordinance, shall constitute a violation and a citation shall be issued by the Commissioner of Inspectional Services or designee. Each day during which a violation exists shall constitute a separate offense, including but not limited to any days in which the Commissioner of Inspectional Services or designee is forced to obtain and/or exercise an inspection warrant.

B. Notice of violation shall be sent or hand delivered to the offender, the owner of the Lot or Responsible Party at the Lot or establishment thereon, to their last known address, or to addresses listed on the Dumpster Plan. Any violation herein shall be considered a municipal charge as described in G.L. c. 40, §57.

Section 8.25.140 Administrative Hearings.

A. Right to Hearing. Any person upon whom a notice of violation has been served may request a hearing from the Inspectional Services Department by filing a written petition requesting a hearing on the matter with the Inspectional Services Department within seven days after the day the notice of violation was sent or hand delivered.

B. Hearing Notice. Upon receipt of a petition, the Inspectional Services Department shall inform the petitioner of the date, time, and place of the hearing in writing.

C. Time for Hearing. The hearing shall commence within thirty days after the day on which the notice of violation was served. The time period in which the cited violations must be remedied shall be stayed upon receipt of the petition for a hearing until such time as the hearing is held.

D. Hearing of Petitioner. At the hearing, the petitioner shall be given an opportunity to be heard, to present witnesses or documentary evidence, and to show why the notice of violation should be modified or withdrawn. Failure to hold a hearing within the time period specified herein shall not affect the validity of any notice of violation.

E. Final Decision after Hearing; Failure to Comply with Final Order.

1. Within seven (7) days after the conclusion of the hearing, the Inspectional Services Department shall sustain, modify, or withdraw the notice of violation and shall inform the petitioner in writing of its decision and the reasons therefor. If the Department sustains or modifies the notice of violation, said violation shall be remedied within the time period allotted in the original notice of violation or in the modification.

2. If a written petition for a hearing is not filed with the Inspectional Services Department within seven (7) days after the notice of violation has been served, or if after a hearing the notice of violation has been sustained in full or in any part, each day's failure to comply with the notice of violation within the time allotted as issued or modified shall constitute an additional offense, including any days prior to the filing of a written petition, and any days subsequent to the issuance of the written decision by the Commissioner of Inspectional Services, or a designee.

Section 8.25.150 Penalties.

A. Failure to Obtain License. If an owner of a Lot or Responsible Party stores or maintains a Dumpster without first obtaining a License, the Commissioner of Inspectional Services may issue a violation pursuant to the process described in Section 8.25.130, not to exceed three hundred dollars. Each day during which a violation exists shall constitute a separate offense. The Commissioner of Inspectional Services may also seek an injunction from a court of competent jurisdiction prohibiting the operation of the establishment or Dumpster until a License is secured.

B. Failure to Comply With Terms of License. If a Licensee fails to comply with the terms of a License, the Commissioner of Inspectional Services may issue a violation pursuant to the process described in Section 8.25.030, not to exceed three hundred dollars. Each day during which a violation exists shall constitute a separate offense. The Commissioner of Inspectional Services may also suspend the License, after an administrative hearing, and seek an injunction from a court of competent jurisdiction prohibiting the operation of the establishment or Dumpster until the Licensee proves to the court its compliance with the License. If a Licensee fails to comply with the terms of the License three (3) times in the preceding twelve (12) month period, the Commissioner of Inspectional Services or a designee may suspend, cancel, or revoke the License after an administrative hearing. In the event of suspension or cancellation of the License, other municipal agencies issuing licenses and permits will be so notified.

C. Failure to Comply with Notice of Violation. Any person who fails to comply with any notice of violation or other order issued pursuant to this chapter by the Inspectional Services Department, or duly appointed agents or representatives, shall be issued a violation pursuant to the process described in Section 8.25.130, not to exceed three hundred dollars. Each day during which a violation exists shall constitute a separate offense.

D. Interference After Inspection Warrant Presented. Any owner of a Lot or Responsible Party who refuses, impedes, inhibits, interferes with, restricts or obstructs entry and free access to every part of the structure, site, operation or premises where inspection is sought under this chapter after an inspection warrant has been obtained and presented in accordance with Section 8.25.120, shall be issued a violation pursuant to the process described in Section 8.25.130, not to exceed three hundred dollars. Each day during which a violation exists shall constitute a separate offense.

E. Fines. All fines and penalties assessed and collected under this chapter may be enforced pursuant to G.L. c. 40, Section 21D.

Section 8.25.160 Severability.

If any section provided for under this chapter shall be declared invalid for any reason whatsoever, that decision shall not affect any other portion of this chapter, which shall remain in full force and effect; and to this end the provisions of this chapter are hereby declared severable.

Section 8.25.170 Regulatory Authority.

The Commissioner of Inspectional Services shall have the authority to promulgate rules and regulations necessary to enforce this chapter.

Section 8.25.180 Delegation of Authority.

The Commissioner of Inspectional Services may delegate enforcement of this Chapter to any City department authorized to enforce public safety, health, or environmental laws and regulations, including but not limited to any enforcement officer with the Department of Public Works, the Traffic, Parking, and Transportation Department, the License Commission, or the Police Department.

Section 8.25.190 Effective Date.

This chapter shall take effect January 1, 2010.

In City Council September 14, 2009.

Passed to be ordained as amended by a yeas and nays vote:-

Yeas 9; Nays 0; Absent 0.

Attest:- D. Margaret Drury, City Clerk.

A true copy;

ATTEST:-

D. Margaret Drury
City Clerk

Attachment IV

**SPECIAL PROVISIONS FOR DISADVANTAGED
BUSINESS ENTERPRISES
MASSACHUSETTS DEPARTMENT OF
ENVIRONMENTAL PROTECTION
DIVISION OF MUNICIPAL SERVICES**

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DISADVANTAGED BUSINESS ENTERPRISE PROGRAM BACKGROUND

In May 2008 a new United States Environmental Protection Agency (EPA) rule became effective that changed the Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) Program to a Disadvantaged Business Enterprise (DBE) Program.

For firms to qualify under the old MBE/WBE program they needed to be socially disadvantaged and had to be certified by the State Office of Minority and Women Business Assistance (SOMWBA), recently renamed the Supplier Diversity Office (SDO). Under the new DBE rule, the firms must be both **socially** and **economically** disadvantaged, citizens of the United States, and certified as a DBE. Women and certain minorities are presumed to be socially disadvantaged. The economic disadvantage is measured by the owner's initial and continuing personal net worth of less than \$1,320,000.

Because the Clean Water Act requires the use of MBEs and WBEs, these firms will still be utilized in the State Revolving Fund (SRF) Loan Program, but they must also be certified as DBEs.

SDO (formerly SOWMBA) will continue to be the certifying agency for the SRF program.

BID SPECIFICATIONS

I. In this contract, the percentage of business activity to be performed by disadvantaged business enterprise(s) (DBE) shall not be less than the following percentages of the total contract price or the percentage submitted by the contractor in the Schedule of Participation, whichever is greater:

Disadvantaged MBE (D/MBWE) <u>3.40%</u>	Disadvantaged WBE (D/WBE)
<u>3.80%</u>	

II. DEFINITIONS

For the purpose of these provisions, the following terms are defined as follows:

- A. Awarding Authority – Entity that awards a prime contract under a State Revolving Fund loan.
- B. Bidder - Any individual, partnership, joint venture, corporation, or firm submitting a price, directly or through an authorized representative, for the purpose of performing construction or construction related activities under a Contract.
- C. Certified DBE – A DBE certified by the United States Small Business Administration, under its 8(a) Business Development Program (13 CFR part 124, subpart A) or its Small Disadvantaged Business Program (13 CFR part 124, subpart B); The United States Department of Transportation (DOT), under its regulations for Participation by DBEs in DOT programs (49 CFR parts 23 and 26); or SDO in accordance with 40 CFR part 33; provided that the certification meets the U.S. citizenship requirement under 40 CFR §33.202 or §33.203.
- D. Compliance Unit - A subdivision of MassDEP’s Affirmative Action Office designated to ensure compliance under these provisions.
- E. Contractor - Any business that contracts or subcontracts for construction, demolition, renovation, survey, or maintenance work in the various classifications customarily used in work and that is acting in this capacity under the subject contract.
- F. Construction Related Services - Those services performed at the work site ancillary to, and/or in support of, the construction work, such as hauling, trucking, equipment operation, surveying or other technical services, etc. For the purposes hereof, supply and delivery of materials (e.g. pre-cast concrete elements) to the site by a supplier who has manufactured those goods, or substantially altered them before re-sales shall be considered as “construction related services
- G. Construction Work - The activities at the work site, or labor and use of materials in the performance of constructing, reconstructing, erecting, demolishing, altering, installing, disassembling, excavating, etc, all or part of the work required by the Contract Documents.
- H. Disadvantaged Business Enterprise (DBE) - An entity owned or controlled by a socially and economically disadvantaged individual as described by Public Law 102-389 (42 U.S.C. 4370d) or an entity owned and controlled by a

socially and economically disadvantaged individual as described by Title X of the Clean Air Act Amendments of 1990 (42 U.S.C. 7601 note); a Small Business Enterprise (SBE); a Small Business in a Rural Area (SBRA); or a Labor Surplus Area Firm (LAF), a Historically Underutilized Business (HUB) Zone Small Business Concern, or a concern under a successor program.

- I. Equipment Rental Firm - A firm that owns equipment and assumes actual and contractual responsibility for renting said equipment to perform a useful function of the work of the contract consistent with normal industry practice
- J. Good Faith Efforts – The race and/or gender neutral measures described in 40 CFR 33, subpart C.
- K. HUBZone - A historically underutilized business zone, which is an area located within one or more qualified census tracts, qualified metropolitan counties, or lands within the external boundaries of an Indian reservation.
- L. HUBZone small business concern - A small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.
- M. Joint Venture - An agreement between SDO certified DBE and a non-DBE or non-DBE controlled enterprise.
 - 1. A pairing of companies will be considered a DBE joint venture if the SDO certified DBE which is part of the relationship has more than 51% of the profits that are derived from that project.
 - 2. A joint venture between a certified DBE subcontractor and a non DBE subcontractor, in which the DBE for that proportion of the joint venture's contract equal to the DBE participation in the joint venture.
 - 3. Whenever a general bid is filed by a joint venture with a certified DBE participant in the joint venture that does not exercise more than 51% control over management and profits, that joint venture shall be entitled to credit as a DBE for that portion of the joint venture's contract equal to the DBE participation in the joint venture. Minority As deemed by SDO.
- N. Labor surplus area firm (LSAF) - A concern that together with its first-tier subcontractors will perform substantially in labor surplus areas (as identified by the Department of Labor in accordance with 20 CFR part 654). Performance is substantially in labor surplus areas if the costs incurred under the contract on account of manufacturing, production or performance of appropriate services in labor surplus areas exceed 50 percent of the contract price.
- O. Letter of Intent – Certified document signed by the principal(s) of the DBE with respect to the work to be performed under contract.

- P. Local Government Unit (LGU) – A city, town, or municipal district which applies for a loan under the Water Pollution Abatement Trust Program.
- Q. Material Supplier – A vendor certified by SDO as a DBE in sales to supply industry from an established place of business or source of supply, and that vendor.
1. Manufactures goods from raw materials, or substantially utilizes them in the work, or substantially alters them before resale, entitling the general contractor to DBE credit for 100% of the purchase order.
 2. Provides and maintains a storage facility for materials utilized in the work, entitling the general contractor to DBE credit for 10% of the purchase order
- R. Minority and Women Business Enterprise (M/WBE) – Any business concern certified by the SDO as a bona-fide M/WBE. A bona-fide M/WBE is a business whose minority group/women ownership interests are real, which have at least 51% ownership and control over management and operation.
- S. Percent of Total Price – Is the percentage to be paid to the DBE, work they perform, as compared to the total bid price
- T. Recipient - An agency, person or political subdivision which has been awarded or received financial assistance by the Trust or MassDEP.
- U. Small business, small business concern or small business enterprise (SBE) - A concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR part 121.
- V. Small business in a rural area (SBRA) - A small business operating in an area identified as a rural county with a code 6-9 in the Rural-Urban continuum Classification Code developed by the United States Department of Agriculture in 1980.
- W. SDO – The Supplier Diversity Office.
- X. Subcontractor – A company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an award of financial assistance.
- Y. Total Contract Price – The total amount of compensation to be paid for all materials, work or services rendered in the performance of the contract
- Z. Trust – The Massachusetts Water Pollution Abatement Trust established by M.G.L. c.29.

III. REQUIREMENTS FOR CONTRACT AWARD

DBE packages must be submitted by the bidders on the project. Bidders, including a bidder who is a MBE, WBE or DBE, shall submit the following information:

- A. A Schedule of Participation (Form EEO-DEP-190). The Schedule of Participation shall list those certified DBEs the bidder intends to use in fulfilling the contract obligations, the nature of the work to be performed by each certified DBE subcontractor and the total price they are to be paid.
 - 1. A listing of bona-fide services such as a professional, technical, consultant or managerial services, assistance in the procurement of essential personnel, facilities, equipment, materials, or supplies required for performance of the contract, and reasonable fees or commissions charged.
 - 2. A listing of haulers, truckers, or delivery services, not the contractors, including reasonable fees for delivery of said materials or supplies to be included on the project.
- A. A Letter of Intent (Form EEO-DEP-191) for each DBE the bidder intends to use on the project. The Letter of Intent shall include, among other things, a reasonable description of the work the certified DBE is proposing to perform and the prices the certified DBE proposes to charge for the work. A Letter of Intent shall be jointly signed by the certified DBE and the General Contractor who proposes to use them in the performance of the Contract.
- B. The SDO "DBE Certification" as prepared by each certified DBE.
- C. A completed Request for Waiver form and backup documentation should the goals not be achieved (See IV below).

IV. REQUIREMENTS FOR MODIFICATION OR WAIVERS.

The bidder shall make every possible effort to meet the minimum requirements of certified DBE participation. If the percentage of DBE participation submitted by the bidder on its Schedule of Participation (EEO-DEP-190) does not meet the minimum requirements, the bid may be rejected by the Awarding Authority and found not to be eligible for award of the contract.

In the event that the bidder is unable to meet the minimum requirements of DBE participation, the bidder shall submit with his/her submittal required in Section III. Requirement of Contract Award a Request for Waiver form (EEO-DEP-490). The Awarding Authority shall review the waiver request to determine if the request should proceed. If approved by the Awarding Authority, the Awarding Authority shall submit the waiver request and supporting documentation, with a

recommendation to MassDEP within five days of receipt of the Request for Waiver. MassDEP in conjunction with the project manager, Compliance Unit, will determine whether the waiver will be granted.

The waiver request shall include detailed information as specified below to establish that the bidder has made a good faith effort to comply with the minimum requirements of DBE participation specified in Part I. In addition, the bidder must show that such efforts were undertaken well in advance of the time set for opening of bids to allow adequate response. A waiver request shall include the following:

- A. A detailed record of the effort made to contact and negotiate with the certified DBE, including, but not limited to:
 - 1. names, addresses and telephone numbers of all such companies contacted;
 - 2. copies of written notices(s) which were sent to certified DBE potential subcontractors, prior to bid opening;
 - 3. a detailed statement as to why each subcontractor contacted (i) was not willing to do the job or (ii) was not qualified to perform the work as solicited; and
 - 4. in the case(s) where a negotiated price could not be reached the bidder should detail what efforts were made to reach an agreement on a competitive price;
 - 5. copies of advertisements, dated not less than ten (10) days prior to bid opening, as appearing in general publications, trade-oriented publications, and applicable minority/ women-focused media detailing the opportunities for participation.
- B. MassDEP may require the bidder to produce such additional information as it deems appropriate.
- C. No later than fifteen (15) days after MassDEP receives all required information and documentation, it shall make a decision in writing, whether the waiver is granted and shall provide that determination to the bidder and Awarding Authority. If the waiver request is denied, the facts upon which a denial is based will be set forth in writing. If the waiver request is denied, the bid shall be rejected by the Awarding Authority, or the contract will be determined ineligible for SRF funding.

If a Request for Waiver is denied by MassDEP and the bid is rejected by the Awarding Authority, the Awarding Authority may then move to the second bidder on the project. At the Awarding Authority's discretion, it may collect a DBE package from the third bidder on the project.

V. DISADVANTAGED BUSINESS ENTERPRISES PARTICIPATION

A. Reporting Requirements

1. The Contractor's utilization of certified DBEs will be documented based upon submittal of the LGU's monthly Payment Requisitions as reported on Form-2000. The Form-2000 form will show all certified DBEs performing work on the project regardless of any billing activity for that month. For auditing and accounting purposes, the Contractor periodically may be required to submit copies of canceled checks verifying that payments have been made to the certified DBE as listed on the schedule. The Contractor may also be required to submit current schedules on utilization of all DBEs to indicate when their services will commence and be billed for.
2. During the life of the Contract, the Contractor's fulfillment of the percentage requirements in Part I shall be determined with reference to the Contract price as follows:
 - A. If the price in the Contract executed exceeds the base bid price (e.g., because an alternate was selected or because unit prices were used in awarding the Contract), the Contractor shall submit for approval by MassDEP a revised Schedule of Participation by certified DBEs satisfying the percentage requirements and such other information concerning additional DBE participation as may be requested by MassDEP.
 - B. If the Contract price increases after execution due to change orders or other adjustments, MassDEP may require the Contractor to subcontract additional work or to purchase additional goods and services from certified DBEs up to the percentages stated in Part I.

VI. COMPLIANCE

- A. If the Schedule or any of the Letters of Intent are materially incomplete or not submitted in a timely manner, the LGU may rescind its vote of award; treat the bid informal as to substance and reject the bid. If the bid is incomplete in any other respect than the Schedule the LGU with the approval of MassDEP may waive the informalities upon satisfactory completion of the required information by the Contractor and the certified DBE as applicable.

- B. If the LGU finds that the percentage of certified DBE participation submitted by the contractor on its Schedule does not meet the percentage requirement in Part I, it shall rescind its vote of award and find such contractor not to be eligible for award of the contract.
- C. The Contractor shall not perform with its own organization, or subcontract to any other primary or subcontractor any work designated for the named certified DBEs on the schedule submitted by the Contractor under Part III without the approval of MassDEP.
- D. A Contractor's compliance with the percentage requirement in Part I shall continue to be determined by reference to the required percentage of the total contract price as stated in Section I even though the total of actual contract payments may be greater or less than the bid price.
- E. If the Contractor for reasons beyond its control cannot comply with Part III in accordance with the Schedule submitted under Part III, Section B, the contractor must submit to MassDEP as soon as they are aware of the deficiency, the reason for its inability to comply. Proposed revisions to the Schedule stating how the contractor intends to meet its obligations under these conditions must be submitted within ten (10) working days of notification.
- F. If the Contractor becomes aware by any means that that DBE is no longer certified, the Contractor shall immediately notify MassDEP. The Contractor shall use good faith efforts to retain a substitute certified DBE.
- G. If a certified DBE listed by the bidder in its Schedule of M/WBE contractors fails to obtain a performance or payment bond requested by the bidder, said failure shall not entitle the bidder to avoid the requirements of Part III (A). After a bidder has been awarded the contract, he shall not change the certified DBE listed in its Schedule at the time of the award or make any other such substitutions without the written approval of MassDEP.

VII. SANCTIONS

- A. If the Contractor does not comply with the terms of these Special Provisions, the Awarding Authority may (1) suspend any payment for the work that should have been performed by a certified DBE pursuant to the schedule, or (2) require specific performance of the Contractor's obligation by requiring the Contractor to subcontract with a DBE for any contract or specialty item at the contract price established for that item in the proposal submitted by the Contractor.
- B. To the extent that the Contractor has not complied with the terms of these Special Provisions, the Awarding Authority may retain in connection with

Estimates and Payments an amount determined by multiplying the bid price of this contract by the percentage in Section I, less the amount paid to DBE's for work performed under the contract and any payments already suspended under VII A.

- C. The Awarding Authority may suspend, terminate or cancel this contract, in whole or in part, or may call upon the Contractor's surety to perform all terms and conditions in the contract, unless the contractor is able to demonstrate his compliance with the terms of these Special Provisions, and further deny to the Contractor, the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.
- D. In any proceeding involving the imposition of sanctions by the Awarding Authority, no sanctions shall be imposed if the Awarding Authority finds that the contractor has taken every possible measure to comply with these Special Provisions or that some other justifiable reason exists for waiving these Special Provisions in whole or in part.
- E. The contract shall provide such information as is necessary in the judgment of the Awarding Authority to ascertain its compliance with the terms of these Special Provisions.
- F. A contractor shall have the right to request suspension of any sanctions imposed under this section upon demonstrating that he is in compliance with these Special Provisions.

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Attachment V

Massachusetts Diesel Retrofit Program

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DIESEL RETROFIT PROGRAM

The Department of Environmental Protection (“DEP”) has developed the Diesel Retrofit Program in response to increasing public health concerns with the emissions from diesel engines and vehicles.

Diesel Construction Equipment Standard

All diesel powered non-road construction equipment and vehicles greater than 50 brake horsepower which will be used in the performance of the work under the Contract (hereinafter “Diesel Construction Equipment”) must have the following pollution control device installed unless exempt as provided below:

1. Emission control technology verified by U.S. Environmental Protection Agency (“EPA”) or the California Air Resources Board (“CARB”) for use with non-road engines;
2. Emission control technology verified by EPA or CARB for use with on-road engines provided that such equipment is operated with diesel fuel that has no more than 15 parts per million sulfur content (i.e. Ultra Low Sulfur Diesel fuel); or
3. Emission control technology certified by the manufacturer that such technology meets or exceeds the emission reductions provided by on-road or off-road emission control technology verified by EPA or CARB, i.e. that a Diesel Oxidation Catalyst is achieving the following minimum emission reductions: particulate matter 20%; carbon monoxide 40%; volatile organic compounds 50%; or a Diesel Particulate Filter is achieving a minimum of 85% emission reductions for particulate matter.

Emission control devices, such as oxidation catalysts or particulate filters, shall be installed on the exhaust system side of the Diesel Construction Equipment. The Contractor shall be responsible to insure that the emissions control technology is operated, maintained, and serviced as recommended by the manufacturer.

For the latest up-to-date list of EPA verified-technologies, see:

<http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm>

For the latest up-to-date list of CARB verified technologies, see:

<http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/vt.htm>

Exemptions

The following Diesel Construction Equipment shall be exempt from the standard above. The Contractor shall include such Diesel Construction Equipment in the required recordkeeping:

1. Diesel Construction Equipment not owned by the Contractor and used in the performance of the work under this Contract for 30 calendar days (cumulative days but not necessarily consecutive) or less;
2. Unless otherwise exempt, additional Diesel Construction Equipment originally not anticipated to be used under the Contract or used as permanent replacement after the work under the Contract has commenced, for 15 calendar days from the date such Diesel Construction Equipment is brought on site;

3. Diesel Construction Equipment with an engine that meets the EPA particulate matter (PM) Tier emission standards in effect at the start of the Contract for non-road diesel engines for the applicable engine power group_(e.g., as of January 1, 2009, a piece of Diesel Construction Equipment with a Tier 3 engine is exempt from meeting the standard until the piece of Diesel Construction Equipment is available with a Tier 4 engine) provided that if such emissions standards are superseded during the Contract then such Diesel Construction Equipment must be retrofitted in accordance with the standards above prior to the end of the Contract;
4. A large crane (e.g. a sky crane or link belt crane which is responsible for critical lift operations) if such device would adversely affect the operation of the crane provided the Contractor submits to the municipality's project engineer written technical justification documenting the adverse impact on operation; and
5. Diesel Construction Equipment that the project engineer has determined is necessary to control a compelling emergency including but not limited to, the need for rescue vehicles or other equipment to prevent harm to human beings or additional equipment required to address a catastrophic emergency such as structure collapse or imminent collapse. After the compelling emergency is controlled, such non-compliant equipment must be removed from the Contract site and may not be used in further performance of the work under this Contract. Meeting Contract deadlines is not a compelling emergency.

Contractor Certification

Each bidder shall submit as part of its bid, the Statement of Intent to Comply. Within 10 days of being notified that it has been awarded a contract, the bidder and each of its Contractors and Subcontractors shall submit a Diesel Retrofit Program Contractor Certification. Each such Certification shall contain the following information for each piece of Diesel Construction Equipment:

1. Contractor or Subcontractor name;
2. Equipment type, make, model;
3. Vehicle Identification Number or VIN;
4. Engine model and year of manufacture;
5. Engine HP rating;
6. Emission Control Device (ECD) type (Diesel Oxidation Catalyst or Diesel Particulate Filter);
7. ECD make, model, and manufacturer;
8. ECD EPA or CARB Verification Number or manufacturer's certification that the DOC or DPF meets or exceeds emission reductions provided by similar emission control technology verified by EPA or CARB;
9. ECD installation date;
10. Type of fuel to be used; and
11. Whether the equipment is owned or rented.

Recordkeeping

Each Contractor and Subcontractor shall maintain detailed records of all Diesel Construction Equipment used under the Contract, including the dates and duration times the Diesel Construction Equipment is used at the Contract site. Records shall be available for

inspection by DEP. Each Contractor and Subcontractor shall notify DEP within 48 hours of any new Diesel Construction Equipment brought onto the Contract site.

For Diesel Construction Equipment that has an emissions control device with a manufacturer's certification, the Contractor shall maintain records of all supporting emissions test data and test procedures. If upon review the emissions reductions are not supported by the test data and test procedures, then the emissions control device may need to be replaced with a compliant retrofit device.

The City shall require each Contractor and Subcontractor to submit the Diesel Retrofit Program Contractor Certification to DEP and the City prior to commencing work on the Project. The City shall not allow any Contractor or Subcontractor to commence work at the Project site prior to submitting such Certification.

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Attachment VI

Excerpts from Massachusetts General Laws

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NOTICE: - This is NOT the official version of the Massachusetts General Laws (MGL). While reasonable efforts have been made to assure the accuracy of the data provided, do not rely on this information without first checking an official edition of the MGL.

If you are in need of legal advice or counsel, consult an attorney.

MASSACHUSETTS GENERAL LAWS

(Updated to July 12, 2013)

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

Chapter 30: Section 38A Price adjustment clause

Contracts for road, bridge, water, and sewer projects awarded as a result of a proposal or invitation for bids under chapter 7C, section 11C of Chapter 25A, section 39M of this chapter and sections 44A to 44H, inclusive, of chapter 149 shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. 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 provided for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent.

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

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

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

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

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials

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

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

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

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

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

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

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

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

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

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

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part

(iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction.

CHAPTER 30. 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 willfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

**CHAPTER 30. 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 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.

**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.

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.

**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.

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.

**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.

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

**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).

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This project is part of a phased program by the City of Cambridge in cooperation with the MWRRA to improve water quality in the Little River and Alewife Brook and to protect the Fresh Pond Reservoir by reducing the activation and frequency of Combined Sewer Overflows through the sewer separation and improved stormwater management in northwest Cambridge. This project is needed to reduce the severity and frequency of combined sewer surcharging and flooding in the Fresh Pond Parkway area. The project area includes Concord Ave between Fresh Pond Parkway and Huron Avenue, Alpine Street and Chilton St between Vassal Lane and Field Street, Fayerweather Street between Saville Street and Field Street, Birch Street, Fern Street, Baystate Road, Field Street, Corporal Burns Road, Hazel Street, Ivy Street, Copley Street, Garden Street between Field Street and Walden Street, Saville Street between Fayerweather Street and Walden Street, Walden Street between Concord Ave and Garden Street, and some work within existing structures at the Concord Ave rotary.

The major components of work under Milestone 1- Concord Ave Neighborhood Sewer Separation and Stormwater Management Subsurface Infrastructure Work (see below) to be performed include, but are not limited to the following:

- A. Sewer separation and stormwater components of the work for Concord Ave Neighborhood (Contract 9) include, but are not limited to, the separation of approximately 25,000-lf of combined sewer in the CAM004 tributary area by replacement, rehabilitation, or addition of (Reinforced Concrete Pipe) RCP, (Polyvinyl Chloride) PVC, and (Ductile Iron) storm and sewer pipe between the sizes of 8-inches in diameter to 48-inches in diameter and associated manholes; replacement and addition of approximately 113 catch basins with hoods and 6-foot sumps; the removal of illicit service and inflow connections; and private inflow removal work for 31 of the buildings within the project area, and coordination with gas, electric, telecom, MBTA, and water companies for relocations and support of existing infrastructure during construction necessary to complete this work.
- B. Upon completion of sewer separation in the Concord project area, a weir and hydroslide at the intersection of Concord Ave and Birch Street shall be abandoned under Milestone 1.

- C. This sewer separation project is the last phase of the CAM 004 system. The Huron A (8A) Sewer Separation and Huron B (8B) Sewer Separation Projects are ongoing. Upon completion of the ongoing Huron A and Huron B Contract sewer separation efforts, weir and hydrosides at Lexington Ave near Worthington Street and Lakeview Ave near Fresh Pond Parkway require removal under the Concord Ave Milestone 1.
- D. At the completion of the Huron A, Huron B, and Concord Contract sewer separation efforts, modifications to the Bending Weir Structure, modifications to Drain Vault 5, and abandonment of an MWRA sewer located at the Fresh Pond Rotary and on Wheeler Street shall be completed under Milestone 1.

The major components of work under Milestone 2- Concord Ave Neighborhood Subsurface Non-Sewer Separation and Non-Stormwater Management Related Subsurface Infrastructure and Concord Ave Neighborhood Surface Work to be performed include, but are not limited to the following:

- A. Additional utility enhancements including the replacement and rehabilitation of approximately 9,700-lf of water main ranging in sizes between 6-inches and 20-inches in diameter and replacement of related fittings, valves, hydrants, and services, where these mains and appurtenances were not already replaced due to conflicts with the work in Milestone 1.
- B. Surface restoration components of work for Concord Ave Neighborhood (Contract 9) include, but are not limited to, roadway restoration of approximately 13,500-lf of roadway and sidewalks conforming to the latest MA AAB and ADA rules and regulations; full depth roadway construction; asphalt excavation by cold planer; pavement overlay; granite curbing; concrete sidewalk reconstruction; the installation of curb extensions and raised crosswalks for pedestrian safety and traffic calming; the installation of a raised multi-use path on Fern Street and other bicycle facility improvements within the project area; art coordination on Fern Street; relocation and consolidation of bus stop locations along Concord Ave; installation of a new park entrance to Danehy Park at the intersection of Garden Street and Hazel Street; and traffic signal upgrades at the intersections of Concord Ave and Alpine Street, Concord Ave and Walden Street, Concord Ave and Huron Ave, and Walden Street and Garden Street.
- C. Water quality system enhancements include, but are not limited to, the installation of approximately 4,900-lf of porous pavement and a 6-inch PVC underdrain along the gutter of roadways; installation of planting areas throughout the project area and one biobasin, at the intersection of Field Street and Fayerweather Street; and the installation of approximately 100 additional street trees with tree pits and trees on private property.
- A. A general description of the Work to be performed under this Contract shall include, but will not be limited to the following construction operations:

1. Coordination with public and private utilities for the relocation of their facilities as may be required.
2. Relocation, rehabilitation, and replacement of existing water mains.
3. Installation of (Reinforced Concrete Pipe) RCP, (Polyvinyl Chloride) PVC, and (Ductile Iron) DI storm drains with related manholes; installation of PVC sewer with related manholes; and the replacement of the existing water mains with DI water mains with related hydrants and valves.
4. Installation of full length and segmented cured-in-place pipelining.
5. Removal and relocation of existing sewer, drain and water services which are in direct elevation or alignment conflict with the Work of this Contract or which may interfere with the installation of that work as approved by the Owner and Engineer.
6. Installation of diversion structure on Concord Ave for future drainage.
7. Demolition and abandonment of existing structures and pipes.
8. Disposal of excess geotechnically, analytically, and logistically unsuitable excavated material and modification and re-use of existing piles.
9. Vibration monitoring and installation of structure, ground, and utility monitoring points.
10. Reuse geotechnically and analytically suitable excavated material on site as backfill and dispose of excess material from excavation not required for fill or backfill as specified, and to the satisfaction of the Owner.
11. Remove and Reset or furnish and install new granite curb; cold planing and overlay paving; trench pavement restoration; and installation of new cement concrete and brick sidewalks, driveways, and cement concrete wheelchair ramps conforming to the latest MA AAB rules and regulations and to the latest ADA standards for accessible design.
12. Installation of porous asphalt parking lanes with an underdrain system.
13. Installation of a biobasin, planting areas, and street trees.
14. Full-depth roadway reconstruction and cold plane and overlay.
15. Removal of concrete roadway subbase and rails.

16. Traffic signal upgrades and reconstructions.
 17. Installation of pavement markings.
 18. Installation of new street signs.
 19. Art coordination and installation on Fern Street.
- B. The work shall conform to such additional drawings, specifications and addenda to these Specifications and Drawings as may be published or exhibited prior to the opening of Bid Proposals or as may be furnished by the Engineer from time to time during the construction.
- C. Work and materials which are necessary in the construction but which are not specifically referred to in the Specification, or shown on the Drawings, but implied by the Contract shall be furnished by the Contractor and included in the Contractor's Unit and Lump Sum Prices Bid. The work and materials shall be such as will correspond with the general character of the work as may be determined by the Engineer, whose decisions as to the necessity for and character of such work and materials shall be final and conclusive. It is the intent of these specifications to produce a complete, finished job whether shown in every detail or not.
- D. For the purposes of this Contract, anywhere the term "Temporary" is used in the Specifications, in the Plans, in Contract Addenda, in any revisions made to the Contract Documents at any time prior to or during construction, verbally, in writing, in change orders or work change directives or at any other time whether listed here or not, it shall be taken to mean "Temporary" only as it relates to the duration of the Contract. All repairs, restoration, and construction shall be considered permanent.

1.2 CONSTRUCTION SEQUENCE

Inclusion of the following sequencing restrictions does not relieve the Contractor from its responsibility to complete the Work with the specified contract duration, nor does it relieve the Contractor from its responsibility to sequence and carry out the work so as not to cause harm to the existing systems, environment, or community.

- A. Establish baseline Rodent Control
- B. Pre-construction Survey
- C. Establish baseline Sedimentation and Erosion Control and Tree Protection
- D. Establish baseline Geotechnical Instrumentation and Monitoring
- E. Mobilization

- F. Establish advance warning Traffic Management
- G. Layout of site work and survey control
- H. Establish the construction dewatering treatment system
- I. Perform Test Pits: All Test Pits identified in the Contract Drawings as well as those by the Owner and Engineer shall be performed and completed prior to any other work commencing on the site.
- J. Prior to installation of the Work the Contractor shall verify the relocation of any existing utilities that are scheduled for relocation, coordinate with the responsible utility, and relocate those utilities which are the Contractor's responsibility as per these Contract Documents.
- K. Refer to Specification Section 02510 – Hot Mix Asphalt Porous Paving for construction sequencing requirements related to the installation of porous pavement and Specification Section 01063 for additional project sequencing notes.

1.3 UNDERGROUND UTILITIES

- A. The underground utilities shown on the plans have been located primarily from information furnished by others and are considered approximate both as to size and location. There are additional utilities to be encountered that are not shown on the plans, and it shall be the Contractor's responsibility to locate all existing utilities and to protect same from damage or harm. All utilities interfered with or damaged shall be properly restored, at the expense of the Contractor, as required by Owner. Unapproved service interruptions will not be allowed. Refer to Specification Section 01200 for additional utility coordination information and requirements.

1.4 SURFACE RESTORATION

- A. Any damage to the pavement, curbing, or sidewalks outside of the limits of excavation and excavation support as defined in the Contract Documents shall be the responsibility of the Contractor and all costs associated with the repair of the excavation, sub-base, pavement, curbing, and sidewalks shall be fully borne by the Contractor. Repairs shall be immediately made by the Contractor as per the Contract Documents and as required by the Engineer.

1.5 HOURS OF WORK

- A. The hours of work shall be Monday through Friday, 7:00 a.m. – 4:00 p.m. excluding the City of Cambridge Holidays and 9:30 a.m. to 3:30 p.m. for work

on Fresh Pond Parkway and 9 AM – 3 PM for work on Concord Ave.

- B. The Contractor shall be prepared and available to work at nights for water and sewer main and service tie-ins on Concord Ave and Walden Street for businesses that require service interruption during non-working hours.
- C. During non-work hours (4:00 p.m. – 7:00 a.m. weekdays; weekends and holidays), the Contractor shall make the following provisions:
 - 1. Access to all properties shall be maintained. Work zones shall be clean, protected and safe. The Contractor shall minimize the amount of parking restrictions.
 - 2. At the end of each work day, the Contractor shall backfill and pave and/or place steel road plates over all excavations so as to maintain automobile/truck traffic, bicycle traffic, and pedestrian traffic access and flow. Under no circumstances will obstructions or open excavations be allowed during non-work hours. All parking will be given back to the community and businesses during non-work hours. Work zones shall be cleaned, protected and made safe.

1.6 CONTRACTOR USE OF PROJECT SITE

- A. The Contractor's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities and field offices.
- B. The Contractor shall determine the location(s) of the staging area(s) to be used for this project and shall obtain approval of the location(s) from the City of Cambridge prior to any mobilization activities. The Contractor shall not store equipment or materials on Concord Ave during non-working hours.
- C. The Contractor shall maintain access to street parking and driveway parking and access to all properties and businesses outside the work zone during off work hours.

1.7 LIST OF DRAWINGS

- A. The location, general characteristics, and principal details of the work are indicated on a set of drawings entitled "Concord Ave Neighborhood (Contract 9) Sewer Separation and Surface Improvements Project".
- B. The drawings stated above are the Contract Drawings, sometimes referred to herein as the "Drawings." Additional drawings showing details in accordance with which the work is to be done may be furnished from time to time by the Engineer, if found necessary, and shall then become a part of the Drawings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01010

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SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 — GENERAL

1.1 SUMMARY

- A. Payment for the items specified in the Bid Schedule shall include compensation for furnishing all labor, tools, equipment, supplies, and manufactured articles, and for all operations, and incidentals appurtenant to the items of work described, to complete the various items of the Work, all in accordance with the requirements of the Contract Documents, Drawings, Specifications, Addendum, and other modifications issued and approved by the Owner and Engineer.
- B. Payment for the items specified in the Bid Schedule shall include all costs for permits and compliance with the regulations of public agencies having jurisdiction including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA).
- C. The bid prices listed in the Bid Schedule shall include all Work items described or implied in the Contract Documents, Drawings, Specifications, Addendum, and other modifications issued and approved by the Owner and Engineer, and all other Work items necessary to manufacture, furnish, install and test a complete working project.
- D. The following items are considered “Incidental” to the completion of the Work included in this Contract. These incidental work items shall be included in the Bid Schedule prices and are not included for separate payment. The incidental work items include, but are not limited to:
 - a. Abandonment, removal and disposal of existing, abandoned or relocated private utilities not specified for payment elsewhere
 - b. Establishing and maintaining Construction Baselines and Profile Grade Lines.
 - c. Horizontal and vertical layout and staking
 - d. Dust control
 - e. Construction photographs
 - f. Attending Owner meetings, neighborhood meetings, and all other Construction meetings

- g. Submitting work plans, shop drawings, and materials samples.
- h. Construction of mock-ups and sample panels.
- i. Protection of installed materials from damage, and replacement of damaged materials as directed by the Engineer.
- j. Warrantees and Guarantees as indicated in the Contract Documents.
- k. Maintenance of plant materials as indicated in the Contract Documents.
- l. Concrete encasement of impacted utilities
- m. Street sweeping and removing snow from streets and sidewalks where work is ongoing
- n. Transporting trash and recyclables out of the work area where municipal pickup is hindered
- o. Providing certificates of design where required
- p. Submitting weekly and bi-weekly construction schedule projections and updates
- q. Fulfilling all reporting requirements
- r. Clean-up and restoration of all surface features not included for payment elsewhere.
- s. Obtain all permits including payment of fees
- t. Cast-in-Place Concrete Collars for Pipe to Pipe Connections for Pipe Smaller than 15-in Diameter
- u. Demolition and Removal of Pipe Smaller than 15-in Diameter
- v. Permanent Masonry Plugs and Bulkheads for Pipe Abandonment smaller than 15-in Diameter
- w. CDF for pipe abandonment for Pipe Smaller than 15-in Diameter
- x. Furnishing and Placing Backfill by one of the approved methods listed below:
 - 1. Reuse excavated material immediately on site at the general area of excavation.

2. Furnish and install imported suitable backfill
 3. Transport the material to a staging area, stage and protect the material, load the material, transport the material to be used as backfill at the general area of excavation or to another backfill area of equal or greater contamination, where geotechnically suitable.
- y. Furnishing, installing, compacting and testing gravel sub-base by one of the approved methods listed below:
1. Reuse excavated sub-base material immediately on site at the general area of excavation, as sub-base material
 2. Transport the material to a staging area, stage and protect the material, load the material, transport the material to be used as backfill at the general area of excavation or to another sub-base area of equal or greater contamination, where geotechnically suitable.
- z. Remove and reset all signs and sign posts, meters, trash receptacles, or any other site feature or furnishing not specifically listed for separate payment elsewhere.
- aa. Rodent Control
- bb. Pre- and Post- Construction Video
- cc. Protection of private property including walls at the back of sidewalk.
- dd. Modification, removal, and disposal of existing tree pits
- E. No separate payment shall be made for any item that is not specifically specified in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.
- F. The Contractor and Subcontractors shall not take advantage of any apparent error or omission on the Drawings or in the Specifications. The Contractor and Subcontractors shall make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents at no additional cost to the Owner.
- G. Anywhere in these Contract Documents, the term furnish shall mean manufacture; supply; delivery to the Project site including the actual unloading and unpacking; assembly; erection; placing; installation;

anchoring; applying; working to dimension; finishing; curing; protecting; cleaning; testing; start-up; and similar operations unless stated otherwise.

1.2 LUMP SUM ITEMS

- A. Payment for the lump sums shall be full compensation for all labor, materials and equipment required to furnish, install, construct, startup and test the work covered under that lump sum item, whether listed in the related Compensation subsection for each item or not. All supervision; overhead items including but not limited to bonds, insurance, and labor burden; and profit are also included.
- B. Payment shall fully compensate the Contractor for any other work which is not specified or shown, but which is necessary to complete the Work.

1.3 UNIT PRICE ITEMS

- A. Unit prices shall be full compensation for all labor, materials and equipment required to furnish, install, construct, startup and test the work covered under that unit price item, whether listed in the related Compensation subsection for each item or not. All supervision; overhead items including but not limited to bonds, insurance, and labor burden; and profit are also included.
- B. Payment shall fully compensate the Contractor for any other work which is not specified or shown, but which is necessary to complete the Work.

1.4 MEASUREMENT FOR PAYMENT

- A. Work completed to date shall be submitted by the Contractor and substantiated as required by the Engineer.
- B. The Owner and Engineer will review the submittal for completeness and verification. Failure to submit any of the below requirements will be grounds for a rejection of the submitted pay request until such time as the submittals are complete, accurate, up to date, and have been approved by the Owner and Engineer.
 - 1. Include a checklist of completed items. Only items signed-off by the Engineer will be considered for payment.
 - 2. Include red-lined "As-built" drawings indicating degree of completion, as described in Section 01400 – QUALITY CONTROL.
 - 3. Include a revised CPM schedule and narrative as required in the Specifications and showing actual record information.

4. Include a copy of all required test results including, but not limited to geotechnical and settlement monitoring results, compaction test results, concrete strength test results, grain size analysis and analytical test results.
5. Certified pay-rolls for general and all sub-contractors.
6. MBE and WBE reporting and certifications.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01025

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SECTION 01040

PROJECT COORDINATION AND MEETINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes general coordination requirements including preconstruction conference, site mobilization conference, and progress meetings.

1.2 CONTRACTOR COORDINATION

- A. Coordinate scheduling, submittals, and the Work to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate completion of the Work and clean up for Substantial Completion and for portions of Work designated for Owner's partial utilization.
- C. Coordinate access to site for correction of nonconforming Work to minimize disruption of Owner's activities where Owner is in partial utilization.
- D. Contractor to provide a full onsite project manager for the duration of the project. Refer to Specification Section 00312- Statement of Bidder's Qualifications for project manager experience requirements.

1.3 PRECONSTRUCTION CONFERENCE

- A. The Owner will schedule a preconstruction conference.
- B. Attendance Required: Owner's representatives, Engineer, Contractor, Contractor's Project Manager and Superintendent and major Subcontractors.
- C. Sample Agenda:
 - 1. Designation of personnel representing the parties in Contract and the Architect/Engineer.
 - 2. Description of the Project background, purpose, basis of design and major elements of the Work.
 - 3. Community Relations requirements
 - 4. Soil and Waste Management requirements

5. Major Geotechnical requirements such as temporary support of excavation; backfill and compaction; geotechnical instrumentation and monitoring, and dewatering.
6. Requirements and procedures for the submission of change orders and pay requisitions.
7. Requirements, procedures and processing of shop drawings and other submittals; Schedules and schedule updates; substitutions; and Requests for Information.
8. Scheduling of the Work and coordination with other contractors.
9. Review of Subcontractors
10. Continuation of City services (trash and rubbish removal, recycling, street sweeping, and snow removal).
11. Meeting requirements (Progress, Work Shops, etc.)
12. Utility coordination
13. Traffic and pedestrian management requirements
14. Other

1.4 PROGRESS MEETINGS

- A. Project meetings shall be held at a location designated by the Owner and Engineers. Meetings shall be held at weekly intervals, or more frequent intervals if required by the Owner or Engineer.
- B. The Contractor will be required to attend weekly Concord Ave Project Meetings, weekly CAM 004 coordination meetings, private inflow coordination meetings, and additional coordination or community meetings as required by the City. These meetings will include project teams from the ongoing Huron A (Contract 8A) and Huron B (Contract 8B) construction projects.
- C. Attendance Required: Job superintendent, Contractor's Project Manager, major Subcontractors and suppliers, Owner representatives, and Architect/Engineer as appropriate to agenda topics for each meeting.
- D. The Owner or Engineer or their representative will make arrangements for meetings, and record minutes.

- E. The Owner or Engineer or their representative will prepare the agenda and preside at meetings.
- F. Contractor shall provide required information and be prepared to discuss each agenda item.
- G. Sample Agenda:
 - 1. Review minutes of previous meetings
 - 2. Community Relations
 - 3. Review of work progress. Review of work completed, work on going and work scheduled within the coming month.
 - 4. Field observations, problems, and decisions
 - 5. Identification of problems which impede planned progress
 - 6. Review of submittals schedule and status of submittals
 - 7. Review of RFI and RFP status
 - 8. Proposed Change Orders (PCO), claims, credits, Work Change Directive, and change order status
 - 9. Review of off-site fabrication and delivery schedules
 - 10. Maintenance of progress schedule
 - 11. Corrective measures to regain projected schedules
 - 12. Maintenance of quality and work standards
 - 13. Effect of proposed changes on progress schedule and coordination
 - 14. Other item relating to Work

1.5 MWRA REQUIREMENTS

- A. The Contractor shall adhere to the following MWRA requirements for the duration of this contract.
 - 1. The City of Cambridge agrees to routinely apprise the Massachusetts Water Resources Authority of the progress of the Project and to make the Project site and all Project records available to the MWRA for

review during the course of the Project in order to enable the MWRA to routinely monitor the progress of the work. The Contractor shall cooperate with the City and the MWRA in this regard.

2. The City of Cambridge, its Consultants and its Contractors shall maintain books, records and other documents that pertain to and involve transactions related to the Financial Assistance Agreement (FAA) and Memorandum of Understanding (MOU) between the Massachusetts Water Resources Authority and the City of Cambridge. These documents shall be maintained in accordance with generally accepted professional practice and generally accepted accounting principles. The City, its Consultants and its Contractors shall also maintain the financial information and data used by the City, its Consultants and its Contractors in the preparation or support of all invoices and progress reports. MWRA and any other duly authorized person shall have access to such books, records, documents, and other evidence of inspection, audit, and copying during normal business hours, at MWRA's expense and upon reasonable notice to the City. The City, its Consultants and its Contractors shall provide proper facilities for such access and inspection. All documents shall be kept for at least seven (7) years after either the final payment to the Consultant and/or Contractor or closeout of the Projects, whichever is later.
3. The MBTA and the Massachusetts Water Resources Authority shall be named as an additional insured on the policies providing coverage for general liability, automobile liability, and valuable papers.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01040

SECTION 01045

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 1. Requirements of this Section do not apply to mechanical installations.

1.2 SUBMITTALS

- A. Submit proposed procedures for cutting and patching at a minimum of 4 weeks in advance of the time cutting and patching will be performed. The submittal shall contain, but not be limited to the following information:
 - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing or proposed construction; include changes to structural elements and operating components.
 - 3. List firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching is to be performed.
 - 5. List utilities, service, or performance that will be disturbed or affected and indicate how long service will be disrupted.
 - 6. Where cutting and patching involves addition of reinforcement to structural elements, submit details stamped by a Massachusetts Professional Engineer to show how reinforcement is integrated with the original structure.
- B. Review by the Engineer prior to proceeding with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of a part of the Work found to not meet the requirements of the

Contract.

1.3 QUALITY ASSURANCE

- A. Requirements for Structural and Utility Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
 - 1. Submit the cutting and patching proposal, including a structural analysis and design of additional reinforcement, stamped by a Massachusetts Professional Engineer, before cutting and patching.

- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
 - 1. Submit the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Shoring, bracing, and sheeting.
 - b. Primary operational systems and equipment.
 - c. Control systems.
 - d. Electrical wiring systems.

- C. Visual Requirements: Do not cut and patch construction exposed on the exterior, in a manner that would, in the Engineer's opinion, reduce aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work that has been cut and patched that does not meet requirements of the Contract as determined by the Engineer.
 - 1. Retain the original installer or fabricator to cut and patch or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm acceptable to the Engineer:

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use materials whose installed performance will equal or surpass that of existing materials.
- B. Where cutting and patching occurs on exposed exterior structures or work, use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with parties involved in cutting and patching, including but not limited to mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Take all precautions to avoid cutting existing pipe, conduit or duct banks that are scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 CUTTING

- A. General: Employ skilled workmen to perform cutting and patching. Complete cutting and patching without delay.
- B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- C. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible, review the proposed procedures with the original installer or manufacturer or with an installer or manufacturer with similar experience. Comply with the installer's and / or manufacturer's recommendations.
- D. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- E. Cut through concrete and masonry using a cutting machine such as carborundum saw or diamond core drill.
- F. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

3.4 PATCHING

- A. Inspect and test patched areas to demonstrate integrity of the installation.

3.5 CLEANING

- A. Thoroughly clean areas where cutting and patching is performed or used as access. Remove completely mortar, oils, reinforcing, concrete, masonry and items of similar nature. Thoroughly clean piping, conduit and similar features before finishing is applied. Restore damaged pipe to its original condition.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01045

SECTION 01060

PERMITS AND REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 REGULATORY AGENCIES

- A. The Contractor shall comply with all laws, rules, and regulations and ordinances promulgated by any authority having jurisdiction over the Work.
- B. The Contractor shall be fully responsible for obtaining and complying with all required permit(s). The Contractor shall be responsible for including all costs and fees required to obtain and comply with the permits, in the Bid. The Contractor shall ensure that all necessary permits from the Department of Public Safety, Cambridge Fire Department, Cambridge Police Department, Cambridge Electrical Department, Cambridge Water Department, Cambridge Department of Public Works, Massachusetts Water Resource Authority, Massachusetts Department of Environmental Protection, Department of Conservation and Recreation, Massachusetts Bay Transit Authority and all other regulatory agencies and/or inspectional authorities having jurisdiction are obtained and paid for by the Contractor or its subcontractor (s) as appropriate.

1.2 PERMITS OBTAINED BY THE CONTRACTOR

- A. The Contractor or its subcontractor shall be responsible for obtaining; paying for; and complying with, as part of its base Bid, all permits; licenses; certifications; and approvals required for the work of this contract. The Contractor's responsibility includes but is not limited to, all permits required for his equipment, work force, and particular operations such as transportation and storage of fuel, chemicals or other materials and air emission.
- B. At a minimum, the Cambridge Department of Public Works and Cambridge Traffic and Parking Department permits that the Contractor shall be responsible for obtaining, paying for, and complying with include, but are not limited to, the following:
 - 1. NPDES and/or MWRA Dewatering Permits
 - 2. Excavation Permit
 - 4. Street Obstruction Permit
 - 5. Sidewalk Obstruction Permit
 - 6. Street Closing Permit

7. Curb Cut Permit
 8. Traffic Management Plans including Detours
 9. Pedestrian Management Plans
 10. Water Construction Permit
 - a. The Cambridge Water Department (CWD) will not issue new water construction permits until all requirements for previous (i.e., initial CWD permit) CWD permits are met. These requirements include accurate and legible swing tie dimensions to all new water main gate valves, Tee's and elbows, required CWD "sign off's" on the contractor's copy of the CWD executed permit (when permitted work is complete), test documentation that includes Massachusetts State certified initial chlorination and bacteria testing of new water main work, and pressure test results of new water main work. The contractor is hereby advised that the CWD will not be responsible for the contractor's slip in project schedule if these requirements for permits are not followed.
 11. MWRA wastewater discharge permits for CIPP lining operations.
- C. The Contractor shall be responsible for scheduling and coordinating inspections and receipt of local, state, or federal permits/approvals/certifications for all Work as part of this Contract.
- D. The Contractor shall be responsible for obtaining, paying for and complying with DEP and City of Cambridge Backflow Prevention Permits.

1.3 PERMITS OBTAINED BY THE OWNER

- A. The Owner has obtained the Order of Conditions, MWRA 8M Permit, and DCR Permit. All other permits including construction dewatering discharge permits are the responsibility of the Contractor.
- B. The Contractor is solely responsible for the implementation of the permit requirements and shall include as such in the Bid.
- C. The Contractor is solely responsible for any punitive action resulting from any violation of the permit.
- D. Actual permits, issued by the respective agencies will be considered part of this Contract.
- E. The Contractor shall, at a minimum, include compliance with the provisions

and requirements of a typical NPDES Construction Dewatering Discharge Permit, NPDES Remediation General Permit, MWRA dewatering permit, and the typical Cambridge permits listed above. The Contractor will receive no additional compensation for compliance with any permit requirements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01060

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SECTION 01063

SEQUENCING OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies construction sequencing requirements for the following work:
1. General sequencing requirements.
 2. Work on Concord Avenue
 3. Coordination with Huron A and Huron B neighborhood streets
 4. Private Inflow Removal work on Private Property
 5. Porous Pavement Installation
 6. Coordination with Local Businesses

1.2 SUBMITTALS

- A. The Contractor or its subcontractor shall be responsible for submitting sequencing plans for the construction activities described in Section 1.1 of this section. Each plan shall describe sequence of activities required to complete work described in Section 1.1 of this Specification Section, indicate duration and schedule of work; indicate work zones and equipment used to complete work; provide traffic and pedestrian management description and plans for each activity. Contractor shall also provide any flow diversion information to the Engineer so that work can be sequenced with the adjacent construction projects.

1.3 RELATED SECTIONS

- A. Specification Section 00020 – INVITATION TO BID
- B. Specification Section 01010 – SUMMARY OF WORK
- C. Specification Section 01570 – MAINTENANCE AND PROTECTION OF TRAFFIC
- D. Specification Section 02500 – PAVING AND SURFACING
- E. Specification Section 02510 – HOT MIX ASPHALT POROUS PAVING
- F. Specification Section 02534 – BUILDING INFLOW REMOVAL

1.4 DEFINITIONS

- A. Street: A section of continuous roadway from its intersection with a major roadway (i.e. Concord Avenue, Fresh Pond Parkway, Huron Ave, Walden Street) to its intersection with a second major roadway.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 GENERAL SEQUENCING REQUIREMENTS

- A. The Contractor shall sequence the work with the following general requirements:;
 - a. Test pits indicated in the Contract Drawings or as otherwise required by the Engineer shall be performed prior to starting subsurface work on a street.
 - b. The Private Inflow removal work can proceed following the subsurface work on each street.
 - c. Surface Restoration work shall proceed following all subsurface work on each street.
 - d. When developing traffic management plans, one direction streets shall not be permitted to be reversed in traffic directions.
 - e. With the exception of Concord Ave, the Contractor has two (2) years to complete subsurface and surface work beginning on the date the Traffic Management Plan is established on a street.
 - f. Contractor shall complete a specific utility on a Street once utility work has begun on that Street before commencing work on another utility on that Street.
 - g. Contractor shall progress with surface work on a Street until substantially complete.
 - h. Contractor shall coordinate with utility companies for required relocations. Refer to U-sheets for required relocations and/or test pits required to confirm relocations.
 - i. During non-working hours, the Contractor shall not store equipment or materials on Concord Ave.
 - j. For water service and sewer connections or any other work affecting the water service provided to commercial properties, the contractor shall be prepared to complete work during off-peak hours, including night work.
 - k. Refer to the description in Milestone 1 for sequencing of removal of the hydrosides and modifications to Drain Vault 5 and the Bending Weir Structure.

3.2 GENERAL SEQUENCING REQUIREMENTS FOR WORK ON CONCORD AVE

- A. This Section specifies construction sequencing requirements for the following work:
 - a. Subsurface work on Concord Ave between Birch Street and Alpine Street shall be prioritized at the beginning of construction. Sewer main installation and replacement on Concord Ave between Birch Street and

- Alpine Street shall be completed prior to sewer and storm drain work on streets tributary to Concord Ave (between Birch Street and Alpine Street).
- b. Contractor shall maintain one lane alternating at a minimum on Concord Ave.
 - c. The 6-inch water main on Concord Ave between Birch St and Alpine Street is proposed to be abandoned and services shall be transferred to the 12-inch water main on Concord Ave. The existing corridor for the 6-inch water main is proposed for the drain and sewer work on Concord Ave. Contractor to sequence work appropriately.
 - d. For work at the intersection of Concord Ave and Huron Ave, the Contractor shall coordinate with the MBTA for shutting down of the existing overhead catenary cables prior to work.
 - e. Sewer and storm drain work on Concord Ave shall be performed starting at the west end of the street near the Rotary and progress upstream.
 - f. Contractor shall be responsible for notifying the MBTA and coordinating relocation of bus stop locations for work that affects the location of the existing bus stops.
 - g. Sewer main installation and replacement on Concord Ave between Birch Street and Alpine Street shall be completed prior to sewer and storm drain work on streets tributary to Concord Ave (between Birch Street and Alpine Street).

3.4 GENERAL SEQUENCING REQUIREMENTS FOR COORDINATION WITH HURON A AND HURON B NEIGHBORHOOD STREETS

- A. This Section specifies construction sequencing requirements for the following work:
 - a. Contractor shall keep the Engineer informed of any planned flow or traffic diversions so that work can appropriately be sequenced with other construction.
 - b. For work on Concord Ave between Walden Street and Huron Ave, the Contractor shall coordinate work with the Huron B contractor. Subsurface work shall be completed on Appleton St, Royal Ave, and Huron Ave prior to any surface restoration work on Concord Ave.
 - c. NSTAR Gas has planned relocations within the Huron B and Concord Ave project areas. Contractor to coordinate work with NSTAR Gas and any other utility companies.

3.5 GENERAL SEQUENCING REQUIREMENTS FOR WORK ON PRIVATE INFLOW REMOVAL WORK ON PRIVATE PROPERTY

- A. This Section specifies construction sequencing requirements for the following work:
 - a. Refer to Specification Section 02534 – BUILDING INFLOW REMOVAL
 - b. Contractor is required to meet with designated home owners 6 weeks prior to work on private property

- c. A Right of Entry document (ROE) – written authorization is required prior to entry of private property.

3.6 GENERAL SEQUENCING REQUIREMENTS FOR POROUS PAVEMENT INSTALLATION

A. This Section specifies construction sequencing requirements for the following work:

- a. Refer to Specification Section 02510 – HOT MIX ASPHALT POROUS PAVING
- b. Refer to Specification Section 02500 – PAVING AND SURFACING
- c. Hot Mix Asphalt Porous Pavement shall not be placed between October 31st and May 1st.
- d. Porous pavement shall be placed in 2 – 2inch layers.
- e. No traffic loading is allowed on choker course, reservoir course and filter medium cross section in the porous pavement trench.
- f. Contractor to control surface run-off water from entering the porous pavement trench.
- g. Hot mix asphalt base course shall be placed prior to the hot mix asphalt porous pavement course.
- h. Hot mix asphalt top course shall be placed prior to hot mix asphalt porous pavement course.

3.7 GENERAL SEQUENCING REQUIREMENTS FOR COORDINATION WITH LOCAL BUSINESSES

A. This Section specifies construction sequencing requirements for the following work:

- a. For water and sewer mains and service tie-ins to existing mains on Walden Street and Concord Ave, work shall be completed at night. Contractor to coordinate with local businesses to minimize shut-down durations.

3.8 GENERAL SEQUENCING REQUIREMENTS FOR CLEANING AND LINING OF 20-INCH WATER MAIN ON WALDEN STREET

A. This Section specifies construction sequencing requirements for the following work:

- a. The 20-inch water main on Walden Street between Concord Avenue and Garden Street is proposed to be cleaned and lined.
- b. Prior to any cleaning and lining activities, the Contractor shall install proposed connections to Copley Street and Fayerweather Street. The Contractor shall provide all pipe materials removed during installation of connections to the Engineer for evaluation.
- c. Cleaning and lining activities shall only occur after the Engineer and Owner have evaluated the condition of the existing water main and

determined that cleaning and lining is required.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01063

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SECTION 01070

ABBREVIATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	American Disabilities Act
AFBMA	Anti-Friction Bearing Manufacturer's Association, Inc.
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association or American Parquet Association, Inc.
API	American Petroleum Institute
APWA	American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASLE	American Society of Lubricating Engineers
ASME	American Society of Mechanical Engineers
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association

BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CABO	Council of American Building Officials
CDA	Copper Development Association
CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drill Manufacturer's Association
DCR	Department of Conservation and Recreation
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
FM	Factory Mutual System
FPL	Forest Products Laboratory
HI	Hydronics Institute
HPMA	Hardwood Plywood Manufacturers Association
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISDSI	Insulated Steel Door Systems Institute
ISA	Instrument Society of America
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
MADEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MBMA	Metal Building Manufacturer's Association
MIL	Military Standards (DoD)
MBTA	Massachusetts Bay Transit Association
MHD	Massachusetts Highway Department
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
MUTCD	Manual of Uniform Traffic Control Devices
MWRA	Massachusetts Water Resource Authority
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers

NAGDM	National Association of Garage Door Manufacturers
NB	National Board of Boiler and Pressure Vessel Inspectors (alternate NBBPVI)
NBS	National Bureau of Standards (Now NIST)
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association or National Fluid Power Association or National Forest Products Association
NISO	National Information Standards Organization
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NPDES	National Pollution Discharge Elimination
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PPI	Plastics Pipe Institute
RCRA	Resource Conservation and Recovery Act
RIS	Redwood Inspection Service
RMA	Rubber Manufacturers Association
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SDI	Steel Door Institute
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry, Inc.
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Society for Protective Coating
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
TIA	Telecommunications Industries Association
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WCRSI	Western Concrete Reinforcing Steel Institute
WEF	Water Environment Federation

WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01070

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.
- B. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.
- C. Specialists, Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of regulations governing the Work; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the Contractor.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and

Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the Work is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or furnishing labor. The Contractor shall bid for the most stringent requirements.
- D. The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- E. Applicable Standard Specifications: References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction, 1991 Edition unless otherwise stated in the specification section.
- F. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- G. References herein to "OSHA Standards" shall mean, Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- H. References herein to "MUTCD Standards" shall mean, the latest edition of the Manual for Uniform Traffic Control Devices (MUTCD) published by the US DOT, including all changes and amendments thereto.
- I. References herein to "MHD Standards" and/or "MASSDOT Standards" shall mean, the Massachusetts Highway Department Standard Specifications for Highways and Bridges, latest edition, including all changes and amendments thereto.
- J. References herein to "ADA Standards" shall mean, the Americans with Disabilities Act of 1990 including all changes and amendments thereto.
- K. ASTM: American Society for Testing Materials

- L. AASHTO: American Association of State Highway and Transportation Officials
- M ACI: American Concrete Institute
- N. Final Rule for the Accessibility Guidelines for Recreational Facilities and Outdoor Developed Areas by the Recreational Access Advisory Committee, US Architectural and Transportation Barriers Compliance Board, most recent edition, including all changes and amendments thereto.
- O. MAAB: Massachusetts Architectural Access Board, most current edition.

1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

- A. The Contractor is responsible for ensuring that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01090

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SECTION 01105

RODENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies rodent control and general pest control requirements within project areas, and bordering areas as designated by the Owner and Engineer. This work is to be performed prior to demolition, excavation, and site preparation and throughout the Contract, so that rodents and other pests do not disperse from or infest the project area.
- B. The Contractor shall develop and implement an Integrated Pest Management (IPM) approach. As part of that approach, the Contractor shall maintain a cooperative dialogue with appropriate agencies and management/representatives of neighboring properties.
- C. The Contractor shall perform the rodent control tasks described in this Scope of Work and also respond to other pest control needs when required by the Owner.

1.2 SUBMITTALS

- A. Submit to the Engineer copies of pesticide applicator certifications and licenses within ten (10) days of the start of Rodent Control activities and ten (10) days prior to their issuance or renewal for the duration of this Contract.
- B. After performing the survey described in Paragraph 3.2 below and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticides to be used, submit a copy of the pesticide manufacturer's EPA-approved pesticide label with application directions.
- C. Submit to the Engineer documentation of pest control activities and results and follows:
 - 1. Weekly - Submit data sheets with locations of sites treated, amounts and types of pesticide used, number and types of traps set, survey and inspection results, sanitation conditions, complaint calls investigated, and any problem that occurred.
 - 2. Monthly - Submit a written summary that includes determinable results of the IPM program and recommendations.

3. Quarterly - Submit a map that shows bait stations, manholes, and catch basins where rodent baits are being maintained.

1.3 QUALIFICATIONS

- A. The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Owner and Engineer.
 1. The Contractor and key personnel shall have experience with commercial and residential accounts and construction projects; have experience and technical training in vertebrate pest management and integrated pest management; have experience with various rodent control techniques, equipment, and strategies; have training and experience with insect control; and have knowledge of and experience with techniques to reduce non-target hazards.
 2. The supervisor shall be licensed and certified by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41) and Vertebrate Pest Control (category 44). The supervisor shall have specific training and experience in vertebrate pest management, commercial rodent control, general pest control, and integrated pest management.
 3. Applicators shall be licensed by the Massachusetts Pesticide Bureau and certified in General Pest Control (category 41). Applicators shall have specific training and experience in commercial rodent control and integrated pest management.

1.4 COORDINATION

- A. Perform this Work in cooperation with the other Work performed under the Contract.
- B. Initiate the work on or before field mobilization begins for the Contract and with adequate timing to achieve control before environmental disruptions. Provide a maintenance program until Contract is completed and all equipment and materials are removed.
- C. Perform the Work according to the preliminary schedule described in this section and as accepted or revised by the Owner and Engineer. Estimated durations and start dates may be changed by the Owner or Engineer to suit changes in construction schedules and field conditions. The Work could potentially require performance any day of the week and any hour of the day or night, regardless of weather.
- D. Perform this work in such a manner that toxicant or other control tools do not pose a hazard to persons, domestic animals, or non-target wildlife.

1.5 PERMITS

- A. Obtain and maintain in coordination with the Subcontractor appropriate permit(s) from city or state agencies for pest control activities associated with this Work.
- B. Obtain and maintain in coordination with the Subcontractor all right of entry permits required for the performance of this Work. This includes all utilities and private properties to which entrance is required.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Furnish and use only pesticide formulations registered by the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Food and Agriculture, where appropriate according to label directions and as acceptable to the Engineer.
- B. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the management and effectiveness of the pest control program, where appropriate and as acceptable to the Engineer.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Before proceeding with the Work, all pest control personnel shall attend a Work Shop held by the Contractor and Engineer to discuss planned pest control methods and coordination.
- B. The supervisor shall meet with the Contractor and Engineer weekly to discuss pest control activities.

3.2 SURVEY

- A. Prior to baiting, survey the proposed construction area and accessible or observable bordering areas and record signs of rodent activity and sanitation conditions. Closely inspect all embankments, edge areas, and properties within and abutting the construction area. Maintain survey records in the manner described in Paragraph 3.7 below.
- B. Thoroughly inspect construction area and accessible or observable bordering

areas and any nearby areas designated by the Owner or Engineer, for rodent activity and sanitation deficiencies weekly throughout the duration of this Contract and in accordance with the work schedule. Maintain inspection records in the manner described in Paragraph 3.7 below.

- C. Plan the control program and allocate resources based on survey and inspection data and as acceptable to the Owner.

3.3 APPLICATION FOR RODENT CONTROL

- A. Apply rodenticide in strict accordance with EPA-approved label directions and the Rules and Regulations of the Massachusetts Department of Food and Agriculture. Maintain records of all bait placements in the manner described in Paragraph 3.7 below.

- B. Where appropriate, especially for surface placements of rodent baits, use properly secured and tamper-resistant bait stations consistent with EPA regulation. Individually number and properly identify all bait stations.

- C. Surface Applications

- 1. Initial Surface Baiting

- Rid the construction area of all detectable rodents before construction begins, or as acceptable to the Owner. Bait all observable rodent burrows. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent activity (burrows, droppings, bait consumed, dead rodents). Replenish bait and shift bait stations as necessary to ensure complete control of rodent populations. Bait edge and accessible bordering areas as necessary to ensure that rodents will not be dispersed by construction activities and that rodents will not infest work areas.

- 2. Maintenance Surface Baiting

- Establish a maintenance baiting program prior to mobilization by the Contractor, including construction areas and accessible bordering areas, as acceptable to the Owner. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriate to ensure continued control.

- D. Subsurface Applications

- 1. General

For situations involving underground construction/demolition, utility relocation, or utility construction, and for other situations when determined necessary by the Owner or Engineer, initiate subsurface baiting and rid underground environments of all detectable rodents before construction begins. Assign an identifying number to each manhole and catch basin where bait is placed so that locations of bait placements can be identified and rodent activity (droppings, bait consumed, dead rats) can be documented. Conduct bait applications during off-peak traffic hours unless otherwise required by the Engineer. Access manholes according to the requirements of appropriate agencies and utility companies. Coordinate the Work with appropriate municipal agencies and utility companies.

2. Initial Subsurface Baiting

Apply appropriate baits to control rodent populations in manholes and catch basins. This will involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area and as acceptable to the Owner. Identify all baited manholes and catch basins with a standardized paint mark on the street and a numbered tag to be attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed or as acceptable to the Owner and Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

3. Maintenance Subsurface Baiting

Prior to mobilization by the Contractor, establish a maintenance baiting program appropriate for the rodent infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed in a manner acceptable to the Owner and Engineer. Maintain bait in manholes and catch basins that have rodent activity and those that had activity during initial baitings. Check each bait according to rodent activity levels. This could range from weekly to approximately every three months, depending upon the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute baiting locations as necessary to ensure adequate interception points for controlling immigrating rodents.

E. Cleanup

1. Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations.
2. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

3.4 SANITATION

- A. Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas. This includes any littering or improper or insufficient use of trash receptacles in construction areas. It also includes any bordering areas with sanitation conditions or structural deficiencies that violate City or State sanitation codes.
- B. Maintain records of sanitation conditions in the manner described in Paragraph 3.7 below.

3.5 COMPLAINT CALLS

- A. During construction, respond to pest-related complaints from the "adjacent" neighborhood (i.e. within 200 feet of the project limits) within 12 hours when required by the Owner or Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when required by the Owner or Engineer.
- B. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

3.6 GENERAL PEST CONTROL

- A. When required by the Owner or Engineer, the Contractor shall determine appropriate methods for any pest control task not specifically identified above and shall submit them in writing to the Owner and Engineer for approval in advance. Such pest control tasks would relate to unanticipated pest control needs within construction areas or adjacent areas. This could include control of insects

or vertebrates other than rats and mice.

- B. Maintain records of general pest control activities and results in the manner described in Paragraph 3.7 below.

3.7 RECORD KEEPING

- A. Use standardized data sheets acceptable to the Owner and Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g., traps) applied. Similarly, maintain records of surveys, inspections, changes in pest activity, sanitation conditions, and complaint calls. Submit data in a format acceptable to the Owner and Engineer and as required under Paragraph 1.3 (3) above.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01105

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SECTION 01108

HEALTH AND SAFETY PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Prepare a Health and Safety Plan (HASP) that meets all applicable state and federal health and safety regulations, including, but not limited to, those listed below. The Contractor shall be solely responsible for developing a HASP suitable for the Contractor's use and all work done by their subcontractors. The Owner, Engineer and/or their representative is not responsible for establishing or enforcing the health and safety requirements of the Contractor, and that nothing herein shall relieve the Contractor from its exclusive responsibility for the health and safety of its employees, and/or its representatives, and/or subcontractors.
- B. The Contractor shall be responsible for being aware of all potential hazards at the site, and reviewing existing information which provides evidence of contamination within the limit of the work.
- C. Copies of the "Oil and Hazardous Materials Findings and Soil Management Recommendations –Concord Ave Sewer Separation and Surface Improvements Project" Dated March 25, 2013 and Memorandum Addendum dated July 22, 2013, attached as Appendix A to these Specifications.
- D. The Contractor shall also be required to defend, indemnify, and hold the City of Cambridge, MA, and the Engineer harmless against any and all claims, liabilities, fines, or penalties arising out of actual or alleged failure of the Contractor and/or its agents, employees, or subcontractors to comply with any health or safety regulation, rule, ordinance, legislation, and/or health and safety plan.
- E. All work required in the Specifications regarding development and implementation of a HASP shall be in accordance with State hazardous waste site regulations (310 CMR 40.0018) and OSHA requirements (29 CFR 1910 and 1926). The HASP shall be submitted to the Engineer prior to site mobilization. Work shall not proceed at the site until the Engineer and the City of Cambridge has received a copy of the Contractor's Health and Safety Plan meeting all the requirements specified herein.
- F. The Contractor shall be responsible for the construction, maintenance, and dismantling of the decontamination areas specified within the HASP. This includes providing all labor, materials, and equipment to prepare, maintain in working order, and remove the decontamination area, including collection and

disposal of decontamination water and solids, and subsequent dismantling and disposal of materials.

- G. The Contractor is responsible for establishing, implementing and maintaining of ambient air and dust monitoring programs and all other environmental monitoring programs. All such programs shall be operated by the Contractor whenever there are soils handling construction activities occurring at the site.
- H. The Contractor shall be responsible for providing all materials, equipment, and labor associated with applying dust control suppressants, including equipment that shall be required during all soil handling activities, in the event that fugitive dust or excessive odors are encountered.

1.2 DUST CONTROL

- A. During excavation of soil and fill material, dust shall be controlled to limit potential spread of contaminants and potential exposure of contaminants to workers and the public. The dust control measures implemented at the site shall be performed in accordance with this Section.
- B. During the progress of the work, the Contractor will conduct his operations and maintain the area of his activities, including sweeping and sprinkling of water if acceptable to the Engineer, so as to minimize the generation and dispersion of dust.

1.3 AIR MONITORING

- A. Air monitoring shall involve direct reading instruments capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for assuring that monitoring is conducted in an approved manner, that air monitoring/sampling are conducted at a frequency sufficient to ensure accurate assessments of site conditions, and that work practices, engineering controls, and/or personal protective equipment are proper for the conditions.
- B. At a minimum, detectors for organic contaminants shall be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g., excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions, and personnel protection measures.
- C. The Contractor shall keep accurate documentation of all air monitoring, which shall be made available to the Owner and Engineer for review at all times.

PART 2 - PRODUCTS

2.1 HEALTH AND SAFETY PLAN AND CERTIFICATIONS

- A. The Contractor shall, prior to the start of work on the site, submit six (6) copies of its site-specific Health and Safety Plan to the Engineer. Submit with the site-specific Health and Safety Plan, a certification that states the following:
1. The Contractor hereby certifies that the Contractor and any workers engaged in work on the project meet the requirements of 29 CFR 1910.120 and the provisions of the American National Standards Institute, Standard Z88.2, for training, medical surveillance, and respirator protection unless the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards. These requirements include, but are not limited to, the following items:
 - a. The Contractor's employees have been examined by a licensed physician within the last 12 months, and have been determined to be physically able to perform the work and use the respirator and other protective or safety equipment required for this assignment.
 - b. The employees have received health and safety training for working in environments with known and unknown hazards within the past twelve months.
 - c. The Contractor has established and is maintaining a respiratory protection program that complies with the provision of 29 CFR 1910.134.
 - d. The Contractor maintains appropriate surveillance of the work area conditions and degree of employee exposure or stress.
 2. The Contractor shall further certify that only respirators approved or accepted by NIOSH/MSHA shall be provided and used by the Contractor's employees; that each of the Contractor's employees has been properly fitted to the respirators provided by the Contractor, including a test of the face-to-face piece seal; that the Contractor has provided its employees with written procedures covering the use of respirators in dangerous atmospheres; and that the Contractor has established a program for inspection, maintenance, and care of the respirators.

The certification shall be signed and dated by the Contractor.

3. Work shall not proceed at the project site until the Engineer has received all certification(s) and the Contractor's Health and Safety Plan. Any delays incurred by the Contractor relating to the Health and Safety Plan shall be the responsibility of the Contractor, and constitute no additional costs or claims to the City of Cambridge.

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY PLAN CONTENTS, MAINTENANCE, AND IMPLEMENTATION

- A. The Contractor's Plan shall address the specific work activities to be conducted by the Contractor. The HASP shall include, but not be limited to, the following:
 1. All anticipated hazards based on site conditions, construction activities and the levels of contamination and information presented in previous studies.
 2. Provisions for continually updating the Plan in accordance with any new applicable state and federal regulations or any additional information regarding conditions at the site.
 3. The following information, shall be included in the HASP in accordance with the minimum standards set forth in 29 CFR 1910.120, 29 CFR 1910.1000, and 29 CFR 1926, and 310 CMR 40.0018:
 - a. Contractor's Standard Operating Procedures, including Personnel Training and Field Orientation; Personal Hygiene Requirements and Guidelines; Field Monitoring of Site Contaminants; Respiratory Protection Training and Requirements; Levels of Protection and Selection of Equipment Procedures; Zone Delineation of the Project Site; Site Security and Entry Control Procedures; Contingency and Emergency Procedures; and Listing of Emergency Contacts.
 - b. Identification of Contractor's Site Safety Officer.
 - c. Identification of Contractor's Designated Field Personnel.
 - d. Identification of hazard and risks associated with the Contractor's work.
 - e. Type of Medical Surveillance Program.
 - f. List of all hazardous materials that the Contractor shall have on site; the location of the latest Material Safety Data Sheets

(MSDS) for each material listed; and the plan for notifying all on-site personnel, including, but not limited to, the Engineer and/or their representatives, of the presence of hazardous materials on site. If there are no hazardous materials to be brought on site, the Contractor shall provide a written statement to the Engineer and/or their representative, prior to initiating work activities, certifying that the Contractor shall not transport, store, or use hazardous materials on site.

- B. The Contractor shall keep a copy of the HASP on site during all operations and shall conduct daily health and safety meetings. Failure to keep a copy of the HASP on site, or any other breach of the Contractor's Plan, shall be cause for stopping work at the cost of the Contractor. Delays caused by the Contractor's failure to comply with the health and safety regulations, or any health and safety plan, shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are implemented.
- C. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's health and safety plan for personnel working on the site shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer.
- D. The Contractor shall make available Level C personal protective equipment and clothing, not including respirators, to the Engineer and/or their representative for use during site inspections by the Engineer and/or their representative, up to a maximum of three (3) complete sets per day. These shall be supplied and maintained at no cost to the Owner and shall be returned to the Contractor upon completion of the work (except for expendable disposal protective clothing). The Contractor shall provide a repository for collection of disposed health and safety materials. Collection and disposal of contaminated expendable supplies shall be the Contractor's responsibility.
- E. The level of dermal and respiratory protection shall be determined based upon continuous air monitoring to be performed by the Contractor. The Engineer may conduct duplicate air monitoring for quality control purposes. As air monitoring indicates the levels of contaminants in the air, the personal protective equipment shall be determined based upon established standards and the standards set forth in the Contractor's Health and Safety Plan. Regardless, modified Level D protection for all on-site personnel is the minimum project requirement.
- F. The Contractor shall be aware of site-specific requirements, such as site security during non-working hours, limited work space, and minimizing the effects of soil excavation, in preparing its health and safety program.

3.2 ROUTINE SAFETY MEETINGS

- A. The Contractor shall keep a copy of the HASP on site during all operations, and shall conduct routine health and safety meetings to ensure that all work is being performed in accordance with OSHA regulations, the Contractor's HASP, and prior to initiating a new task, following an incident or following any changes to the HASP necessitated by site conditions. Failure to conduct routine safety meetings may be cause for stopping work at the cost of the Contractor.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01108

SECTION 01200

GENERAL REQUIREMENTS FOR UTILITY WORK

1200.1	TEMPORARY UTILITY SUPPORT AND COORDINATION	LUMP SUM
1200.2	SURVEY CONSTRUCTION LAYOUT AND BASELINE, AS-BUILTS	ALLOWANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies general requirements for construction, protection, support, maintenance, and restoration for underground and overhead utilities affected by construction of the Project. This section includes coordination with private utility companies. The Work includes new construction, reconstruction, relocation, and abandonment.
- B. The utility works and services that may be affected include, but are not limited to:
 - 1. Storm drain, sanitary sewer, and combined sewer
 - 2. Water distribution and transmission mains
 - 3. Gas distribution
 - 4. Electric power, heat exchange return pipelines, utility poles, and street lighting (underground and overhead)
 - 5. Telephone
 - 6. Traffic signals
 - 7. Fiber optic communications
 - 8. Cable Television
 - 9. Signal communication
 - 10. City fire signal lines and pull boxes
 - 11. Steam
 - 12. MBTA overhead and underground electric
- C. This Section shall be used in conjunction with the specific underground utility work sections that apply to the Contract.
- D. There is an existing 20-inch cast-iron water main on Walden Street installed in the 1880's. All subsurface work within Walden Street shall be sequenced and performed to minimize impact and exposure of the existing 20-inch water main due to its age and condition.

- E. There is an existing NSTAR Electric heat exchange return pipeline and (2) 115 KV ducts on Bay State Rd., Field St. and Garden St. Coordination requirements with NSTAR Electric are detailed in this section.

1.2 WORK BY UTILITY COMPANIES

- A. Certain parts of the utility work shall be performed, where shown or specified, by the utility company.
- B. For all utilities, with the exception of storm drains, sanitary sewers, combined sewers, water main, and electrical conduit for street lighting, work shall be performed by the respective utility companies.
 - 1. Disconnecting and connecting of storm drains, sanitary sewers, and combined sewers services shall be the Contractor's responsibility as shown on the Drawings or required in the Specifications. In the event the Contractor determines sewer disconnections or connections must be made that are not shown on the Drawings or required by the Specifications, he shall first notify the Owner before performing this work.
 - 2. Disconnecting and connecting of water services shall be the Contractor's responsibility as shown on the Drawings or required in the Specifications. In the event the Contractor determines water service disconnections or connections must be made that are not shown on the Drawings or required by the Specifications, he shall first notify the Cambridge Water Department before performing this work
- C. The MBTA is expected to temporarily discontinue the use of electric cable cars and will provide diesel buses while work is conducted at the intersection of Concord Avenue and Huron Avenue. Refer to Specification Section 01063- Sequencing of Work for additional sequencing requirements related to MBTA coordination.
- D. Contact the utility companies in advance of construction to allow sufficient time for the utility companies to accomplish the work they are required to perform. Provide the utility company at least thirty (30) days advance notice prior to the scheduled date for commencement of work under this Contract.
- E. Work performed by utility companies to facilitate the Work under this Contract, and other work performed by utility companies solely for the convenience of the Contractor, shall be at no additional cost to the Owner.

1.3 DEFINITIONS

- A. Abandoned means that use of a utility asset has been discontinued by the utility company.

- B. To be abandoned means that use will be discontinued as part of the Work under this Contract.
- C. Maintenance means providing continuous service that meets project requirements during construction.
- D. Maintain complete-in-place means to protect, support, and otherwise maintain the existing condition and function of a facility during construction.
- E. Restoration means replacement of a facility or portions of a facility that have been removed or made inoperative by the Contractor in the performance of the Work.
- F. Utility Company means the company, agency, owner, or operator of the facility concerned.
- G. Temporary Facility means a facility provided, in lieu of an existing or new facility, to ensure continuity of service. When a temporary facility is not shown on the Contract Drawings, but is provided for the convenience of the Contractor, it shall be constructed at no additional cost to the Owner.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTALS
 - 1. Submit working drawings and, if applicable, shop drawings showing the details, procedures, and scheduling for performance of each utility work. Show actual verified field locations of existing utility facilities that are affected by the Work under this Contract; interferences which these facilities present to the new work; location of settlement markers; method proposed to proceed with the construction; and, if applicable, procedures for restoration and method of testing to demonstrate restoration was performed satisfactorily.
 - 2. Submit to the Engineer specifications and drawings describing the method to be used to temporarily support existing subsurface, surface and overhead utilities during construction. Include working drawings that indicate proposed materials and details.
 - 3. Submit to the Engineer for review a detailed excavation procedure for subsurface utilities. At a minimum, the procedure shall include:
 - a. Equipment to be used for anticipated subsurface utility investigation and excavation.
 - b. Personnel to be used and designated utility coordinator.

- c. Duration and schedule of investigation and excavation.
 - d. Techniques proposed to isolate and protect existing utilities.
 - e. Method for the Contractor to provide utility information derived from subsurface investigation to field personnel doing excavation.
 - f. A disciplinary plan that delineates all steps to be taken as a result of a utility disruption caused by negligence or failure to follow proper procedures or the Contract requirements, including possible removal of Contractor personnel from the site.
5. Submit an emergency action plan outlining procedures to be followed by the Contractor in case of unplanned utility interruptions or unplanned damage to utilities in service. Obtain concurrence from each affected utility company.
- a. List Contractor's personnel assigned responsible charge for emergency action on site for each shift, and those on call.
 - b. List phone notification numbers for each utility company, fire, and police departments, and other relevant agencies.
 - c. Include copies of utility plans showing the valve or switch locations to isolate each line.
- B. Transmit to the Engineer the as-built utility location survey data as specified in Article 3.10 of this Section.

1.5 APPROVAL BY UTILITY COMPANIES

- A. All personnel performing work on to expose and support existing utility facilities shall be fully qualified and able to meet the standards of the affected utility company. If the Contractor does not have the required utility experience, Contractor shall retain a specialist firm acceptable to the affected utility company to perform the Work.
- B. Prior acceptance of temporary support methods for each affected utility facility shall be obtained by the Contractor from each utility company concerned.
- C. Prior permission for disrupting a utility shall be obtained by the Contractor from each utility company concerned.

- D. Prior approval for disrupting fire signal lines, high pressure fire water mains and hydrants, and fire service lines shall be obtained from the Cambridge Fire Department.

1.6 NOTIFICATION

- A. In addition to the initial 30 day utility company notification, the Contractor shall notify the appropriate utility companies and the Engineer at least seven (7) days prior to starting any work involving or adjacent to surface, subsurface, or overhead utility facilities.
- B. NStar Gas Requirements:
 - 1. As shown on the Contract Drawings, NSTAR Gas has planned relocations and replacements within the project area. The Contractor shall coordinate and sequence relocations and replacements with NSTAR Gas.
 - 2. If cut-off or connection is expected, notify the NSTAR Gas Company Engineering Department four (4) weeks prior to cut-off or connection to gas main.
 - 3. At locations where the sand bedding material of gas mains are excavated and removed by the Contractor, the Contractor shall put back or replace the bedding material, in kind. Crushed stone shall not be used as backfill for bedding material beneath gas mains.
 - 4. Immediately notify the Gas Company Engineering Department if surface or subsurface settlement or movement in excess of the design amount is observed, regardless of the proximity to an existing gas facility.
 - 5. Existing gas steel mains found within the project area potentially contain asbestos fibers on the coal tar pipe coating of the main. Where required for removal, the Contractor shall use hand tools for removal. Contractor to notify and coordinate removal of pipe with NSTAR Gas. NSTAR Gas will be responsible for disposing of removed steel mains and the Contractor will be responsible, where required, to remove steel mains with use of hand tools.
- C. Contractor to contact NSTAR Electric a minimum of 72 hours prior to any excavation that exposes the NSTAR Electric 115 KV duct banks and heat exchange return pipe. The following NSTAR Electric contact information is provided for work around these utilities:
Outage and Emergency-1-800-592-2000

Gaye Ohanesian -Transmission Lines Manager 1-781-441-3612

1.7 STANDARD SPECIFICATIONS OF UTILITY OWNERS

- A. Specifications and construction methods from each utility owner apply to individual utility specification sections.
- B. It is the Contractor's responsibility to ensure that, unless otherwise specified, the standards for materials and construction methods required by the utility owner are met.

PART 2 - MATERIALS

2.1 GENERAL

- A. Materials for temporary and permanent work shall be of the type, grade, and class specified by reference to utility company standards.

PART 3 - EXECUTION

3.1 GENERAL CONSTRUCTION REQUIREMENTS

- A. Unless otherwise noted, conform to the construction standards, specifications, and standard practices of the affected utility companies. Coordinate with each utility company the work to be done by the Contractor and the work to be done by utility company. Ensure continuity of all existing utility services to all users, except when the utility company determines that temporary interruption is acceptable.
- B. Unless otherwise indicated, maintain all utility facilities complete in place. Provide temporary support of utilities during construction only by methods acceptable to the utility company concerned.
- C. Provide and maintain all temporary facilities required to provide interim utility service when a utility facility is to be relocated and when a utility facility to be replaced is abandoned prior to replacement.
- D. Where an existing utility facility is encountered that is not indicated or that is determined to be a different utility facility than that indicated, promptly notify the Engineer. The Contractor is responsible for determining the owner of the facility and the disposition of the facility.
- E. All water, sanitary, and storm services must be maintained throughout the project through the use of temporary pumps and piping. Unless otherwise noted, no service interruptions will be permitted.

- F. The Contractor shall dewater existing utility manholes and structures prior to beginning construction. Any dewatered material shall be properly treated and disposed.
- G. All subsurface work within Walden Street shall be sequenced and performed to minimize impact and exposure of existing water transmission main due to its age and condition. The Contractor shall not conduct any work above, below or within 10-feet of the water transmission main unless a designated representative of the Engineer is present.
- H. Prior to any trenchless method being implemented, the Contractor shall locate the existing water main using methods that will provide Subsurface Utility Engineering (SUE) results, per CI/ASCE 38-02, Level A accuracy information. This will first involve locating the lateral position of the pipeline using toning techniques and then locating the pipe vertically using vacuum excavation at each of the proposed crossings. This work is needed to verify the pipe elevation and help define an acceptable grade for the sewer crossing, so as not to impact the existing water main. An appropriate vertical clearance limit must be established for each tunneling method based on the accuracy of the tunneling technique and the level of ground disturbance created by the method. This work shall be performed in the presence of a representative of the Engineer.
- I. In addition to notices previously specified, the Contractor shall notify the Cambridge Water Department , Owner, and Engineer forty-Eight (48) hours prior to excavating or working near the existing large diameter (>18-inch) water transmission main.
- J. Contractor shall carefully excavate soils and materials adjacent to the existing water transmission main. Excavation shall be performed slowly and carefully to minimize the possibility of failure of the existing water transmission main due to sudden relief of soil pressure on the pipe exterior. Exposure of the existing water main shall be minimized so as to limit exposure of the line to damage.
- K. Where the new sewer pipe is to be installed within a soil wedge drawn downward at a 45 degree angle from the springline of the each transmission main, hand excavation shall be performed to expose the existing water main and remove the soil from over top of the pipe. This will reduce the load on the pipe and allow hand tunneling under the pipe to reach the other side. All excavation work within 3 feet of the existing pipe shall be done by hand shovel methods or by vacuum excavation, to avoid any physical damage to the pipe from construction equipment.
- L. Trenchless installation of the new sewer or drain crossings shall only be performed in locations where prior approval of the Owner has been obtained.
- M. If requested by the Engineer or Water Department, the Contractor shall obtain a coupon sample of the existing water transmission main and provide to the

Engineer for testing. The location and size of the coupon shall be determined by the engineer.

N. If concrete or controlled density fill (CDF) is encountered at or in the vicinity of the NSTAR Electric 115 KV ductbanks and/or heating exchange return pipe on Baystate Rd, Field Street, and Garden Street, the Contractor shall notify NSTAR Electric and shall obtain approval from NSTAR Electric prior to chipping or removing concrete. This is the Contractor's responsibility. If sand is encountered, the Contractor shall replace the sand, at no additional cost to the Owner, with the following product:

- a. Thermal sand to be used for backfill shall conform to following standards:
 - i. Retained on: No. 4 sieve 0% to 5%
No. 8 sieve 10% to 20%
No. 16 sieve 20% to 40%
No. 30 sieve 40% to 70%
No. 50 sieve 70% to 85%
No. 100 sieve 92% to 96%
 - ii. Moisture content: 13% to 15%
 - iii. Thermal resistivity: 65°C-cm/W at a moisture content of 3%
100°C-cm/W at a moisture content of 0%
 - iv. Minimum dry density: 105 lbs/ft³

O. For work around NSTAR Electric 115 KV ductbanks and heating exchange return pipe on Baystate Rd, Field Street, and Garden Street, the Contractor shall use the following utility support methods.

- a. The maximum unsupported length NSTAR will allow on its utilities is 10 ft. Do not support the pipe at any welds. If the frequency of supports places the Contractor on a weld, then the distance of the support shall be lessened to less than 10 ft to avoid the weld. Pipes may move in the horizontal direction so the sides of the utility shall also be braced at the same frequency of the vertical supports.
- b. VP Anti-Vibration Neoprene Pads shall be installed between the pipes and the support hangers. The pads can be cut to size; allow 1/2" margin on all sides to provide firm footing. The pads shall be glued or cemented for placement and banded on each side of the support to secure the neoprene. The contractor shall be responsible for a method to lift the pipes so that the pads can be inserted between the pipe and the supports.

3.2 SUBSURFACE UTILITY INVESTIGATION

- A. The Contractor shall excavate test pits where indicated on the Contract Drawings and as specified.

3.3 UNSAFE AND UNSUITABLE UTILITY STRUCTURES

- A. If, upon exposure, the condition of a facility to be maintained complete-in-place is found to be unsafe, the Contractor shall notify the utility company, for support or for maintenance of service, the Contractor shall replace or reconstruct or coordinate the replacement or reconstruction of the facility with the utility Owner and shall promptly notify the Engineer of additional costs anticipated prior to beginning the work.

3.4 ABANDONED FACILITIES

- A. Demolish and remove abandoned utility facilities that interfere with the Work of this Contract. Abandoned facilities that do not interfere with the Work of this Contract may remain.
- B. Do not undertake demolition or removal until permission for such Work has been obtained from the utility company.
- C. When abandoned facilities are to be left in place, plug or cap the ends of conduits and pipes, and fill with controlled density fill (CDF) unless otherwise indicated. Remove abandoned utility manholes, junction boxes, and similar structures to a minimum depth of 4 feet below finished grade, and puncture or break the bottom slabs of manholes and similar structure to allow drainage. Backfill and compact excavations resulting from removal of utility facilities as required to restore original grade.

3.5 SETTLEMENT OR MOVEMENT

- A. In case of settlement or other movement that causes or could cause damage, take immediate remedial measures to correct the conditions and repair the damage.

3.6 ACCESS

- A. At all times permit free and clear access to the affected facilities by personnel of the utility companies.
- B. Throughout the construction period, maintain access to all utility vaults and structures.

3.7 SERVICE CONNECTIONS

- A. Work required for maintaining, supporting, relocating, restoring, and constructing all service connections is included as part of the Work of this

Contract, even though some existing service connections, for which record information is not available, may not be shown on the Contract Drawings.

3.8 REPAIR AND RESTORATION

- A. Repair all damage to utilities caused by Work under this Contract. Clean all utility structures of dirt caused by Work under this Contract. Immediately notify the Engineer and the utility company of damage to utilities.

3.9 EXCAVATION AND BACKFILL

- A. Perform excavation and backfill in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- B. Excavation and handling of contaminated soil is specified in Sections 02080 - SOIL AND WASTE MANAGEMENT, and 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL.

3.10 CLEANING UP

- A. In accordance with Section 01630 – RESTORATION OF GROUNDS AND CLEANING UP, the Contractor shall, upon completion of the Work, remove all temporary construction facilities, equipment, debris, and unused materials, and shall restore the project area and adjacent affected areas to a neat and clean condition.

3.11 AS-BUILT UTILITY LOCATION SURVEY

- A. For each new or relocated utility installed, including those installed or relocated by others in the Project Area, perform an as-built location survey by coordinates prior to backfilling the excavation.
- B. For each new hardscape feature installed perform an as-built location survey by coordinates. Hardscape features to be surveyed for location and elevation include but are not limited to; top and bottom of curb lines, limits of sidewalks and wheelchair ramps, roadway crown, manhole covers, gate box covers, pavers and limits of loam and seed. Hardscape features to be surveyed for location include but are not limited to; street lighting, pedestrian lighting, pedestrian signals, traffic signals, crosswalks, control panels, benches, trash receptacles, parking and traffic striping, landscaping features, fences and irrigation heads.
- C. The survey work, including verification of the existing survey data, shall be performed by a licensed Professional Land Surveyor registered in Massachusetts to accurately record progress of the work throughout the duration of the Contract.

1. The Surveyor is subject to the approval of the Owner. The Contractor shall submit the qualifications of the Surveyor documenting performance of similar scopes of work utilizing software specified below.
 2. All coordinates shall be geographically registered in the project datum coordinate system using the control points for horizontal and vertical controls.
 3. Horizontal accuracy shall be 0.01 feet.
 4. Elevation accuracy shall be 0.1 feet except benchmarks, topography, and structure foundations (including manholes pipe inverts) shall be accurate to 0.01 feet.
 5. Digital As-built drawings, including surface data shall be provided in AutoCAD Civil 3D format to match the text styles and line types of the design drawings provided by the Engineer.
 6. It is recommended that the Surveyor attend the Preconstruction meeting.
 7. Prior to submitting a monthly payment application, the Contractor's progressive electronic as-built drawings shall be acceptable to the Engineer.
- D. The Contractor shall also maintain red line record documents at the site to accurately record progress of the work throughout the duration of the Contract.
1. Contractor shall delegate the responsibility for maintenance of the record documents to one person on the Contractor's staff as approved by the Owner.
 2. Changes to the record documents shall be coordinated with adequate and proper entries on each page of the specifications and each sheet of drawings and other documents where such entry is required to show progress and changes properly, including change orders, approved shop drawings, RFIs, and other modifications.
 3. Record information shall be updated within 24 hours of installation or survey.

PART 4 - COMPENSATION

Item 1200.1 – Temporary Utility Support and Coordination

METHOD OF MEASUREMENT:

Measurement for payment for Temporary Utility Support and Coordination will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT/INCLUSIONS:

Payment for Temporary Utility Support and Coordination will be based on the bid for this item in the proposal. Under the Lump Sum Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment and incidentals required to maintain continuity of gas, telephone, electric, telecommunications, cable TV, steam, MBTA, and privately owned utilities. The work includes all trunk, supply, transmission, service, heat exchange pipelines and main lines impacted by the Work. Under the Lump Sum Price bid for this item, the Contractor shall also furnish all labor, materials, tools, equipment and incidentals to coordinate and/or temporarily support all utilities exposed during the excavation for the installation of the Work; submission of all utility coordination and support work plans and shop drawings; coordinate the protection of and protect all overhead utilities; and perform all coordination with the utility companies for the relocation, abandonment, protection, support, and other work required to facilitate the completion of the project. This Item further includes utility location (Dig Safe); provide, install, maintain, and disconnect portable generators to maintain electrical service to dwellings; coordination of construction with existing utility owners and operators; providing access for utility owners and operators to their respective utilities; and communicating with affected homeowners and residents.

EXCLUSIONS:

The following items are not included for payment under this item and are included for payment elsewhere; labor, materials, tools, equipment and incidentals required to maintain continuity of water mains; restoration of curbing, sidewalks, and bituminous concrete pavement; providing by-pass pumping of sanitary sewers and storm drains; and temporarily and permanently relocating sanitary sewers, storm drains, water and services for sanitary sewers, storm drains and water mains.

Item 1200.2 – Survey Construction Layout and Baseline, As-Builts

METHOD OF MEASUREMENT:

Payment will be made against the allowance based on invoices submitted by the General Contractor on a monthly basis. Labor, professional services, technician, and other invoices shall include a breakdown of hours, labor rates, direct expenses all sub-consultant and contractor mark-ups, material costs, shipping, taxes and all other costs included in the request. Incomplete or incorrect invoices will not be approved.

The General Contractor is allowed up to a 5% Mark-up on labor, professional service, technician, and other costs related to construction layout and baseline and as-builts and as approved by the resident engineer.

BASIS OF PAYMENT:

The allowance for this item shall be reimbursement to the General Contractor to furnish all labor, professional services, technician, equipment, and incidentals for the Contractor to establish survey control, survey construction layout and baseline layout required in this contract

and not included in other pay items. The work includes, but is not limited to, survey control, survey construction layout and baseline layout.

END OF SECTION 01200

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SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes general requirements for project submittals by the Contractor.

1.2 PROGRESS REPORTS, RECORDS AND DATA

- A. The Contractor shall submit to the Owner such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as outlined in Section 01311 – SCHEDULING AND REPORTING and as the Owner may request concerning work performed or to be performed under this Contract.

1.3 OPERATION MANUALS

- A. Unless the specified operations manuals for equipment are submitted along with shop drawings at the time of submission no action will be taken on reviewing the shop drawings. The manuals shall include, at a minimum, operating instructions and recommended maintenance schedules for all the equipment to be furnished.

1.4 SHOP DRAWINGS, SAMPLES, PROJECT DATA

- A. Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer for review, as required. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.
 1. Each submittal shall cover items from only one section of the specification unless the item consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, Contractor's initial submittal shall be complete including all components.
 2. All submittals, regardless of origin, shall be clearly identified with the name and number of this Contract, Contractor's name, and references to

applicable specification paragraphs and Contract Drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data. Engineer will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

3. All deviations from the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.
4. Contractor shall submit shop drawings electronically. For electronic submittals, drawings and the necessary data shall be submitted electronically to Engineer as specified below. Submittal documents shall be in black and white unless color is required for the review of the submittal. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0 or higher. The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. PDF images must be at a readable resolution. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file. The PDF documents shall have a bookmark created in the navigation frame for each major entry ("Section" or "Chapter") in the Table of Contents. Thumbnails shall be generated for each page or graphic in the PDF file.

The opening view for each PDF document shall be as follows:

- Initial View: Bookmarks and Page
- Magnification: Fit In Window
- The file shall open to the Contractor's transmittal letter, with bookmarks to the left. The first bookmark shall be linked to the Table of Contents.

PDF document properties shall include the submittal number for the document title and the Contractor's name for the author. Electronic submittal file sizes shall be limited to 10 MB. When multiple files are required for a submittal the least number of files possible shall be created. The contractor shall post submittals and retrieve the Engineer's submittal review comments through the Engineer's project website accessible through the Internet. Instruction on procedures for posting and retrieving submittals will be provided after award of the Contract. Facsimiles (fax) will not be acceptable. Engineer will not accept submittals from anyone but

Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

5. In addition, two hard copies of each *full size* drawing shall be submitted to Engineer and will return two marked copies (or one marked reproducible copy) to Contractor.
 6. Engineer's submittal review period shall be 21 consecutive calendar days and shall commence on the first calendar day following receipt of the submittal or resubmittal on the project website. The time required to mail any hard copies of the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.
 7. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal. When corrected copies are resubmitted, Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by Engineer on previous submittals. Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) or a unique identification that indicates the initial submittal and correct sequence of each resubmittal. If more than one resubmittal is required because of failure of Contractor to provide all previously requested corrected data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmittals. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal. Resubmittals shall be made within 60 days of the date of the letter returning the material to be modified or corrected, unless within 30 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time. The need for more than one resubmittal, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of Engineer to review and return any submittal to Contractor within the specified review period.
- B. When submitted for the Engineers' review, all shop drawings shall bear the Contractor's certification that he has reviewed, checked and approved the shop drawings, that they are in harmony with the requirements of the Project and with the provisions of the Contract Documents, and that he has verified all field measurements and construction criteria, materials, catalog numbers and similar data. The Contractor shall also certify that the work represented by the shop drawings is recommended by the Contractor and the Contractor's Guaranty will fully apply.
- C. All samples called for in the Specifications or required by the Engineer shall be

furnished by the Contractor and shall be submitted to the Engineer for his review. Samples shall be furnished so as not to delay fabrication, and to allow the Engineer reasonable time for the consideration of the samples submitted.

- D. Checking of submittals is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- E. The Contractor may only proceed with fabrication and construction of items with returned submittals marked "No Exception Taken", "Make Corrections as Noted" or "Noted : No Action Required". Resubmit submittals if marked "Rejected", "Revise and Resubmit" or "Submit Specified Item."
- F. The Contractor shall furnish such samples of material as may be required for examination and test. All samples of materials for tests shall be taken according to ASTM Specifications or as provided in the Contract Documents.
- G. All samples shall be submitted by the Contractor with a covering letter indicating that such samples are recommended by the Contractor for the service intended and that the Contractor's Guaranty will fully apply.
- H. All materials, equipment and workmanship shall be in accordance with samples guaranteed by the Contractor and reviewed by the Engineer.
- I. Submittals requiring a Certificate of Design will be considered incomplete and not acceptable unless a complete Certificate of Design is submitted.
- J. The Certificate of Design requires that the engineer providing the submittal carries Professional Liability insurance meeting the requirements laid out in Section 00800 "General Terms and Conditions" and additionally meeting the requirements of Section 00825 "Supplemental General Conditions".

1.5 CONTRACTOR'S ORDER OF CONSTRUCTION

- A. The Contractor shall submit schedules and reporting information in accordance with the requirements of Section 01311 – SCHEDULING AND REPORTING.

1.6 CONTRACTOR'S COST BREAKDOWN

- A. The Contractor shall submit a schedule of values in accordance with the requirements of Section 01301 – SCHEDULE OF VALUES.

1.7 CERTIFICATE OF DESIGN

CERTIFICATE OF DESIGN

The undersigned hereby certifies that he/she is a Professional Engineer registered in the state of _____ and that he/she has been employed by (Name of Contractor) _____ to design _____ in accordance with Specifications Section _____ for the (Name Project) _____. The undersigned further certifies that he/she has performed similar designs previously and has performed the design of the _____; and regulations and professional practice standards; that his/her signature and Professional Engineer (P.E.) Stamp have been affixed to all calculations and drawings used in, and resulting from, the design; and that the use of that stamp signifies the responsibility of the undersigned for that design.

The undersigned hereby certifies that he/she has Professional Liability Insurance and a Certificate of Insurance is attached.

The undersigned hereby agrees to make all original design drawings and calculations available to the City of Cambridge or Owner's representative with seven (7) days following written request therefore by the Owner.

P.E. Name

Contractor's Name

P.E. Registration Number, State of Registration and Discipline

Signature

Signature

Title

Title

Address

Address

Telephone

Telephone

Email Address

Email Address

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01300

SECTION 01301

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section defines the process whereby the Schedule of Values shall be developed and incorporated into the cost loading function of the CPM Schedule as specified in Section 01311 – SCHEDULING AND REPORTING. Monthly progress payment amounts shall be determined from the monthly progress updates of the CPM Schedule activities.
- B. The Schedule of Values shall be developed independently but simultaneous with the development of the CPM Schedule activities and logic as follows:

1.2 PRELIMINARY SCHEDULE OF VALUES

- A. The Contractor shall submit a preliminary Schedule of Values for the major components of the work at the Preconstruction Conference. The listing shall include, at a minimum, the proposed value for the following major work components:
 - 1. Mobilization.
 - 2. The total value of civil piping work inclusive of excavation, support of excavation, pipe installation, testing and backfill of pipe or other structures, and all incidental work associated with underground pipe installations. Additionally, this total value shall be broken down into separate values for water lines, drain lines, sanitary sewer lines, and appurtenant work such as manholes and service connections constructed or modified as a part of the work.
 - 3. The total value of site civil work inclusive of full depth roadway reconstruction, cold planing, regrading, paving, grading, curbs and sidewalks, and landscaping.
 - 4. The total value of water quality related work porous pavement work.
 - 5. The total value of the planting areas and biobasin, including a breakdown of the costs for planting soils and related plants.
 - 6. The total value of work related to private inflow removal.
 - 7. The total value of work related to traffic signals.

8. The total value of all other work not specifically included in the above items.
 8. The total value of work related to traffic signals.
- B. After the Pre-construction Conference, the Contractor and Engineer shall meet and jointly review the preliminary Schedule of Values and make any adjustments in value allocations if, in the opinion of the Engineer, these are necessary to establish fair and reasonable allocation of values for the major work components. Front end loading will not be permitted. The Engineer may require reallocation of major work components from items in the above listing if in the opinion of the Engineer such reallocation is necessary. This review and any necessary revisions shall be completed within fourteen (14) calendar days from the date of Notice to Proceed.

1.3 DETAILED SCHEDULE OF VALUES

- A. The Contractor shall prepare and submit a detailed Schedule of Values to the Engineer within twenty-eight (28) calendar days from the date of Notice to Proceed. The detailed Schedule of Values shall be based on the accepted preliminary Schedule of Values for major work components. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts through cost loading of the CPM Schedule activities, sufficient detailed breakdown shall be provided to meet this requirement. The Engineer shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the Engineer, a greater number of Schedule of Values items than proposed by the Contractor is necessary, the Contractor shall add the additional items so identified by the Engineer.
- B. All lump sum, allowance and unit price items included for payment in the Contract shall be included in the schedule of values. Greater detail shall be provided for the following items and as further required by the Engineer.
1. Mobilization by activity
 2. Scheduling and Reporting broken down by submittal
 3. Geotechnical Instrumentation and Monitoring
 4. Soil and Waste Management
 5. Pre / Post Construction Survey
 6. Tree Protection
 7. Utility Coordination
 8. Traffic and Pedestrian Management

9. All other work not specifically included in the above items shall be broken down as necessary for establishment of pay and Schedule activity items.
- C. The Contractor and Engineer shall meet and jointly review the detailed Schedule of Values within thirty-five (35) calendar days from the date of Notice to Proceed. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been proposed to provide cost loading of the CPM Schedule activities. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the Contractor and a revised detailed Schedule of Values shall be submitted within thirty-eight (38) calendar days from the date of Notice to Proceed.
- D. Following acceptance of the detailed Schedule of Values, the Contractor shall incorporate the values into the cost loading portion of the CPM Schedule. The CPM activities and logic shall have been developed concurrent with development of the detailed Schedule of Values; however, it shall be necessary to adjust the detailed Schedule of Values to correlate to individual Schedule activities. It is anticipated that instances will occur, due to the independent but simultaneous development of the Schedule of Values and the CPM Schedule activities, where interfacing these two documents will require changes to each document. Schedule activities may need to be added to accommodate the detail of the Schedule of Values. Schedule of Value items may need to be added to accommodate the detail of the CPM Schedule activities. Where such instances arise, the Contractor shall propose changes to the Schedule of Values and to the CPM Schedule activities to satisfy the CPM Schedule cost loading requirements.

1.4 CROSS REFERENCE LISTING

- A. To assist in the correlation of the Schedule of Values and the CPM Schedule, the Contractor shall provide a Cross Reference Listing which shall be furnished in two parts. The first part shall list each Scheduled Activity with the breakdown of the respective valued items making up the total cost of the activity. The second part shall list the valued item with the respective Scheduled Activity or Activities that make up the total cost indicated. In the case where a number of schedule items make up the total cost for a valued item (shown in the Schedule of Values) the total cost for each scheduled item should be indicated.
- B. These listings shall be updated and submitted in conjunction with the CPM monthly submittals as stated in Specification Section 01311 – SCHEDULING AND REPORTING.
- C. Approved change orders reflected in the CPM Schedule shall be incorporated into the Schedule of Values as a single unit identified by the change order number.

1.5 CHANGES TO SCHEDULE OF VALUES

- A. Changes to the CPM Schedule which add activities not included in the original schedule but included in the original work (schedule omissions) shall have values assigned as approved by the Engineer. Other activity values shall be reduced to provide equal value adjustment increases for added activities as approved by the Engineer.
- B. In the event that the Contractor and Engineer agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values for activities may be made.

1.6 LIQUIDATED DAMAGES

- A. The Schedule of Values information is an integral part of the scheduling and reporting under Section 01311 – SCHEDULING AND REPORTING and the progress payment information. As such, it is critical information to evaluating the project's progress and the proper planning of the Owner's and Engineer's work effort as well as their financial obligations associated with this Project. Accordingly, if any submittal required by this Section is found to be incomplete or is submitted later than required, the Owner will suffer financial loss and, accordingly, liquidated damages will be assessed against the Contractor in accordance with the Agreement.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01301

SECTION 01311

SCHEDULING AND REPORTING

1311.1

PROJECT SCHEDULE

ALLOWANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes scheduling and reporting requirements of the Contractor.

1.2 GENERAL

- A. The scheduling of the Work under the Contract shall be performed by the Contractor in accordance with the requirements of this Section. The development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling. The CPM Schedule shall be cost loaded based on the schedule of values as approved by the Owner in accordance with the requirements of Section 01301 – SCHEDULE OF VALUES. The CPM schedule and all reports should be prepared with Primavera P6 Release 8.2 software. Where submittals are required hereunder, the Contractor shall submit an electronic copy and four hard copies of each submittal item.

1.3 INITIAL QUALIFICATIONS

- A. The Contractor shall submit a statement of computerized CPM capability at the First Progress Meeting verifying that either the Contractor has in-house capability qualified to use CPM techniques and the Primavera P6 Release 8.2 software or that the Contractor will employ a CPM consultant so qualified. In either event the statement shall identify the individual who will perform the CPM scheduling. Capability shall be verified by description of construction projects on which the individual has successfully applied computerized CPM and shall include at least two projects of similar nature, scope and value not less than one-half the Total Bid Price of this project. The statement shall also provide the contact persons for the referenced projects with current telephone and address information.

1.4 INITIAL SCHEDULE SUBMITTALS

- A. The Contractor shall submit two short term schedule documents at the First Progress Meeting which shall serve as the Contractor's Plan of Operation for the initial 60 day period of the Contract Time and to identify the manner in which the Contractor intends to complete all work within the Contract Time.

The Contractor shall submit: (1) a 60 day Plan of Operation bar chart, and (2) a project overview bar chart type plan for all work as indicated below.

1. 60-Day Plan of Operation: During the initial 60 days of the Contract Time, the Contractor shall conduct Contract operations in accordance with the 60-day bar chart Plan of Operation. The bar chart so prepared and submitted shall show the accomplishment of the Contractor's early activities (mobilization, permits, submittals necessary for early material and equipment procurement, submittals necessary for long lead equipment procurement, CPM submittals, initial site work and other submittals and activities required in the first 60 days).
 2. Project Overview Bar Chart: The overview bar chart shall indicate the major components of the project work and the sequence relations between major components and subdivisions of major components. The overview bar chart shall indicate the relationships and time frames in which the various components of the Work will be made substantially complete and placed into service. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 36-inch by 60-inch in size. Not more than three sheets shall be employed to represent this overview information.
- B. The Owner and the Contractor shall meet to review and discuss the 60-day plan of operations and project overview bar chart within one week after they have been submitted to the Owner. The Contractor shall make corrections to the schedules necessary to comply with the Contract requirements and shall adjust the schedules to incorporate any missing information requested by the Owner.

1.5 CPM SCHEDULE SUBMITTALS

- A. Original CPM Schedule Submittal: Within 30 calendar days after the commencement date stated in the Notice to Proceed, the Contractor shall submit for review by the Owner an electronic and hard copy of the CPM Network Schedule. This submittal shall have already been reviewed and approved by the Contractor's Project Manager, Project Superintendent, and the Project Estimator prior to submission. The CPM Schedule shall show a complete interdependence and sequence of construction and project related activities reasonably required to complete the Work. The CPM Schedule shall also describe the activities to be accomplished and their logical relationships and show a discernible Critical Path.
- B. As stated in Paragraph 1.7.F herein, all float indicated in the schedule shall belong to the project. The Computerized Schedule Report tabulations shall include the following:
 1.
 1. Report of activities sorted by Early Start date.

2. Report of activities sorted by Total Float.
 3. Report of activities sorted by Responsibility Code. Responsibility Codes shall be established for the Contractor, Owner, subcontractors, suppliers, etc. These codes shall be identified in the CPM Schedule.
 4. A successor-predecessor report which shall identify the successor and predecessor activities for each activity and ties between schedule activities.
 5. A report explaining changed logic.
 6. Report explaining adjusted or modified sequences of work.
 7. Schedule of Values report showing budgeted, cost this period, total cost billed to date, remaining cost and approved change order values. Organization shall be based upon the Owner's accepted SOV line items.
- C. Original CPM Schedule Review Meeting: The Contractor shall, within 40 calendar days from the commencement date stated in the Notice to Proceed, meet with the Owner and Engineer to review the original CPM schedule submittal. The Contractor shall have the Project Manager, Project Superintendents, and the Project Scheduler in attendance. The Owner's review will be limited to the submittal's conformance to the Contract requirements. However, the review may also include:
1. Clarifications of the design intent, process, and startup requirements.
 2. Directions to include activities and information missing from the submittal.
 3. Requests to the Contractor to clarify the schedule.
- D. Revisions to the Original CPM Schedule: Within 50 calendar days after the commencement date stated in the Notice to Proceed, the Contractor shall have revised the original CPM schedule submittal to address all review comments from the original CPM schedule review meeting and resubmit the network diagrams and reports for the Owner's review. The Owner, within 14 calendar days from the date that the Contractor submitted his revised schedule will either (1) accept the schedule and cost loaded activities as submitted, or (2) advise the Contractor in writing to review any part or parts of the schedule which either do not meet the Contract requirements or are unsatisfactory for the Owner to monitor the project's progress and status or evaluate monthly payment requests by the Contractor. The Owner may accept the schedule with conditions that the first monthly CPM schedule update be revised to correct deficiencies identified. When the schedule is accepted, it shall be considered as the "Original CPM Construction Schedule" until an updated schedule has been submitted. The Owner reserves the right to require that the Contractor adjust,

add to, or clarify any portion of the schedule which may later be discovered to be insufficient for the monitoring of the Work, coordinating the Work with the work of other contractors in the area (i.e. Huron A, Huron B) or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions or clarifications.

- E. Acceptance: The acceptance of the Contractor's schedule by the Owner will be based solely upon the schedule's compliance with the Contract requirements. By way of the Contractor assigning activity duration and proposing the sequence of the Work, the Contractor agrees to utilize sufficient and necessary management and other resources to perform the work in accordance with the schedule. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.
- F. Submission of the Contractor's progress schedule to the Owner shall not relieve the Contractor of total responsibility for scheduling, sequencing, and pursuing the Work to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed work.
- G. Monthly Updates and Periodic CPM Schedule Submittals: Following the acceptance of the Contractor's Original Construction Schedule, the Contractor shall monitor the progress of the Work and adjust the schedule each month to reflect actual progress and any changes in planned future activities. Each schedule update submitted must be complete including all information requested in the original schedule submittal and that shown in Paragraph 1.7. Each update shall continue to show all work activities including those already completed. These completed activities shall accurately reflect the "as built" information by indicating when the work was actually started and completed.
- H. Neither the submission nor the updating of the Contractor's original schedule submittal nor the submission, updating, change or revision of any other report, curve, schedule or narrative submitted to the Owner by the Contractor under this Contract, nor the Owner's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying, in any way, the Contract completion date or milestone dates or of modifying or limiting, in any way, the Contractor's obligations under this Contract. Only a signed, fully executed change order can modify these contractual obligations.
- I. Weekly schedule updates shall be submitted by the Contractor and will be reviewed with the Contractor during weekly construction progress meetings and weekly Program Sequencing meetings with Huron A, B and Concord Ave project teams. The Contractor shall submit traffic management plans, sketches, variable message board locations, and other signage information with the weekly schedule updates. The goal of these meetings is to enable the Contractor and the Owner to initiate appropriate remedial action to minimize any known or foreseen delay in completion of the Work, to determine the amount of Work completed since the last month's schedule update, and to coordinate construction efforts, including traffic management, between contracts. The

status of the Work will be determined by the percent complete of each activity shown in the CPM Schedule. Weekly construction progress meetings are considered a critical component of the overall monthly schedule update submittal and the Contractor shall have appropriate personnel attend. As a minimum, all Construction progress meetings and Program sequencing meetings shall be attended by the Contractor's Scheduler, Project Manager, and General Superintendent.

- J. The Contractor shall submit the electronic schedule files in a format importable to another P6 program and hard copies of the revised CPM Schedule, the revised successor/predecessor report, and the Project Status Reports as defined by Paragraph 1.8 of this Section with the Contractor's Application for Payment. Applications for Payment which are submitted without the proper CPM Updates shall be held until the Contractor has satisfied the Contract requirement. Within five (5) working days of receipt of the above noted revised submittals, the Owner will either accept or reject the monthly schedule update submittal. If accepted, the percent complete shown in the monthly update will be the basis for the Application for Payment to be submitted by the Contractor. If rejected, the update shall be corrected and resubmitted by the Contractor before the Application for Payment for the update period can be processed.
- K. Schedule Revisions: The Contractor shall highlight or otherwise identify all changes to the Network Diagram Schedule Logic or activity durations made from the previous schedule. The Contractor shall modify any portions of the CPM schedule which become infeasible because of activities behind schedule or for any other valid reason.

1.6 CHANGE ORDERS

- A. Upon written approval of a change order, or upon written receipt by the Contractor of authorization to proceed with additional work, the change shall be reflected in the next submittal of the CPM schedule by the Contractor. The Contractor shall utilize a sub-network in the schedule depicting the changed work and its effect on other activities (such as a "fragnet"). This sub-network shall be tied to the main network with the appropriate logic so that a true analysis of the Critical Path can be made.

1.7 CPM STANDARDS

- A. Definitions: CPM, as required by this Section, shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." In the case of conflicts between this specification and the AGC Document, this specification shall govern.

- B. Construction Schedules: Construction schedules shall include a graphic network diagram and computerized construction schedule reports as described in Paragraph 1.8.
- C. Networks: The CPM network shall be in a form of a time scaled precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets. Individual sheets shall not exceed 36-inch by 60-inch.
- D. Activity IDs: Activities should be numbered with a unique identification number beginning with #3000. Note that other projects referred to in this Section will use Project IDs #1000 to 2999 and Project IDs 5000 to 7999.
- E. All construction activities and procurement shall be indicated in a time-scaled format and a calendar time line shall be shown along the entire sheet length. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar time line. All activities shall be shown using the symbols that clearly distinguish between critical path activities, non-critical activities and free float for each non-critical activity. All activity items shall be identified by their respective Activity Number, Responsibility Code, Work Duration, and their Dollar Value. All non-critical path activities shall show their total float time in scale form by utilizing a dotted line or some other graphical means.
- F. Duration Estimates: The duration estimate indicated for each activity shall be computed in working days and shall represent the single best estimate considering the scope of the activity work and resources planned for the activity. Except for certain non-labor activities, such as curing of concrete or delivery of materials, activity duration shall not exceed 10 working days nor be less than one working day unless otherwise accepted by the Owner.
- G. Float Time: Float time shall be as follows:
1. Definition: Unless otherwise provided herein, float as referenced in these documents, is total float. Total float is the period of time measured by the number of working days each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, that activity then becomes part of the critical path and controls the end date of the project. Thus, the delay of the non-critical path activity beyond its float period will cause delay to the project itself.
 2. Float is not for the exclusive benefit of the Contractor, but is an expiring resource available to the Owner, or the Contractor, to accommodate changes in the Work, however originated, or to mitigate the effect of events which may delay performance or completion of all or part of the Work within the Late Dates, the Contractor's anticipated completion, or Contract Time. Contract time extensions for the

Contract performance will be granted only to the extent that delays or disruptions to affected work paths exceed total float along those paths of the current Working Schedule (updated schedule) in effect at the time of delay or disruption. Delays and disruptions which cause the end date of the Work to exceed current contract completion date must be beyond control and without fault or negligence of the Contractor or any Subcontractor at any tier. In the event that the delays or disruptions impact an already negative float path, the Contractor will not receive a time extension unless and until the activity with the highest negative float is driven even further negative. Delays or disruptions are not considered a basis for time extension to this contract unless and until such delays or disruptions are resolved as set forth in the General Conditions.

3. Pursuant to the float sharing requirements of this Section, the use of float suppression techniques such as preferential or logic sequencing (crew movement, equipment use, etc.), special lag/lead restraints, and extended activity times or duration, imposed dates, scheduling of work not required for a Contract Time as required work, and others, are expressly prohibited. Use of float time disclosed or implied by use of alternate float suppression techniques shall be shared to the benefit of both the Owner and the Contractor. Justify use of preferential sequencing, special lag/lead relationships and other network techniques that may be construed as float suppression techniques as being necessary for efficient utilization of resources in execution of the Contract. Use of any network techniques solely for the purpose of suppressing float will be cause for rejection of schedule submittal. The Contractor shall adjust or remove any float suppression techniques as a prerequisite to a request for an increase in Contract Price or Contract Time.

1.8 SCHEDULE REPORTS (FORMAT)

- A. Schedule Reports: Schedule Reports shall be prepared based on the Construction Schedule, and shall include the following minimum data for each activity:
 1. Activity Numbers and Responsibility Codes.
 2. Work Order No.
 3. CIP No.
 4. Estimated Activity Duration.
 5. Activity Description.
 6. Start Station (in format #####)

7. End Station (in format #####)
 8. Engineer's Alignment for stationing basis
 6. Activity's Percent Completion.
 8. Early Start Date (Calendar Dated).
 9. Early Finish Date (Calendar Dated).
 10. Late Start Date (Calendar Dated).
 11. Late Finish Date (Calendar Dated).
 12. Status (Whether Critical).
 13. Total Float for Each Activity.
 14. Free Float for Each Activity.
 15. Cost Value for Each Activity.
 16. Other specific data fields as necessary to coordinate the Huron A, Huron B and Concord Ave schedules.
- B. Project Information: Each Schedule Report shall be prefaced with the following summary data:
1. Project Name.
 2. Contractor.
 3. Type of Tabulation.
 4. Project Duration.
 5. Contract Completion Date (revised to reflect time extensions).
 6. The Commencement Date Stated in the Notice to Proceed.
 7. The Data Date and Plot Date of the Network Diagram.
 8. If an update, cite the new schedule completion date.

1.9 PROJECT STATUS REPORTING

- A. In addition to the submittal requirements for the CPM scheduling identified in this Section, the Contractor shall provide monthly project status reports (Overview Bar Chart and a written narrative report) to be submitted in

conjunction with the revised CPM Schedules as specified in Paragraph 1.5. Status reporting shall be in the form specified below.

- B. The Contractor shall prepare and submit monthly an Overview Bar Chart schedule of the major project components. The overview bar chart schedule shall be a summary of the current CPM schedule (original and as updated and adjusted throughout the entire construction period). It shall be limited to not more than four sheets which shall not exceed 8-1/2-inch by 11-inch. The major project components shall be represented as time bars which shall be subdivided into various types of work.
- C. Each major component and subdivision shall be accurately time scale plotted consistent with the project overview bar chart specified above. It shall represent the same status indicated by early start and finish activity information contained in the latest update of the CPM schedule. In addition, a percent completion shall be indicated for each major component and subdivision. The initial submittal of the overview bar chart schedule shall be made at the time that the revised original CPM schedule is submitted to the Owner. The Contractor shall amend the overview schedule to include any additional detail required by the Owner. The Contractor shall include any additional information requested by the Owner at any time during the construction of the Work.
- D. The Contractor shall prepare monthly written narrative reports of the status of the project for submission to the Owner. Written status reports shall include:
 - 1. The status of major project components (Percent Complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.
 - 2. The progress made on critical activities indicated on the CPM schedule.
 - 3. Explanations for any lack of work on critical path activities planned to be performed during the last month.
 - 4. Explanations for any schedule changes, including changes to the logic or to activity duration.
 - 5. A list of the critical activities scheduled to be performed in the next two month period.
 - 6. The status of major material and equipment procurement.
 - 7. The value of materials and equipment properly stored at the site, but not yet incorporated into the work-in-place.
 - 8. Any delays encountered during the reporting period.

9. An assessment of inclement weather delays and impacts to the progress of the Work.
 10. A statement as to the adequacy of remaining contract time to complete Work.
- E. The Contractor shall include copies of the last month's daily logs, field reports, and As-Built redlines with the written monthly narrative report.
 - F. The Contractor may include any other information pertinent to the status of the project. The Contractor shall include additional status information requested by the Owner.

1.10 INCLEMENT WEATHER PROVISIONS OF THE SCHEDULE

- A. The Contractor's construction schedule shall include lost days on the CPM schedule's critical path due to inclement weather during an active period of Work. The Contractor's schedule shall also include lost days due to an inclement weather related shutdown at the requirement of the Owner, see Article 2 of the Special Conditions.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION

Item 1311.1 – PROJECT Schedule

METHOD OF MEASUREMENT:

Payment will be made against the allowance based on invoices submitted by the General Contractor on a monthly basis. Labor, professional services, technician, and other invoices shall include a breakdown of hours, labor rates, direct expenses all sub-consultant and contractor mark-ups, material costs, shipping, taxes and all other costs included in the request. Incomplete or incorrect invoices will not be approved.

The General Contractor is allowed up to a 5% Mark-up on labor, professional service, technician, and other costs related to the CPM Schedule.

BASIS OF PAYMENT

The allowance for this item shall be reimbursement to the General Contractor to furnish all labor, professional services, technician, equipment, and incidentals for the developing and maintaining the CPM Schedule. The work includes, but is not limited to developing and maintaining the CPM Schedule; providing weekly schedules; attending all meetings; and revising the CPM schedule on a monthly basis.

END OF SECTION 01311

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 CONSTRUCTION PHOTOGRAPHS

- A. The Contractor shall arrange for a professional photographer to take photographs during construction.
- B. Sufficient photographs to document the work, but no less than twelve, shall be taken per month. Three compact discs (CD's) with digital images shall be furnished on a monthly basis. The Owner, Engineer, and Contractor shall each receive one CD.
- C. Monthly photographs shall be filed digitally with project name, job number and date, and kept by both the Engineer and the Contractor.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01380

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SECTION 01390

PRE CONSTRUCTION SURVEY

1390.1 INTERNAL AND EXTERNAL BUILDING INSPECTION EACH

PART 1 - GENERAL

1.1 SUMMARY:

- A. Provide construction videos and photographs pertinent to the work during the Contract period specified.
- B. Perform pre-construction conditions surveys on all exterior surface features and building exterior surfaces and interiors at locations where building monitoring points are required or as otherwise required by the Geotechnical Engineer.
- C. Perform post-construction survey at properties where a damage claim has been reported. Assume 20 properties require post-construction survey.

1.2 SYSTEM DESCRIPTION:

- A. Work under this section includes photography and video recording of surface conditions of interior and exterior of building and exterior areas and structures as indicated on the drawings.
- B. Perform photography and video recording:
 - 1. Before commencement of work.
 - 2. After completion of construction activities at areas where damage claims have been reported.

1.3 QUALITY ASSURANCE

- A. Qualifications
 - 1. The company engaged for professional photography shall, during the past 5 years, have successfully completed photographing and video recording three construction projects of similar scope and dollar value as the construction project which is the subject of this Contract.
 - 2. Qualifications of the firm performing the pre- and post-construction building surveys:

- a. Inspections shall be performed by or under the direct supervision of a Registered Professional Engineer, licensed in the state of Massachusetts. This individual shall have at least 3 years' experience in the inspection or design of residential and commercial structures.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01300 Submittals.
- B. Submit prior to performing any photography and video work, the qualification of the firm performing the photography and video recording work. Include a list of projects to demonstrate compliance with paragraph 1.3.A.1 of this section. For each project, include project name, location, owner, year(s), name of general contractor, and current address and phone number of the owner or owner's representative.
- C. Submit copies of all videos as follows:
 1. Four (4) copies of the pre-construction video to the ENGINEER within 30 days after Notice to Proceed.
 2. Format shall be DVD.
- D. Submit copies of photographs as follows:
 1. Photographic compact discs (photo CDs) and prints of each view. Submit two sets of prints and three photo CDs.
 2. Each print shall be identified and mounted as herein specified.
- E. Submit written release(s) from the photographer and photographic studio covering all videos, photographs (prints), and photo CDs of images taken as specified. Submit each release at the time of development of the subject video and/or photograph.
- F. Within 30 days of Notice to Proceed, submit the qualifications of Professional Engineer(s) that will perform the "before and after" condition survey of building as specified in paragraph 3.1 of this section.
- G. Within 30 days of Notice to Proceed, submit four (4) copies of pre-construction ("before") "Building Condition Survey" reports and videos (on DVD) of buildings as indicated in paragraph 3.1 to ENGINEER.

1.5 SEQUENCING AND SCHEDULING:

- A. Pre-construction photography and video, including pre-construction building surveys and exterior areas shall be completed prior to beginning of construction.
- B. Post-construction building condition survey work: only of areas where a damage claim has been reported.
- C. Dates for other photography and video recording at the site shall be coordinated with the ENGINEER.

1.6 WORKSITE CONDITIONS

- A. Right of entry for building conditions survey: Contractor shall obtain the right of entry for all structures to be surveyed.
 - 1. Prior to contacting the individual building owners, the ENGINEER will provide a general notice describing the project and the need to obtain access to each building. The Contractor shall not contact individual building owners until at least 2 weeks after the ENGINEER has provided notice to the building owners.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Video:
 - 1. Format: Digital recorded and submitted on DVD.
 - 2. Video Identification:
 - a. Video Number:####-yyy

Where: ### = Contract Number
yyy = video number, sequentially numbered 001
 - b. Clearly identify and indicate:
 - 1) Project name and Contract No.
 - 2) General description of the subject(s) of the video.
 - 3) Date (s)
 - 3. Log of Videos: Provide a binder with the log of all videos taken for this Contract. Format of the log shall be tabular and shall include a description of each photograph that includes all the information specified in paragraph 2.1.A.2 of this section.

B. Photographs:

1. Prints:

- a. Type: Color prints from digital or film negatives for color photography.
- b. Finish: smooth glossy surface.
- c. Size: 8-inch x 10-inch plus suitable margin for identification.
- d. Paper weight: Single weight.
- e. Electronic format: photographic compact disc (photo CD).

2. Print identification:

- a. Photograph number: ####-yyy-zz

Where: #### - Contract Number
yyy – roll of film, sequentially numbered from 001
zz – Photograph number, sequentially numbered from 01
for each
roll of film

- b. Clearly identify and indicate:

- 1) Project name and Contract No.
- 2) The location (e.g., station number) where the photograph was taken.
- 3) The view/orientation of the photograph (compass direction and vertical declination of view (e.g., horizontal, looking up, looking down, etc.)
- 4) Identification of main features in view.
- 5) Any other data and information pertinent to the purpose and identification of the exposure.
- 6) Date and time.
- 7) Weather conditions (for exterior shots).

- c. Each print shall be identified with information on it in a manner that results in minimum interference with exposure printed.

3. Print mounting:

- a. Each print shall be inserted in a clear plastic photograph holder jacket.
 - 1) Material or fabrication shall not cause discoloration
 - 2) Holder shall be designed to prevent print from slipping out of envelope.
 - 3) Holder shall permit convenient removal and insertion of print.
 - 4) Holder shall have a reinforced binding edge suitable for binder herein specified.
4. Print Filing Binder:
 - a. Binders shall be sturdy and durable.
 - b. Provisions for labeling front cover and binding face:
 - 1) Label front of each binder with: Project name, Contract No., “Project Photographs, Volume No. __”, dates covered by photographs included in the binder.
 - c. Binders shall be a size suitable for filing mounted prints.
 - d. Permit convenient removal and insertion of mounted prints.
 - e. Include a tabular index of all photographs, describing each photograph in the binder and including the information specified in paragraph 2.1.B.2 of this section.
 - f. Include the photo CD(s) that contain the digital images of all the photographs that are included in the binder. Provide a sleeve or pocket in the binder for storing the photo CD(s). Each photo CD shall be numbered with a sequential number.
5. Master Log of Photographs: Provide a binder with the master log of all photographs taken for this Contract. Format of the log shall be tabular and shall include a description of each photograph that includes all information specified in paragraph 2.1.B.2 of this section. For each photograph indicate the CD it is included on.
 - a. Include a separate tabular log of all photo CD(s) and cross-reference which photo numbers are included on each photo CD.

PART 3 - EXECUTION

3.1 GENERAL PHOTOGRAPH AND VIDEO RECORDING:

A. General:

1. All views shall contain a relative dimension reference that is easily recognizable. In views where dimensions are critical use a recognizable measuring device such as folding ruler or measuring tape in a manner that the markings are clean and sharp in the photograph and the device located in close relationship to the subject of the photograph.

B. Detailed examination of the above grade structures, buildings and outside areas shall include documentation of exterior visual survey of the property, on-site improvements and plantings; detailed video inspections of the exteriors of buildings; color photographs of the exteriors showing visually evident structural faults, including but not limited to:

1. exterior façade and interior for structures indicated in the Contract Drawings.
2. location and size of cracks in exterior/interior walls, especially instances of cracked or missing plaster within defined survey areas;
3. damaged masonry or roofing with the defined survey areas;
4. damaged windows or doorway within the defined survey areas;
5. walls which are not vertical within the survey area;
6. damage to foundation, including exterior/interior basement walls; and tightness of fit of doors and windows with respective jambs.;
7. sidewalks, paved areas, utility poles, stairways, patios, retaining walls, and landscaped areas.

PART 4 – COMPENSATION

Item 1390.1 – Internal and External Building Inspections

METHOD OF MEASUREMENT:

Measurement for payment for Internal and External Building Inspections will be based on the per Each bid as approved by the Engineer.

BASIS OF PAYMENT/ INCLUSIONS:

Under the Unit Price for Internal and External Building Inspections, the Contractor shall furnish all labor, materials, instrumentation, tools, equipment, and incidentals required to complete an internal and external building inspection, irrespective of the number of units within a building. Payment under this Item includes, but is not limited to, obtaining Right of Entry(ies), up to 3 documented attempts to notify the property owner(s) via certified mail; video inspection and documentation of internal and external conditions; delivering DVD and report of internal and external inspection; and re-inspection of internal and

external building.

END OF SECTION 01390

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SECTION 01400

QUALITY CONTROL

1400.1 **QUALITY CONTROL AND TESTING** **ALLOWANCE**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes quality assurance and control of installation and manufacturer's field services and reports.

1.2 WATERTIGHTNESS

- A. All structures, pipes, and equipment which are to contain water shall be watertight under all operating conditions for which they are intended. The Contractor shall furnish all labor, materials and equipment and do all work required by the Engineer to make all such parts of the work watertight, or to replace them if in the opinion of the Engineer any leakage is excessive. All such parts of the work filled with water for testing watertightness shall be left filled as required by the Engineer.

1.3 LAYOUT OF WORK

- A. The Contractor shall employ at his own expense a Massachusetts Registered Land Surveyor, acceptable to the Engineer and direct him to establish an initial "Construction Base Line" as indicated on the Drawings. Said base line shall be staked at 25 foot stations. The Engineer shall also provide bench mark information on the Drawings or separately in writing. The Contractor shall do all layout of the work from said base line and bench marks.
- B. The Contractor shall employ, at his own expense, a Registered Land Surveyor, approved by the Engineer and cause him to establish permanent bench marks during the entire progress of the work, to which easy access may be made to determine and assure all lines and grades and to verify same from time to time. The Contractor shall keep on the job a level and transit and allow the Owner's Representative and the Engineer unrestricted use of same at the work site. Such check shall not be considered as approval of the Contractor's work.
- C. The Contractor shall maintain the construction base line stakes at all times. Should stakes or marks be destroyed during the course of the work, by the Contractor or by others, the Contractor shall, at his own expense, provide the services of a Massachusetts Registered Land Surveyor, acceptable to the Engineer, to reestablish such stakes and marks.

1.5 CARE OF WATERCOURSES

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

1.6 HYDRANTS

- A. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times.

1.7 MANUFACTURER'S FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections, provide material or product supplier's or manufacturer's technical representative to observe site conditions; conditions of surfaces and installation; quality of workmanship; start-up of equipment; operator training, testing, adjustment, and balance of equipment as applicable; and to initiate operation, as required. Conform to minimum time requirements for start-up operations and operator training if defined in specification sections.
- B. At the Owner's or Engineer's request, submit qualifications of the manufacturer's representative 15 days in advance of required representative's service. The representative shall be subject to approval of the Owner and Engineer.
- C. Manufacturer's representative shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions. Submit reports within 14 days of observation to Engineer for review.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION

Item 1400.1 – Quality Control and Testing

METHOD OF MEASUREMENT:

Payment will be made against the allowance based on invoices submitted by the General Contractor on a monthly basis. Labor, professional services, technician, and other invoices shall include a breakdown of hours, labor rates, direct expenses all sub-consultant and contractor mark-ups, material costs, shipping, taxes and all other costs included in the request. Incomplete or incorrect invoices will not be approved.

The General Contractor is allowed up to a 5% Mark-up on labor, professional service, technician, and other costs related to testing.

BASIS OF PAYMENT:

The allowance for this item shall be reimbursement to the General Contractor to furnish all labor, professional services, technician, equipment, and incidentals for testing required in this contract and not included in other pay items. The work includes, but is not limited to, testing for: backfill compaction, concrete and Hot Mix Asphalt standard paving compaction testing items.

SPECIAL NOTES/EXCLUSIONS:

Contamination, In-situ Soil density, Hot Mix Asphalt Porous Paving compaction testing, pipe and manhole testing, water main testing, test pits and all other testing not explicitly called out in this Section will not be paid for under this item and are covered under separate pay items.

END OF SECTION 01400

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SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

1500.1 CAM 004 PROGRAM OWNER'S FIELD OFFICE ALLOWANCE

PART 1 - GENERAL

1.1 PLANT

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

1.2 SUBMITTALS

- A. The Contractor shall submit a complete work plan including: proposed hours of operation, sequencing of work, number of shifts, number of work crews, and anticipated conflicts with existing utilities and facilities throughout the project. The work plan shall also include dates for temporary facility service interruption and required utility relocation. The plan shall also include a detailed schedule of all cooperation requirements with owners/operators of existing utilities and facilities.

1.3 PRIVATE LAND

- A. The Contractor shall not enter or occupy private land outside of easements, except by permission of the Owner.

1.4 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 utilities, structures or for other reasons.
- B. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him for laying and jointing different or additional items where required.

1.5 HAULING, HANDLING AND STORAGE OF MATERIALS

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

1.6 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, steel plates, construction and caution signs, concrete barriers, protective 7' tall fencing, lights and other means to prevent accidents to persons, vehicles, and damage to property. The Contractor shall, at his own expense, provide suitable and safe means for completely covering all open excavations and for accommodating pedestrian and/or vehicular travel when work is not in progress. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench 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, then special construction procedures shall be taken, such as limiting the length of open trench.

1.7 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor in accordance with the requirements of the Engineer, as shown on the Drawings, or described in the Specifications, or as directed by the Owner or Engineer. Test pits shall be backfilled and compacted immediately after their purpose has been completed and the surface restored and maintained as required by the Engineer.

1.8 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, fiber optic lines, fire signals, cable television cables, whether or not they are shown on the Drawings. The

Contractor shall carefully support and protect all such structures and utilities from injury of any kind. The Contractor shall notify the owner/operator of the proposed work and proposed protection plan so the owner/operator can review and approve protection measures. The Contractor is required to comply with all provisions of Massachusetts General Laws Chapter 353 entitled "Excavations-Public Ways-Notice Requirements" otherwise known as Dig Safe. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.

- B. The Contractor shall bear full responsibility for obtaining all locations of underground structures, utilities, and services. Services to buildings shall be maintained and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures as described in this section shall be a part of the work under the Contract.. The Contractor will be responsible for the removal and replacement of existing utilities or coordination with the owners/operators of the existing utilities and assisting the existing utilities where required.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City of Cambridge is required, that is not shown on the plans or the specifications; he may require the Contractor, in writing, to perform the work. Work so ordered will be paid for as extra work under provisions of the General Conditions. If relocation of a privately owned utility is required, the Contractor will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and utility, and shall have no claim for delay due to such relocation. The Contractor shall notify public utility companies in writing at least seven days (excluding Saturdays, Sundays and legal holidays) before excavating or working in any public way. The Contractor shall notify public utilities 30 days prior to any service call wherever possible.

1.9 WATER FOR CONSTRUCTION PURPOSES

- A. The Contractor will be allowed to purchase water from the City of Cambridge, MA for construction testing and start-up purposes.
- B. The express approval of the Cambridge Water Department shall be obtained before water is used. Water shall be metered as specified by the Cambridge Water Department. Hydrants shall only be operated under the supervision of Cambridge Water Department personnel.
- C. No direct cross connections will be permitted between the public water supply and the new water mains, or any other point where the possibility of backflow of contaminated water exists. All connections to points where there is the possibility of backflow shall be arranged to prevent backflow and shall be

approved by the City's Plumbing Inspector before they are put into operation.

1.10 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed Work shall be carefully protected. No driving or wheeling, walking or placing of heavy loads on newly constructed Work shall be allowed. All portions damaged shall be reconstructed, repaired, or replaced by the Contractor at his own expense.
- B. All elements of the Work shall be protected in a manner approved by the Engineer. Should any part of the Work become heaved, cracked, or otherwise damaged, all such damaged portions of the Work shall be completely repaired and made good by the Contractor at his own expense as required by of the Engineer.
- C. If, in the final or any daily inspection of the Work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein for at least the guarantee period described in the Contract Documents.
- D. The Contractor shall take all necessary precautions to prevent damage to all elements of the Work due to water pressure during and after construction and until such Work is accepted and taken over by the Owner.

1.11 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor at his expense to a condition similar or equal to that existing before the damage was done or he shall make good the damage in another manner acceptable to the Owner and Engineer.
- B. Along the location of this Work, all fences, walks, bushes, trees, shrubbery, and other physical features shall be protected and restored in a thoroughly workmanlike manner. Fences and other features removed by the Contractor shall be replaced in their original location or at a location indicated on the Drawings as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be graded and seeded.
- C. Trees close to the work shall be boxed or otherwise protected against injury.

No trees shall be cut, braced, or damaged without prior notification of the City Arborist.

- D. The protection, removal, and replacement of existing physical features along the line of work shall be a part of the work under the Contract, and all costs in connection therewith shall be included in the Bid Proposal unless a Bid Item has been established elsewhere in these Construction Documents for the express payment of that specific item of Work.

1.12 INSTALLATION OF EQUIPMENT

- A. All wedges, shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

1.13 SLEEVES AND OPENINGS

- A. The Contractor shall provide all openings, channels, etc., and install anchor bolts and other items to be imbedded in concrete, as required to complete the work under this Contract, together with those required by subcontractors, and shall do all cutting and patching excepting cutting and patching of materials of a specific trade and as stated otherwise in the following paragraph.

1.14 REJECTED MATERIALS AND DEFECTIVE WORK

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor as required by the Owner and Engineer. The Contractor shall reimburse the Owner for any expenses, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as required by the Owner and Engineer, occurring previous to the final payment.

1.15 TEMPORARY UTILITIES

- A. Temporary Light and Power: The Contractor shall at his own expense, provide his own temporary light and power as required for the prosecution and completion of work, including light and power for the construction and engineering field office as well as light and power for dewatering pumps, and

trench and staging area lighting.

- B. Temporary Heat: The Contractor shall, at his own expense, provide sufficient temporary heat to maintain minimum temperatures specified elsewhere, in all areas designated elsewhere in these documents.
- D. Temporary Water: Water for drinking purposes and other usage will be provided by the Contractor at his own expense.
- E. Sanitary Provisions: The Contractor shall provide and maintain sanitary accommodations for the use of his employees and the Engineer, as may be necessary to comply with the requirements and regulations of the local and state departments of health.
- F. Maintaining Operation of the Existing Facilities:
 - 1. The Contractor shall provide temporary utilities and/or cooperate with utilities to maintain full service to the residences and buildings in the project area. The Contractor shall be responsible for careful consideration of the construction scheduling and anticipation of potential interferences with existing utilities, operations and structures. The Contractor shall maintain close communications with the Engineer and provide the Engineer with a detailed description of each proposed activity sufficiently in advance of its commencement for review and comments to be made.
 - 2. Temporary facilities which may be required include, but are not limited to, electrical power; lighting; heating; cooling; ventilating; telephone; cable television; potable water; fire protection; drainage; sanitary facilities; trench covers; protection of existing utilities; structures; streams; trees and shrubs; access roads; sewage conveyance; piping; and pumping. The Contractor will be responsible for providing, connecting, and maintaining emergency generators to serve homes in the event temporary electrical services cannot be established by the power company. The Contractor will be responsible to furnish a licensed electrician to connect the houses to the emergency generators, maintain the generators 24 hours a day, and disconnect the houses when service can be reestablished to the power lines. The generators will be provided and maintained at no additional cost to the Owner.
 - 3. The Contractor shall coordinate efforts with the owners and/or operators of the existing facilities to avoid any service interruption. The Contractor shall keep utilities informed of proposed work activity and notify utilities of required work four weeks in advance. The Contractor must schedule work to avoid repeated, unnecessary, or last minute service calls by the owners/operators of existing facilities.

1.16 ACCESS TO THE WORK

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

1.17 POLLUTION CONTROL

- A. The Contractor shall conduct clean-up and disposal operations, as necessary, to comply with state and local ordinances and anti-pollution laws.
- B. Outdoor burning of rubbish and waste material on the site will not be permitted.
- C. Disposal of volatile fluid wastes (such as mineral spirits, oil, gasoline, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.

1.18 CAM 004 PROGRAM ENGINEER'S FIELD OFFICE

- A. The Contract provides for an Allowance for the Engineer's field office, supplies, electronics and support. The Allowance will be paid as expenses are actually incurred by the Contractor. Mark-ups are not allowed. The Contractor will apply the field office expenses including utilities and rent as described in Paragraph 1.18.B, below, against the allowance with detailed receipts or proof of payment submitted to the Engineer on a monthly basis. Further expenditures made against the Allowance will include those items described in Paragraph 1.18.C below. The Contractor may be directed to procure or coordinate those services directly in which case, receipts and proof of purchase shall be provided on a monthly basis for payment against the Allowance. In some instances, the Engineer or Owner will facilitate coordination but payment will ultimately be made, by the Contractor with receipts and proof of purchase shall be provided on a monthly basis for payment against the Allowance.
- B. The Contractor shall provide and maintain at an approved location at or near the site, for the duration of the Contract, a separate office for the exclusive use

of the Engineer and Owner. At this time a field office has been procured, by others, at 20 Wilson Road, Cambridge, MA. The Concord Ave Project Contractor shall be responsible for the rent and all utilities (air conditioning, electric, gas/heat, telephone, XFINITY or FIOS cable/internet service, water/sewer, etc.) for the entire duration of the Contract. The Contractor shall further be responsible for the maintenance of the space including repairs and maintenance to the utilities. If the 20 Wilson Road facility becomes unavailable during the execution of the Contract, the Contractor will be responsible for procuring a new office space and facilities and for paying for the office space and utilities. At no time shall the Engineer and Owner be without the suitable office space. If a move is required, all arrangements and the move must be completed prior to the end of the use of the 20 Wilson Road office space. The responsibility for furnishing and moving the Engineer's field office furnishings and equipment will be the Contractor's responsibility. If a move is necessary, the new office space shall include, at a minimum, the following facilities: a minimum of one men's bathroom (with a minimum of two flushing toilets, one urinal, and a sink) and one women's bathroom (with a minimum of two flushing toilets and a sink); a kitchen with working sink, refrigerator, stove and oven; a conference room or space capable of accommodating meetings of up to 25 attendees; no less than 8 offices with doors; cubical office space accommodating no less than 10 8-ft x 8-ft cubical with desks and walls; storage closets; and a room or space suitable for a large printer/copy machine and large format printer. The office shall have central air conditioning, heat, lighting, water and suitable internet services.

C. Items which the Contractor shall expect to be responsible for payment under the Allowance include, but are not limited to the following, and only as directed and approved by the Engineer:

1. 18 flat top desks with drawers
2. Cubicle walls sufficient to build 10 office cubicles approximately 8-ft x 8-ft in dimension.
3. desk lamps
4. 25 tables at least 2 feet 8-inches wide and 6 feet long
5. drafting tables with lamps
6. 18 desk chairs with casters and 6 adjustable drafting stools with casters
7. 18 desk guest chairs
8. (4) 4-section fireproof lockable file case
9. 20 metal folding chairs
10. 2 wall clocks
11. (18) 10 gallon wastepaper baskets
12. 1 locker for survey equipment
13. (36) 2-drawer filing cabinets
14. 6 hanging file holders
15. 24 book shelves minimum 4 shelves and a minimum dimension of 4-ft wide

16. 1 full size refrigerator and one microwave
17. 1 individual cup Coffee Maker and coffee supplies provided on a monthly basis (Kurig or equal)
18. (3) 5-pound fire extinguisher
19. (3) industrial type first aid kit
20. (14) 96" x 48" Dry Erase Boards with Cleaner, Erasers, and Markers
21. (16) 24" x 9" Dry Erase Boards with Cleaner, Erasers, and Markers
22. XFINITY or FiOS Service for the field office (see above)
23. 1 photocopy machine Canon Color imageRUNNER C5185 or approved equal, capable of wireless printing from remote work stations, photocopies, scanning to remote e-mail locations and capable of being used as a fax machine.
24. 4 NEW Digital Cameras, Nikon Coolpix S9400 OR AS REQUESTED BY the Owner or Engineer
25. 1 potable water cooler with hot and cold taps
26. 2 NEW Automatic levels equal to TOPCON AT G6 with aluminum dome head tripod
27. 2 NEW 25-foot fiberglass level rod
28. 2 NEW 2' Smart Levels
29. 2 new 1 TB portable hard drives with USB 3.0 connection, factory formatted in the NTFS file system for compatibility with Windows 7, Vista, or XP, and with a minimum 2 year limited warrantee.
30. 8 NEW Laptop Computers meeting the following requirements:
 - Computers shall be NEW HP EliteBook 8560w or approved equal. Final computer specs shall be provided to the Contractor prior to the time of purchase.

Include all cable, manuals, and associated equipment. Manufacturer on site warranty shall cover the time period of the Contract. An additional 4 Year Limited Warranty plus 4 Year NBD On-site Service and CompleteCare shall be carried for all computers.

- C. The Contractor shall maintain the office during construction. Operation and maintenance of the field office shall include: supplying toilet paper, paper towels, liquid hand soap, paper, , field books, office supplies, bottled water, paper and plastic kitchen supplies for the kitchen, cleaning supplies, marking paint in assorted colors, monthly utility costs (telephone, high speed internet, Wi-Fi, electricity, water/sewer, and gas), heating, cooling costs, restocking the first aid kit, cleaning of the copier on a monthly basis, and cleaning service for the inside of the trailer on a weekly basis.
- D. The Contractor shall pay the regular monthly service charges and for long-distance calls.
- E. As part of the field office Allowance, the Contractor shall supply up to 16

Verizon or AT&T iPhone 5S or equivalent model acceptable to the Engineer for the use by the Owner and Engineer. Cellphones shall have the following minimum features; texting services; color display; speaker phone; camera; web and e-mail capable; Wi-Fi capable; touchscreen display; etc. The Contractor shall have a Verizon or AT&T Wireless representative provide a service demonstration for the Project Team and shall connect all internet and e-mail access. Contractor shall pay for the cost of the phone, maintenance and all monthly service and telephone charges for the duration of the Contract. A baseline program of 4000 monthly minutes and unlimited direct connect and e-mail usage shall be included. Prior to the purchase of the phones and plans, the Owner and Engineer will provide the specific phone type and plans requested.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION

Item 1500.1 – CAM 004 PROGRAM ENGINEER’S FIELD OFFICE

METHOD OF MEASUREMENT:

Measurement for Payment for the CAM 004 Program Engineer’s Field Office allowance will be based on actual invoices paid by the Contractor for the items listed above and any other field office and field personnel needs, for the Owner and Engineer as necessary to perform their work obligations and as directed by the Owner or Engineer. Payment shall be made after receipt of a copy of the invoice and/or proof of payment from the Contractor. A mark-up is not allowed. This item is for direct expenses only. Drawdown of the allowance shall be tracked as costs are realized. Payment will not be made without the explicit request for a service or item by the Owner or Engineer, approval of costs by the Owner or Engineer, and satisfactory delivery and set-up of the item or service requested.

BASIS OF PAYMENT:

Payment for the CAM 004 Program Engineer’s Field Office shall be based on actual invoices and/or proof of payment submitted by the Contractor for the engineer’s field office and engineer’s and owner’s personnel’s work needs. Under the allowance amount for this item, the Contractor shall provide all the needs for the Engineer’s Program Field Office and other phone and work needs of the Owner and Engineer, for the duration of the work and only as requested and approved by the Owner and Engineer.

EXCLUSIONS:

All costs associated with the Contractor’s field office, facilities, and administrative needs are not included herein. The Contractor’s time and labor and office support time is not included herein. These costs are considered incidental to the overall price of the contract.

END OF SECTION 01500

SECTION 01505

MOBILIZATION

1505.1

MOBILIZATION

LUMP SUM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes mobilization consisting of moving all plant and equipment onto the site required for the contractors operations; furnishing and erecting plants, temporary buildings, and project and other construction facilities; erecting project signs and traffic management signs; implementing security features and requirements; all as required for the proper performance and completion of the Work. Mobilization shall further include the following principal items:
1. Installing temporary construction power, wiring, and lighting facilities.
 2. Developing construction water supply.
 3. Providing field office trailers for the Contractor and the Engineer, complete with all specified furnishings, office equipment, communications facilities, fax machines, computers, and utility services.
 4. Providing and setting Cellular Phones for the Owner and Engineer as specified.
 5. Providing on-site sanitary facilities and potable water facilities.
 6. Arranging for and erection of Contractor's work and storage/staging yard(s).
 7. Having all OSHA required notices and establishment of safety programs.
 8. Having the Contractor's superintendent and project manager at the job site full time. The project manager shall not have superintendent duties.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION

Item 1505.1 - Mobilization

METHOD OF MEASUREMENT:

Payment for Mobilization will be at lump sum price bid for this item in the proposal and shall be payable by percentage complete per the previous listed items when the Contractor is operational on the site. Operational is defined as the substantial commencement of work on site as described in the following paragraph. The Lump Sum price bid for mobilization shall not exceed 2 percent of the Total Amount of Bid.

BASIS OF PAYMENT:

Under the Lump Sum price bid for Mobilization, the Contractor shall move his equipment to the site and prepare to begin construction. Mobilization shall include all costs of initiating the Contract, exclusive of the cost of materials. Mobilization includes securing and constructing a staging area(s) for materials and office trailers and erecting all temporary fencing (0.4%); furnishing office trailers fully equipped and supplied (0.2%); furnishing Cellular Phones for the Owner and Engineer and Cellular Phone services for the duration of the Contract (0.1%); furnishing and paying for all utilities (0.1%), broadband (0.1%), furnishing and installing pre-construction traffic management signage (0.1%); fabrication and installation of project sign (0.1%); distributing contact numbers for Contractor's staff to Owner and Engineer; submission and approval of initial shop drawings (0.1%); submission and approval of Traffic Management Plans (0.2%); submission and approval of initial work plans and sequencing plans (0.1%); installing temporary power, lighting and water for construction purposes (0.2%); implementing security features (0.1%); furnishing and installing temporary sanitary facilities (0.1%); transporting all necessary trucks and construction equipment to the site necessary to begin construction (0.1%); and all other work necessary to start Construction.

END OF SECTION 01505

SECTION 01560

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes temporary environmental controls necessary for the project including dust abatement, rubbish control, sanitation, chemicals, and cultural resources. Snow removal and sweeping of streets and sidewalks are discussed in Section 01570 - MAINTENANCE AND PROTECTION OF TRAFFIC.

1.2 DUST ABATEMENT AND CONTROL

- A. The Contractor shall prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from dust originating from its operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility for the Work. Dust abatement measures shall include but not be limited to spraying water, applying calcium chloride, or placing temporary pavement on and around trenches and at work sites.
- B. During excavation of soil/fill material dust shall be controlled to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.
- C. Ambient dust levels at the site shall be monitored by the Contractor prior to construction. During construction, real-time dust monitoring shall be conducted during any soil/fill handling activities. The monitoring shall consist of total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level, the Contractor shall perform additional measures to reduce the total dust concentrations.
- D. Nuisance dust levels may be encountered during regrading activities and excavation. Dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust. The Contractor shall refer to Section 02080 - SOIL AND WASTE MANAGEMENT for the Dust, Vapor and Odor Control Plan submittal requirements. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.

- E. Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation. Additional water spray may be utilized only when any indication of excessive dust is observed. The Contractor shall minimize the use of water within the limits of excavation.
- F. Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

1.3 RUBBISH CONTROL

- A. During the progress of the Work, the Contractor shall keep the Site and other areas used by it in a neat and clean condition and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Site and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.
- B. In the event that the Contractors work zone restricts municipal trash or recycling collection or makes it difficult for residents to bring trash or recycling to the street, the Contractor shall collect all trash and recycling within the work zone and transport it outside the work zone for municipal collection. Return trash and recycling receptacles back to respective properties.

1.4 SANITATION

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the Site in a manner satisfactory to the Work and in accordance with all laws and regulations pertaining thereto.

1.5 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the

U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

1.6 CULTURAL RESOURCES

- A. The Contractor's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. The Contractor shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:
 - 1. The Engineer will issue a Field Order requiring the Contractor to cease all construction operations at the location of such potential cultural resources find.
 - 2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Historic Preservation Office.
- D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Historic Preservation Office, the Contractor shall suspend work at the location of the find under the provisions for changes contained in the General Conditions.

1.7 NOISE CONTROL

- A. The Contractor shall comply with the City of Cambridge Noise Ordinance.
- B. The Contractor shall make every effort to minimize noises caused by his/her operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with State and Federal (OSHA) regulations.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01560

SECTION 01568

EROSION CONTROL, SEDIMENTATION AND
CONTAINMENT OF CONSTRUCTION MATERIALS

1568.1 SEDIMENTATION AND EROSION CONTROL LUMP SUM

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall provide all work and take all measures to control soil erosion resulting from construction operations, prevent flow of sediment from construction site.

1.2 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Two weeks prior to the start of the work, the Contractor shall submit for review, a plan with detailed sketches showing the proposed methods to be used for controlling erosion during construction.
 - 2. Contractor shall submit manufacturer's literature describing products, installation procedures, and routine maintenance of the sediment filter device and composting sock.
 - 3. Contractor shall submit one sample of a sediment filter fabric device as produced by the manufacturer for the City's Approval.

1.3 QUALITY ASSURANCE

- A. Use acceptable procedures, including water diversion structures, diversion ditches, composting socks, settling basins, and sediment filter devices.
- B. Operations restricted to areas of work indicated on Contract Drawings.
- C. If construction materials are washed away during construction, contractor shall remove materials from fouled areas.

PART 2 – PRODUCTS

2.1 COMPOSTING SOCKS

- A. Composting socks shall consist of a three dimensional tubular sediment control and storm water runoff filtration device.

- B. The compost material for the composting socks shall consist of unvegetated composting material and be made with sanitized, mature compost that has no identifiable feedstock constituents or offensive odors. The compost used in the composting sock shall meet all local, state, and Federal quality requirements.
- C. The mesh material for the composting socks shall be biodegradable.

2.2 SEDIMENT FILTER DEVICE

- A. Sediment filter device shall be manufactured to fit the opening of the catch basin or drop inlet. The sediment filter device shall have the following features:
 - 1. Two dump straps attached at the bottom to facilitate the emptying of the device and shall have lifting loops as an integral part of the system.
 - 2. Yellow restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls. Yellow restraint cord is also a visual means of indicating when the sack should be emptied.
 - 3. Fabric shall consist of a woven polypropylene geotextile and be sewn by a double needle machine, using a high strength nylon thread.
 - 4. Sediment filter device shall have a certified average wide width per ASTM Standard D-4884 standard of 165 lbs/in.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall not discharge chemicals, fuels, lubricants, bitumen, raw sewage, and other harmful waste into or alongside any body of water or into natural or manmade channel.
- B. It is the intent of these Specifications to prevent the unnecessary occurrence of sedimentation or siltation of waterways and private properties. In the event the sedimentation or siltation prevention measures used by the Contractor prove to be inadequate as determined by the Owner and Engineer, the Contractor shall be required to adjust his operations to the extent necessary to prevent any such sedimentation or siltation from occurring.

3.2 INSTALLATION

- A. Composting Socks shall be placed to form temporary water stops, dams, diversions, dikes, berms and for other uses connected with water pollution control and; bales shall be disposed of by the Contractor upon completion.

Composting socks shall be installed per manufacturer's written installation procedures.

- B. The Contractor shall protect catch basins by installing sediment filter devices as specified in this Specification in every catch basin within and downstream of the project limits.
- C. The Contractor shall install the sediment filter device before any work begins and shall place the device so that it is flush with the material around the frame of the grate of the catch basin structure. The Contractor shall be responsible for maintenance and placement of the strap lift holes to ensure that they do not become a hazard for pedestrians.
- D. The Contractor shall maintain the sediment filter device and remove the collected debris as required by the Engineer. If any material is lost in the removal of the sediment filter device, then the Contractor shall be responsible for cleaning of the catch basin. The Contractor shall inspect the position of the device to ensure that the sediment filter device will work properly during any heavy rain or any storm greater than a 10 year flood.
- E. Existing natural drainage patterns and vegetative cover shall be preserved to the maximum possible extent.
- F. The Contractor shall use temporary vegetation, mulching, and paving to protect areas exposed during construction. He shall minimize the amount of bare earth exposed at any one time during construction, and he shall also minimize the length of time bare earth is exposed.
- G. On sloping terrain, composting socks may be used to trap sediment until vegetation has become established. The details of their placement shall be as approved by the Engineer.
- H. Water that is being pumped from the trenches or excavations shall not be pumped directly into water courses or pipe conveyance systems. At a minimum, sedimentation control measures shall include portable sedimentation tanks, pumps, and piping, or other means acceptable to the Owner and Engineer to meet the water quality parameters specified in both the NPDES Dewatering Permits and these Specifications, whichever is more stringent.
- I. Spoil resulting from the trench excavation shall be leveled or removed to permit free entry of water from adjacent land surfaces without excessive erosion or harmful ponding.
- J. The Contractor shall protect exposed porous paving media beds by placing composting socks around the perimeter of the bed. Once the site is fully stabilized, composting socks shall be removed.

PART 4 – COMPENSATION

Item 1568.1 – Sedimentation and Erosion Control

METHOD OF MEASUREMENT:

Measurement for payment for Sedimentation and Erosion Control will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT/INCLUSIONS

Payment for Sedimentation and Erosion Control will be based on the bid for this item in the proposal. Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment and incidentals required to furnish, install, maintain, relocate, and remove all sedimentation and erosion control measures. Under the Unit Price bid for this item, the Contractor shall also furnish all labor, materials, tools, equipment and incidentals to prepare and submit all work plans and submittals; line all existing and new catch basins with sediment filter devices and remove prior to inclement weather; install, maintain, and remove composting socks; install, maintain and remove temporary vegetation for erosion control; removal and disposal of all silt and sediment collected from sedimentation and erosion control measures; install, maintain and remove composting socks used for protection of porous paving media beds; and all other items of work not specifically included herein or elsewhere required to furnish, install, maintain, relocate, and remove sedimentation and erosion control devices as specified and required.

END OF SECTION 01568

SECTION 01570

MAINTENANCE AND PROTECTION OF TRAFFIC

1570.1	TRAFFIC AND PEDESTRIAN MANAGEMENT	LUMP SUM
1570.2	REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN	UNIT WEEK

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, equipment, and materials and perform all operations in connection with the maintenance and protection of vehicular, bicycle, and pedestrian traffic on all roads, state and local, directly or indirectly affected by the construction. The work of this section also includes maintaining access to all properties adjacent to the work.
- B. The Contractor is responsible for preparing and submitting a plan for traffic management to the Owner and Engineer, including updates as conditions warrant. The Contractor is responsible for design and implementation of revisions to the traffic management procedures during the course of the project at the requirements of the Engineer and at no additional cost to the Owner.
- C. The Contractor shall develop and implement a detailed Traffic Management and Control Plan and obtain approval from the City of Cambridge Traffic Department and Department of Public Works prior to proceeding with the work.
- D. Coordination with MBTA is also required for temporary relocation of bus stops if work zones impact existing MBTA bus stops.
- E. Furnish, erect, set, reset, relocate, move, remove, and dismantle sufficient signs, temporary lighting, barrels, flashers, channelizing devices (concrete barriers), fencing, and other traffic control devices on a continuous basis as necessary to protect the work and the general public at all times during construction in accordance with Contractor's approved Traffic Management and Control Plans. The work of this Section shall also include temporary bridging for traffic across excavations.
- F. The design, application, and installation of all traffic control devices required by this section shall conform to the requirements of the Manual on Uniform Traffic Control Devices (MUTCD) published by U.S. DOT, latest edition; American Disabilities Act (ADA); Massachusetts Architectural Access Board;

and the Commonwealth of Massachusetts, Highway Department (MHD), Standard Specifications for Highways and Bridges, latest edition.

- G. “Approved by the Owner” throughout this Section shall mean the approval of the Cambridge Department of Public Works and Traffic and Parking Department.
- H. Traffic control during construction also includes street sweeping and snow removal from sidewalks and streets within the work zone as described in section 3.1 D. Maintaining rubbish and recyclable removal is also required and described in Section 01560 - TEMPORARY ENVIRONMENTAL CONTROLS.

1.2 REFERENCES

- A. Reference is made herein to the Commonwealth of Massachusetts, Highway Department, Standard Specifications for Highways and Bridges, latest edition. References made to particular sections or paragraphs in the Standard Specifications for Highways and Bridges shall include all related articles mentioned therein.
- B. Manual of Uniform Traffic Control Devices Part VI Standard and Guides for Traffic Controls for Streets and Highway Construction, Maintenance, Utility and Incident Management Operations, latest edition.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Traffic Management and Control Plan: Before starting any work under this Contract, the Contractor shall prepare a plan that indicates construction equipment movement and the traffic routing proposed by the Contractor during the various stages and time periods of the work, and the location of temporary pedestrian, bicycle routes and construction facilities, temporary barricades, signs, drums, and other traffic control devices to be employed during each stage and time period of the work, to maintain traffic and access to abutting properties. Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. The Plan shall be submitted a minimum of four weeks prior to the start of construction for acceptance by the Engineer and approved by the Owner and the City prior to start of Work. The Plan shall be reviewed on a daily basis with the Engineer during construction. The Plan shall include procedures for the Contractor to coordinate daily with the Owner and City Departments (Department of Public Works, Traffic and Parking Department, Police, Fire, and Emergency Medical Services).

2. Temporary Pedestrian Access Ramp Work Plan, Temporary Pedestrian Protection Work Plan and Temporary Pedestrian Detour Plan: Contractor shall provide a work plan detailing the location and layout of ramps and their protection, type of ramps and protection to be used with manufacturer's information, and duration the ramps and protection will be utilized. All pedestrian detours required shall be submitted for approval with these plans.
- B. Shop Drawings shall be submitted for review four weeks prior to start of construction. Thereafter, the Contractor shall submit to the Engineer updated Traffic Management and Control Plans a minimum of 10 working days prior to the start of construction at any new location or updates required in the work zone resulting from progress of Work throughout the duration of construction.
1. Submit complete shop drawings and work plans for staged construction and traffic movement including temporary vehicle, pedestrian, and bicycle as needed, certified by a Professional Engineer registered in the Commonwealth of Massachusetts.
 2. Show on the shop drawings all materials, dimensions, sizes, and methods of installation.
 3. Safety Signing for Construction Operations: The Contractor shall submit temporary pedestrian, bicycle, and traffic management sign placement and sign size sketches showing the proposed sign setups intended to be used to provide the necessary traffic control and protection during the progress of work, plus the sign and legend size and layout. These sketches shall be submitted to the Engineer, Owner and City for review and approval before work begins.
 4. When a detour or by-passing of vehicular traffic is anticipated, the Contractor shall submit for approval by the Engineer, Owner and City, a detour plan showing the proposed alternative routes and location, size, and type of signs and traffic controls to be used. The traffic routing through or around the Work and provisions for control of same shall be approved by the Engineer, Owner, and City.
 5. The Contractor shall submit a Truck and Hauling Route Work Plan for all proposed truck routes prior to mobilizing. No trucking or hauling will be allowed without the approval of the City of Cambridge. No trucking or hauling will be allowed outside the proposed routes without the prior approval of the Engineer, Owner, and City. The Contractor is responsible for obtaining all permits and permissions. The Contractor is further responsible for obtaining approval for and coordinating parking restrictions required to facilitate trucking and hauling.

1.4 SPECIAL REQUIREMENTS

- A. The Contractor shall provide access for fire apparatus and other emergency vehicles through the work zones to abutting properties at all times.
- B. At the end of each workday, where trenches in areas of public travel are covered with steel plates, each edge of the plates shall be either beveled or protected by a bituminous concrete ramp as accepted by the Engineer. Temporary bituminous patching material may be used to construct the ramps. The cost of patching materials, and their maintenance and removal, will be considered incidental to the Traffic Management item with no separate payment elsewhere. Plates shall be pinned or welded together to eliminate movement, noise or vibration.
- C. Open excavations adjacent to the traveled way or shoulders shall not remain open through non-work hours unless steel plated for the passage of heavy vehicles or protected by concrete barricades or barriers and specifically authorized by the Owner, City and Engineer.
- D. Do not block more than one-side of the roadway at a time when making open cut or other street crossings unless otherwise approved.
- E. The Contractor shall be responsible for the costs in obtaining all permits to perform the Work.
- F. At least one serviceable driveway access to all residences and businesses within the project shall be maintained at all times unless otherwise approved.
- G. The Contractor shall provide temporary lighting to properly illuminate the work area and approaches in the event of nighttime work.
- H. The Contractor shall not allow unnecessary idling of trucks and/or equipment throughout the entire project area. The City of Cambridge prohibits idling of trucks and equipment for periods of time exceeding five (5) minutes when not in use.
- I. The Contractor shall notify the Cambridge Fire and Police Departments of any street closings.

1.5 SEQUENCING AND SCHEDULING

- A. All streets within or adjacent to the contract limits, not specifically cited shall have their full roadway widths available for traffic or permitted parking at all times except for such restrictions as may be approved by the Owner, City and Engineer.
- B. Notify the Owner, City and Engineer at least 48 hours in advance (not including Saturday or Sunday or Holidays) prior to the access lane restriction of the roadway. Notification shall include the date of the restriction, the hours

of the day the roadway access will be restricted, and the estimated completion date.

- C. The Owner, City and Engineer shall be notified of any re-routing of traffic 48 hours in advance (not including Saturday or Sunday or Holidays). Approval shall be obtained from the Owner, City and Engineer prior to any re-routing of traffic (except emergencies).
- D. The Contractor shall verify street sweeping schedules in the work zone. Delivery related parking restrictions will not be permitted on days where street sweeping is scheduled unless otherwise approved.

1.6 HAULING AND TRUCK ROUTES

- A. The Contractor is advised that all roads and bridges within or adjacent to the project shall be subject to legal loads, heights of vehicles and vehicle type / use restrictions. The Contractor is responsible for understanding the restrictions and obtaining all necessary permits.
- B. The Contractor is advised that no agreements have been made by the Owner, the City of Cambridge, MassDOT, or with surrounding cities or towns to relieve the Contractor of liability for damage to local roads and bridges caused by the Contractor's operation. The Contractor shall contact appropriate officials of the surrounding cities, towns or agencies concerning hauling over city or town roads and bridges.

1.7 STORAGE OF MATERIALS, PARKING OF CONSTRUCTION EQUIPMENT AND WORKER PARKING

- A. No material shall be stored within the work area or on adjacent roadways or residential streets except that which is needed to complete the work for that day.
- B. Construction workers shall park their vehicles within the work zone during work hours, and remove them thereafter. Parking outside the work zone will be required if the vehicles obstruct traffic flow.
- C. The Contractor shall park construction equipment within the work zone and protect equipment with barriers or barricades. Parking outside the work zone will be required if the equipment obstructs traffic flow.

1.8 BARRICADES, WARNING SIGNS AND OTHER PROTECTIVE DEVICES

- A. Install, inspect, remove, maintain, and reset all temporary construction controls as frequently as required and in accordance with an approved construction staging sequence and traffic management plan.

- B. Regulatory and warning devices shall be subject to removal, replacement and repositioning as often as necessary, and as directed by the Owner and Engineer.
- C. Temporary pavement markings and devices shall be used as shown on the approved plans and as required by MUTCD and ADA standards for traffic control and pedestrian safety.

1.9 POLICE DETAILS SERVICE

- A. Uniformed City, Municipal, or State police officers shall be utilized to maintain safe traffic flow throughout the construction period. A Police Detail is to be present during all construction activity. Scheduling Police Details shall be the responsibility of the Contractor. To schedule a detail officer, call (617) 349-3350.
- B. The Cambridge Police Department requires 24-hour advance notice to obtain a Police Detail, except in emergencies and 4-hour advance notice to cancel a detail. Contractor shall use as many police details as needed to ensure the safety of pedestrians and traffic at all times.
- C. The Contractor shall coordinate all work with the police officers including but not limited to: locations of work, delivery of materials, equipment movement, required traffic management and schedules.
- D. The Contractor must submit all signed detail forms to the project managers or engineer, so that Public Works can pay all submitted and approved Police Detail invoices. Any invoices that are not approved will be the responsibility of the Contractor to pay.
- E. The City of Cambridge Police Department shall bill the City of Cambridge Department of Public Works or whatever department has oversight of the contract for the services of uniformed police officers provided by the Police Department.
- F. The Contractor will be required to reimburse Public Works or whatever department has oversight of the contract for Police Details, if the Contractor fails to show for the job or if the Contractor fails to cancel the detail with adequate advance notice.

1.10 PEDESTRIAN TRAFFIC

- A. Sidewalks shall be maintained at all times through the construction period. Temporary sidewalks, pedestrian detours and pedestrian and construction facilities shall be constructed as needed to maintain pedestrian traffic and business access. The Contractor shall anticipate that temporary pavement markings (paint or tape) will be required in order to comply with this provision.

- B. Pedestrian access shall be provided to abutting land uses and businesses at all times, as approved by the Owner, City and Engineer and in accordance with MUTCD and ADA requirements.
- C. Unobstructed walkways of 4-foot minimum width, unless otherwise approved by the Owner, City and Engineer shall be provided at all times.
- D. Temporary pedestrian walkways shall be separated from roadway and construction areas by barricades and fence as approved by the Owner, City and Engineer.
- E. The Contractor shall be notified by telephone of any location not providing adequate pedestrian access. The Contractor shall acknowledge notification of the call within one (1) hour by contacting the Project Engineer or the Public Works Dispatcher at (617) 349-4800.
- F. The Contractor shall respond to the work site within one and a half (1.5) hours of acknowledged notification with sufficient equipment and labor to perform the required work.
- G. The Contractor's failure to respond within the specified response time twice within the Contract time will result in a permanent deduction of \$250.00 from Contract payments due.
- H. The Contractor's failure to respond within the specified response time three times within the Contract time will result in an additional permanent deduction of \$400.00 from Contract payments due.
- I. The Contractor's failure to respond within the specified response time four or more times within the Contract time will result in an additional permanent deduction of \$500.00, per each additional occurrence, from Contract payments due.
- J. Continued failure to provide adequate pedestrian access may result in the City terminating the contract in accordance with Paragraph 18.3 of Section 800 (General Terms and Conditions of the Contract).

1.11 VEHICULAR CONTROL REQUIREMENTS

- A. The Contractor shall meet the following conditions, unless otherwise specifically approved by the Owner, City, and Engineer:
 - 1. All work shall be prosecuted with proper regard for the convenience of the public and in a manner to permit unimpeded traffic flow whenever possible. The interruption of traffic will not be permitted unless specifically allowed by the Owner, City and Engineer and in accordance with the requirements of the Owner and City and in conformance with MUTCD requirements.

2. The Contractor shall be responsible for necessary coordination with the City departments affected by the project.
3. Traffic control devices and signs shall be removed, demounted or properly covered for those periods of the day not in use.
4. The Contractor shall coordinate the work with the schedules of City Rubbish and Recycling Collection trucks and delivery trucks to the adjacent stores and property owners so as not to impede their access, and cooperate with delivery personnel to facilitate deliveries to properties within the work zone.
5. No operations shall be conducted, including the loading or unloading of equipment or materials, on or near the traveled lanes or road shoulders without first erecting warning signs and channelizing devices. These precautions shall be maintained at all times while work, loading and unloading is in progress.
6. Construction signs and channelizing devices shall be used to separate traffic from the work areas and for traffic control. Placement, other than as shown in the plans or the MUTCD, will require prior approval.
7. Temporary signs and channelizing devices shall not be set up until there is adequate visibility or appropriate construction lighting. The Contractor shall schedule his work so that temporary signs and channelizing devices are removed and traffic is returned to its normal pattern before the end of the work period.
8. Work requiring overnight lane closures shall not begin until all materials required for the completion of each night's work are delivered or available to the project site, unless otherwise approved by the Owner, City and Engineer.
9. Accesses to buildings shall be maintained at all times.
10. Work operations shall not be performed on the roadway in such a manner that traffic is obstructed or endangered simultaneously from both sides of the roadway unless otherwise approved.
11. The Contractor shall keep all roadway areas open to traffic as clear as possible at all times. Materials shall not be stored on any roadway area or within 4-ft. of the traveled way. Material shall be delivered to the installation areas as they are needed to provide a continuous installation. Location of storage areas shall be subject to approval.
12. The Contractor shall remove all equipment and construction vehicles from the traveled way and shoulders open to traffic during non-work

hours. Vehicles shall be parked no closer than 4-feet from the traveled way in pre-approved areas unless specifically permitted.

13. Each driver of any vehicle or piece of equipment used on this contract shall be furnished written instructions concerning the manner of operation for that vehicle or piece of equipment. Specifically, these instructions shall warn against stopping on the traveled portions of the roadway, against passing other vehicles, and against traveling in close proximity to other vehicles. A copy of these instructions shall be given to the Engineer.
14. Temporary signs and channelizing devices shall not be set up in inclement weather.
15. The Contractor shall furnish 60-inch x 30-inch approved signs reading "CONSTRUCTION VEHICLE - DO NOT FOLLOW" to be used on trucks hauling to the project, when such signs are deemed necessary by the City and/or Engineer. The color, type of sheeting and size of lettering shall conform to that of the permanent construction signs.
16. The Contractor shall furnish, install, and maintain 36-inch x 36-inch approved signs reading "ROUGH ROAD" in advance of all roadway areas which have been cold-planed.
17. The Contractor shall furnish, install and maintain additional temporary cones and barrels, as required by the Engineer, after Traffic Calming devices (horizontal and vertical deflections) have been constructed.
18. The Contractor will be responsible for snow removal within active work zones.

1.12 BICYCLE CONTROL REQUIREMENTS

- A. The Contractor shall meet the following conditions, unless otherwise specifically approved by the Owner, City, and Engineer:
 1. Bicycle traffic shall be accommodated on all public streets either within bicycle lanes where existing or in vehicular travel lanes.
 2. Where bicycle lanes are not present, provide a shared vehicle lane as wide as physically feasible.
 3. When travel lanes are restricted to less than 14-foot in width warning signage (W11-1/W16-1 combination - Bicycle warning symbol with SHARE THE ROAD plaque) shall be placed warning motor vehicle operators of the presence of bicycles in the roadway.
 4. If the disruption occurs in a bicycle lanes over a short distance

(approximately 500 feet or less), bicyclists should be routed to share a motor vehicle lane.

5. On projects where the disruption occurs over a longer distance (more than 500 feet), and on busy roadways, a temporary bicycle lane or wide outside lane (at least 14 foot wide) should be provided. If that is not feasible, provide access, including ramps if necessary, for bicyclists to have the option of using sidewalks, except within zones where sidewalk bicycle riding is prohibited by the City.

6. Steel plates:

When steel plates are used in the travel way warning signage (Warning Steel Plates 100 FT) shall be placed at least 100 feet in advance.

Steel plates shall be set so there is no vertical lip over 1/4 inch between the plate and adjacent pavement. This shall be accomplished in one of the following ways:

- a. Recessing the plate so that the top of the plate matches adjacent pavement (with no lip over 1/4 inch).
- b. Providing bituminous concrete lip painted reflective orange to provide a smooth transition slope up from existing pavement to top of plate.

Non-slip surface steel plates are preferred for use, and must be used where plates are in an intersection or within a crosswalk.

7. Raised castings: Where raised castings are present after cold planing and/or in anticipation of final paving, provide the following:
 - a. Advance warning signs saying: "Caution – Raised Castings Ahead."
 - b. Spray paint reflective fluorescent orange the raised portions of the castings.
8. Cold planing and pavement installation: Where cold planing or the installation of pavement in lifts results in vertical joints greater than 1/4 inch, provide temporary bituminous concrete lip painted reflective orange to provide a smooth transition slope between the pavement layers.
9. When the roadway or travel lanes narrow due to construction, advance warning signs should be placed at least 20 feet in advance.
10. Narrow cuts that are parallel with the direction of travel create an extreme hazard for cyclists, whose tires could get caught. These should

never be made and left in an area where bicyclists will be traveling. If necessary, they should be blocked off and cyclists routed around the hazard. When performing advance pavement cutting for trenching or other roadway excavation, use only saw cutting (approximately 1/4 inch or narrower).

11. Debris should be swept to maintain a reasonably clear riding surface in the bicycle lanes or, where there are no bicycle lanes, the outer 5 or 6 feet of roadway. Promptly remove gravel, debris, litter, sand, stone, and other obstructions from bicycle lanes and travel lanes.
12. Advance construction signs shall not be placed in bicycle lanes and shall not otherwise obstruct bicyclists' path.
13. Temporary ramps for site access ramps. The creation of ramps in the roadway is not permitted unless being created in an area that is otherwise used by on-street parking.
14. Restore pavement markings for bike lanes within 2 weeks of paving.

PART 2 – PRODUCTS

2.1 MATERIAL

- A. All barricades, drums, cones and other channelizing devices shall meet the requirements for MassDOT Standard Specifications for Highways and Bridges Section 850 Traffic Control for Construction and Maintenance Operation (Latest Revision) and the Manual of Uniform Traffic Control Devices (Latest Revision).
- B. Traffic Control Materials
 1. Materials required for the work of this Section need not be new, but must be in first-class condition and acceptable to the Owner and Engineer. Any materials that in the judgment of the Owner are unsatisfactory in appearance or performance shall be removed and immediately replaced by acceptable units.
 2. Signs, portable barricades, and drums shall have “High Intensity Encapsulated Lens Reflective Sheeting” in accordance with Section M9.30.2 of the MHD Standard Specifications for Highways and Bridges and MUTCD requirements.
 3. Signs shall be fabricated with “High Intensity Encapsulated Lens Reflective Sheeting”. Transparent red, blue, yellow or black opaque paint (ink) may be used over “High Intensity Encapsulated Lens Reflective Sheeting” in accordance with the provisions of subsection

M9.30.2, "D.2 Surface", of the MassDOT Standard Specifications for Highways and Bridges, where these colors are specified.

4. Safety signage for construction operations shall consist of furnishing, positioning, repositioning, inspecting, maintaining, and removing regulatory, warning, and guide signs and temporary bus stop signs and taxi stop signs and their supports as approved by the Owner, City and Engineer.
5. Replace all signs and posts, which are damaged or are missing from their location at no additional cost to the Owner.
6. Maintain all signs in a satisfactory manner including the removal of dirt or road film that cause a reduction in sign reflective efficiency.

C. Portable Barricades

1. Furnish, install, relocate, remove, re-install, and maintain portable barricades in accordance with MassDOT and MUTCD requirements or as directed by the Owner, City and Engineer.
2. Portable barricades shall conform with Standard Plate No. 40612 of the MassDOT (Metric Edition). Reflectorized sheeting shall conform to Section M9.30.2, of the MassDOT Standard Specifications for Highways and Bridges.
3. Eight-foot-long units of portable barricades shall be constructed, as needed.
4. Alternating 6 inches (152.4 mil) wide diagonal stripes shall be orange and white and shall slope downward at 45 a degree toward the end by which traffic is to pass. Barricades that block the passage of traffic or designate the end of the traveled way shall have alternating vertical orange and white stripes on the rails.
5. Barricades shall be maintained in good and serviceable condition throughout the duration of the Contract.
6. Temporary pedestrian and construction facilities shall be kept clean and freshly painted as required.

D. Signs, Covered

1. Cover any existing regulatory and warning signs as required by the Owner, City and Engineer.
2. Use a cover approved by the Owner, City and Engineer which shall be securely fastened to the existing sign and shall completely cover the

legend of the existing sign. The cover shall remain in place as long as necessary at which time it shall be promptly removed.

3. Signs shall be covered without causing any damage to the existing sign.

E. Traffic Signals

1. Traffic lights shall remain operable at all times throughout the duration of the contract unless approved otherwise by the City.
2. It shall be the Contractor's responsibility to maintain the traffic signal system in continuous and good working order. The Contractor at his expense, shall repair any damage to the traffic signal system resulting from the Contractor's work.

F. Temporary Precast Concrete Barriers and Work Zone Protection

1. Temporary precast concrete barriers shall be furnished and installed as shown on the approved traffic management plans and where required to protect work zones and excavations which cannot be completed and backfilled or plated within a daily work period. Barriers shall be removed or relocated when no longer required and with the approval of the Owner, City and Engineer.
2. Precast concrete median barrier shall conform with Standard Plate No. 401.15.1 of the MassDOT, as well as be acceptable for temporary pedestrian and construction facilities and signage.
3. Temporary precast barrier for use for temporary pedestrian and construction facilities shall have three sleeves cast in the barrier to receive a post for panel and fence installations.
4. Temporary chain link fence, 4-feet high, shall be erected at work zones abutting pedestrian travel paths and around work zones hazardous to pedestrians in conjunction with precast barriers to form a "safety zone" 7 feet high, or as required by the Owner, City and Engineer. The top 2-feet shall be fixed with plywood panels painted as required by the Owner and Engineer. The barriers and fencing shall be overlapped at the corners of the excavated area to provide a continuous protective screen.

G. Remote Controlled Changeable Message Signs

1. The internally illuminated changeable message sign shall consist of a magnetically operated matrix, LED, fiber optic, or lamp matrix message board; a diesel engine driven generator power supply; hardware for connection to a 110 volt power source; and a computer operated interface, all mounted on a towable, heavy duty trailer.

2. In the raised position, the bottom of the sign shall be at least 7 feet above the pavement surface. The sign shall be clearly legible for a distance of 900 feet.
3. The sign shall be controlled by an on-board computer. The sign shall automatically change to a pre-selected default message upon failure. That default message shall remain on display until the problem is corrected.
4. The Remote Controlled Changeable Message Sign unit shall be equipped with a security system to prevent unauthorized access. The security system shall allow access only through use of a code or password unique to that sign. If the proper code or password is not entered within 60 seconds of initial telephone contact, the call will be terminated. Remote control for the changeable message sign shall be by cellular telephone and touch tone modem decoder.
5. The lamp matrix, LED or fiber optic sign, shall be equipped with a top-mounted photocell for automatic sign dimming during nighttime use.
6. The remote controlled portable changeable message sign shall be capable of performing all functions at ambient temperatures ranging from -31° to 165°F (-35 to 74°C). There shall be no degradation of operation due to fog, rain or snow. Maintenance shall include periodic cleaning. When not being used the sign shall be stored in a secure area approved by the Engineer.
7. Message Sign
 - a. Type – The technology can be LED or a combination of both Flip Disk and LED (Hybrid).
 - b. Matrix Displays – Shall be character, line or full matrix.
 - c. Size – The message sign shall have a minimum height of 6 feet, maximum height of 6.5 feet and a minimum width of 8 feet, maximum width of 12 feet.
 - d. Colors – The display shall be either fluorescent yellow or ITE amber.
 - e. Lines – The message sign shall have the capability of displaying at least three lines of 18 inch characters with a minimum of 8 characters per line.
8. The sign shall be capable of storing 100 pre-programmed messages and be able to display any one of those messages upon call via the trailer-mounted terminal or through the cellular telephone hookup.

9. The sign shall be capable of operation from a diesel powered generator, a battery or solar power. The power supply shall be protected from the weather and be locked for security.
10. The trailer shall include swivel jacks capable of leveling the trailer on a 1:6 (1 vertical to 6 horizontal) slope and capable of stabilizing the trailer in winds of up to 80 miles per hour. The sign shall be capable of being locked in a stowed position while being towed

PART 3- EXECUTION

3.1 GENERAL

- A. Conduct the work in manner that interferes as little as possible with public travel, whether vehicular or pedestrian.
- B. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel whenever it is necessary to cross, or obstruct roads, driveways, and walks, whether public or private.
 1. Give a minimum of 48 hours (not including Saturday, Sunday or Holidays) written notice to owners of private driveways before interfering with them.
- C. Provide temporary surfacing on shoulders when necessary.
- D. Provide snow removal and street sweeping within the work limits to maintain safe and efficient vehicular and pedestrian traffic flow, including accesses and sidewalks. Contractor shall plow snow out of the work zone in all areas where municipal snow removal is prevented by construction in the opinion of the Owner, City and Engineer. The Contractor shall also remove snow from all sidewalks in areas where construction related activities are occurring or have recently occurred. The Contractor shall sweep sidewalks, pedestrian walkways and detours, and streets within the work zone on a daily basis. In the event that the Contractors work zone restricts municipal street sweeping in the area, the Contractor shall sweep the restricted streets (including streets outside the work zone) to a point where municipal street sweeping can continue.
- E. Sufficient and adequate signs, flashers, channelizing devices, lights, arrow boards and other precautions necessary to protect the work and the public, as determined by the Engineer shall be used at all times during construction.
- F. Provide trench bituminous paving repairs on a daily basis, but at intervals no longer than weekly, unless required or allowed otherwise by the Owner, City and Engineer or applicable agency having jurisdiction.

- G. Pedestrian access shall be maintained at all times. Access shall be a minimum of 4-feet, clear of all obstructions and meet all American with Disability Act (ADA) requirements. If an existing pedestrian walkway is interrupted, temporary walkways with ramps shall be provided.
- H. Contractor shall post “No Parking” signs 48-hours in advance for residential permit parking locations and 24-hours in advance for metered, public, etc. If work does not take place that day, signs must be reposted. Standard Cambridge signs shall be used that provide information regarding proposed construction and parking restriction hours. Signs shall be placed at a minimum of 25-foot intervals.

3.2 DETOURS

- A. If approved by the Owner, City, and Engineer, construct and maintain detours around the work to maintain traffic over any construction work in a public street, road, or highway where traffic cannot be maintained on alignment of original roadbed or pavement.
- B. When detours are allowed, the Contractor shall provide all detour signs approved by the City and/or Engineer with directional arrows. Signs shall be placed at all streets and intersections to provide required direction to allow motorists to return to the street location beyond the detour. The Contractor must submit a written detour plan for the City and/or Engineer's approval prior to implementation of the detour.
- C. All detouring and signing shall meet the requirements of the applicable references specified in Parts 1 and 2 above.
- D. The Contractor shall provide Police details in the work areas. Contractor shall coordinate vehicle towing with the police.
- E. The Detour Plan shall be reviewed and approved by the Owner, City, and Engineer prior to establishing any detours.
- F. The Contractor is responsible for the notification of any parties affected by the detour, including, but not limited to Cambridge Fire Alarm, Cambridge Police, State Police, MBTA, DCR, Cambridge Traffic Department, and abutting property owners.

3.3 PROTECTION

- A. Signs and Channelizing Devices:
 - 1. Locate signs and channelizing devices with lights to protect public thoroughfares which are closed to traffic.

2. Ensure that all open trenches and other excavations have signs, channelizing devices and lights to provide protection to the public.
 - a. Provide similar warning signs and lights for obstruction such as material piles and equipment.
 - b. Ensure that the material storage and conduct of the work on or alongside streets causes minimum obstruction and inconvenience to the traveling public.
3. Install and maintain all signs, channelizing devices, lights, and other protective devices in conformity with applicable statutory requirements and as required by the municipalities or agencies having jurisdiction.
4. Illuminate all channelizing devices with flashing lights.
5. No traffic control devices shall be stored adjacent to the roadway.

B. REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN

1. The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor. The cellular telephone required for the Remote Controlled Changeable Message Sign shall be provided to the Engineer for his use, and subsequently returned to the Contractor. When the sign is not in use, it shall either be turned off or turned from view.
2. Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

PART 4 – COMPENSATION

Item 1570.1 - Traffic and Pedestrian Management

METHOD OF MEASUREMENT:

Measurement for payment for Traffic and Pedestrian Management will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the original Contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Traffic and Pedestrian Management shall be based on the lump sum price bid for this item in the proposal. Under the lump sum price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to provide, maintain, relocate, and remove Traffic and Pedestrian Management in areas directly or indirectly influenced by

construction within the limits of work or outside the limits of work; along truck routes inside or outside the limits of work; as delineated in the approved Traffic and Pedestrian Management Plan, by the MUTCD, ADA, MA AAB, and MassDOT standards; and as further required by the Owner and Engineer. The work includes but is not limited to; fabrication of signage; furnishing and installing signage; mounting and securing signage; maintaining signage; protecting and storing signage not in use; relocating signage; removal of signage; The work further includes, but is not limited to; obtaining permits; coordination with the City Department of Public Works and Traffic and Parking Department; coordination with private property owners within the limits of work; preparing, submitting, reviewing, implementing, and revising traffic management and control plans; work zone layouts, installing, and maintaining traffic management devices based on approved traffic management and control plans including precast concrete and/or triplex barriers with fencing and plywood panels, reflectorized drums, lane delineators, portable barricades, temporary crosswalks, and cones; temporary pavement markings; removal of temporary and existing pavement markings; furnishing, installing, shimming, pinning, maintaining, and removing steel road plates; furnishing, installing, and removing cold patch pavement as necessary or as directed by the Engineer; ordering and coordinating police details; furnishing and installing temporary construction fencing; maintaining roadways and sidewalks inside or outside the limits of work; establishing and dismantling detours; covering existing traffic signs; obtaining, posting and maintaining “No Parking” signs; meeting with police details daily; coordinating police detail locations; and all incidental work, whether listed here or not, required to provide maintenance and protection of traffic and pedestrians.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item and are included for payment elsewhere; bituminous hot mix asphalt pavement; variable message boards; and Police Details. Police Details will be paid directly by the Owner. Signage damaged as a result of misuse or improper handling shall be replaced by the Contractor at no additional cost to the Owner.

Item 1570.2 - Remote Controlled Changeable Message Signs

METHOD OF MEASUREMENT:

Measurement for Payment for Remote Controlled Changeable Message Signs (CMSs) shall be based on the number of weeks each changeable message sign is provided, moved, removed and maintained, complete, as required by the Owner or Engineer. CMSs which are on site but not requested or approved by the Owner or Engineer shall be at the Contractor’s expense, i.e. CMSs which are brought on site earlier than directed, not removed in a timely manner when required, or which are not operational.

BASIS OF PAYMENT:

Payment for Remote Controlled Changeable Message Signs (CMSs) will be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to provide, program, move, remove and maintain changeable message signs in approved locations within or adjacent to the project area, complete, as required by the Owner or Engineer. The work further includes, but is not limited to the following; coordinating with the Owner and Engineer for changeable message sign locations; furnishing and setting-up changeable message signs, power supply, programming equipment and appurtenances; maintaining message signs throughout

project; relocating message signs to new locations as required by the Owner and Engineer; transportation and handling; and all incidental work required to furnish, place, program, maintain, relocate, and remove the CMSs. Additionally, for the "Remote Controlled Changeable Message Sign," the cellular telephone service and telephone charges shall be included.

END OF SECTION 01570

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SECTION 01600

PRODUCTS, MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install products, equipment and materials as specified and indicated in accordance with the Contract Documents.
- B. Provide transportation, handling, storage, and protection of all products, materials and equipment in accordance with the Contract Documents.

1.2 DEFINITIONS

- A. The word "Products," as used herein, is defined to include purchased items for incorporation into the Work, regardless of whether specifically purchased for the project or taken from Contractor's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
- C. Spare Parts are defined as subassemblies or components of the Products installed in the Work.

1.3 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible for each unit of work, the Contractor shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product, material, or equipment, the Contractor shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.4 PRODUCT DELIVERY AND STORAGE

- A. The Contractor shall deliver and store products, materials, and equipment for the Work in accordance with manufacturer's written recommendations and by methods and means that will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of materials, products, and equipment at site and overcrowding of construction spaces. In particular, the Contractor shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive products, materials, and equipment to deterioration, theft, and other sources of loss.

1.5 TRANSPORTATION AND HANDLING

- A. Products, materials and equipment shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. The Contractor shall provide equipment and personnel to handle products, materials, and equipment by methods to prevent soiling and damage.
- C. The Contractor shall provide additional protection during handling to prevent marring and otherwise damaging products, materials, equipment, packaging, and surrounding surfaces.

1.6 STORAGE AND PROTECTION

- A. Products, materials and equipment shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products, materials and equipment shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, materials and equipment, the products, materials and equipment shall be placed on sloped supports above ground. Products, materials and equipment subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for maintenance and inspection. The Contractor shall periodically inspect to assure products, materials and equipment are undamaged and are maintained under required conditions.
- E. Storage of materials and equipment in resource areas shall not be permitted.

1.7 MAINTENANCE OF STORAGE

- A. Stored products, materials and equipment shall be periodically inspected. The Contractor shall maintain a log of inspections and shall make the log available on request.
- B. The Contractor shall comply with manufacturer's product, material and equipment storage requirements and recommendations.
- C. The Contractor shall maintain manufacturer-required environmental conditions continually.
- D. The Contractor shall ensure that surfaces of products, materials and equipment exposed to the elements are not adversely affected and that weathering of finishes and coatings does not occur.
- E. Products, materials and equipment shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to acceptance by the Owner in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Do not use materials and equipment removed from existing premises, except as specifically required by the Contract Documents.
- B. Where similar Products (such as grease fittings, flexible couplings, etc.) are used on different pieces of equipment or in different areas within the Work, standardize the Products by providing all Products from the same Supplier.

2.2 SPARE PARTS

- A. Provide spare parts for Products as indicated and specified.
- B. The Contractor shall deliver to the Owner all spare parts except those requiring maintenance in storage, at least 30 days prior to scheduled starting of system. Spare parts that require maintenance in storage shall be held and maintained by the Contractor until Substantial Completion and then a separate delivery of the remaining spare parts will occur. The spare parts that do not require maintenance in storage shall be packed so that they are protected from damage and the environment during storage.
- C. Tag spare parts and containers to clearly identify them. Cross reference all parts to the Tag ID numbers as indicated and as specified.

- D. All spare parts are to be identical and interchangeable with similar parts installed in the Work.
- E. The Contractor is to submit to the Owner at least 120 days prior to startup, all initial submittals of spare parts for review and approval.
 - 1. Early submittal is encouraged.
 - 2. The Contractor will have all spare parts submittals finalized, submitted and approved, and all spare parts shall be delivered to the Owner at least 30 days prior to scheduled starting of systems.

2.3 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS:

- A. The following requirements shall constitute the acceptable minimum standards for the equipment specified herein. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements.
- B. Grease Fittings:
 - 1. Provide extension fittings and tubing on all grease fittings that are installed so that equipment can be lubricated from the operating level without the use of ladders, staging, or shutting down the equipment. Tubing shall be of corrosion resistant materials compatible with the material to which it is attached.

C. Concrete Inserts:

1. Use concrete inserts for hangers to completely support the maximum load that can be imposed by the hangers used in the inserts.
2. Provide inserts for hangers of a type which will permit adjustment of the hangers both horizontally (in one plane), and vertically, and locking of the hanger head or nut. Galvanize all inserts by the hot-dip process in conformity with ASTM Standard Specification for Zinc (Hot -Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip, Designation A123-78, or ASTM Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Designation A153-80.

D. Sleeves:

1. Provided sleeves shall be of ample diameter to pass the pipe and its insulation, if any, and to permit expansion.
2. Provide sleeves that are flush at the walls and at the bottom of slabs. Sleeves must project one inch above the finished floor surface. Threaded nipples shall not be used as sleeves.

E. Protection against Electrolysis:

1. Where dissimilar metals are used in conjunction with each other, provide insulation between adjoining surfaces to eliminate direct contact and any resultant electrolysis. Provide bituminous insulation, heavy bituminous coatings, nonmetallic separators or washers, impregnated felt, or similar arrangement.

PART 3 - EXECUTION

3.1 GENERAL MATERIAL AND EQUIPMENT INSTALLATION REQUIREMENTS

A. The following requirements shall constitute the acceptable minimum standards for installing the equipment specified herein. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements.

1. Bolts, Anchor Bolts, and Nuts
 - a. Set anchor bolts and expansion bolts as indicated and as specified.
 - b. If anchor bolts are set before the concrete has been placed, use templates.

- c. Where indicated, or specified, provide anchor bolts with square plates at least 4 in. by 4 in. by 3/8 in., or with square heads and washers set in the concrete forms with pipe sleeves, or both.
- d. If anchor or expansion bolts are set after the concrete has been placed, do all drilling and grouting or caulking without damaging the structure or finish by cracking, chipping, or spalling.

B. Equipment Foundations and Grouting

- 1. In setting pumps, motors, and other grouted equipment, make an allowance of at least one inch for grout under the equipment bases. Use steel shims to level and adjust the bases. Shims may be left embedded in the grout, in which case they shall be installed neatly and inconspicuous in the completed work. Use non-shrink grout.
- 2. Mix and place grout in accordance with the recommendations of the Supplier and as indicated and as specified. Place grout through the grout holes in the base, work outward and under the edges of the base, and across the rough top of the concrete foundation to a peripheral form to provide a chamfer around the top edge of the finished foundation.
- 3. After the grout has hardened, remove all forms, hoppers, and excess grout. Patch all exposed grout surfaces, give a burlap-rubbed finish, and coat with at least two coats as specified.

C. Sleeves and Openings

- 1. Provide all chases or openings for the installation of the Work, or cut the same in existing Work.
- 2. Provide all sleeves or forms at the Work, and set them as indicated and as specified, and in ample time to prevent delays.
- 3. Locate all chases, openings, and sleeves as specified and indicated. If the location is not specified or indicated, locate all openings to avoid interference with equipment and piping.
- 4. If openings and/or sleeves were not provided prior to concrete placements, the Contractor shall provide and set them afterwards at no additional cost to the Owner. Confine the cutting to the smallest extent possible. In no case shall piers or structural members be cut without the written consent of the Owner.
- 5. Fit around, close up, repair, patch, and point around the work specified herein to the requirements of the Owner.

6. Perform all of this work by workmen using small hand tools. Do not use power tools except where, in the opinion of the Owner, the type of tool proposed can be used without damage to any work or structures and without interference with the operation of any facilities. The Owner's concurrence with the type of tools shall not in any way relieve or diminish the responsibility of the Contractor for such damage, or interference resulting from the use of such tools.
7. Do not cut or alter the work of any subcontractor or any other contractor, nor permit any subcontractor to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered, and with the written consent of the Owner. All cutting and patching or repairing made necessary by the Contractor or any subcontractors shall be done at no additional cost to the Owner.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01600

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SECTION 01630

RESTORATION OF GROUNDS AND CLEANING UP

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. The Contractor on or before the completion of the work, except as otherwise expressly required or permitted in writing by the Owner, shall tear down and remove and legally dispose of all temporary structures built or used by him; shall remove all rubbish and debris of all kinds from all Contract structures and from any grounds which he shall have occupied within the limits of the project site; shall leave the site of the work in a satisfactorily neat and clean condition; shall remove from the land all abandoned materials and plant; and shall leave the spoil areas and the property which may have been affected by his operations in a neat and satisfactory condition. Also included is the restoration of all private grounds, including lawns, landscaped areas, driveway aprons and walkways damaged or disturbed in connection with the new work not elsewhere specified. Unless otherwise specified, all materials salvaged and not required to be reused shall be the property of the Contractor, and shall be legally disposed of off the site of the work.
- B. Included in the work under this Section is the restoration, including replacement of damaged and disturbed shrubs and trees, retaining walls, of all grounds and grassed and landscaped areas removed or disturbed or damaged during the construction of the new work, including pipe laterals within private property areas, and storage and field office areas.
- C. Also included in the work under this Section is the furnishing of all labor, materials, and equipment required to remove, store, and reset or replace bumper posts, stone walls of all types, flagstone, brick, concrete, asphalt walks, fences of all types, railings, signs and sign posts, signal posts, mailboxes and such other miscellaneous objects damaged or disturbed during construction.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01630

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SECTION 01701

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes the requirements for project closeout including final clean up, closeout timetable, Owner's manual submittal, final submittals, maintenance and guarantee, and bonds.

1.2 FINAL CLEANUP

- A. The Contractor shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the Work by the Owner will be withheld until the Contractor has satisfactorily complied with the foregoing requirements for final cleanup of the project site.
- B. The Contractor shall cleanup and restore all areas affected by staging, trailer(s) placement and parking. Restoration includes regrading, re-establishing topsoil and reseeding.

1.3 CLOSEOUT TIMETABLE

- A. The Contractor shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established as specified elsewhere in the Contract Documents.

1.4 OPERATION AND MAINTENANCE

- A. The Contractor's attention is directed to the condition that one percent (1%) of the applicable bid item price will be deducted from any monies due the Contractor as progress payments, if at the 75 percent construction completion point, the final O & M manuals complying with Section 01300 and the individual technical specification sections have not been submitted. The aforementioned amount will be retained by the Owner as the agreed, estimated value of the approved O & M manuals. Any such retention of money for failure to submit the approved O & M manuals on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the Contractor.

1.5 FINAL SUBMITTALS

- A. The Contractor, prior to requesting final payment, shall obtain and submit the

following items to the Engineer for transmittal to the Owner:

1. Written guarantees, where required.
2. New permanent cylinders and key blanks for all locks.
3. Maintenance stock items; spare parts; special tools.
4. Completed as-built / record drawings as described in Section 01200 GENERAL REQUIREMENTS FOR UTILITY WORK.
5. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
6. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.6 MAINTENANCE AND GUARANTEE

- A. The Contractor shall comply with the guarantee and warranty requirements contained in the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the Contractor which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private owner or public agency releasing the Owner from further responsibility in connection with such repair or resurfacing.
- C. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the Owner. If the Contractor fails to make such repairs or replacements promptly, the Owner reserves the right to do the Work and the Contractor and his surety shall be liable to the Owner for the cost thereof.

1.7 BOND

- A. The Contractor shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and of the General Conditions.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01701

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SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 RELATED WORK

- A. Refer to General Conditions of the Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01701 - 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 Specification Sections.
- D. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

1.3 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 fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Engineer for approval prior to final execution.
- D. Refer to individual Specification Sections for specific content requirements, and particular requirements for submittal of special warranties.

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

1.4 WARRANTY REQUIREMENT

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.

- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.5 DEFINITION

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

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01740

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SECTION 02010

SUBSURFACE INVESTIGATION

2010.1	MONITORING WELL	EACH
2010.2	GEOTECHNICAL BORING FOR TRAFFIC SIGNAL	EACH

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section includes the basic requirements and expectations of the Contractor in all work pertaining to subsurface conditions.
- B. This section includes the requirements for the completion of 4 geotechnical borings prior to the installation of traffic signals. Each boring shall be installed to a depth of 20 feet unless otherwise indicated by the Engineer.
- C. This section includes the requirements for the installation of groundwater monitoring wells at 3 locations within the Project Area that are to be determined by the Engineer during Construction. The 3 wells shall be installed prior to the completion of the surface restoration work. Each well shall be installed to a depth of 15 feet unless otherwise indicated by the Engineer.

1.2 GENERAL REQUIREMENTS

- A. The Contractor acknowledges that he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon groundwater table or similar physical conditions at the site; the characterization and conformation of subsurface materials to be encountered; and all other matters that can in any way affect the work or the cost thereof under this Contract. Any failure by the Contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

1.3 SUBSURFACE DATA

- A. The findings of recent subsurface investigations are provided in the boring log information (included in the Appendix to these Specifications) and the analytical results of samples collected for waste characterization analyses are available for review upon request.
- B. Concrete below the roadway asphalt was encountered in some of the borings throughout the project limits. Refer to the boring logs in Appendix C for locations where concrete was encountered. Due to the irregular locations where concrete was encountered, the Contractor shall

be prepared to excavate and remove concrete found within the limits of utility trenches and full depth restoration. Refer to Section 02210 – Earth Excavation, Backfill, Fill and Grading for measurement and payment descriptions for Item 2210.5 – Unclassified Excavation.

- C. Such data is offered in good faith solely for the purpose of placing the Contractor in receipt of information available. The Contractor shall interpret such data according to his own judgment, and acknowledges that he is not relying upon the same as accurately describing the actual subsurface conditions or quantities of materials that may be encountered. The Contractor further acknowledges that he assumes all risk contingent upon the nature of the subsurface conditions to be actually encountered in performing the work covered by the Contract, even though such actual conditions may result in the Contractor performing more or less work than originally anticipated. In the event that quantities of waste soil/fill and related work as established in this Contract vary significantly from estimates provided, the unit bid prices will be the basis for compensation.
- D. Re-use of excavated soils on- or off-site is subject to local, state and federal regulations and as specified in Section 02080 – SOIL AND WASTE MANAGEMENT and 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL.
- E. Since individual disposal facilities will have different permit conditions and specific pre-characterization data requirements, the Contractor shall use the information provided for waste characterization; however the Contractor shall be responsible for final waste characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final waste characterization testing is the responsibility of the Contractor, and costs for any additional characterization shall be incorporated into the Contractor's lump sum bid price for Soil Management.
- F. Additional subsurface investigation as may be warranted to satisfy a disposal facility's data requirements shall be the responsibility of the Contractor. Subsurface investigation activities shall not commence until a written work plan detailing the Contractor's approach for obtaining the data is approved by the Owner's Licensed Site Professional. The work plan must indicate the location and frequency of sampling; sampling parameters and sampling methodology. The Contractor shall allow a minimum of 14 days for review and comment.
- G. Groundwater monitoring wells will be installed at the locations shown determined by the Engineer.

PART 2 – PRODUCTS

2.1 WELL CASING

- A. Provide new monitoring well casing 2 inch nominal internal diameter, schedule 40 flush-joint threaded PVC pipe, meeting the requirements of NSF/ANSI 14, with required fittings conforming to ASTM F480 flush thread male by female fittings. Provide a PVC cap that threads or slips onto the top of the well casing.

2.2 CENTRALIZERS

- A. Attach PVC centralizers to the well casing when monitoring wells are over 20 feet in length. Centralizers are not required if the monitoring wells are installed through hollow-stem augers.

2.3 WELL SCREEN

- A. Monitoring well screen shall consist of new commercially fabricated flush-joint threaded 2 inch nominal internal diameter PVC schedule 40, non clogging design. Provide required fittings conforming to ASTM F480, flush thread male by female. Provide screen slot size 0.010 inch, and screen length of 5 feet. Seal bottom section of the screen watertight by means of a flush threaded end cap of the same material as the well screen, within 6 inches of the open portion of the screen.

2.4 FILTER PACK

- A. Provide filter pack consisting of clean, washed, rounded to sub-rounded siliceous material free from calcareous grains or material. Submit filter pack material test results; sieve and chemical analyses. Organic matter, soft, friable, thin, or elongated particles are not permissible.

2.5 BENTONITE SEAL

- A. Provide a bentonite seal, intended to keep grout from entering the filter pack, consisting of hydrated granular, or pelletized, sodium montmorillonite furnished in sacks or buckets from a commercial source, free of impurities which adversely impact the water quality. If the bentonite seal is located above any borehole fluid levels, place a layer of fine sand at the top of the bentonite seal, to provide an additional barrier to any downward migration of grout.

2.6 CEMENT AND BENTONITE GROUT

- A. provide cement grout with a mixture of a maximum of 7 gallons of approved water per 94 lb bag of portland cement, conforming to ASTM C150/C150M Type I. Add no more than 5 percent by weight of bentonite powder to reduce

shrinkage, hold the cement in suspension prior to the grout set. Use sodium bentonite powder and/or granules for high-solids bentonite grout. Mix water from an approved source with these powders or granules to form a thick bentonite slurry, consisting of a mixture of bentonite and the manufacturer's recommended volume of water to achieve an optimal seal. The slurry shall contain at least 20 percent solids by weight and have a density of 9.4 lb per gallon of water or greater. Provide additional construction details for grout placement above the bentonite seal for frost heave protection as directed in paragraph Protective Cover Placement.

2.7 CONCRETE PAD

- A. Construct a concrete pad around the protective cover at the ground surface.

2.8 PROTECTIVE COVERS

- A. Equip monitoring wells with a steel lockable protective casing/enclosure set over the well casing, set in the concrete pad or surface seal. Provide weather resistant padlocks which use the same key (keyed-alike) on the protective covers, or lockable caps for all wells. Cap any well that is to be temporarily removed from service or left incomplete due to delay in construction with a watertight cap and equipped with a vandal resistant cover.

PART 3 – EXECUTION

3.1 INSTALLATION

A. DRILLING METHOD

1. Use a drilling method which prevents the collapse of formation material against the well screen and casing during installation of the well. Make the inside diameter of any temporary casing used sufficient to allow accurate placement of the screen, riser, filter pack, seal and grout.
2. The use of drilling aids such as bentonite, other clay-based agents, or any other foreign matter capable of affecting the characteristics of the ground water is prohibited. Any drilling fluid additive used shall be inorganic in nature. Grease or oil on drill rods, casing, or auger joints are not permitted; however, PTFE tape or vegetable oil (in solid phase form) are acceptable. Submit manufacturer's data, if available, including analytical test results of the additive, if not a part of the manufacturer's data.
3. Provide a drill rig free from leaks of fuel, hydraulic fluid, and oil which may contaminate the borehole, ground surface or drill tools. During construction of the wells, use precautions to prevent tampering with the well or entrance of foreign material, and prevent

runoff from entering the well during construction. If there is an interruption in work, such as overnight shutdown or inclement weather, close the well opening with a watertight uncontaminated cover. Secure the cover in place or weighted down so that it cannot be removed except with the aid of the drilling equipment or through the use of drill tools.

B. Provide sufficient diameter in borings for monitoring well installation to permit at least 2 inches of annular space between the boring wall and all sides of the centered riser pipe and screen.

C. SCREEN, WELL CASING PIPE PLACEMENT

1. Provide the monitoring well screen in 5 feet in length, with specified bottom cap securely attached, set to the appropriate depth.
2. Place the bottom of the well screen no more than 3 feet above or less than 6 inches below the bottom of the drilled borehole. Place the well screen in the appropriate location in the borehole so that the completed monitoring well functions in accordance with paragraphs SYSTEM DESCRIPTION and WELL ACCEPTANCE.
3. Place the well screen to the depths as specified on the drawings. Join the screen and well casing pipe sections by flush threaded watertight joints, with the well casing pipe extending upwards from the screen to an elevation appropriate for the surface completion described in paragraph Protective Cover Placement. Do not allow the well screen and riser pipe to drop or fall uncontrolled into the borehole. Clean the screen and well casing pipe with high pressure hot water/steam just prior to installation; allowing no foreign material to remain on the screen and well casing before installation. The use of factory-sealed (plastic wrapped) screen, free from painted markings, does not waive requirements for pre-installation cleaning.
4. Provide watertight flush threaded joints and fastenings; solvent glue or set screws are not permitted.
5. Make the well centered and plumb by the use of a minimum of 2 stainless steel centralizers, in accordance with paragraph CENTRALIZERS, spaced 120 degrees apart at intervals not exceeding 20 feet along the length of the casing. Do not place centralizers on the screened interval or within the bentonite seal. Verify the alignment of the well by passing a 5 foot long section of rigid pipe 1/4 inch smaller in diameter than the inside diameter of the casing through the entire well. If the pipe does not pass freely, the well will not be accepted. Thoroughly clean the pipe section with high pressure hot water prior to each test. Use temporary casing, hollow stem augers or other measures, as necessary, to prevent collapse of the boring against the well screen and well casing/riser

pipe prior to placement of the filter pack and sealing materials. Install a cap on the top of the riser pipe, either vented, or a telescopic fit, constructed to preclude binding to the well casing caused by tightness of fit, unclean surfaces, or weather conditions. Make cap secure enough to preclude the introduction of foreign material into the well, yet allow pressure equalization between the well and the atmosphere.

D. FILTER PACK PLACEMENT

1. After the screen and well casing have been concentrically placed in the hole, construct the approved filter pack around the screen by filling the entire space between the screen and the wall of the hole over the selected screened interval. Place the lowermost 1 foot of filter pack in the boring prior to installation of the well screen, serving as a base on which to place the screen. Lower a tremie pipe having an inside nominal diameter of not less than 1 inch to the bottom of the annulus between the hole and well. Clean the tremie pipe with high pressure hot water/steam prior to each use. Arrange the tremie pipe so that water and filter pack material fed at uniform rates are discharged as the filter pack material fills the hole from the bottom up. Raise the tremie pipe at a rate that will keep the bottom of the pipe no more than 5 feet above the top of the surface of the filter pack level, and no more than 2 feet below the surface of the filter pack level at all times.
 2. Dumping filter pack material from the surface of the ground and agitating the well in an effort to settle the filter material is not allowed. Install the filter pack continuously and without interruption until the filter pack has been placed 2 feet above the top of the screen in the monitoring well. Directly measure the depth to the top of the filter pack and record.
 3. Protect filter pack material from contamination prior to placement by either storing it in plastic lined bags, or in a location protected from the weather and contamination on plastic sheeting. Transport filter pack material to the well site in a manner which prevents contamination by other soils, oils, grease, and other chemicals. Remove temporary drill casing, if installed, or auger simultaneously with the above operation. Minimize lifting of the riser pipe when withdrawing the temporary casing/auger. Place filter pack material in lifts no greater than 2 foot prior to retraction of the temporary casing/auger. Leave a minimum of 6 inches of filter pack in the temporary casing/auger at all times during filter pack installation. Take frequent measurements inside the annulus during retraction to ensure that the filter pack is properly placed.
- E. Place a minimum 2 foot thick hydrated bentonite seal on top of the filter pack in a manner which prevents bridging of the bentonite in the annulus, such that the bottom of the bentonite seal is a minimum of 2 feet above the top of the filter pack. Directly

measure the depth to the top of the bentonite seal and record immediately after placement, without allowance for swelling. If the bentonite seal is located above any borehole fluid levels, place a 1 foot layer of fine sand at the top of the bentonite seal.

- F. Mechanically mix a non-shrinking cement grout, in accordance with paragraph CEMENT AND BENTONITE GROUT, and placed in one continuous operation into the annulus above the bentonite seal to the ground surface. Make grout injection in accordance with ASTM D5092. If the casing interval to be grouted is less than 15 feet, and without fluids after any drill casing is removed, place the grout either by pouring or pumping. Thoroughly clean the tremie pipe with high pressure hot water/steam before use in each well. Construct the bottom of the tremie pipe to direct the discharge to the sides rather than downward, keeping the discharge end of the tremie pipe submerged at all times. Add additional grout from the surface to maintain the level of the grout at the land surface as settlement occurs. Work is not permitted in the well within 24 hours after cement grouting. Verify the alignment of the well by passing a 5 foot long section of rigid PVC 1/4 inch smaller in diameter than the inside diameter of the casing through the entire well. If the pipe does not pass freely, the well will not be accepted. Thoroughly clean the pipe section with high pressure hot water/steam prior to each test.
- G. Construct a concrete pad with a minimum radius of 2 feet from the protective casing and 4 inches thick, sloped away from the well around the well casing at the final ground level elevation.
- H. Provide all monitoring wells with a steel lockable protective enclosure set in the annular seal over the well casing with keyed-alike locks on the protective covers for all wells.
- I. PROTECTIVE STEEL CASING
 - 1. Install a protective steel casing around the well casing pipe by placing the protective casing into the annular seal. Clean the protective casing with high-pressure hot water/steam prior to installation to ensure that it is free of any contamination. Provide a protective casing with an inside diameter of at least 2 inches greater than the nominal diameter of the well riser. Fit the protective casing with a locking cap and install so that there is a maximum 0.2 foot clearance between the top of the in-place inner well casing cap and the bottom of the protective casing locking cap when in the locked position.
 - 2. Position and maintain the protective casing in a plumb position. Extend the bottom of the protective casing a minimum of 2.5 feet below the top of the ground surface; extending a minimum of 1 foot below the maximum depth of frost penetration (frost line); and anchored into the cement grout annular seal; and also extending at least 2 feet above the surface of the ground. Seal and immobilize the protective casing in concrete placed around the outside of the protective casing, then place dry bentonite pellets, or granules, in the annular space below ground level within the protective casing.

3. Provide the protective casing with a 1/4 inch diameter drain hole installed just above the top of the concrete pad. Place coarse sand or pea gravel in the annular space between the protective casing and the riser pipe, above the drain hole, to within 3 inches from the top of the riser pipe.
- J. Affix a corrosion resistant metal tag to the exterior and interior of the protective cover. Provide the metal tag stamped with the well identification number, elevation of the highest point on the rim of the well casing or riser pipe, elevation of the ground surface at the well, well coordinates, date of well installation, and the top of the protective casing elevation in feet. Use identification numbers for the monitoring wells as indicated on the drawings.
- K. WELL DEVELOPMENT
1. Within 7 days of completion of each well, but no sooner than 48 hours after cement grouting is completed, develop the well. Perform development using only mechanical surging or over pumping or a combination thereof in accordance with ASTM D5521. Development is complete when:
 - i. Well water is clear to the unaided eye
 - ii. Sediment thickness in the well is less than 1 percent of the screen length
 - iii. A minimum of three times the standing water volume in the well plus three times the volume of all added water and drilling fluid lost during drilling and installation of the well is removed
 - iv. Temperature, specific conductivity, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity readings, measured before, twice during and after development operations, have stabilized. Stabilization means variation of less than 0.2 pH units, variation of + 1 degree Fahrenheit, + 3 percent change in specific conductance; + 10mV for ORP; and + 10 percent for DO, and turbidity, measured between three consecutive readings with one casing volume of water removed between each reading. Determine ORP in accordance with AWWA 10084. Conduct temperature, specific conductance, DO, turbidity, and pH readings in accordance with EPA 600/4-79/020. At completion of well development, collect approximately 1 pint of well water in a clear glass jar. Label the jar with project name, well number and date; and photographed. Suitably backlight the subject in the photograph close-up to show the clarity of the water and any suspended sediment. Water removed during development and testing operations shall be discharged to the ground surface in a down gradient area.

- L. Any well disapproved by the Engineer, or any well decommissioned/abandoned by the Contractor for any reason shall be decommissioned/abandoned according to the requirements of the State of MA, ASTM D5299, and the requirements of these specifications. Well decommissioning/abandonment includes the removal of all materials left in the borehole/well, excluding the filter pack, and including backfill materials, casing, screen, and any other material placed into the hole before the decision was made to abandon the borehole/well. Grout test holes decommissioned/abandoned for any reason from the bottom to within 3 feet of the top of the ground surface according to the protocol for grout/bentonite placement established in paragraph Grout Placement, using the grout mix specified in paragraph CEMENT AND BENTONITE GROUT. Backfill the top 3 feet with material appropriate for the intended land use. Maintain a well decommissioning/abandonment record. Measure groundwater levels, if encountered before the decision is made for decommissioning/abandonment, in all borings prior to backfilling. Include these water levels in the well decommissioning/abandonment records. No well may be decommissioned/abandoned without the approval of the Engineer.
- M. It is the responsibility of the Contractor to properly design, construct, install, develop, and test all monitoring wells according to the requirements of this specification so that they are suitable for the intended purpose. If the Contractor installs wells that are not functional or not in accordance with these specifications, the Engineer will disapprove the well and direct the Contractor to repair or replace it, and to abandon the disapproved well in accordance with this specification.

PART 4 – COMPENSATION

Item 2010.1-MONITORING WELL

METHOD OF MEASUREMENT:

Measurement for payment for monitoring wells shall be per each basis paid by the schedule of values as measured by the Engineer. Assume each monitoring well is 15 feet in depth.

BASIS OF PAYMENT/INCLUSIONS:

Payment for EACH monitoring well will be based on the unit price bid for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install the Monitoring well. The work shall include but is not limited to: furnishing and installing the well screen, well riser, protective steel casing, protective cover, centralizers, filter pack, bentonite seal, cement or bentonite grout, concrete pad and all incidental work.

Item 2010.2-GEOTECHNICAL BORING FOR TRAFFIC SIGNAL

METHOD OF MEASUREMENT:

Measurement for payment for Geotechnical Borings for Traffic Signal shall be per each basis paid by the schedule of values as measured by the Engineer. Assume each boring is 20 feet in depth.

BASIS OF PAYMENT/INCLUSIONS:

Payment for EACH boring shall be based on the unit price bid for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete the boring. The work shall include but is not limited to: conducting boring, backfill boring with cement or bentonite grout, and all incidental work.

END OF SECTION 02010

SECTION 02015

GEOTECHNICAL MONITORING AND INSTRUMENTATION

2015.1	VIBRATION MONITORING	LUMP SUM
2015.2	BUILDING OR STRUCTURE MONITORING POINTS	EACH
2015.3	GROUND AND UTILITY MONITORING POINTS	EACH

PART 1 – GENERAL

1.1 SUMMARY

- A. Work in this Section shall include, but not be limited to, all materials, equipment, labor, and services required to install, protect, replace, monitor and report on geotechnical instrumentation specified herein.
- B. The work included in this section includes the following:
 - 1. Vibration monitoring shall be performed continuously during all excavation, backfill, and compaction and installation of temporary earth support. Two seismographs shall monitor vibrations at two separate locations per a crew; one adjacent to the work and one adjacent to the nearest private property. Vibration levels shall not exceed the criteria indicated herein.
 - 2. Furnish, install, protect, replace, monitor and report on wall monitoring points on the top of the temporary excavation support walls (not including trench boxes), a minimum of one every 20 feet, to measure horizontal displacements of these points during the Work. Locations of the monitoring points shall be distributed uniformly around the excavation support wall at locations proposed by the Contractor and accepted by the Engineer.
 - 3. Furnish, install, protect, replace, monitor and report on ground surface and building deformation monitoring points. The Engineer will assist the Contractor in determining the final locations. Contractor shall conduct site visit with the Engineer at least two weeks prior to the start of construction to determine locations of ground, surface, and utility monitoring points.
 - 4. At locations where structure monitoring points are required on buildings, the Contractor shall conduct an internal inspection of the building. Pre-Construction Surveys shall be conducted in accordance

with Section 01390.

5. At locations where structure and/or monitoring points are required on private property, the Contractor shall obtain a right of entry to obtain access. A Right of Entry form shall be obtained from the property owner prior to conducting an internal building inspection.
6. The Contractor shall retain the services of Geotechnical Monitoring Consultant to install, monitor, maintain and report on geotechnical instrumentation that includes but is not limited to temporary excavation support wall monitoring points, ground surface, building deformation monitoring points, Utility Monitoring Points, crack gauges and vibrations. Monitoring frequency shall be daily during installation of the support of excavation, and two times per week thereafter for all instruments located within 100 feet from the edge of the excavation, during all excavation, backfill and compaction, unless otherwise directed by the Engineer or specified
7. Replace instrumentation damaged or made inaccessible by the construction operations at no additional cost to the Owner.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS.
 1. Shop drawings that indicate the instrumentation locations, sizes, material types, manufacturers' data and specifications, installation procedures, and other data. Provide description of work and materials
- B. A mitigation plan shall be submitted to the Engineer by the Contractor prior to any excavation and prior to the installation of the excavation support system. The mitigation plan shall detail the Contractor's course of action in the event threshold or limiting response values are met or exceeded. Such mitigation plan shall be revised as appropriate for each instance threshold and/or limiting values are reached.
- C. The Geotechnical Monitoring Consultant shall submit initial baseline survey data on a plan indicating locations and elevations of all instrumentation monitoring points to the Engineer at least three days prior to beginning of the installation of the excavation support and excavation operations.
- D. The Geotechnical Monitoring Consultant shall submit subsequent survey data on all instrumentation monitoring points to the Engineer prior to the beginning of work the following day. A faster turnaround of data reporting may be required by the Engineer if threshold or limiting response values, as specified in this Section, are approached or exceeded. Data shall be tabulated and depicted graphically on plots and show incremental and cumulative movement since the start of excavation.

1.3 QUALITY CONTROL

- A. The Contractor shall provide sufficient notice to the Engineer to allow the Engineer to be present to observe the Work. Cooperate with the Engineer in all respects to facilitate any testing or observations.
- B. The Contractor may conduct additional testing or monitoring for its own information, at no additional cost to the Owner.
- C. The presence of the Engineer (including observations and review of test results) shall not relieve the Contractor of its sole responsibility to perform the work in accordance with the Contract Documents, nor shall they be construed to relieve the Contractor from full responsibility for the means and methods of construction and for safety on the construction site.
- D. Work not in conformance with the specified requirements shall be improved, or removed and replaced, at no additional cost to the Owner. All costs related to testing of nonconforming Work or materials shall be paid for by the Contractor, at no additional cost to the Owner.
- E. Measure and report all data on movements of all instrumentation monitoring points to the nearest 0.01 ft.
- F. Retain the services of Geotechnical Monitoring Consultant to monitor the geotechnical instrumentation, which includes and is not limited to excavation support system, building and ground surface deformation monitoring points, Utility monitoring Points, and vibrations. The consultant shall be a Geotechnical Engineer registered in the Commonwealth of Massachusetts and shall have demonstrated at least five years' experience and at least three projects of similar type, size, and complexity including installation and monitoring of surface settlement and vibrations with seismographs. The Geotechnical Monitoring Consultant shall be approved by the Engineer and must be approved two weeks prior to mobilization for construction. The Geotechnical Monitoring Consultant shall adhere to all methods and standards described in this Specification.

PART 2 – PRODUCTS

2.1 BUILDING AND GROUND SURFACE DEFORMATION MONITORING POINTS

- A. Deformation monitoring points shall consist of 3-inch long surveyors' "PK" nails, securely nailed in place, a #4 rebar 12 inches long driven flush into the ground surface or ½-inch diameter carriage bolts drilled 2 inches into the building surface and extending approximately 3 inches from the building face. Surface monitoring points may also consist of an observable point punch

marked on the top horizontal surface of a manhole or catch basin rim. The steel surface within 3 inches of the point shall be cleaned by wire brush to permit easy identification of the exact point. The point shall be clearly identified using fluorescent spray paint adjacent to the point.

2.2 TEMPORARY EXCAVATION SUPPORT WALL MONITORING POINTS

- A. Temporary excavation support wall monitoring points shall consist of an observable point punch marked on the top horizontal surface of the piles or sheeting. The surface within three inches of the point shall be cleaned by wire brush to permit easy identification of the exact point. The point shall be clearly identified using fluorescent spray paint adjacent to the point.

2.3 VIBRATION MONITORING

- A. Construction vibrations shall be monitored as described in the Contract Specifications in terms of peak particle velocity using a seismograph with continuous recording capability. Capability to record vibrations at two locations simultaneously is required. The vibration sensors shall be capable of recording three orthogonal components of vibration.

2.6 UTILITY MONITORING POINTS

- A. Utility Monitoring Points (UMPs) will be used to monitor vertical deformation of the existing utilities as determined by the Engineer during site visit with the Contractor prior to construction.
- B. Provide 2-inch PVC casing, threaded and coupled, as-needed.
- C. Provide No. 4 rebar, threaded and coupled, as-needed.
- D. Installation borehole shall be backfilled with cement-bentonite grout.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Do not install any instruments until the Owner and the Engineer have been notified.

3.2 INSTALLATION

- A. Building or Structure Monitoring Points (SMPs)
 - 1. SMPs shall be installed at the locations and depths as determined by the Engineer during site walks prior to construction.

2. All SMPs shall have the horizontal as-built location determined to an accuracy 0.5-feet and the elevation to an accuracy of 0.01-feet.

B. Utility Monitoring Points (UMPs)

1. UMPs shall be installed at the locations and depths as determined by the Engineer during site walks prior to construction.
2. Where necessary, the Contractor shall install the UMPs by the use of vacuum excavation exercising due diligence not to disturb or damage the utility being monitored and to minimize disruption and damage to adjacent areas.
3. The location of the utility in plan shall be determined and the borehole advanced to within a maximum of 2-feet above the utility. The Contractor shall be responsible for any damage to the utility during installation of the utility monitoring points. Drill casing may be used during the installation.
4. After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of 1-foot and in elevation to an accuracy of 0.01-feet.

C. Ground Surface Monitoring Points (GMPs)

1. GMPs shall be installed at the locations and depths as determined by the Engineer during site walks prior to construction.
2. All GMPs shall have the horizontal as-built location determined to an accuracy of 0.5-feet and the elevation to an accuracy of 0.01-feet.

3.3 MONITORING

- A. Monitoring frequency may be increased as required by the Engineer for some or all of the monitoring points if the threshold or limiting response values are approached or exceeded during the Work, at no additional cost to the Owner.
- B. After each set of readings is obtained, the data shall be sent to the Engineer, where the data will be reviewed and interpreted. The Contractor shall make its own interpretations for the data. The Contractor shall monitor and interpret data from additional instrumentation that it deems necessary to ensure the safety of its work. The Engineer is not responsible for the safety of the work based on its review of the instrumentation data.

Reporting Data:

1. A plan showing location and numbering system for monitoring points

shall be submitted to the Engineer prior to start of temporary excavation support installation and excavation operations, along with results of two initial baseline surveys. Monitoring frequency shall be on a daily basis during installation of the excavation support system and once per week thereafter for all instruments located within 100 feet from the edge of the excavation unless otherwise required by the Engineer.

2. Tables of results of surveys shall be submitted prior to the beginning of work the following day. The table of survey results shall include the initial measurement, the current measurement, and the amount of movement since start of excavation.
3. Survey data shall be depicted graphically on plots and submitted with the tabular results to show incremental and cumulative movement since the start of excavation.

C. Criteria for "threshold" and "limiting" vibration acceptance measured from seismographs during demolition, construction of temporary excavation support, excavation and backfilling shall be as follows:

1. "Threshold" values in peak particle velocity (inches per second): for wood, steel and brick buildings shall be 0.6, and for historical stone structures 0.3 at frequencies of 50 Hz or less as measured from the ground surface within the limits of the work zone or adjacent areas where vibrations are monitored.
2. "Limiting" values in peak particle velocity (inches per second): for wood, steel and brick buildings shall be 0.8, and for historical stone structures 0.5 at frequencies of 50 Hz or less as measured from the ground surface within the limits of the work zone or at other adjacent areas where vibrations are monitored.

D. Criteria for "threshold" and "limiting" movements of wall elements of temporary lateral support systems have been established as follows:

1. "Threshold" Horizontal Movement: No greater than 0.5 inch where buildings are present within 25 feet of the support of excavation system.
2. "Limiting" Horizontal Movement: No greater than 1.0 inch where buildings are present within 25 feet of the support of excavation system.

E. Criteria for "threshold" and "limiting" settlement of sidewalk, paved roadway areas adjacent to the temporary lateral support systems have been established as follows:

1. "Threshold" Settlement: No greater than 0.5 inches.
 2. "Limiting" Settlement: No greater than 1.0 inch.
- G. Criteria for "threshold" and "limiting" settlement of UMPs adjacent to the temporary lateral support systems have been established as follows:
- "Threshold" Settlement: No greater than 0.25 inches.
- "Limiting" Settlement: No greater than 0.50 inch.
- H. Criteria for "threshold" and "limiting" angular distortion (measure of building rotation due to vertical settlement) of adjacent buildings have been established as follows:
1. "Threshold" Angular Distortion: No greater than 1/1000 for wood, steel and brick buildings. No greater than 1/1200 for historical stone structures. Where the angular distortion is defined as the ratio of the differential elevation between any two building points over the horizontal distance between those points.
 2. "Limiting" Angular Distortion: No greater than 1/750 for wood, steel and brick buildings. No greater than 1/900 for historical stone structures. Where the angular distortion is defined as the ratio of the differential elevation between any two building points over the horizontal distance between those points.
- I. The Contractor shall immediately notify the Engineer and shall take immediate steps to control further movement by revising construction procedures, providing supplemental bracing or other measures (working extended hours as approved or temporarily terminating work in the area of movement if necessary) as required if any of the following occur:
1. Field measurements indicate that any of the "threshold" movement criteria are reached or exceeded.
 2. Field measurements or observations indicate that significant or sustained wall movements, beyond those reasonably expected, are occurring (total movement may be less than the "Limiting" movement criteria).
 3. Movements of adjacent structures, utilities or other facilities are detected.
- J. If "Limiting" movements are being approached or reached, the Owner may require the Contractor to temporarily suspend the work in the area where such

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

- K. Installation of Work in the area where the Limiting Values had been reached shall not be permitted until the results of optical surveys indicate no increase in lateral movement of the earth support system and adjacent surface and building settlement for the one-week period immediately prior to resuming construction.
- L. These criteria are intended to establish a minimum basis for the Contractor's design and procedures and do not relieve the Contractor of its responsibility for preventing detrimental movements and damage to adjacent structures, utilities or other work.
- M. The Contractor shall pay a penalty \$1,000 for each day the Contractor works in violation of any threshold or limiting values being reached or exceeded as determined by the Engineer.
- N. In the event the Contractor does not comply with the approved mitigation plan, or continues to work in violation of threshold or limiting values being reached or exceeded, the Contractor shall not be allowed to continue work until proper mitigation procedures and corrections have been made as required by the Owner and Engineer.
- O. The Contractor shall be responsible for repairing all property damage caused by construction activities.

3.4 PROTECTION OF INSTRUMENTATION

- A. Protect all instruments during the course of the Work. Any damage or loss of function caused by the Contractors operations, or by any other cause, to new or existing instrumentation devices, shall be immediately repaired or the equipment replaced at no additional cost to the Owner.

PART 4 – COMPENSATION

Item 2015.1 - Vibration Monitoring

METHOD OF MEASUREMENT:

Measurement for payment for Vibration Monitoring will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT/ INCLUSIONS:

Under the Unit Price for Vibration Monitoring, the Contractor shall furnish all labor, materials, instrumentation, tools, equipment, and incidentals required to perform all vibration monitoring as specified in the Contract Specifications and also as required by the Engineer. Payment under this Item includes, but is not limited to; furnishing, installation and maintenance of

seismographs; monitoring seismograph data and submission of all data to the Engineer; submission of shop drawings and submittals as required.

Item 2015.2 – Building or Structure Monitoring Points

METHOD OF MEASUREMENT:

Measurement for payment for Building or Structure Monitoring points will be based on the per Each bid as approved by the Engineer.

BASIS OF PAYMENT/ INCLUSIONS:

Under the Unit Price for Building or Structure Monitoring Points, the Contractor shall furnish all labor, materials, instrumentation, tools, equipment, and incidentals required to furnish, install, replace, monitor, and report on all structure monitoring points as specified in the Contract Specifications and also as required by the Engineer. Payment under this Item includes, but is not limited to; acquisition of rights of entry, furnishing, installation, maintenance, and monitoring for structure monitoring points; furnishing, installation, and maintenance of all crack gauges; monitoring of all crack gauges and submission of all data to the Engineer; conduct site visits with the Geotechnical Engineer to locate building or structure monitoring points of shop drawings and submittals as required.

Item 2015.3 – Ground and Utility Monitoring Points

METHOD OF MEASUREMENT:

Measurement for payment for Ground and Utility Monitoring points will be based on the per Each bid as approved by the Engineer.

BASIS OF PAYMENT/ INCLUSIONS:

Under the Unit Price for Ground and Utility Monitoring Points, the Contractor shall furnish all labor, materials, instrumentation, tools, equipment, and incidentals required to furnish, install, replace, monitor, and report on all ground and utility monitoring points as specified in the Contract Specifications and also as required by the Engineer. Payment under this Item includes, but is not limited to; furnishing, installation, and maintenance of all crack gauges; monitoring of all crack gauges and submission of all data to the Engineer; furnishing, installation, maintenance, and monitoring for ground and utility monitoring points and temporary support excavation monitoring points; conduct site visits with the Geotechnical Engineer to locate ground and utility monitoring points; submission of all data to the Engineer; submission of shop drawings and submittals as required.

END OF SECTION 02015

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SECTION 02051

DEMOLITION, MODIFICATION, AND ABANDONMENT

2051.1	DISPOSAL OF CONSTRUCTION DEBRIS AS SOLID WASTE	TON
2051.2	DISPOSAL OF BITUMINOUS CONCRETE	TON
2051.3	DEMOLITION OR REMOVAL OF LAMP HOLE, MANHOLE, CATCH BASIN OR OTHER STRUCTURE	EACH
2051.4	ABANDON IN PLACE MANHOLE, CATCH BASIN OR OTHER STRUCTURE	EACH
2051.5	ABANDON IN PLACE PIPE – 15-INCH THROUGH 48-INCH DIAMETER	LF
2051.6	DEMOLITION OR REMOVAL OF PIPE 15-INCH THROUGH 24-INCH DIAMETER	LF
2051.7	DEMOLITION OR REMOVAL OF PIPE GREATER THAN 24-INCH DIAMETER	LF
2051.8	DRAIN VAULT NO. 5 STRUCTURE MODIFICATIONS	LS
2051.9	HYDROSLIDE REMOVAL	EACH
2051.10	WEIR REMOVAL	EACH
2051.11	MWRA WHEELER STREET STRUCTURE MODIFICATIONS	LS
2051.12	BENDING WEIR STRUCTURE MODIFICATIONS	LS
2051.13	MASONRY PLUG OR BULKHEAD FOR PIPE GREATER THAN 30-INCH DIAMETER	EACH
2051.14	MODIFICATIONS TO EXISTING PILES	LF
2051.15	CONCRETE FILL REMOVAL AT 54" – DIA RCP DRAIN	LS

PART 1 – GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish all plant, labor, tools, equipment, materials, and supplies as required for utility and structure removal, demolition, modification, and/or abandonment as specified.
- B. The Work of this Section shall include the following significant items; all other activity shown on the Drawings; and work necessary and defined herein pertaining to the project area: demolition of roadway and sidewalk; removal of existing catch basins and manholes; abandonment of existing catch basin laterals; removal of existing pipe; modification to existing piles; and selective demolition.

1.2 RELATED DOCUMENTS

- A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- B. Section 02590 – BRICK MASONRY
- C. Section 03315 – GROUT
- D. Section 02160 – TEMPORARY EXCAVATION SUPPORT SYSTEMS
- E. Section 02080 – SOIL AND WASTE MANAGEMENT
- F. Section 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Removal and abandonment procedures that shall provide for safe conduct of the Work, careful removal and disposition of materials and equipment, protection of utilities, structures, property, or other features which are to remain undisturbed and coordination with existing utilities or owners responsible for those nearby elements to remain in service.
 - 2. A detailed work plan to include a list of items to be removed and/or abandoned, a sequence and schedule, and a list of salvageable materials and equipment.

3. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

B. Schedule of Selective Demolition, Modification and Abandonment Activities

1. The Schedule of Selective Demolition, Modification and Abandonment Activities shall be subject to approval by the Owner and Engineer.

Indicate the following:

- a. Detailed sequence of selective demolition, modification and abandonment work, with starting and ending dates for each activity. Ensure the Owner's operations are uninterrupted.
- b. Interruption of utility services.
- c. Coordination for shutoff, capping, bulkheading and continuation of utility services.
- d. Proposed materials, construction details, locations of temporary utilities, abandonment materials, and means of access.
- e. Coordination of Owner's continuing use of portions of utilities, structures, property or other features and of Owner's partial occupancy of completed Work.

C. Additional Submittals for Selective Demolition, Modification, and Abandonment Activities

1. Inventory: After selective demolition or modifications are complete, submit a list of items that have been removed and salvaged.
2. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining utility construction and site improvements that might be misconstrued as damage caused by selective demolition or modification operations. Submit before Work begins.
3. Landfill Records: Indicate receipt and acceptance of all wastes by disposal facility licensed to accept the wastes to be disposed.

D. Masonry Plugs and Bulkheads

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Conformed Set

DEMOLITION, MODIFICATION, AND
ABANDONMENT

02051-3

1. For each permanent and temporary bulkhead and masonry plug, the Contractor, at a minimum, shall submit the following, prepared by a Massachusetts Registered Professional Civil or Structural Engineer:
 - a. Design Loads
 - b. Restraining Mechanisms
 - c. Method of Installation
 - d. Results of Field Inspection after Installation
 - e. Decommissioning Method
2. If temporary pneumatic or hydro plugs are proposed, in addition, the Contractor shall submit the method and procedure of maintaining bladder pressure.

1.4 REPAIR OF DAMAGE

- A. Any damage to existing facilities to remain, as caused by the Contractor's operations shall be repaired at no additional cost to the Owner.
- B. Damaged items shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract.

1.5 PROTECTION OF EXISTING WORK

- A. Before beginning any cutting, trenching or demolition work, the Contractor shall carefully review the work sequence and examine the Drawings and Specifications to determine the extent of the Work. The Contractor shall take all necessary precautions to prevent damage to existing facilities, which are to remain in place, and be responsible for any damages to existing facilities, which are caused by the operations. Damages to such work shall be repaired or replaced to its existing condition at no additional cost to the Owner. The Contractor shall carefully coordinate the work of this Section with all other work and shall provide shoring, bracing, and supports, as required. The Contractor shall insure that structural elements are not overloaded or compromised and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract. The Contractor shall remove all temporary protection when the work is complete.

- C. The Contractor shall carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, the Contractor shall consult with the Owner prior to the placement of such equipment or material.

1.6 JOB CONDITIONS

- A. The Owner assumes no responsibility for actual condition of the facilities to be removed, abandoned or modified. The Contractor shall visit the site; inspect all facilities to get familiarized with all existing conditions and utilities.
- B. The Owner may occupy portions of the utilities, structures, properties or other facilities immediately adjacent to selective demolition area. Conduct selective demolition, modification and abandonment so Owner's operations will not be disrupted. Provide not less than 24 hours notice to Owner of activities that will affect Owner's operations.
- D. Owner assumes no responsibility for condition of the utilities, structures, properties or other facilities to be selectively demolished.
- E. If materials suspected of containing hazardous or asbestos materials are encountered, do not disturb; immediately notify Engineer.
- F. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition, modification and abandonment operations.

1.7 QUALITY ASSURANCE

- A. Comply with Section 01400 - QUALITY CONTROL
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-Demolition, Modification, and Abandonment Conference: Conduct conference at Project site, which includes Owner and Engineer. Review methods and procedures related to selective demolition.
- D. Review and finalize selective demolition, modification and abandonment schedule and verify availability of materials, labor, equipment, and facilities needed to make progress and avoid delays.

1.8 WARRANTY

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Conformed Set

DEMOLITION, MODIFICATION, AND
ABANDONMENT

02051-5

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Comply with material and installation requirements specified in individual Specification Sections.

2.2 MATERIALS OWNERSHIP

- A. Coordinate with Engineer and Owner, who will make final determination as to whether an item is to be salvaged or removed. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

2.3 REPAIR MATERIALS

- A. Use repair materials identical to existing materials. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 – EXECUTION

3.1 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

3.2 PREPARATION FOR WORK

- A. Verify that utilities have been disconnected and capped, shut-off, or bulk headed. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition, modification and abandonment required. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Engineer.
- C. Engage a professional engineer to survey condition of structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- E. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition, modification, and abandonment operations.

3.3 SITE ACCESS, TEMPORARY FACILITIES AND PROTECTION

- A. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used utilities, structures, properties or facilities.
- B. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
- D. Protect existing site improvements, appurtenances, and landscaping to remain.
- E. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

- F. Temporary Facilities: Provide temporary barricades and other protection required for demolition security and to prevent injury to people and damage to adjacent utilities, structures, properties and facilities to remain.
- G. Provide protection to ensure safe passage of people around the area.
- H. Temporary Shoring: Provide and maintain in accordance with Section 02160 - TEMPORARY EXCAVATION SUPPORT SYSTEMS.
- I. Strengthen or add new supports when required during progress of selective demolition.
- J. Existing landscaping materials, structures, pipes and appurtenances, which are not to be removed/abandoned shall be protected and maintained as required by the Engineer and as specified.

3.4 POLLUTION CONTROL

- A. Water sprinkling, temporary enclosures, and other suitable methods shall be used to limit dust and dirt rising and scattering in the area. Comply with government regulations pertaining to environmental protection. Water shall not be used when it creates hazardous or objectionable conditions such as ice, flooding, or pollution.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.5 CLEANING

- A. During and upon completion of work, the Contractor shall promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave areas affected by work in a clean, approved condition.
- B. All areas shall be cleaned of dust, dirt, and debris caused by demolition, modification, or abandonment and adjacent areas returned to conditions existing prior to start of work.

3.6 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition, modification and abandonment operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

- C. Provide at least 72 hours notice to Owner if shutdown of service is required during changeover.
- D. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished or abandoned.
- E. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition, relocation or abandonment, and that maintain continuity of service to other parts of building.

3.7 DEMOLITION AND ABANDONMENT PROCEDURES

- A. Disposal of all materials shall be performed in compliance with applicable local, state, and federal codes and requirements. Provide labor, equipment, and materials to perform work as specified and indicated.
- B. The Contractor shall flush all pipe and structures to be removed or abandoned to remove solids and objectionable material prior to commencing demolition, modification, or abandonment.
- C. When existing pipe is removed, the Contractor shall plug all resulting abandoned connections whether or not shown. Where removed piping is exposed, the remaining piping shall be fitted with a removable cap or plug, or bulk headed. Where existing piping, to include catch basin laterals, is to be abandoned, the Contractor shall cut back the abandoned pipe for a distance of 5 feet from any connecting structures to remain. Pipes to be abandoned in structures to be abandoned may be capped, plugged or bulk headed from inside the structure. All holes at the existing structures shall be repaired. Abandoned pipe smaller than 15 inches diameter shall be capped or plugged at both ends prior to backfill. Abandoned pipe 15 inches diameter and larger shall be filled with Controlled Density Fill (CDF) prior to being capped, plugged, or bulk headed and backfilling unless otherwise noted. Each pipe reach to be abandoned with CDF shall be filled with CDF from the up gradient end of the pipe reach wherever possible. The CDF shall completely fill each pipe reach and flow out the other end. The Contractor can aid the flow of the CDF in the pipe by providing a temporary structure at the access point to build up head or by pumping the CDF or by providing vibration in the pipe reach or access point. Requirements for Controlled Density Fill are described in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- D. Where existing drainage structures such as catch basins, drain manholes, sewer manholes, and combined sewer manholes are to be abandoned in place, the Contractor shall remove the frames, grates, and covers and cut the structures down a minimum of 2 feet below final grade. The Contractor shall

put a minimum of four, 2-inch diameter drainage holes in the invert of each structure and then backfill the structure with control density fill or compacted sand as specified and as approved by the Engineer. Backfill around the structure shall be in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

- E. Permanent plugs shall be constructed of Class B concrete, brick or other material approved by the engineer.
- G. Fill excavations with solid fill resulting from earth removal operations and/or with select borrow material in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING. Final grade to be restored in kind unless otherwise noted.
- H. Exercise precautions for fire prevention. Make fire extinguishers approved for Class A, B and C fires available at all times in areas where performing demolition or abandonment work with burning torches. Do not burn demolition debris on site.

3.8 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings, joints and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 5. Dispose of demolished items and materials promptly.
 - 6. Return elements of construction and surfaces that are to remain to

condition existing before selective demolition operations began.

7. Existing Facilities: Comply with Owner's requirements for using and protecting utilities, structures, properties and other facilities.

B. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.9 REHABILITATION/MODIFICATION PROCEDURES

A. Certain areas of existing piping, conduits, and the like will be affected by work necessary to complete modifications under this Contract. The Contractor shall be responsible to rehabilitate those areas affected by his construction activities.

B. When new piping is installed in existing manholes, catch basins or other structures, the Contractor shall accurately position core-drilled openings in

the concrete as shown or otherwise required. Openings shall be of sufficient size to permit a final alignment of pipelines and fittings without deflection of any part and to allow adequate space for satisfactory installation of a flexible connector to ensure water tightness around openings so formed.

- C. When new piping is to be connected to existing piping, the existing piping shall be cut square and ends properly prepared for the connection shown. Any damage to the lining and coating of the existing piping shall be repaired by the Contractor.
- D. At locations where existing piles are to be reused to replace the existing sewer or drain, the Contractor shall verify that the wood pile is not deteriorating. If wood piles scheduled for reuse are found to be in good condition, the piles shall be trimmed and capped with a concrete pile cap as indicated in the Contract Drawings. If wood piles scheduled to remain in place are found to be deteriorating, the Contractor shall notify the Engineer immediately.

3.10 DISPOSAL OF REMOVED/DEMOLISHED MATERIALS

- A. The Contractor shall prepare and transport all demolition debris, materials, refuse, and abandoned equipment to an approved disposal site as part of the work under this section. All costs associated with the proper performance of this work shall be included in the appropriate Bid Items and at no additional cost to the Owner.
- B. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Demolition material shall be reused as fill to the extent possible. Removal of demolition debris, not utilized as fill, shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities which shall not be closed or obstructed without permission from the Owner. Alternate routes shall be provided around closed or obstructed traffic ways.
- C. Burning: Do not burn demolished materials.
- D. Disposal: Transport demolished materials off Owner's property and legally dispose of them. See Sections 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL and 02080 – SOIL AND WASTE MANAGEMENT as they relate to the transportation and disposal of non-hazardous and hazardous solid waste.

3.11 REPAIR OF DAMAGE

- A. Any damage to existing facilities to remain, as caused by the Contractor's operations shall be repaired at no additional cost to the Owner. Damaged items shall be repaired or replaced with new materials as required to restore

damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract.

- B. Promptly repair damage to adjacent construction caused by selective demolition operations.
- C. Patching: Comply with Section 01045 - CUTTING AND PATCHING.
- D. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- E. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

3.12 MASONRY PLUGS AND BULKHEADS

- A. Shall be designed by a Massachusetts Registered Professional Civil or Structural Engineer and shall be installed by a qualified mason having experience in the construction of temporary and permanent masonry plugs and bulkheads of the same general nature of those Specified and proposed.

3.12 MODIFICATION OF EXISTING PILES

- A. The Contractor shall modify existing piles as indicated on the Contract Drawings and install new concrete pile caps as indicated in the Drawing Details.

PART 4 – COMPENSATION

Item 2051.1 - Disposal of Construction Debris as Solid Waste

METHOD OF MEASUREMENT:

Measurement for payment for Disposal of Construction Debris as Solid Waste shall be on the basis of Tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip. Solid Waste disposed of for which return manifests or certified weight slips have not been submitted will not be paid for.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Disposal of Construction Debris as Solid Waste shall be based on the per ton price bid for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Dispose of Construction Debris as Solid Waste. The work includes, but is not limited to; handle, load, transport, stockpile, weigh and dispose at an appropriately permitted facility; all cobbles, rail, timber, brick, cement concrete, metals, granite curb, edging, inlets and corners, plastic, or other construction debris; and all fees, permits, taxes, sampling, testing and analysis required by the facility.

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SPECIAL NOTES ON EXCLUSIONS:

The excavation and removal of the items listed above for disposal are not included herein but are included for payment elsewhere. This is a disposal item only. Soils are not included for payment herein but are included for payment in the appropriate soil disposal item. Soil weight excavated and disposed with Construction Debris due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Disposal of bituminous concrete is not paid for herein but is included for payment elsewhere. Bituminous Concrete weight excavated and disposed with Construction Debris due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Payment for the disposal of abandoned or relocated existing gas, telephone, electric, cable TV, telecommunications, fire alarm and traffic signal utilities shall NOT be paid herein or separately elsewhere and are considered “incidental” to the Contract, with costs to be carried in the Contractor’s base bid. Disposal of concrete and brick sidewalks, driveways, and handicap ramps removed and disposed of is not included herein but is carried under the unit price for the construction of the new sidewalks, driveways and handicap ramps.

Item 2051.2 - Disposal of Bituminous Concrete

METHOD OF MEASUREMENT:

Measurement for payment for Disposal of Bituminous Concrete shall be on the basis of Tons of bituminous concrete actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip. Bituminous Concrete disposed of for which return manifests or certified weight slips have not been submitted will not be paid for.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Disposal of Bituminous Concrete shall be based on the per ton price bid for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Dispose of Bituminous Concrete. The work includes, but is not limited to; handle, load, transport, stockpile, weigh and dispose at an appropriately permitted facility all bituminous concrete; and all fees, permits, taxes, sampling, testing and analysis required by the facility.

SPECIAL NOTES ON EXCLUSIONS:

The excavation and removal of bituminous concrete is not included herein. The excavation of bituminous concrete is considered incidental to the contract and is not included for separate payment unless otherwise specified. This is a disposal item only. Soils are not included for payment herein but are included for payment in the appropriate soil disposal item. Soil weight excavated and disposed with Bituminous Concrete Pavement due to poor segregation techniques shall be estimated by the Engineer and deducted from the total weight disposed. Disposal of construction debris as solid waste is not included for payment herein but is included for payment elsewhere.

Item 2051.3 - Demolition or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure

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METHOD OF MEASUREMENT:

Measurement for payment for Demolition or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure shall be on the basis of the number of individual lamp holes, manholes, catch basins or other structures demolished or removed complete as measured by the Engineer. Manholes, catch basins or other structures that are partially demolished or removed for the Contractor's convenience, or not fully removed or demolished where indicated in the Contract Documents, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Demolition and/or Removal of Lamp Hole, Manholes, Catch Basins or Other Structures shall be based on the number of individual lamp holes, manholes, catch basins or other structures demolished or removed complete for this item in the proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Demolition or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure. The work includes, but is not limited to: saw cutting existing bituminous and cement concrete; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; removal or demolition of the manhole, catch basin or other structure; masonry plugs in the disconnected pipe not specified for payment elsewhere; remove and stack or remove and dispose existing castings as required; salvage of materials specified; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; demolition and removal of pipes; abandonment of manholes, catch basins or other structures.

The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.4 – Abandon in Place Manhole, Catch Basin, or Other Structure

METHOD OF MEASUREMENT:

Measurement for payment for Abandon in Place Manhole, Catch Basin or Other Structure shall be on the basis of the number of individual manholes, catch basins or other structures abandoned in place as specified herein and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Abandon in Place of Manholes, Catch Basins or Other Structures shall be based on the per number of individual manholes, catch basins or other structures abandoned in place complete for this item in the proposal. Under the per each price for this item, the

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Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Abandon in Place a Manhole, Catch Basin or Other Structure. The work includes, but is not limited to; saw cutting existing bituminous or cement concrete; excavation; furnishing and placing backfill per one of the approved methods; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; remove and stack or remove and dispose existing castings as directed; cutting and demolition of the manhole, catch basin or other structure sections 2-ft below finished grade or to a greater extent to facilitate installation of adjacent work; masonry plugs in the disconnected pipe not specified for payment elsewhere; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner; drill 2-in holes in invert of structure and furnish, install control densityfill or compacted sand; and incidental work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; demolition and removal of pipes, lamp holes, manholes, catch basins or other structures.

The abandonment-in-place of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.5 - Abandon In Place Pipe – 15-Inch Through 48-Inch Diameter

METHOD OF MEASUREMENT:

Measurement for payment for Abandon in Place Pipe 15-inch Through 48-inch Diameter shall be based on the per linear feet of individual pipes, 15-inch through 48-inch diameter, abandoned in place as measured by the Engineer as measured from beginning of abandonment to end of abandonment.

BASIS OF PAYMENT / INCLUSIONS:

Payment Abandon in Place Pipe 15-inch Through 48-inch Diameter shall be based on the linear feet of abandoned main as indicated in the Contract Documents or as required by the Engineer. Under the per unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to abandon the existing sewers, drains, or water mains between the sizes of 15-inch and 48-inch diameter. The work includes, but is not limited to; saw cutting; excavation; furnish and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; furnish and installation of masonry plugs or caps; coordination with water department for abandonment of existing water main; construction dewatering; disconnecting existing pipe, services and other connections; identification and verification of all unknown active connections through surface inspection, CCTV inspection, dye testing, test pit, or other method approved by the Engineer for transfer to an active and functioning pipe; installation of control density fill; and incidental work not indicated for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; and demolition and removal of lamp holes, manholes, catch basins or other structures; removal, demolition, or abandonment of pipe less than 15-inches in diameter. Abandonment of pipe less than 15-inch diameter is incidental work.

The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.6 – Demolition or Removal of Pipe 15-inch Through 24-inch Diameter

METHOD OF MEASUREMENT:

Measurement for payment for Demolition or Removal of Pipe 15-Inch Through 24-Inch Diameter shall be based on per linear feet of individual pipes, 15-inch through 24-inch diameter, demolished or removed complete as measured by the Engineer as measured from inside wall of structure or beginning of demolition to inside wall of structure or end of demolition. Pipe demolished or removed for the Contractor's convenience, not indicated to be removed or demolished in the Contract, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Demolition or Removal of Pipe 15-Inch Through 24-Inch Diameter shall be based on the linear feet of existing pipe requiring removal as indicated in the Contract Documents or as required by the Engineer. Under the per unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Demolish or Remove Pipe 15-Inch Through 24-Inch Diameter. The work includes, but is not limited to; saw cutting; excavation; furnish and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; furnish and installation of masonry plugs or caps; construction dewatering; disconnecting existing pipe, services and other connections; identification and verification of all unknown active connections through surface inspection, CCTV inspection, dye testing, test pit, or other method approved by the Engineer for transfer to an active and functioning pipe; demolition and removal of the pipe; salvage of materials specified; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner; and incidental work not indicated for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; and demolition and removal of lamp holes, manholes, catch basins or other structures; removal, demolition, or removal of pipe less than 15-inches in diameter or greater than 24-inches in diameter.

The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.7 – Demolition or Removal of Pipe Greater Than 24-inch Diameter

METHOD OF MEASUREMENT:

Measurement for payment for Demolition or Removal of Pipe Greater Than 24-Inch Diameter shall be based on per linear feet of individual pipes, greater than 24-inch diameter, demolished or removed complete as measured by the Engineer as measured from inside wall of structure or beginning of demolition to inside wall of structure or end of demolition. Pipe demolished or removed for the Contractor’s convenience, not indicated to be removed or demolished in the Contract, will be at the Contractor’s expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Demolition or Removal of Pipe Greater Than 24-Inch Diameter shall be based on the linear feet of existing pipe requiring removal as indicated in the Contract Documents or as required by the Engineer. Under the per unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Demolish or Remove Pipe Greater Than 24-Inch Diameter. The work includes, but is not limited to; saw cutting; excavation; furnish and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; furnish and installation of masonry plugs or caps; construction dewatering; disconnecting existing pipe, services and other connections; identification and verification of all unknown active connections through surface inspection, CCTV inspection, dye testing, test pit, or other method approved by the Engineer for transfer to an active and functioning pipe; demolition and removal of the pipe; salvage of materials specified; stockpile of salvaged materials and delivery of materials identified as to be salvaged to a location designated by the Owner; and incidental work not indicated for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere; disposal of construction debris as solid waste; and demolition and removal of manholes, catch basins or other structures; removal, demolition, or removal of pipe less than 24-inches in diameter.

The demolition of existing, abandoned or relocated gas, electric, telephone, cable TV, fire alarm, traffic signal, or telecommunications structures and utilities are not included for payment herein or elsewhere but are considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.8 – Drain Vault No. 5 Structure Modifications

METHOD OF MEASUREMENT:

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Payment for Drain Vault No. 5 Structure Modifications shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for Drain Vault No. 5 Structure Modifications will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the Drain Vault No. 5 Structure Modifications as indicated on the Contract Drawings and Specifications, or as required by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: prepare and submit all work plans and submittals; selective demolition work as shown on the Contract Drawings; restoration of surface; and all incidental work not indicated for payment elsewhere, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS

The following item(s) are not included for payment under this item and are included for payment elsewhere: cleaning of Drain Vault No. 5; cleaning of Box Culvert; tree protection; removal of weir in Box Culvert upstream of Drain Vault No. 5; and disposal of construction debris.

Item 2051.9 – Hydroslide Removal

METHOD OF MEASUREMENT:

Measurement for payment for Hyrdoslide Removal shall be on the basis of the number of individual hydroslices removed as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Hydroslide Removal shall be based on the number of individual hydroslices removed complete for this item in the proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Hydroslide Removal. The work includes, but is not limited to: protection of existing pipe, structures and materials to remain; disassembly, and removal of hydroslice equipment; provide temporary protective storage as required by Engineer and Owner; provide transportation and delivery of hydroslice equipment to Owner; cut and grind remaining steel anchor bolts flush within structure; refinishing and grouting of newly exposed pipe and concrete surfaces; and all incidental work not indicated for payment elsewhere, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere: disposal of construction debris.

Item 2051.10 – Weir Removal

METHOD OF MEASUREMENT:

Measurement for payment for Weir Removal shall be on the basis of the number of individual weirs removed as measured by the Engineer. Weirs removed or modified for the

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Contractor's convenience, not indicated to be removed or modified, in the Contract, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Weir Removal shall be based on the number of individual weirs removed complete for this item in the proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Weir Removal. The work includes, but is not limited to: selective demolition of weir structures as shown on the Contract Drawings; protection of pipe invert and manhole invert; restoration of brick channel, pipe invert and manhole invert; refinishing and grouting of newly exposed pipe and concrete surfaces; and all incidental work, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for separate payment elsewhere: disposal of construction debris; weir removal internal to Drain Vault No. 5 Modifications; Concrete Fill Removal at 54"-dia RCP Drain.

Item 2051.11 – MWRA Wheeler Street Structure Modifications

METHOD OF MEASUREMENT:

Payment for MWRA Wheeler Street Structure Modifications shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for MWRA Wheeler Street Structure Modifications will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to for the MWRA Wheeler Street Structure Modifications as indicated on the Contract Drawings and Specifications, or as required by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: prepare and submit all work plans and submittals; cleaning and preparation of existing pipe and concrete surfaces; miscellaneous metal work including anchors and appurtenances; reinforced concrete bulkhead, concrete fill above 24"-dia sewer with reinforcement, and masonry channel as shown on the Contract Drawings; vent pipe; and all incidental work not indicated for payment elsewhere, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS

The following item(s) are not included for payment under this item and are included for payment elsewhere: CCTV inspection of 36" RCP CS Siphon; abandonment of 36" diameter RCP CS Siphon; bulkheads specified elsewhere; and disposal of construction debris.

Item 2051.12 – Bending Weir Structure Modifications

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Payment for Bending Weir Structure Modifications shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for Bending Weir Structure Modifications will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to for the Bending Weir Structure Modifications as indicated on the Contract Drawings and Specifications, or as required by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: prepare and submit all work plans and submittals; selective demolition as shown on the Contract Drawings; refinishing and grouting of newly exposed concrete surfaces; reinforced concrete weir wall; miscellaneous metal including dowels and appurtenances; restoration of surface; and all incidental work not indicated for payment elsewhere, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS

The following item(s) are not included for payment under this item and are included for payment elsewhere: cleaning of Box Culvert; disposal of construction debris.

Item 2051.13 – Masonry Plug or Bulkhead for Pipe Greater Than 30-inch Diameter

METHOD OF MEASUREMENT:

Measurement for payment for Masonry Plug or Bulkhead for Pipe Greater Than 30-inch Diameter shall be on the base of the number of Masonry Plugs or Bulkheads for Pipe Greater Than 30-Inch Diameter, installed complete as measured by the Engineer. Masonry Plugs or Bulkheads for Pipe installed for the Contractor’s convenience, not indicated in the Contract to be installed, will be at the Contractor’s expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Masonry Plug or Bulkhead for Pipe Greater Than 30-inch Diameter shall be based on the unit price bid for each in this Proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install Masonry Plug or Bulkhead for Pipe Greater Than 30-Inch Diameter. The work includes, but is not limited to; saw cutting; excavation; furnishing and placing backfill per one of the approved methods; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; disconnecting existing pipe, services and other connections; identification and verification of all unknown active connections through surface inspection, CCTV inspection, dye testing, test pit, or other method as necessary for transfer to an active and functioning pipe; the design and installation of masonry plugs or bulkheads in the disconnected pipe including but not limited to brick, concrete masonry units, other masonry, cement, mortar, grout, concrete, miscellaneous metals, and fasteners; and all incidental work not indicated elsewhere.

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The following item(s) are not included for payment under this item and are included for payment elsewhere: bulkhead for the MWRA Wheeler St Structure Modifications; plugs or bulkheads for abandonment of pipe 15-inch through 36-inch diameter.

Item 2051.14 – Modification to Existing Piles

METHOD OF MEASUREMENT:

Measurement for payment for Modification to Existing Piles shall be on the base of the linear feet of new pipe installed over the modified piles, installed complete as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Modification to Existing Piles shall be based on the unit price bid for each in this Proposal. Under the per each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install Modification to Existing Piles. The work includes, but is not limited to; saw cutting; excavation; furnishing and placing backfill per one of the approved methods; furnish and install crushed stone or dense graded crushed stone as indicated; compaction and compaction testing; temporary excavation support furnished and installed complete; construction dewatering; installation of new concrete pile caps; and all incidental work not indicated elsewhere.

SPECIAL NOTES ON EXCLUSIONS

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of construction debris; over-excavation of geotechnically unsuitable soils where existing piles are found to be deteriorated.

Item 2051.15 – Concrete Fill Removal at 54”-dia RCP Drain

METHOD OF MEASUREMENT:

Payment for Concrete Fill Removal at 54”-dia RCP Drain shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for Concrete Fill Removal at 54”-dia RCP Drain will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the Concrete Fill Removal at 54”-dia RCP Drain as indicated on the Contract Drawings and Specifications, or as required by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: prepare and submit all work plans and submittals; selective demolition work as shown on the Contract Drawings at the 54”-dia RCP drain and existing DMH D38DMH4110; protection of existing pipe and manhole; restoration of pipe invert and rebuilding of manhole channel; and all incidental work not indicated for payment elsewhere, in accordance with the sequence of construction.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item but are included for

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separate payment elsewhere: disposal of construction debris; weir removal specified elsewhere.

END OF SECTION 02051

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SECTION 02076

ASBESTOS-CEMENT (TRANSITE) PIPE REMOVAL

**2076.1 EXCAVATION, REMOVAL, AND DISPOSAL OF LINEAR FOOT
ASBESTOS CEMENT PIPE (UP TO 16" DIA)**

PART 1 - GENERAL

1.01 CONTRACT REFERENCES

- A. Drawings and General Provisions of Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.
- B. Examine all other sections of the specifications for requirements therein affecting the work of this Section.

1.02 DESCRIPTION OF WORK

- A. This section covers the furnishing of all labor, materials, facilities, equipment, services, employee training and testing, permits and agreements necessary to perform the work required for the removal, transportation and disposal of asbestos-cement piping and of underlying soil as required by regulation and guidance. The Contractor shall perform all work in accordance with these specifications, U. S. Environmental Protection Agency (U. S. EPA) and OSHA regulations, NIOSH recommendations, Massachusetts Department of Environmental Protection (MassDEP) and Department of Labor and Workforce Development (DLWD), Division of Occupational Safety (DOS) regulations, local statutes, local ordinances, local codes and any other applicable federal, state and local government regulations and guidelines. Whenever there is a conflict or overlap of the above referenced requirements, the strongest provisions are applicable as determined by the Owner. Deviations from this specification must be approved in writing by the Owner prior to the Contractor continuing work.
- B. The Contractor shall furnish all labor, material, supervision, construction tools, staging, rigging and other equipment necessary to perform the work described below.
- C. Provide appropriate worker training, personal protective equipment (PPE), respiratory protection and medical examination and monitoring.
- D. Provide access, support and protection to all authorized visitors and inspectors.
- E. Filing of all required notifications and permits and payment of all required associated costs and fees.

- F. Abatement activities including removal and disposal of Asbestos Containing Material (ACM), recordkeeping, security, etc.
- G. The Contractor shall be responsible for the complete removal and disposal of all identified asbestos-containing/contaminated materials located at the site as specified herein. This shall include, but shall not be limited to the following:
 - 1. Remove and properly dispose of asbestos-cement (AC) pipe as required to complete the Work as shown on the drawings.

1.03 SCHEDULING

- A. The Contractor shall prepare an abatement schedule for submittal to the Owner at the Pre-Construction Conference.
- B. The Contractor shall update the abatement schedule on a weekly basis.
- C. The Contractor shall submit all required MassDEP notification forms in a timely manner so as not to cause a delay in implementing the Work as indicated in the Project Drawings.

1.04 PERIOD OF PERFORMANCE

- A. The Contractor shall complete all work of this Section including completion of all punch list items within the period indicated in the Bid Form and contract documents.

1.05 AUTHORITY TO STOP WORK

- A. If the Owner or the Owner's Representative presents a written stop asbestos removal order, or initially verbally directs the Contractor to halt work based on the Owner or Owner's Representative's observations of Contractor practices, the Contractor shall immediately stop all asbestos removal and adequately wet and cover with polyethylene sheeting any exposed ACM. The Contractor shall not resume any asbestos removal activity until authorized to do so by the Owner or the Owner's Representative. A stop asbestos removal order may be issued at any time the Owner or the Owner's Representative determines abatement conditions/activities are not within specification requirements or are not in compliance with applicable regulations. Work stoppage shall continue until conditions have been corrected to the satisfaction of the Owner or the Owner's Representative. Cost of standby time and costs for corrective actions shall be paid by the Contractor.
- B. Stop asbestos removal orders may be issued for, but may not be limited to the following:
 - 1. If the Contractor disregards the authority of the Owner's Project Monitor;

2. If the Contractor disregards laws or regulations of any public body having jurisdiction; or
 3. If the Contractor's work presents a risk to a building, building occupants, the general public, other contractors, owner representatives or the environment.
- C. The absence of a stop work order by the Owner or the Owner's Representative shall not in any way be construed as an approval or acceptance of the Contractor's work.
- D. A stop work order may also be issued by the Owner or Owner's Representative in the event that previously unknown asbestos cement pipe or other asbestos materials are exposed and a blanket notification has not been submitted by the Contractor to MassDEP to allow work to continue. Cost of standby time and costs for corrective actions required for previously unknown asbestos containing materials shall be paid per these Specifications.

1.06 RELATED SECTIONS

- A. Carefully examine the Contract Documents for requirements that affect the work of this section.

1.07 DEFINITIONS

All terms not defined herein shall have the meaning given in the applicable publications and regulations.

- A. Abatement: Procedures to control the release of asbestos fibers from ACM; includes removal, encapsulation, and enclosure of ACM.
- B. ACM: Asbestos-containing and/or asbestos-contaminated materials.
- C. Adequately Wet: Sufficiently mixed or penetrated with liquid to prevent the release of particulate. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.
- D. Amended Water: Water containing a wetting agent or surfactant that has been added to increase the ability of the water to penetrate ACM.
- E. Asbestos: Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered.
- F. Asbestos-Cement (AC) Piping: AC pipe has been widely used for water and sewer mains and occasionally used as electrical conduits, drainage pipe, and vent pipes.

- G. Asbestos-Containing Building Material (ACBM): Any building material containing more than one percent by weight of any asbestos of any type or mixture.
- H. Asbestos Containing Material (ACM): Any material containing equal to or greater than 1% asbestos based on analysis via polarized light microscopy (PLM) is considered ACM.
- I. Asbestos Contaminated Material: any material which has become contaminated (surficially or in the materials matrix or composition) with one or more asbestos fibers.
- J. Asbestos Notification Form (ANF-001): MassDEP form required prior to implementation of asbestos abatement [see 310 CMR 7.15(1)(b)].
- K. Authorized Visitors: Any visitor authorized by the Owner or any representative of a regulatory agency or other agency having jurisdiction over the project.
- L. Clean: Visually free of dust, dirt, debris and any foreign material.
- M. Clean Room: An uncontaminated room that is a part of the worker decontamination unit and in which worker's street clothes and uncontaminated protective equipment can be stored.
- N. Competent Person: In addition to the definition in 29 CFR 1926. 32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy to minimize asbestos exposure, who has the authority to take prompt corrective measures, as specified in 29 CFR 1926. 32(f); in addition, for Class I and II work, who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for Asbestos Supervisor.
- O. Critical Barrier: One or more layers of plastic sealed over all openings into a work area or other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.
- P. Decontamination Area/Unit: An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.
- Q. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component.

- R. Employee Exposure: The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.
- S. Friable Asbestos Material: Material that contains more than one percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.
- T. Glovebag: Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
- U. HEPA Filter: High-Efficiency Particulate Air (HEPA) An air filter capable of trapping and retaining at least 99.97 percent of all monodispersed particles sized 0.3 micron in diameter or larger.
- V. HEPA Vacuum: Vacuum equipment with HEPA filter system for filtering the exhaust air from the unit.
- W. Intact: The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.
- X. Negative Initial Exposure Assessment: A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL's.
- Y. NESHAP: National Emission Standards for Hazardous Air Pollutants (Title 40, Part 61).
- Z. Project Designer: A person who has successfully completed the training requirements for an abatement project designer established by 40 U. S. C Sec. 763.90(g) and is certified in accordance with 453 CMR 6.00.
- AA. Project Monitor: An individual who is certified by applicable state agencies to observe abatement activities performed by contractors, to represent the Owner to ensure work is completed according to specifications and in compliance with statutes and regulations, and to perform air monitoring to determine final clearance.
- BB. Regulated Area: An established area within which airborne concentration of asbestos fibers exceeds or can reasonably be expected to exceed the permissible exposure limit.
- CC. Removal: All procedures necessary to remove and dispose of ACM from the designated areas in accordance with the contract documents and all applicable regulatory requirements.

- DD. Waste Generator: Any owner or operator whose act or process produces asbestos-containing waste material.
- EE. Waste Shipment Record: The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

1.08 CODES, REGULATIONS, AND STANDARDS

A. General Applicability

1. All work under this contract shall be performed in strict accordance with all applicable Federal, State, and Local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
2. The most recent edition of any relevant regulation, standard, document, code or policy statement shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
3. Copies of all standards, regulations, codes and other applicable documents, including this specification shall be available at the work site.

B. Contractor Responsibility

1. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to all aspects of the abatement project. The Contractor is responsible for providing and maintaining training, accreditation, medical exams, medical records, and personal protective equipment as required by applicable Federal, State and Local regulations. The Contractor shall hold the Owner and Owner's Representative harmless for any failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of the Contractor, Contractor's employees, or subcontractors of the Contractor.

C. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. The publications listed below are not intended to be a comprehensive list of all regulations, applicable to this work.

1. Environmental Protection Agency (EPA):

National Emission Standards for Hazardous Air Pollutants (NESHAP) Title 40, Part 61).

A Guide to Respiratory Protection for the Asbestos Abatement Industry.

2. Occupational Safety and Health Administration (OSHA):

Asbestos Construction Standard 29 CFR Part 1926.1101

Asbestos General Industry Standard 29 CFR 1910.1001

Respiratory Protection, 29 CFR 1910.134

3. U. S. Department of Transportation

49 CFR 100 - 185, Transportation

4. National Institute for Occupational Safety and Health (NIOSH):

"Respiratory Protection A Guide for the Employee. "

5. American National Standards Institute (ANSI):

Z86.1-1973 - Commodity Specification for Air

Z9. 2 - HEPA Filter Specifications

Z88. 2-1980-Respiratory Protective Equipment

6. Massachusetts Division of Occupational Safety:

The Removal, Containment or Encapsulation of Asbestos (453 CMR 6),
including all clarifications, policy statements, etc.

7. Massachusetts Department of Environmental Protection:

310 CMR 7.00, 7.09, 7.15 and all related amendments and policy
statements.

Asbestos Cement Guidance Document, June 2011

1.09 PERSONNEL QUALIFICATIONS

A. All personnel of the Contractor or any approved subcontractors involved with
asbestos abatement work shall meet the following minimum qualifications:

1. Medical examination within the past year in accordance with OSHA
1926.1101 with a physician's written opinion that the worker has no
condition that would preclude him/her from working with asbestos or
wearing a respirator.

- B. The Contractor shall employ a Competent Person to oversee all aspects of ACM removal. The Competent Person shall be present during, and oversee all, aspects of ACM removal and management.
- C. There shall be a sufficient number of trained and qualified workers, foremen and superintendents to accomplish the work within the required schedule. No untrained nor fully qualified and pre-approved person shall be employed to speed up completion of the abatement work.
- D. Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101(k)(9) and 453 CMR 6.10 Training must include, at a minimum, the elements listed at 29 CFR 1926.1101(k)(9)(viii). Training shall have been conducted by an EPA approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.
- E. Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. The physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the opinion that the person has been evaluated for working in a heat stress environment while wearing personal protective equipment and is able to perform the work.

1.10 SITE SECURITY

- A. Regulated area access is to be restricted to authorized trained/accredited and protected personnel. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel.
- B. Asbestos storage shall be within a secure property contained with a lockable chain link fence. Roll-offs or other containers used for temporary storage shall be locked at the conclusion of each work day on which asbestos abatement activities are undertaken and at all times on days in which abatement is not undertaken.

1.11 EMERGENCY PRECAUTIONS

- A. A site specific Emergency Action Plan shall be submitted by the Contractor prior to the pre-construction meeting and shall be reviewed by the Owner. The Plan shall meet the requirements of 29 CFR 1926. 35.

1.12 RESPIRATORY PROTECTION PROGRAM

- A. The Contractor shall develop and implement a Respiratory Protection Program (RPP) which complies with the January 8, 1998 OSHA requirements, 29 CFR 1926.1101 and 29 CFR 1910.132 and 134. All respirators used must be approved for asbestos abatement activities by the proper regulatory authority.
- B. Minimum respiratory protection required shall conform to current OSHA and Massachusetts DOS regulations including 29 CFR 1926.1101 and 453 CMR 6.00.

1.13 PROTECTIVE CLOTHING

- A. Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101.
- B. Provide boots, booties, hard hats, goggles, gloves, protective clothing, respirators and any other appropriate personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project.
- C. Provide Fall Protection Training and OSHA approved fall protection for all work performed at a height of 6-feet or more above floor/ground level.
- D. The Competent Person shall ensure that each time workers enter the regulated area, they observe and follow all required procedures and wear appropriate personal protective equipment.
- E. The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for regulated areas at 29 CFR 1926.1101 (e) are met. No person within a regulated area shall be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator (if applicable).

1.14 PERSONNEL PROTECTION AND DECONTAMINATION

- A. Provide all personnel throughout the abatement process with the specified protective clothing and gear. Ensure that all personnel entering and leaving the workspace follow procedures described below:
 - 1. Entering from the outside: Don two protective suits over street clothes and clean protective equipment.
 - 2. Exiting from the work area: Dispose of all protective clothing into labeled plastic bags for disposal as asbestos waste. Remove respirator and wash and wipe thoroughly to decontaminate the respirator.

3. A three-chamber decontamination unit shall be constructed adjacent to the work area if the AC pipe is broken or cut within a negative pressure work area. Otherwise, the workers shall be provided and use a hand and face washing decontamination area prior to exiting the demarcated area.
4. Post written procedures in the workplace and train all personnel on the procedures for the evacuation of the injured and the handling of potential fires. Provide aid to a seriously injured worker without delay for decontamination. Make provisions to minimize exposure of rescue workers and to minimize spreading of contamination during evacuations and fire procedures. Exceptions to normal, routine exiting procedures shall be made for emergencies such as, but not limited to, serious personal injury and fires.
5. The Contractor shall instruct all employees and workers in the proper care of their personally issued respiratory protection equipment (if applicable), including daily maintenance, sanitizing procedures, etc.
6. All respiratory protection (if applicable) equipment shall be inspected by Contractor's personnel at the beginning of each work period, including breaks and lunch periods.

1.15 CONTAINMENT BARRIERS AND NEGATIVE PRESSURE AIR FILTRATION SYSTEMS

- A. The Contractor shall construct a regulated negative pressure work area containing the AC pipe if it cannot be removed intact **or unless approval is obtained from MassDEP in the form of an approved Asbestos Work Plan to remove the AC pipe and underlying soil, as applicable, without containment.**
- B. The work area enclosure shall consist of 2 layers of 6 mil polyethylene sheeting with an attached 3-chambered decontamination chamber unless a waiver from DOS is obtained. Polyethylene sheeting shall then be placed beneath the AC pipe.
- C. Prior to starting work, the Contractor shall install air-tight coverings on all potential openings encountered during the work between the work area and adjacent areas with polyethylene sheeting.
- D. Asbestos warning tape shall be used to restrict access to the regulated work area.
- E. ..
- F. Within the work area, there shall be a minimum of 4 air changes per hour and a minimum pressure differential of -0.02-inches water column within the work area(s) relative to the adjacent areas (outdoors). All materials removed

shall be wet with amended water prior to removal and maintained wet until properly containerized.

1.16 DISPOSAL ACTIVITIES

- A. It is the responsibility of the Contractor to determine current waste handling, transportation, and disposal regulations and or requirements for each waste stream generated at this site by this work and for each waste disposal facility. The landfill destination must be approved by the Owner. The Contractor must comply fully with these specifications and all U.S. Department of Transportation and EPA requirements as well as the requirements of all states through which the waste is transported and all requirements of the state where disposal occurs.
- B. The Contractor will document actual disposal of the waste at the designated landfill by completing a WASTE SHIPMENT RECORD and forwarding the original along with the Bill of Lading to the Owner within the time limits specified by EPA NESHAP regulations.
- C. Contractor shall insure that transport vehicles do not leak water or other material while being loaded, being transported or while on site partially loaded. If water is observed leaking from any transport or storage container, contractor shall immediately stop work, unload the container (including dumpsters and semi-trailers) find and correct the source of the leak, and place waste material back into the container. This process will be repeated each time any water is observed leaking from a storage or transport vehicle that contains asbestos waste. Contractor shall also take all steps necessary, as determined by the Owner's Industrial Hygiene Consultant, to decontaminate the ground or other surfaces that became wet due to water leaking from a container that holds asbestos waste.
- D. Since individual disposal facilities have different permit conditions and specific characterization data requirements, the Contractor is responsible for final characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final waste characterization is the responsibility of the Contractor, and costs for characterization shall be incorporated into the Contractor's bid price for construction.

1.17 SUBMITTALS

- A. Submittals shall be in accordance with Specification Section 01300 - Submittals.
- B. The following submittals shall be submitted to the Owner's Representative at the Pre-construction meeting. Submittals shall be submitted to and accepted in writing by the Owner's Representative prior to the Contractor receiving approval to begin work.

1. Certificates of training and documentation of medical examination including a physician's determination that the employee is able to wear a respirator and documentation of current successful respirator fit test (29 CFR 1926.1101 Appendix C) of all personnel assigned to the project, including Competent Person.
2. Certification of compliance with OSHA requirements including but not limited to medical surveillance, record keeping and personnel exposure monitoring.
3. Respiratory Protection Program. Include site specific exposure assessment for respirator selection.
4. A written project schedule. The schedule shall be date specific and include all phases of the project.
5. Emergency Action Plan.
6. Proposed waste disposal site and waste transporter. Include name, address, telephone number and operating permits, etc.
7. Material safety data sheets (MSDS) for all materials and products to be used by the Contractor on this project.
8. Prior to the start of work, the Contractor shall submit to Owner's Design Team for review, a Work Plan outlining the methods to be used during the removal of Asbestos-Cement Piping.

The work plan shall include the use of the Best Management Practices pertaining to the qualifications of field personnel and methods for dust control, packaging, transportation, and decontamination of equipment.

9. A copy of all Asbestos Notification Form (ANF-001) submitted prior to the start of Work. The ANF shall include a copy of the accepted Work Plan.

C. During Abatement

1. Results of personnel exposure monitoring.
2. Project schedule.
3. A daily summary of all asbestos removal activities shall be provided by the Contractor to the Owner's Representative at the close of each day on which asbestos removal, handling or transportation has been conducted. The summary shall include the length of all pipe removed; amount of soil bagged; number of pipes placed in temporary storage; the total number of

pipes in temporary storage; and, the total days the storage container has been utilized. If materials have been shipped, the daily summary shall include documentation of all transportation, including copies of shipping manifests.

D. Post Abatement Submittals

1. Disposal receipts (within timeframes regulated by EPA) signed by the landfill operator demonstrating that the ACM removed from the project has been packaged, transported and disposed of properly.
2. Provide the owner with copies of on-site job logs, notifications, permits, accident reports, personnel exposure air monitoring results, waivers of lien.
3. Copies of any notices of non-compliance issued by governmental authorities.

PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS

- A. Deliver all materials in original packages, containers or bundles bearing the name of the manufacturer.
- B. Damaged, deteriorating or contaminated products or equipment shall not be used on this project, and shall be removed from the work site.
- C. Polyethylene sheeting shall be at least 6-mil thickness, shall be fire retardant and shall meet all applicable Standards for temporary construction barriers.
- D. All lumber shall be fire rated.
- E. Duct tape or other waterproof tape, furring strips, staples, nails, screws, or other materials shall be available to secure polyethylene sheeting
- F. Disposable bags and/or drums shall be of 6-mil polyethylene, on which labels are directly printed, as required by EPA, OSHA and DOT regulations.
- G. Truck and roll-off container liners shall be a minimum of 10-mil thickness and shall be fitted for the truck or container.
- H. Asbestos warning signs that are posted at all approaches and/or entrances to work areas shall conform to OSHA 29 CFR 1926.1101. Warning signs shall be posted in English as well as all other applicable languages if persons who cannot read English are present.

- I. All fire extinguishers required for the project shall be ABC class type, properly pressurized and in good working condition.
- J. Adequately stocked first aid kits shall be on-site.
- K. Surfactant (wetting agent) shall be a 50/50 mixture of polyoxyethylene ether and polyoxyethylene ester, or equivalent, mixed in a proportion of 1 fluid ounce to 5 gallons of water or as specified by manufacturer. An “equivalent surfactant” shall be understood to mean a material with a surface tension of 29 dynes/cm as tested in its properly mixed concentration, using ASTM method D1331-56- (“Surface and Interfacial Tension of Solutions of Surface Active Agents”).
- L. Truck and roll-off container liners shall be purpose built for the size of the container. Two 10-mil polyethylene liners shall be provided for each container.

2.02 TOOLS AND EQUIPMENT

- A. **Transportation Equipment:** Transportation equipment, as required, shall be suitable for loading, temporary storage, transport, and unloading of contaminated waste without exposure to persons or property. The equipment shall be secured at all times and access limited to authorized personnel only.
- B. **Vacuum Equipment:** All vacuum equipment utilized in the work area shall be equipped with HEPA filtration systems, 99.97% efficient to 0.3 microns particulate size. Deliver all vacuums to the site with clean waste containers and new HEPA filters installed. Vacuum wands, brushes, hoses, and other accessories shall be delivered to the site new or, if previously used, shall be delivered to the site in airtight disposal bags.
- C. The Contractor shall provide approved respirators and protective clothing to all Contractor personnel. The Contractor shall also provide approved protective clothing to representatives of the Owner, and to representatives of the State or other governmental entity who may inspect the job site.
- D. Protective clothing requirements must include, but may not be limited to:
 - 1. One-time use, disposable, full-body coveralls made of Tyvek® fabric or approved equal.
 - 2. Hard Hats
 - 3. Eye protection
 - 4. Gloves
 - 5. Respiratory protective equipment in accordance with OSHA 29 CFR 1926.1101 and 29 CFR 1910.134. Respirators shall be NIOSH/MSHA approved for protection against asbestos exposure.

- 6. Other as appropriate for site conditions
- E. The Contractor shall have sufficient equipment to mix and spray wetting agents.
- F. The Contractor shall have a sufficient quantity of, ladders, platforms, hand tools, and materials to conduct the abatement project in an efficient and workmanlike manner. All equipment shall be used according to OSHA Safety and Health Standards for the Construction Industry (29 CFR Part 1926).
- G. All electrical cord and connections within all work areas shall be protected with ground-fault circuit interrupters (GFCI).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Examine the areas and conditions under which asbestos will be abated and notify the Owner's Design Team and Industrial Hygiene Consultant in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Examine the asbestos-cement piping to determine the condition of the piping. If the pipe is damaged or friable, notify the Design Team and the Owner's Industrial Hygienist in writing or of other conditions requiring work plan modification are encountered.
- C. Before any work commences, post danger signs in and around the Work Area to comply with 29 CFR 1926.1101 as required by federal and state regulations, and as specified herein.
- D. Before any work commences, submit ANF-001 and Asbestos Work Plan in accordance with regulations.

3.02 GENERAL PROCEDURES

- A. Install polyethylene sheeting beneath the AC pipe to minimize contamination of adjacent soil.
- B. All surfaces shall be wetted during removal activities.
- C. If AC pipe is found to be friable, or will be rendered friable if disturbed, abatement shall be conducted in containment.
- D. AC pipe shall be removed from the trench in an "intact" condition in sizes such that the piping may be handled without breakage.

- E. If AC pipe sections can be separated without cutting, the removal may be conducted without containment in accordance with MassDEP 2011 Guidance.
- F. Separated non-friable AC pipe sections may be removed without containment. in accordance with MassDEP 2011 Guidance.
- G. If AC pipe sections require breaking/cutting to separate, all breaking/cutting activities shall be conducted within a glove bag or negative pressure regulated work area (containment).
- H. In the event of breakage of AC pipe during removal which results in pieces contacting soil, then the Contractor shall remove all debris and soil located adjacent to and beneath the debris as well as six inches of soil from beneath and surrounding the debris. All resultant debris and soils shall be properly handled, packaged and disposed of as friable, regulated asbestos waste.
- I. The Engineer and the Owner shall be notified immediately in the event of breakage.
- J. All AC pipe shall be double wrapped in 6-mil polyethylene sheeting and labeled as ACM prior to transport.
- K. All soil removed as part of asbestos abatement shall be double bagged in 6-mil polyethylene sheeting and labeled as ACM prior to transport.
- L. All roll-off containers and trucks used to transport AC piping and associated soil and PPE shall be lined with 2 layers of form fitting 10- mil polyethylene liners and sealed prior to exiting the site.

3.03 WORK AREA PREPARATION:

- A. Prior to any asbestos related work in an area, use warning tape to demarcate the asbestos abatement work areas, in a manner that will prevent access by untrained personnel and unauthorized visitors. The Contractor shall erect signs around the perimeter in accordance with EPA, OSHA and this specification and provide 24-hour security against unauthorized entry during the abatement process. Maintain a log of all people entering and exiting the workplace.
- B. The Contractor shall be responsible for taking whatever steps are necessary to prevent a release to the environment and additional contamination of the areas beneath the AC pipe.
- C. Construct negative pressure enclosures and install air filtration units, as applicable.

- D. Dust and airborne fiber release shall be minimized by the use of amended water. The Contractor shall prevent visible dust emissions during, abatement, cleaning and all other activities.

3.02 UTILITIES

- A. All temporary electrical power shall be in accordance with OSHA Electrical Code for Wet Environment.

3.03 MONITORING, TESTING AND INSPECTION

- A. The Contractor is responsible for personnel (employee) exposure monitoring for airborne asbestos fibers and other contaminants in compliance with OSHA regulations. The Owner's Industrial Hygienist may, at his or her discretion, also conduct exposure monitoring on Contractor personnel and area air monitoring at locations inside and outside of the work area.
- B. Provide cooperation and support to the Owner's Industrial Hygienist throughout the abatement process.
- C. The Contractor is responsible for meeting OSHA requirements for his personnel, including but not limited to, monitoring requirements, safety compliance training and record keeping. Employee exposure monitoring results from the previous day shall be posted each day, and copies of the results forwarded to the Owner's Design Team.

3.04 CLEANING AND FINAL DECONTAMINATION

- A. After the removal of the AC pipe has been completed and before removal of barriers (as applicable), the entire area shall be thoroughly wet cleaned and/or vacuumed with HEPA filtered vacuum. All plastic barriers, tapes and disposable contaminated equipment shall also be disposed of as asbestos waste. All reusable contaminated equipment such as masks, hard hats, etc. , shall be thoroughly decontaminated through wet cleaning or sealed within 6-mil polyethylene bags before removal from the work area.

3.05 FINAL INSPECTION AND TESTING

- A. After a thorough cleaning of the negative pressure regulated work area (as applicable), the Owner's Project Monitor shall determine the workspace is ready for inspection and final testing. The Project Monitor will visually inspect the workspace for the detection of any visible dust or debris. The cleaning procedures shall be repeated until a level of no visible debris is achieved.
- B. Following successful visual inspection of the work area and after a sufficient period of time has elapsed to allow complete drying of the work area, the

final clearance air sampling will be performed by the Owner's Project Monitor.

- C. The final testing within negative pressure regulated work areas (as applicable) shall take place under active agitation of the air in the work space with fans running, leaf blowers operating and any other means found suitable by the Owner's Industrial Hygienist during the final testing. The number of air samples collected within the work area shall be in accordance with the Massachusetts Department of Labor and Work Force Development regulation 453 CMR 6.00. If analysis of clearance air samples show fiber levels in excess of 0.010 f/cc using phase contrast microscopy (PCM), then repeat cleaning and re-sampling will be required until regulated clearance criteria are met.

3.06 GENERAL APPLICABILITY OF CODES, REGULATIONS, LAWS AND STANDARDS:

- A. Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, laws and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

3.07 CONTRACTOR RESPONSIBILITY:

- A. The Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling and disposal of asbestos contaminated materials, and protection of workers and visitors to the site, and persons occupying areas adjacent to the site. The Contractor shall hold the Owner's consultants harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulation on the part of himself, his employees or his subcontractors.

PART 4 – COMPENSATION

2076.1 - Excavation, Removal, and Disposal of Asbestos Cement Pipe (up to 16" Dia):

METHOD OF MEASUREMENT:

Measurement for Payment for Excavation, Removal, and Disposal of Asbestos Cement Pipe (up to 16" Diameter) shall be on the basis of linear feet of asbestos cement pipe removed and disposed of as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Excavation, Removal, and Disposal of Asbestos Cement Pipe (up to 16" Diameter) shall be based on the per linear foot price complete for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for handling, excavating, managing, transporting and disposing of asbestos cement pipe indicated on the Contract Documents, in accordance with local, state and federal requirements. The work includes, but is not limited to: remove, handle, transport and dispose of asbestos cement pipe, segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; all controls necessary to maintain compliance with regulatory requirements relative to asbestos in soils; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; all fees, permits, and taxes; and construct, maintain, and remove a secure asbestos contaminated staging area for stockpiling pending analytical testing, reuse, or disposal.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of asbestos cement pipe which is not handled as specified herein; excavation, and removal of asbestos cement pipe crushed in the trench.

END OF SECTION 02076

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SECTION 02080

SOIL AND WASTE MANAGEMENT

2080.1	OHM - SOIL AND WASTE MANAGEMENT	LUMP SUM
2080.2	OHM - HANDLING ASBESTOS CONTAMINATED SOIL/FILL	CUBIC YARD
2080.3	OHM - HANDLE AND CHARACTERIZE UNKNOWN MATERIAL	CUBIC YARD

PART 1 – GENERAL

1.1 QUALIFICATIONS

- A. The Contractor shall be experienced and knowledgeable and have the trained and qualified personnel needed to conduct the work as specified herein

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. The following documents are available for review at the office of the Owner, 147 Hampshire St, Cambridge, MA 02139 and appended to the technical specifications in Appendices or the Attachment to the Special Conditions in Division 0.
 - 1. Memorandum – Oil and Hazardous Materials Findings and Soil Management Recommendations – CAM004 Concord Ave (Contract 9) Sewer Separation and Surface Improvements Project, Cambridge, Massachusetts, dated March 25,2013.
 - 2. Summary of Analytical data and boring logs, completed December 2012 and January 2013.
 - 3. Memorandum Addendum– Oil and Hazardous Materials Findings and Soil Management Recommendations – CAM004 Concord Ave (Contract 9) Sewer Separation and Surface Improvements Project, Cambridge, Massachusetts, dated July 22, 2013.
 - 4. City of Cambridge Asbestos Ordinance.

1.3 OBJECTIVE and OVERVIEW

- A. This Section includes furnishing all plant, labor, equipment, appliances, and materials, and performing all operations in connection with the handling, treating, stockpiling, transporting, and disposal and/or reuse of soil and associated fill and waste material resulting from the construction operations as specified.
- B. This Section also includes requirements for handling spills of contaminated and/or hazardous materials.
- C. The objective of soil management practices is to handle all soil and fill excavated during this contract in accordance with applicable state, federal and local regulations and bylaws and to implement off-site soil management in a cost-effective manner. The Contractor shall reuse excavated soils on-site to the maximum extent possible and minimize the volume of material to be disposed off-site.
- D. This Section includes protocol for handling and management of waste materials, including, but not limited to, construction debris, municipal waste, boulders, soil, fill, ash, rubble, and empty or crushed drums and/or drum parts. The Contractor shall provide the services of an Environmental Professional qualified to coordinate all soil/fill-handling activities with the Owner or Engineer and/or their representative.
- E. In the course of the work, it may be necessary to excavate and handle potentially contaminated soil/fill. The soil/fill management practices specified herein apply to all soil/fill excavated during the course of this contract. To the extent possible, the Contractor shall reuse geotechnically suitable excavated material prior to using imported backfill to reduce the volume of material to be disposed off-site. Imported backfill shall be used only as accepted by the Engineer.
- F. Excavation and management of project soils and groundwater shall be conducted in accordance with:
 - 1. A project-wide Utility-related Abatement Measure (URAM) Plan to be prepared by the Owner's Licensed Site Professional (LSP) and submitted to MassDEP by the City of Cambridge DPW prior to the start of work;
 - 2. A release-specific URAM Plan to be prepared by the Owner's Licensed Site Professional (LSP) and submitted to MassDEP by the City of Cambridge DPW in the event that an unanticipated release is encountered; or,
 - 3. A Release Abatement Measure (RAM) Plan to be prepared by the Owner's Licensed Site Professional (LSP) and submitted to MassDEP by the City of Cambridge DPW for work on private properties with existing Activity and Use Limitations;

- G. All work shall be conducted in compliance with the following Contractor-prepared plans:
1. Site-Specific Health and Safety Plan;
 2. Soil Management Plan;
 3. Equipment and Personnel Decontamination Plan;
 4. Dust, Vapor and Odor Control Plan;
 5. Air Monitoring and Quality Control Plan; and
 6. Spill and Discharge Control Plan.
- H. For private inflow removal work conducted on properties outside of the Right of Way, additional requirements for soil testing, reuse, storage, and backfill apply, as described in this section. Excavated soil shall not be removed from the property until all excavation and backfill has been completed on the property. Soil shall be stored, if necessary, on the property from which it came until backfill is completed on that property. The Contractor shall reuse excavated soils as backfill within the same property from which it originated. If surplus soil cannot be used on the same property, it shall be used as backfill in the Right of Way within the project limits. If surplus soil cannot be used as backfill in the Right of Way, it shall, with the Engineer's approval, be combined with other surplus soils and reused or disposed of in accordance with the requirements of this section. Under no circumstances shall surplus project soil be used as backfill on a property outside of the Right of Way unless the soil originated on that property.
- I. For private inflow removal work conducted on properties outside of the Right of Way, the Contractor shall notify the Engineer if visual or olfactory evidence of contamination is observed in the soil on any property. The Contractor shall not collect samples for chemical testing from individual properties outside of the Right of Way except as allowed by the Engineer.

1.4 DEFINITIONS

- A. Area of Contamination: For the purpose of managing soil which is RCRA hazardous waste, the area of contamination is the contiguous area within which the waste has been identified.
- B. Area of Excavation: For the purposes of reusing soil/fill on-site, the *area of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristics as accepted by the Engineer. Soil/fill returned to the *area of excavation* shall be placed approximately in the same horizontal and vertical location from which it originated

- C. Excavation: The removal of materials encountered to the elevation and width limits indicated in the Contract Drawings, Specifications, or as directed by the Engineer.

- D. Fill (Historic Fill): Fill, also known as historic fill or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Materials commonly associated with historic fill include, but are not limited to; coal, glass, brick, ash, wood fragments and other similar granular materials. Historic fill shall not include boulders, ledge, consolidated rock, asphalt pieces, concrete, railroad timbers, rail, cobblestones or other abandoned building materials that would preclude the disposal of the urban fill as daily cover at a landfill.

- E. Hazardous Waste:
 - 1. Defined in 310 CMR 40.0006; or
 - 2. Defined in 40 CFR 261.3.
 - 3. A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:
 - a. Cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or
 - b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

- F. Peat: A substance of vegetable origin, consisting of roots and fibers, moss, etc., in various stages of decomposition, and found as a kind of turf or bog. Peat shall be considered natural soil when it is encountered in small amounts (layers 1-foot (304.8 mm) or less in thickness) and when it is impractical to separate the peat from the natural soil or urban fill strata. Otherwise, peat shall be considered a distinctive stratum.

- G. Sediment: All detrital and inorganic or organic matter situated on the bottom of lakes, ponds, streams, rivers, the ocean, or other surface water bodies.

- H. Soil Classification Categories: Unless specifically stated otherwise terms used in this specification are as defined in the MCP, 310 CMR 40.0006. For purposes of this Section, sediments shall also be included as soil. The following definitions and soil classifications apply to these specifications:
 - 1. (Class A-1) Background: Any soil or fill material which has concentrations of chemicals consistent with MassDEP-published concentrations for natural soil or attributable to known geologic conditions. A-1 soil may also contain diminimus total petroleum

hydrocarbon concentrations (up to 100 parts per million) attributable to non-reportable releases listed in 310 CMR 40.0317. A-1 soil may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in Section 02210 - Earth Excavation, Backfill, Fill and Grading. Excess soil/fill that meets the definition of background, and that contains oil or hazardous materials (OHM) at concentrations less than release notification thresholds established by 310 CMR 40.0300 and 40.1600, shall be transported under a Material Shipping Record (MSR).

Excess soil/fill that meets the definition of background, and that contains OHM at concentrations greater than release notification thresholds established by 310 CMR 40.0300 and 40.1600, shall be transported under a non-electronic Bill of Lading (BOL) or a Material Shipping Record.

Background soil may also be re-used off-site provided it is reused in an area where the excavated soils concentrations are equal to or less than the site-specific background determined at the off-site reuse location. The Contractor is responsible for determining the background levels in the area of excavation. The Contractor shall identify one or more disposal facilities/locations with background levels appropriate to receive the material to be disposed. It is the Contractor's responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations. Background soil may be used in gravel processing facilities provided the soil analytical data is comparable to materials being used by the facility and such use is approved by the Engineer.

2. (Class A-2) Impacted: Any soil or fill material which contains oil or hazardous materials (OHM) at concentrations greater than MassDEP--published concentrations for natural soil or those greater than concentrations attributable to known geologic conditions or total petroleum hydrocarbons greater than 100 ppm, but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused in the area of excavation or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in Section 02210 - Earth Excavation, Backfill, Fill and Grading. Class A-2 soils requiring off-site transportation and disposal/reuse shall be transported using a Material Shipping Record (MSR).

Impacted soil may also be re-used off-site provided it is reused in an area where the excavated soils concentrations are equal to or less than the site-specific background determined at the off-site reuse location. The Contractor shall identify one or more disposal facilities/locations

with background levels appropriate to receive the material to be disposed. It is the Contractor's responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations. Background soil may be used in gravel processing facilities provided the soil analytical data is comparable to materials being used by the facility and such use is approved by the Engineer.

3. (Class B) Contaminated: Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, regardless of whether it is exempt from notification.

Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials as accepted by the Engineer shall be handled as potentially contaminated soils. Soils which do not exhibit evidence of contamination can be reused within the area of excavation without first performing laboratory analyses. Any excavated soil/fill material which is not reused within the area of excavation, must be characterized prior to reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill. Soil/fill which may be contaminated shall be set aside by the Contractor for assessment by the Contractor's Environmental Professional. Soil/fill which is staged and characterized can be reused within the area of excavation or elsewhere on site provided the material has been tested and has equal or less contamination than the point where it is to be reused and it is not reused beneath a permanent structure such as a building foundation.

4. Class B soil which cannot be reused on site shall be reused off-site, recycled, or disposed of at a permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR part 261 or contains detectable asbestos. Subcategories of Class B are defined as follows:
 - a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., Massachusetts Department of Environmental Protection (MassDEP) Policy # COMM 97-001 - Reuse and Disposal of Contaminated Soil at Massachusetts Landfills Policy, and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills. Note: per COMM 97-001, sediments may not be re-used as Class B-1.
 - b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.

- c. Class B-3: Soil and Fill that meet all applicable criteria for in-state recycling at an asphalt batching plant and/or the specific licensing requirements for the proposed in-state recycling facility.
 - d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state asphalt batching acceptance criteria, but meet the criteria for regional thermal treatment facilities, and are not classified as a RCRA Hazardous Waste.
 - e. Class B-5: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined and unlined landfill reuse criteria or which require removal to regional disposal facilities and are not classified as RCRA Hazardous Waste.
 - f. Class B-6: Soil and fill which does not meet one of the designations above due to excessive foreign materials and/or debris that are not classified as a hazardous waste.
5. (Class C) Hazardous Waste: A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, subpart C and/or that is listed in 40 CFR 261, subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Soil suspected of having the characteristics of a hazardous waste or of containing a listed hazardous waste shall not be removed from the excavation or staged at another location except at the direction of the Engineer. Subcategories of Class C shall be as follows:
- a. Class C-1: Soils classified as hazardous waste that can be treated on-site to eliminate the toxicity characteristic (e.g., for lead).
 - b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be treated on-site. Land disposal of hazardous soil is prohibited until the soil has been treated to meet Land Disposal Restrictions (LDR) standards pursuant to 40 CFR 268.48. This material must be transported to an out-of-state approved RCRA permitted disposal or treatment facility under a Uniform Hazardous Waste Manifest. Land disposal following achievement of the Uniform Treatment Standards (UTS) shall be at a RCRA landfill.

- I. Special Waste: means any solid waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the solid waste. Asbestos and PCB-contaminated soils/fill (at regulated concentrations) are examples of special waste categories.
- J. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix.
- K. Over Excavation: Consists of removal of materials beyond indicated elevations and width limits indicated in the Contract Documents without direction of the Engineer. Over-excavation material handling, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Over-excavations shall be backfilled and compacted as specified for excavations of the same class, unless otherwise directed by the Engineer.
- L. Unknown Materials: Any material, that is not readily identifiable as non-hazardous waste, and which has not been previously characterized or encountered during site investigation activities. The Unknown Material classification is to be used in the event that an unexpected, unusual material is encountered for which special handling procedures shall be required in order to handle the material safely. Such wastes include but are not limited to:
 - 1. Unlabelled drums or containers containing material which is not readily identifiable as a non-hazardous substance.
 - 2. Any material which varies significantly from material previously observed on site and which cannot be readily identified as a non-hazardous.
 - 3. Waste material of unusual color or odor or material with indications of hazardous levels (e.g. exceeding OSHA permissible exposure limits) of contaminants as evidenced on an organic vapor monitor or other similar instrument.

The Owner reserves the right to apply generator knowledge to classify and profile the material as a previously encountered waste or as a known waste. In the event that a material is encountered which the Contractor is uncertain as to its nature, the Owner or their representative shall assess the material with the Contractor and direct the Contractor as to the nature of the material being known or unknown.

1.5 WORK INCLUDED

- A. Managing excavated soil and fill material.

- B. Characterization of soil, fill, and unknown material for disposal/reuse purposes; field screening and soil management/segregation; temporary storage/staging; and characterization (as may be necessary for unknown materials and/or for compliance with receiving facility requirements); and disposal and/or reuse of excavated soil and fill material.

All laboratory chemical analyses conducted shall utilize currently accepted U.S. EPA and applicable state agency analytical protocols and procedures. Laboratory chemical analysis reports shall meet MassDEP Compendium of Analytical Methods (CAM) requirements for analysis which have published CAM requirements. The MassDEP MCP Analytical Method Protocol Certification Form shall be provided by the Laboratory with all sample results.

- C. Management of contaminated groundwater: If groundwater potentially impacted by OHM, based on visual or olfactory evidence, is encountered in the course of the work, construction dewatering and discharge permits and groundwater treatment may be necessary depending upon the discharge method(s) and/or location(s) utilized by the Contractor. The Owner and Engineer shall be notified by the Contractor if groundwater potentially impacted by OHM is identified.

- D. All work at the site must be performed in accordance with all applicable federal, state, and local regulations, permits and licenses, including, but not limited to:

1. The applicable parts of the Code of Federal Regulation (CFR) Title 40: Protection of Environment, pertaining to the Comprehensive Environmental Response and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA), RCRA, Toxic Substances Control Act (TSCA), and the National Emission Standards for Hazardous Air Pollutants (NESHAPS) as regulated by the U.S. Environmental Protection Agency (U.S. EPA);
2. State regulations specified in the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000), and Massachusetts General Law 21E - Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, and applicable Massachusetts Department of Environmental Protection (MassDEP) guidelines and policies;
3. MassDEP Technical Update. Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (2002)
4. Department of Transportation (DOT) regulations 49 CFR, and state transportation licenses and permits;
5. OSHA regulations (including, but not limited to, 29 CFR 1910.1000, 29 CFR 1926, and CFR 1910.120), 40-hour Occupational Safety and Health Administration (OSHA) training (plus 8-hour refresher

training) and all other applicable state and federal regulations regarding health and safety requirements;

6. NIOSH/OSHA/USCG/EPA: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" October 1985, DHHS (NIOSH). Publ. No. 85-115;
7. Department of Transportation training;
8. U.S. Army Corps of Engineers Section 404 Programmatic General Permit, Commonwealth of Massachusetts;
9. General Contractor's license;
10. National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) to discharge and associated Construction General Permits and Remediation General permits;
11. Regional and local Publicly Owned Treatment Works (POTW) pre-treatment and construction dewatering requirements and permits;
12. Excavation and/or grading permits;
13. Special use permits;
14. Special waste haulers certificate;
15. Massachusetts Wetlands Protection Act and associated Order of Conditions;
16. The Contractor's Soil Management Plan (SMP) and Health and Safety Plan to protect the workers and the public.
17. Massachusetts Division of Occupational Safety (DOS): The Removal, Containment or Encapsulation of Asbestos (453 CMR 6), including all clarifications, policy statements, etc.
18. Massachusetts Department of Environmental Protection: 310 CMR 7.00, 7.09, 7.15 and all related amendments and policy statements, and
19. MassDEP: Asbestos Cement Pipe Guidance Document (2011)

20. Massachusetts Division of Occupational Safety (DOS): The Removal, Containment or Encapsulation of Asbestos (453 CMR 6), including all clarifications, policy statements, etc.
 21. Massachusetts Department of Environmental Protection: 310 CMR 7.00, 7.09, 7.15 and all related amendments and policy statements.
 22. MassDEP Technical Update: Considerations for Managing Contaminated Soil: RCRA Land Disposal Restrictions and Contained-In Determinations, August 2010;
- E. Implementation of the submitted HASP and other applicable monitoring and control plans including establishing work zones (e.g., support zone, contamination reduction zone, exclusion zone), preparing a decontamination pad(s) and staging area(s), performing the appropriate environmental monitoring, training and medical monitoring of personnel, coordinating waste disposal and waste characterization as needed.
- F. The Contractor's Environmental Professional shall characterize all excavated soil and fill material prior to off-site reuse or disposal. Characterization requirements may vary depending on the site selected to receive soil suitable for reuse or the disposal facility permits and policies. The Contractor is responsible for final waste characterization and shall determine if any additional waste characterization is required at no additional cost to the Owner.
- G. The Contractor shall develop, implement, maintain, supervise, and be responsible for all soil management practices during the course of this contract. The Contractor's Environmental Professional shall be present during all field screening, segregating, handling, and characterization of all soils excavated in the course of completing this contract to ensure that soil is managed in accordance with applicable laws, regulations, and this Section.

Soil management activities shall include and be conducted as specified herein:

1. Providing and constructing a secure soil staging area sized to adequately segregate soils in accordance with the conditions specified without impeding construction-related activities. The Contractor is to use existing information and obtain additional information as may be needed at no additional cost to the Owner to minimize the need for a staging area. If a staging area is required to characterize unknown or excess material for any reason, the Contractor is responsible for locating, selecting, preparing and securing the area. Contractor shall provide means of separating potentially contaminated material from the staging area ground surface to prevent the potential of cross-contamination. Separation method to be provided in accordance with 3.4(C).
2. Excavated soil that cannot be re-used on site shall either be loaded directly into containers for off-site reuse or disposal (provided the

material is consistent in visual, olfactory and chemical characteristics as observed in previous investigations) or be staged at a location determined and secured by the Contractor pending sampling and analytical characterization by the Contractor's Environmental Professional prior to characterization and off-site reuse or disposal, with the exception that soil suspected of having the characteristics of a hazardous waste or of containing a listed hazardous waste shall not be removed from the excavation or staged at another location except at the direction of the Engineer. Since individual disposal facilities have different permit conditions and specific pre-characterization data requirements, the Contractor is responsible for final soil characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final soil characterization is the responsibility of the Contractor and costs for securing a staging area and conducting waste characterization shall be incorporated into the Contractor's bid price for construction.

3. The Contractor shall control and contain runoff of free liquids drained from stockpiled soil/fill. Free liquids shall be managed in accordance with applicable regulations.
4. Soil that has been chemically stabilized shall be confirmed through laboratory chemical analysis to be characteristically non-hazardous pursuant to RCRA prior to off-site shipment and disposal.
5. Soil/fill shall not be staged within 100 feet (30.5 meters) of a Reservoir, or Area of Critical Environmental Concern. Soil/fill shall not be staged in the work area over night.
6. Excavating unknown, previously uncharacterized material which may be classified as RCRA hazardous waste and disposing of it at an approved facility and/or on-site treatment of these materials to render it non-hazardous prior to and disposing of it at an approved facility.
7. Removing characterized on-site materials for off-site re-use or disposal.
8. Demobilizing the site, including, but not limited to, removing and disposing of construction-related equipment and materials used for personnel and equipment decontamination and related waste such as personal protective equipment (PPE), decontamination water/solids, temporary covers, and washwater storage tanks; disconnection of temporary utilities; and final clean-up to pre-construction conditions.
9. The Contractor shall manage unknown material separately and temporarily stage the material pending characterization.

- H. All incidental, Contractor-generated waste (such as Personal Protective Equipment, decontamination wash water, etc.) resulting from the services hereunder are the property and responsibility of the Contractor and are to be

disposed of by the Contractor under a Uniform Hazardous Waste Manifest and/or by a Massachusetts Bureau of Waste Site Cleanup Bill of Lading, as appropriate.

- I. The Contractor is responsible for identifying potential hazards at the site and reviewing existing information.

1.6 RELATED WORK

- A. Section 01025 – MEASUREMENT AND PAYMENT
- B. Section 01108 – HEALTH AND SAFETY PROCURES
- C. Section 01500 - TEMPORARY FACILITIES AND CONTROLS
- D. Section 02010 - SUBSURFACE INVESTIGATION
- E. Section 02080 – SOIL AND WASTE MANAGEMENT
- F. Section 02095 - TRANSPORTATION AND DISPOSAL OF SOIL AND FILL
- G. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- H. Section 02140 – DEWATERING

1.7 EXISTING CONDITIONS.

- A. Limited chemical characterization of soil has been conducted, the results of which are presented in the reports and tables referenced in Paragraph 1.2 of this section. The Contractor is obligated to review existing environmental assessment reports and manage the soil and groundwater in accordance with applicable state and federal regulations.
- B. Reports and files regarding the project area indicate the following:
 - 1. MassDEP-listed releases and sites have been identified in the vicinity of the work area.
 - 2. MCP Activity and Use Limitations (AULs) have been recorded for parcels within or adjacent to the work area. Work within the limits of these parcels will require that work be performed as an MCP Release Abatement Measure.
 - 3. Two MCP sites adjacent to or within the work areas west of Corporal Burns Road have documented releases of an F-listed hazardous waste, and dense non-aqueous phase liquid (DNAPL) has been reported to the present in the subsurface at one site. Both soil and groundwater may be impacted by listed hazardous wastes in the project area. The presence of F-listed wastes in excavated soil and dewatering fluids may cause these materials

- be F-listed wastes subject to RCRA land-disposal restrictions or require treatment within the limits of the disposal site.
4. Provisions for treatment and discharge of dewatering fluids under a NPDES Remediation General Permit or Massachusetts Water Resources Authority Permit are likely to be necessary.
 5. Petroleum releases have been documented at several locations adjacent to or within project areas.
 6. Soil throughout the project area may have been emplaced during historic filling and could include coal, ash or other debris.
 7. The presence of soil with the RCRA toxicity characteristic for lead has been identified in soils near the project area. The presence of characteristic waste in excavated soils may cause these soils to require in-situ stabilization or be subject to RCRA land disposal restrictions.
- C. Site investigation results indicate the following:
1. Forty-nine (49) soil borings were advanced across the project area; soil samples were collected from thirteen borings. Sample analysis indicates that samples have been impacted by petroleum hydrocarbons and polycyclic aromatic hydrocarbons at concentrations exceeding the MCP Reportable Concentration (RCS-1) in multiple boring locations.
 2. Monitoring wells were installed and groundwater was sampled in ten locations. Analyses indicated the presence of chlorinated solvents in groundwater samples from six wells; concentrations in two samples exceeded the MCP Reportable Concentrations (RCGW-1 or RCGW-2) and/or were consistent with the presence of DNAPL. Groundwater analysis indicated the presence of petroleum constituents including benzene exceeding the RCGW-1 limit in one sample.

1.8 SUBMITTALS

- A. The Contractor shall prepare a Work Plan that generally describes the work to be performed under Section 02080 Part 3 (Execution). The work plan shall include, but not be limited to detailing the submittal and implementation of the following:
1. Site-Specific Health and Safety;
 2. Soil Management;
 3. Dust, Vapor, and Odor Control;
 4. Air Monitoring and Quality Control; and
 5. Spill and Discharge Control.

The Work Plan shall be submitted to the Owner and Engineer for review and acceptance at least two weeks prior to beginning any intrusive work at the site.

- B. The Contractor shall provide the qualifications of the Environmental Professional(s) to be assigned to this project. The Environmental

Professional(s) shall be at a minimum certified, registered or licensed as an Environmental Professional or equivalent and hold a Bachelor of Science Degree in Environmental Science, Environmental Engineering, or Public Health or related degree and have sufficient experience in similar work to perform the responsibilities detailed herein. The Environmental Professional(s) shall have demonstrated experience in management of RCRA hazardous waste soils and groundwater.

- C. Soil Management: The Contractor shall prepare a Soil Management plan that outlines measures for soil and fill sampling, field screening, laboratory chemical analysis, treatment, and disposal/reuse. At a minimum, this plan shall address the following:
1. Methods, procedures, and equipment used for treating, excavating, dewatering, characterizing, segregating, reusing/backfilling, loading, and transportation of contaminated soil/fill materials encountered during excavation operations, including Class A, B, and C soils;
 2. A list of all transporters and waste facilities, complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor utilizes for waste disposal. In addition, a copy of a memorandum of understanding between the Contractor and each disposal facility shall be attached. The memorandum of understanding shall detail that the disposal facility agrees to accept a specified quantity of waste as characterized in the contract specifications and detail what, if any, restrictions may apply. The Contractor shall provide copies of the permits held by each disposal facility which the Contractor plans to use to dispose of non-hazardous solid waste; and if necessary to dispose of hazardous waste (due to lead toxicity), PCB-impacted waste and asbestos-containing waste;
 3. A summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history;
 4. Procedures for securing the staging area, controlling dust and soil/fill migration, prevention of contamination of excavated soil by trucks used for asphalt, separation of stockpiled materials from staging area ground surface, preventing damage to uncontaminated areas via contaminant migration and for decontaminating vehicles and personnel exiting the staging area;

5. The means and methods for decontaminating all equipment and personnel, including provisions for installing an equipment decontamination pad if required or specified;
6. Methods and procedures for identifying stockpiled material (e.g., labeling, marking containers) and procedures for identification and tracking;
7. Methods, procedures, and equipment used for obtaining the necessary information needed to satisfy the off-site reuse/disposal facility requirements specified herein and/or by the facility;
8. Methods, procedures, and equipment proposed for assessing and handling Unknown Materials. The SMP shall indicate which laboratory(ies) the Contractor shall utilize for chemical analysis of soil, groundwater and unknown materials:
 - a. An Unknown Materials information sheet shall be developed as part of the Contractor's SMP, upon which the Contractor shall record information such as container type, size, and condition; and, any identifying characteristics of the unknown material. The format of the information sheet shall be as accepted by the Owner and/or its representatives;
 - b. The Contractor's plan for notifying the Owner and Engineer in the event that an unknown material as defined in this specification is encountered. The plan shall include the phone numbers and names of the Owner's representative(s) that the Contractor will contact in such an event.
9. Provisions for separation of incompatible materials;
10. Protocol for over-packing drums (if encountered); and
11. Procedures for consolidating (i.e., bulking) compatible materials for disposal.
12. Procedures for dewatering; testing, handling, treatment, and disposal/discharge of groundwater.

D. Soil Management/Tracking Documentation:

Prior to off-site disposal or reuse, the Contractor shall provide to the Engineer a letter from the disposal facility indicating that the facility has reviewed the available data relative to the soil/fill to be delivered and agrees that the soil/fill meets their acceptance criteria. The letter shall be signed by a duly authorized representative of the receiving facility.

Within the time constraints established in state and/or Federal laws and regulations, the Contractor shall submit to appropriate authority(ies), as applicable, Uniform Hazardous Waste Manifests and/or Bills of Lading for all soils and associated fill disposed or reused of off-site utilizing such documents. Copies of all manifests, Bills of Lading, and all other documents used to track and/or permit off-site transportation of soils shall be submitted to the Engineer within ten (10) days of shipment. The Contractor is responsible for preparation of all manifests, Bills of Lading, Material Shipping Records, and all other related documents completely, legibly, and accurately prior to submitting them to the Owner and/or its representative for generator and LSP signatures. (Bills of Lading shall be prepared electronically by the Owner's LSP; the Contractor shall be responsible for providing information necessary for completion of the BOL). The Contractor shall be responsible for paying for any and all fines associated with inaccurate, incorrect, or improperly completed manifests, Bills of Lading and all other related documents, including fines resulting from late or untimely submittals.

- E. Spill and Discharge Control (SDC): The SDC program shall provide contingency measures and reporting responsibilities for potential uncontrolled spills and discharges of contaminated and/or hazardous materials, including, but not limited to, leachate, decontamination water, sewage, and other on-site waste materials. In addition to the above listed items, the SDC program shall specifically contain: procedures for containing dry and liquid spills; absorbent material available on site; storage of spilled materials; governmental reporting (i.e., notification) procedures; decontamination procedures; discharges of sanitary or combined sewers into storm drains either by flow handling/bypassing or accidental or unintentional discharge; and procedures for protecting wetlands and surrounding public and private property.

The Spill and Discharge Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries shall be performed in a designated area which has either secondary spill containment or an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

1. Notification Procedures: The Contractor shall prepare in advance of work activities a notification list, complete with phone numbers, addresses, and contact names for all parties to be notified in the event of a spill. This list shall include:
 - a. Owner's designated representatives;
 - b. Owner;
 - c. Fire Department;

- d. Engineer; and
- e. Massachusetts Department of Environmental Protection (as required per 310 CMR 40.0000).

The Owner shall be notified immediately of an uncontrolled spill or discharge. If human health or the environment are potentially threatened, the Contractor shall take immediate action to abate the conditions and notify emergency personnel.

- 2. Spill Incident Report(s): In the event of an uncontrolled spill or discharge, a written report detailing each uncontrolled spill or discharge shall include, at a minimum, the cause and resolution of incident, outside agencies involved, and date of occurrence. The report shall be submitted to the Owner within 48 hours of the incident. The Contractor shall document all spills on the as-built Drawings and submit the Drawings to the Owner at project completion. The Contractor shall be responsible for remediating any spills or releases of oil or hazardous materials as a result of the Contractor's activities. The site shall be remediated to pre-release conditions at no additional cost to the Owner.

- F. Dust, Vapor and Odor Control (DVOC): The DVOC program shall include measures to control objectionable dust, vapors, and odors originating from the site. The DVOC Plan shall describe procedures to minimize the creation of dust, and the control of objectionable vapors and odors originating from the site. At a minimum, the DVOC program shall include air monitoring as specified in paragraph 3.6.

PART 2 – PRODUCTS

2.1 DUST CONTROL

- A. Air monitoring shall include total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments.

2.2 SPILL CONTROL

- A. At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials in sufficient quantity to address a release of fuel oil, hydraulic oil or other OHM that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site.

2.3 EQUIPMENT DECONTAMINATION PAD

- A. The Contractor shall provide all materials and labor to complete an equipment decontamination pad if required or specified. Liner materials and collection system shall be selected by the Contractor to perform as specified.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work in this section will be performed in accordance with the Contractor's Work Plan, SMP and Site-Specific HASP.
- B. The primary concern of the Contractor in the excavating, handling, sampling, bulking, and on-site storage of soil/fill and/or drummed material (if encountered) will be to protect the health and safety of the site workers, the public, and the environment.
- C. The Contractor shall keep a copy of the Health and Safety Plan (HASP) on site during all operations and shall conduct daily health and safety meetings. Failure to keep a copy of the HASP on-site, or any other breach of the Contractor's Plan, may be cause for stopping work at the cost of the Contractor. Delays caused by the Contractor's failure to comply with the health and safety regulations or any health and safety plan shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are accepted by the Engineer and/or their representative and implemented.
- D. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site (who are subject to exposure to potentially contaminated soil) shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer and/or their representative.

3.2 SOIL/FILL MANAGEMENT

- A. Soil and fill material that is managed under a Utility-related Abatement Measure (URAM) Plan pursuant to the MCP, which is staged off-site, and which is not characteristically hazardous, may be re-used within fourteen (14) calendar days of excavation. Any material which is suitable for re-use as ordinary borrow, based on analytical results and could have been placed on site, but was not, due to Contractor delay (i.e. analytical results were not available within 10 days following excavation) will be disposed in accordance with the applicable regulations by the Contractor at no cost to the Owner.
- B. Soil and fill material that is managed under a Utility-related Abatement Measure (URAM) Plan pursuant to the MCP, which is staged off-site and which is determined at the staging area to be characteristically hazardous for

lead may be treated (stabilized) within the “Area of Contamination” (AOC) only and must be reused or disposed of within ninety (90) calendar days of excavation. No treatment may occur at the staging area if outside the “Area of Contamination”.

- C. Class B and C excavated soils shall be completely covered with a minimum 10-mil thick layer of plastic tarp. Soils exhibiting evidence of potential contamination including but not limited to odors and/or staining shall be covered prior to characterization and off-site reuse or disposal. Stockpiled soils determined to be Class B or C, as described herein, shall be securely covered at the close of each day and continuously when not being added to or otherwise being handled by the Contractor. Stockpiles, including those of Class A soils, shall also be covered at times as directed by the Engineer.
- D. All soil that is excavated from private properties outside of the Right of Way and the public Right of Way shall at all times be segregated by the location of origin. Soil from each location shall only be used as backfill on the property of origin and shall not be used as backfill on other properties, except as allowed by the Engineer. Soil from each location shall not be moved off the property without the approval of the Engineer. Surplus soil from individual parcels shall not be mixed with soil from other parcels or from the Right of Way without the approval of the Engineer.
- E. Excavated soil shall be managed such that it is not exposed to contamination following excavation. Equipment and supplies in contact with excavated soil shall be free of asphalt, petroleum products or other hazardous materials that could be transferred to soil. Vehicles used to transport asphalt shall not be used to transport soil except by permission of and following inspection by of the truck, by the Engineer.

3.3 SOIL/FILL CHARACTERIZATION

- A. Soil and fill material shall be classified based on the criteria established in the accepted SMP and these Specifications.
- B. Initial Characterization of Soil/Fill Material: A summary of existing conditions and investigation findings performed by the Engineer during design, including a summary of analytical results, is appended to this section.
- C. The Contractor shall review the information provided and perform sampling and pre-characterization of soil/fill strata to be encountered during construction such that excavated soil can be stabilized as required to render soils characteristically non-hazardous, segregated and directly transported to an appropriate facility.
- D. The Contractor may either perform independent sampling and pre-characterization of soil/fill strata to be encountered during construction in advance of excavation such that excavated soil can be directly transported to

an appropriate facility; or the Contractor shall make the necessary arrangements to secure a staging area(s) suitable for storing soil stockpiles pending analyses.

E. Soil shall be preliminarily segregated based on the Soil Classification Categories detailed in Sub-section 1.4, except as indicated below.

1. Potential Asbestos Containing Material (PACM): If soil/fill suspected of including asbestos-containing debris is encountered during excavation, the Contractor or the Contractor-hired Environmental Professional shall immediately contact the Engineer to discuss the nature and extent of the PACM and to assess potential hazards and appropriate handling procedures. Prior to handling and removing the PACM, MassDEP shall be notified and approval for handling and disposal obtained. Discovery and management of PACM shall be documented as required in the SMP. Evidence of PACM includes but is not limited to the presence of suspect asbestos-containing building debris such as broken or crushed asbestos-cement (transite) piping, vinyl floor tiling, tar-based pipe wrap, roofing paper or paper-like insulation materials. Following MassDEP approval, such soil/fill shall be managed in accordance with applicable regulations. Soils shall be analyzed for OHM to determine appropriate disposal requirements, as required by the proposed disposal facility.

2. Unknown Material. If unknown material is encountered during excavation, the Contractor or the Contractor-hired Environmental Professional shall immediately contact the Engineer to discuss the nature and extent of the unknown material and to assess potential hazards and appropriate handling procedures. Prior to handling and removing the unknown material from the excavation area, the Contractor and Owner and/or its representatives, shall visually assess the material and its potential hazards. Drums shall be assessed to determine whether they are leaking, bulging (evidence of reactive waste), crushed, or empty. Crushed, empty, and/or skeletal parts of drums shall be handled as solid waste, as specified. The Contractor shall record any identification or markings on the drummed material(s). Discovery and management of unknown materials shall be documented as required in the SMP.

F. Disposal Characterization: Waste characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the characterization requirements of each disposal facility in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements. Disposal or reuse of the material shall depend on sampling and characterization analytical results. The Contractor shall, at the direction of the Engineer, provide a split sample to the Engineer. The Contractor shall provide notice to the Engineer of when sampling will occur so that the Engineer may observe the sampling procedure.

Stockpiles within the staging area shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner including the cost of imported fill material used in its place.

3.4 STAGING AREAS

- A. Unless the staging area is comprised of an impervious surface material such as asphalt or concrete, the Contractor shall pre-characterize the surface soils (0-6") at the staging area(s) prior to staging any soils to document the existing conditions relative to contamination which may result from using the area to stage excess or unknown materials. A minimum of one composite surface soil sample, consisting of at least five grab samples, for every 2,500 square feet of staging area shall be collected by the Contractor prior to staging materials at the location. The samples will be submitted to a certified laboratory for analysis for:
1. RCRA 8 total metals;
 2. Volatile organic compounds (EPA Method 8260B);
 3. Semi-volatile organic compounds (EPA Method 8270);
 4. Total petroleum hydrocarbons (EPA Method 8100M or equivalent); and
 5. Polychlorinated biphenyls (PCBs) (EPA Method 8082).
- B. At the completion of the work, the Contractor shall replicate the pre-staging sampling and analysis protocol to assess impacts to the area from use as a staging area.
- C. Stockpiles located within the soil staging areas shall be placed on a 20-mil HDPE liner and bermed to minimize the effects of contamination release. Each soil category shall be staged in separate areas with berms constructed a minimum of 2 feet above the existing grade with common fill, hay bales, concrete barriers, or functionally equivalent berm material. Waste characterized as RCRA hazardous waste shall not be stored on site for a period greater than sixty (60) days. All other waste must be disposed off-site within ninety (90) days of excavation.
- D. As described above and herein, excavated materials shall be completely covered with a minimum 10-mil thickness polyethylene tarp and secured with tires, ropes, anchors or equivalent material. The covered system shall be capable of resisting actual wind gusts at the site, with a minimum wind capacity of 40 miles per hour. The stockpile covers shall be installed and secured at the end of each working day and at all times when earthwork is not taking place on site. Stockpile covers shall be immediately recovered should

wind forces expose any of the excavated materials. Stockpiles shall also be covered at times as directed by the Engineer.

- E. Stockpiles are to be segregated based on a review of pre-characterization data and visual and olfactory conditions and field screening results obtained during excavation. Stockpiles shall be segregated by source location as approved by Engineer. Each stockpile must be clearly separated from adjacent stockpiles.
- F. Stockpiles shall be limited in size to approximately 500 cubic yards, unless approved by the Engineer. If, as a result of combining soil piles into larger volumes than 500 cubic yards, soil must be disposed of as a higher cost bid item than would otherwise be required, the Contractor shall be responsible for the additional cost.
- G. Stockpiles shall be clearly designated by a sign post or marker which can be cross-referenced with the source location and with samples collected from the pile for characterization purposes. The signs/markers are not to be moved, except by authorized personnel and not until the soil is ready to be either reused on site or loaded for off-site disposal.
- H. Excavated soil shall not be added to a stockpile after it has been sampled for characterization.
- I. Unknown, potentially hazardous soils/debris and drummed materials encountered during the project shall be located in a separate bermed location. The Contractor's Soil Management Plan shall provide construction details of the dimensions and protective measures proposed for the staging area(s). The construction details and protective measures are subject to the acceptance of the Owner and/or its representatives. The Contractor shall select the area to facilitate handling of the material and to minimize interference with other ongoing construction activities. The Owner or Engineer must agree with the location prior to construction.

3.5 EQUIPMENT AND PERSONNEL DECONTAMINATION

- A. Equipment and personnel decontamination area(s), conforming with the Contractor's HASP and these Specifications, shall be constructed in such a manner to protect existing site surfaces, materials, and structures from contamination. Equipment decontamination areas shall be sized adequately to provide for the decontamination of the largest piece of equipment to be decontaminated. Filter fabric shall be placed over an impermeable liner to protect the liner from rips, punctures, or tears from traffic and heavy equipment.
- B. The Contractor shall establish a site-specific decontamination protocol and decontamination areas for personnel and equipment utilized at the subject site. Personnel and equipment decontamination shall be conducted in compliance with the HASP.

- C. The decontamination protocol shall include (i) the means, methods, and materials for the proposed decontamination procedures; (ii) the procedures employed to contain and store the wash or rinse liquids/sludges; (iii) procedures used to sample, analyze, and characterize the contaminated wash or rinse liquids/sludges; (iv) procedures to contain or clean contaminated equipment and PPE; and (v) the procedures for handling and disposing of solid wastes generated from site decontamination activities. All sample analysis or sample compositing shall be completed by a certified laboratory. The Contractor shall be responsible for the cost of this analytical work. The Contractor shall submit a copy of the analytical results and laboratory certifications to the Owner for review prior to proceeding with disposal. The Contractor shall be responsible to properly manifest and dispose of all residual wastes generated from on-site activities in conformance with federal, state, and local environmental and transportation regulations. The Contractor shall be responsible for the manifests and procedures to be used to package and dispose of contaminated solid wastes, wash, or rinse liquids at an EPA or state-approved treatment or disposal facility. The Contractor shall be responsible for any releases from site or decontamination activities due to its work, and will remediate any release for which the Contractor is responsible to pre-existing conditions at the Contractor's expense.

- D. Provisions for collecting decontamination water will be incorporated into the maintenance of the decontamination pad and will include placing an impermeable liner over a sloped surface such that water is directed, if necessary, into an area for subsequent pumping to 55-gallon drums or other appropriate tankage. Following completion of the work, the wash water shall be characterized by the Contractor and disposed off-site, in accordance with federal, state, and local regulations.

3.6 ENVIRONMENTAL FIELD MONITORING/DUST CONTROL

- A. The Contractor shall hire an Environmental Professional to keep accurate documentation of all air monitoring, which will be made available to the Engineer or Owner upon request.

- B. During excavation and construction, the Contractor shall monitor the air quality at and surrounding the areas where construction activities involve soil handling such as excavation, re-location, staging, loading or grading of soil/waste materials. Air monitoring shall involve appropriate techniques, capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. If there are indications of contamination, the frequency of air monitoring shall be determined by the Contractor's Industrial Hygienist or competent environmental health professional. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for assuring that monitoring is conducted in an appropriate manner, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.

- C. The air monitoring program is to be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind, and two downwind conditions during periods of activity on the site and when there is a potential for dust being generated on the site. The air monitoring information including air monitoring in the vicinity of all site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health and Safety Plan. The Contractor shall submit his/her air quality monitoring program for review prior to commencement of site activities. At the direction of the Engineer, air monitoring may be limited to visual and odor monitoring; instrument monitoring may be required at any time by the Engineer, based on the results of visual and odor monitoring.
- D. Air monitoring shall be performed by the Contractor during all soil handling operations. In contaminated areas, detectors for organic contaminants and dust should be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g. excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information by the Contractor. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions and personnel protection measures.
- E. Dust shall be controlled during excavation of soil/fill material to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.
- F. Ambient dust levels at the site shall be monitored by the Contractor prior to construction. During construction, real-time dust monitoring shall be conducted during any soil/fill handling activities. The monitoring shall consist of total dust testing using MIE, Inc. Miniram PDM-3 Dust Monitors, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level, the Contractor shall perform additional measures to reduce the total dust concentrations.
- G. Nuisance dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.

Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation if there is potential for nuisance dust generation. Additional water spray may be utilized only when any indication of excessive dust is observed. To the extent feasible, the Contractor shall minimize the use of water within the limits of excavation.

Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

- H. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall monitor the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.
- I. In the event that asbestos containing materials are encountered, dust control measures, which may include negative air containment, shall be instituted in accordance with all applicable local, state and federal laws and regulations.

3.7 VAPOR AND ODOR CONTROL

- A. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's Vapor and Odor Control Plan. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants, or other methods to reduce off-site odors to acceptable levels. The Contractor shall not use soil suitable for on-site reuse as cover to control vapor and odors.

3.8 BULKING

- A. Following characterization and compatibility testing of waste material, the Contractor shall place compatible materials into common containers to reduce transport and disposal costs. In addition, materials that are improperly contained shall be transferred into the appropriate containers. Drums and containers used during this project shall meet the appropriate DOT, OSHA, and U.S. EPA regulations for the materials contained. The Contractor shall describe the bulking procedures in the Soil and Fill Management Plan.

3.9 BACKFILLING AND COMPACTION

- A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Imported backfill used in excavated areas shall have been analyzed and certified as free of contaminants and as specified in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

PART 4 – COMPENSATION

Item 2080.1 – OHM - Soil and Waste Management

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the following breakdown; A maximum of 3 percent of the lump sum will be paid upon the finished construction of the completed soil/fill staging area as specified and accepted by the Engineer. A maximum of 4 percent of the lump sum will be paid upon the submittal and acceptance of all related submittals, plans and shop drawings. A minimum of 3 percent of the lump sum will be paid at the complete removal and restoration of the staging area, as approved by the Engineer. The balance of the Lump Sum measurement for payment for will be on a percent of the Lump Sum bid remaining, calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer. Deducts for work not performed as specified shall be applied.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Soil and Waste Management shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Soil and Waste Management. The work includes, but is not limited to; Environmental Professional; dewatering Professional; soil/fill sampling; analytical services; development and implementation of all submittals and plans specified including, but not limited to: Health and Safety Plan; Equipment and Personnel Decontamination Plan; Soil and Waste Management Plan; Dust, Vapor, and Odor Plan; Air Quality Control Plan; and a Spill and Discharge Control Plan; submittal of all required certifications; coordination with all parties affected and maintaining proper documentation necessary; disposal of wastes, such as construction-related waste and by-products, and Contractor-generated waste material, such as personal protective equipment, excess materials, debris, wash water, and any other waste materials not specifically addressed in other payment items; waste characterization sampling and analysis costs for the waste referenced above; construct and maintain a secure (enclosed with 8 foot high fencing and gate) soil/fill staging area for soil/fill stockpiling pending analytical testing, reuse, or disposal; all permits and administration fees; collecting and testing surface soil samples pre- and post- use of staging area; placement of polyethylene liner under piles; additional placement of bituminous or cement concrete as may be needed at the staging area; construction of segregated soil/fill bays; signage and lighting at the staging area; installation of sedimentation and erosion control at the staging area; construction of a truck wash down area; construction of a decontamination area with wheel wash; maintenance including placement of daily polyethylene covers over existing stockpiles; performing dust control; street sweeping; vehicle wheel-washing in the staging areas as needed to control airborne dust and sediment from spreading beyond the staging area or presenting a health risk to the workers or public; day to day security measures; maintenance of the soil/fill stockpiles to avoid migration; and maintenance of the sedimentation and erosion control measures; and removal, hauling, and disposal of all items of which the staging area was constructed as well as the restoration of the site to pre-construction conditions.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material; re-use of soil and fill material on site as backfill; handling unknown materials; sedimentation and erosion control for other uses besides soil management (at the staging area); and all work associated with a staging area for other uses beyond soil and waste management.

2080.2 – OHM - Handle Asbestos Contaminated Soil / Fill

METHOD OF MEASUREMENT:

Measurement for payment for Handling Asbestos Contaminated Soil/Fill shall be based on the actual in-place volume excavated, in cubic yards, as measured by the Engineer, within the horizontal and vertical trench pay limits indicated elsewhere in the Contract Documents.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Handling Asbestos Contaminated Soil/Fill shall be based on the cubic yard price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Handling Asbestos Contaminated Soil/Fill. The work includes, but is not limited to; segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; all controls necessary to maintain compliance with City of Cambridge ordinances relative to asbestos in soils; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; all fees, permits, and taxes; and construct, maintain, and remove a secure asbestos contaminated fill staging area for stockpiling pending analytical testing, reuse, or disposal.

EXCLUSIONS:

The following items are not included for payment under this item: disposal of asbestos contaminated material; soil and waste management items covered under other bid items; and all work associated with a staging area for other uses beyond asbestos contaminated material staging.

2080.3 – OHM - Handle and Characterize Unknown Material

METHOD OF MEASUREMENT:

Measurement for payment for Handle and Characterize Unknown Material shall be based on the actual in-place volume excavated, in cubic yards, as measured by the Engineer, within the horizontal and vertical trench pay limits shown on the Contract Drawings.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Handle and Characterize Unknown Material shall be based on the cubic yard price complete for this item in the proposal. The Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Handling and Characterizing Unknown Material. The work includes, but is not limited to; segregate, handle, stage, test and characterize any soil and fill material which is inconsistent with previous observations and is not readily identifiable as non-hazardous waste; procuring all health and safety equipment; protecting the excavation from accidental entry; controlling windblown litter and the spread of airborne contaminants; and all fees, permits, and taxes. The staging area for handling unknown materials shall be constructed only after suspected materials are encountered, and the Owner is notified. The staging area shall be sized based on field observations and estimates of potential material volume.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of unknown material; soil and waste management items covered under other bid items; and all work associated with a staging area for other uses beyond staging unknown materials.

END OF SECTION 02080

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SECTION 02095

TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

2095.1	OHM - DISPOSAL OF SOIL- LESS THAN RCS-1 (CLASS A-1 AND A-2)	TON
2095.2	OHM - DISPOSAL OF SOIL – DAILY COVER UNLINED LANDFILL (CLASS B-1)	TON
2095.3	OHM - DISPOSAL OF SOIL – DAILY COVER LINED LANDFILL (CLASS B-2)	TON
2095.4	OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE ASPHALT BATCHING IN-STATE (CLASS B-3)	TON
2095.5	OHM - DISPOSAL OF SOIL - NON-HAZARDOUS SOLID WASTE THERMAL TREATMENT (CLASS B-4)	TON
2095.6	OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE (CLASS B-5)	TON
2095.7	OHM - DISPOSAL OF SOIL WITH DEBRIS – NON-HAZARDOUS SOLID WASTE DISPOSAL (CLASS B-6)	TON
2095.8	OHM - DISPOSAL OF SOIL – TREATMENT OF RCRA CHARACTERISTICALLY HAZARDOUS SOIL TO DE-CHARACTERIZE & DISPOSAL OF SOIL AS NON-HAZARDOUS WASTE (CLASS C-1)	TON
2095.9	OHM - DISPOSAL OF SOIL – RCRA HAZARDOUS WASTE (CLASS C-2)	TON
2095.10	OHM - DISPOSAL OF SPECIAL WASTE	TON

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish all labor, materials, equipment, and incidentals required to transport off site, and dispose, reuse or recycle excess soil (defined herein as including sediments and fill) at a licensed facility approved by the Owner.
- B. All personnel involved in the transportation of waste from the site shall have the required Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) training.

1.2 RELATED WORK

- A. Section 01108 – HEALTH AND SAFETY PROCEDURES
- B. Section 01500 – TEMPORARY FACILITIES AND CONTROLS
- C. Section 02010 – SUBSURFACE INVESTIGATION
- D. Section 02080 – SOIL AND WASTE MANAGEMENT
- E. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. A list of all transporters, destination/receiving sites and waste facilities, complete with license numbers and permit numbers (as appropriate), contact person, and address and telephone number that the Contractor utilizes for soil management and waste disposal. In addition, a copy of a memorandum of understanding between the contractor and each facility that will receive excess soil and/or waste material shall be attached to the Waste Management Plan. The memorandum of understanding shall detail the terms under which the facility agrees to accept a specified quantity of soil or waste and detail what if any restrictions may apply.
 - 2. Where appropriate the Contractor shall submit waste manifests for all waste disposed off site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Copies of all waste manifests and Bill of Lading documentation including weigh slips and BOL summary sheets shall be provided to the Owner within 10 days. It is the responsibility of the Contractor to complete all waste manifests and bills of lading completely and accurately prior to submitting them to the Owner. For MassDEP Bills of Lading the Contractor shall provide the Owner's Licensed Site Professional (LSP) all information required for preparation of electronic Bills of Lading. The Contractor shall be responsible for preparation of Material Shipping Records. The Contractor shall be responsible for submitting to the Owner's LSP all information necessary for preparation of LSP opinion letters to disposal facilities and coordinating disposal documentation with all parties. The Owner's LSP and the Owner shall sign any MassDEP Bill of Lading forms where required only after the Contractor has provided the information required for preparation of electronic MassDEP forms. The Contractor shall reimburse the Owner for any and all fines associated with inaccurate, incorrect, or improperly

completed waste manifests, including fines resulting from late or untimely submittals.

3. Disclose a summary of the history of compliance for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.
4. Prior to transporting any soils or fill material to a disposal facility the Contractor shall submit a letter from the disposal facility indicating that the facility has reviewed the available data and the generator's profile of the material and the facility agrees that it meets the facility's acceptance criteria.
5. Following off-site disposal of soil or fill materials at a disposal facility the Contractor shall submit Material Shipping Record or MCP Bill of Lading load log sheets signed by the facility.
6. Following disposal of all the soil represented by a Material Shipping Record or Bill of Lading, the Contractor shall submit that Material Shipping Record "Acknowledgment of Receipt by Receiving Facility" or Contractor shall arrange for receiving facility to sign that Bill of Lading "Attestation of Disposal", as applicable, within 60 days of shipment.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide completed Bills of Lading, Material Shipping Records, manifests, certificates of disposal, weight slips and all other documentation relative to disposal, reuse, treatment or recycling of soil material.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall reuse, recycle or dispose of all excess soil resulting from excavation activities in accordance with federal, state and local regulations and these specifications. Transport shall be by a permitted and licensed waste transporter. The Contractor shall be responsible for supplying the proper manifests to be approved and signed by a representative of the Owner.

- B. Prior to disposal, it shall be the responsibility of the Contractor to maintain segregated waste stockpiles in conformance with all applicable federal, state, and local waste disposal regulations and as specified in Section 02080 - SOIL AND WASTE MANAGEMENT.
- C. The Contractor shall be responsible for preparing and keeping in proper order all waste manifests, BOLs, MSRs, and shall designate one person who shall be made available to sign all transportation documentation. The Contractor shall be responsible for obtaining the generator's and receiving facilities' signature and all other signatures required for the proper completion of the manifests. The Contractor shall allow a minimum of five working days from the date of the submittal for any documents requiring the signature of the Owner and/or the LSP. The manifests shall document the handling of the waste from the time it is generated until the time it is properly disposed.
- D. The Contractor shall be responsible for obtaining all federal, state, and local permits and variances to allow transport of materials on public roadways.
- E. The Contractor shall be responsible to inform the Owner if hazardous waste disposal will not be performed within 60 days of hazardous waste characterization. This notification shall take place a minimum of 30 days prior to the 60-day deadline. No hazardous waste stockpiled at the site shall remain on site more than 60 days after it is characterized.
- F. The Contractor shall obtain certificates of disposal for all disposed waste.
- G. Transportation of solid wastes shall be in compliance with any relevant federal, state and local special waste requirements, and such as to assure that waste material is not released during transit.

3.2 SOLID WASTES

- A. Transporters of solid wastes that include, but are not limited to, contaminated soil/fill (including oil-contaminated soil/fill), construction and demolition debris, non-hazardous laboratory wastes, bottles, tires, metal parts, tree stumps, brush, and grass cuttings will utilize truck or dumpsters specifically designed to ensure that material, dust, or liquid is not released in transit. No truck shall be allowed to exit the site until all free liquids are drained from soil/fill being transported off-site. Material shall be covered at all times. The vehicle in which the waste is transported shall be driven directly to the intended destination without any stops or detours in between, except those necessary in response to road conditions, vehicle service needs, or emergencies. Discharge or release of material during transport shall be immediately reported to the Owner. Transporters shall clean up any discharge that occurs in transit, at the Contractor's expense.
- B. The disposal site shall be permitted by the state in which the facility is located to receive and dispose of solid waste, and shall be approved for use by the

Owner. The Contractor shall provide copies of the disposal facility's operating permit.

- C. Manifesting of solid waste shall be required and shall include vehicle identification; date of loading and disposal; tonnage, as measured at the disposal site; and signature of the Owner and/or its representative, transporter, and disposal facility's representative. Transportation of the wastes shall be accompanied by the appropriate manifests as required in the Code of Massachusetts Regulations (CMR) 310 CMR 40.0030, such as a Material Shipping Record or by a Uniform Hazardous Waste Manifest. The original shall be returned to the Owner, and/or their representative, within ten (10) working days of disposal.
- D. All solid waste shall be disposed in accordance with all applicable federal, state and local laws and regulations, as well as all other state laws through which the waste material is being transported.
- E. Transport of soils in which asbestos containing materials have come to be located shall be transported and disposed of in accordance with Section 02080 – SOIL AND WASTE MANAGEMENT and all applicable local, state and federal laws and regulations.

3.3 HAZARDOUS WASTES

- A. Transporters of hazardous wastes shall be in conformance with Code of Federal Regulations (CFR) 40 CFR, Part 171, all other federal laws and regulations, 310 CMR 30.400, and all other state laws through whose boundaries the waste material is being transported. The transporter shall provide copies of its EPA identification number, Massachusetts transporter's license, and proof of driver training in transporting hazardous waste.
- B. The disposal site shall be in conformance with 40 CFR, Part 264 and relevant laws of the state in which the facility is located. The Contractor shall provide copies of the disposal facility's EPA and state treatment and disposal permit.
- C. Manifesting of hazardous wastes shall be in conformance with 40 CFR, Part 264, Subpart E, 310 CMR 30.310 and 310 CMR 30.405.

3.4 DUST CONTROL

- A. Dust control measures shall be implemented during loading and transport of waste material from the site in accordance with the contractor's Dust Control Plan, as specified in Section 02080 – SOIL AND WASTE MANAGEMENT.

PART 4 – COMPENSATION

4.1 GENERAL

- A. Measurement and Payment for Transportation and Disposal of Soil and Fill items shall be as listed below. Payment for lump sum items and unit price items shall constitute full payment for all fees, labor, materials and equipment required to perform the work; all supervision; all overhead items including but not limited to bonds, insurance, labor burden, profit, protections and cautions are also included. Payment for unit price items shall be as detailed below and as measured by the Engineer. The Contractor shall be made aware that for Transportation and Disposal of Soil and Fill unit price items, the actual quantities encountered may vary significantly from the estimated quantities presented in the Bid Schedule. The estimated quantities presented have been established for bid comparison purposes only and do not represent a warranty of work. In the event of quantity changes, the unit bid price shall be the basis for compensation or credit.
- B. The following unit price payment items are for transporting and disposing excess soils and fill material encountered during the course of this contract. Management of soil/fill shall be in accordance with applicable regulations and technical specifications. The costs associated with disposing excess soil and fill other than allowed for in the following payment items shall be incorporated into the contractor's Base Bid Item 2080.1- Soil Management. A minimum unit bid cost has been established for each unit price bid item. The Contractor is required to review the minimum unit bid price and increase it within the bid table as the Contractor sees fit. The Contractor is not obligated to accept the minimum unit price indicated but shall not be able to reduce it. The minimum unit price established may be below actual market cost and is provided to avoid unbalanced bidding. The Contractor is required to review the minimum unit price presented and develop a competitive unit price for inclusion in the bid table. Any bids received which do not present a unit price entered by the Contractor within the bid table or present a unit price below the minimum unit price established, shall be rejected as non-responsive.
- C. The quantity of any pay item expressed as tons shall be subject to verification by the Engineer by calculation of the in-place weight using the horizontal and vertical trench pay limits defined in the Contract Drawings, a bulking factor applicable to the soil type, and in place density tests supplied from a certified soil testing lab, hired by the Contractor. Should the quantity presented by the Contractor on the certified weight slips, be significantly more (i.e. greater than 10%) than that as determined through the Engineer's calculations, the Contractor shall be compensated for the lesser tonnage. The Contractor shall receive no additional compensation for material removed outside of the approved pay limits. The Owner, and/or their representative, shall have the right to perform independent weighing of trucks. No payments will be made in cases of incomplete documentation of disposal. Payment will be at the unit price established set in the FORMS FOR GENERAL BID.
- D. The quantity of any pay item expressed as cubic yards shall be as measured by the Engineer, per the horizontal and vertical trench pay widths established in the Drawings, and confirmed through field engineering surveys performed by the Contractor. The Contractor shall receive no additional compensation

for material removed outside of the approved pay limits. Payment will be at the unit price established set in the FORMS FOR GENERAL BID.

- E. Preference is to be given to the most cost effective option of either reusing excavated material on-site as fill or disposal off-site.

02095.1 OHM Disposal of Soil- Less than RCS-1 (Class A-1 and A-2):

Measurement for Payment for Disposal of Soil –<RCS-1 (Class A-1 and A-2) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate Lading or Material Shipping Record form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as directed by the Engineer shall be done at the Contractor’s expense, at no additional cost to the Owner.

It is the intent that payment under this item shall be limited to soil/fill excavated on site, which is non-remediation waste as defined in the Massachusetts Contingency Plan and has been determined through testing to be suitable for general reuse as fill. This pay item shall apply to material which is suitable for re-use off-site as fill and shall include the costs associated with characterizing the destination site as necessary to assess background conditions.

It is the intent that, if the analytical characteristics of the material meet the criteria for this classification, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a reuse location that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Less than RCS-1 (Class A-1 and A-2) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Less than RCS-1 (Class A-1 and A-2). The work includes, but is not limited to; handle, load, transport, and dispose at a facility in accordance with the facilities acceptance criteria, all soil/fill which is unsuitable for on-site reuse and is defined as less than RCS-1; placing, grading and compacting the material at the disposal site as specified; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.2 – OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1)

METHOD OF MEASUREMENT:

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Measurement for Payment for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill which is unsuitable for on-site reuse and is defined as a non-hazardous solid waste suitable for reuse as daily cover at an unlined Massachusetts Landfill (as defined in MassDEP Policy #COMM-97-001); placing, grading and compacting the material at the disposal site as specified; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.3 – OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at

the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill which is unsuitable for on-site reuse or disposal at one of the lesser unit price options and is defined as a non-hazardous solid waste suitable for reuse as daily cover at a lined Massachusetts Landfill (as defined in MassDEP Policy #COMM-97-001); placing, grading and compacting the material at the disposal facility as specified; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2 or B-1 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.4 – OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) shall be based on the per ton price complete for this item in the proposal.

Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, asphalt batching plant, all soil/fill which is suitable for recycling at an asphalt batching plant (as defined in MassDEP Policy WSC-94-400) and which is unsuitable for on-site reuse or off-site reuse or as daily cover at a Massachusetts Landfill; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, or B-2 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.5 – OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste Thermal Treatment (Class B-4). The work includes, but is not limited to; handle, load, transport, and dispose soil/fill which is unsuitable for in-state recycling, on-site reuse, off-site reuse or as daily cover at a Massachusetts Landfill, at an appropriately permitted out-of-state, recycling or thermal treatment facility; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, or B-3 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement

imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.6 – OHM - Disposal of Soil – Non-Hazardous Solid Waste (Class B-5)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste (Class B-5) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor’s expense, at no additional cost to the Owner.

It is the intent, that if the analytical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste (Class B-5) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil – Non-Hazardous Solid Waste (Class B-5). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill (including embedded debris or foreign objects), which is not hazardous waste but is unsuitable for other non-hazardous recycling and disposal options listed above; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, or B-4 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.7 – OHM - Disposal of Soil with Debris – Non-Hazardous Solid Waste (Class B-6)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil Debris – Non-Hazardous Solid Waste Disposal (Class B-6) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid

for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

It is the intent, that if the analytical and physical characteristics of the material meet the criteria for this classification, but not that of lower levels of contamination, that the disposal be paid for at the unit price bid for this item. The Contractor shall use due diligence to identify a disposal facility that meets the criteria identified in Section 02080 (Item 1.4 Definitions). Payment for disposal of the material at a higher unit price item shall be made only if the Contractor provides written certification that a reuse location that meets the criteria is not available; and only if approved in writing by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil with Debris– Non-Hazardous Solid Waste Disposal (Class B-6) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Soil with Debris– Non-Hazardous Solid Waste Disposal (Class B-6). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility, all soil/fill (including embedded debris or foreign objects), which is not hazardous waste but is unsuitable for other non-hazardous recycling and disposal options listed above; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, or B-4 or B-5 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.8 – OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Disposal of Soil as Non-Hazardous Waste (Class C-1)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Dispose of as Non-Hazardous (Class C-1) shall be on the basis of tons of waste actually treated and disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Soil – Treatment of RCRA Characteristically Hazardous Soil to De-Characterize and Dispose of as Non-Hazardous (Class C-1) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for

OHM - Disposal of Soil – Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (Class C-1). The work includes, but is not limited to: treat on-site all soil/fill determined through testing to be characteristically hazardous waste due to lead toxicity to render the material characteristically non-hazardous; handle, load, transport, and dispose at an appropriately permitted facility, all soil/fill determined through testing to be hazardous waste due to lead toxicity which has been treated on-site and subsequently determined through laboratory testing to be characteristically non-hazardous; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, B-4, B-5, or B-6 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.9 – OHM - Disposal of RCRA Hazardous Waste (Class C-2)

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of RCRA Hazardous Waste (Class C-2) shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of RCRA Hazardous Waste (Class C-2) shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of RCRA Hazardous Waste (Class C-2). The work includes, but is not limited to; handle, load, transport and dispose at an approved RCRA-permitted hazardous waste facility all soil and fill determined through testing to be hazardous waste; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which can be disposed of at the A-1, A-2, B-1, B-2, B-3, B-4, B-5, B-6 or C-1 levels; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; and disposal of construction debris.

2095.10 - OHM - Disposal of Special Waste

METHOD OF MEASUREMENT:

Measurement for Payment for OHM - Disposal of Special Waste shall be on the basis of tons of waste actually disposed, as measured at the disposal facility by certified scale, and documented on the return manifest or certified weight slip and accompanied by the

appropriate MassDEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser tonnage, as further described above, paid for. Material excavated outside of the pay limits indicated elsewhere in the Contract Documents or as required by the Engineer shall be done at the Contractor's expense, at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for OHM - Disposal of Special Waste shall be based on the per ton price complete for this item in the proposal. Under the per ton price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for OHM - Disposal of Special Waste. The work includes, but is not limited to; handle, load, haul, and dispose all soil and fill material defined as asbestos-containing waste; procuring all health and safety items; compliance with local ordinances and preparing appropriate waste manifests; and all fees, permits, and taxes.

EXCLUSIONS:

The following items are not included for payment under this item; transportation and disposal of soil and fill material which does not meet the definition of soil of this classification; reuse of soil and fill material on site as backfill; furnishing and installing replacement imported backfill; staging; disposal of bituminous concrete; disposal of construction debris; segregate, handle, stage, test, and characterize all soil and fill material suspected of containing asbestos-containing materials; protecting the excavation from accidental entry; and controlling windblown litter and the spread of airborne contaminants.

END OF SECTION 02095

SECTION 02100

SITE PREPARATION AND TREE PRUNING

2100.1	TREE PROTECTION AND MAINTENANCE	LUMP SUM
2100.2	TREE REMOVAL	EACH
2100.3	STUMP REMOVAL	EACH
2100.4	BACK OF SIDEWALK PROPERTY TREE REMOVAL	EACH
2100.5	PRIVATE SHRUB REMOVAL	EACH

PART 1 – GENERAL

1.1 SUMMARY

- A. The work to be done under this section consists of instituting and maintaining positive measures to protect and maintain public and private shade trees within and adjacent to the limits of work as detailed on the Drawings and as directed by the Owner's Representative.
- B. This work includes proactive measures prior to, during and after construction to ensure the short- and long-term health of existing trees to remain on site and to prevent damage due to construction operations.
- C. Tree Protection should be assumed for existing trees to remain within the project limit of work where proposed construction activity is to occur beneath the canopy and within the drip lines of existing trees to remain. Tree protection shall remain in place throughout the duration of the construction project but may be temporarily relocated to allow for work in select areas in close proximity to the trees to occur as approved by the Owner's Representative. Tree protection shall be promptly restored following work operations. The measures described herein are anticipated to be required and will be verified based on actual field conditions. Provisions under this item include: tree protection fencing measures to minimize disturbance to existing trees and their root systems; canopy and root system review and evaluation; canopy and root pruning in areas of proposed disturbance; and post-pruning care including mulching and watering of root zones.
- D. Work in this section includes the following:
 - 1. Tree Protection
 - 2. Preparation of a Tree Protection and Maintenance Plan and Work Schedule
 - 3. Hiring of a Certified Arborist for the Duration of the Construction Activity
 - 4. Developing a Plant Health Care Program
 - 5. Tree Pruning
 - 6. Tree Removal
 - 7. Stump Removal

8. Subsurface Root Exploration

1.2 RELATED WORK

- A. Division 1 – General Requirements
- B. Section 01570 – Maintenance and Protection of Traffic
- C. Section 02210 – Earth Excavation, Backfill, Fill and Grading
- D. Section 02524 - Curbs, Walks and Driveways
- E. Section 02900 – Landscaping

1.3 GENERAL REQUIREMENTS

- A. Tree, stump and shrub removal: Remove City and private trees as specifically designated on the plans, as listed in this specification (see attached list of Urban Forestry work orders to be executed as part of this project) and as directed by the Owner's Representative. Trees to be removed shall be verified with the Owner's Representative prior to undertaking any work under this Item. Trees shall be completely removed, including stumps, and legally disposed of offsite. Existing tree pits shall be restored to existing conditions or as per the Contract Documents.
- B. Pruning: The Contractor shall prune City and private trees within the limit of work under the direction of a Massachusetts Certified Arborist and only as directed by Owner's Representative. Provide protection of existing trees and vegetation not designated for removal within the limits of work and along truck routes outside the limit of work. Temporarily stump or stockpile as applicable topsoil, shrubs, and vegetation within the limits of work that will interfere with construction and as required.
- C. Conduct site clearing and pruning operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities only as directed by the Owner's Representative. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Owner's Representative. Pruning operations shall include the specific pruning requests identified in this specification (see attached list of Urban Forestry work orders to be executed as part of this project).
- D. Contractor is required to comply with the City of Cambridge Department of Public Works, Division of Urban Forestry regulation “Tree Protection during Construction”. This regulation contains specific measures and remedies should the Contractor fail to abide the City’s requirements.
- E. Public trees are protected by Massachusetts State Law, Chapter 87. Section 12 states that a fine of up to five hundred dollars, (\$500.00) per incident of

damage to public shade trees can be levied. Each branch broken or improperly pruned, each improper wounding of the trunks of the trees, and each root improperly pruned shall constitute an infraction. Section 12 further provides that anyone who negligently or willfully damages a tree will be liable to the City for all damages.

- F. The Contractor shall take the utmost care to avoid unauthorized, unnecessary or improper wounding of City or private shade trees. Prior to construction, the Contractor shall provide a Tree Protection and Maintenance Plan and Work Schedule. A Massachusetts or International Certified Arborist shall be sub-contracted by the Contractor to provide a protection and maintenance plan and perform specified work. All plans and schedules shall be subject to review and approval by the City Tree Warden. Infraction of Massachusetts State Law Chapter 87 or failure to provide a protection plan and work schedule will result in fines or the immediate cancellation of the contract.
- G. The Contractor shall engage a board certified arborist with a **minimum of five (5) years of experience** including experience with supersonic air tools such as the “airspade” for the project.
- H. The work shall consist of the provision of all labor, materials, equipment, and transportation required to complete the pruning as required by the Owner's Representative in strict accordance with the conditions and specifications of these Contract Documents. The work shall include, but is not necessarily limited to, the following:
 - 1. Attending initial site visit and assessment with City representatives
 - 2. Securing necessary permits and approvals before commencement of work
 - 3. Posting work areas for parking restrictions
 - 4. Securing police details, if necessary
 - 5. Marking work zones for traffic and pedestrian control
 - 6. Providing a schedule of work for City review and approval
 - 7. Meeting with City staff on a periodic basis (up to 5 meetings)
 - 8. Visual assessment of each tree to be pruned including the assessment of the need for airspading and/or tree root pruning
 - 9. Determination of pruning objectives
 - 10. Making pruning cuts and wound care
 - 11. Wood waste and debris consolidation & disposal
 - 12. Site cleanup

1.4 QUALITY ASSURANCE

- A. Tree Protection measures to be performed by Massachusetts Certified Arborist with a minimum of five years of experience and as reviewed and approved by the Owner's Representative and City Tree Warden.

1.5 SUBMITTALS

- A. Certification: Submit the Certification of the arborist to be performing the work.
- B. Tree Protection and Maintenance Plan, Plant Health Care Program and Work Schedule: submit for review and approval by the Owner's Representative and City Tree Warden at least two (2) weeks prior to beginning initial work on a project street.
- C. Product Data: Submit most recent printed information from manufacturers for:
 - 1. Tree Watering Bags (if required)
 - 2. Slow Release Fertilizer
- D. Samples: Submit samples of:
 - 1. Tree Trunk Wrapping
 - 2. Tree Protection Fencing
 - 3. Wood Chips
 - 4. Tree Watering Bags
- E. Shop Drawing/ Field Mock-Up: Submit for review and approval by the Owner's Representative and City Tree Warden:
 - 1. Tree Box. Owner's Representative to approve first tree box constructed prior to Contractor completing remaining boxes.

PART 2 – PRODUCTS

2.1 TREE BOX

- A. Tree Box shall be constructed from 2 in. x 4 in. lumber creating a box around the border of the tree pit with 2 in. x 4 in. lumber standing straight up at the corners and wrapped with orange snow fence. Fasteners as per detail.

2.2 TREE TRUNK WRAPPING PROTECTION LUMBER

- A. Tree Trunk Wrapping Protection Lumber shall consist of 2 in. x 4 in. and 8 ft. height lumber wired together in close spacing with 16 gauge galvanized steel wire to form a protective enclosure around tree trunks.

2.3 TREE PROTECTION FENCING

- A. Tree Protection Fencing shall be new 4 ft. height orange snow fence.
- B. Stakes shall be 2” diameter black painted galvanized steel pipe or 2in. x 4in. stained lumber stock as approved by the Owner's Representative.

2.4 WOOD CHIPS

- A. Wood Chips shall conform to provisions of Wood Chip Mulch under Materials Section M6.04.3 of the MassDOT Standard Specifications.

2.5 WATER

- A. Water shall be furnished by Contractor, suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for work shall be furnished by Contractor.

2.6 TREE WATERING BAGS

- A. Tree Watering Bags shall be 20 gallon, slow-release drip irrigation bags, made of UV treated polyethylene. Color: green.

PART 3 – EXECUTION

3.1 GENERAL

- A. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions that interfere with installation of new construction and as required. Removal includes digging out stumps in their entirety and grubbing roots to at least 2.5 feet below existing grades shown on the Drawings.
- B. Prior to start of subsurface work, Contractor shall conduct project-wide pruning of existing trees and shrubs within the right-of-way.
- C. A list of additional trees requested to be removed or pruned by the City as part of this project are attached to the end of this specification section. This work is required to be completed at the beginning of construction operations (Fall 2013). Associated removal of stumps can be postponed to coordinate with the work on individual streets.

3.2 SPECIAL REQUIREMENTS

- A. The Contractor is required to conform to the requirements of the City of Cambridge Department of Public Works, Division of Urban Forestry regulation “Tree Protection During Construction”. This regulation contains specific measures and remedies should the Contractor fail to abide the City’s requirements.
- B. For definitions and pruning standards, the Contractor is required to adhere to the requirements of ANSI A300, American National Standard for Tree Care Operations “Tree, Shrub and Other Woody Plant Maintenance Standard Practices”.

3.3 TREE, STUMP AND SHRUB REMOVAL

- A. Work to be done under this item shall conform to the relevant provisions of Section 101 Clearing and Grubbing of the MassDOT Standard Specifications.
- B. Trees to be removed shall be verified with the Owner's Representative prior to undertaking any work under this Item. Trees shall be completely removed, including stumps, and legally disposed of offsite. Existing tree pits shall be restored as sidewalk under the appropriate sidewalk item.

3.4 SITE REVIEW OF EVALUATION OF TREES AND POTENTIAL CONSTRUCTION RELATED IMPACTS TO ROOT SYSTEMS

- A. Prior to mobilization and construction operations, Contractor, Arborist, Owner's Representative and City Tree Warden shall conduct a site review of the existing trees to remain in relation to proposed limits of construction operations, confirm the limits of tree protection fencing, and confirm which trees are to receive other types of Tree Protection including those designated as "Special Mature Trees". Contractor to document the trees and strategy to receive type of Tree Protection and submit for Owner's Representative's approval.

3.5 PROTECTION OF EXISTING TREES AND IMPROVEMENTS

- A. Provide protection necessary to prevent damage to existing trees and improvements indicated to remain in place inside or outside of the limit of work. Existing trees and shrubbery to remain shall be protected from injury. Except as otherwise approved, cutting and trimming of existing tree limbs and roots will not be permitted. Existing trees to remain which can potentially be damaged by construction operations shall be protected. Trees having a caliper under 20" dbh shall be wrapped with tree protection lumber. "Special Mature Trees", those trees with a caliper over 20" dbh, shall be wrapped with tree protection lumber and protected with a tree box. Protection shall be maintained until completion of the work of the Contractor. Tree protection requirements are described in City of Cambridge Department of Public Works, Division of Urban Forestry regulation "Tree Protection During Construction".
- B. Protect trees and improvements on adjoining properties and within City right-of-way. Restore improvements damaged by Contractor's clearing and construction activities to their original condition, at no additional expense to the City. Remove and replace trees damaged by Contractor's clearing and construction activities at no additional expense to the City.
- C. Protect existing trees and other vegetation indicated to remain in place or outside of the clearing/grading limit lines.

3.6 TREE PROTECTION FENCING

- A. Contractor shall erect the tree protection fence before site preparation or other construction activity commences. For each tree to be protected, set posts and fencing at minimum to the limit of the existing non-paved area, i.e. existing tree pit opening, and to the drip line in cases where pedestrian and vehicular movements will not conflict with an expanded fence location. Individual tree protection fencing, trunk protection, branch protection, and wood chips shall be determined on a case by case basis at the start of the project and shall be maintained throughout the duration of the contract until removal is approved by the Owner's Representative.
- B. During the course of the project, adjustments or temporary relocations to the fence locations might be required to facilitate the work. Adjustments shall be made at no additional cost to the City.
- C. Erect the protective fence so that it is securely in place and resistant to seasonal climatic forces, adjacent pedestrian movement, and work operations to ensure root and tree protection.
- D. Periodically inspect, repair and maintain protective fences during the course of construction operations. During periods of construction stoppages, including but not limited to delays and over-wintering, periodically inspect, repair and maintain protective fences. Of particular concern is compaction by vehicles once the existing pavement has been removed, exposing roots to damage and by drying out.
- E. Owner's Representative reserves the right to require Contractor to provide additional or more secure tree protection devices if it is determined that the existing trees are not being properly protected or if the vegetation is threatened with damage through the construction operations.
- F. Protect existing trees and other vegetation to remain in place. Do not burn, cut, break, skin, or bruise trunk, roots, or branches. Do not fasten ropes, cables, or guys to any existing trees unless specifically authorized by the Owner's Representative.
- G. If the Owner's Representative determines that trees are not being protected to the standards herein, Owner's Representative may order construction activity to stop immediately and to remain stopped until the non-compliant condition or practice is corrected. The Contractor shall comply with this provision at no additional cost to the City. This provision in no way affects the Contractor's obligation to complete the work of this contract by the date specified.

3.7 TEMPORARY ACCESS

- A. Temporary access within plant protection areas is permitted to perform construction operations as approved by the Owner's Representative. Work

within tree protection areas shall be performed by hand or with small equipment that will not damage or threaten damage to trees. Restore tree protection at the end of each day's operation.

3.8 TREE PROTECTION AND AIR SPADING OF ROOTS FOR SPECIAL MATURE TREES

- A. The Contractor shall stake out the following in relation to "Existing mature trees" as identified as being greater than 20" dbh or as identified in the field by the City Arborist at the start of the project. This should be done prior to initiating excavation and should be reviewed together in the field by the City's representatives, the Contractor, Contractor's arborist, and Owner's Representative. This includes:
 - 1. limits of utility trenching
 - 2. limits of sidewalks and proposed tree pit openings
 - 3. limits of proposed construction fences,
 - 4. alignment of proposed limits of excavation.
- B. After areas of potential negative impact are reviewed and confirmed in the field, the Contractor's arborist shall perform subsurface root exploration and evaluate root distribution in the area of the final cut lines.
- C. As a guideline, the minimum final cut line distance from trunk of tree shall be established by taking the tree's diameter at breast height in inches and converting it to feet, (For example, 12" caliper tree translates into a 12' offset from the edge of the trunk to the final cut line.) Site constraints may dictate that the final cut line is closer to the trunk than guidelines will allow. Do not perform subsurface exploration near the trunk or within the drip line without authorization from the Owner's Representative.
- D. The Contractor's arborist shall perform subsurface exploration in areas of negative impact adjacent to the final cut line using an air spade to cut windows in the soil to a depth of 10" or greater to expose the root systems without damaging them.
- E. Based on the proposed alignment of the new utilities, pavement, curbs, formwork, etc. in relation to "Existing mature trees" the Contractor's arborist with the Owner's Representative's review and approval, will define the final cut lines depending on the density and distribution of the root systems. The final cut line will be created by the supersonic air tool such as "airspade".
- F. The Contractor's arborist shall redirect root systems within the final cut line area and shall prune roots that extend beyond the final cut line with pruning tools. The Contractor and arborist shall minimize exposure of tree root systems during the exploration and pruning/construction activities over exposed roots, support edge of excavation and mulch to a depth approved by the Owner's Representative. The Contractor shall saturate burlap and mulch with water and

maintain the burlap in a damp condition during daylight hours as to not allow roots to dry out. If tree roots will be exposed for a period of time longer than 1 week, the contractor shall install 2" depth of wood chip mulch.

- G. Once final cuts are completed by the Contractor's arborist with airspade and pruning tools, no mechanical excavation shall be allowed beyond the final cut line around the existing tree to remain.
- H. The Contractor shall install forms for sidewalks or install curbs, etc. in locations shown on the Drawings at the limits of excavation. If possible existing tree roots to remain can be extended below pavement areas or planting surfaces, or within pavement sand based structural soils or other similar landscape zones that are not in conflict with the final pavements. Planting soils shall be hand placed over these areas as shown on drawings and as described in specifications.

3.9 GENERAL HORTICULTURAL TREE AND ROOT RELATIONSHIPS

- A. The majority of a tree's roots are located in the upper few inches of topsoil. For this reason, trees are vulnerable to immediate and long-term damage. Immediate damage to roots is caused by grading, use of vehicles and tools, and excess pedestrian traffic above the roots. Long-term damage is caused by the compaction of the soil above the roots by use of vehicles, storage of materials, and excess pedestrian traffic.
- B. Protection of a tree therefore includes the protection of the roots of the tree as well as its trunk, branches, and leaves. Roots are best protected by fencing off as large an area as possible around each tree, so that no driving, parking, walking, or storage of materials takes place where it may cause damage.
- C. The roots of a tree often extend far into the surrounding landscape, including areas well beyond the outer perimeter of the tree's canopy / drip line. For this reason, operations should be confined to the smallest possible area.
- D. As a practical minimum, however, every effort shall be made to protect the area beneath the canopy of the tree, also known as the area inside the "drip line." This area is sometimes referred to as the "root zone."
- E. Soil is most vulnerable to compaction, and roots to damage, when the soil is wet.

3.10 ROOT PROTECTION

- A. Roots that cannot be avoided during construction for all other trees to remain shall be carefully and cleanly cut. Only hand methods for grubbing roots will be accepted inside drip lines of trees to be left standing. All pruning of any roots greater than 2" must be completed under the supervision of the City Arborist. Root pruning shall include application of root treatment or fertilizer

as required. In order to minimize impacts to roots, Contractor shall uncover roots with air spade for all Special Mature Trees as identified under Section 3.8 of this specification. Additionally, the City Arborist may determine that certain significant roots of trees under 20" in diameter may also require the use of an air spade.

- B. Trucks and heavy equipment shall not pass over or park on roots of public shade trees; nor shall construction materials, debris, or excavated material be stored within drip line of trees or within tree pits. For occasional or one time access over roots, ½-inch plywood overlapped may be used. Permeable materials such as gravel or wood chips shall be placed over root systems of trees which are not covered by hardscape and over which trucks and heavy equipment must travel during construction operations, when such travel is unavoidable, to prevent soil compaction and root damage. Material shall be replaced as needed.
- C. During sidewalk construction adjacent to trees, suitable soil shall be maintained within tree wells. Moist soil or mulch shall also be maintained around surface roots outside of tree wells which may become exposed during construction. Such covering shall be placed as soon as possible after roots are exposed. If roots are going to be exposed for more than one hour, cover roots with damp burlap. Burlap shall be kept moist until most soil and mulch can be used for permanent cover.
- D. Tunneling shall be the preferred method of excavation adjacent to tree roots to avoid root pruning. If root pruning is unavoidable, a certified arborist shall be onsite to execute or oversee the operation with sufficiently sharpened hand tools and in such a fashion as to have minimum negative impact on tree health and safety.

3.11 EXCAVATION WITHIN DRIP LINE

- A. Where excavation for new construction is required within drip line of trees, tie branches out of the way, hand clear and excavate to minimize damage to root systems and place wood chips to a depth of six inches (6") on the ground to protect the root systems.
- B. Use narrow-tine spading forks and comb soil to expose roots. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits to bend and relocate them without breaking. No roots greater than two (2) inches in diameter shall be cut from trees to remain without prior approval of the Owner's Representative. Provide protection for roots over one inch (1") diameter cut during construction operations. Prune roots that are either cut or broken with a smooth, clean cut.

3.12 ROOT PRUNING

- A. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of structures. Cut roots with sharp pruning instruments; do not break or chop; cutting of roots with machinery is expressly prohibited. When roots that must be cut are encountered, work shall cease until roots have been properly cut.

3.13 ROOT SYSTEM EXPOSURE AND SUPPORT

- A. Provide saturated burlap or temporary earth to cover tree roots exposed by construction. Do not allow exposed roots to dry out before placing permanent backfill. Water and maintain roots in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.14 PRUNING SAFETY STANDARDS

- A. Tree pruning and airspading shall be performed only by certified arborists or arborist trainees who, through related training or on-the-job experience, or both, are familiar with the practices and hazards of arboriculture and the equipment used in such operations.
- B. The Contractor's certified arborist must be present at all times while tree pruning is performed.
- C. Tree pruning operations shall comply with the American National Standard for Tree Care Operations—Safety Requirements (ANSI Z133.1), as approved by the American National Standards Institute, and published by the National Arborists Association. Operations shall also comply with applicable Occupational Health and Safety Administration (OSHA) standards.

3.15 PRUNING OBJECTIVES

The pruning operation shall focus on the following types of pruning:

- A. **Cleaning.** Cleaning shall consist of selective pruning to remove one or more of the following parts—dead, diseased, and/or broken branches. All deadwood that is two (2) inches or greater in diameter shall be removed. Branches with splits, large cavities or any defect that may result in failure shall be reduced, or removed to the trunk if reduction is not feasible.
- B. **Thinning.** Thinning shall consist of selective pruning to reduce density of live branches. Thinning shall result in an even distribution of branches on individual limbs and throughout the crown.
- C. **Raising.** Raising shall consist of selective pruning to provide vertical clearance. The intent of crown raising for this project will be the removal of all branches extending lower than fourteen (14) feet above a public roadway and eight (8) feet above a public sidewalk. This includes trees endangered by traffic re-

routing as the result of construction operations, as well as trees over existing roadways and sidewalks which do not presently meet these height requirements. However, the level of pruning of each tree will be determined at the site walk with the Contractor, Contractor's arborist, Owner's Representative and City arborist. Additionally, any cuts to lateral branches over 4" as well as any questionable cuts will require the approval of the City arborist.

- D. Reducing. Reduction shall consist of selective pruning to decrease height and/or spread. Consideration shall be given to the ability of a tree species to tolerate this type of pruning. All branches obstructing park signs, street signs, traffic signs, traffic lights, and park or street lighting shall be removed. Branches shall be pruned away from all houses and buildings a minimum of five (5) feet, or more if appropriate to the tree shape and structure.
- E. Specialty (Young) Trees. For young yet established trees, branches that are rubbing or poorly attached shall be removed. A central leader or leaders as appropriate to the species should be developed. A strong, properly spaced scaffold branch structure should be selected. For newly planted trees, pruning shall be limited to cleaning.
 - 1. During the First Three Years After Planting: A central leader or leaders (as most appropriate for the species and specimen) shall be developed by removing competing leaders and removing vigorously growing branches that compete with the selected leader(s). A strong scaffold branch structure shall be developed by selecting the primary scaffold branches. To improve the scaffold structure, branches that are crossing, have included bark or interfere with the scaffold branches shall be removed. Scaffold branches shall be properly spaced. For deciduous shade trees that will reach or exceed 40 ft (12.2 m) in height at maturity, the recommended spacing is approximately 18 in (457.2 mm). For smaller species, 6 to 8 in. (152.4 mm to 203.2 mm) would be adequate.
 - 2. Between Four and Six Years After Planting: The development of a good, structurally sound scaffold branch system should be continued by selective thinning of or on branches and removing dead, interfering, split and broken branches. Large-growing branches with narrow angles of attachment shall be removed from the trunk and canopy. The crown shall be raised for pedestrian clearance and vehicular clearance.

3.16 PRUNING PRACTICES

- A. The Contractor's certified arborist shall visually inspect each tree before commencing work.

- B. If a condition is observed requiring attention, the condition should be reported to the City within 24 hours. Such conditions may include structural weakness, rot or decay that cannot be corrected by cleaning, and dead trees.
- C. Equipment and work practices that damage living tissue and bark beyond the scope of work shall be avoided. Climbing spurs shall not be used when climbing and pruning trees. Spurs may be used to reach an injured climber or when removing a tree.
- D. Pruning tools (e.g. chain saws, pole saws, hand saws, pole pruners, etc.) shall be sharp and regularly sharpened and maintained throughout the Contract Term.
- E. Not more than 25% of the foliage of an individual tree should be removed within an annual growing season. The percentage and distribution of foliage to be removed shall vary according to the tree species, age, health and site, in accordance with the types of pruning identified above.
- F. Not more than 25% of the foliage of a branch or limb shall be removed when it is cut back to a lateral. The lateral shall be large enough to assume apical dominance.
- G. Heading shall be permitted only by the expressed permission of the City, when needed to reach a defined objective.
- H. Topping and lion tailing shall be considered unacceptable pruning practices.
- I. All pruning cuts shall be made in accordance with the American National Standard for Tree Care Operations—Standard Practices (ANSI A300 Part 1), as approved by the American National Standards Institute, and published by the National Arborists Association (revised 2001). All terminology included in these Technical Specifications shall be defined by ANSI A300 Part 1.
- J. When tracing wounds, only loose, damaged tissue should be removed. No other wound treatments shall be used.
- K. On mature trees the maximum diameter of any undesirable branch (dead, broken, rubbing, structurally unsound) that may be left shall not exceed 2 in. (50.8 mm).
- L. Pruning cuts shall be clean and smooth with the bark at the edge of the cut firmly attached to the wood.
- M. Large or heavy branches that cannot be thrown clear shall be lowered on ropes to present injury to the tree and other property.
- N. Rope injury to trees from leading out heavy wood shall be avoided by using a cambium guard or installing a false crotch.

3.17 UTILITY CONSTRUCTION NEAR TREES

- A. Route utilities away from existing trees. Review re-routing with Owner's Representative. Do not proceed without written direction. Minimize the cutting of tree roots, and when cutting is unavoidable, cut cleanly with a power saw and not an excavating machine.

3.18 ACTIVITIES PROHIBITED WITHIN DRIP LINE

- A. Do not store and stockpile construction materials and/or excavated materials, park vehicles, drive vehicles, remove soils, and stockpile soils within the drip line of trees, including trees located on adjacent properties which overhang the site unless otherwise indicated in Contract Drawings. Excavation within these areas shall be subject to special care as described below in "Excavation within Drip line".

3.19 EQUIPMENT

- A. The following equipment and vehicles shall be available on-site for use. All gas-powered equipment and vehicles must be five years old or less and in good condition as determined by the Owner's Representative.
 - 1. Two (2) aerial lift trucks with an articulating boom that have a working height of not less than sixty (60) feet with Contractor's name painted on each side.
 - 2. Two (2) chipper dump trucks with a minimum capacity of nine (9) cubic yards, with Contractor's name painted on each side.
 - 3. Two (2) wood chippers with a capacity for 16" diameter limbs.
 - 4. All relevant traffic control devices as prescribed by the Manual of Uniform Traffic Control Devices (MUTCD) of the U.S. Department of Transportation.
 - 5. Supersonic air tools such as the "airspade" for use on designated trees with root conflicts as designated by Owner's Representative.

3.20 PLANT HEALTH CARE PROGRAM

- A. Prior to mobilization and construction operations, Contractor's arborist to document and submit a strategy for maintaining the health of existing trees within the project limits including strategies for watering and fertilizing as outlined below.
- B. Watering: Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
- C. Drainage: Do not permit water to stand around the base of plants within the drip line during construction operations except during that period of inundating

flooding which would, in its natural course, cover the base of trees. Provide temporary drainage where required to avoid ponding during construction operations.

- D. Fertilizing: After pruning operations are completed, fertilize trees to increase vigor with a complete, slow release nitrogen, phosphorus, potassium (1:1:1 or 2:1:1) liquid injected fertilizer. Where liquid injected fertilizer is not practical, and when approved by Owner's Representative, drill holes 6" to 10" deep and place granular fertilizer at frequent spacing.

3.21 DAMAGE DUE TO CONSTRUCTION OPERATIONS

- A. Contractor shall be responsible for the health of the existing trees in the immediate vicinity of construction. Trees damaged by construction operations which, as determined by the Owner's Representative, can be remedied by corrective pruning measures shall be addressed immediately.
- B. Owner's Representative shall engage an independent qualified Arborist to inspect the damaged trees and to make a determination on damage, sustainability, and remediation procedures.
- C. The Contractor shall strictly adhere to the independent Arborist's recommendations.
- D. Broken limbs shall be pruned according to industry standards.
- E. Wounds shall not be painted.
- F. The total cost of tree repair, including the cost of the independent Arborist, shall be borne by the Contractor.

3.22 TREE REPLACEMENT DUE TO DAMAGE

- A. If the independent Arborist determines that the damaged tree cannot be repaired and restored to full-growth status, the Contractor shall replace the damaged tree(s) and pay liquidated damages as noted below.
- B. The size of the replacement tree shall equal ½" caliper for every 1" caliper inch of the damaged tree (size of the damaged tree shall be measured, the new tree shall be based on nursery measurements). The species of the replacement tree shall be determined by the Owner's Representative and the City.
- C. In addition to providing a new tree replacement, Contractor shall pay City \$250.00 for every caliper inch of the damaged tree (the size of the damaged tree shall be as shown on the Drawings).

- D. An example of the conditions stated above: A 20" caliper tree was damaged and determined to need replacement. To remedy this situation, the Contractor would purchase and install a 10" caliper tree and pay the Owner \$5,000.
- E. The total cost of tree replacement, including the cost of the tree and stump removal and the independent Arborist, shall be borne by the Contractor.

3.23 TEMPORARY REMOVAL OF SHRUBS AND TOPSOIL

- A. Topsoil, shrubs, and vegetation to be temporarily removed shall be carefully removed from overall areas to be excavated, and over all other areas to be disturbed as a result of the Contractor's operations in the performance of the Contract work. The topsoil shall be transported and deposited in storage piles convenient to the areas which are subsequently to receive the application of topsoil, separate from other excavated materials, and in approved locations. The topsoil shall be stockpiled free of roots, stones and other undesirable material. The Contractor shall take all necessary precautions to prevent other excavated material or other objectionable material from becoming intermixed with the topsoil, either before or after the stripping and stockpiling operations. Shrubs and other vegetation shall be balled and burlaped and then transported and stored until they can be replaced after construction has been completed in that area. The shrubs and vegetation must be watered and maintained to remain healthy while being temporarily stored. Any shrubs and vegetation that do not remain healthy during storage shall be replaced by the Contractor at no additional cost to the City.

3.24 DISPOSAL OF WASTE MATERIALS

- A. Remove waste materials and unsuitable topsoil from project area and dispose of off site in a legal manner. Waste materials shall include but not be limited to timber, brush, refuse, stumps, roots, vines, debris and other objectionable matter. Removal includes raking and sweeping after completion of clearing and pruning operations.
- B. Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree, or to surrounding people and property. Where necessary, ropes or other equipment shall be used to lower large branches to the ground.
- C. All severed limbs shall be chipped, hauled away from the site, and disposed of in a legal manner. All wood waste, sawdust, leaves, and associated organic debris shall be collected from both public ways and adjacent private property, hauled away from the site, and disposed of in a legal manner.
- D. Site cleanup shall follow as closely as possible to the pruning operation.

3.25 POST-CONSTRUCTION CLEANUP

- A. After construction is complete, but prior to preparation and seeding of lawn area and planting, remove and properly dispose of the following off site: wood chips, temporary fencing, branch protection, tree boxes and trunk protection, and other materials.

PART 4 – COMPENSATION

Item 2100.1 --- Tree Protection and Maintenance

METHOD OF MEASUREMENT:

Measurement for payment for Tree Protection and Maintenance will be based on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the original Contractual construction time limit as approved by the Owner's Representative.

BASIS OF PAYMENT:

Payment for work under Tree Protection and Maintenance will be based on the Lump Sum price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to protecting trees, including tree box at Special Mature Trees; tree maintenance; root and branch pruning; furnishing, installing, maintaining, and removing drip line or tree pit fencing and/or tree wrap; covering exposed roots with moist burlap, mulch, or soil, watering trees; injecting fertilizer into trees; project-wide pruning; air spading of roots at trees; and removing, storing, maintaining and re-planting of targeted shrubs and plantings as specified or as otherwise required by the Owner's Representative or City arborist.

EXCLUSIONS AND SPECIAL NOTES:

Payment for tree removal shall not be paid for under this item and is paid for elsewhere.

Item 2100.2 --- Tree Removal

METHOD OF MEASUREMENT:

Measurement for payment for Tree Removal will be based each tree removed as required by the City Arborist.

BASIS OF PAYMENT:

Payment for work under Tree Removal will be based on the unit price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to removal and disposal of tree, tree roots, and stump; coordination with overhead electric and other utilities for the removal of the tree; and any other work incidental to the removal of the tree.

EXCLUSIONS AND SPECIAL NOTES:

Payment for tree removal on private property shall not be paid for under this item and is paid for elsewhere.

Item 2100.3 --- Stump Removal

METHOD OF MEASUREMENT:

Measurement for payment for Stump Removal will be based each stump removed as required by the City Arborist.

BASIS OF PAYMENT:

Payment for work under Stump Removal will be based on the unit price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to removal and disposal of stump and roots; coordination with overhead electric and other utilities for the removal of the tree; and any other work incidental to the removal of the stump.

EXCLUSIONS AND SPECIAL NOTES:

Payment for stump removal on private property shall not be paid for under this item.

Item 2100.4 --- Back of Sidewalk Tree Removal

METHOD OF MEASUREMENT:

Measurement for payment for Back of Sidewalk Tree Removal will be based each tree removed as indicated in the Contract Documents and as approved by the Owner's Representative.

BASIS OF PAYMENT:

Payment for work under Back of Sidewalk Tree Removal will be based on the unit price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to removal and disposal of tree, tree roots, and stump; coordination with overhead electric and other utilities for the removal of the tree; including but not limited to removal and disposal of each tree, tree stump, and associated roots; coordination with private property owner; protection of adjacent site features; and any other work incidental to the removal of the tree.

EXCLUSIONS AND SPECIAL NOTES:

Payment for tree removal on public property shall not be paid for under this item and is paid for elsewhere.

Item 2100.5 --- Private Shrub Removal

METHOD OF MEASUREMENT:

Measurement for payment for Private Shrub/Bush Removal will be based each shrub or bush removed as indicated in the Contract Documents and as approved by the Owner's Representative.

BASIS OF PAYMENT:

Payment for work under Private Shrub/Bush Removal will be based on the unit price bid for this item in the proposal and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the completion of this work as specified, including but not limited to removal and disposal of shrub and/or bush and associated

roots; coordination with private property owner; protection of adjacent site features; and any other work incidental to the removal of the shrub/plants.

EXCLUSIONS AND SPECIAL NOTES:

Shrub or bush removals within limits of public property are not paid for under this item.

END OF SECTION 02100

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SECTION 02140

DEWATERING

2140.1 TREATMENT OF CONSTRUCTION DEWATERING DAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Design, furnish, operate, maintain, and remove temporary dewatering systems to control groundwater and surface water to maintain stable, undisturbed subgrades, and allow work to be performed under dry and stable conditions and comply with permit and other regulatory requirements. Work to be done as part of dewatering includes, but is not limited to:
 - a. Lower the groundwater level within excavations to at least 12 inches below the bottom of the excavation.
 - b. Lower hydrostatic pressure.
 - c. Prevent surface water from entering the excavation during construction.
 - d. Limit settlement of utilities and adjacent structures.
 - e. Implement erosion and sedimentation control measures for disposing of discharge water.
 - f. Provide treatment system to treat all water removed from excavations, except water that is re-infiltrated to the ground on site in a manner that does not result in negative on- or off-site impacts.
 - g. Provide observation well and geotechnical implementation as specified and indicated or as otherwise required by the Engineer.

- h. Provide an Environmental Site Professional/Dewatering Specialist/Field Representative (hereinafter referred to as the Dewatering Professional) who will be responsible for dewatering, reinfiltration, treatment and discharge of dewatering flows as specified and in compliance with all applicable permits and regulations.
 - i. Common dewatering methods include, but are not limited to, sump pumping, deep wells, well points, vacuum well points or any combinations thereof.
 2. The Contractor shall be aware of groundwater under drains that may exist under all existing sanitary, storm, or combined piping. The Contractor shall identify such drains, bypass pump and dewater in accordance with the dewatering permits, and relocate and reconnect under drains upon completion of the work in the area.
 3. There are sections of unconfirmed existing piles on Bay State Road, Field Street, Fayerweather St, Saville St, and Chilton Street at locations indicated in the Contract Drawings. At these locations, the Contractor shall conduct dewatering operations so that the portions of the existing piles that are to remain in place to not dry out or become damaged due to a change in groundwater conditions.
 3. Water removed from excavations shall be reinfiltrated to the ground if feasible. If reinfiltration is not feasible, treated water shall be directly or indirectly discharged to a surface water in accordance with a National Pollutant Discharge Elimination System (NPDES) permit issued by the U.S. Environmental Protection Agency (EPA). If neither reinfiltration nor surface water discharge is feasible, treated water shall be discharged to the Massachusetts Water Resources Authority (MWRA) or local sewer system in accordance with the appropriate permit and regulations. In no case shall dewatering flows be directly or indirectly released to surface waters or storm drains prior to settling and appropriate additional treatment.
 4. Related Sections:
 - a. Section 02210: "EARTH EXCAVATION, BACKFILL, FILL, AND GRADING"
 - b. Section 02160: "TEMPORARY EXCAVATION SUPPORT SYSTEMS".

1.3 SUBMITTALS

- A. Shop Drawing: Submit the following in accordance with Section 01330 – SUBMITTALS:

1. Qualification of the both the Contractor's dewatering specialist or firm's qualifications (installation) and the Dewatering Professional (all other responsibilities) a minimum of four (4) weeks prior to execution of any dewatering. The submittal shall include, but not be limited to:
 - a. Qualifications of specialist or firm's Registered Professional Engineer as specified below.
 - b. Qualifications of the Dewatering Professional who shall oversee the installation, operation and maintenance of the dewatering system.

2. Submit a dewatering plan including design calculations at least four (4) weeks prior to start of any dewatering operation. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
 - a. Dewatering plan and details stamped and signed by a Massachusetts Registered Professional Engineer that conform to the requirements of the dewatering permit(s), and all other applicable regulations and permits including, but not limited to, requirements for equipment, monitoring, sampling and reporting.
 - b. Submit a generalized plan of actions at least two (2) weeks before operation of the groundwater control system to be implemented in the event that the Threshold and Limiting values for groundwater lowering have been reached.
 - c. Certificate of Design: Attached to Specification Section 01300 – Submittals.
 - d. A list of equipment including, but not limited to, pumps, prime movers, and standby equipment.
 - e. A description of the proposed method of dewatering; water reinfiltration; containment; treatment and discharge; and installation, monitoring, maintenance, and system removal procedures.
 - f. A groundwater monitoring plan shall be developed by the Professional Engineer retained by the Contractor and that designs the dewatering system. The monitoring plan shall

address groundwater control within the excavations and address settlements of utilities and adjacent structures. The monitoring plan shall address specific groundwater control measures for dewatering to limit drawdown around existing wood piles scheduled to remain in place within excavation limits.

- g. A description of erosion/sedimentation control measures, and methods of disposal of pumped water.
 - h. List of all applicable laws, regulations, rules, and codes to which dewatering design conforms.
- 3. Data for the required discharge reports shall be collected by the Contractor's Dewatering Professional. It shall consist of periodic sampling and analysis of system influents, midfluents and/or effluents and discharge quantities and other requirements of the relevant permits. The Contractor's Dewatering Professional shall also coordinate analysis of samples at an appropriately certified analytical laboratory and shall comply with all permit reporting requirements.
 - 4. A modified dewatering plan within 24 hours, if open pumping from sumps and ditches results in boils, loss of fines or softening of the ground.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Employ the services of a Dewatering Professional and a Massachusetts Registered Professional Engineer having the following qualifications:
 - 1. The Massachusetts Registered Professional Civil Engineer shall have completed the design of at least five (5) successful dewatering projects of equal size and complexity and with equal systems within the last five (5) years consisting of deep wells, well points, vacuum well points, and sump pumping for heavy Civil projects of similar size, type, and complexity in urban areas with the appropriate temporary support of excavation systems proposed by the Contractor including, but not limited to, trench boxes, soldier pile and lagging, timber sheeting support and secant pile support of excavation systems.
 - 2. The dewatering systems installer supervisor shall have a minimum of 5 years experience in installation of well points, deep wells, recharge systems, or equal systems.
 - 3. The Dewatering Professional responsible for day to day operation of the system shall have the following minimum qualifications:

- a. Completion of at least 5 successful dewatering projects of equal size and complexity with equal systems within the last five (5) years consisting of system operation and troubleshooting, collection of readings, maintenance of logs and other required documents, collection of samples, coordination of analysis of samples, and compliance with reporting requirements during pumping for heavy Civil projects of similar size, type, and complexity in urban areas.
 - b. Valid certification from the Massachusetts Department of Environmental Protection (DEP) to operate the proposed treatment system.
- B. If subgrade soils are disturbed or become unstable due to dewatering operation or an inadequate dewatering system, notify the Engineer, stabilize the subgrade, and modify system to perform as specified at no additional cost to the Owner.
 - C. Notify the Engineer immediately if any settlement or movement is detected on any adjacent structures. If the settlement or movement is deemed by the Engineer to be related to the dewatering, take actions to protect the adjacent structures and submit a modified dewatering plan to the Engineer within 24 hours. Implement the modified plan and repair any damage incurred to the adjacent structures at no additional cost to the Owner.
 - D. Notify the Engineer immediately if groundwater drawdown exceeds the level planned for areas of wood piles to remain in place. If the drawdown is deemed by the Engineer to be in excess of levels set forth in the dewatering plan, take actions to raise the groundwater to acceptable level and submit a modified dewatering plan to the Engineer within 24 hours to maintain groundwater within acceptable levels and protect the wood piles from degradation. Implement the modified plan at no additional cost to the Owner.
 - E. If oil and/or other hazardous materials are encountered after dewatering begins, immediately notify the Engineer.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide groundwater monitoring wells in accordance with the submitted dewatering plan or as specified.
- B. Provide casings, well screens, piping, fittings, pumps, power and other items required for dewatering system.
- C. Provide sand and gravel filter around the well screen. Wrapping geotextile

fabric directly around the well screen shall not be allowed.

- D. When deep wells, well points, or vacuum well points are used, provide pumping units capable of maintaining high vacuum and handling large volumes of air and water at the same time.
- E. Provide and store auxiliary dewatering equipment, consisting of pumps and hoses on the site in the event of breakdown, at least one (1) pump for every five (5) used.
- F. Provide dewatering equipment, including an appropriately sized settling tank, and maintain erosion/sedimentation control devices as indicated or specified and in accordance with the dewatering plan.
- G. Provide temporary pipes, hoses, flumes, or channels for the transport of discharge water to the discharge location.
- H. Provide cement grout having a water cement ratio of 1 to 1 by volume.

PART 3 – EXECUTION

3.1 GENERAL

- A. Execution of any earth excavation, installing earth retention systems, and dewatering shall not commence until the related submittals have been reviewed by the Engineer with all Engineer's comments satisfactorily addressed, the geotechnical instrumentation has been installed and baselines established and submitted to the Engineer, and the Dewatering Professional is on site and has begun the duties specified herein.
- B. Furnish, install, operate, and maintain dewatering, re-infiltration, treatment and discharge systems as indicated or specified and in accordance with the dewatering plan. As no dewatering flows shall be discharged to surface waters either directly or indirectly without appropriate settling, at a minimum, the Contractor shall provide a settling tank with a capacity of 10,000 gallons, so that if pumping rates exceed discharge rates, sufficient storage capacity is available. Delays due to insufficient storage capacity will be at no additional cost to the Owner. The Contractor is responsible to evaluate available data and determine the necessary storage capacity so as to not impede construction activities.
- C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or existing wood piles to remain in place or of work ongoing or previously completed.
- D. Do not excavate until the dewatering system is operational.

- E. Unless otherwise specified, continue dewatering uninterrupted until all structures, pipes, and appurtenances below groundwater level have been completed such that they will not be floated or otherwise damaged by an increase in groundwater elevation.
- F. Discontinue open pumping from sumps and ditches, if such pumping is resulting in boils, loss of fines, softening of the ground, or instability of the slopes. Modify dewatering plan and submit to the Engineer at no additional cost to the Owner.
- G. Where subgrade materials are disturbed or become unstable due to dewatering operations, remove and replace the materials in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING at no additional cost to the Owner.

3.2 DEWATERING DISCHARGE

- A. Water to be infiltrated need not be treated. Contractor shall provide infiltration that complies with relevant local, state and federal regulations.
- B. Transport pumped or drained water to discharge location in compliance with applicable permits and without interference to other work; damage to or contamination of pavement, other surfaces, or property; erosion; or siltation.
- C. Provide separately controlled pumping lines.
- D. Immediately notify the Engineer if groundwater is encountered that is suspected to be contaminated with substances other than those for which the treatment system has been designed. Do not pump water found to be contaminated with oil or other hazardous material to the discharge locations.

3.3 COMPLIANCE WITH DEWATERING AND RELATED PERMITS AND REGULATIONS

- A. Discharging groundwater and allowing for natural infiltration may not be a viable option for controlling groundwater in the project area. Should dewatering activities be required where the Contractor needs to discharge groundwater to a location other than the point of origin, then the Contractor shall be prepared to store, treat and discharge the water in accordance with applicable permits and regulations. Periodic sampling, as may be required to demonstrate treatment effectiveness and compliance with pretreatment standards specified in any local, state, or federal discharge permit required shall be the responsibility of the Contractor and its Dewatering Professional. Water that cannot be infiltrated is anticipated to be discharged to the existing City of Cambridge Storm Drain system which discharges to the Charles River. The Contractor shall be responsible for seeking coverage under the appropriate

EPA/NPDES permit. At a minimum, the Contractor shall be prepared to comply with the following periodic testing requirements: of the effluent for Total Toxic Organics (TTO) (VOA), TTO (ABN Extractables), petroleum hydrocarbons (MADEP EPH), pH, total metals, and total suspended solids (TSS); and with standard NPDES permit conditions including periodic testing of the treatment system influent, midfluent and effluent for benzene, toluene, ethylbenzene, xylenes, TPH, metals, and TSS. The Dewatering Plan shall include a description of procedures and information related to the collection of readings, maintenance of logs and other required documents. At a minimum, the dewatering plan shall describe compliance with relevant provisions of the EPA/NPDES Stormwater General Permit for Construction Activities, EPA/NPDES Remediation General Permit, EPA/DEP NPDES Permit and Plan Approval for Construction Site Dewatering, and the Cambridge Conservation Commission Order of Conditions.

- B. The Contractor, through its Dewatering Professional:
1. Shall furnish all labor, equipment and materials necessary to obtain accurate representative samples of the groundwater and for analysis for the set of analytical parameters specified above and as required by local, state and federal permits and regulations.
 2. Shall coordinate sampling activities with the Engineer. The engineer reserves the right to sample treated and untreated dewatering flows at any time.
 3. Shall take readings from the treatment system in accordance with the dewatering plan.
 4. Shall collect an initial sample of untreated and treated groundwater at the beginning of dewatering activities within the construction area.
 5. Shall prepare and keep in proper order all records required by regulatory authorities and permits.
 6. Shall maintain logs and other records in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan.
 7. Shall coordinate analysis of samples by an appropriately certified analytical laboratory in accordance with the Specifications, regulatory agency and permit requirements, and the Dewatering Plan, and ensure that laboratory detection limits meet permit requirements.
 8. Shall comply with reporting requirements in a timely manner and in the format required by the relevant permit. Reporting in compliance with permit requirements includes, but is not limited to, notification to the appropriate regulators and the Owner and Engineer prior to discharge;

submittal of laboratory analytical reports for each sampling event; submittal of reports for each reporting period during which no discharge occurs; notification of non-compliant discharges; notification of termination of discharge; and response to permit-related questions posed by regulators or the Owner and Engineer.

- a. Water will be discharged under a National Pollutant Discharge Elimination System (NPDES) permit. The Contractor shall submit notifications and reports to both the Environmental Protection Agency (EPA) and the appropriate regional office of the Massachusetts Department of Environmental Protection (DEP). Comply with pre-discharge notification, discharge reporting, notification of no discharge, and termination of discharge notification requirements; and respond to inquiries or correspondence from EPA or DEP regarding permit issues.
 - b. If water will be discharged under a local permit, submit notifications and reports as required in the permit.
 - c. For monthly or less frequent reporting deadlines, provide the Engineer with copies of all reports fourteen (14) days prior to the reporting deadline, and submit reports to the appropriate agency(ies) at the same. Provide copies of other dewatering documents to the Engineer immediately.
9. Install and maintain erosion/sedimentation control devices at the point of discharge as indicated or specified and in accordance with the dewatering plan.
 10. The Contractor shall obtain all federal, state, county, and local permits and variances to allow transport of materials on public roadways, should such transport be necessary.
 11. The Contractor shall dispose of all wastes resulting from construction dewatering activities in accordance with local, federal and state regulations.
 12. The Contractor is solely responsible for the implementation of the permit requirements, and is solely responsible for any punitive action resulting from any violation of the permit. The actual permit issued by EPA/DEP shall become part of this Contract by either addendum or by change order. If the actual permit is included by change order, no additional costs for implementing the permit will be considered by the Owner, when the actual permit is issued.

3.4 REMOVAL

- A. Do not remove dewatering system without written approval from the Engineer.

- B. Backfill and compact sumps or ditches with crushed stone wrapped with geotextile fabric in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- C. All dewatering wells shall be abandoned upon completion of the work, and completely backfilled with cement grout.

PART 4 – COMPENSATION

2140.1 - Treatment of Construction Dewatering

METHOD OF MEASUREMENT:

Measurement for payment for Treatment of Construction Dewatering will be on a per day basis for treatment of dewatering, as measured by the Engineer. The Contractor shall be paid per day that the dewatering treatment system(s) is onsite and operational, as defined by this Section, as required by the applicable dewatering permits, and as required by the Owner or Engineer. The Contractor shall not be compensated when the dewatering treatment system is onsite when not required by the Engineer or not required by the applicable dewatering permits. A dewatering treatment system shall include a settling tank, granular activated carbon (GAC) unit, filters, meters, hose connections, hoses and other treatment apparatus.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Treatment of Construction Dewatering will be based on the unit price bid for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for treatment of construction dewatering complete, as required and as required by the Engineer. The work includes, but is not limited to: preparation, submittal, and receipt of a NPDES and/or MWRA dewatering discharge permit; mobilization and demobilization of the complete system(s); design of the system(s); furnishing and installing treatment system(s); maintenance of the treatment system(s); “breakdown”, transportation and set-up of the treatment system(s) between on-site areas requiring treatment; sampling; reporting; maintenance of all logs and other documentation required; laboratory testing; coordination with permitting agencies and the Owner and Engineer; compliance with all permit requirements; removal, transportation, stockpiling, testing and disposal of all collected sediment; Dewatering Professional services; Dewatering Specialist services and all incidental work not included for payment elsewhere.

EXCLUSIONS

The Contractor shall not be compensated for construction dewatering under this item; including but not limited to re-infiltrated construction dewatering; providing, installing and maintaining pumps and hoses; installation and maintenance of well points, deep wells and pump filters and screens; temporary power sources and all incidental work. Construction dewatering shall be covered in the Contractor’s base bid, at no additional cost to the Owner. This is a Treatment Item only.

END OF SECTION 02140

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SECTION 02160

TEMPORARY EXCAVATION SUPPORT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Design, furnish and install temporary excavation support systems as required to maintain lateral support, prevent loss of ground, limit soil movements to the allowable limits indicated, and protect from damage existing and proposed improvements including, but not limited to, pipelines, utilities, structures, roadways, and other facilities.

The location, configuration, design, construction and maintenance of the excavation support walls and internal bracing shall be the sole responsibility of the Contractor.

2. The temporary excavation support system to be used on this project may include singular or multiple stages comprised of internally braced timber or steel sheeting, soldier piles and timber lagging or trench box. Temporary excavation support system is, at a minimum, required at excavation locations within 25 feet of building walls. Within 25 feet of existing building walls, the soldier piles and timber or steel sheeting shall be drilled or hydraulically pushed in place. No vibratory or impact hammers will be used to install the excavation support system within this area. At excavation locations along the alignment outside 25 feet of existing building walls, other approved methods of excavation support system installation may be determined as acceptable after submittals by the Contractor have been submitted and reviewed, for informational purposes only, by the Engineer.
3. Wherever the word "sheeting" is used in this section or on the Contract Drawings, it shall be in reference to steel soldier piles and timber lagging or steel and timber sheeting support systems.
4. Construction of the temporary excavation support system shall not disturb the existing structures or the completed proposed structures. The Contractor, at no additional cost to the Owner, shall repair damage to such structures.
5. The Contractor shall bear the entire cost and responsibility of correcting any failure, damages, subsidence, upheaval or cave-ins as

a result of improper installation, maintenance or design of the temporary excavation support systems. The Contractor shall pay for all claims, costs and damages that arise as a result of the work performed at no additional cost to the Owner.

6. Monitoring movement of the lateral support systems by optical survey techniques is required by an independent geotechnical monitoring consultant until installation and backfilling is complete. Additional survey monitoring of the lateral support system may be required if movement (lateral or vertical) is measured following backfilling to the existing grade.
7. If, in the Engineers judgment, the performance of the excavation support system is unacceptable, the Owner may instruct the Contractor to stop work and implement remedial measures to arrest further movements or restore groundwater levels to pre-construction levels. The Contractor shall take immediate steps to implement the remedial measures designed by the Contractor and reviewed by the Engineer. The costs for these measures shall be at no additional cost to the Owner.
8. Temporary excavation support systems shall be designed and installed in accordance with OSHA excavation safety standards.

1.2 SENSITIVE UTILITIES

- A. The following utilities are identified as “Sensitive Utilities” requiring the utmost care and precautionary measures by the Contractor:
 1. Large diameter water transmission mains > 18-inch on Walden St.
 2. NSTAR Electric heat exchange return pipeline on Bay State Rd., Field St. and Garden St.
- B. Temporary excavation support systems impacting Sensitive Utilities shall conform to the following:
 1. Hydraulic, pneumatic or screw-jack shoring systems (Speed Shores) will only be allowed where soldier piles or sheeting systems cannot be installed without damage to the utility.
 2. Lateral support systems shall be monitored for movement and/or settlement for the entire time it the utility is exposed.

1.3 SUBMITTALS

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

1. Submit the following qualifications three weeks prior to the construction:
 - a. Qualifications of Contractor's temporary excavation support system designer as specified below.
 - b. Qualifications of Contractor's temporary excavation support system installer as specified below.
2. Submit a temporary excavation support plan stamped and signed by a Registered Professional Civil Engineer at least two weeks prior to start of the construction. Submit design calculations for review that will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include the following items as a minimum:
 - a. Drilled or hydraulically pushed in place excavation support system, details, location, layout, depths, extent of different types of support relative to existing features and the permanent structures to be constructed, and methods and sequence of installation and removal.
 - b. Certificate of Design
 - c. Requirements of dewatering during the construction.
 - d. Minimum lateral distance from the edge of the excavation support system for use for vehicles, construction equipment, and stockpiled construction and excavated materials.
 - e. List of equipment used for installing the excavation support systems.
3. Submit a Construction Contingency Plan specifying the methods and procedures to maintain excavation support system stability if the allowable movement of the adjacent ground and adjacent structures is exceeded.
4. For excavation support systems left in place, submit the following as-built information prior to backfilling and covering the excavation support systems:
 - a. Survey locations of the temporary excavation support

systems, including coordinates of the ends and points of change in direction.

- b. Type of the temporary excavation support system.
 - c. Elevations of top and bottom of the excavation support systems left in place.
5. Estimates of the lateral and vertical displacements of the excavation lateral support systems under applied loads at critical stages.
6. For Sensitive Utilities, submit plans for preventing movement of the utility. Lateral support systems shall not come in contact with the utility. Temporary Earth Support Systems shall maintain positive contact with undisturbed earth at all times. Horizontal overexcavation, intentional or unintentional, outside the limits of the lateral support system is prohibited. In addition, the Contractor shall propose and submit for the Engineer's approval no less than 30 days prior to the start of excavation adjacent to the utility main, the methods to be used to monitor movement and/or settlement of the utility.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Conform to the requirements of the OSHA Standards and Interpretations: "Part 1926 Subpart P - Excavation, Trenching, and Shoring", and all other applicable laws, regulations, rules, and codes.
- C. All welding shall be performed in accordance with AWS D1.1.
- D. Prepare design, including calculations and drawings, under a Professional Civil Engineer registered in the Commonwealth of Massachusetts and having the following qualifications:
 - 1. Not less than five years experience in the design of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.
 - 2. Completed not less than five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of comparable type, size, and complexity as this project within the last five years.

- E. Temporary Excavation Support System Installer's Qualifications:
 - 1. Not less than five years experience in the installation of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.
 - 2. Completed not less than five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of comparable type, size, and complexity as this project within the last five years.

- F. Install all temporary excavation support system under the supervision of a supervisor having the following qualifications:
 - 1. Not less than five years experience in installation of soldier pile and lagging and steel or timber sheeting temporary excavation support systems of at least 10 feet deep in urban areas of comparable type, size, and complexity as this project.
 - 2. Completed at least five successful soldier pile and lagging and steel or timber sheeting temporary excavation support system projects of comparable type, size, and complexity as this project within the last five years.

- G. Provide pre-construction surveys in accordance with Section 01390 – PRE-CONSTRUCTION SURVEY.

1.5 DESIGN CRITERIA

- A. Design of temporary excavation support systems shall meet the following minimum requirements:
 - 1. Support systems shall be designed for earth pressures, hydrostatic pressure, equipment, traffic, temporary stockpiles, construction loads, and other surcharge loads.
 - 2. Design internal bracing to provide sufficient reaction to maintain stability.
 - 3. Limit movement of ground adjacent to the excavation support system to be within the allowable ground deformation as specified.
 - 4. Design the embedment depth below bottom of excavation to minimize lateral and vertical earth movements and provide bottom stability. Toe of braced temporary excavation support systems shall not be less than 5 feet below the bottom of the excavation.

5. Design temporary excavation support system shall withstand an additional 3 feet of excavation below proposed bottom of excavation without redesign except for the addition of lagging and/or bracing.
6. Maximum width of pipe trench excavation shall be as indicated on the Drawings.
7. Permanent structure walls shall not be directly cast against excavation support walls.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT and as specified.
- B. Store sheeting and bracing materials to prevent sagging, which would produce permanent deformation. Keep concentrated loads, which occur, during stacking or lifting below the level, which would produce permanent deformation of the material.

1.7 PROJECT/SITE CONDITIONS

- A. Subsurface investigation data are available as referenced in Section 02010 – SUBSURFACE INVESTIGATION. The geotechnical data is made available to the Contractor for informational purposes only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, boring logs, or other data.
- B. Prior to submitting a bid, the Contractor shall review and understand the information contained in the geotechnical data and all Contract Documents.
- C. The Contractor shall draw his own conclusions regarding site conditions based upon site visit(s) and from available sources, for which the Owner and its Consultants assume no responsibility. The Contractor shall assume that subsurface conditions between subsurface explorations could differ from conditions shown in the records of the explorations.
- D. The Contractor shall notify the Engineer immediately if obstructions are determined to conflict with the location of the excavation support system. Cobbles and boulders within dense well-bonded soils or other competent naturally deposited soils will not be considered obstructions.
- E. The Contractor shall protect adjacent structures above ground and buried from damage associated with lateral support of excavation operations and other operations. Damage due to lateral excavation support operations or other Contractor activities shall be repaired immediately by the Contractor at

his own expense.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Structural Steel

1. All soldier piles, Wales, rakers, struts, wedges, plates, waterstop and accessory steel shapes shall conform to ASTM A36.

B. Timber Lagging Left-in-Place

1. Structural grade having a nominal thickness of 3 inches and a minimum allowable working stress of 1100 psi.

C. Timber Sheeting Left-in-Place

1. Structural grade having a nominal thickness of 4 inches and a minimum allowable working stress of 1100 psi.

D. Other Materials

1. Tamping tools adapted for backfilling voids after removal of the excavation support system.
2. Provide specific trench box sizes for each pipe and utility excavation with structural capacity of retaining soil types as described in OSHA's 29 CFR Part 1926 Subpart P.
3. For Sensitive Utilities, hydraulic, pneumatic or screw-jack shoring systems (Speed Shores) used to support excavations adjacent to the utility shall be in good working order and shall conform to all of the manufacturer's requirements for new equipment; bent or otherwise damaged supports, leaking hydraulic cylinders, or damaged sheeting shall not be used, and the Contractor shall immediately remove such damaged materials/equipment from the work site.

PART 3 – EXECUTION

3.1 GENERAL

- #### A.
- Installation of the temporary excavation support system shall not commence until the Engineer has reviewed the related earth excavation and dewatering submittals with all Engineers' comments satisfactorily addressed.

- B. Install excavation support system in accordance with the Contractor's temporary excavation support plan.
- C. Carry out program of temporary excavation support in such a manner as to prevent undermining or disturbing foundations of existing structures of work ongoing or previously completed.
 - 1. For Sensitive Utilities, excavation support in trenches near the utility shall be installed to keep the trench as narrow as possible and prevent the loss of soil under the utility. Trench width shall not exceed 18-inches plus the pipe OD for sewers and drains, or 3 feet maximum for service laterals within the soil wedge delineated by a line drawn downward at a 45 degree angle from the springline or flat bottom of the utility.
- D. Perform preparatory work to discover, protect, maintain and restore, or remove utilities, foundations or other facilities located in close proximity of the proposed excavation lateral support system.
- E. Conduct pre-excavation as necessary to remove obstructions and identify exiting utilities along the alignment of the excavation lateral support system which will interfere with installation in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- F. The Contractor shall provide fully equipped rig(s) and appropriate tools in full-time operation at the site during the work, and shall mobilize additional equipment, if necessary, to complete the work on schedule.
- G. Excavation shall not proceed more than 2 ft below the bracing level, anywhere within the excavation support limits, until the entire level of bracing is completely installed, including prestressing.
- H. Notify utility owners if existing utilities interfere with the temporary excavation support system. Modify the existing utility with the utility owner's permission or have the utility owner make the modifications at no additional cost to Owner.

3.2 SOLDIER PILES AND TIMBER LAGGING

- A. Install steel soldier piles before starting excavation. Install soldier piles by drilling or hydraulically pushing to the design tip elevation. Driving by impact or vibratory hammers shall not be allowed. Drilled methods shall prevent loss of ground around the hole. Each soldier pile shall be installed in its drilled hole within 2 hours after drilling is completed to the required depth.

- B. The Contractor shall have equipment on-site able to advance the drilled hole, for installation of the soldier piles, through sand below the water table, through concrete, and through large boulders and other obstructions which may be encountered.
- C. Space soldier piles at intervals indicated on the Shop Drawings. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- D. Within the same day of seating the soldier piles in the drilled holes, encase the piles with MHD (1995) M4.08.0 – Controlled Density Fill, Type 1E from the tip elevations to the currently existing ground surface. Crushed stone or other granular materials are not acceptable.
- E. Prior to completion of the final backfilling operations, soldier piles shall be cut off five feet below the final ground surface.
- F. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. As installation progresses, backpack the voids between the excavation face with sand and on-site soils to establish a tight contact. Pack louver openings between lagging with hay or other porous material to allow free drainage of groundwater without loss of retained soil or backpacking. In no case shall the louvered openings be allowed to exceed 1-inch.
- G. Beginning at the top of the soldier piles, the maximum permissible height of unlagged face of excavation shall not exceed 2-feet in all soil types encountered at the site. If water is flowing from the face of the excavation, or if soil to be retained moves toward the excavation, the maximum height of unlagged face shall not exceed 8-inches.
- H. If unstable ground is encountered, take suitable measures (grouting behind the lagging or other approved method) to retain the material in place and prevent loss of ground or movements, which may cause damage to adjacent structures or utilities.

3.3 INSTALLATION – STEEL OR TIMBER SHEETING

- A. Length Markings: Before installation is started each steel or timber section shall be marked so that the depth of the tip can be readily determined. This shall be accomplished by a method that is approved by the Engineer.
- B. Sheeting shall be installed by means of hydraulically pushing each sheet piling to the required design depth. No impact or vibratory hammers will be allowed for installation of steel or timber sheeting on this project. The Contractor shall take all precautions against excessive vibrations in all areas. The Contractor shall be solely responsible for any damages caused directly or

indirectly to structures, sewer and other utilities, and shall repair any such damage occurring due to his operations to the requirements of the Owner.

- C. All sheeting shall be protected from damage during installation.
- D. All sheeting shall be hydraulically pushed to its full depth ahead of the excavation so as to avoid the loss of material from behind the sheeting; where voids occur outside of the sheeting, they shall be filled immediately with structural fill and thoroughly compacted.
- E. Requirements for the sheeting include the following:
 - 1. Install sheeting in the plumb position.
 - 2. Install sheeting such that the piling is in direct contact with the material to be retained.
 - 3. Install sheeting to the depths indicated on approved Shop Drawings.
 - 4. Methods and equipment used in pushing, setting, cutting and splicing shall conform to approved Shop Drawings.
 - 5. Use templates or other temporary alignment facilities to maintain piles plumb and on line.
 - 6. Control vibrations and noise associated with installation.
 - 7. Pre-excavate as necessary to remove existing structures along alignment of the sheeting.
 - 8. Sheeting shall be positioned within 3 inches of the design plan location along its length from top down to bottom of excavation grade. Design plan locations are to be established by the Contractor's Professional Engineer and submitted to the Engineer for review.
- F. The Contractor shall provide all inspection equipment to determine whether the sheeting has been started in their planned location, are vertical, and are within the allowable tolerance for position after installation.

3.4 INTERNAL LATERAL WALL BRACING (WALES AND STRUTS)

- A. Use walers and struts as necessary to provide support of the excavation lateral support walls as required. Include web stiffeners, plates, brackets, or angles as required to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. All for eccentricities due to fabrication and assembly. Consider effects of temperature changes.

- B. Install and maintain all support members in continuous tight contact with each other and with the earth wall being supported.
- C. Coordinate locations of all bracing and components thereof for temporary lateral excavation support with locations of permanent structures.
- D. Control rate of excavation and installation of support members to minimize movement of adjacent ground surface.
- D. Excavation shall proceed in accordance with the detailed sequence submitted by the Contractor and reviewed by the Engineer. It shall be the responsibility of the Contractor to schedule and sequence the work accordingly.

3.5 LATERAL TRENCH SUPPORT ADJACENT TO AND UNDER SENSITIVE UTILITIES

- A. Lateral trench support adjacent to and under Sensitive Utilities shall be furnished and installed in accordance with the Contractor's submittal submitted and reviewed under paragraph 2.1 of this Section and paragraph 1.4 of Section 01200.
- B. All trench support shall be installed and maintained so it is in continuous positive contact with the undisturbed earthen trench walls being supported. Horizontal overexcavation is prohibited.
- C. Installation, maintenance and removal of the lateral trench support shall be coordinated with the exposure and support of Sensitive Utilities. It shall also be coordinated with the installation of the proposed main or lateral.
- D. Contractor shall control the rate of the trench excavation and removal of the support system to minimize the movement of permanent structures and the adjacent ground surface. The Contractor shall submit a proposal, stamped by a Massachusetts Registered Professional Engineer which specifies the recommended rate of excavation and removal of the temporary earth support system with the goal of limiting overexcavation and movement of sensitive, adjacent utilities.

3.6 MONITORING

- A. As proposed by the Contractor and approved by the Engineer.
- B. In the event the monitoring system proposed by the Contractor proves ineffective, the Contractor shall implement additional measures as required by the Engineer at no additional cost to the Owner.

3.7 REMOVAL OF EXCAVATION SUPPORT SYSTEM

- A. Where removal of sheeting is not possible without damage to Sensitive Utilities or work recently installed or other facilities it shall be left in place with the exception of the top 5 ft. of excavation support wall below final grades, which shall be removed, unless otherwise approved by the Engineer.
- B. Remove excavation support in a manner that will maintain support as excavation is backfilled and will not leave voids in the backfill.
- C. Do not begin the removal of the excavation support system until it can be safely removed damage to existing facilities, completed work or adjacent property.
- D. Fill any void left by the shoring system or voids created by the removal of the shoring system to provide soil support between the trench backfill and the native soil.
- E. Sheet piling removal must be performed in a manner that will avoid “vibro-consolidation” (densification) of sandy or granular material below or adjacent to the excavation that could lead to settlement and damage of the pipeline, utilities, other works of construction and adjacent property.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02160

SECTION 02210

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

2210.1	TEST PITS	CUBIC YARD
2210.2	CONTROL DENSITY FILL FOR BACKFILL	CUBIC YARD
2210.3	GRAVEL SUBBASE	CUBIC YARD
2210.4	OVEREXCAVATION OF GEOTECHNICALLY UNSUITABLE	CUBIC YARD
2210.5	UNCLASSIFIED EXCAVATION	CUBIC YARD
2210.6	ROADWAY EARTH EXCAVATION	CUBIC YARD

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following:

1. The Work shall consist of excavation of all materials removed within the limits of the Contract in accordance with the Specifications and in close conformity with the lines, grades, thickness and cross sections shown on the plans or established by the Engineer.
2. The Contractor shall comply with all applicable laws, rules, ordinances, and general regulations of the Federal Government, the Commonwealth of Massachusetts, the City of Cambridge, the Cambridge Department of Public Works, DEP, EPA, OSHA, and other regulatory agencies having jurisdiction over the Work.
3. Provide materials for backfilling excavations as indicated and specified.
4. Grade surfaces to meet finished grades indicated. Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.
5. The Engineer will provide exact test pit locations during construction.
6. The boring logs indicate some locations of organic silt/peat and loose soils on: Concord Ave at Chilton St, and at Corporal Burns Rd; Field St between Garden St and Corporal Burns, at Fern St; Bay State Rd at and west of Birch St; as well as mid-block on Birch St, Fern St, Corporal Burns St, and Chilton St between Concord Ave and Field St. There is a section of unconfirmed existing piles on Bay State Road and Field Street between STA 3100+70 and STA 3108+41. There is a section of unconfirmed existing piles Fayerweather St between STA

1327+20 and STA 1328+30. There is a section of unconfirmed existing piles on Saville St between STA 3801+05 and STA 3802+58. There is a section of unconfirmed existing piles on Chilton St between STA 1256+57 and STA 1259+33. For the installation of the proposed sewer and drain, the Contractor shall overexcavate organic silt/peat deposits where encountered to the top of stiff clay or other suitable material as required by the Engineer. The Contractor shall overexcavate 3' below proposed drain manholes and catch basins between Sta 1327+20 and 1328+38 on Fayerweather St and Sta 3801+05 and 3802+58 on Saville St or as otherwise required by the Geotechnical Engineer. Excavated soil at these locations shall be replaced with structural backfill or dense graded crushed stone.

1.2 SUBMITTALS

A Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Submit an Excavation, Backfilling, Grading and Compaction plan at least two weeks prior to start of any earth moving activities. The review will be only for the information of the Owner and third parties for an overall understanding of the project relating to access, maintenance of existing facilities and proper utilization of the site. The Contractor shall remain responsible for the adequacy and safety of the means, methods and sequencing of construction. The plan shall include, but not be limited to the following items:
 - a. Detailed sequence of work.
 - b. General description of construction methods.
 - c. Numbers, types, and sizes of equipment proposed to perform excavation, backfilling, grading and compaction.
 - d. Details of dust control measures.
 - e. Proposed locations of stockpiled excavation and/or backfill materials.
 - f. Proposed surplus excavated material off-site disposal areas and required permits.
 - g. Erosion and sedimentation control measures, which will prevent erosion and sedimentation during the earth moving and soil stockpile activities.
 - h. See Section 01200 for the work plan requirements for

installation of sewers and drains across/under the large diameter water transmission mains in Walden St.

2. Backfill Materials: Submit a 20 lb. sample, grain size analysis and moisture density curve performed in accordance with ASTM D422 and compaction test results (ASTM D1557 Procedure C) for each proposed source of backfill, imported material and on-site material to be reused, for review by the Engineer at least, one week prior to use of the material. The grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
 - a. In addition, a certification statement and analytical results shall accompany each physical sample of earth materials to be imported onto the site, including but not limited to crushed stone, loam, bedding sand, gravel sub-base, common fill and structural backfill. At a minimum the certification shall state the point of origin and that the material is free of contaminants. The certification shall include representative sample analysis from each point of origin of backfill to be used on the site. The sample(s) shall be analyzed by a certified laboratory for RCRA 8 metals, volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082). On-site soils defined as suitable for reuse in this Section and in Section 02080 – SOIL AND WASTE MANAGEMENT can be used as backfill without providing the certification required above.
 - b. All sampling of soils for chemical testing shall be performed by a person experienced in sample collection and shall be either: 1) a Licensed Site Professional registered in the Commonwealth of Massachusetts; 2) a Professional Engineer registered in the Commonwealth of Massachusetts; 3) a professional Geologist registered in the Commonwealth of Massachusetts; 4) a certified groundwater/environmental professional; or 5) an authorized representative of the one of the persons listed above. Samples of each material shall be submitted to a chemical analytical laboratory, certified by the Massachusetts Department of Environmental Protection.
 - c. Submit additional samples and geotechnical and analytical test data and certifications for every 1000 cubic yards (every 200 cubic yards for moisture density curves) of material imported or reused on-site or anytime consistency of material changes in the opinion of the Engineer. Submit associated chemical laboratory data on the imported materials throughout the course of the Work, if requested by the Engineer, to evaluate the

consistency of the source or process, at no additional cost to the Owner.

- d. Controlled Density Fill Mix Design: Prior to beginning the work the Contractor shall submit for review, controlled density fill mix designs which shall show the proportions and gradations of all materials proposed for each class and type of controlled density fill specified herein.
 - e. Filter Fabric: Submit shop drawings and product data sheets.
- 3. During Construction, submit written confirmation of fill lift thickness, in-place soil moisture content, and percentage of compaction to the Engineer before placing the next lift or constructing foundations.
 - 4. Submit Qualifications of the Contractor's Independent Testing Laboratory as specified in Paragraph 1.5.K, three weeks prior to the execution of any earth excavation, backfilling, filling, or compaction process.
 - 5. Not less than 10 calendar days prior to starting a new phase of the work or any time prior to changing the accepted blast design and procedures, submit in writing to the Engineer the following data of the proposed blasting operations.
 - a. Location, depth, area, anticipated neat lines and relationship to adjacent structures.
 - b. Diameter, spacing, burden, depth, pattern and inclination of blast holes.
 - c. Type, strength, amount in terms of weight and cartridges of explosives to be used in each hole, on each delay and the total for the blast.
 - d. The distribution of the charge in the holes and the priming of each hole.
 - e. Type, sequence and number of delays, delay pattern; wiring diagram for blast; size and type of hookup lines, and lead lines; type and capacity of firing source; type, size and location of safety switches, lightning gaps.
 - f. Scaled range or distance used to calculate the scaled range if the blast will exceed vibration limits.
 - g. Stemming of holes and matting or covering of blast area.

6. Complete, maintain and submit to the Engineer permanent blast reports including logs of each blast. Complete reports after each blast to include the following information:
 - a. Date, time and limits of blast by station.
 - b. Amount of explosives used by weight and number of cartridges.
 - c. Total number of delays used and number of holes used for each delay period.
 - d. On a diagram of the approved blast pattern indicate any holes not drilled, drilled but not loaded, changes in spacing or in pattern of delays or in loading of holes.
 - e. Total number of holes, maximum charge per hole and corresponding delay number.
 - f. An evaluation of the blast indicating tights, areas of significant overbreak and any recommended adjustments for the next blast.

B. Test Pit Logs

1. Prepare and submit a log of the existing conditions observed. Each test pit log shall be submitted as its own document. The following information shall be indicated on the log at a minimum:
 - a. Plan sketch indicating size, material, quantity, function, ownership and direction of flow for each structure and utility. Include a north arrow and approximate STA number.
 - b. Swing ties indicating the horizontal location of each structure, utility and duct bank. Where horizontal alignment is found to vary, swing ties shall be recorded at appropriate intervals.
 - c. Top and bottom elevations of each structure and utility, and the dimensions of any encasement. Where vertical elevations are found to vary, elevations shall be recorded at appropriate intervals.
 - d. Where test pits are conducted to establish a vertical corridor for a proposed pipeline through conflicting utilities, include a profile sketch indicating the vertical separation between utilities.

2. Submit photographs that document wide-angle and close-up views of the existing conditions observed.

1.3 DEFINITIONS

- A. **Acceptable Material:** Material which does not contain organic silt or organic clay; peat; vegetation; wood or roots; stones or rock fragments over 6-inch in diameter; porous biodegradable matter; loose or soft fill; excavated pavement; or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material. Clay or silt content shall not exceed 25 percent by weight of the backfill material.
- B. **Unacceptable Materials:** Materials that do not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.
- C. **Percentage of compaction** is defined as the ratio of the field dry density, as determined by ASTM D1556 or ASTM D2922 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.
- D. **Proof Roll:** Compaction with a minimum of four passes of a vibratory steel drum roller. Vibratory plate compactors shall be used in small areas where a vibratory steel drum roller cannot be used.
- E. **Rock Excavation:**
 1. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42-inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10 foot 0-inches in width and pits in excess of 30 feet 0-inches in either length or width are classified as open excavation.
 2. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).
 3. Determination of rock excavation classification will be made by the Engineer. Typical of materials classified as rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits. Intermittent drilling, blasting or

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

1.4 REGULATIONS

- A. The Contractor shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- B. Comply with all applicable laws, rules, ordinances, and general regulations of the Federal Government, the Commonwealth of Massachusetts, the City of Cambridge, the Cambridge Department of Public Works, the Cambridge Water Department, DEP, EPA, OSHA, and other regulatory agencies having jurisdiction over the Work.

1.5 QUALITY ASSURANCE

- A. Dewatering and Groundwater Control: Provide and maintain as specified in Section 02140 - DEWATERING.
- B. Excavations shall be performed in the dry, and kept free from standing water, snow and ice during construction.
- C. Temporary Excavation Support Systems: Provide and maintain as specified in Section 02160 – TEMPORARY EXCAVATION SUPPORT SYSTEMS
- D. Do not excavate or fill until the Engineer has reviewed all the required submittals.
- E. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

- F. Cut pavement and all surface materials to the top of the existing fill material with a saw to prevent damage to remaining pavement without extra compensation. Surface materials may include concrete slabs, cobblestones, rails and other miscellaneous materials. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.
- G. Dig test pits considered separate to the normal excavation as required to locate underground utilities, obstructions or water table.
- H. If material for foundation support is found to be unacceptable, as defined in these Specifications, at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, remove such material to the required width and depth as required by the Engineer and replace it with crushed stone.
- I. During progress of work, conduct earth-moving operations and maintain work site so as to minimize the creation and dispersion of dust.
- J. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.
- K. Employ an independent testing laboratory to perform particle size and gradation analyses, in accordance with ASTM D422, as well as compaction testing. The independent testing laboratory shall have the following qualifications:
 - 1. Be accredited by the American Associates of State Highway and Transportation Officials (AASHTO) Accreditation Program;
 - 2. Have three years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations;
 - 3. Able to provide three references from previous work.

1.6 AVAILABLE INFORMATION

- A. Prior to submitting his bid, the Contractor shall review and understand all available information possible. Geotechnical Design Memorandum, prepared by the Engineer, is available upon request and is made available to the Contractor for informational purposes only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, boring logs, or other data. The subsurface data represent conditions only at the sampling locations at the times the explorations were conducted.
- B. Neither the Owner nor Engineer shall be liable for any error or discrepancy in the subsurface information provided, nor for the Contractor's use or

interpretation of the information. Additional test borings, test pits or other exploratory operations may be made by the Contractor with the written approval of the Owner, at no additional cost to the Owner.

1.7 MATERIAL TESTING

- A. Moisture Density - One per source, except for crushed stone. Repeat the moisture density test for every 200 cubic yard of material used, and whenever visual inspection indicates a change in material gradation as required shall be as determined by the Engineer.
- B. Gradation Analysis - A minimum of one per source, for each moisture density test, for every 100 cubic yards of material used, and whenever visual inspection indicates a change in material gradation. For on-site fill soil, the Engineer shall determine frequency of tests required.
- C. Construction Tolerances: Construct finished surfaces to plus or minus 0.5 inches of the elevations indicated. Provide the Engineer with adequate survey information to verify compliance with above tolerances.

1.8 FIELD TESTING

- A. Field Testing and Inspections: By Contractor's independent testing laboratory, acceptable to the Engineer, at Contractor's expense as specified. Location of tests shall be mutually acceptable to testing laboratory and the Engineer or as required by the Engineer. In the event compacted material does not meet specified in-place density, recompact material and retest this area until specified results are obtained at no additional cost to the Owner.
- B. Methods of Field Testing: In-Place Density: ASTM D1556, ASTM D2167, or ASTM D2922; In-Place Moisture Content: ASTM D3017, ASTM D4944, or ASTM D4959; Material Testing Frequency: The following testing frequencies are minimum required for all structural and non-structural fill materials.
- C. Field In-Place Density and Moisture Content - Crushed stone shall be compacted as specified and indicated. For other backfill and fill materials, minimum test frequency shall be as follows, and no less than two tests per lift:
 - 1. Trenches under structures, foundation preparation, or roadways subbase: Every 30 liner ft. per lift.
 - 2. Trenches in areas without structures or roadways: Every 50 lin. ft. per lift
 - 3. Under Structure: Every 300 sq. ft. per lift.
 - 4. Around Structures: Every 100 sq. ft. per lift.

PART 2 – PRODUCTS

2.1 SAND BORROW

- A. Sand borrow shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock free from clay and loam or other deleterious or organic material. Sand borrow shall be used as pipe bedding for all pipe with the exception of Reinforced Concrete Pipe, placed between 6 inches below pipe invert to 6 inches above pipe crown. The sand borrow shall conform to Massachusetts Highway Department (MHD) Specification Designation, M1.04.1, and the following gradation:

Sieve Size	Percent Passing by Weight
½-inch (12.7mm)	100
³ / ₈ -inch (9.525mm)	85-100
No. 4	60-100
No. 16	35-80
No. 50	10-55
No. 200	2-10

2.2 COMMON FILL AND ON-SITE MATERIAL GEOTECHNICALLY SUITABLE FOR REUSE ON-SITE AS BACKFILL:

- A. Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall consist of sand and gravel consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic matter. Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall be used from the top of the sand borrow or crushed stone and below the gravel subbase layer.

Common fill and on-site material geotechnically suitable for reuse on-site as backfill shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
6-inch (152.4mm)	100
No. 4	30-80
No. 40	30-50
No. 200	0-25

2.3 CRUSHED STONE

- A. Crushed stone shall consist of durable crushed rock or durable crushed gravel

stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. Crushed stone shall be used as Reinforced Concrete Pipe bedding between 6 inches below pipe invert to 6 inches above pipe crown and initial 12 inches of backfill under structures, as a working mat or as a filter around perforated drain pipe.

Crushed stone shall be wrapped in filter fabric, placed in maximum 6-inch thick layers, loose measure, and compacted with a minimum of four passes of a vibratory plate or roller compactor. The crushed stone shall be uniformly blended and shall conform to the following requirements.

Sieve Size	Percent Passing by Weight
1-inch (25.4 mm)	100
3/4-inch (19.05 mm)	90-100
5/8-inch (15.875 mm)	---
1/2-inch (12.7 mm)	10-50
3/8-inch (9.5 mm)	0-20
No. 4	0-5
No. 8	---

2.4 CONTROLLED DENSITY FILL (CDF)

- A. Controlled density fill shall consist of a cementitious hard excavatable mixture of aggregate, Portland Cement, and air entraining admixtures. The material shall be of the type specified in Massachusetts Highway Department 1995 Standard Specifications for Highway and Bridges, as amended, Type 2E. Controlled density fill shall be used as trench backfill material around structures (not including manholes and catch basins) between the top of the crushed stone layer and the top of the structure. Controlled density fill shall also be used to fill abandoned utilities, encasement of pipe and utilities, and around the excavation support systems as required by the Engineer.
- B. Controlled density fill placed in contact with ductile iron pipe shall utilize a non-fly ash mix design.

2.5 STRUCTURAL FILL

- A. Structural fill shall consist of gravel and sand consisting of hard durable particles, and free from trash, ice and snow, tree stumps, roots and other organic and deleterious or organic matter. Structural fill shall be used for replacement of soft organic soils below pipe and tank inverts and below structures. Structural fill shall conform to the following gradation requirements.

Sieve Size	Percent Passing by Weight
3-inch (76.2 mm)	100
No. 4	40-80
No. 40	10-30
No. 200	0-8

2.6 FILTER FABRIC

- A. Filter Fabric used, as a drainage medium shall consist of a nonwoven fabric made from polypropylene or polyethylene filaments or yarns. The fabric shall be inert to organic chemicals commonly encountered in the soil. The fabric shall conform to the following recommended property tests:

Property	Unit	Test Method	Minimum Value
Weight	oz/sy	ASTM D-3776	4.5
Grab Strength	Lbs	ASTM D-4632	120
Grab Elongation	percent	ASTM D-4632	55
Trapezoid Tear Strength	Lbs	ASTM D-4533	50
Mullen Burst Strength	Psi	ASTM D-3786	210
Puncture Strength	Lbs	ASTM D-4833	70

Edges and ends of filter fabric shall overlap a minimum of two feet.

- B. For placement beneath Drain Vault No. 2, the contractor shall install MIRAFI 140N, or approved equal geosynthetic filter fabric.

2.7 GRAVEL SUBBASE

- A. Gravel subbase shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The gravel subbase shall be used in the upper one foot of trench backfill material immediately below pavements and graded in accordance with Massachusetts Highway Department (MHD) specification section M1.03.1 as indicated below:

Sieve Size	Percent Passing by Weight
3-inch	100
1-1/2-inch	70-100
3/4-inch	50-85
No. 4	30-60
No. 200	0-10

PART 3 – EXECUTION

3.1 GENERAL

- A. Do not excavate or fill until the Engineer has reviewed all the required submittals.

3.2 SITE MAINTENANCE

- A. Roadway and Site Leveling: Grade roadway and site as to maintain them in a level unrutted condition and to eliminate puddling of surface and subsurface water.

3.3 SUBGRADE PREPARATION AND PROTECTION

- A. Proof roll the subgrade prior to backfilling and filling operation, or placing crushed stone or sand borrow.
- B. Proof roll the pipe trench foundation subgrade prior to backfilling and filling operation.
- C. Over excavate all organic soil at subgrade and replace with compacted structural fill material.

3.4 COMPACTION EQUIPMENT

- A. The compaction equipment shall be selected by the Contractor, and shall be capable of consistently achieving the specified compaction requirements. The selected compaction equipment shall meet the following minimum requirements:
 - 1. Manually operated vibratory plate compactors weighing no less than 200 pounds with vibration frequency no less than 1600 cycles per minute.
 - 2. Vibratory steel drum roller weighing at least 12,000 pounds.
 - 3. Water jetting and puddling will not be allowed.

3.5 COMPACTION REQUIREMENTS

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

Area	ASTM Density Degree of Compaction
Natural subgrade	Proof roll
Crushed stone	As specified herein
Sand Borrow	As specified herein
Gravel subbase	95%
General backfill with CDF adjacent to structures	As specified herein
Trench backfill (on-site fill)	
- below pavements	95%
- below landscaped areas	90%
Other areas	90%

- B. Moisture Control: Fill that is too wet for proper compaction shall be desiccated, harrowed, or otherwise dried to a proper moisture content to allow compaction to the required density. If fill cannot be dried within 24 hours of placement, it shall be removed and replaced with drier fill at no additional cost to the Owner.
- C. Fill that is too dry for proper compaction shall receive water uniformly applied over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.
- D. Unfavorable Conditions: In no case shall fill be placed in standing water, over organic silt or peat or material that is frozen. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.
- E. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of the day's operations. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth wheeled roller to eliminate ridges of soil left by compaction equipment.
- F. Compaction Control: In-place density tests shall be made at the Contractor's expense in accordance with ASTM D1556, D2922 or D2167 as the work progresses, to determine the degree of compaction being attained by the Contractor. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to the Owner.
- G. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing performed by him shall excuse the Contractor from defects discovered in his work at that time or subsequent to the

testing.

- H. Placement: All fill shall be placed in horizontal layers. Fill shall not be placed following the natural contours of the ground. Fill shall be placed starting in the lowest areas working up to finish grades in horizontal layers in the manner specified herein. Each layer of fill should be benched into the existing slope in order to avoid the formation of a shear plane.
- I. Surfaces: After backfilling trenches and excavations, the Contractor shall maintain the surfaces of backfill area in good condition so as to present a smooth surface at all times level with adjacent surfaces. The Contractor shall repair any subsequent settling over backfilled area immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to the Owner.
- J. The finished subgrade of the fills and filled excavations upon which topsoil is to be placed, or pavements are to be constructed, shall not be disturbed by traffic of other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.

3.6 SEPARATION OF EXCAVATED MATERIAL FOR REUSE

- A. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material or for disposal or immediately reuse at the area of excavation as backfill.
- B. Reuse surplus acceptable excavated materials for backfill as indicated and in accordance with Section 02080 – SOIL AND FILL MANAGEMENT; deposit neatly and grade.

3.7 BACKFILL MATERIAL SELECTION

- A. Backfill Material Selection: Unless otherwise specified or required, material used for filling and backfilling shall meet the requirements specified under Backfill materials. In general, the material used for backfilling trench excavations within the zone above structures and 6 inches above pipe crowns shall be material removed from the excavation provided that the reuse of these materials result in the required trench compaction and meets the gradation requirements specified for on-site fill. In areas where the bottom of the excavation is in silt and clay, and is below the groundwater table, a working mat and drainage layer of 12 inches of compacted crushed stone wrapped in filter fabric shall be placed.
- B. Place backfill to a maximum loose lift thickness of 9 inches except where used as pipe bedding. Maintain backfill material with a uniform moisture content, with no visible wet or dry streaking, between plus 2 percent and minus 3

percent of optimum moisture content. The final filled soil mass shall be as uniform as possible in lift thickness, moisture content, and effort required to compact soil mass.

3.8 STRUCTURE AND TRENCH BACKFILL

- A. The trenches shall be backfilled as soon as practicable with the material specified herein. All trench backfilling shall be done with special care, in the following manner and as required by the Engineer.
- B. Backfill material for pipe bedding shall be deposited in the trench, uniformly on both sides of the pipe, for the entire width of the trench as indicated on the drawings. Sand borrow bedding shall be placed by hand shovels, in layers not more than 4-inches thick in loose depth, and each layer shall be thoroughly and evenly compacted by tamping on each side of the pipe to provide uniform support around the pipe, free from voids. Crushed stone bedding material shall be placed in layers not more than 6-inches thick in loose measure, and compacted with at least 4 passes using a vibratory plate or roller compactor.
- C. The balance of trench backfill around structures (not including manholes or catch basins) shall be CDF material from the crushed stone layer at the bottom of the structure to the common fill layer at the top of the structure. The common fill material shall be spread in layers not exceeding 9-inches in loose depth and each layer thoroughly compacted by mechanical methods and shall contain no rock, stones or boulders larger than 6-inches in their greatest dimension. The balance of the trench with no structures shall be common fill material placed in 9-inch thick lifts and compacted up to the bottom of the gravel subbase layer.
- D. All trench backfill under, and service lateral trench backfill within 3 feet of the large diameter (>18-inches) water transmission mains shall be quick-set CDF. Backfill shall be placed in appropriately sized lifts and on both sides of the transmission main simultaneously to ensure that all loads applied to the main by the backfill are properly balanced and that they do not exceed the safe load carrying capacity of the main at any time.
- E. All trench backfilling shall be done with special care and must be carefully placed so as not to disturb the work at any time if necessary, timber grillage or other suitable method shall be used to break the fall of material. The moisture content of the backfill material shall be such that proper compaction will be obtained. Backfill shall be made to grades required to establish the proper subgrade for the placement of topsoil or pavement base courses.
- F. In backfilling trenches, each layer of backfill material shall be moistened and compacted to a density as specified herein, and in such a manner as to permit the rolling and compaction of the filled trench or excavation with the adjoining

earth to provide the required bearing value.

- G. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.
- H. During filling and backfilling operations, pipelines will be checked by the Engineer to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied to meet Engineer and Owner requirements at no additional cost to the Owner.

3.9 BACKFILLING AGAINST STRUCTURES

- A. Backfilling against masonry or concrete shall not be done until permitted by the Engineer. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed, the Contractor, as required by the Engineer, shall make special leakage tests of the structures. After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using CDF Material.
- B. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures.
- C. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be remedied by the Contractor at no additional expense to the Owner.

3.10 CDF QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Slump: ASTM C143; one test at point of discharge for each day's placement; additional tests when CDF consistency seems to have changed.
- B. Compression Test Specimen: ASTM C31; one set of four (4) standard cylinders for each compression strength test, plus additional sets for each 100 cu yds more than the first 50 cu yds placed in any one day unless otherwise required.
- C. Compressive Strength Tests: ASTM C39; one set for each day's pour plus

additional sets for each 100 cu. yds more than the first 50 cu. yds placed in any one day; two specimens tested at 28 days, and two specimens tested at 90 days.

- D. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of placement, name of testing service, fill type and class, location of fill batch along route, design compressive strength limits at 28 days and 90 days, fill mix proportions and materials, compressive breaking strength, and type of break for both 28 day tests and 90 day tests.

3.11 TRENCH EXCAVATION

- A. For pipe installation in a cradle or within bedding, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.
- B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated by use of hand tools just before placing of pipe. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.
- C. Excavate trenches to depths so as to permit pipe to be laid at elevations, slopes, or depths of cover indicated on drawings, and at uniform slopes between indicated elevations.
- D. Make trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.
- E. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. above top of pipe.

3.12 EXCAVATION AT WATER TRANSMISSION MAINS

- A. Caution shall be used during trench excavation for the installation of sewers and drains in Walden Street that cross the large diameter (>18-inches) water transmission mains.
- B. Hand excavation methods shall be used within 3 feet horizontally of the transmission main pipe. Hand excavation methods shall also be used within a soil wedge delineated by a downward line at 45 degree angle drawn from the springline of the transmission main.

- C. Trenchless methods for the installation of sewers and drains crossing the water transmission main will not be allowed.

3.13 EXCAVATION NEAR EXISTING STRUCTURES

- A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.
- B. Excavate test pits when determination of exact location of pipe utilities or other underground structures is necessary for doing work properly.
 - 1. Conduct test pits in accordance with Specification Section 01500-1.7 TEST PITS.
 - 2. Record all information required under Part 1.2.B - Test Pit Logs of this Specification Section.
 - 3. Perform an instrument survey of all horizontal and vertical alignments.
 - 4. Photograph the existing conditions observed. Mark any utilities, structures or encasement that is difficult to discern with orange paint prior to photographing.
- C. Execution of any earth excavation shall not commence until the related dewatering, soil and fill management, excavation support systems, and required backfill and fill materials submittals are reviewed by the Engineer and all Engineers' comments addressed.
- D. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or utilities of the work previously completed under this contract.
- E. Excavate to widths that give suitable room for constructing structures or laying and jointing piping.
- F. Do not plow, scrape or dig by machinery near to finished subgrade in a manner that would result in disturbance of subgrade.
- G. Excavate to lines and grades indicated in an orderly and continuous program.
- H. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.

- I. Excavate to elevations indicated, or deeper, as required by the Engineer, to remove unacceptable subgrade material.
- J. Exercise care to preserve material below and beyond the lines of excavations.
- K. Boulders, rock fragments, and concrete less than one-half cubic yard encountered during excavation shall not be included for payment as rock.

3.13 REMOVAL OF SUBSURFACE OBSTRUCTIONS

- A. Remove indicated or approved subsurface structures and related obstructions to complete the work.
- B. Promptly notify the Engineer when any unexpected subsurface facilities are encountered during excavation such as utility lines and appurtenances, walls and foundations.

3.14 UNAUTHORIZED EXCAVATION

- A. When the bottom of any excavation is excavated beyond limits indicated or specified, backfill with crushed stone wrapped with non-woven geotextile fabric. No additional payment will be made for the excavation of backfill or unauthorized excavation.

3.15 SUBGRADE PREPARATION AND PROTECTION

- A. As required by the Engineer, over-excavate any unacceptable materials below the subgrade, and replace with compacted structural fill. Refer to Part 1.1.A.6 of this Specification Section for extent of this work.
- B. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench subgrade to avoid disturbance of the bearing surface.
- C. Backfill the overexcavation with crushed stone and compact as previously indicated.
- D. Proof roll with a vibratory plate compactor or double drum roller (4 passes) the exposed subgrade prior to backfilling and filling operation, or placing soil-supported pipeline.

3.16 CARE AND RESTORATION OF PROPERTY

- A. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces. Restore surfaces damaged by the Contractor's operations to a condition at least equal to that in which they were

found immediately before work commenced. Use suitable materials and methods for such restoration.

3.17 POLLUTION CONTROL

- A. During progress of work, conduct earth-moving operations and maintain work site so as to minimize the creation and dispersion of dust.
- B. Separation of Excavated Material for Reuse: Remove only existing pavement and all other surface materials, which may include concrete slabs, cobblestones, rail ties, by saw cutting that is necessary for prosecution of work.

PART 4 – COMPENSATION

Item 2210.1 - Test Pits

METHOD OF MEASUREMENT:

Measurement for payment for Test Pits will be based on the computed volume in cubic yards of material displaced during test pit excavation as required and measured by the Engineer. Depth of excavation will be measured to the average depth of the excavation. Irregularly deep parts of the excavation will not be used as the excavation depth. The width of the excavation will be measured to an average width across the excavation. Irregularly wide parts of the excavation will not be considered the width of the excavation. Test Pits, completed for the Contractor's convenience, not approved by the Engineer, will be at the Contractor's expense and at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Test Pit shall be based on the cubic yards excavated complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Test Pits. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavate and backfill such materials as necessary to locate pipe, utilities and other possible obstructions as indicated on the Drawings, as required by the Owner or Engineer, or as approved by the Owner or Engineer prior to performing the test pit; temporary excavation support; furnishing and placing backfill per one of the approved methods; compaction and compaction testing; coordination with utility companies/owners; survey of existing conditions including horizontal and vertical utility alignments and reflecting the actual conditions on the Project's As-built Drawings; and construction dewatering and all work incidental thereto and all work not specifically included for payment under other items.

EXCLUSIONS:

Test Pits completed for the purpose of soil characterization shall not be paid for under this item. Pre-trenching prior to the installation of temporary support of excavation or for any other purpose shall not be paid for herein unless approved by the Owner and Engineer prior to the pre-trenching or test pitting. Test pitting related to transferring existing water services to an existing water main are not paid for here and are paid for elsewhere.

Item 2210.2 - Controlled Density Fill for Backfill

METHOD OF MEASUREMENT:

Measurement for payment for Controlled Density Fill for Backfill shall be made on the basis of cubic yards placed within the trench width pay limits shown indicated elsewhere in the Construction Documents or as otherwise approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Controlled Density Fill for Backfill shall be based on the cubic yards installed complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Controlled Density Fill for Backfill. The work includes, but is not limited to; furnish and install controlled density fill for backfill under existing utilities, encasement of shallow pipe and utilities, and in areas of difficult compaction, and where required by the Engineer; temporary bulkheads and forms; furnishing and installing filter fabric; and material testing.

EXCLUSIONS:

Controlled Density Fill used for the abandonment of pipes and structures will not be paid for under this item.

Item 2210.3 – Gravel Subbase

METHOD OF MEASUREMENT:

Measurement for payment for Gravel Subbase shall be made on the basis of cubic yards placed during full depth construction between limits of proposed curbing as indicated elsewhere in the Construction Documents or as otherwise approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Gravel Subbase shall be based on the cubic yards installed complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Gravel Subbase. The work includes, but is not limited to; furnish and install Gravel Subbase where there is insufficient existing roadway base material, and where required by the Engineer and material testing.

SPECIAL NOTES/EXCLUSIONS:

Gravel Subbase used as trench backfill and for sidewalk construction will not be paid for under this item and are covered under separate pay items. Gravel subbase shall only be paid for work related to full depth roadway construction work. This item does not include payment for gravel subbase used within limits of porous pavement and is covered elsewhere.

Item 2210.3 – Overexcavation of Geotechnically Unsuitable Material

METHOD OF MEASUREMENT:

Measurement for payment for Overexcavation of Geotechnically Unsuitable Material shall be made on the basis of cubic yards of organic peat or silt, loose foundation soils, or other unsuitable material excavated as approved by the Engineer. The depth of unsuitable material in

pipe trenches shall be measured from 6 inches below the invert of the pipe to the top of suitable material or specified depth of overexcavation as determined by the Engineer. The width of unsuitable material shall be determined as outlined in the Typical Trench Detail included with the Contract Documents. The depth of unsuitable material in structure excavations shall be measured from 12 inches below the bottom of the structure slab to the top of suitable material or specified depth of overexcavation as determined by the Engineer. The width of unsuitable material in structure excavations shall be based on a 1:1 slope from the edge of the bottom of the structure to the top of the acceptable material.

BASIS OF PAYMENT / INCLUSIONS:

Overexcavation of Geotechnically Unsuitable Material shall be based on the cubic yards excavated complete for this item in the proposal. Under the unit price bid, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for overexcavation of organic peat or silt, loose foundation soils, or other unsuitable material below the grade of structures, pipe, or manholes, as directed and approved by the Engineer and as may be indicated in the Contract Documents. The work includes, but is not limited to; excavate organic peat or silt, loose foundation soils, or other unsuitable material; transporting material to the temporary soil staging area; furnish and install required temporary excavation support; furnish and place approved geotechnically suitable replacement backfill; compaction and compaction testing; and construction dewatering and all work incidental thereto and all work not specifically included for payment under other items.

EXCLUSIONS/SPECIAL NOTES:

This item does not include payment for the disposal and transportation of soil, other than to temporary staging, as it is paid for under soil management, transportation, and disposal quantities.

Item 2210.5 – Unclassified Excavation

METHOD OF MEASUREMENT:

Measurement for payment for Unclassified Excavation shall be made on the basis of cubic yards of asphalt, concrete subbase, and cobblestones, excavated to final grade as indicated elsewhere in the Construction Documents or as otherwise approved by the Engineer. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the removal of concrete subbase and cobblestones excavated to final grade. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavating, and all work incidental thereto and all work not specifically included for payment under other items.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Unclassified Excavation shall be based on the cubic yards excavated complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the removal of asphalt, concrete subbase, and cobblestones excavated to final grade. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavating concrete subbase and cobblestones; and all work incidental thereto and all work not specifically included for payment under other items.

EXCLUSIONS OR SPECIAL NOTES:

This item does not include payment for as removal of asphalt or temporary asphalt within the trench limits of structures, manholes, or pipe, as it is paid for elsewhere in the Contract Documents. This item does not include payment for removal of existing sidewalks (all types) as it is paid for elsewhere in the Contract Documents. This item does not include transportation and disposal of Unclassified Excavation, as it is paid for elsewhere in the Contract Documents. This item does include payment for removal of soil or gravel, as it is paid for elsewhere in the Contract Documents.

Item 2210.6 – Roadway Earth Excavation

METHOD OF MEASUREMENT:

Measurement for payment for Roadway Earth Excavation shall be made on the basis of cubic yards of gravel and soil, excavated to final grade as indicated elsewhere in the Construction Documents or as otherwise approved by the Engineer. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the removal of gravel and soil excavated to final grade within limits of full depth construction. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavating, and all work incidental thereto and all work not specifically included for payment under other items.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Roadway Earth Excavation shall be based on the cubic yards excavated complete for this item in the proposal. Under the per cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the removal of gravel and soil cobblestones excavated to final grade. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavating gravel and soil; transporting material to/from soil staging area; reuse of existing gravel or soil suitable for subbase; and all work incidental thereto and all work not specifically included for payment under other items.

END OF SECTION 02210

SECTION 02252

MANHOLES

2252.1	TYPE-1 MANHOLE – PRECAST 4-FOOT DIAMETER	EACH
2252.2	TYPE-1 MANHOLE – PRECAST 5-FOOT DIAMETER	EACH
2252.3	TYPE-1 MANHOLE – PRECAST 6-FOOT DIAMETER	EACH
2252.4	TYPE-3 EXTERNAL DROP MANHOLE – PRECAST 4-FOOT DIAMETER	EACH
2252.5	TYPE-4 SUMP MANHOLE – PRECAST 4-FOOT DIAMETER	EACH
2252.6	TYPE-4 SUMP MANHOLE – PRECAST 6-FOOT DIAMETER	EACH
2252.7	TYPE-4 SUMP MANHOLE – PRECAST 8-FOOT DIAMETER	EACH
2252.8	TYPE-6 MANHOLE OVER EXISTING UTILITY – PRECAST 4-FOOT DIAMETER	EACH
2252.9	TYPE-7 SQUARE MANHOLE – PRECAST 3-FOOT BY 4-FOOT	EACH
2252.10	EXISTING DRAINAGE OR SEWAGE STRUCTURE ADJUSTED	EACH
2252.11	MANHOLE – REMOVE AND REPLACE EXISTING FRAME AND COVER	EACH

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing, installing, and testing of precast concrete sanitary sewer manholes and storm drain manholes, complete and in place, within the limits and to the lines and grades indicated.

1.2 RELATED TECHNICAL SECTION

- A. Section 00825A – SPECIAL CONDITIONS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

- C. Section 02590 – BRICK MASONRY
- D Section 03300 – CONCRETE
- E. Section 03315 – GROUT
- F. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Complete shop drawings for all precast manhole sections, cast iron frames and covers and appurtenances.
 - 2. Prior to fabrication, submit shop drawings showing details of precast monolithic base sections; risers; eccentric cone and flat slab manhole tops; joints and gaskets; and construction details, tolerances, and other information as required by the Owner.
 - 3. Submit manufacturer’s recommended installation procedures for informational purposes.
 - 4. Submit concrete strength testing as specified herein.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Owner reserves right to inspect and test by independent services at manufacturer’s plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.
- B. Removed manhole fixtures must not be reused and shall be salvaged and delivered to the City of Cambridge Public Works storage yard unless directed by the Owner to dispose off site.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Precast Bases, Risers, and Tops:

1. Except as otherwise indicated, precast reinforced concrete manhole bases and risers shall be 48 inches, 60 inches, 72 inches, or 96 inches, with top sections of types indicated or as directed.
2. Manhole sections shall conform to the requirements of ASTM C478, latest revision, except as modified herein and/or on the drawings.
3. Each manhole section shall be constructed with a bell-and-spigot or tongue-in-groove joint.
4. The manhole sections shall be manufactured by the centrifugal, roller suspension or vertical cast process; workmanship and methods shall be in accordance with the best practices of modern shops for this type of work.
5. The height and diameter of manhole bases shall be as required to accommodate size of pipe used, as approved. The manhole risers shall be available in 1, 2, 3, and 4-foot lengths.
6. Manhole tops of the eccentric cone type shall be 3 or 4 foot lengths, with opening at top matching size of casting nominal diameter, unless otherwise noted as shown in the details.
7. Manholes larger than 4 feet in diameter at the base shall be reduced in diameter to 4 feet at the top riser section unless noted otherwise on the plans.
8. Manhole tops of the flat slab type, where space restrictions exist or where directed, shall not be less than 8 inches thick and reinforced as indicated, and shall have an opening having a minimum inside diameter of 24 inches.
9. Manhole bases and risers shall have the wall thicknesses as stated in the Drawings; cone type units shall taper to a minimum wall thickness of 8-inches at top.
10. Exterior concrete surfaces not otherwise manufactured with crystalline waterproofing admix shall be coated with bituminous damp proofing as per Section 07160 – BITUMINOUS DAMPPROOFING.

B. Concrete:

1. Cement shall be moderate heat-of-hydration Portland cement conforming to ASTM C150, latest revision, Type II. Absorption, determined by absorption test described in ASTM C478, latest revision, shall not exceed 8 percent of dry weight.

2. The concrete for precast manhole sections shall have an average strength of not less than 4,000 psi at 28 days. Strength shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the manhole sections, cores cut from the manhole sections, or by other approved methods. Not less than two concrete strength tests shall be made for each 100 linear feet of manhole sections and the test results submitted to the Owner. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.
3. Concrete mix design for pre-cast sections shall include crystalline waterproofing admix in accordance with Section 03300 – CONCRETE.

C. Frames and Covers:

1. All frames shall have a minimum clear opening of 24 inches. Standard frame height shall be 8 inch. Compact 4-inch high frames shall be used only where indicated on the drawings or directed by the ENGINEER.
2. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under seasonable temperature changes.
3. Frames and Covers shall be Cast Iron, conforming to ASTM A48, Class 35B and as follows:
 - a. Castings to be free from scale, lumps, blisters and sandholes.
 - b. Machine contact surfaces to prevent rocking.
 - c. Thoroughly clean and conduct hammer inspection.
4. Two pickholes cast 180° apart shall be closed loops to facilitate removing cover allowing manhole pick to “hook” the loops.
5. Frames and covers shall be similar to a style typified by East Jordan Iron Works (Series 2111) or approved equal.
6. Frames and covers shall be capable of withstanding AASHTO H-20 loading unless otherwise indicated or specified.
7. The Contractor shall furnish all manhole frames and covers conforming to the details shown on the drawings, or as herein specified. Frames and covers shall be of cast iron with diamond cover surface design.

Manhole covers shall be machined to fit securely and evenly on the frame.

8. Covers for all structures shall have the word "SEWER", "DRAIN" or other appropriate designation cast upon them.

D. Jointing:

1. Precast machine-made solid segments shall conform to ASTM C139.
2. Ends of each length of manhole riser, the bottom end of manhole tops of the cone type, base slabs, and the tops of monolithic bases shall be provided with bell-and-spigot or tongue-and-groove ends of concrete formed on machined rings to insure accurate joint surfaces.
3. Jointing shall be O-ring gaskets or butyl rubber molded sealants. All joints shall be provided so as to be watertight under all conditions of service. The ends of base, riser, and cone sections to be jointed using neoprene "O-ring" type joints shall be designed to enclose the gasket on four surfaces when the joint is in its final position.

E. Gaskets:

1. Gaskets for sealing joints using the "O-ring" type gaskets shall conform to ASTM C443, latest revision, and shall be of rubber of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of neoprene gaskets for pipe joints, or shall be vulcanized butyl rubber sealants meeting or exceeding Federal Specifications SS-S-210.
2. Each gasket shall be a continuous ring of round solid cross-section having smooth surfaces free from blisters, porosity and other imperfections. The joint sealing gasket shall be of a composition and texture which shall be resistant to sewage, industrial wastes including gasoline, oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,200 psi. The elongation shall be such that 2-inch gauge marks shall stretch to not less than 9 inches. The compression set (constant deflection) shall not exceed 25 percent of the original gauge length. The tensile strength after accelerated aging shall be not less than 80 percent of the original strength.
3. The butyl rubber sealant shall have a self adhesive nature and shall have a diameter of 1 inch and shall be furnished in coils. The sealant shall meet the following properties:

<u>DESCRIPTION</u>	<u>SEALANT PROPERTY</u>
Base	Vulcanized Butyl Rubber
Percent of Solids	100%
Shore "A" Durameter:	
- Initial	10
- Aged	20
Adhesion to Clean Surfaces	Excellent
Temperature Range:	
- Application	-20° F to 120° F
- Service	-65° F to 200° F
Water Absorption after 14 days immersion:	Less than 5%
Chemical Resistance after 7 days immersion in 5% Potassium Hydroxide and 5% Hydrochloride Acid	Excellent
Resistance to Water and Organic Solvents	Excellent
Resistance to Shock, Heat, and Cold	Excellent
Color	Black
Shelf Life	Excellent
Elongation	
- Initial	30%
- 2 weeks at 190° F, drying	250%
- 2 weeks in water	300%
Weather Resistance	Excellent
Moisture Diffusion Resistance	Excellent
Specific Gravity	1:18
Flash Point	None
Fire Point	Over 620° F

F. Mortar for Sealing Joints:

1. Mortar (grout), for sealing mortar-type joints or grouting field made pipe openings, shall be a non-shrink type mortar or grout which shall be a factory-mixed ready-to-use product containing especially prepared aggregate, cement and sand and other components which will produce a mortar or grout with properties to counteract shrinkage, increase density, withstand impact, improve workability, produce watertight joints, and which will be suitable for jointing around pipes entering manholes.

G. Mortar for Brickwork:

1. Per Section 02590 – BRICK MASONRY

H. Brick

1. Per Section 02590 – BRICK MASONRY

I. Flexible Seals

1. Flexible manhole seals shall be:
 - a. New Lok Joint Flexible Sleeve by Interpace,
 - b. A-Lok Manhole Sleeve by L & L Concrete Products,
 - c. Press Wedge II by Pre-Seal Basket Corporation,
 - d. or approved equal.
2. Field applied seals shall be similar to a style typified by Kor-N-Seal boot or an approved equal.
3. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

PART 3 – EXECUTION

3.1 HANDLING:

- A. Manhole sections shall not be shipped for at least five days after manufacture.
- B. All manhole sections which have been damaged after delivery, and manhole sections installed in the work which are found to be damaged will be rejected and shall be removed and replaced by the Contractor with new, sound and approved material, at no additional expense to the Owner. At the time of inspection, the surfaces of the sections shall be dense and close-textured. Cores shall serve as a basis for rejection of manhole sections if poor bond or reinforcement is exposed.
- C. Each manhole section shall be handled into its position in the trench only in such manner and by such means as recommended by the manufacturer of the manhole sections, and as approved. Provide all necessary slings, straps and other devices for the safe and satisfactory handling and support of the manhole sections during lifting, installation and final positioning of the sections. Lifting holes may be permitted provided suitable rubber or concrete stopper or other approved devices are provided for plugging and sealing the holes and watertight, all as approved.

3.2 INSPECTION

- A. All manhole sections will be inspected upon delivery; manhole sections which do not conform to specification requirements will be rejected and shall be removed immediately from the site by the Contractor at no additional cost to the Owner. The Contractor shall furnish all labor and facilities necessary to assist the Owner in inspecting the material.

- B. The quality of all materials, processes of manufacture, and the finished manhole sections shall be subject to inspection and approval of the Owner. Such inspection may be made at the place of manufacture and/or on the site, and the manhole sections shall be subject to rejection at any time because of failure to meet any of the specification requirements, even though sample manhole sections may have been accepted as satisfactory.

3.3 INSTALLATION

- A. Manhole sections shall be installed level and plumb and set on 12 inches compacted crushed stone or gravel base as indicated on the Drawings.
- B. Manhole sections shall be installed using approved type neoprene "O-Ring" type gasket or butyl rubber sealants for sealing joints of manhole sections; jointing shall be performed in accordance with the pipe manufacturer's recommendations, and as approved.
- C. Water shall not be permitted to rise over newly made joints until after inspection as to their acceptability. All jointing shall be done in a manner to insure watertight joints.
- D. All holes in sections used for handling shall be thoroughly plugged with non-shrink grout.
- E. The manhole frames shall be set with tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings utilizing brick and mortar or reinforced precast concrete rings as per Section 02590 – BRICK MASONRY. Frames shall be set in a full bed of mortar so that the space between the top of the brick and mortar and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to a height of 4-inches above the flange. Exterior surfaces of brick masonry shall be plastered with 1/2 inch of cement mortar.
- E. Opening in precast manhole sections to extent indicated on the drawings to receive entering pipes shall be made at the place of the manufacturer. Where opening cannot be determined, they shall be hole cored in the field. Depending upon the type of pipe seals to be furnished, pipe openings shall be provided with manhole seals of proper sizes to accommodate pipe sizes and shall be cast into the manhole at the time of manufacture. When openings are hole cored in the field, the openings for entering pipes shall be of a size to provide a uniform annular space between the outside of pipe wall and the opening in the manhole section. The annular space for pipes requiring mortar connections (RCP pipe) shall be 3/4 inch, and after the pipe is in position the annular space shall be solidly filled with non-shrink mortar. The annular space for pipes requiring flexible connections (DI, PVC and FRP pipe) shall be made in accordance with

the Drawing details. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Openings which are hole cored in the manhole sections in the field shall be circular, not square and shall be made by the appropriate coring operation; damaged sections will be rejected and shall be replaced at no additional expense to the Owner.

- F. Manhole inverts shall be brick masonry or concrete and shall have a cross-section shaped to conform to connecting pipes; changes in size shall be made gradually and evenly. Concrete and brick masonry for manhole inverts shall conform to Section 03300 – CONCRETE and Section 02590 – BRICK MASONRY, constructed as indicated and as specified.

3.4 BACKFILLING

- A. Conduct backfill operations of open cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed, all in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

3.5 INSPECTION AND TESTING

- A. Acceptance of precast reinforced concrete manhole sections will be made on the basis of plant tests, material tests, and inspection of the completed product, in accordance with the requirements of ASTM C478, latest revision, with the following modifications.
- B. Manhole sections shall not be shipped for at least five days after manufacture when cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 150° F for a period of not less than 8 hours, or when necessary, for such additional time as may be required to enable the manhole sections to meet specification requirements.
- C. Leakage Tests
 - 1. Refer to Article 51 – “Leakage Tests” in Section 00825A – SPECIAL CONDITIONS.
 - 2. If Leakage Test method consists of visual or Close Circuit Television Inspection, the contractor shall perform at no additional cost to the Owner. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.

3.6 CLEANING

- A. All excess material including dirt, loose concrete, bricks, grit, stones and any other material, shall be removed from all manholes prior to final review by the Engineer. A final cleaning shall be performed, to include complete removal of

all accumulated debris and fluids from each catch basin, upon complete project completion.

PART 4 – COMPENSATION

Item 2252.1 --- Type-1 Manhole – Precast 4-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 4-foot diameter precast concrete manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 4-foot Diameter shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 10 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.2 --- Type-1 Manhole – Precast 5-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and

leakage testing/inspection of 5-foot diameter precast concrete manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 5-foot Diameter shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 11 feet as measured from the floor of the structure section to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.3 --- Type-1 Manhole – Precast 6-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 6-foot diameter precast concrete manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary

sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 6-foot Diameter shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 9 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.4 --- Type-3 External Drop Manhole – Precast 4-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 4-foot diameter precast concrete manholes with external drop connections complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); pipe and concrete for external drops; bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 4-foot Diameter External Drop shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 11 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.5 – Type-4 Sump Manhole – Precast 4-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 4-foot diameter precast concrete sump manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 4-foot Diameter Sump Manhole shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 11 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.6 – Type-4 Sump Manhole – Precast 6-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 6-foot diameter precast concrete sump manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 6-foot Diameter Sump shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 14 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.7 – Type-4 Sump Manhole – Precast 8-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 8-foot diameter precast concrete sump manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material

to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 8-foot Diameter Sump shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 16 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.8 – Type-6 Manhole Over Existing Utility – Precast 4-foot Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 4-foot diameter precast concrete manholes over existing utility complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 4-foot Diameter Over Existing Utility with Base shall be based

on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 12 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; drop manholes of the same diameter; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.9 Type-7 Square Manhole – Precast 3-foot by 4-foot

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of 3-foot by 4-foot square precast concrete manholes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast manhole sections with frames, covers, masonry chimney, appurtenances, bench, and sanitary sewer (if applicable) pipe sleeve (if applicable); pipe and concrete for external drops; bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Precast 3-foot by 4-foot square manholes shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manholes as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume manholes to have an average vertical depth of 12 feet as measured from the floor of the structure to finished grade.**

Manholes installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: manholes of different diameters; manholes of different types; disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2252.10 – Existing Drainage or Sewer Structure Adjusted

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, and inspection of replaced frame and cover on existing manhole(s) complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; protection of existing manhole; adjusting castings; masonry chimney; bituminous damp proofing (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Existing Drainage or Sewer Structure Adjusted shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional, manholes frames and covers adjusted as shown on the Contract Drawings or as directed by the Owner or Engineer.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; procurement, installation, and compaction of CDF; frames and cover for proposed manholes; adjusting castings for paving.

Item 2252.11 --- Manhole – Remove and Replace Existing Frame and Cover

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and inspection of removal and replacement of existing manhole frame and grate complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; manhole frames, covers, masonry chimney, hoods, appurtenances; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Manhole – Remove and Replace Existing Frame and Grate shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional manhole frame and covers removed and replace as shown on the Contract Drawings or as directed by the Owner or Engineer.

Manhole frame and grates installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement of off-site common fill; procurement, installation, compaction of CDF; removal and replacement of existing catch basin frame and covers; and removal of existing manholes or catch basins included elsewhere.

-END OF SECTION 02252-

SECTION 02500

PAVING AND SURFACING

2500.1	HOT MIX ASPHALT BASE COURSE –TRENCH WIDTH	TON
2500.2	TEMPORARY 2-INCH OVERLAY	SQUARE YARD
2500.3	HOT MIX ASPHALT BASE COURSE – FULL WIDTH	TON
2500.4	HOT MIX ASPHALT TOP COURSE – FULL WIDTH	TON
2500.5	HAND PLACED HOT MIX ASPHALT	TON
2500.6	COLD PLANE 2-IN, FULL WIDTH	SQUARE YARD
2500.7	FINAL GRADING SUB-BASE UNDER ROADWAYS	SQUARE YARD
2500.8	HOT POURED RUBBERIZED ASPHALT SEALER	LINEAR FOOT
2500.9	HOT MIX ASPHALT INFRARED PAVEMENT SEALING	LINEAR FOOT
2500.10	RUBBER PAVING SURFACE	SQUARE FOOT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Furnish and install paving on all roadway areas as indicated and specified.
- B. Pavement and surfacing shall be constructed in courses as shown on the plans and as required in accordance with these specifications and in close conformity with the lines, grades, compacted thickness and cross sections shown on the plans.
- C. The Contractor shall take all reasonable measures to assure proper drainage on the final surface of the roadway. Pavement that does not drain properly due to poor workmanship shall not be accepted by the Owner and shall be replaced by the Contractor at no additional cost to the Owner.
- D. Reference is made herein to the Commonwealth of MassDOT, Standard Specifications for Highways and Bridges, latest edition, and all addendums/supplemental specs hereinafter referred to as the "Standard Specifications." All references to method of measurement, basis of payment,

and payment items in the Standard Specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

- E. Where required by the Engineer, the roadway surface shall be repaired by the infrared method. The repairs shall include the cleaning of the area, infrared heating, the addition of recycling agent and additional hot mix asphalt as required, raking to grade, compacting, and the addition of rejuvenating sealer with sand cover. The work shall be done in accordance with these Specifications and/or as required by the Engineer.
- F. This Specification Section refers to standard pavement. For Hot Mix Asphalt Porous Pavement, refer to Specification Section 02510.

1.2 RELATED WORK

- A. Division 1 – General Requirements
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02524 – CURBS, WALKS AND DRIVEWAYS
- D. Section 02577 – PAVEMENT MARKINGS
- E. Section 03300 – CONCRETE

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with the General Conditions of Contract and Section 01300 – SUBMITTALS:
 - 1. Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.
 - 2. Design Data: Submit design mix for asphalt base, binder and top course.

1.4 GRADE CONTROL

- A. Establish and maintain required lines and elevations.

1.5 QUALITY CONTROL

- A. The Engineer may require the Contractor to remove at their own expense, any

defective mix not conforming to the specified job mix formula within the stipulated tolerances. Samples of the actual mixture in use will be taken as many times daily as necessary and the mixtures shall be maintained uniform for the project. The Engineer may suspend further approval for use of the Plant mixtures if the mixtures do not conform to the specified requirements.

- B. Do not place materials when underlying surface is muddy, frozen, or has frost, snow, or water thereon.

1.6 GUARANTEE

- A. During the one-year guarantee period, the Contractor shall maintain the surfacing and shall promptly fill with similar material in compliance with the Specifications, any depressions and holes that may occur during that time period.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Gravel Subbase

1. Materials including preparation of subgrades shall meet the requirements of the applicable sections of the Specifications.
2. The trench gravel subbase shall be used in the upper 1-foot of trench backfill material immediately below pavements and graded in accordance with Massachusetts Highway Department “Standard Specifications” Section M1.03.1 and applicable subsections of Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

B. Hot Mix Asphalt Pavement – Base Course

1. Asphalt Base Course and Asphalt Tack Coat shall conform to the applicable subsections of Section 460, Hot Mix Asphalt Pavement, of the Massachusetts Highway Department’s “Standard Specifications”.
2. Tack coat shall be RS-1 emulsion.

C. Hot Mix Asphalt Pavement – Top Course

1. Asphalt Top Course shall conform to the applicable subsections of Section 460, Hot Mix Asphalt Pavement, of the Massachusetts Highway Department’s “Standard Specifications.”

D. Hot Poured Rubberized Asphalt Sealer

1. Hot Poured Rubberized Asphalt shall conform to Federal Specification Number SS-S-1401 as required in Section 460, Hot Mix Asphalt Pavement, of the Massachusetts Highway Department's "Standard Specifications."
- E. Rubber Paving Surface
1. The paving material shall be K.B. Industries Flexi-Pave or approved equivalent product and shall be used in accordance with the supplier's specifications. Rubber Paving Surface shall be submitted to the Engineer for review and approval

PART 3 – EXECUTION

3.1 SUBGRADE PREPARATION AND PROTECTION

- A. Bring subgrade to required grade as necessary prior to placing subbase material.
- B. As required by the Engineer, over-excavate on-site fill material and any unacceptable materials below the subgrade. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the on-site fill material and unacceptable materials to avoid disturbance of the bearing surface.
- C. Proof roll the overexcavated subgrade prior to placing crushed stone.
- D. Backfill the overexcavation with crushed stone and compact as indicated in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

3.2 PLACEMENT OF SUBBASE

- A. Do not begin placement of subbase and paving work until deficient subgrade areas have been corrected and are ready to receive paving.
- B. Subbase under roadway shall be installed and compacted as covered in the Contract Drawings and in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

3.3 HOT MIX ASPHALT BASE COURSE

- A. Weather Limitations
 1. Apply prime and tack coats when ambient temperature is above 50 deg.F (10 deg.C), and when temperature has not been below 35 deg.F

(1 deg.C) for 12 hours immediately prior to application. Do not apply when subbase is wet or contains an excess of moisture.

2. Base course pavement for temporary pavement may be placed when air temperature is above 30 deg.F (-1 deg.C) and rising.

B. Placement

1. Base course shall be spread and compacted to a finished thickness indicated on the Contract Drawings. A smooth even surface shall be produced.
2. Base course placement for temporary paving and trench paving shall be performed on a weekly basis or as otherwise approved by the Owner and Engineer. Cold Patch for temporary pavement shall not be allowed with the exception of in an emergency or to cover steel road plate edges.
3. Base course placed as temporary paving shall be maintained until removed prior to final paving.

3.4 HOT MIX ASPHALT TOP COURSE

A. Weather Limitations

1. Construct asphalt surface course when atmospheric temperature is above 40 deg.F (4 deg.C) and when base is dry.

B. Placement

1. Top course shall be spread and compacted, to the width required in the Contract Documents and to a finished thickness indicated in the Contract Documents. A smooth, even surface shall be produced. Full width overlays shall be installed after the street has been cold planed or as approved by the Owner and Engineer.
2. Apply tack coat at a rate of 0.05 to 0.10 gallons per square yard over the base and binder courses. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

C. Placing Mix

1. Place hot mix asphalt mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 deg.F (107 deg.C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness. Protect all adjacent construction from staining with mix or damage by mechanical equipment. Clean, repair or replace any construction stained or

damaged at no additional cost to the Owner.

2. Place pavement in strips not less than 2-feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete binder course for a section before placing top course.
3. The Contractor shall supply an approved Dial Type Asphalt Thermometer (Range 10° C to 260° C) for each paving machine in operation on the project. The thermometer shall remain the property of the Contractor upon completion of the project.

D. Rolling

1. Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
2. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.
3. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
4. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
5. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot mix asphalt. Compact by rolling to match the surrounding surface density and smoothness.
6. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked by wheel traffic.

E. Existing Pavement/Joints

1. The edges of existing pavement, which are to remain, shall be saw cut to even, straight edges. This includes road and trench edges. Any joints at junction of old and new pavements shall be sealed with an asphalt emulsion and covered with sand.

2. Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt course. Clean contact surfaces and apply tack coat.

F. Compaction

1. The asphalt mixture shall be compacted to at least 95% of the density achieved on the laboratory testing of the design mix for the project. Density will be checked by the Nuclear Density Gage Method, ASTM D2950. Testing shall be completed by Contractor at no expense to Owner for every 200 square yards of surface area placed.

G. Field Quality Control

1. Thickness: Test in-place asphalt courses for compliance with requirements for thickness. Repair or remove and replace unacceptable paving as required by Engineer, and at no additional cost to the Owner. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
 - a. Base or Binder Course: 1/4-inch, plus or minus.
 - b. Surface Course: 1/4-inch, plus or minus.

H. Crack Sealing

1. Crack sealing shall be performed where required by the Engineer with modified asphalts (e.g. hot poured rubberized asphalt sealer). Prior to sealing a crack all compressible material shall be removed by high-pressure air or routing. If grass or vegetation is present in the crack the Contractor shall inject a liquid herbicide to prevent future growth. For small hairline cracks, an asphalt slurry mixture type SS-1, SS-1h shall be squeegeed over the surface and forced in the cracks. The slurry shall be maintained at a significant fluidity to be able to flow into the hairline cracks. Sealing of cracks shall be considered to be complete upon review and approval by the Engineer.

I. Liquid Asphalt Emulsion

1. Liquid Asphalt Emulsion shall be applied prior to installation of asphalt as incidental to all pavement pay items. Emulsion shall be AC-20 conforming to AASHTO M226 and shall be applied at a temperature over 100 degrees F by an emulsion truck.
2. The emulsion truck shall have pneumatic tires of such width and number that the load produced on the surface shall not exceed 672 lbs/in of tire width, and it shall be designed, equipped, and operated so

that at an even heat the emulsion may be applied uniformly on variable widths of surface at a readily controlled rate of 1/20 gal/square yard or as required by the Engineer.

3. The emulsion shall be applied within a pressure range of 25 psi to 75 psi. Distributor equipment shall include a tachometer, pressure gauges, volume-measuring devices, and a thermometer for reading the temperature of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

3.5 RAISING AND ADJUSTING CASTINGS

- A. Prior to top course paving, all existing City or Owner owned catch basin and manhole castings and curb and valve boxes shall be raised, if necessary, to the proper grade by the Contractor.
- B. Castings owned by private utilities shall be raised by the responsible utility. The Contractor shall be responsible for coordinating this work.
- C. The method of adjusting catch basin and manhole castings shall be as follows: Cut around catch basin or manhole castings a minimum of 8 inches from casting. Excavate and, if required, rebuild up to 12 inches of masonry below the bottom of the casting. Backfill with suitable material and compact to bottom of casting. Place high, early strength cement concrete or hot mix asphalt collar, as required by the Authority, to approximately 1½ inches below the raised casting grade. Masonry work shall conform to Section 02252 - MANHOLES and Section 02590 – BRICK MASONRY.
- D. The method of raising curb and valve boxes shall be as follows: Cut around valve box a minimum of 8 inches from valve box. Excavate as required and raise the valve box. Pour high early strength cement concrete or hot mix asphalt collar, as required, to approximately 1½ inches below the top of the valve box.

3.7 EXCAVATION BY COLD PLANING

- A. The Contractor shall cold plane 2 inches as transitions onto the adjoining streets, and to the limits as established on the Plans. Cold planing shall be done after all excavation affecting the area is complete and prior to final paving.
- B. The Cold Planer shall be equipped with an elevating device capable of loading planed material directly into dump trucks while operative. The Cold Planer shall further have all necessary safety devices such as reflectors, headlights, taillights, flashing lights, and back-up signals so as to operate safely in traffic, both in the day or at night. The Cold Planer shall be designed and built for planing flexible pavements and possess the ability to plane cement concrete

patches when encountered in bituminous pavement. The Cold Planer shall be self-propelled and have the means for planing without tearing or gouging the underlying surface. The Cold Planer shall be adjustable as to crown and depth and shall meet the standards of the Air Quality Act for noise and air pollution.

- C. Variable lacing patterns shall be provided to permit a rough grooved surface as directed. A 2-inch cut is required in one (1) pass. The minimum width of pavement planed in each pass shall be 6-feet, except in areas to be trimmed and edged.
- D. The milled or planed surface shall conform generally to the existing grade and cross slope. The surface shall not be torn, gouged, shoved, broken or excessively grooved. It shall be free of imperfections in workmanship that prevent resurfacing after this operation. Excess material shall be swept and removed so that the surface is acceptable to traffic.

3.8 HOT MIX ASPHALT INFRARED PAVEMENT SEALING

- A. Area to be repaired shall be swept clean to remove loose and foreign materials.
- B. An approved infrared heater 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 improper heating techniques shall be avoided. If this condition occurs, the oxidized pavement material shall be considered a defective material, and shall be disposed of and replaced in accordance with Article 16 and Article 20 of Section 00825 – SPECIAL CONDITIONS.
- C. The softened area shall have a minimum cutback of one foot on all sides of the excavation. The area shall then be scarified and sprayed with a liquid asphalt emulsion approved by the engineer, and raked to a workable condition.
- D. For trenches longer than 20 linear feet with jogs within 50 feet of each other, the contractor shall have a minimum cutback of one foot. The cutback shall be cut in a straight line consistent and equidistant from the opposite outside extremity of the one foot cutback trench line.
- E. For street crossings, no jogs are allowed. A one-foot cutback on each side from the widest section of the crossing, and uniform width throughout is required.
- F. Any additional hot mix asphalt required, shall be obtained from an engineer approved solid metallic heated asphalt storage unit. No hot mix asphalt, with a temperature of under 200 degrees F, shall be used.
- G. After the paving mixture has been properly admixed and raked to grade, compaction with a steel wheeled roller shall be required to establish a uniform density consistent to that of the adjacent surface within the work area. The

finished patch shall be level with no depression retaining water on any of its surface.

3.9 RUBBER PAVING SURFACE

- A. The Contractor shall install a flexible/porous paving material made up of recycled rubber tires over a crushed stone base, at existing tree locations where roots are exposed or pushing up the sidewalk/roadway. Locations to be determined in the field with the Engineer, Landscape Architect, and City Arborist.
- B. The product shall be used in accordance with supplier's specifications.

PART 4 – COMPENSATION

Item 2500.1 --- Hot Mix Asphalt Base Course – Trench Width

METHOD OF MEASUREMENT:

Measurement for Payment for Hot mix asphalt Base Course – Trench Width shall be based on the tons of base course placed complete, to a maximum width defined by the payment limits shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer. Tonnage of pavement placed will be verified through calculation based on the actual thickness and trench widths and lengths or the pavement thicknesses, widths, and lengths defined in the Contract, whichever is less. The formula for calculating the tonnage of pavement shall be $W' \text{ (trench width)} \times L' \text{ (trench length)} \times D' \text{ (trench depth)} \times 0.075 \text{ ton/cf} = \text{tons}$. Calculated tonnage will be compared to the actual tonnage placed as submitted on pavement tonnage slips. If the tonnage calculated is greater than 10% lower than the tonnage on the pavement slips, the lesser tonnage shall be paid to the Contractor. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents shall be at no additional cost to the Owner.

BASIS OF PAYMENT:

Payment for Hot mix asphalt Base Course – Trench Width shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install hot mix asphalt base course within the limits of the trenches to depth and width indicated within the payment limits, complete, as shown in the Contract Documents or at the requirements of the Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; installation and compaction of hot mix asphalt base course to the depth and width and in the area specified; hand placement and compaction of hot mix asphalt around structures, aprons, driveways and as required; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

Items not included for payment herein include, but are not limited to; hot mix asphalt for permanent base course placed full roadway width and within trenches; hot mix asphalt for

permanent top course; hot mix asphalt porous pavement; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.2 --- Temporary 2-inch Overlay

METHOD OF MEASUREMENT:

Measurement for Payment for Temporary 2-inch Overlay shall be based on the Square Yards of temporary overlay installed as required by the Owner or Engineer.

BASIS OF PAYMENT:

Payment for Temporary 2-inch Overlay shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install 2-inch temporary overlay as required by the Owner or Engineer. The work includes, but is not limited to the following; furnishing and installing overlay; raising and resetting existing structures, castings and boxes; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not included for payment elsewhere.

SPECIAL NOTES/EXCLUSIONS:

Items not included for payment herein include, but are not limited to; hot mix asphalt for temporary paving; hot mix asphalt for permanent base course placed within trenches; hot mix asphalt for permanent top course; hot mix asphalt porous pavement; and pavement installed to replaced asphalt damaged by the Contractor. Contractor shall only be paid once within the limits as required by the Owner or Engineer.

Item 2500.3 --- Hot Mix Asphalt Base Course – Full Width

METHOD OF MEASUREMENT:

Measurement for Payment for Hot mix asphalt Base Course – Full Width shall be based on the tons of base course placed complete, to a maximum width defined by the payment limits shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer. Tonnage of pavement placed will be verified through calculation based on the actual thickness and roadway widths and lengths or the pavement thicknesses, widths, and lengths defined in the Contract, whichever is less. The formula for calculating the tonnage of pavement shall be $W' \text{ (trench width)} \times L' \text{ (trench length)} \times D' \text{ (trench depth)} \times 0.075 \text{ ton/cf} = \text{tons}$. Calculated tonnage will be compared to the actual tonnage placed as submitted on pavement tonnage slips. If the tonnage calculated is greater than 10% lower than the tonnage on the pavement slips, the lesser tonnage shall be paid to the Contractor. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents shall be at no additional cost to the Owner.

BASIS OF PAYMENT:

Payment for Hot mix asphalt Base Course – Full Width shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install hot mix asphalt base course full roadway width to depth and width indicated within the payment limits, complete, as

shown in the Contract Documents or at the requirements of the Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; installation and compaction of hot mix asphalt base course to the depth and width and in the area specified; hand placement and compaction of hot mix asphalt around structures, aprons, driveways and as required; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

Items not included for payment herein include, but are not limited to; hot mix asphalt for temporary paving; hot mix asphalt for permanent base course placed within trenches; hot mix asphalt for permanent top course; hot mix asphalt porous pavement; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.4 --- Hot Mix Asphalt Top Course – Full Width

METHOD OF MEASUREMENT:

Measurement for Payment for Hot mix asphalt Top Course – Full Width shall be based on the tons of top course placed complete, to a maximum width defined by the payment limits shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer. Tonnage of pavement placed will be verified through calculation based on the actual thickness and roadway widths and lengths or the pavement thicknesses, widths, and lengths defined in the Contract, whichever is less. The formula for calculating the tonnage of pavement shall be $W' \text{ (trench width)} \times L' \text{ (trench length)} \times D' \text{ (trench depth)} \times 0.075 \text{ ton/cf} = \text{tons}$. Calculated tonnage will be compared to the actual tonnage placed as submitted on pavement tonnage slips. If the tonnage calculated is greater than 10% lower than the tonnage on the pavement slips, the lesser tonnage shall be paid to the Contractor. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents shall be at no additional cost to the Owner.

BASIS OF PAYMENT:

Payment for Hot mix asphalt Top Course – Full Width shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install hot mix asphalt top course to depth and full roadway width, complete, as shown in the Contract Documents or at the direction of the Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; installation and compaction of hot mix asphalt top course to the depth and width and in the area specified; hand placement and compaction of hot mix asphalt around structures, aprons, driveways and as required; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

Items not included for payment herein include, but are not limited to; hot mix asphalt for temporary paving; hot mix asphalt for permanent base course; hot mix asphalt porous pavement; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.5 --- Hand Placed Hot Mix Asphalt

METHOD OF MEASUREMENT:

Measurement for Payment for Hand Placed Hot mix asphalt shall be based on the tons of hand placed hot mix asphalt placed complete, to limits as required by the Engineer or Owner and as measured by the Engineer. Tonnage of pavement paid will be calculated based on the actual thickness measured, width of placement measured and length of placement measured or the pavement thicknesses, widths, and lengths defined in the Contract, if appropriate, whichever is less. The formula for calculating the tonnage of pavement shall be $W' \text{ (trench width)} \times L' \text{ (trench length)} \times D' \text{ (trench depth)} \times 0.075 \text{ ton/cf} = \text{tons}$. Calculated tonnage will be compared to the actual tonnage placed as submitted on pavement tonnage slips. If the tonnage calculated is greater than 10% lower than the tonnage on the pavement slips, the lesser tonnage shall be paid to the Contractor. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents or as required shall be at no additional cost to the Owner.

BASIS OF PAYMENT:

Payment for Hand Placed Hot mix asphalt shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install hand placed hot mix asphalt to depths, widths, and lengths required by the Owner or Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; hand placement and compaction of hot mix asphalt binder, base or top course to the depth, width and length and in the area required by the Owner or Engineer; jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not included for payment elsewhere.

This item shall include hand placed hot mix asphalt in locations where paving machines cannot maneuver. All locations of hand placement of hot mix asphalt shall be approved by the Engineer.

SPECIAL NOTES ON EXCLUSIONS:

This item is NOT used for hand placement of hot mix asphalt in trenches or for other temporary conditions within the roadway or sidewalk including, but not limited to, temporary pavement at tree well locations. Hand placement of hot mix asphalt in trenches and for other uses of temporary placement shall be paid for under Item 2500.1. This item is NOT used for hand placement of hot mix asphalt under wire cut bricks. Hand placement of hot mix asphalt under wire cut bricks shall be considered incidental to the unit price bid for item 2524.12. This item is NOT used for hand placement of hot mix asphalt aprons around castings or other transitions after cold planning and before final paving. Hand placement of hot mix asphalt aprons around castings or other transitions after cold planning and before final paving shall be considered incidental to the unit price bid for item 2500.6. Hand placement of hot mix asphalt at driveways at the back of sidewalk are not paid for in this item and are paid for in Section 02950 – BACK OF SIDEWALK RESTORATION.

Item 2500.6 --- Cold Plane 2-In, Full Width

METHOD OF MEASUREMENT:

Measurement for the Cold Plane 2-In, Full Width will be based on the square yards of hot mix asphalt pavement cold planned to a depth of 2-inches, as measured by the Engineer to the payment limits described in the Contract Drawings and Specifications.

BASIS OF PAYMENT:

Payment for Cold Plane 2-In, Full Width shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to cold plane 2-inches to the pay limits indicated on the Drawings and as specified. The work includes removing, hauling, stockpiling, and disposing or reusing of cold planned asphalt material; sweeping after the cold planning operation; removal of asphalt from around existing structures and castings; providing transitions at the limits of the cold planning; providing and maintaining; temporary hot mix asphalt aprons at transitions and castings until final paving; maintaining the cold planned surface until final paving; providing temporary pavement markings, as required, until final paving; and all incidental work not included for payment elsewhere.

Item 2500.7 --- Final Grading Sub-Base Under Roadways

METHOD OF MEASUREMENT:

Measurement for the Final Grading Sub-Base Under Roadways will be based on the square yards of roadway sub-base graded to its final elevations, as measured by the Engineer to the payment limits described in the Contract Drawings and Specifications.

BASIS OF PAYMENT:

Payment for the Final Grading Sub-Base Under Roadways shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to final grade the roadway sub-base, to the pay limits indicated on the Drawings and as specified. The work includes removing, hauling, stockpiling, and disposing or reusing of excess road sub-base; final grading; raising existing castings including frames and covers, frames and grates, curb boxes or gate boxes as required to achieve final grades; replace damaged castings as required by the Owner or Engineer including damaged frames and covers; damaged frames and grates, damaged gate boxes and damaged curb boxes; layout by a professional land surveyor registered in the Commonwealth of Massachusetts of final grades, elevations and alignments; maintaining the graded sub-base until final paving; and all incidental work not included for payment elsewhere.

Item 2500.8 --- Hot Poured Rubberized Asphalt Sealer

METHOD OF MEASUREMENT:

Measurement for Hot Poured Rubberized Asphalt Sealer will be based on the linear foot of Hot Poured Rubberized Asphalt Sealer placed, as measured by the Engineer and where indicated on the Contract Drawings.

BASIS OF PAYMENT:

Payment for Hot Poured Rubberized Asphalt Sealer shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to place Hot Poured Rubberized Asphalt Sealer where indicated on the Drawings and as specified. The work includes cleaning the

surface prior to placing the sealer; prep all surfaces prior to placing the sealer; furnishing and placing the hot poured rubberized asphalt sealer; protecting areas where the sealer was installed; and all incidental work not included for payment elsewhere.

Item 2500.9 --- Hot Mix Asphalt Infrared Pavement Sealing

METHOD OF MEASUREMENT:

Measurement for Payment for Hot mix asphalt Infrared Pavement Sealing shall be based on the linear feet of Hot mix asphalt Infrared Pavement Sealing performed complete, where shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for Hot mix asphalt Infrared Pavement Sealing shall be based on the unit price bid for this item in the proposal. Under the Unit Price for Hot mix asphalt Infrared Pavement Sealing, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to infrared pavement seal, where shown on the Contract Drawings, indicated in the Contract Specifications or at the requirements of the Engineer. The Work shall include; but is not limited to; cleaning and prepping joints prior to sealing the joint; removal and disposal of any surplus asphalt removed to provide an acceptable joint; furnish and install additional hot mix asphalt pavement as may be necessary to provide an acceptable joint; protecting the joint after sealing; and all incidental work required to infrared pavement seal all joints required, not included for payment elsewhere, whether stated here or not.

Item 2500.10 --- Rubber Paving Surface

METHOD OF MEASUREMENT:

Measurement for the rubber paving surface will be based on the square foot of rubber paving surface to a depth of 2-inches and gravel subbase or approved subbase to a depth of 4-inches, as measured by the Engineer to the payment limits described in the Contract Drawings and Specifications or as directed by Engineer.

BASIS OF PAYMENT:

Payment for Rubber Paving Surface shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, including supplier recommended substrate, equipment, and any other incidentals necessary for the satisfactory completion of this work as specified.

END OF SECTION 02500

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SECTION 02510

HOT MIX ASPHALT POROUS PAVING

2510.1	HOT MIX ASPHALT POROUS PAVING (36" DEPTH, 6' WIDTH)	SQUARE YARD
2510.2	HOT MIX ASPHALT POROUS PAVING, (36" DEPTH, 2' WIDTH)	SQUARE YARD
2510.3	POROUS PAVING TRENCH EXCAVATION	CUBIC YARD
2510.4	INDEPENDENT LABORATORY TESTING OF HOT MIX ASPHALT POROUS PAVING MIX	EACH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, titled "Related Documents."

1.2 SUMMARY

- A. Hot mix asphalt porous paving is an infiltration BMP used to store and treat stormwater runoff from the roadway. This system is designed with a subdrain that is connected to the City of Cambridge's stormwater system. It is not designed to infiltrate into the adjacent subsoils.

- B. Work in this Section includes the following:

1. Subgrade Preparation
2. Choker Course
3. Reservoir Course
4. Filter Medium Course
5. Base Course
6. Hot Mix Asphalt Porous Paving Course
7. Subdrain
8. Non-woven Geotextile Fabric
9. Protection of Porous Media Beds During Construction
10. Testing of Hot Mix Porous Asphalt Paving Mix by Independent Testing Company
11. Maintenance of Porous Paving systems for one full (1) year following construction

1.3 RELATED WORK

- A. Section 01568 – EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS

B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

C. Section 02622 – POLYVINYL CHLORIDE PIPE

1.4 PROJECT CONDITIONS

A. Protection of Existing Improvements:

1. Protect adjacent work from splashing of paving materials. Remove all stains from exposed surfaces of paving, structures, and grounds. Remove all waste and spillage.
2. Do not damage or disturb existing improvements or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.
3. Restore damaged improvements, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Engineer, and authority having jurisdiction at no additional cost.

B. Safety and Traffic Control:

1. Notify and cooperate with local authorities and other organizations having jurisdiction when construction work will interfere with existing roads and traffic.
2. Provide temporary barriers, signs, warning lights, flaggers, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.

C. Weather Limitations:

1. **Hot Mix Asphalt Porous Paving shall not be placed between October 31 and May 1.** When it is in the public interest, only the Engineer or his/her agents may adjust the air temperature requirement or extend the dates of the paving season.
2. The material shall not be placed when the ambient air temperature at the paving site in the shade away from artificial heat is below 16° C (60° F) or when the actual ground temperature is below 10° C (50° F).
3. The Contractor shall not pave on days when the ground is damp or rain is forecast for the day, unless a change in the weather results in favorable paving conditions as determined by the Engineer.

D. Protection of Porous Paving Beds

1. Porous pavement beds shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.
2. Contractor shall take any other necessary steps to prevent sediment from washing into beds during site development. When the site is fully stabilized, temporary sediment control devices shall be removed. For temporary sediment control devices refer to Section 01568 – EROSION CONTROL, SEDIMENTATION AND CONTAINMENT OF CONSTRUCTION MATERIALS.

1.5 GUARANTEE

- A. During the one-year guarantee period, the Contractor shall maintain the surfacing and shall promptly fill with similar material in compliance with the Specifications, any depressions and holes that may occur during that time period.

1.6 SUBMITTALS

- A. Submit a list of materials proposed for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.
- B. Submit certificates, signed by the materials producer and the paving subcontractor, stating that materials meet or exceed the specified requirements.
- C. Submit samples of coarse aggregates and non-woven geotextile fabric for review and approval by the Owner's Representative.
- D. The asphalt mixing plant shall certify the aggregate mix, abrasion loss factor, polymer additive, binder draindown, tensile strength ratio, resistance to stripping by water and asphalt content in the mix.
- E. Submit name and contact information of company responsible for performing paving operations as soon as this information becomes available.

1.7 REFERENCES

- A. Annual Book of ASTM Standards, 1997 or latest edition; American Society for Testing and Materials, Philadelphia, PA.
- B. Commonwealth of Massachusetts Highway Department (MHD): Standard Specifications for Highways and Bridges, 1988, or latest edition.
- C. University of New Hampshire Stormwater Center: Design Specifications for Porous Asphalt Pavement and Infiltration Beds, current edition.

PART 2 – PRODUCTS

2.1 CHOKER COURSE AND BASE COURSE

- A. All aggregates within the choker course and base course shall meet the following:
 - 1. Maximum Wash Loss of 0.5%
 - 2. Minimum Durability Index of 35
 - 3. Maximum Abrasion of 10% for 100 revolutions and maximum of 50% for 500 revolutions

- B. Unless otherwise approved by the Engineer aggregate for the choker course and base course shall be uniformly graded with the following gradation (AASHTO size number 57):

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
1 1/2" (37.5mm)	100
1" (25mm)	95-100
1/2" (12.5mm)	25-60
#4 (4.75mm)	0-10
#8 (2.36mm)	0-5

2.2 RESERVOIR COURSE

- A. All aggregates within the reservoir course shall meet the following:
1. Maximum Wash Loss of 0.5%
 2. Minimum Durability Index of 35
 3. Maximum Abrasion of 10% for 100 revolutions and maximum of 50% for 500 revolutions
- B. Unless otherwise approved by the Engineer coarse aggregate for the gravel sub base course shall be uniformly graded with the following gradation (AASHTO size number 3):

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
2 1/2" (63mm)	100
2" (50mm)	90-100
1 1/2" (37.5mm)	35-70
1" (25mm)	0-15
1/2" (12.5mm)	0-5

If the above gradation cannot be met, the following gradation (AASHTO size number 5) is acceptable with approval of the Engineer and a minimum void space of 40%:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
1 1/2" (37.5mm)	100
1" (25mm)	90-100
3/4" (19.0mm)	20-55
1/2" (12.5mm)	0-10
3/8" (9.5mm)	0-5

2.3 FILTER COURSE

- A. Filter course material shall have a hydraulic conductivity (also referred to as coefficient of permeability) of 10 to 60 ft/day at 95% standard proctor compaction unless otherwise approved by the Engineer. Do not over compact materials as this will result in the loss of infiltration capacity. The hydraulic conductivity should be determined by ASTM D2434 and reported to the Engineer.
- B. Unless otherwise approved by the Engineer aggregate for the filter course shall be uniformly graded with the following gradation:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
6" (150mm)	100
#4 (4.75mm)	70-100
#200 (0.075mm)	0-6

2.4 NON-WOVEN GEOTEXTILE FABRIC

- A. Non-woven geotextile fabric shall meet the following properties:

<u>Mechanical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Minimum Average Roll Value</u>	
			<u>MD</u>	<u>CD</u>
Grab Tensile Strength	ASTM D 4632	kN (lbs)	0.71 (160)	0.71 (160)
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.27 (60)	0.27 (60)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2100 (305)	2100 (305)
Puncture Strength	ASTM D 4833	kN (lbs)	0.42 (95)	0.42 (95)
Apparent Opening Size (AOS)	ASTM D 4751	mm (U.S. Sieve)	0.212 (70)	0.212 (70)
Permittivity	ASTM D 4491	sec-1	1.4	
Permeability	ASTM D 4491	cm/sec	0.22	
Flow Rate	ASTM D 4491	l/min/m ²	4477 (110)	
			(gal/min/ft ²)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	
<u>Physical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Typical Value</u>	
Weight	ASTM D 5261	g/m ² (oz/yd ²)	217 (6.4)	
Thickness	ASTM D 5199	mm (mils)	1.9 (75)	
Roll Dimensions (w x l)	-	m (ft)	4.5 x 91 (15 x 300)	
Roll Area	-	m ² (yd ²)	418 (500)	
Estimated Roll Weight	-	kg (lb)	99 (217)	

2.5 HOT MIX ASPHALT POROUS PAVING COURSE

- A. Hot Mix Asphalt Porous Paving Mix shall conform to the Open-Graded Friction Course (OFGC) requirements of the Massachusetts Highway Department Standard Specifications M3.11.00 with the exceptions as hereinafter noted.
- B. Hot mix asphalt porous paving shall be placed in one 4 inch layer as shown in the Contract Documents. **The hot mix asphalt porous paving may be placed in (2) 2 inch layers.**
- C. Contractor shall allow time for testing of porous paving mix by independent testing company at batch plant to assure conformance to project specifications.

2.6 SUBDRAIN

- A. Perforated pipe for use as a subdrain under the hot mix asphalt porous paving shall conform to Section 02622 – POLYVINYL CHLORIDE PIPE, 2.1 B (3).

PART 3 – EXECUTION

3.1 POROUS MEDIA BEDS

A. Grade Control:

1. Establish and maintain required lines and elevations. The Engineer shall be notified for review and approval of final stake lines for the work before construction work is to begin. Finished surfaces shall be true to grade and even, free of roller marks and free of puddle forming low spots. All areas must drain freely. Excavation elevations should be within +/-0.1 ft (+/- 3 cm).
2. If, in the opinion of the Engineer, based upon reports of the testing service and inspection, the quality of the work is below the standards which have been specified, additional work and testing will be required until satisfactory results are obtained.
3. The Engineer shall be notified at least 24 hours prior to all porous media bed and porous pavement work.

B. Subgrade Preparation:

1. Native subgrade refers to materials beyond the limit of the excavation. The existing native subgrade material under all bed areas shall be compacted to 98% standard proctor compaction prior to geotextile and stone bed placement.
2. Excavate subgrade to line, grade, and elevations indicated. Fill, regrade and compact to 98% standard Proctor any areas damaged by erosion, ponding, or traffic compaction before the placing of the stone subbase.
3. All bed bottoms shall be as level as feasible. For pavement subbases constructed on grade, soil or fabric barriers should be constructed along equal elevation for every 6-12” of grade change to act as internal check dams. This will prevent erosion within the subbase on slope.

C. Porous Media Bed Installation:

1. Subbase refers to materials below the pavement surface and above the native subgrade. Upon completion of subgrade work, the Engineer shall be notified and shall inspect at his/her discretion before proceeding with gravel bed installation.
2. All aggregates for use in the porous media bed shall be washed.
3. Geotextile and porous media bed aggregate shall be placed immediately after approval of subgrade preparation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of geotextile at no extra cost to the Owner.

4. Place geotextile in accordance with manufacturer's standards and recommendations. Adjacent strips of geotextile shall overlap a minimum of sixteen inches (16"). Secure geotextile at least four inches (4") outside of bed and take any steps necessary to prevent any runoff or sediment from entering the storage bed.
5. Install base course aggregate to a maximum 95% standard Proctor compaction. Install aggregate evenly to grades indicated on drawings.
6. Install filter course aggregate in 8 inch maximum lifts to a maximum 95% standard Proctor compaction. Lightly compact each layer with equipment, keeping equipment movement over storage bed subgrades to a minimum. Install aggregate to grades indicated on the drawings.
7. Install reservoir and choker course aggregates to a maximum 95% standard Proctor compaction. Reservoir course shall be placed evenly over surface of filter course. Choker course shall be placed evenly over surface of the reservoir course below it, sufficient to allow placement of the hot mix asphalt porous paving course and notify Engineer for approval. Choker course thickness shall be sufficient to allow for even placement of the porous paving but no less than 4 inches in depth.
8. The density of subbase courses shall be determined by AASHTO T 191(Sand-Cone Method), AASHTO T 204 (Drive Cylinder Method), or AASHTO T 238 (Nuclear Methods), or other approved methods at the discretion of the supervising Engineer.
9. The infiltration rate of the compacted subbase shall be determined by ASTM D3385 or approved alternate at the discretion of the supervising Engineer. The infiltration rate shall be no less than 5-30 ft/day or 50% of the hydraulic conductivity (D2434) at 95% standard proctor compaction.
10. Compaction of subbase course material shall be done with a method and adequate water to meet the requirements. Rolling and shaping shall continue until required density is attained. Water shall be uniformly applied over the subbase course materials during compaction in the amount necessary for proper consolidation.
11. Rolling and shaping patterns shall begin on the lower side and progress to the higher side of the subbase course while lapping the roller passes parallel to the centerline. Rolling and shaping shall continue until each layer conforms to the required grade and cross-section and the surface is smooth and uniform.
12. Following placement of the subbase aggregate, the geotextile shall be folded back along all bed edges to protect from sediment washout along bed edges. At least a four inch edge strip shall be used to protect beds from adjacent bare soil. This edge strip shall remain in place until all bare soils contiguous to beds are stabilized and vegetated. In addition, take any other necessary steps to prevent sediment from washing into beds during site development. When the site is fully stabilized, temporary sediment control devices shall be removed.

3.2 TESTING OF HMA POROUS PAVING COURSE DURING PRODUCTION

- A. The Contractor shall provide at Contractors' expense and the Engineer's approval an independent laboratory testing company to oversee and document mix production.
- B. The testing company shall test for the following:

<u>Test</u>	<u>Min. Frequency</u>	<u>Test Method</u>
Temperature in Truck at Plant	6 times per day	

Gradation	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	AASHTO T30
Binder Content	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	AASHTO T164
Air Void Content	greater of either (a) 1 per 500 tons, (b) 2 per day, or (c) 3 per job	ASTM D6752
Binder Draindown	greater of either (a) 1 per 500 tons, (b) 1 per day, or (c) 1 per job	ASTM D6390

If an analyzed sample is outside the testing tolerances immediate corrective action will be taken. After the corrective action has been taken the resulting mix will be sample and tested. If the re-sampled mix test values are outside of the tolerances the Engineer will be immediately informed. The Engineer may determine that it is in the best interest of the project that production is ceased. The Contractor will be responsible for all mix produced for the project.

- C. The paving mixture produced should not vary from the design criteria for aggregate gradation and binder content by more than the tolerances in the following table:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing</u>
¾" (19.0mm)	-
½" (12.5mm)	±6.0
3/8" (9.5mm)	±6.0
No. 4 (4.75mm)	±5.0
No. 8(2.36mm)	±4.0
No. 200(0.075mm)	±2.0
%PGAB	+0.4, -0.2

Should the paving mixture produced vary from the designated grading and asphalt content by more than the above tolerances, the appropriate production modifications are to be made until the hot mix asphalt porous paving mixture is within these tolerances.

Samples of the mixture, when tested in accordance with AASHTO T164 and T30, shall not vary from the grading proportions of the aggregate and binder content designated by the Engineer by more than the respective tolerances specified above and shall be within the limits specified for the design gradation.

- D. Should the hot mix asphalt porous paving mixture not meet the tolerances specified in this section upon repeat testing, the Engineer may reject further loads of mix. Mix that is loaded into trucks during the time that the plant is changing operations to comply with a failed test shall not be accepted, and should be recycled at the plant.

3.3 HOT MIX ASPHALT POROUS PAVING COURSE

- A. The mixing plant, hauling and placing equipment, and construction methods shall be in conformance with the applicable requirements of MHD Standard Specifications Section M3.11.00, except as modified by this Section.

- B. The use of surge bins shall not be permitted.
- C. No mix shall be placed on wet or damp surfaces. When surface and ambient temperatures are 15 C and rising, the Contractor shall use mix prepared and placed in accordance with the specified requirements of the mix hereinbefore designated as Hot Mix Asphalt Porous Paving Course.
- D. Preparation of Bituminous Material. Mixing temperatures for OGFC shall be between 107 C and 121 C. A continuous supply of bituminous material shall be furnished to the mixer at a uniform temperature.
- E. Preparation of Aggregates. The aggregate for the mixture shall be dried and heated at the mixing plant before being placed in the mixer. Flames used for drying and heating shall be properly adjusted to avoid damaging the aggregate and depositing soot or unburned fuel on the aggregate. Mineral filler, if required to meet the grading requirements, shall be added in a manner approved by the Engineer after the aggregates have passed through the dryer. The above preparation of aggregates does not apply for drum-mix plants.
- F. Mixing. The dried aggregate shall be combined in the mixer in the amount of each fraction of aggregate required to meet the job-mix formula and thoroughly mixed prior to adding the bituminous material.
 - 1. The dried aggregates shall be combined with the bituminous material in such a manner as to produce a mixture that when discharged from the pugmill is at a target temperature in the range that corresponds to an asphalt cement viscosity of 700 to 900 centistokes and within a tolerance of ± 11 °C (± 20 °F).
 - 2. After the required quantity of aggregate and bituminous material has been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is secured. The mixing time will be regulated by the Engineer, and a suitable locking means shall be provided for these regulations.
 - 3. All plants shall have a positive means of eliminating oversized and foreign material from being incorporated into the mixer.
- G. Hauling Equipment. Trucks used for hauling bituminous mixture shall have tight, clean, smooth metal bodies. The Contractor shall apply a thin coat of a non-petroleum based or soap solution to prevent the mixture from adhering to the bodies. Each truck shall have a cover of canvas or other suitable material of such size sufficient to protect the mixture from the weather. When necessary to ensure delivery of material at the specified temperature, truck bodies shall be insulated, and covers shall be securely fastened.
- H. Placing Equipment. The paver shall be a self-propelled unit with an activated screed or strike-off assembly, capable of being heated if necessary, and capable of spreading and finishing the mixture without segregation for the widths and thicknesses required. The screed shall be adjustable to provide the desired cross-sectional shape. The finished surface shall be of uniform texture and evenness and shall not show any

indication of tearing, shoving, or pulling of the mixture. The machine shall, at all times, be in good mechanical condition and shall be operated by competent personnel.

Pavers shall be equipped with the necessary attachments, designed to operate electronically, for controlling the grade of the finished surface.

The adjustments and attachments of the paver will be checked and approved by the Engineer before placement of bituminous material.

Hot mix asphalt pavers shall be equipped with a sloped plate to produce a tapered edge at longitudinal joints. The sloped plate shall be attached to the paver screed extension.

The sloped plate shall produce a tapered edge having a face slope of 1:3 (vertical: horizontal). The plate shall be so constructed as to accommodate compacted mat thickness from 35 to 100 mm (1 1/4 to 4 inches). The bottom of the sloped plate shall be mounted 10 to 15 mm (3/8 to 1/2 inch) above the existing pavement. The plate shall be interchangeable on either side of the screed.

Pavers shall also be equipped with a joint heater capable of heating the longitudinal edge of the previously placed mat to a surface temperature of 95°C (200°F), or higher if necessary, to achieve bonding of the newly placed mat with the previously placed mat. This shall be done without undue breaking or fracturing of aggregate at the interface. The surface temperature shall be measured immediately behind the joint heater. The joint heater shall be equipped with automated controls that shut off the burners when the paving machine stops and reignite them with the forward movement of the paver. The joint heater shall heat the entire area of the previously placed wedge to the required temperature. Heating shall immediately precede placement of the bituminous material.

- I. Rollers. Rollers shall be in good mechanical condition, operated by competent personnel, capable of reversing without backlash, and operated at speeds slow enough to avoid displacement of the hot mix asphalt mixture. The mass (weight) of the rollers shall be sufficient to compact the mixture to the required density without crushing of the aggregate. Rollers shall be equipped with tanks and sprinkling bars for wetting the rolls. Rollers shall be two-axle tandem rollers with a gross mass (weight) of not less than 7 metric tons (8 tons) and not more than 10 metric tons (12 tons) and shall be capable of providing a minimum compactive effort of 44 kN/m (250 pounds per inch) of width of the drive roll. All rolls shall be at least 1 m (42 inches) in diameter.

A rubber tired roller will not be required on the open graded asphalt friction course surface.

- J. Conditioning of Existing Surface. Contact surfaces such as curbing, gutters, and manholes shall be painted with a thin, uniform coat of Type RS-1 emulsified asphalt immediately before the hot mix asphalt mixture is placed against them.

- K. Spreading and Finishing. Placing temperature shall be between 107°C and 121°C. As placing temperature is a critical factor in this type of mix, hauling time to the project should be limited so as to avoid mix temperature from dropping below the required minimum. All mixes should be covered during transportation.

The Contractor shall protect all exposed surfaces that are not to be treated from damage during all phases of the paving operation.

The hot mix asphalt mixture shall be spread and finished with the specified equipment. The mixture shall be struck off in a uniform layer to the full width required and of such depth that each course, when compacted, has the required thickness and conforms to the grade and elevation specified. Paver shall be used to distribute the mixture over the entire width or over such partial width as practical. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture shall be spread, raked, and luted by hand tools.

No material shall be produced so late in the day as to prohibit the completion of spreading and compaction of the mixture during daylight hours, unless night paving has been approved for the project.

No traffic will be permitted on material placed until the material has been thoroughly compacted and has been permitted to cool to below 38°C (100°F). The use of water to cool the pavement will not be permitted. The Engineer reserves the right to require that all work adjacent to the pavement, such as guardrail, cleanup, and turf establishment, is completed prior to placing the Hot Mix Asphalt Porous Paving course when this work could cause damage to the pavement. On projects where traffic is to be maintained, the Contractor shall schedule daily paving operations so that at the end of each working day all travel lanes of the roadway on which work is being performed are paved to the same limits. Suitable aprons to transition approaches where required shall be placed at side road intersections and driveways as directed by the Engineer.

- L. Compaction. Immediately after the hot mix asphalt mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.
1. The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving.
 2. The number, mass (weight), and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. Generally, one breakdown roller will be needed for each paver used in the spreading operation.
 3. To prevent adhesion of the mixture to the rolls, rolls shall be kept moist with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.
 4. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons or with mechanical tampers. On depressed

areas, either a trench roller or cleated compression strips may be used under the roller to transmit compression to the depressed area.

5. Other combinations of rollers and/or methods of compacting may be used if approved in writing by the Engineer, provided the compaction requirements are met.
6. Unless otherwise specified, the longitudinal joints shall be rolled first. Next, the Contractor shall begin rolling at the low side of the pavement and shall proceed towards the center or high side with lapped rollings parallel to the centerline. The speed of the roller shall be slow and uniform to avoid displacement of the mixture, and the roller should be kept in as continuous operation as practical. Rolling shall continue until all roller marks and ridges have been eliminated.
7. Rollers will not be stopped or parked on the freshly placed mat.
8. The density of compacted pavement shall be at least 92 percent, but not more than 96 percent of the corresponding daily average maximum specific gravity for each type (i.e., I, II, III, or IV) of hot mix asphalt mix placed during each day.
9. Values above 98 percent and below 90 percent will be evaluated by the Engineer to determine whether the pavement shall be removed and replaced by the Contractor at no expense to the owner or if a greater penalty will be imposed.
10. It shall be the responsibility of the Contractor to conduct whatever process control the Contractor deems necessary. Acceptance testing may be conducted by the owner-authorized personnel using cores provided by the Contractor.
11. Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture. The mixture shall be compacted to conform to the surrounding area. Any area showing an excess or deficiency of bitumen shall be removed and replaced. These replacements shall be at the Contractor's expense.
12. Should the Contractor choose to use vibratory rollers, the following additional criteria shall govern their operation. Vibratory rollers may be used when operated at an amplitude, frequency, and speed that produces a mat conforming to specifications and that prevents the creation of transverse ridges in the mat. A vibratory roller may be used as a breakdown roller, an intermediate roller, or a finish roller. A vibratory roller shall not be used as a substitute for a pneumatic-tired roller on leveling courses or to compact lifts of pavement less than 25 mm (1 inch) in depth. The same single vibratory roller shall not be used alone as the breakdown, intermediate, and finish roller, but may be used as any one of the rollers in the roller train.
13. If the Engineer determines that unsatisfactory compaction or surface distortion is being obtained or damage to paving components and/or adjacent property is occurring using vibratory compaction equipment, the Contractor shall immediately cease using this equipment and proceed with the work in accordance with the fourth paragraph of this Subsection.
14. The Contractor assumes full responsibility for the cost of repairing all damages that may occur to roadway or parking lot components and adjacent property if vibratory compaction equipment is used. After final rolling, no vehicular traffic of any kind shall be permitted on the surface until cooling and hardening has taken place, and in no case within the first 48 hours. Provide barriers as

necessary at no extra cost to the Owner to prevent vehicular use; remove at the discretion of the Engineer.

M. Joints:

1. Joints between old and new pavements or between successive days work shall be made to ensure a thorough and continuous bond between the old and new mixtures. Whenever the spreading process is interrupted long enough for the mixture to attain its initial stability, the paver shall be removed from the mat and a joint constructed.
2. Butt joints shall be formed by cutting the pavement in a vertical plane at right angles to the centerline, at locations approved by the Engineer. The Engineer will determine locations by using a straightedge at least 4.9 m (16 feet) long. The butt joint shall be thoroughly coated with Type RS-1 emulsified asphalt just prior to depositing the paving mixture when paving resumes.
3. Tapered joints shall be formed by tapering the last 450 to 600 mm (18 to 24 inches) of the course being laid to match the lower surface. Care shall be taken in raking out and discarding the coarser aggregate at the low end of the taper, and in rolling the taper. The taper area shall be thoroughly coated with Type RS-1 emulsified asphalt just prior to resuming paving. As the paver places new mixture on the taper area, an evenly graduated deposit of mixture shall complement the previously made taper. Shovels may be used to add additional mixture if necessary. The joint shall be smoothed with a rake, coarse material discarded, and properly rolled.
4. Longitudinal joints that have become cold shall be coated with Type RS-1 emulsified asphalt before the adjacent mat is placed. If directed by the Engineer, joints shall be cut back to a clean vertical edge prior to applying the emulsion.

N. Surface Tolerances. The surface will be tested by the Engineer using a straightedge at least 4.9 m (16 feet) in length at selected locations parallel with the centerline. Any variations exceeding 3 mm (1/8 inch) between any two contact points shall be satisfactorily eliminated. A straightedge at least 3 m (10 feet) in length may be used on a vertical curve. The straightedges shall be provided by the Contractor.

O. Work shall be done expertly throughout, without staining or injury to other work. Transition to adjacent impervious hot mix asphalt paving shall be merged neatly with flush, clean line. Finished paving shall be even, without pockets, and graded to elevations shown on drawing.

P. Porous pavement beds shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.

Q. Repair of Damaged Paving. Any existing paving on or adjacent to the site has been damaged as a result of construction work shall be repaired to the satisfaction of the Owner without additional cost to the Owner.

3.4 FIELD QUALITY CONTROL

- A. The full permeability of the pavement surface shall be tested by application of clean water at the rate of at least 5 gpm over the surface, using a hose or other distribution devise. Water used for the test shall be clean, free of suspended solids and deleterious liquids and will be provided at no extra cost to the Owner. All applied water shall infiltrate directly without puddle formation or surface runoff, and shall be observed by the Engineer and Owner.
- B. Testing and Inspection. Employ at Contractor's expense an inspection firm acceptable to the Engineer and Owner to perform soil inspection services, staking and layout control, and testing and inspection of site grading and pavement work. Inspection and list of tests shall be reviewed and approved in writing by the Engineer prior to starting construction. All test reports must be signed by a licensed Engineer.
- C. Test in-place base and surface course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable work as directed by the Owner.
- D. Surface Smoothness. Test finished surface for smoothness using a 10 foot straightedge applied parallel with and at right angles to the centerline of the paved area. Surface will not be accepted if gaps or ridges exceed 3/16 of an inch.

3.5 GRADE CONTROL

- A. Establish and maintain required lines and elevations. The Engineer shall be notified for review and approval of final stake lines for the work before construction work is to begin. Finished surfaces shall be true to grade and even, free of roller marks and free of low spots to form puddles. All areas must drain.
- B. If, in the opinion of the Owner, based upon reports of the testing service and inspection, the quality of the work is below the standards which have been specified, additional work and testing will be required until satisfactory results are obtained.

3.6 POST-CONSTRUCTION MAINTENANCE

- A. During the guarantee period, the hot mix asphalt porous paving should be inspected for cracks, water ponding (failure to infiltrate), or other failures.
- B. Quarterly (every three months). Pavement surface should be vacuumed to remove sediment and organic debris. The sweeper may be fitted with water jets.
- C. As needed. Ensure that all upgradient landscaping areas are well maintained to prevent soil from being transported onto the pavement. In early Spring remove any sediment buildup at curbs and driveway aprons. Fill potholes and cracks with traditional patching mixes unless more than 10 percent of the area needs repair. If large areas (10 percent or more of the total porous paving area) need repair, consult the porous paving installer. Spot-clogging can be alleviated by drilling half-inch diameter holes through the porous paving layer every few feet.

- D. Do not store materials such as sand/salt, mulch, soil, yard waste, and other stock piles on porous surfaces.

PART 4 - COMPENSATION

Item 2510.1 --- Hot Mix Asphalt Porous Paving (36" Depth, 6' Width)

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the square yard of hot mix asphalt porous paving installed by the Contractor as shown on the Contract Drawings and as directed by the Engineer, complete and as measured by the Engineer. Hot mix asphalt porous paving (36" depth, 6' width) shall have a standard section as shown on the Contract Drawings.

BASIS OF PAYMENT:

Payment for Hot Mix Asphalt Porous Paving (36" Depth, 6' Width) shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete installation of Hot Mix Asphalt Porous Paving (36" Depth, 6' Width) as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to the following; furnishing and installing hot mix asphalt porous paving course; compacting subgrade; install, grade, and compact pavement base course, filter medium, reservoir course, and choker course; compaction and compaction testing; furnishing and installing filter fabric as required; maintenance of the porous paving system for one full (1) year following construction; and all incidental work not included for payment elsewhere required to furnish and install hot mix asphalt porous paving whether included here or not.

EXCLUSIONS AND SPECIAL NOTES:

Subdrain pipe, subdrain pipe installation, excavation and disposal of material and temporary sediment controls are not included in this bid item.

Item 2510.2 --- Hot Mix Asphalt Porous Paving (36" Depth, 2' Width)

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the square yard of hot mix asphalt porous paving installed by the Contractor as shown on the Contract Drawings and as directed by the Engineer, complete and as measured by the Engineer. Hot mix asphalt porous paving, (36" Depth, 2' Width) shall have a standard section as shown on the Contract Drawings.

BASIS OF PAYMENT:

Payment for Hot Mix Asphalt Porous Paving, (36" Depth, 2' Width) shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete installation of Hot Mix Asphalt Porous Paving, (36" Depth, 2' Width) as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to the following; furnishing and installing hot mix asphalt porous paving course; compacting subgrade; install, grade, and compact pavement base course, filter medium, reservoir course, and choker course; compaction and compaction testing; furnishing and installing filter fabric as required; maintenance of the porous paving system for one full

(1) year following construction; and all incidental work not included for payment elsewhere required to furnish and install hot mix asphalt porous paving whether included here or not.

EXCLUSIONS AND SPECIAL NOTES:

Subdrain pipe, subdrain pipe installation, excavation and disposal of material and temporary sediment controls are not included in this bid item.

Item 2510.3 --- Porous Paving Trench Excavation

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the cubic yard of excavation for the installation of the porous paving by the Contractor as shown on the Contract Drawings and as directed by the Engineer, complete and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for Porous Paving Trench Excavation shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the excavation of the trench to install the porous paving sections as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to the following: excavation to the depths required to install the porous paving section in its entirety; and all incidental work not included for payment elsewhere required to excavate the trench for the porous paving installation whether included here or not.

Item 2510.4 --- Independent Laboratory Testing of Hot Mix Asphalt Porous Paving Mix

METHOD OF MEASUREMENT:

Measurement for payment for Independent Laboratory Testing of Hot Mix Asphalt Porous Paving Mix shall be on a per EACH test basis.

BASIS OF PAYMENT:

Payment for Independent Laboratory Testing of Hot Mix Asphalt Porous Paving Mix shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall hire an independent laboratory testing company to verify that the porous paving mix conforms to the specifications. A test shall be performed on each batch produced at the mixing plant.

END OF SECTION 02510

SECTION 02524

CURBS, WALKS AND DRIVEWAYS

2524.1	4-IN CEMENT CONCRETE SIDEWALKS	SQUARE YARD
2524.2	6-IN CEMENT CONCRETE SIDEWALKS AT DRIVEWAYS	SQUARE YARD
2524.3	6-IN CEMENT CONCRETE AT PEDESTRIAN RAMPS AND INTERSECTIONS	SQUARE YARD
2524.4	REMOVE AND RESET/RELOCATE GRANITE CURB (STRAIGHT AND CURVED)	LINEAR FOOT
2524.5	REMOVE AND DISCARD GRANITE CURB (STRAIGHT AND CURVED)	LINEAR FOOT
2524.6	NEW GRANITE CURB TYPE VA4 (STRAIGHT AND CURVED)	LINEAR FOOT
2524.7	NEW GRANITE TRANSITION CURB FOR PEDESTRIAN RAMPS AND DRIVEWAYS (STRAIGHT AND CURVED)	LINEAR FOOT
2524.8	NEW GRANITE CURB TYPE VA3 FOR BACK OF SIDEWALKS AND RAISED CROSSWALKS	LINEAR FOOT
2524.9	NEW CONCRETE CURB	LINEAR FOOT
2524.10	GRANITE CURB 2-FT CURB CORNER	EACH
2524.11	CAST-IN-PLACE DETECTABLE TILE	SQUARE FOOT
2524.12	CONCRETE PAVERS ON HOT MIX ASPHALT	SQUARE YARD
2524.13	HOT MIX ASPHALT - MULTI-USE PATH	SQUARE YARD
2524.14	HOT MIX ASPHALT WALKWAY	SQUARE YARD

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section specifies the following: cement concrete, hot mix asphalt, and brick sidewalks, driveways, pedestrian ramps, walkways and multi-use paths; the removal and

resetting of curb and edging; and the construction of new granite, granite back curb and asphalt curbs, berms, and edging.

- B. Specifically, Item 2524.13- Hot Mix Asphalt – Multi-Use Path refers to the multi-use path on Fern Street and Item 2524.14 – Hot Mix Asphalt – Walkway refers to the walkway proposed at Danehy Park.

1.2 RELATED WORK

- A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- B. Section 02500 – PAVING AND SURFACING
- C. Section 02900 – LANDSCAPING
- D. Section 02950 – BACK OF SIDEWALK RESTORATION
- E. Section 02980 – SITE IMPROVEMENTS
- F. Section 03300 – CONCRETE

1.3 SUBMITTALS

- A. Shop Drawings. Submit the following in accordance with Section 01300 - SUBMITTALS:
 - 1. Manufacturer product data and specifications for all materials, including, but not limited to:
 - a. Cement Concrete for sidewalks, driveways, and pedestrian ramps including design mix
 - b. Micro-fiber for sidewalk reinforcement
 - c. Membrane Curing Compound
 - d. Alkaline Resistant Protective Penetrating Concrete Sealer
 - e. Expansion Joint
 - f. Granite Curb, Granite Curb Inlet, Granite Curb Corner and Granite Edging
 - g. Cement Concrete Design Mix for granite curb work
 - h. Hot mix asphalt for driveways, walkways and multi-use paths including design mix – Refer to Section 02500 – PAVING AND SURFACING for requirements
 - i. Gravel Subbase – Submit in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

j. Wire Cut Brick

2. Detail drawings and layout plans for all materials.

B. Submit compaction testing results.

1.4 QUALITY CONTROL

A. Cement concrete and hot mix asphalt placement, weather, and temperature restrictions shall be in accordance with Section 03300 – CONCRETE and Section 02500 – PAVING AND SURFACING.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT.

B. Cement Concrete delivery time and storage time onsite shall be in accordance with Section 03300 – CONCRETE.

C. Batch ticket information shall be submitted to the Engineer upon placement of cement concrete and hot mix asphalt.

1.6 REGULATIONS

A. All pedestrian ramps and sidewalks shall conform to the most current applicable details of the Massachusetts Highway Department (MHD); to the latest Massachusetts Architectural Access Board (MA AAB) rules and regulations; and to the latest ADA standards for accessible design.

1.7 GUARANTEES

A. The Contractor shall guarantee all work for one year from the date of Substantial Completion from damage due to improper installation and improper use.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Cement Concrete for Sidewalks, Driveways and Pedestrian Ramps: Cement concrete shall conform to the Commonwealth of Massachusetts Highway Department, Standard Specifications for Highway and Bridges, M4.02.00 through M4.02.12 and be 4000 PSI at 28 day test, ¾-inch coarse aggregate, 610 pounds cement per cubic yard, 6% air entrained (AASHTO - M154), Type A water reducing admixture (AASHTO - M194), 3 to 4-inch slump, and Type II dark-colored by adding 1-1/2 to 2 lbs. of lamp black per cubic yard at the plant. Cement concrete

shall contain micro-fiber added during batching at the plant to insure uniform distribution.

- B. Micro-fiber: The cement concrete shall contain 1 pound of polypropylene micro-fiber per cubic yard. Fibers shall be 1/2" or 3/4" 100% polypropylene fibers, maximum 3 denier, complying with ASTM C 1116, Type III, Par. 4.1.3. Fibers per pound shall be not less than 50 million individual fibers. The micro-fiber shall be used in accordance with the manufacturer's specifications.
- C. Curing Compound: Shall conform to Section 03300 – CAST-IN-PLACE CONCRETE for Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids.
- D. Alkaline Resistant Protective Penetrating Concrete Sealer: Sealers shall be clear, VOC compliant and solvent-based. Sealer shall be deep penetrating.
- E. Expansion Joints: Shall be 3/8" thick polyethylene foam and 1/4" thick polyethylene foam conforming to ASTM D1751.
- F. Hot Mix Asphalt for driveways, multi-use path, and walkways: Shall conform to the applicable subsections of Section 02500 – PAVING AND SURFACING.
- G. Granite curb, granite back curb, granite curb inlets, granite curb corners, granite edging, and granite curb transitions at pedestrian ramps: Shall conform to the Standard Specifications Section M9.04.
- H. Cement Grout: Shall conform to Section 03315 – GROUT.
- I. Cement Concrete for Granite Curb, Granite Back Curb, Granite Curb Inlet, Granite Curb Corner, Granite Transitions for Pedestrian Ramps, and Granite Edging: Shall conform to Class A Concrete as indicated in Section 03300 – CONCRETE.
- J. Water: Potable.
- K. Gravel Subbase: Shall be in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- L. Forms: Shall be in accordance with Standard Specification Section 701.61A.
- M. Brick: Shall be a full dimension paver conforming to the quality standards, size and color range of: "Pathway Full Range" brick paver as manufactured by Pine Hall Brick, Winston-Salem, NC, or an equivalent approved by the Engineer. Size shall be 4" W by 8" L by 2 1/4" D. Brick shall meet or exceed the requirements of ASTM C902, Class SX, Abrasion Type I, Application PS with average water absorption of not more than 5% with the five hour boil and an average compressive strength of 8,000 PSI (55Mpa) or more. Brick shall pass a minimum of 100 freeze thaw cycles.

- N. Setting Bed: Shall contain coarse sand and aggregates mixed with the Portland Cement as processed by Rowe Contracting Company, Malden, Massachusetts or Quinn Perkins Company, Burlington, Massachusetts or approved equivalent, in order to add stability to the brick walk so that bricks will not roll, move, or rock. The sand for joint sweeping shall be mixed with Portland Cement Type II (2 parts sand to 1 part Portland Cement) and be free of coarse aggregates, enabling the fines to freely fill in around all sides of the bricks.
- O. Edge Restraints: Edge sections shall be L-shaped galvanized steel paver restraints and are to be notched to provide for smooth curves and crisp angles. Sections shall conform to the following specifications: Height: 1.5", Flange:1.75", Lengths:6'0" or 8'0" and Thickness: 3/16". Edge Restraints to be supplied by Border Concepts, Inc., P.O. Box 471185, Charlotte, NC 28241, Telephone Numbers: 1-800-845-3343 or 1-704-541-5509, Fax Number: 1-704-541-5610 or approved equivalent.
- P. The mastic adhesive shall consist of 2% neoprene (grade WM1) oxidized asphalt with 155 degrees F softening point (80 penetration) and 10% asbestos-free fibers and 88% asphalt. Contractor shall follow manufacturer's installation procedure.
- Q. Iron Edge Sections shall be provided at all tree pits, all locations where the sidewalk does not abut a hard edge and as directed by the Engineer. Iron Edge sections shall be L-shaped galvanized steel paver restraints and are to be notched to provide for smooth curves and crisp angles. Sections shall conform to the following specifications: Height: 1.5", Flange:1.75", Lengths:6'0" or 8'0" and Thickness: 16 gauge. Iron Edge to be supplied by Border Concepts, Inc., P. O. Box 471185, Charlotte, NC 28241, Telephone numbers: 1-800-845-3343 or 1-704-541-5509, Fax Number: 1-704-541-5610 or approved equal.
- R. Spikes: Are to be galvanized steel spiral not less than 10" in length.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The edges of existing pavement, which is to remain, shall be saw cut to an even, straight edge in accordance with Section 01045 – CUTTING AND PATCHING. This includes roadways, sidewalks, and driveways.
- B. Excavate, remove, segregate, and stockpile existing asphalt and cement concrete walks and driveways as required for utility installation or as indicated for replacement on the Contract Drawings.
 - 1. Existing walks and driveways shall be sawcut at the limits of removal. Cement concrete walks and driveways shall be sawcut at existing score joint, so entire panel is removed.

2. Prior to excavation for pedestrian ramps, the Contractor shall review the location with the Engineer to determine what is necessary to allow for the installation to be compliant with the standards referenced above. Fixed objects such as utility poles and fire hydrants must be considered in location of pedestrian ramps. The type of pedestrian ramp may vary based on sidewalk width and slope.
 3. Removed cement concrete and asphalt pavement including reinforcement shall be disposed of in accordance with Section 02051 – DEMOLITION, MODIFICATION AND ABANDONMENT.
 4. Excess soil material removed shall be disposed of in accordance with Section 02080 – SOIL AND WASTE MANAGEMENT.
- C. Excavate, remove, protect, and stack existing granite curb, granite edging, granite curb corners, and granite curb inlets as required for utility installations or as indicated for replacement on the Contract Drawings in accordance with the Standard Specifications Section 580.
- D. Existing granite curb, granite edging, granite curb corners, and granite curb inlets not indicated to be reset shall be disposed of in accordance with Section 02051 – DEMOLITION, MODIFICATION AND ABANDONMENT
- E. The Contractor shall exercise special care when excavating near trees and roots. Excavation shall conform to the requirements in Section 02100 – SITE PREPARATION AND TREE PRUNING.
- F. Traffic signs shall be removed as required during the excavation. Signs to be reused shall be appropriately protected, stacked, and stored for reuse. Traffic signs to be replaced, as indicated on the Contract Drawings or as required by the Engineer, shall be disposed of by the Contractor. Reinstallation of traffic signs shall be done the prior to the concrete pour. All regulatory signs shall be maintained throughout construction.
- G. Subgrade under walks, pedestrian ramps, driveways, and curbs shall be graded to required elevations and proof rolled.
- H. Gravel subbase under sidewalks, pedestrian ramps, driveways, walkways, multi-use paths and curbs shall be graded to required elevations and compacted with plate-type mechanical compactors to ninety-five percent (95%) of the maximum dry density at optimum moisture content as determined by the AASHTO Standard Method of Test T99 Method.
- I. Existing in-situ material shall be used for gravel subbase only when approved by the Engineer. The Contractor shall provide analytical proctor results of the existing material in accordance with Section 02210 - EARTH EXCAVATION, BACKFILL, FILL, AND GRADING for compaction testing if requested by the Engineer.

- J. Imported gravel subbase shall be placed in one six-inch lift, loose measure unless otherwise noted.
- K. Add approved material to bring to required grade and compact.
- L. The subbase for sidewalks shall be graded to be sloped from the City right of way towards the street in order to meet ADA requirements, or as shown on the Contract Drawings, or as required by the Engineer.
- M. Materials shall not be placed when subgrade and subbase is muddy, frozen, or has frost, snow, or water thereon.
- N. The Contractor shall raise all water curb stop boxes and sewer, drain, and combined sewer castings to final grade and shall coordinate raising of other utility boxes and castings prior to pouring of concrete. The Contractor shall remove material from curb stop boxes with compressed air, after raising is complete and prior to pouring of concrete. Prior to pouring the concrete, the Contractor shall review locations where curb boxes have been raised with the Engineer.

3.2 CEMENT CONCRETE WALKS AND DRIVEWAYS

- A. Concrete shall be installed to a depth of 6" across driveways and at pedestrian ramps. At all other locations, concrete shall be installed to a depth of 4".
- B. Forms shall be placed in accordance with Standard Specification Section 701.61A.
- C. Concrete placement shall be in accordance with the Standard Specifications Section 701.61B.
 - 1. The concrete shall be placed in alternating slabs 30 feet in length unless otherwise required by the Engineer.
 - 2. The slabs shall be separated by transverse performed expansion joint filler as specified below:
 - a. Expansion joints of 3/8" thick foam shall be placed every 30 feet perpendicular to curb alignment extending through the sidewalk depth. Expansion joints of 3/8" thick foam shall also be placed around all appurtenances such as utility poles, hydrants, manholes, and other obstructions extending into and through the sidewalk. Six-inch expansion joints shall be placed at all locations where six-inch concrete driveways meet four-inch concrete walks. Expansion material protruding above the finished sidewalk shall be trimmed flush with a sharp instrument as soon as the concrete has set.

- b. A 3/8" thick expansion joint shall be installed between all new cement concrete installations and existing cement concrete.
 3. The slabs shall be separated by the curb by longitudinal expansion joint filler as specified below:
 - a. Expansion joints of 1/4" thick foam shall be placed 4" deep longitudinally along the granite curb between curb and the concrete and also between buildings and retaining walls and the concrete as required by the Engineer. Expansion material protruding above the finished sidewalk shall be trimmed flush with a sharp instrument as soon as the concrete has set.
 4. In conveying the concrete from the place of mixing to the place of deposit, the operation shall be conducted in such a manner that no mortar will be lost and the concrete shall so be handled that the concrete will be of uniform composition throughout, showing neither excess nor lack of mortar in any one place.
- D. Concrete finishing shall be in accordance with the Standard Specifications Section 701.61B.
 1. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all bleed water and water sheen has left the surface and concrete has started to stiffen.
 2. Between the expansion joints at 30 foot spacing, the sidewalk shall be divided at five foot intervals with score joints, made with creasing tools, having a penetration depth of minimum 1-1/2" and at 10 foot intervals with construction joints. Joints shall be placed 90° transverse with the direction of traffic and shall be straight within a tolerance of 1/4-inch of a straight edge laid along the joint. Longitudinal joints shall be installed, at the requirements of the Engineer when the sidewalk is greater than 6' wide.
 3. The surface shall be floated after completion of edging.
 4. Immediately after floating the surface shall be steel troweled. If necessary the joints and edges shall be rerun before and after troweling to maintain uniformity.
 5. After troweling the surface shall be brushed by drawing a soft-bristled pushbroom with a long handle over the surface of the concrete to produce a non-slip surface.
- E. Concrete shall be membrane-cured. The curing compound shall not discolor the concrete and shall be applied according to the manufacturer's specifications. The mixture shall be applied immediately after the finishing is complete and free water

has left the concrete's surface.

- F. Forms shall be left in place for a period of 12-hours prior to removal. Upon removal, the Contractor shall backfill the void with either loam in accordance with Section 02210 – EARTH EXCAVATION, FILL, BACKFILL AND GRADING and seeded in accordance with Section 02900 – LANDSCAPING or match the existing material and grade as specified.
- G. Alkaline Resistant Protective Penetrating Concrete Sealer shall be applied to the concrete sidewalks after the concrete is at least 14 days old and after a 48-hour minimum drying period just prior to the time of treatment (if walk has become wet), the exposed surface shall be cleaned to remove all oil, grime and loose particles which would prevent the mixture from penetrating the concrete immediately before the application of the mixture, an air blast shall be directed over the surface to be treated so that all dust will be removed. Unless otherwise directed, the temperature of the concrete and air shall be 50°F or higher at the time of application. For the rate of application see Section 03300 – CONCRETE. The second application of the surface treatment mixture shall not be made until the concrete, in the judgment of the Engineer, has regained its dry appearance.
- H. The Contractor shall fully protect all new concrete work for a minimum of forty-eight hours. A representative of the Contractor shall remain on site at least three hours after the last section of concrete is placed. In addition, the contractor shall fully protect the concrete with plastic sheeting or matting. Plastic sheeting shall be installed so that it cannot pull or blow away under windy conditions and not damage installed concrete. Sidewalk vandalized or disturbed within three hours after the last section of concrete is placed shall be replaced by the Contractor at no additional cost to the Owner.

3.3 CEMENT CONCRETE PEDESTRIAN RAMPS

- A. Concrete shall be installed to a depth of 6" depth.
- B. The Contractor shall establish grade elevations at all pedestrian ramp locations, and shall set transition lengths as shown on the Contract Drawings and as per ADA and MA AAB requirements.
- C. All pedestrian ramps joints and transition sections which define grade changes shall be formed, staked, and checked prior to placing cement concrete. All grade changes are to be made at joints.
- D. At intersections, pedestrian ramps shall be located in front of vehicle stop lines and within the crosswalk. The ramp shall be constructed so that the finished elevation of the concrete (curb removed) will meet the roadway flush (less than 1/2" lip) for a width no less than 42 inches. The elevation at this meeting point shall be properly designed to meet the gutter elevation of the road. The Contractor shall install pedestrian ramps and road grades in a manner which minimizes the potential for

puddles in front of them.

- E. The Contractor shall use a digital “Smart Level” to check all subbase grades for compliance prior to installation of concrete. The Contractor shall not proceed with concrete installation on a ramp that is out of compliance.
- F. Forming, placement, finishing, curing and alkaline resistant protective penetrating concrete sealer shall be completed in accordance with Paragraph 3.2 of this Section except the pushbroom finish, which shall be perpendicular to the direction of the slope.

3.4 BRICK WALKS AND DRIVEWAYS

- A. Hot mix asphalt base shall be installed to a depth of 4” and placed in accordance with the MHD Standard Specifications for hot mix asphalt.
 - 1. Hot mix asphalt surface shall be rolled to remove irregularities prior to installing stone dust.
- B. The iron edge shall be installed as detailed, longitudinally to the granite curb at the back edge of the specified brick walk width and at all tree wells. The iron edge shall be secured by 10” spiral galvanized steel spikes placed every 12”.
- C. A 3/4” sand setting bed shall be installed on the asphalt base. Wet saw is required for cutting of bricks and filling in pieces where needed. No other method will be acceptable.
- D. After all the bricks are in place, stone dust free of coarse aggregates shall be swept into the voids around the bricks.
- E. Once the bricks are placed in their specified patterns, they shall be compacted with a plate compactor. The compactor shall have a minimum force of 5000 lbs. and a frequency of 75 to 90 cycles per second.
- F. Contractor shall follow manufacturer’s installation procedures for the installation of mastic adhesive.

3.5 GRANITE CURB, GRANITE BACK CURB, GRANITE CURB CORNER, GRANITE CURB INLET GRANITE CURB TRANSITION AT PEDESTRIAN RAMPS, AND GRANITE EDGING

- A. Granite Curb, Granite Back Curb, Granite Curb Corners, Granite Curb Inlets, Granite Curb Transitions at Pedestrian Ramps, and Granite Edging shall be installed in accordance with the requirements of Section 501 of the Standard Specifications.
- B. Existing Granite Curb, Granite Curb Corners, Granite Curb Inlets, Granite Curb Transitions at Pedestrian Ramps, and Granite Edging that are to be removed and reset shall be installed in accordance with the requirements of Section 580 of the

Standard Specifications.

1. The Contractor shall verify and record all existing grades at locations where granite will be reset at the existing grade.

C. Installations shall be backfilled with concrete as indicated on the Contract Drawings.

3.6 ASPHALT CURBS, BERMS, WALKS, DRIVEWAYS AND WATERWAYS

A. Hot mix asphalt driveways shall be placed in accordance with the Standard Specifications Section 701.63.

3.7 HOT MIX ASPHALT MULTI-USE PATHS AND WALKWAYS

A. Hot mix asphalt multi-use paths and walkways shall be placed in accordance with the Standard Specifications Section 701.63 or as otherwise specified in the Contract Documents.

PART 4 – COMPENSATION

Item 2524.1 – 4-Inch Cement Concrete Sidewalks

METHOD OF MEASUREMENT:

Measurement for 4-inch Cement Concrete Sidewalks shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for 4-inch Cement Concrete Sidewalks shall be based on the square yard of 4-in Cement Concrete Sidewalks installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of 4-in Cement Concrete Sidewalks as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; remove, transport, stack, protect, and reset all parking meters, signs, or other items obstructing the construction of the sidewalk; excavate, removal and disposal of existing sidewalks; install, grade, compact, and test compaction of gravel sub-base and sub-grade; raise and adjust gate boxes, frames and covers, and other castings; furnish, install and compact Gravel Sub-base; furnish and install Cement Concrete complete with micro-fiber, expansion joints, and formwork; finish the Concrete; furnish and place the curing compound; protect the concrete after placement; furnish and place alkaline resistant protective penetrating concrete sealer; remove and dispose of formwork; backfilling; furnish and install loam and seed, mulch, or other backing and/or adjacent material specified including tree pits and grass areas; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; sidewalks installed to replace sidewalks damaged by the Contractor during construction; and 6-in sidewalks at driveways and

pedestrian ramps.

Item 2524.2 – 6-Inch Cement Concrete Sidewalks at Driveways

METHOD OF MEASUREMENT:

Measurement for 6-inch Cement Concrete Sidewalks at Driveways shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for 6-inch Cement Concrete Sidewalks at Driveways shall be based on the square yard of 6-inch Cement Concrete Sidewalks at Driveways installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of 6-inch Cement Concrete Sidewalks at Driveways as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; remove, transport, stack, protect, and reset all parking meters, signs or other items obstructing the construction of the sidewalk; excavate, removal and disposal of existing sidewalks; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; raise and adjust gate boxes, frames and covers and other castings; furnish and install Cement Concrete complete with micro-fiber, expansion joints, and formwork; finish the Concrete; furnish and place the curing compound; protect the concrete after placement; furnish and place alkaline resistant protective penetrating concrete sealer; remove and dispose of formwork; reinforcing; backfilling; furnish and install loam and seed, mulch, or other backing and/or adjacent material specified including tree pits and grass areas; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; sidewalks installed to replace sidewalks damaged by the Contractor during construction; and 4-in sidewalks; pedestrian ramps.

Item 2524.3 – 6-Inch Cement Concrete at Pedestrian Ramps and Intersections

METHOD OF MEASUREMENT:

Measurement for 6-inch Cement Concrete at Pedestrian Ramps and Intersections shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for 6-inch Cement Concrete at Pedestrian Ramps and Intersections shall be based on the square yard of 6-inch Cement Concrete at Pedestrian Ramps and Intersections installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of 6-in Cement Concrete Pedestrian Ramps as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; remove, transport, stack, protect, and reset all parking meters, signs or other items obstructing the construction of the sidewalk; excavate, removal and disposal of pedestrian ramps; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; raise and adjust gate boxes, frames and covers and other castings; furnish and install Cement Concrete complete with micro-fiber, expansion joints, and formwork; finish the Concrete;

furnish and place the curing compound; protect the concrete after placement; furnish and place alkaline resistant protective penetrating concrete sealer; remove and dispose of formwork; reinforcing; backfilling; furnish and install loam and seed, mulch, or other backing and/or adjacent material specified including tree pits and grass areas; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; sidewalks installed to replace sidewalks damaged by the Contractor during construction; 4-in sidewalks; and 6-in sidewalks at driveways.

Item 2524.4 --- Remove and Reset/Relocate Granite Curb (Straight and Curved)

METHOD OF MEASUREMENT:

Measurement for Remove and Reset/Relocate Granite Curb (Straight and Curved) shall be based on the linear foot of granite curb removed and reset installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer. Payment will be made only after the curb has been reset.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Remove and Reset/Relocate Granite Curb (Straight and Curved) shall be based on the linear foot of granite curb removed and reset or relocate complete for this item in the proposal. Under the linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and reset and/or relocate existing granite curb as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cut; excavate, remove, transport, stack, protect and reset straight and curved granite curb; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; modifications to the existing granite curb; furnish and install Cement Concrete; point the granite curb; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and reset to accommodate the Contractor's means and methods; new curb to replace curb damaged by the Contractor; new granite curb; and removing and resetting granite curb transition for pedestrian ramps.

Item 2524.5 --- Remove and Discard Granite Curb (Straight and Curved)

METHOD OF MEASUREMENT:

Measurement for Remove and Discard Granite Curb (Straight and Curved) shall be based on the linear foot of granite curb removed and relocated installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer. Payment will be made only after the curb has been relocated.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Remove and Discard Granite Curb (Straight and Curved) shall be based on the linear foot of Granite Curb removed from an existing alignment and discarded. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and dispose of existing granite curb as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cut; excavate, remove and transport, existing damaged or unsalvageable straight and curved granite; backfilling; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and discarded to accommodate the Contractor's means and methods; and disposal of existing granite curbing.

Item 2524.6 --- New Granite Curb Type VA4 (Straight and Curved)

METHOD OF MEASUREMENT:

Measurement for New Granite Curb Type VA4 (Straight and Curved) shall be based on the linear foot of granite curb installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for New Granite Curb Type VA4 (Straight and Curved) shall be based on the linear foot of Granite Curb (straight and curved) installed complete for this item in the proposal. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new granite curb as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; furnish and install new granite curb (straight and curved); install curbing at shallow depths as required; furnish and install cement concrete; point the granite curb; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and reset to accommodate the Contractor's means and methods; new curb to replace curb damaged by the Contractor; new granite transition curb at pedestrian ramps, driveways, and curb corners; and removing and resetting granite curb.

Item 2524.7 --- New Granite Transition Curb at Pedestrian Ramps, Driveways(Straight and Curved)

METHOD OF MEASUREMENT:

Measurement for New Granite Transition Curb at Pedestrian Ramps, Driveways, (Straight and Curved) shall be based on the linear foot of granite transition curb installed at pedestrian ramps, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Granite Transition Curb at Pedestrian Ramps, Driveways, (Straight and Curved) shall be based on the linear foot of Granite Transition Curb at Pedestrian Ramps, Driveways, (straight and curved) installed complete for this item in the proposal. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new granite transition curb at pedestrian ramps, driveways as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish, install, grade, compact, and test compaction of gravel sub-base and sub-grade; furnish and install new granite transition curb at pedestrian ramps, driveways, (straight and curved); furnish and install cement concrete; point the granite curb; install curbing at shallow depth as required; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and reset to accommodate the Contractor's means and methods; new curb to replace curb damaged by the Contractor; new granite transition curb corners and curb corners; and removing and resetting granite curb.

Item 2524.8 --- New Granite Curb Type VA3 for Back of Sidewalks and Raised Crosswalks

METHOD OF MEASUREMENT:

Measurement for New Granite Back Curb Type VA3 for Back of Sidewalks and Raised Crosswalks shall be based on the linear foot of granite curb installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for New Granite Back Curb Type VA3 for Back of Sidewalks, Raised Crosswalks shall be based on the linear foot of Granite Curb installed complete for this item in the proposal. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new granite back curb as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; furnish and install new granite back curb (straight); furnish and install cement concrete; point the granite back curb; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and reset to accommodate the Contractor's means and methods; new curb to replace curb damaged by the Contractor; new granite transition curb at pedestrian ramps, driveways, and curb corners; and removing and resetting granite curb. This item includes the raised curbing located between and the curbing.

Item 2524.9 --- New Concrete Curb

METHOD OF MEASUREMENT:

Measurement for New Concrete Curb shall be based on the linear foot of cast-in-place concrete curb

installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for New Concrete Curb shall be based on the linear foot of cast-in-place concrete installed complete for this item in the proposal. Under the per linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new cast-in-place concrete curb as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; furnish and install cement concrete; point the granite back curb; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

Item 2524.10--- Granite Curb, 2-FT Curb Corner

METHOD OF MEASUREMENT:

Measurement for New Granite Curb, 2-ft Curb Corner shall be based on Each of granite curb corners installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for New Granite Curb Corner, 2-ft Curb Corner shall be based on Each Granite Curb Corner installed complete for this item in the proposal. Under the Each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install new granite curb corners as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish, install, grade, compact and test compaction of gravel sub-base and sub-grade; furnish and install new granite curb corner; furnish and install cement concrete; point the granite curb corner; backfilling; furnish and install loam and seed, mulch, or other backing material specified; and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; granite curb removed and reset to accommodate the Contractor's means and methods; new Type VA 4 granite curb; and removing and resetting granite curb.

Item 2524.11--- Cast-in-Place Detectable Tile

METHOD OF MEASUREMENT:

Measurement for Cast-in-place Detectable Tile shall be based on each square foot of detectable tile installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Cast-in-place Detectable Tile shall be based on Each Cast-in-place Detectable Tile installed complete for this item in the proposal. Under the Each price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install detectable tiles

as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; furnish install cast iron detectible warning panels; and all other work not included for payment elsewhere.

Item 2524.12--- Concrete Pavers On Hot Mix Asphalt

METHOD OF MEASUREMENT:

Measurement for Concrete Pavers on Hot Mix Asphalt shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Concrete Pavers on Hot Mix Asphalt shall be based on the square yard of concrete pavers on hot mix asphalt as detailed in the Contract Documents installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of concrete pavers on hot mix asphalt as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; remove, transport, stack, protect parking meters, signs, or other items obstructing the construction of the intersection; removal of existing pavement; excavate, removal, and disposal of existing sidewalks within limits of intersection; install, grade, compact, and test compaction of gravel sub-base and sub-grade; furnish and install hot mix asphalt base; compaction of the hot mix asphalt base; furnish and install 6” granite curb edging; remove, stack, protect and reinstall existing granite curb edging; furnish and install 1-1/2” sand dust setting bed; applying asphalt tack coat and neoprene modified asphalt tack coat; sweeping with dry sand/ cement mix; raise and adjust gate boxes, frames and covers, and other castings; and all other work not included for payment elsewhere.

Item 2524.13--- Hot Mix Asphalt - Multi-Use Path

METHOD OF MEASUREMENT:

Measurement for Hot Mix Asphalt – Multi Use Path shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents shall be at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Hot Mix Asphalt Multi-Use Path shall be based on the square yard, complete along Fern Street as detailed in the Contract Documents. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for clearing the area for installation of the walkway, including but not limited to removal of the existing curbing and concrete sidewalk; grading, installation of the gravel base course, hot mix asphalt binder course, hot mix asphalt top course, as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; installation and compaction of hot mix asphalt base course and top course to the depth and width and in the area specified; hand placement and compaction of hot mix asphalt around structures, aprons, driveways and as required; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; and all incidental work not

included for payment elsewhere.

EXCLUSIONS:

The following items are not included for payment under this item; temporary paving; hand placement of asphalt.

Item 2524.14--- Hot Mix Asphalt - Walkway

METHOD OF MEASUREMENT:

Measurement for Hot Mix Asphalt – Walkway shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer. Placement of pavement to excess thicknesses and outside the limits defined in the Contract Documents shall be at no additional cost to the Owner.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Hot Mix Asphalt – Walkway shall be based on the square yard of hot mix asphalt – walkway installed complete at Danehy Park as detailed in the Contract Documents. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for clearing and excavating the area for installation of the walkway, grading, installation of the gravel base course, hot mix asphalt binder course, hot mix asphalt top course, as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to the following; raising and resetting existing structures, castings and boxes; excavation and removal of asphalt and soil; transportation of excavated soil to/from staging area; installation and compaction of hot mix asphalt base course and top course to the depth and width and in the area specified; hand placement and compaction of hot mix asphalt around structures, aprons, driveways and as required; power sweeping; keyways and other jointing between new and existing asphalt; furnish and place tack coat on all edges; furnish and install loam and seed in areas adjacent to path and where existing path is to be abandoned; and all incidental work not included for payment elsewhere.

EXCLUSIONS:

The following items are not included for payment under this item; temporary paving; hand placement of asphalt.

END OF SECTION 02524

SECTION 02534

BUILDING INFLOW AND ILLICIT REMOVAL

2534.1	BUILDING SITE PRE-INSPECTION	EACH BUILDING
2534.2	BUILDING DYE TESTING	EACH BUILDING
2534.3	PRIVATE SERVICE LATERAL INVESTIGATIONS	EACH BUILDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the work required to separate or disconnect storm water inflow sources (downspouts/roof leaders, area drains, building foundation drains, basement sump pumps, etc.) from the waste plumbing of existing buildings as generally shown on the Drawings and as provided in Appendix F of the Specifications. It also covers the verification of existing service laterals identified as “potential illicit” in Appendix E of the Specifications, and the verification of existing service laterals suspected to be separate drain laterals or otherwise unknown. The work includes, but shall not be limited to the following:
1. Coordination with representatives from the Owner, including the Engineer, various City of Cambridge departments, Building Owner, other City contractors etc., throughout the implementation of the work to obtain written permission and approval to access the building and to inspect and document the completed work.
 2. Contractor provision of a licensed plumber (certified by City of Cambridge) to perform the portion of the separation work governed by 248 CMR 10.00: Uniform State Plumbing Code.
- B. It is the intent of the related items of work that storm water inflow sources on select properties be separated from the building’s waste plumbing, that all separate drain laterals be connected to the storm drain, and that all sewer laterals be connected to the sewer main. As currently exists, it is typical for waste, storm water and groundwater piping to be tied together inside a building and discharge to a single sewer lateral, which then connects to a

sanitary sewer, combined sewer or storm drain in the street. However, a portion of properties possess multiple laterals, and the function of each lateral must be verified (sewer, drain or abandoned) prior to connecting or re-directing into the storm drain or sewer main. In particular, existing and proposed separate drain laterals must be verified that they are not connected to waste fixtures on the property.

- C. The Owner shall arrange for each Building Owner's consent for entry and to construct on the private property. The Contractor shall be provided with copies of consent approvals and any special considerations of the consent which will be incorporated into the work as directed by the Owner.
- D. All Contractor representatives who will be visiting or working on private property shall be screened through the Massachusetts Criminal Offender Record Information (CORI) process. CORI records shall be submitted to the Owner for review. The Owner may prohibit Contractor representatives from visiting and/or working on private property based on CORI records.
- E. Prior to beginning any work on private property, the Contractor shall coordinate with Owner's Resident Engineer and the Building Owner to obtain written authorization to enter the Building Owner's premises to perform the building separation work. Owner makes no guarantees that the premises will be available in any certain order or condition with any degree of timeliness. Historical interior basement and exterior site property conditions are provided in the Appendix F of the Specifications to aid the Contractor in the preparation of the Bid and in the preparation of any initial coordination of the work. Contractor shall have no basis for claim(s) related to delays associated with the order in which permission is obtained or delays related to existing interior basement or exterior site conditions that differ from historical record.
- F. The Contractor shall furnish and install all separation piping, provide existing drain modifications and install required drain appurtenances including cleanouts as herein specified and as indicated on the drawings. The Contractor shall provide a licensed plumber to perform all required plumbing connections governed by 248 CMR 10.00 to new and existing sanitary building sewer or building drain as indicated on the drawings.
- G. All materials shall be as specified or approved herein. The workmanship level required shall be of the highest quality commensurate with the location of the improvements. All restoration work shall be coordinated with the Building Owner and Owner's Resident Engineer ahead of the work to ensure that

necessary restoration work equals or exceeds existing conditions and is completed in a professional manner.

- H. The Contract Drawings show the general arrangement, direction, and anticipated sizes of pipes and drainage facilities required for inflow removal/disconnection from sanitary connections. The Drawings are not intended to show every fitting, or account for every condition or circumstance to be encountered by the Contractor. The Contractor shall furnish all necessary resources including a licensed plumber, experienced and qualified labor, materials and equipment to build new work to suit existing conditions. All required piping and appurtenances shall be installed to avoid interference with existing fixtures, equipment, or other piping including make any necessary repairs to the existing piping to accommodate the new work. All measurements shall be field verified and approved at the job site ahead of the work.
- I. The Contract Drawings show approximate locations where existing sewer laterals identified as “known illicit” and “potential illicit” connect to main lines in the street, based on historical tie cards and CCTV inspection records. These laterals are located for the purposes of identifying the types of site conditions that the Contractor will encounter when re-directing laterals. The Contract Drawings DO NOT identify the location or quantity of other existing sewer laterals, separate drain laterals, abandoned laterals and otherwise unknown laterals serving each property. The Owner and Engineer’s inventory of historical tie cards, sewer volumes, building inspection and CCTV inspection records are available upon request from the Engineer for the Contractor to infer the location, quantity and function of private service laterals, but these records shall not be used as a substitute for the testing and investigations required by this Specification.
- J. “Potential illicit” indicate properties where building inspections and historical dye testing were either not undertaken or inconclusive. These properties are assumed to be illicit by the Engineer and must be verified by the Contractor prior to re-direction.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 07631 – GUTTERS AND DOWNSPOUTS
- B. Section 02604 – CATCH BASINS
- C. Section 02622 – POLYVINYL CHLORIDE PIPE

D. Section 02950 – PRIVATE PROPERTY RESTORATION

1.3 SUBMITTALS

- A. Submit product data for dye test product to be furnished under this section.
- B. Submit typical dye testing and service lateral investigation plans outlining the approach for each of the following types of service laterals: “potential illicit”, separated drain, abandoned and unknown.
- C. Submit building preconstruction inspection report and the Owner’s coordination results prior to mobilizing on the property.
- D. Submit record drawings (as-builts) of facilities and modifications constructed on private property upon completion of the work. At a minimum, the record drawings should include a plan view of the property with dimensions and facilities clearly labeled, and a representative number of photos of the work during installation and completed restoration of disturbed areas.

1.4 QUALITY CONTROL

- A. The Contractor shall do all work required by and in accordance with applicable state and local building or plumbing codes; shall arrange for all permits, inspections, and tests required by those codes; and shall do everything necessary including coordination with the Building Owner, Owner and the Owner’s Resident Engineer to provide complete systems which will be ready for use without further expense to the Owner or the Building Owner.
- B. Work and materials shall conform to applicable codes, utility company standards, and the rules and regulations of authorities having jurisdiction.
- C. Should work or material called for in the Specifications or on the Drawings conflict, the Contractor shall notify the Owner when submitting the proposal. Failure to do this shall require the Contractor to comply with the more stringent requirements at his own expense.
- D. Inspections
 - 1. The Contractor shall not enclose, cover, or put into operation sanitary or drainage piping systems until inspected and approved by the authority having jurisdiction.
 - 2. During the progress of the installation, the Contractor shall notify the Owner’s Resident Engineer and/or Code Official having jurisdiction, at least 24 hours prior to the time such inspection must be made. The

Contractor shall perform tests specified below in the presence of the Code Official or authorized representative.

- E. Reports - The Contractor shall assist with preparation of inspection reports, signed by the Code Official at no additional cost to the Owner.
- F. Piping System Test - Soil, waste, and roof or other drain piping shall be visually inspected and tested as required by the related technical specification sections and deemed appropriate by the Code Official, or their designated agent, prior to acceptance by the Owner.
 - 1. The Contractor shall test for leaks and defects all new piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 - 2. The Contractor shall leave uncovered and unconcealed all new, altered, extended, or replaced piping until it has been tested and approved. If covered or concealed by the Contractor, the work shall be re-exposed before it can be tested and approved.
 - 3. Contractor shall modify, repair, reinstall, or make any other corrections or repairs required by such inspection and/or testing. The Contractor shall repair all leaks and defects using new materials and retest the system or portion thereof until satisfactory results are obtained. Should leaks be found, faulty joints shall be repaired by the Contractor, even to the extent of disassembling and remaking the joint at no additional cost to the Owner. Caulking of threads or the use of chemical compounds to correct leaks will not be permitted. The Contractor shall replace defective pipe or fittings, and the tests shall be repeated until test requirements are met to the satisfaction of the Code Official or authorized representative.
 - 4. The Contractor shall prepare reports for all tests and required corrective action.
 - 5. All materials, equipment, tools and labor for testing shall be furnished by the Contractor.

1.5 DEFINITIONS

- A. Public Right of Way: The right to travel unrestricted by land ownership or any other legality. The designated area that lies between private property lines on the side that parallels the street.

- B. Driveway: A private right of way that provides the principal means of vehicular access from a public right of way to a private parcel.
- C. Private Parcels: The private land owned by an individual that begins at the end of the public right of way.
- D. Private Walkways: Any walkway found in the private parcel outside of the public right of way.
- E. Public Sidewalk: Any sidewalk found in the public right of way not owned by an individual.
- F. Combined Facilities: Building drain or sewer that conveys both sewage and storm water or other drainage.
- G. Drain Facilities: Anything designed or created to transport rainfall or run-off.
- H. Sanitary Facilities: Anything designed or created to transport sanitary (waste) flows.
- I. Public Lateral Stubs: Capped piping from the sewer main to the property line for future connection to the lateral at the property line.
- J. Gutters: The channel at the eaves of the building used for collecting and transporting rainwater.
- K. Downspouts (Roof Leaders): The metal conductor perpendicular to the gutter of the building used for transporting rainwater.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials are designated in the Construction Details included in the Drawings. The following is an abbreviated list of materials.
 - 1. Straight pipe, adapters and fittings are to be of a type and class equivalent to the lateral pipe.
 - 2. Furnish adapter couplings as necessary to connect one pipe material to another or to connect one pipe size to another.

3. Pipe - PVC, Cast Iron, Ductile Iron
4. Fencing - Chain Link, Stockade, Picket, Wood, Wrought Iron
5. Driveway - Bituminous Concrete, Concrete, Gravel
6. Private Walkway - Concrete, Bituminous Concrete, Pavers, Brick
7. Public Sidewalk – Concrete
8. Porch/Decks – Wood
9. Gutters and Downspouts – Aluminum conforming to Section 07631
10. Walls - Block, Brick, Stone, Concrete, Railroad Ties

B. Cast-Iron Soil Pipe, Fittings and Supports

1. Pipes cast-iron (CI) soil pipe shall be the hubless type and shall conform to ASTM A888 or CISPI 301. For below grade (buried) installations the Contractor may use hub and spigot CI pipe with mechanical joints.
2. Fittings shall conform to CISPI 301 with 24 gauge type 304 corrosion resistant 18-8 chromium-nickel bearing stainless steel no-hub fittings with neoprene gaskets or approved equivalent. For below grade (buried) installations the Contractor may use hub and spigot CI fittings with mechanical joints.
3. Joints the elastomeric sealing sleeve shall conform to ASTM C 564 or CSA CAN/CSA-B602 and shall be provided with a center stop and clamp with high torque type (100 to 125 in/lbs), of same construction (Type 304 stainless) as above. For below grade (buried) installations the Contractor may use CI compression gasket joints conforming to ASTM C 564.

C. PVC plastic pipe (Type DWV, SDR35, PS50 and PS100) and fittings shall conform to ASTM D 2665 or ASTM D 3034.

1. Fittings shall conform to ASTM 3311.

PART 3 – EXECUTION

3.1 BUILDING-SITE PRE-INSPECTIONS

- A. Contractor shall inspect every property designated on the Drawings for Inflow Removal work prior to construction. The intent of this inspection is to:
1. Identify any change of conditions since the Owner's building inspection during the design phase.
 2. Make initial contact with the Building Owner to obtain acceptance of the proposed activities and begin coordination and scheduling of work.
 3. Identify any alternative disconnection options and coordinate alternative options with the Engineer.
 4. Verify connection elevations and identify any conflicts with the proposed public separation work before the public work commences.
 5. Determine extent of work to which 248 CMR 10.00 applies.
- B. The Contractor shall verify existing interior and exterior grades, existing and proposed inverts, location and elevation of existing utilities, (interior and exterior) obstacles, and topographical conditions prior to implementing interior and exterior work. This work shall be done in conjunction with plans to install or layout proposed main line sewers in the street or public right-of-way.
- C. The Contractor shall also examine the condition of roof, soffit, trim, exterior trim, walls, floors, and piping to ensure adequate preparation is provided ahead of the work.
- D. If conflicts or existing conditions prevent the execution of the work, the Contractor shall not proceed until unsatisfactory conditions have been corrected or addressed at no additional cost to the Owner.

3.2 BUILDING DYE TESTING

- A. Contractor shall conduct dye testing of waste fixtures and storm water inflow sources in advance of excavation and when suspect laterals are encountered during excavation. The general dye testing approach shall be as follows based on the suspected function of the lateral. Contractor shall adapt their approach to suit site specific conditions encountered in the field.

1. “Potential Illicit” Lateral - Perform initial dye tests of waste fixtures to verify function of the lateral. Undertake additional dye tests if results suggest alternate function.
 2. Separated Drain Lateral – Perform initial dye tests of storm water inflow sources to verify function of the lateral. Undertake additional dye tests of every waste fixture on the property to eliminate the potential for unknown illicit discharges to the lateral.
 3. Unknown Lateral - Perform initial dye tests to identify suspected function of the lateral. Undertake additional dye tests based on the suspected function.
- B. Contractor shall observe the results of dye testing by opening and closing manholes within the public right of way and breaking into sewer mains and service laterals encountered during excavation. Supply all materials needed to completely repair pipes broken into.

3.3 PRIVATE SERVICE LATERAL INVESTIGATIONS

- A. If the function, source and/or location of an existing service lateral cannot be identified through building dye testing and the review of historical records, identify the service by one or a combination of the following methods, with the approval of the Engineer:
1. Insert a transmitter into the service pipe through a clean-out or other access point inside the building that sends a signal to a receiver at the ground surface. Mark out the service location from the main line sewer to the property line using marking paint, stakes, or other means.
 2. Dig test pits to locate existing sewer services. If necessary, break into existing building connection pipes to determine the source of flow in the pipe. Repair the broken pipe until such time as connection to the new sewer is completed. Supply all materials needed to completely repair all pipes broken into.
 3. Perform CCTV inspection concurrent with smoke testing, dye testing, or other investigation methods to determine connectivity/configuration and achieve visual confirmation of discharge from service laterals to the main line.

3.4 COORDINATION OF THE WORK

- A. The Contractor shall coordinate the work with the Building Owner and/or building resident(s) to minimize the temporary interruption of drain or sanitary services or other utility services impacted by the work. Control and/or divert flow using portable pumps, plugs, etc. during this work, as required to prevent the discharge of wastewater flow to the ground surface and to prevent flow backups into buildings.
- B. There may be delays while homeowners are contacted, testing is accomplished, record ties are taken, and repair materials are obtained. Contractor's crew will be required to stand by during these delays at no additional cost to the Owner and to assist the Engineer in contacting the Building Owners and taking record ties.
- C. Work on private property shall conform to the following at a minimum:
 - 1. The Contractor shall remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill in accordance with the Drawings and Specification Section 02210.
 - 2. The Contractor shall grade and compact trench bottoms to provide a smooth, firm, and stable foundations. The trench shall also be free from rock throughout the length of the pipe.
 - 3. Shape the bottom of trench to fit bottom of pipe for 90° (bottom ¼ of the circumference). Fill unevenness with compacted sand backfill. At each pipe joint dig bell holes into bedding material to ensure continuous bearing of the pipe along its length.
 - 4. The Contractor shall coordinate the relocation of existing obstacles with the Building Owner and/or building resident(s) to get access to proposed interior and exterior pipe routes at no cost to the Owner.
 - 5. The Contractor shall repair or modify existing exterior structures, exterior gutters and roof leaders as necessary to support and connect new work at no additional cost to the Owner.
 - 6. The Contractor shall coordinate final restoration of disturbed areas on private property with the schedule for work to be performed by other City contractors at the same location. Temporary restoration is required immediately after exterior inflow removal work is complete. Final restoration is required within 30 days after interior work is completed by other City contractors (if interior work is required).
- D. All sanitary flows must be separated from the drain system prior to finish paving and completion of the Contract. If a Building Owner is non-responsive or refuses to grant permission to complete the work, the property's existing lateral(s) must be redirected to the sanitary pipe and a drain lateral stub shall be installed and capped at the property line. To aid in the future connection

of the drain stub to a new drain lateral and to reduce the risk of damage to the public sewer and drain due to excavation, wood markers shall be left in the ground extending from a point directly in front of the capped stub to a point approximately four feet below the ground.

3.5 INSTALLATION

- A. Perform pipeline installation in accordance with the appropriate related technical specification sections and applicable plumbing codes.
- B. Complete service reconnection work on the day on which it was started.
- C. Where the new building sewer and drains cross abandoned piping connected to cesspools, the abandoned piping shall be cut and capped.
- D. Provide written notification to each Building Owner at least 24 hours prior to the reconnection of the house service so that the Owner may make arrangements to suspend use of the service during reconnection.
- E. After the section of public pipeline has been satisfactorily tested and when the Owner informs the Contractor that the system is ready for operation, connect/reconnect all service connections to the new public sewers and drains.

PART 4 – COMPENSATION

Item 2534.1 --- Building Site Pre-Inspection

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include initiation of building owner contact and scheduling the building inspection, inspecting the property and building interior/exterior, and preparing the plan for construction of the inflow removal work including any downspout or gutter modifications. The plan is to be submitted to the Engineer no less than 15 working days prior to the construction of the building service lateral. Note that a minimum bid of at least \$200.00 per inspection is required for this item.

METHOD OF MEASUREMENT:

Payment for Building Site Pre-Inspection shall be based on the Unit Price bid in the proposal. Measurement for payment shall be equal to the number of Building Pre-inspection plans submitted and accepted by the Engineer.

Item 2534.2 --- Building Dye Testing

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include Building Owner coordination, dye, providing water, opening and closing manholes, performing tests and observing results. This item shall also include widening of excavations required to fully expose suspect laterals encountered during excavation, breaking into laterals, repair or

replacement of laterals broken into, backfill, and any other work and equipment incidental to the performance of the dye test.

METHOD OF MEASUREMENT:

Payment for Building Dye Testing shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of buildings tested as indicated on the Drawings or directed by the Engineer.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are considered incidental to the project: verifying the function of existing service laterals which are suspected to be sanitary sewer laterals or catch basin laterals.

Item 2534.3 --- Private Service Lateral Investigations

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include Building Owner coordination, building dye testing, smoke testing, tracing with transmitters, test pitting, CCTV inspection, and observing results. This item shall also include excavation required to locate and expose laterals, breaking into laterals, repair or replacement of laterals broken into, backfill, surface restoration, and any other work and equipment incidental to the investigation.

METHOD OF MEASUREMENT:

Payment for Private Service Lateral Investigations shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of buildings investigated as indicated on the Drawings or directed by the Engineer.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are considered incidental to the project: verifying the function of existing service laterals which are suspected to be sanitary sewer laterals or catch basin laterals.

-END OF SECTION 02534-

SECTION 02555

CATCH BASIN LINING

2555.1

CATCH BASIN LINING

EACH

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cleaning of catch basin interior; repair of cracks and voids in catch basin walls, flush surfaces and invert; resetting the frame and grate; replacement of hood; stopping of active manhole leaks; interior application of a pure fused calcium aluminate coating and application of an epoxy coating over the calcium aluminate coating.

1.2 RELATED TECHNICAL SECTION

- A. Section 01300 – SUBMITTALS
- B. Section 02080 – SOIL AND WASTE MANAGEMENT
- C. Section 02604 – CATCH BASINS
- D. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION
- E. Section 03300 – CONCRETE

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Manufacturer's technical data sheet and Material Safety Data Sheet for each product used. Also provide the coating manufacturer's written instructions and recommendations on surface preparation, application, and repair of discontinuities.
2. Coating manufacturer's written certification that the products meet or exceed the technical requirements of this Specification Section and that the products have been successfully manufactured and installed for at least 5 years.
3. Coating installer's written certification that it has a minimum of one year of experience with installation of the products. Provide a minimum of three project references to verify experience.

4. Proposed method of catch basin cleaning including the equipment to be used and OSHA-compliant confined space entry procedures. Include method of solid and liquid waste management, a list of permits required, and a list of lawful sites and/or facilities proposed for disposal of grit, debris and degreased petroleum product.

PART 2 – PRODUCTS

2.1 MATERIALS

A. PREPARATORY INFILTRATION CONTROL PRODUCTS

Preparatory products used shall be compatible with the lining system to be used.

1. PATCHING MATERIAL

A quick setting corrosion resistant cementitious material shall be used as a patching material and is to be mixed and applied according to manufacturer's recommendations, and shall have the following minimum requirements:

Compressive Strength	ASTM C109	1,400 psi, 6 hours
Bond Strength	ASTM C952	Minimum 145 PSI
Cement		sulfate resistant
Applied Density		105 pcf +/- 5 lbs
Shrinkage	ASTM C596	0% at 90% R.H.

Product shall be Strong Seal QSR as manufactured and/or supplied by The Strong Company, Inc., Pine Bluff, AK; Raven 700 as manufactured by Raven Lining Systems, Broken Arrow, OK; or approved equal.

2. INFILTRATION CONTROL MATERIAL

A rapid setting cementitious product specifically formulated for leak control shall be used to stop minor water infiltration, and shall be mixed and applied according to manufacturer's recommendations and shall have the following minimum requirements:

Compressive Strength	ASTM C109	1 hour - 400-600 psi
	(2-inch Cubes)	24 hours - 2,000-2,400 psi
Expansion	ASTM C827	1 day - 10 percent
Freeze/Thaw	ASTM C666	No loss after 15 cycles
	"Method A"	At 2,000 ppm, test continuing
Pull out strength	ASTM C234	14,000 pounds
Placement time		<60 seconds

Product shall be Strong Seal Strong-Plug as manufactured and/or

supplied by The Strong Company, Inc.; Raven 715 as manufactured by Raven Lining Systems; or approved equal.

3. GROUTING MATERIAL

A cementitious grout shall be used for stopping active infiltration and filling voids, and shall be mixed and applied according to manufacturer's recommendations. The cement grout shall be volume stable and have a minimum one day compressive strength of 250 psi. Constituents of cement grout shall conform to Section 03300 – CONCRETE.

B. PURE FUSED CALCIUM ALUMINATE COATING

An acid resistant pure fused calcium aluminate cementitious liner product shall be used to form a structural/structurally enhanced monolithic liner covering all interior substrate surfaces and shall have the following minimum requirements at 28 days:

Compressive Strength	ASTM C109	>9,000 psi
Tensile Strength	ASTM C496	>700 psi
Flexural Strength	ASTM C293	>1,200 psi
Shrinkage at 95% R.H.	ASTM C596	0 percent
Bond	ASTM C882	>1,600 psi
Applied density		130 - 150 pcf
Freeze/Thaw	ASTM C666	300 cycles, no damage

Product shall be SewperCoat PG as manufactured by Lafarge Calcium Aluminates, Strong Seal High Performance Mix as manufactured by The Strong Company, Inc.; Raven 705CA as manufactured by Raven Lining Systems; or approved equal.

C. EPOXY COATING (PC 2/11)

Epoxy coating material shall conform to the following design criteria:

Compressive Strength	ASTM D695	12,000 psi
Tensile Strength	ASTM D638	7,000 psi
Flexure Strength	ASTM D790	11,000 psi
Flexure Modulus	ASTM C790	400,000 psi
Bond Strength	ASTM C882	Tensile Strength of Concrete
Shore Hardness	ASTM D2240	80
Cure Time	NA	8 Hours

Epoxy coating material shall be a solvent-free, 100% solids, two-component system; thixotropic in nature, formulated for service under submerged and atmospheric sanitary sewage conditions. Epoxy coatings shall have a chemical resistance to 10% sulfuric acid (submerged service) and 20% sodium hydroxide (submerged service). Epoxy coating systems shall be as manufactured by

Raven Lining Systems; Warren Environmental, Inc, Carver, MA; or equal.

At least 14 days before the patching/repair materials are to be applied, submit documentation to the Engineer from the manufacturer that includes application, cure time and surface preparation procedures that permit optimum bond strength between the epoxy coating and the calcium aluminate coating.

D. WET FILM THICKNESS GAUGE

Wet film thickness gauges shall meet the requirements of ASTM D4414, Standard Practice for Measurement of Wet Film Thickness Gauges. Gauges shall be as supplied by Paul N. Gardner Company, Inc. or equal.

E. CATCH BASIN HOOD

Provide hoods in accordance with Section 02604 – CATCH BASINS.

PART 3 – EXECUTION

3.1 CLEANING AND PREPARATION

Remove the inlet grate, frame and hood from the catch basin. Remove all grit and debris at the base of the structure.

Prepare the interior catch basin surface such that it is clean, structurally sound and free from oil, grease, loose mortar, paints, protective coatings, efflorescence, laitance and airing compounds.

Use a chemical wash to clean the interior of the catch basin. The use of only a high-pressure water spray is not acceptable. The condition of the catch basin has a petroleum product on the walls and may require the use of an environmentally safe degreasing compound; if so, thoroughly degrease and rinse to eliminate any residue.

The entire structure shall be thoroughly water and/or sand blasted to remove any loose or deteriorated material. Clean all accumulations of debris, such as dirt and grease, loose mortar, bricks and concrete, and dispose of properly. Prevent any loose material from entering outlet drain lines by inserting a 1/2-inch or smaller mesh protective screen to the outlet.

Properly characterize, handle and dispose of removed grit, debris and wash water in accordance with Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION.

Install new grade rings or brick, as shown on the Drawings, to reconstruct the top of the catch basin to the elevation required for the frame and cover to meet the existing grade. Seal all joints with mortar.

3.2 INVERT REPAIR

Remove all loose material and wash walls again after preparation has been completed. Apply patching material to the invert in an expeditious manner. Trowel the mix uniformly onto the invert at a minimum thickness of 1/2 inch, extending out onto the bench sufficiently to tie into the liner material. The finished invert shall be smooth and free of ridges.

3.3 CALCIUM ALUMINATE COATINGS

1. MIXING

Apply the base coat material in multiple passes. Build the base coat out to within 1/2 inch of required finished dimension.

The final coat shall be, as a whole, a minimum thickness of 1/2 inch throughout. For each bag of product, use the amount of water or water settings required per manufacturer's recommendations following mixing procedures noted on product bag and using the approved equipment for mixing and application.

Discharge the prepared mix into a hopper and mixing shall continue to occur in such a manner as to allow spraying continuously without interruption until each application is complete.

2. SPRAYING

The surface, prior to spraying base coat applications, shall be clean and free of all foreign material and shall be damp without noticeable free water droplets or running water, but totally saturated, just prior to application of each coat. Spray the materials from the bottom of the wall to the top, to within 1/2 inch of the original substrate dimension using as many passes as necessary but each application shall not exceed 1/2 inch. The Contractor shall rough trowel the surface after each pass.

Apply the final application after the base coat applications have begun to take an initial set (disappearance of surface sheen). The final application shall be a minimum thickness of 1/2 inch, applied from the bottom up. Trowel the surface to a relatively smooth finish being careful not to over finish or over trowel so as to bring additional water to the surface and weaken it. Apply a brush finish to the troweled finish or top coat surface. Manufacturer's recommendations shall be followed whenever more than 24 hours have elapsed between applications.

3. CURING

Caution shall be taken to minimize exposure of applied product to sunlight and air movement. If application of additional coats is to be longer than 15 minutes, the structure shall be covered. At no time shall the finished product be

exposed to sunlight or air movement for longer than 15 minutes before covering or closing access. In environments where humidity level is below 70 percent, it shall be necessary to keep finished product damp for the first 72 hours.

The final application shall have a minimum of eight hours cure time before being subject to active flow.

4. WEATHER

Precautions shall be taken to keep the mix temperature at time of application below 90 degrees F. Water temperature shall not exceed 80 degrees F. Chill with ice if necessary.

5. PRODUCT TESTING

Cast four 2-inch cubes each day or from every pallet of product used and the Contractor shall properly package, label and return to the manufacturer for testing in accordance with the manufacturer's directions for compression strength per ASTM C109 procedure.

6. FIELD TESTING

The catch basin shall be visually inspected for leakage and for a smooth, even finish with good bonding to the manhole.

Prior to installing coating system, the manhole shall exhibit no visible leakage in the structure, around pipe penetrations or at the interface to the cut open sewer pipe liner. Any leakage shall be corrected to the Engineer's satisfaction.

The Contractor shall propose, for approval, methods to assure that the proper thickness of liner coating is applied. Any method that is destructive, such as a dry film scratch tester, shall be followed by a suitable repair to the liner following the test. Any unsuitable coating shall be supplemented or removed and replaced, as applicable. Any liner which is observed to be not properly adhering or buckling shall be replaced.

3.4 EPOXY COATINGS

A. APPLICATION

Epoxy coating shall be applied over the calcium aluminate coating to a minimum wet film thickness of 125 mils.

The temperature of the surface to be coated shall be maintained between 40 degrees F and 120 degrees F during application. Where varying surface temperatures exist, care should be taken to apply the coating when the surface temperature is falling rather than rising.

Material handling, mixing, application and environmental controls shall conform to the manufacturer's requirements. If multiple top-coating or additional coats of epoxy are to be applied, they shall be applied in a timeframe consistent with the manufacturer's requirements. Additional surface preparation procedures will be required if the timeframe is exceeded.

B. MEASURING, TESTING AND INSPECTION

During application, a wet film thickness gauge shall be used to ensure a monolithic coating and uniform thickness during application.

After the coating has set hard to the touch, it shall be inspected for holiday with high-voltage spark tester in accordance with NACE International (formerly National Association of Corrosion Engineers) RP0188-99. All detected holiday shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand-applied to the repair area. All touch-up/repair procedures shall comply with the epoxy coating manufacturer's recommendations.

A final visual inspection shall be made by the Engineer and the manufacturer or its representative. Any deficiencies in the finished coating shall be marked and repaired by the Applicator according to the procedures set forth herein.

3.5 FRAME AND GRATE

- A. Reinstall catch basin frame and grate in accordance with Section 02604 – CATCH BASINS.

3.5 HOODS AND TRAPS

- A. Install a new hood in the catch basin per Section 02604 – CATCH BASINS.

PART 4 – COMPENSATION

Item 2555.1 --- Catch Basin Lining

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage inspection of catch basin lining complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: transporting material to/from staging area; removal and reinstallation of existing grate and frame; removing and replacing hood; infiltration control grouting; cleaning, repair and preparatory work; characterization, removal and disposal of grit, debris and wash water; spraying calcium-aluminate liner; spraying epoxy liner; visual testing and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Catch Basin Lining shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of catch basins lined as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume catch basins proposed for lining to have a vertical depth of 6 feet as measured from inside bottom of base section to finished grade.**

Catch basin lining installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

-END OF SECTION 02555-

SECTION 02577

PAVEMENT MARKINGS

2577.1	4-IN TO 8-IN REFLECTORIZED PAVEMENT MARKINGS – YELLOW AND WHITE THERMOPLASTIC	LINEAR FOOT
2577.2	EMBEDDED REFLECTORS	EACH
2577.3	PAVEMENT ARROWS & LEGENDS REFL. WHITE (THERMOPLASTIC)	SQUARE FOOT
2577.4	CROSSWALKS AND STOP LINES REFL. WHITE (THERMOPLASTIC)	SQUARE FOOT
2577.5	HIGH FRICTION SURFACE TREATMENT	SQUARE FOOT

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish and apply pavement markings in accordance with the Commonwealth of Massachusetts Highway Department, Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the "Standard Specifications." All references to method of measurement, basis of payment, and payment items in the standard specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned therein.

1.2 RELATED WORK

- A. Section 02500 – PAVING AND SURFACING

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:
1. Product data and specification submittals.
 2. For information purposes only, submit manufacturer's printed installation instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. M7.01.03 White Thermoplastic Reflectorized Pavement Markings.
- B. M7.01.04 Yellow Thermoplastic Reflectorized Pavement Markings.
- C. M7.01.07 Glass Beads
- D. 3M Snowplowable Raised Pavement Markers RPM 190 or approved equal. Provide yellow for centerlines and white for edge lines.
- E. High Friction Surface Treatment: Shall be “TYREG RIP VS” as manufactured by Prismo, USA, Inc.; or approved equivalent product. Color shall be green and shall conform to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the following:

a. Daytime chromaticity coordinates shall be as follows:

1		2		3		4	
x	y	x	y	x	y	x	y
0.23	0.75	0.26	0.50	0.36	0.50	0.44	0.55
0	4	6	0	7	0	4	5

b. Daytime luminance factor (Y) shall be at least 7, but no more than 35.

c. Nighttime chromaticity coordinates shall be as follows:

1		2		3		4	
x	y	x	y	x	y	x	y
0.23	0.75	0.33	0.54	0.45	0.50	0.47	0.52
0	4	6	0	0	0	9	0

PART 3 – EXECUTION

3.1 GENERAL

A. Apply Pavement Markings as follows:

Material	Material Application Temperature Degrees F	Line Thickness Inches	Reflectorized Application

M7.01.03	400-425	5.0 – 7.5	1lb/10 SF Drop On
M7.01.04	400-425	5.0 – 7.5	1lb/10 SF Drop On

- B. The ambient air temperature for thermoplastic application shall be minimum of 45 degrees F and rising at the time of marking operations. If work has started and air temperatures fall below 45 degrees F [7.2 C] and continuous cooling is indicated, work shall be stopped. In cool weather conditions, temporary drops in temperature down to 40 degrees F [4.4 C] may be tolerated, providing temperatures also vary upwards. Sustained striping (greater than one hour) at 40 degrees F [4.4 C] shall not be allowed. Starting work at air temperatures lower than 45 degrees F [7.2 C] shall not be allowed.
- C. Apply markings at cross walks and stop lines at the locations required by the Engineer or as shown in the Drawings.
- D. Align new markings to match existing in color, dimensions, and spacing, and extend new markings where required.
- E. Marking widths for crosswalks and stop lines shall be 24 inches and 12 inches respectively, and applied within a tolerance of five percent. Deviation of straight strips shall not exceed ½-inch in 50 feet.
- F. Existing pavement markings no longer required shall be completely removed, by grinding method, prior to placement of any temporary lines.
- G. Pavement markings for crosswalks, fog lines, and stop lines shall be white. Pavement markings for centerlines shall be yellow.
- H. All temporary pavement markings shall be traffic paint. All permanent markings shall be thermoplastic. Pavement markings for centerlines shall be yellow.
- I. Pavement markings shall not be installed until a minimum of 15 days after final paving is completed. The Contractor shall notify the City of Cambridge Traffic Engineer at least 72 hours in advance of scheduled pavement marking installation. The exact location of pavement markings will be determined by the City’s Traffic Engineer at the time of installation. The City’s Traffic Engineer or representative must be present to supervise the pavement marking operations.
- J. Broken lines through intersections (vehicular and bicycle) are indicated only graphically on the plans. Actual pattern shall be 4-foot line and 4-foot space.
- K. Pavement arrows and legends in areas subject to general vehicle traffic shall

be thermoplastic. Pavement arrows and legends on bicycle facilities shall be surface applied tape.

- L. Locations and spacing of Embedded Reflectors along the centerline and edge lines are indicated in the Contract Drawings.
- M. Placement of the reflectorized pavement marker shall be installed so that the reflective face is visible and perpendicular to oncoming traffic so that the top of the marker is set $\frac{1}{4}$ +/- inch above the top of the adjacent pavement.
- N. The green-colored high friction surface treatment shall be installed at bicycle conflict areas and bicycle turn boxes as indicated on the plans and as directed by the Engineer. The Contractor shall install the high friction surface treatment in accordance with all manufacturers' installation and materials specifications. Copies of the manufacturer's installation procedures and materials specifications shall be provided to the Engineer for approval before placement of the surface treatment is allowed.

PART 4 – COMPENSATION

2577.1 - 4-in to 8-in Reflectorized Pavement Markings – Yellow and White Thermoplastic

METHOD OF MEASUREMENT:

Measurement for payment for Reflectorized Pavement Markings shall be per linear foot of lines applied with thermoplastic. Broken lines shall be paid by deducting $\frac{1}{4}$ of the total linear foot of roadway painted with full deductions for breaks greater than 10-feet.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Reflectorized Pavement Markings shall be based on the linear foot price complete for this item in the proposal. Under the linear foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for installing Reflectorized Pavement Markings. The work includes, but is not limited to: sweeping, furnish, apply, and protect all thermoplastic pavement lines; grinding and removing pavement markings and lines no longer required.

EXCLUSIONS:

The following items are not included for payment under this item: Permanent crosswalks; painted lines for temporary or traffic management lines and crosswalks will not be paid for under this item but are considered incidental to other items.

2577.2 – Embedded Reflectors

METHOD OF MEASUREMENT:

Measurement for payment for Embedded Reflectors shall be per each of reflectors legends applied with tape or thermoplastic as specified.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Embedded Reflectors shall be based on the each complete for this item in the proposal. Under the uni price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for installing Embedded Reflectors. The work includes, but is not limited to: sweeping, furnish, apply, and protect all reflectors; excavation and removal of asphalt; grinding and removing pavement markings and lines no longer required.

EXCLUSIONS:

Temporary reflectors installed for temporary or traffic management will not be paid for under this item but are considered incidental to other items.

2577.3 - Pavement Arrows & Legends- Refl. White (Thermoplastic)

METHOD OF MEASUREMENT:

Measurement for payment for reflectorized pavement markings shall be per square foot of arrows and legends applied with thermoplastic as specified.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Reflectorized Pavement Markings shall be based on the square foot price complete for this item in the proposal. Under the square foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for installing Reflectorized Pavement Markings. The work includes, but is not limited to: sweeping, furnish, apply, and protect all surface applied thermoplastic pavement markings; grinding and removing pavement markings and lines no longer required.

EXCLUSIONS:

The following items are not included for payment under this item: Painted lines for temporary or traffic management will not be paid for under this item but are considered incidental to other items.

2577.4 – Crosswalks and Stop Lines Refl. White Thermoplastic

METHOD OF MEASUREMENT:

Measurement for payment for Crosswalks and Stop Lines Reflectorized Pavement Markings shall be per square foot of lines applied with thermoplastic.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Crosswalks and Stop Lines Reflectorized Pavement Markings shall be per square foot of lines applied with thermoplastic price complete for this item in the proposal. Under the square foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for installing Reflectorized Pavement Markings. The work includes, but is not limited to: sweeping, furnish, apply, and protect all

thermoplastic pavement lines; grinding and removing pavement markings and lines no longer required.

2577.5 - High Friction Surface Treatment

METHOD OF MEASUREMENT:

Measurement for payment for high friction surface treatment shall be per square foot of surface treatment installed as specified.

BASIS OF PAYMENT / INCLUSIONS:

Payment for High Friction Surface Treatment shall be based on the square foot price complete for this item in the proposal. Under the square foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for installing High Friction Surface Treatment. The work includes, but is not limited to: sweeping, furnish, apply, and protect all surface applied tape or thermoplastic pavement markings; grinding and removing pavement markings and lines no longer required.

END OF SECTION 02577

SECTION 02590

BRICK MASONRY

2590.1

**RENEW PRIVATE LATERAL
CONNECTION AT EXISTING
BRICK PIPE**

EACH

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The work covered under this Section includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing brick masonry, as directed, for furnishing and installing masonry plugs, brick inverts and tables, raising and adjusting castings, and for all other necessary appurtenant work complete and accepted in accordance with the Drawings and Specifications and as directed.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 02051 – DEMOLITION, MODIFICATION, AND ABANDONMENT
- B. Section 02252 – MANHOLES
- C. Section 03410 – PLANT-PRECAST STRUCTURAL CONCRETE

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Submit manufacturer specification sheets for and shop drawings for all masonry items, mortar and appurtenances.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Masonry
 - 1. Masonry shall include brick masonry for extending manhole and catch basin frames to grade, brick masonry plugs for pipes and structures, manhole invert tables, cement mortar plaster on interior and exterior surfaces of masonry walls, mortar and related work. Brick masonry plugs for pipes and structures shall be a minimum of 8-inches thick,

unless otherwise shown or directed. Other brick masonry shall be provided to the details and the dimensions specified, indicated or as directed.

B. Bricks

1. Bricks in general shall be clay or shale brick and shall conform in all respects to ASTM C32, latest revision, Grade SS. Bricks that are broken, warped, cracked or of improper size or quality, or otherwise defective shall not be used in the work and shall be removed from the site.
2. Brick for extending manhole frames to grade shall be concrete brick conforming to ASTM C139, latest revision.

C. Cement

1. Cement shall conform to the standard specifications for Portland cement of ASTM C150, latest revision, Type II, unless otherwise directed. Whenever directed by the Owner, a quick-setting cement (Type III) shall be used for any desired purpose at no additional expense to the Owner.

D. Sand

1. Sand for mortar shall be graded uniformly from fine to coarse and when dry shall pass a No. 8 sieve. Sand shall consist of aggregate having clean, hard, durable, strong, uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances. The sand shall be washed clean before loading on delivery trucks. Natural sand which shows a color darker than the standard color when tested in accordance with the Colorimetric Test for Sands as described in ASTM C40, latest revision, will be cause for rejection.

E. Lime

1. Lime shall be hydrated lime conforming to ASTM C207, latest revision.

F. Water

1. Mixing water for concrete and mortar shall be clean and free from oil, acid, alkali, injurious amounts of vegetable matter and other impurities. Potable water obtained from a municipal supply is preferable.

G. Mortar

1. Mortar and mortar plaster shall be composed of one part Type II portland cement, and two parts sand to which a small amount of hydrated lime, not to exceed 10 lbs. to each bag of cement, shall be added. Only a sufficient amount of water shall be added to make a stiff plastic mortar of a consistency and texture satisfactory to the Owner. Retempering of mortar in which the cement has started to set will not be permitted.

PART 3 – EXECUTION

3.1 GENERAL

- A. All exterior surfaces of masonry walls shall be plastered with mortar plaster to provide a minimum thickness of 1/2 inch. Mortar plaster shall be applied with sufficient pressure to insure a dense plaster completely filling all voids and thoroughly bonded to the masonry wall. Masonry construction shall be done in a manner to insure watertight construction and all leaks in masonry shall be sealed.
- B. All workmanship shall conform to the best standard practice, and all brick masonry shall be laid by skilled workmen. Brick masonry for extending frames to grade shall be constructed to the thickness indicated. Brick masonry walls shall be constructed to the thickness indicated. All beds on which masonry is to be laid shall be cleaned and wetted properly. Brick shall be wetted as required and shall be damp but free of any surface water when placed in the work. Bed joints shall be formed of a thick layer of mortar which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coat of mortar on the entire end, or on the entire sides as the case requires, and then shoving the mortar-covered end or side of the brick tightly against the bricks laid previously; the practice of buttering at the corners of the brick and then throwing mortar or scrapings into the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints shall be uniform in thickness and shall be approximately 3/8-inch thick. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumbprint hard; the mortar shall be compressed with complete contact along the edges so as to seal the surface of the joints. Brickwork shall be constructed accurately to dimensions, and brickwork at top of manholes shall be to the dimensions of the flange of the cast iron frames.
- C. No water shall be allowed to flow against brickwork or to rise on the masonry for 60 hours after it has been laid, and any brick masonry damaged in this manner shall be replaced as directed at no additional expense to the Owner. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost. Plaster shall be troweled to a smooth hard finish and no backfill shall be placed until the mortar has thoroughly hardened.

PART 4 – COMPENSATION

2590.1 – Renew Private Lateral Connection at Existing Brick Pipe

METHOD OF MEASUREMENT:

Measurement for payment for Renew Private Lateral Connection at Existing Brick Pipe will be for the number of private lateral connections renewed at existing brick pipe as shown on the Contract Drawings or as required by the Engineer furnished and installed complete. Payment for these items shall be payable upon completion of work under this bid item

BASIS OF PAYMENT / INCLUSIONS:

Payment for Renew Private Lateral Connection at Existing Brick Pipe shall be based on each private lateral connection renewed at existing brick pipe complete for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required Renew Private Lateral Connection at Existing Brick Pipe as indicated on the Contract Drawings and as specified. The work includes but is not limited to: remove debris from existing lateral connection; interior grouting of lateral connection; remortar interior loose bricks; and all incidental materials and work not specifically included for payment elsewhere required to complete the Renew Private Lateral Connection at Existing Brick Pipe as detailed and specified.

EXCLUSIONS:

The following items are not included for payment herein but are included for payment elsewhere; cleaning of existing brick drain main line; cured-in-place pipe lining; disposal of construction debris.

-END OF SECTION 02590-

SECTION 02604

CATCH BASINS

2604.1	CATCH BASIN – TYPE 1 SINGLE GRATE (4-FT DIAMETER)	EACH
2604.2	CATCH BASIN – TYPE 2 DOUBLE GRATE (5-FT DIAMETER)	EACH
2604.3	CATCH BASIN – TYPE 3 SINGLE GRATE (3-FT x 4-FT SQUARE)	EACH
2604.4	CATCH BASIN – TYPE 4 DOUBLE GRATE (3-FT x 4-FT SQUARE)	EACH
2604.5	CATCH BASIN – TYPE 5 DIRECT INLET	EACH
2604.6	CATCH BASIN – REMOVE AND REPLACE EXISTING FRAME AND GRATE	EACH
2604.7	PRIVATE EXTERIOR INFILTRATING DRY WELL	EACH
2604.8	PRIVATE EXTERIOR TRENCH DRAIN	EACH

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing, installing, and testing of precast concrete catch basins, complete and in place, within the limits and to the lines and grades indicated.

1.2 RELATED TECHNICAL SECTION

- A. Section 00825A – SPECIAL CONDITIONS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – MANHOLES
- D. Section 02590 – BRICK MASONRY

- E Section 03300 – CONCRETE
- F. Section 03315 – GROUT
- G. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Complete shop drawings for all precast catch basin sections, cast iron frames and covers and appurtenances.
 - 2. Prior to fabrication, submit shop drawings showing details of precast monolithic base sections; risers; eccentric cone and flat slab catch basin tops; joints and gaskets; and construction details, tolerances, and other information as required by the Owner.
 - 3. Submit manufacturer’s recommended installation procedures for informational purposes.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Owner reserves right to inspect and test by independent services at manufacturer’s plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.
- B. Removed catch basin fixtures must not be reused and shall be salvaged and delivered to the City of Cambridge Public Works storage yard unless directed by the Owner to dispose off site.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Precast Bases, Risers, and Tops: catch basins shall be constructed as per the requirements specified for manholes in Section 02252 – MANHOLES.
 - 1. Catch basins shall be constructed as detailed. Catch basins shall be

designed for a minimum of H-20 loading. Catch basins shall have a minimum of 6 ft sump depth, unless otherwise noted.

- B. Concrete: catch basins shall be constructed as per the requirements specified for manholes in Section 02252 – MANHOLES.
- C. Frames and Grates:
 - 1. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects affecting the strength and value for the service intended. The finished coating shall be tough and tenacious when cold and not brittle or with any tendency to scale off under seasonable temperature changes.
 - 2. Frames and Grates shall be Cast Iron, conforming to ASTM A48, Class 35B and as follows:
 - a. Castings to be free from scale, lumps, blisters and sandholes.
 - b. Machine contact surfaces to prevent rocking.
 - c. Thoroughly clean and hammer inspect.
 - 3. Frames and grates shall be capable of withstanding AASHTO H-20 loading unless otherwise indicated or specified.
 - 4. Catch Basin Grates Shall be waffle type similar to a style typified by East Jordan Iron Works (Series 5520M5), or approved equal.
 - 5. Single Catch Basin Frames (3 flanged) shall be similar to a style typified by East Jordan Iron Works (Series 5523) or approved equal.
 - 6. Double Catch Basin Frames (3 flanged) shall similar to a style typified by East Jordan Iron Works (Series 5448Z), or approved equal.
 - 7. Single Shallow Inlet Catch Basin Frames (3 flanged) shall as similar to a style typified by East Jordan Iron Works (Series 5525), or approved equal.
 - 8. Double Shallow Inlet Catch Basin Frames (3 flanged) shall be similar to a style by East Jordan Iron Works (Series 5444), or approved equal.
 - 9. Beehive frames and grates shall be similar to a style typified by Neenah Foundry Grate Model R-2561 and Frame Model R-1733-1, D & L Foundry Co. Model C-130-15; or approved equal. The clear opening in the frames, at its narrowest dimension shall be 24-in unless otherwise specified.

10. Trench drain frames and grates shall be similar to a style typified by Neenah Foundry (Model R-4995-A2), or approved equal.

D Hoods

1. Catch Basin Hoods shall be similar to a style typified by East Jordan Iron Works (Series 5902), or approved equal.
2. Catch Basin Hoods with inserts shall be similar to a style typified by E. L. LeBaron Foundry Co. (Model L-205, acquired by East Jordan Iron Works), or approved equal.

E. Granite Curb Inlets (Throat Stones)

1. Granite shall conform to MassDOT Standard Specifications Sections M9.04.0, M9.04.1, and M9.04.2. The back face for a distance of 3 inches down from the top shall have no projections greater than 1 inch. The front shall be straight split, free from drill holes, and shall have no projection greater than 1 inch or depression greater than 1/2 inch for a distance of 10 inches down from the top. For the remaining distance there shall be no depression or projection greater than 1 inch. The ends shall be squared with the top for the depth of the face finish.
2. The granite curb inlet shall be 6 feet in length, plus or minus 1/2 inch from 18 to 20 inches in depth, 8 inches wide at the top and at least 5 inches wide at the bottom. The reveal shall be as indicated on the drawings. Curb inlets set on a radius of 160 feet or less shall be cut to that radius. The gutter mouth at least 3 inches in depth and at least 4 feet in length shall be cut in the front face of the stone.
3. If there is no other curbing, or as applicable, transitional curbing shall be required on both sides of the inlet. The transitional curbing shall be 6 feet in length, with a height equal to the inlet and tapering to grade at the end.

F. NO DUMP Curb Markers

1. No-dump markers shall be installed on all existing-to-remain, or proposed catch basins and inlets within the project area unless otherwise indicated in the catch basin schedule on the Drawings. Curb markers shall be similar to a style typified by East Jordan Iron Works (Series 7267), or approved equal.

G. Jointing: catch basin jointing shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.

H. Gaskets: catch basin jointing shall be as per the requirements specified for

manholes in Section 02252 – MANHOLES.

- I. Mortar for Sealing Joints: catch basin sealing mortar shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.
- J. Mortar for Brickwork: catch basin brickwork mortar shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.
- K. Brick: catch basin chimney bricks shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.
- L. Waterproofing: catch basin waterproofing shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.
- M. Bituminous Dampproofing: catch basin dampproofing shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.
- N. Flexible Seals: catch basin pipe seals shall be as per the requirements specified for manholes in Section 02252 – MANHOLES.

PART 3 – EXECUTION

3.1 HANDLING:

- A. Handle catch basin sections as per the requirements specified for manholes in Section 02252 – MANHOLES.

3.2 INSPECTION

- A. Inspect catch basins sections as per the requirements specified for manholes in Section 02252 – MANHOLES.

3.3 INSTALLATION

- A. Install catch basins sections as per the requirements specified for manholes in Section 02252 - MANHOLES.

3.4 BACKFILLING

- A. Backfill catch basins sections as per the requirements specified for manholes in Section 02252 - MANHOLES.

3.5 INSTALLING HOODS AND TRAPS

- A. Hoods shall be built into the catch basin wall, shall be watertight, and shall be installed in conformance with the manufacturer's instructions.

- B. Hoods with Inserts shall be built into the catch basin wall and into the pipe, shall be water tight and shall be installed in conformance with the manufacturer's instructions.

3.6 INSPECTION AND TESTING

- A. Inspect and test catch basins as per the requirements specified for manholes in Section 02252 – MANHOLES.

3.7 CLEANING

- A. Clean catch basins as per the requirements specified for manholes in Section 02252 – MANHOLES.

3.8 NO DUMP CURB MARKERS INSTALLATION

- A. "No Dumping" curb markers shall be installed at all existing-to-remain or proposed catch basins and inlets unless otherwise indicated in the catch basin schedule on the Drawings.

PART 4 – COMPENSATION

Precast Concrete Catch Basins

Item 2604.1 --- Catch Basin – Type 1 Single Grate (4-foot Diameter)

Item 2604.2 --- Catch Basin – Type 2 Double Grate (5-foot Diameter)

Item 2604.3 --- Catch Basin – Type 3 Single Grate (3-ft x 4-ft Square)

Item 2604.4 --- Catch Basin – Type 4 Double Grate (3-ft x 4-ft Square)

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of precast concrete catch basin complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast concrete catch basin sections with frames, grates, masonry chimney, appurtenances, pipe sleeve (if applicable); field coring of pipe connections; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Precast Concrete Catch Basins shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional catch basins as shown on the Contract Drawings or as directed by the Owner or Engineer. **Assume catch basins to have a vertical depth of 12 feet as measured from inside bottom of base section to finished grade.**

Catch basins installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2604.5 --- Catch Basin – Type 5 Direct Inlet

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of precast concrete direct inlet catch basin complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast catch basin sections with frames, covers, masonry chimney, hoods, appurtenances; pipe sleeve (if applicable); field coring of pipe connections; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Catch Basin – Direct Inlet shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional catch basins as shown on the Contract Drawings or as directed by the Owner or Engineer.

Assume direct inlet catch basins to have a vertical depth of 4 feet as measured from inside bottom of base section to finished grade.

Catch basins installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2604.6 --- Catch Basin – Remove and Replace Existing Frame and Grate

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and inspection of removal and replacement of existing catch basin frame and grate complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; catch basin frames, covers, masonry chimney, hoods, appurtenances; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Catch Basin – Remove and Replace Existing Frame and Grate shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional catch basin frame and covers removed and replace as shown on the Contract Drawings or as directed by the Owner or Engineer.

Catch basin frame and grates installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, compaction of CDF; and removal of existing manholes or catch basins included elsewhere.

Item 2604.7 --- Private Exterior Infiltrating Dry Well

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of precast concrete infiltrating drywell complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include

furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; precast concrete drywell sections with frames, grates, masonry chimney, appurtenances, pipe sleeves (if applicable); field coring of pipe connections; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Infiltrating Drywells shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional drywells as shown on the Contract Drawings or as directed by the Owner or Engineer.

Infiltration basins installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

Item 2604.8 --- Private Exterior Trench Drain

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of trench drain assembly complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; trench drain with frames and grates; concrete encasement; appurtenances, connection to drain lateral; pipe sleeves (if applicable); furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Trench Drain shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual number of complete and functional drains as shown on

the Contract Drawings or as directed by the Owner or Engineer.

Trench Drains installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

-END OF SECTION 02604-

SECTION 02609

REINFORCED CONCRETE PIPE

2609.1	PIPE – RCP (GRAVITY) 27-INCH	LINEAR FOOT
2609.2	PIPE – RCP (GRAVITY) 30-INCH	LINEAR FOOT
2609.3	PIPE – RCP (GRAVITY) 36-INCH	LINEAR FOOT
2609.4	PIPE – RCP (GRAVITY) 48-INCH	LINEAR FOOT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes the following:
 - 1. Furnishing, installing, and testing of precast concrete circular and elliptical pipe, complete and in place, within the limits and to the lines and grades indicated.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 00825A – SPECIAL CONDITIONS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – MANHOLES

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Shop drawings of pipe and fittings,
 - 2. Product data and certified dimensional drawings of all pipe, joints, bends, special fittings, and appurtenances,
 - 3. Gasket and pipe manufacturer's joint assembly directions,
 - 4. Certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards,
 - 5. For informational purposes only, submit manufacturer's printed installation instructions,

6. Certification with each delivery, that pipe complies to this specification,
7. Anticipated production and delivery schedule,
8. Results of leakage tests performed prior to final paving.
 - a. Test results shall be logs maintained during Infiltration or Exfiltration Tests, or footage and logs of Close Circuit Television Inspection.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Owner reserves right to inspect and test by independent services at manufacturer’s plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Reinforced Concrete Pipe
 1. The concrete pipes provided shall be of types having bell and spigot or tongue-and-groove ends, and the pipe units modified as required to receive the type of gaskets specified. Except as modified herein or on the Drawings, all precast reinforced concrete pipe shall meet the requirements of ASTM C76, latest revision, for Wall “B” or Wall “C” pre-cast concrete pipe. Pipe shall be of the Class indicated in the table below or as specifically indicated on the Plans. Regardless of the process used in the manufacture of the pipe, all pipe shall be manufactured of concrete having uniform high density and impermeability, and free from any objectionable voids, and shall have uniform positive and complete steel reinforcement bond and shall conform to the additional requirements specified herein. Workmanship and methods shall be in accordance with the best practices of modern shops for this type of work and shall be the product of a manufacturing firm having at least five years experience in the manufacture of this type of pipe. Pipe shall have a smooth and even interior surface free from roughness or irregularities. Prior to fabrication of pipe, submit shop drawings showing lengths of pipe, pipe joint details, construction details and tolerances as required by the Owner. Each

pipe shall be marked with the date of manufacture, mark or trademark of the manufacturer, and the class, wall thickness of the pipe, and serial number. No slurry mix shall be used on interior of pipe.

Nominal Diameter Inches	Fill Height: Greater than 1'- 0" Not exceeding 3'	Fill Height: Greater than 3' Not exceeding 10'	Fill Heights: Greater than 10' Not exceeding 15'	Fill Height: Greater than 15' Not exceeding 20'	Fill Height: Greater than 20' Not exceeding 25'	Fill Height: Greater than 25' Not exceeding 30'	Fill Height: Greater than 30' Not exceeding 35'
10	NA	NA	NA	NA	NA	NA	NA
12	IV	III	IV	V	V-3160D	V-3790D	V-4000D
15	IV	III	IV	V	V-3080D	V-3390D	V-3575D
18	IV	III	IV	V	V	V-3115D	V-3300D
21	IV	III	IV	V	V	V	V-3100D
24	IV	III	IV	V	V	V	V
27	IV	III	IV	V	V	V	V
30	III	III	IV	V	V	V	V
33	III	III	IV	IV	V	V	V
36	III	III	IV	IV	V	V	V
42	II	III	IV	IV	V	V	V
48	II	III	IV	IV	V	V	V
54	II	III	IV	IV	V	V	V
60	I	II	IV	IV	V	V	V
66	I	II	III	IV	IV	V	V
72	I	II	III	IV	IV	V	V
78	I	II	III	IV	IV	V	V
84	I	II	III	IV	IV	V	V
90	I	II	III	IV	IV	V	V
96	I	II	III	IV	IV	V	V
102	I	II	III	IV	IV	V	V
108	I	II	III	IV	IV	V	V

2. Bends, fittings, and special sections shall be fabricated by cutting the pipe at the required angle and then rejoining the sections. Special pipe sections are defined as manhole pipe with and without a branch wye or tee and manhole pipe bends with both horizontal and vertical rotation. Complete shop drawings shall be submitted to the Engineer before fabrication. Concrete for repairs shall be as specified herein. The interior surface (face) of all repairs shall be smooth finished, equal to the pipe interior finish. All materials and workmanship shall be subject to the approval of the Engineer.

3. Dimensions, Reinforcement, and Strength Requirements: The dimensions, reinforcing steel, and strength requirements of the pipe shall meet the requirements of ASTM C76, latest revision, for Wall "B", Class III and IV pipe and for Wall "C", Class V pipe and the additional requirements specified

herein. Reinforced concrete pipe shall be provided in full-length units, except where shorter lengths are indicated and/or required to meet field conditions; field cutting of pipe shall be avoided wherever possible. The cross-section of all ASTM C76 pipe shall be circular with circular reinforcing cages properly held in place with adequate longitudinal members to insure the accurate placement of all steel. The total cross-sectional area of steel in the pipe for the class and wall thickness specified herein shall be not less than that shown in ASTM C76, latest revision.

B. Pipe Joints

1. Each length of pipe shall be provided with bell-and-spigot or tongue-and-groove ends of concrete formed on machined joint rings in a manner to insure accurate joint surfaces. The diameter of the joint surfaces depended upon to compress the gasket shall not vary from the theoretical diameters by more than 1/16 inch. The joint shall be sealed by a round rubber gasket so that the joint will remain watertight under all conditions of service, including movement due to expansion, contraction, and normal settlement. The bell-and-spigot or tongue-and-groove ends of pipe shall be designed to enclose the gasket on four surfaces when the joint is in its final position. Pipe for jacking shall be provided with steel end rings and rubber gaskets.
2. Gaskets for sealing joints shall be the "O-ring" type gaskets meeting requirements of ASTM C443, latest revision, in all respects, and shall be of neoprene of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. Gaskets shall be of a composition and texture which shall be resistant to sewage, gasoline, industrial wastes, including oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. Each gasket shall be a continuous ring of round solid section having smooth surfaces free from blisters, porosity and other imperfections. The gasket shall be the sole element of sealing and depended upon to make the joint watertight. When the pipe is laid, the gaskets shall be of adequate size to fill the groove on the spigot ring in which the gasket is placed. Cement mortar or other plastic materials, if required to finish the joints, shall not be employed as means for making joints watertight. Each compression ring shall be marked with type of rubber used. The jointing of the precast reinforced concrete pipe and stoppers using the watertight joints specified above shall be installed in strict accordance with the published recommendations of the pipe manufacturer and as approved. Lubricants shall be used for jointing of pipe and shall be as recommended by the pipe manufacturer. The position of the gasket shall be checked and examined to insure the proper positioning of the gasket; joints that have been improperly made shall be taken apart and remade. It shall be the Contractor's responsibility to install the pipe in a manner that will maintain the

gasket joint in adequate compression to insure watertight joints conforming to the test requirements specified herein.

3. Provide flat gaskets when size of pipe requires this type. The gasket manufacturer shall supply test data and affidavits showing compliance with these Specifications.

C. Concrete

1. Concrete used in the manufacture of all precast reinforced concrete pipe shall have an average strength of not less than 4,000, 5,000 and 6,000 pounds per square inch at 28 days as applicable for the size class and wall specified. Strength of concrete used in the manufacture of the pipe shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the pipe or by cores cut from pipe wall or by other approved method. Cement shall be moderate heat of hydration Portland cement conforming to ASTM C150, latest revision, Type II. Absorption determined by boiling test described in ASTM C76, latest revision, shall not exceed 5.3 percent of dry weight.

D. Marking

1. Each length of pipe shall be plainly marked with the piping class designation which it is designed for, wall of pipe, its individual identifying serial number, the date of its manufacture, manufacturer's mark or trademark, and in addition, all other identification marking or data required by the Owner.

E. Reinforced Concrete Flared Pipe End

1. The flared pipe end shall be reinforced concrete, matching the ASTM C76 class of the adjoining reinforced concrete pipe. The concrete shall be of uniform high density and impermeability, free from any objectionable voids. The steel reinforcement shall be uniform, and satisfying ASTM C76 requirements.
2. The pipe joint shall be compatible with the adjoining reinforced concrete pipe.

E. Reinforced Concrete Elliptical Pipe

1. Elliptical Concrete Pipe shall conform to ASTM C507.

PART 3 – EXECUTION

3.1 PIPE AND PIPE FITTINGS

- A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
- B. Handling Pipe: Each pipe unit shall be handled into its position in the trench only in such manner and by such means, as the Engineer accepts as satisfactory. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.
- C. Laying Pipe: Except where a concrete cradle or envelope is required, all pipe greater than or equal to 18-inches in diameter shall be laid in a crushed stone cradle in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING. In trenches, no blocking or supporting of the piping by concrete, stones, bricks, wooden wedges, or method other than bedding the pipe on crushed stone will be permitted. Each length of pipe shall be shoved home against the pipe previously laid and held securely in position. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- D. Jointing Pipe: After the pipe are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned.
- E. Alignment and Placement: All pipe shall be laid with extreme care as to grade and alignment. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
- F. Stakeout of drain work and setting of line and grade is the responsibility of the Contractor. The Contractor shall establish centerline and offset stakes at each manhole, plus one intermediate centerline and offset stake as a checkpoint between manholes. Laser aligning shall not be used to establish a continuous line in excess of 400 feet.
- G. For installation near crossing utilities and encasement requirements, refer to Contract Drawings.
- H. For Cast-In-Place concrete field closures, refer to Contract Drawings.
- I. For lateral service connections, refer to Contract Drawings.
- J. Cleaning: Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing Drain.
 - 1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
 - 2. Flush lines between manholes if required to remove collected debris.
- K. Review of Completed Storm Drain System: If the visual observation of the completed drain or any part thereof shows any pipe, manhole, or joint to be of

defective work or material the defect shall be replaced or repaired as directed. The visual observation shall be conducted by the Engineer and any defects shall be as identified by such. The Contractor shall coordinate and provide site access for the Engineer.

3.2. LEAKAGE TESTS

- A. Refer to Article 51 – “Leakage Tests” in Section 00825A – SPECIAL CONDITIONS.
- B. If Leakage Test method consists of visual or Close Circuit Television Inspection, the contractor shall perform at no additional cost to the Owner. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.

PART 4 – COMPENSATION

Precast Concrete Pipe

Item 2609.1 --- Pipe – RCP (Gravity) 27-Inch

Item 2609.2 --- Pipe – RCP (Gravity) 30-Inch

Item 2609.3 --- Pipe – RCP (Gravity) 36-Inch

Item 2609.4 --- Pipe – RCP (Gravity) 48-Inch

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of precast concrete pipe complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; reinforced concrete pipe, fittings, couplings, and appurtenances; connecting existing and new laterals; connections to structures; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Precast Concrete Pipe shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual linear feet of complete and functional

pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures, or to the points of connection with existing pipes.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

-END OF SECTION 02609-

SECTION 02615

DUCTILE IRON PIPE FOR SANITARY
AND STORM DRAIN GRAVITY AND FORCEMAINS

2615.1	PIPE – DIP (GRAVITY) 12-INCH DIAMETER	LINEAR FOOT
2615.2	PIPE – DIP (GRAVITY) 8-INCH DIAMETER	LINEAR FOOT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section includes the following:
1. Furnishing, installing, and testing ductile-iron pipe and fittings for gravity sanitary sewers and storm drains complete in place within the limits and to the lines and grades indicated.
 2. Furnishing, installing, and testing ductile-iron pipe and fitting for force mains associated with pump station complete as indicated and specified.
- B. Options:
1. For joints in buried exterior pipelines, provide either push-on or mechanical-joint. All fittings and valves shall be mechanical joint.
 2. Concrete Encasement: For sanitary sewer and/or storm drain installed above water pipe, see Details.
 3. CDF Encasement: For shallow depth of cover at catch basins, see Details.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 00825A – SPECIAL CONDITIONS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – MANHOLES
- D. Section 02622 – POLYVINYL CHLORIDE PIPE
- E. Section 02640 – VALVES AND APPURTENANCES
- F. Section 02704 – PIPELINE PRESSURE LEAKAGE TESTING

G. Section 03300 – CONCRETE

1.3 SUBMITTALS

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

1. Shop drawings of pipe and fittings,
2. Product data and certified dimensional drawings of all pipe, joints, bends, special fittings, and appurtenances.
3. Gasket and pipe manufacturer's joint assembly directions,
4. Certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards,
5. For informational purposes only, submit manufacturer's printed installation instructions.
6. Certification with each delivery, that pipe complies to this specification,
7. Anticipated production and delivery schedule.
8. Results of leakage tests performed prior to final paving.
 - a. Gravity pipe test results shall be logs maintained during Infiltration or Exfiltration Tests, or footage and logs of Close Circuit Television Inspection.
9. Manufacturer's literature stating that the ductile iron pipe and fittings for force mains have been manufactured and tested in accordance with AWWA/ANSI specifications.
10. Detailed description of proposed pressure testing procedures to be used for force mains. The description shall contain the name of the person responsible for pressure testing, and equipment to be used. Review of the description shall not be construed as approval of any methods to be used, the Contractor shall be fully responsible for achieving the specified test results.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Owner reserves right to inspect and test by independent services at manufacturer's plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Listed Manufactures:
 1. US Pipe and Foundry Company,
 2. Griffin Pipe Products Company,
 3. American Cast Iron Pipe Company,
 4. or equal.

2.2 DUCTILE IRON PIPE

- A. Ductile iron pipe shall be that of a United States manufacturer who can demonstrate at least 5 years of successful experience in manufacturing ductile iron pipe conforming to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
- B. The ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths. For shallow installations, Class 53 shall be used where indicated in the Details.
- C. The ductile iron pipe shall be unlined inside, and asphalt seal coated where used for drainage or gravity service. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

2.3 FITTINGS

- A. Fittings shall be manufactured in the United States and shall be compact ductile iron Class 350 Mechanical Joint, conforming to ANSI/AWWA C153/A21.53, latest edition, for pipe sizes 16 inches and smaller. Pipe sizes larger than 16 24 inches shall be Class 350 standard Mechanical Joint fittings conforming to ANSI/AWWA C110/A21.10, latest edition except as specified, or indicated on the drawings. Fittings shall be suitable for use with restraints as specified hereinafter.
- B. Fittings shall be of the same material and have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall

have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends.

- C. Caps and plugs installed in all new work as indicated on the drawings shall be provided with a threaded corporation or bleeder valve so that air and water pressure can be relieved prior to future connection.
- D. Solid sleeves shall be ductile iron with 350 psi rating. Sleeves shall conform to ANSI/AWWA C110/A21.1.

2.4 ADAPTERS

- A. Furnish and install for joining pipe of different types, unless solid sleeves indicated.
 - 1. Provide ends conforming to above specifications for appropriate type of joint, to receive adjoining pipe.
 - 2. Joining two classes of pipe may be of lighter class provided annular space in bell-and-spigot type joints sufficient for jointing.

2.5 JOINTS

- A. Provide mechanical joint or push-on joint pipe with necessary accessories, conforming to ANSI/AWWA C111/A21.11.
- B. Provide gasket composition suitable for exposure to liquid within pipe.
- C. Restrained joints shall be furnished for installation on all fittings, sleeves, hydrants and valves.
 - 1. Restraints for mechanical joints shall be:
 - a. Uni-flanged Series 1400 by Ford Meter Box,
 - b. Stargrip Series 3000 by Star Pipe Products,
 - c. or equal.
 - 2. Restraints for push-on joints shall be:
 - a. Uni-Flange Series 1390 by Ford Meter Box,
 - b. Stargrip Series 3100 by Star Pipe Products,
 - c. or equal.

2.6 COUPLINGS

- A. For gravity applications, couplings shall be shielded flexible type in accordance with Section 02622 – POLYVINYL CHLORIDE PIPE.
- B. For pressure applications, couplings shall be solid sleeve type as follows:
 - 1. Pressure rating at least equal to that of related pipeline with a minimum rating of 150 psi. Couplings shall be provided with; steel sleeve that is fusion bonded epoxy coating; 2 steel followers; 2 nitrile rubbed gaskets; and steel bolts.
 - 2. Couplings shall be similar to a style typified by Style 441 manufactured by Smith Blair, Inc, or an approved equal.

2.7 CONNECTIONS - TAPPED

- A. Provide watertight joint with adequate strength against pullout. Use only tapered thread taps. Maximum size of taps in pipe or fittings without bosses not to exceed that listed in appropriate table of Appendix to ANSI A21.51 based on: 2 full threads for ductile iron.
- B. Where size of connection exceeds that given above for pipe, provide boss on pipe barrel or use tapping saddle. Make tap in flat part of intersection of run and branch of tee or cross, or connect by means of tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, as indicated or permitted.

2.8 STANDARD LINING AND COATING

- A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to ANSI/AWWA C104/A21.4.
- B. Outside of other pipe and fittings: Standard bituminous coating conforming to appropriate ANSI Standard.

2.9 POLYETHYLENE PIPE ENCASEMENT

- A. Material: Virgin polyethylene conforming to ANSI/ASTM D1248.
- B. Thickness: Minimum nominal thickness of 8 mils.
- C. Material and installation methods to conform to requirements of AWWA C105.

2.10 INSULATION

- A. Insulation shall be factory formed-in-place polyurethane foam insulation having nominal thickness of 3", with an in-place density of 2.5 pcf, and a "K" factor of 0.14 BUT/in./hr/°F/ft². Straight joints between insulated pipe

lengths, and the end section of non-insulated pipe shall be 20-gauge corrugated aluminum performed to be fastened with stainless steel screws and bands. Jackets shall have expansion joints at 25-foot intervals.

- B. Jacket shall have one layer of one (1) mil polyethylene film with a protective coat of 40-lb. virgin draft paper to act as a moisture and galvanic corrosion barrier.
- C. Insulation shall be manufactured by:
 - 1. Thermal Pipe Systems, Inc,
 - 2. Insul Tek Piping Systems, Inc,
 - 3. Tricon Piping Systems, Inc,
 - 4. or equal.

2.11 THRUST BLOCKING

- A. Where applicable or directed, reaction or concrete thrust blocks shall be furnished at all tees, plus bends as directed or as detailed on drawings with 3,000 psi, 1-1/2, 470 cement concrete masonry. The blocks will be poured against undisturbed original ground and shall be so placed that the pipe joints will be accessible for any possible future repairs. The primary means of restraint shall consist of a mechanical joint restraint or push-on joint restraint as specified.

PART 3 – EXECUTION

3.1 HANDLING PIPE

- A. The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during handling, and installation. Joint ends of pipe especially shall be kept clean.
- B. Pipe shall be stored above ground at a height no greater than 5 feet, and with even support for the pipe barrel.
- C. Only nylon-protected slings shall be used for handling the pipe. No hooks or bare cables will be permitted.
- D. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone producing electric motors.

3.2 ALIGNMENT AND PLACEMENT OF PIPE

- A. For installation near crossing utilities and encasement requirements, refer to

Contract Drawings.

- B. Jointing of ductile iron pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8 inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to insure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
- C. Installation and jointing of push-on ductile iron pipe shall be in accordance with AWWA C600 Sections 9b and 9c, latest revision, as applicable.
- D. Mechanical joints for force mains: Restraints shall be installed in full accordance with the manufacturers' instructions. All bolt heads shall be tightened sufficiently so that they shear off to provide indication that proper tightening torque was achieved (if applicable).
- E. Restrained push on joints for forces mains shall be installed with specified gasket joint restraints. Restraints shall be installed in full accordance with the manufacturers' instructions.
- F. Fittings and valves for forces mains shall be restrained for the minimum lengths listed in the following table:

MINIMUM RESTRAINED LENGTHS	
FITTING	RESTRAINT LENGTH
45° Bend (Horizontal)	
12"	14-feet in each direction
10"	12-feet in each direction
8"	10-feet in each direction
6"	8-feet in each direction
22-1/2° Bend	7-feet in each direction
12"	7-feet in each direction
10"	6-feet in each direction
8"	5-feet in each direction
6"	4-feet in each direction
11-1/4° Bend	
12"	4-feet in each direction
10"	3-feet in each direction
8"	3-feet in each direction
6"	2-feet in each direction

MINIMUM RESTRAINED LENGTHS	
FITTING	RESTRAINT LENGTH
12" Vertical Offset (7-foot bury assumed for lower bend)	
Upper 45° Bend	27-feet in each direction
Lower 45° Bend	12-feet in each direction
10" Vertical Offset (7-foot bury assumed for lower bend)	
Upper 45° Bend	21-feet in each direction
Lower 45° Bend	8-feet in each direction
8" Vertical Offset (7-foot bury assumed for lower bend)	
Upper 45° Bend	19-feet in each direction
Lower 45° Bend	9-feet in each direction
6" Vertical Offset (7-foot bury assumed for lower bend)	
Upper 45° Bend	14-feet in each direction
Lower 45° Bend	6-feet in each direction
Tee	
12" x 12" x 12"	49-feet along branch
12" x 12" x 10"	37-feet along branch
12" x 12" x 8"	25-feet along branch
12" x 12" x 6"	11-feet along branch
8" x 8" x 8"	32-feet along branch
8" x 8" x 6"	18-feet along branch
8" x 8" x 4"	4-feet along branch
6" x 6" x 6"	22-feet along branch
Reducer	
12" x 8"	31-feet in larger direction only
12" x 6"	42-feet in larger direction only
10" x 8"	17-feet in large direction only
10" x 6"	30-feet in large direction only
8" x 6"	17-feet in larger direction only
Valve or Dead End	
12"	58-feet in each direction
10"	49-feet in each direction
8"	41-feet in each direction
6"	31-feet in each direction

Lengths shown are based on 150 psi test pressure, 4-1/2-foot bury, soil type GP, trench Type 3, and 2:1 safety factor. Changes in conditions will require revision in lengths.

- G. Ductile iron pipe installed within 5 feet of gas lines or within areas subject to corrosive soils or waters shall be fully encased with polyethylene material. Polyethylene shall be 8-millimeters thick and comply with AWWA C-105.
- H. Insulated pipe with jacket is to be installed where shown on the drawings and on any pipe having less than 4-foot cover.
- I. Solid sleeves shall be used to join plain ends on ductile iron pipe. Mechanical joints shall be installed as specified herein before.

3.3 INSTALLATION

A. Piping Support:

- 1. Furnish and install supports to hold piping at lines and grades indicated or specified.
- 2. Support pipe and appurtenances connected to equipment to prevent any strain imposed on equipment.

B. Pipe and Fittings:

- 1. Remove and replace defective pieces.
- 2. Clear of all debris and dirt before installing and keep clean until accepted.
- 3. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.
- 4. Provide firm bearing along entire length of buried pipelines.

C. Socket Pipe Clamps, Tierods, and Bridles: Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, provide suitable socket pipe clamps, tierods, and bridles. Use bridles and tierod at least 3/4 in. in diameter except where they replace flange bolts of smaller size with nut on each side of flange pairs. Coat clamps and tierods or bridles with two coats of bituminous coating after assembly and allow to dry before backfilling.

D. Appurtenances: Set valves, fittings and appurtenances as indicated.

3.4 JOINTS AND COUPLINGS

A. Push-on Joints:

- 1. Insert gasket into groove bell. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end.

2. Insert chamfered end into gasket. Force pipe past it until it seats against socket bottom.
3. Where required install restraint and secure in accordance with manufacturer's instructions.

B. Mechanical Joints:

1. Wire brush surfaces in contact with gasket and clean gasket.
2. Lubricate gasket, bell, and spigot with soapy water.
3. Slip gland and gasket over spigot, and insert spigot into bell until seated.
4. Seat gasket and press gland firmly against gasket.
5. After bolts inserted and nuts made finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint by torque wrench. Torque bolts to values specified above.

C. Sleeve-Type Coupling:

1. Clean pipe ends for distance of 8 inches.
2. Use soapy water as gasket lubricant.
3. Slip follower and gasket over each pipe to a distance of 6 inches from end and place middle ring on pipe end until centered over joint.
4. Insert other pipe end into middle ring and bring to proper position in relation to pipe laid.
5. Press gaskets and followers into middle ring flares.
6. After bolts inserted and nuts made fingertight, tighten diametrically opposite nuts by use of torque wrench of size and torque specified below:

TORQUE

Nominal pipe size (inches)	Bolt diameter (inch)	Range of torque (ft-lb)
3/24	5/8	75
30-36 (1/2 in. mid ring)	5/8	75
(3/8 in. mid ring)	5/8	65
30-48	3/4	70
48-72	3/4	70

7. After assembly and inspection and before backfill, coat exterior surfaces of buried couplings with heavy-bodied bituminous mastic.

D. Tapped Connection:

1. Drill and tap normal to longitudinal axis.
2. Drilled by skilled mechanics using proper tools.
3. Use only tapered threads.

E. Joining to Existing Pipe:

1. For connecting proposed pipe to existing pipe, refer to Details.

F. Service Connections:

1. For connection of laterals to proposed or existing pipe, refer to Details.

3.5 TESTING

- A. Refer to Article 51 – “Leakage Tests” in Section 00825A – SPECIAL CONDITIONS.
- B. If Leakage Test method consists of visual or Close Circuit Television Inspection, the contractor shall perform at no additional cost to the Owner. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.
- C. Force Main Pressure and Leakage Tests: Refer to Section 02704 – PIPELINE PRESSURE AND LEAKAGE TEST for requirements. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.

PART 4 – COMPENSATION

Ductile Iron Pipe (Gravity)

Item 2615.1 --- Pipe – DIP (Gravity) 12-Inch Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of ductile iron pipe complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of looped detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; ductile iron pipe, fittings, couplings, and appurtenances; connecting existing and new laterals; connections to structures; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Pipe – DIP (Gravity) 12-Inch Diameter shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual linear feet of complete and functional pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures, or to the points of connection with existing pipes.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF; ductile iron pipe used for water pipe.

Item 2615.2 --- Pipe – DIP (Gravity) 8-Inch Diameter

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of ductile iron pipe complete as indicated on the Drawings and

Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of looped detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater recharged back to the soil; filter fabric as required; bedding, including compaction; ductile iron pipe, fittings, couplings, and appurtenances; connecting existing and new laterals; connections to structures; furnishing, placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Pipe – DIP (Gravity) 8-Inch Diameter shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual linear feet of complete and functional pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures, or to the points of connection with existing pipes.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF; ductile iron pipe used for water pipe.

-END OF SECTION 02615-

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SECTION 02622

POLYVINYL CHLORIDE PIPE

2622.1	PIPE – PVC (GRAVITY) 6-INCH PERFORATED UNDERDRAIN	LINEAR FOOT
2622.2	PIPE – PVC (GRAVITY) 6-INCH	LINEAR FOOT
2622.3	PIPE – PVC (GRAVITY) 8-INCH	LINEAR FOOT
2622.4	PIPE – PVC (GRAVITY) 10-INCH	LINEAR FOOT
2622.5	PIPE – PVC (GRAVITY) 12-INCH	LINEAR FOOT
2622.6	PIPE – PVC (GRAVITY) 15-INCH	LINEAR FOOT
2622.7	PIPE – PVC (GRAVITY) 18-INCH	LINEAR FOOT
2622.8	RECONNECT, REPAIR, OR RELOCATE EXISTING SANITARY SEWER AND STORM DRAIN LATERALS	LINEAR FOOT
2622.9	DIG AND REPLACE SPOT REPAIR 10” PVC SANITARY SEWER	EACH
2622.10	DIG AND REPLACE SPOT REPAIR 10” PVC STORM DRAIN	EACH
2622.11	DIG AND REPLACE SPOT REPAIR 24” RCP STORM DRAIN	EACH
2622.12	NEW PUBLIC DRAIN LATERAL TO STORM DRAIN, CAPPED AT PROPERTY LINE	LINEAR FOOT
2622.13	NEW PUBLIC SANITARY LATERAL TO SANITARY SEWER, CAPPED AT PROPERTY LINE	LINEAR FOOT
2622.14	PRIVATE EXTERIOR 6" PVC DRAIN OR SANITARY PIPE	LINEAR FOOT
2622.15	PRIVATE EXTERIOR 8" PVC DRAIN OR SANITARY PIPE	LINEAR FOOT
2622.16	PRIVATE EXTERIOR 10" PVC DRAIN OR SANITARY PIPE	LINEAR FOOT
2622.17	PRIVATE EXTERIOR 12" PVC DRAIN OR SANITARY PIPE	LINEAR FOOT

2622.18	PRIVATE EXTERIOR PVC CLEAN OUT	EACH
2622.19	PRIVATE EXTERIOR DOWNSPOUT DISCONNECT/RECONNECT	EACH

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes the following:
1. Furnishing, installing, and testing of PVC pipe and fittings complete and in place, within the limits and to the lines and grades indicated.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 00825A – SPECIAL CONDITIONS
- B. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- C. Section 02252 – MANHOLES
- D. Section 02534 – BUILDING INFLOW REMOVAL
- E. Section 02640 – VALVES AND APPURTENANCES

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
1. Shop drawings of pipe and fittings,
 2. Product data and certified dimensional drawings of all pipe, joints, bends, special fittings, and appurtenances.
 3. Gasket and pipe manufacturer's joint assembly directions,
 4. Certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, as specified in the referenced standards,
 5. For informational purposes only, submit manufacturer's printed installation instructions.
 6. Certification with each delivery, that pipe complies to this specification,

7. Anticipated production and delivery schedule.
8. Results of leakage tests performed prior to final paving.
 - a. Test results shall be logs maintained during Infiltration or Exfiltration Tests, or footage and logs of Close Circuit Television Inspection.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Owner reserves right to inspect and test by independent services at manufacturer's plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General
 1. All PVC pipe shall be continuously and permanently marked with the manufacturer's name, pipe size, and pressure rating or stiffness in psi (kpa).
 2. The Contractor shall also require the manufacturer to mark the date of extrusion on the pipe. This dating shall be done in conjunction with records to be held by the manufacturer for 2 years, covering quality control tests, raw material batch number, and other information deemed necessary by the manufacturer.
- B. Pipe
 1. All PVC pipe shall be joined by compression joints unless otherwise shown or specified, and shall conform to the following requirements:
 2. Non Perforated Polyvinyl chloride pipe (PVC) shall conform to the requirements of ASTM D 3034, Class SDR 35. Material for PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein. All diameters shall be as specified on the Contract Drawings.

3. Perforated PVC pipe shall conform to the requirements of ASTM D 3034, Class SDR 35. Material for perforated PVC pipe shall conform to the requirements of ASTM D 1784 for Class 12454-B or 12454-C as defined therein. The pipe shall have 3/8-inch to 1/2-inch perforations, 6-inch on-center top and sides. The pipe shall be 6 inches in diameter unless otherwise specified on the Contract Drawings.
5. Elastomeric seals for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM D 3212.
6. Service pipes for storm services shall be minimum of 6 inches and shall match diameter of existing services for reconnections. Service pipes for sanitary services shall be minimum of 6 inches and shall match diameter of existing, services for reconnections.

C. Fittings

1. All fittings shall conform to the requirements of ASTM D 3034 or ASTM F 679. The ring groove and gasket ring shall be compatible with PVC pipe ends. The flanged fittings shall be compatible with cast-iron or ductile iron pipe fittings.
2. The strength class of the fittings shall be not less than the strength class of any adjoining pipe.
3. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are acceptable in accordance with Figure 02622 A and Figure 02622 B. Inserta-tees may be used only where approved by the Engineer and if allowed, shall be cast in 6-inches of concrete.

D. Shielded Flexible Couplings

1. General
 - a. Shielded flexible couplings shall be used to connect sewer and drain pipe. Typical applications are where new pipe connects to existing pipe or a pipe with dissimilar material or size.
 - b. Non-shielded flexible couplings are permitted for sewer and drain service laterals 6-inch in diameter or less.
 - c. Couplings and shields shall be sized to fit the outer diameter of pipe, and be rated for the pipe material and conditions of service by the manufacturer.
 - d. Eccentric couplings shall be used where connecting pipes of different nominal diameter.

- e. The CONTRACTOR will not be allowed to substitute any other type of coupling unless approved by the ENGINEER.

2. Construction

- a. Flexible couplings shall be in accordance with ASTM C1173 – Standard Specification for Flexible Transition Couplings for Underground Piping Systems.
- b. Rubber sleeves shall be rated for heavy earth loads and be immune to attack by chemicals and impurities normally found in water or wastewater.
- c. Shields shall consist of a rigid stainless steel shear ring.
- d. Bolts, nuts, straps, and all miscellaneous hardware shall be Type 316 stainless steel.

3. Manufacturer

- a. Shielded flexible couplings shall be Fernco (5000 Repair series), Mission Rubber (Flex-Seal Repair series), Indiana Seal (Heavy Duty Repair series) or approved equal.
- b. Non-shielded flexible couplings shall be Fernco (Stock and Eccentric series), Mission Rubber (Flex Seal Stock series), Indiana Seal (Stock series) or approved equal.

E. Service Connections

- 1. Sanitary services shall be connected to new, parallel, replacement or existing sanitary sewer lines with full bodied tees, wye fittings, saddle-type tees in accordance with the following:
 - a. For 6-inch dia. sanitary services to 15-inch dia or less sanitary sewer mainlines a saddle type (Romac Style CB or equal) or full bodied fitting with solid transition coupling shall be used;
 - b. For 8-inch dia. sanitary services to existing 12-inch dia or less sanitary sewer mainlines a full bodied fitting with solid transition coupling shall be used;
 - c. For 8-inch dia. sanitary services to new 15-inch dia or less sanitary sewer mainlines a full bodied fitting with solid transition coupling shall be used;

- d. For 10-inch dia. sanitary services consult with engineer; and
 - e. Otherwise reference Figure 02622 A.
2. Storm services shall be connected to new, parallel, replacement or existing storm drain mainlines with full bodied tees, wye fittings, saddle-type tees in accordance with the following:
- a. For 6-inch dia. storm services to 15-inch dia. or less storm drain main lines a saddle type (Romac Style CB or equal) or a full bodied fitting with solid transition couplings is required.
 - b. For 8-inch dia. storm services to 15-inch dia. or less storm drain mainlines a full bodied fitting with solid transition coupling is required.
 - c. For 10- and 12-inch dia. storm services to storm drain mainlines consult with engineer; and
 - d. Otherwise reference Figure 02622 B.

Figure 02622 A

Service Connection On New Mainline Pipes

Dia. of Mainline Pipe

	8"	10"	12"	15"	18"	21"	24"
Service Dia.							
New Sanitary Sewer							
6"*	FB/S	FB/S	FB/S	FB/S	FB/S	FB/S	FB/S
8"	FB	FB	FB	FB	FB/S	FB/S	FB/S
10"	C	C	C	C	C	C	C
New Storm Drain							
6"*	FB/S	FB/S	FB/S	FB/S	S	S	S
8-10"	C	FB / C	FB / C	FB / C	FB / C	FB / C	FB / C
12"	C	C	FB / C	FB / C	FB / C	FB / C	FB / C

Note: In every situation a full body fitting is acceptable

* Minimum allowable service diameter

C: consult engineer

FB: full bodied fitting required

S: saddle

Figure 02622 B

Service Connection On Existing Mainline Pipes

Dia. of Mainline Pipe

Service Dia.	Existing Sanitary Sewer						
	8"	10"	12"	15"	18"	21"	24"
6"*	FB/S	FB/S	FB/S	FB/@	S	S	S
8"	FB	FB	FB	IT w/ CE	S	S	S
10"	C	C	C	C	C	C	C
	Existing Storm Drain						
6"*	FB/S	FB/S	FB/S	FB/S	s	S	S
8-10"	C	FB	FB	FB	FB	S	S
12"	C	C	FB	FB	FB	FB	C

Note: In every situation a full body fitting is acceptable

* Minimum allowable service diameter

C: consult engineer

FB: full bodied fitting required

S: saddle

F. Bedding Materials

1. Unless otherwise specified or shown, all material used for pipe bedding shall conform to the requirements in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

G. Gaskets

1. Gaskets shall be flexible elastomeric rings conforming with ASTM F 477.

2.2 PRIVATE DRAIN LATERAL CLEANOUTS

A. Downspout Connections

1. Downspouts shall connect to PVC building laterals with an above-grade cast iron WYE and removable plug per the Drawing details. Cast iron materials shall be in accordance with Section 02534 – BUILDING INFLOW REMOVAL.

A. Exterior Cleanouts

1. Cleanouts for extended length PVC building laterals shall be made with a below-grade PVC WYE, removable plug and valve box per the Drawing details. Valve box materials shall be similar to those specified in Section 02640 – VALVES AND APPURTENANCES.

PART 3 – EXECUTION

3.1 PIPE AND PIPE FITTINGS

- A. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.
- B. All premolded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory, as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

3.2 INSTALLATION

- A. Install PVC pipe and fittings in accordance with manufacturer's printed instructions.
- B. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Bedding material shall be as specified in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.
- C. Suitable bell holes shall be provided, so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material. Special care shall be taken to hold the trench width at the crown of the pipe to the maximum indicated on the Trench Detail included in the Details Section of these Specifications.
- D. Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- E. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be checked to see that the rubber ring is properly seated. Apply lubricant to the spigot end only, paying particular attention to the bevel, in accordance with the manufacturer's recommendation. Each pipe

unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer. The resulting joints shall be watertight and flexible.

- F. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- G. Allowable Pipe Deflection
 - 1. Pipe provided under this Specification shall be so installed as to not exceed a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
 - 2. Upon completion of a section of pipe, including placement and compaction of backfill, the Contractor shall measure the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer, and be reviewed by the Engineer. The section of pipe must be placed and backfilled for a minimum of 90 days before the deflection can be measured.
 - 3. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem without additional compensation.
- H. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.
- I. After each pipe has been properly bedded, enough bedding material shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Bell holes, provided for jointing, shall be filled with bedding material and compacted, and additional material shall be placed and compacted to complete the pipe bedding.
- J. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench. At all times pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.
 - 1. If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe. Pipelines

shall not be used as conductors for trench drainage during construction.

K. For installation near crossing utilities and encasement requirements, refer to Contract Drawings.

L. For lateral service connections and encasement requirements, refer to Contract Drawings.

M. Cleaning

1. Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing pipe.

O. Shielded Flexible Couplings

1. Where couplings are used, plain ends of pipe shall be made smooth and round for a distance of 12 inches from the ends of the pipe, with an outside diameter not more than 1/64 inch smaller than the manufactured outside diameter of pipe. Install couplings per manufacturer's written instructions.
2. SPARE PARTS - CONTRACTOR shall maintain an on-site inventory of couplings suitable for use with the various nominal diameters and materials of proposed and existing pipe referenced in the CONTRACT DOCUMENTS. CONTRACTOR shall be responsible to verify the outer diameter of pipe in advance through measurements taken at access manholes and test pits. The lead times for fabrication, stocking and shipping of couplings shall not be cause for delay or the use of other types of couplings.

3.3. LEAKAGE TESTS

A. Refer to Article 51 – “Leakage Tests” in Section 00825A – SPECIAL CONDITIONS.

B. If Leakage Test method consists of visual or Close Circuit Television Inspection, the contractor shall perform at no additional cost to the Owner. The Engineer must be able to witness the tests and must be provided with a video recording of each test for further inspection.

PART 4 – COMPENSATION

Polyvinyl Chloride Pipe

Item 2622.1 --- Pipe – PVC (Gravity) 6-Inch Perforated Underdrain

Item 2622.2 --- Pipe – PVC (Gravity) 6-Inch

Item 2622.3 --- Pipe – PVC (Gravity) 8-Inch

Item 2622.4 --- Pipe – PVC (Gravity) 10-Inch

Item 2622.5 --- Pipe – PVC (Gravity) 12-Inch

Item 2622.6 --- Pipe – PVC (Gravity) 15-Inch

Item 2622.7 --- Pipe – PVC (Gravity) 18-Inch

Item 2622.8 --- Reconnect, Repair, or Relocate Existing Sanitary Sewer or Storm Drain Laterals

Item 2622.9 --- Dig and Replace Spot Repair-10” PVC Sanitary Sewer

Item 2622.10 --- Dig and Replace Spot Repair-10” PVC Storm Drain

Item 2622.11 --- Dig and Replace Spot Repair-24” RCP Storm Drain

Item 2622.12 --- New Public Drain Lateral to Storm Drain, capped at property line

Item 2622.13 --- New Public Sanitary Lateral to Sanitary Sewer, capped at property line

Item 2622.14 --- Private Exterior 6" PVC Drain or Sanitary Pipe

Item 2622.15 --- Private Exterior 8" PVC Drain or Sanitary Pipe

Item 2622.16 --- Private Exterior 10" PVC Drain or Sanitary Pipe

Item 2622.17 --- Private Exterior 12" PVC Drain or Sanitary Pipe

Item 2622.18 --- Private Exterior PVC Clean Out

Item 2622.19 --- Private Exterior Downspout Disconnect/Reconnect

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of polyvinyl chloride pipe complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; removal of loop detectors; removal of brick, concrete, or bituminous sidewalk; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; temporary excavation support consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; sanitary sewer and storm drain flow handling; removal of groundwater from the trench; handling groundwater

recharged back to the soil; filter fabric as required; bedding, including compaction; polyvinyl chloride pipe, fittings, couplings, and appurtenances; connecting existing and new laterals; connections to structures; cleanout assemblies (if required); placing and compacting suitable backfill soil; grade and compact gravel pavement sub-base; compaction testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Polyvinyl Chloride Pipe shall be based on the Unit Price bid in the proposal.

Measurement for payment of items 2622.1 through 2622.8, and items 2622.12 through 2622.17 shall be based on the actual linear feet of complete and functional pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures, or to the points of connection with existing pipes.

Measurement for payment of items 2622.9 through 2622.11, and items 2622.18 through 2622.19 shall be based on each installation of complete and functional pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be per repair location, per clean out installed, or per downspout cut and connected to the new drain lateral with new PVC piping.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; treatment of groundwater discharged under the DEP Dewatering Permit; procurement, installation, and compaction of CDF.

-END OF SECTION 02622-

SECTION 02630

DUCTILE-IRON PIPE AND FITTINGS

2630.1	PIPE – DI (WATER) 4-INCH	LINEAR FOOT
2630.2	PIPE – DI (WATER) 6-INCH	LINEAR FOOT
2630.3	PIPE – DI (WATER) 8-INCH	LINEAR FOOT
2630.4	PIPE – DI (WATER) 12-INCH	LINEAR FOOT
2630.5	PIPE – DI (WATER) 20-INCH	LINEAR FOOT
2630.6	FITTINGS, COUPLINGS, AND RESTRAINTS	POUND

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnishing and installing ductile-iron pipe and fittings, as indicated and specified.
- B. Options:
 - 1. For joints in buried exterior pipelines, provide push-on joints.
 - 2. Joints within 10-foot horizontally from any existing or proposed sewer and/or any sewer crossing within 18-inches below, shall be restrained joints (in addition to joints as identified in the enclosed restraint table based on their proximity to bends, valves, tees, reducers and dead ends).
 - 3. All fittings and valves shall be mechanical joint.
- C. Related sections include the following:
 - 1. Section 02200 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
 - 2. Section 02640 – VALVES AND APPURTENANCES
 - 3. Section 02645 – HYDRANTS
 - 4. Section 02675 – DISINFECTION OF WATER MAINS

5. Section 02660 – WATER SERVICES
6. Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING

E. Permits:

1. Section 01060 – PERMITS AND REGULATORY REQUIREMENTS
2. The Cambridge Water Department (CWD) will not issue new water construction permits until all requirements for previous (i.e., initial CWD permit) CWD permits are met. These requirements *include accurate and legible swing tie dimensions to all new water main gate valves, Tee's and elbows*, required CWD “sign off’s” on the contractor’s copy of the CWD executed permit (when permitted work is complete), test documentation that includes Massachusetts State certified initial chlorination and bacteria testing of new water main work, and pressure test results of new water main work. The contractor is hereby advised that the CWD will not be responsible for the contractor’s slip in project schedule if these requirements for permits are not followed.

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:

1. Submit shop drawings or descriptive literature, or both, showing dimensions, joint and other details for each type and class of pipe, fitting and restraint system to be furnished for the project. All materials furnished under the Contract shall be manufactured only in accordance with the Specifications. Submittals shall include material information, dimensions, pipe class information, weights, coating and lining system data.
2. Submit manufacturer’s literature stating that the ductile iron pipe and fittings have been manufactured and tested in accordance with AWWA/ANSI specifications.
3. Perform disinfection and pressure testing of installed mains as specified in Sections 02675 and 02704.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.

- B. Owner reserves right to inspect and test by independent service at manufacturer's plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT.

PART 2 - PRODUCTS

2.1 PIPE

- A. Ductile Iron:

1. Ductile iron pipe shall be that of a United States manufacturer who can demonstrate at least 5 years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push-on joints, with exception, flange connections with existing 40-inch water main.
2. All ductile iron pipe shall conform to AWWA C150-09 (ANSI A21.50) and AWWA C151-09 (ANSI A21.51).
3. The ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths, with Push-on Joints as manufactured by U.S. Pipe and Foundry Company, Griffin Pipe Co., or equal with gaskets conforming to AWWA C111-12 (ANSI A21.11) "Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings".
4. The ductile iron pipe shall be double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to AWWA C104-08 (ANSI A21.4). The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

2.2 FITTINGS

- A. Ductile iron fittings shall be new and be cement lined. Fittings are required to be equipped with a mechanical joint restraint unless otherwise specified by the CWD. Mechanical joint fittings in sizes 4-inch through 24-inch shall be ductile iron compact fittings and rated for 350 psi working pressure. Mechanical joint fittings for 30-inch diameter shall be ductile iron compact fittings and rated for 250 psi. Fittings shall be of the same material and have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or

fraction of the circle on all bends. All nuts and bolts shall be of a type equal to ductile iron or KOR-10 steel T-bolts and nuts.

1. Hydrant tees shall have a rotatable mechanical joint gland on the 6-inch plain end branch to provide positive valve restraint, unless otherwise allowed by the Engineer.
2. Caps and plugs installed in all new work as indicated on the drawings shall be provided with a threaded corporation or bleeder valve so that air and water pressure can be relieved prior to future connection.
3. Solid sleeves shall be ductile iron with the same pressure rating as the fittings. Sleeves shall conform to ANSI/AWWA C110.

2.3 JOINTS

- A. Provide mechanical joint, push-on joint, or flanged pipe with necessary accessories, conforming to AWWA C111-12 (ANSI A21.11).
 1. Provide gasket composition suitable for exposure to liquid within pipe.
 2. Provide gasket composition suitable for exposure to potable water.
- B. Provide pipe flanges and accessories conforming to AWWA C115-11 (ANSI A21.15).
 1. Provide flat faced flanges.
 2. Provide 1/8 in. thick, full faced gaskets suitable for exposure to liquid within pipe.
- C. Restrained joints shall be furnished for installation on all fittings, sleeves, hydrants and valves. Restraints for mechanical joints shall be Megalug Series 1100 as manufactured by Ebaa Iron Co., MJ Field Lok by US Pipe Company, Uni-flanged Series 1400 Mechanical Joint Restraint or approved equivalent. Restraints for push-on joints shall be Series 1700 as manufactured by Ebaa Iron Co., or Series 1390 as manufactured by Uni-Flange or approved equivalent.
- D. Restraint systems for push-on pipe utilizing steel-wedge gaskets will be acceptable.

2.4 COUPLINGS

- A. Pressure rating at least equal to that of related pipeline with a minimum rating of 150 psi.
- B. Couplings shall be of a type equal to Smith Blair, Style 441; Dress, Style 153; 360 or Romac Style 501 or an approved equivalent. Couplings shall be

provided with plain, Grade 27, rubber gaskets and with black steel, track-head bolts with nuts. Couplings shall be manufactured in the United States of America.

2.5 FILLING RINGS

- A. Provide where necessary.
- B. Materials, workmanship, facing, and drilling, conforming to 125-lb. ANSI Standard.
- C. Suitable length with nonparallel faces and corresponding drilling, if necessary, for correct assembly of adjoining piping or equipment.

2.6 CONNECTIONS - TAPPED

- A. Provide watertight joint with adequate strength against pullout. Use only tapered thread taps.
- B. Maximum size of taps in pipe or fittings without bosses not to exceed that listed in appropriate table of Appendix to ANSI A21.51 based on:
 - 1. 2 full threads for ductile iron.
- C. Where size of connection exceeds that given above for pipe, provide boss on pipe barrel or use tapping saddle. Make tap in flat part of intersection of run and branch of tee or cross, or connect by means of tapped tee, branch fitting and tapped plug or reducing flange, or tapping tee and tapping valve, as indicated or permitted.

2.7 STANDARD LINING AND COATING

- A. Inside and outside of pipe and fittings: Provide double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to AWWA C104-08 (ANSI A21.4).
- B. Outside of pipe and fittings within structures: Clean and apply one shop coat of Koppers Pug Primer made by Koppers Co., Inc., Pittsburgh, PA; Chem-Prime 37-77 made by Tnemec Co., North Kansas City, MD; 13-R-50 Chromax Primer made by Valspar Corp. Short Hills, NJ; or acceptable equivalent.

2.8 GASKETS, BOLTS, AND NUTS

- A. Provide ring rubber gaskets with cloth insertion for flanged joints,
 - 1. Gaskets 12 in. in diameter and smaller, 1/16 in. thick.
 - 2. Larger than 12 in., 1/8 in. thick.

- B. Make flanged joints with:
 - 1. Bolts.
 - 2. Bolt studs with nut on each end.
 - 3. Studs with nuts where flange is tapped.
- C. Number and size of bolts conform to same ANSI as flanges.
- D. Provide bolts and nuts, except as specified or indicated, Grade B, ASTM A307.
- E. Provide bolt studs and studs of same quality as machine bolts.
- F. Flanged joints for wall castings flush with masonry made up with Type 316 stainless steel stud bolts and nuts.
- G. Submerged flanged joints made up with Type 316 stainless steel bolts and nuts.

2.9 POLYETHYLENE PIPE ENCASEMENT

- A. Material: Virgin polyethylene conforming to ANSI/ASTM D1248.
- B. Thickness: Minimum nominal thickness of 8 mils.
- C. Material and installation methods to conform to requirements of AWWA C105.

2.11 INSULATION

- A. Insulation shall be manufactured by Thermal Pipe Systems, Braintree, Massachusetts, Atlas Insulation, Ayer, Massachusetts or Insulated Piping Systems, Inc., Canton, Massachusetts, or equivalent. Insulation shall be factory formed-in-place polyurethane foam insulation having nominal thickness of 3", with an in-place density of 2.5 pcf, and a "K" factor of 0.14 BUT/in./hr/deg./F/sq. ft. Straight joints between insulated pipe lengths, and the end section of non-insulated pipe shall be 20-gauge corrugated aluminum performed to be fastened with stainless steel screws and bands. Jackets shall have expansion joints at 25-foot intervals. Sections of jacket shall have 2-inch minimum at all seams.
- B. Jacket shall have one layer of one (1) mil polyethylene film with a protective coat of 40-lb. virgin draft paper to act as a moisture and galvanic corrosion barrier.

2.12 THRUST BLOCKING

- A. Where applicable, reaction or concrete thrust blocks shall be furnished at all anchor tees, plus bends as required or as detailed on drawings with 3,000 psi, 1-1/2, 470 cement concrete masonry. The blocks will be poured against undisturbed original ground and shall be so placed that the pipe joints will be accessible for any possible future repairs. The other means of restraint may either be of an interlocking type or mechanical joint restraint as specified by the Cambridge Water Department (CWD) and shall be installed in addition to thrust blocks as required by the CWD.

PART 3 - EXECUTION

3.1 ALIGNMENT AND PLACEMENT OF PIPE

- A. Fittings and valves shall be restrained for the minimum lengths listed on the following table:
- B. Lengths shown are based on 150 psi test pressure, 4-foot bury, soil type GP, trench Type 3, and 2:1 safety factor. Changes in conditions will require revision in lengths.

MINIMUM RESTRAINED LENGTHS	
<u>Fitting</u>	<u>Restrained Length</u>
12" - 45° Bend	15-feet in each Direction
12" - 22.5° Bend	8-feet in each Direction
12" - 11.25° Bend	4-feet in each Direction
8" - 45° Bend	11-feet in each Direction
8" - 22.5° Bend	6-feet in each Direction
8" - 11.25° Bend	5-feet in each Direction
6" - 45° Bend	8-feet in each Direction
6" - 22.5° Bend	4-feet in each Direction
6" - 11.25° Bend	2-feet in each Direction
4" - 45° Bend	6-feet in each Direction
4" - 22.5° Bend	3-feet in each Direction
4" - 11.25° Bend	2-feet in each Direction
12" Vertical Offset	
Upper	49-feet in each Direction
Lower	15-feet in each Direction
8" Vertical Offset	
Upper	36-feet in each Direction
Lower	11-feet in each Direction
6" Vertical Offset	
Upper	27-feet in each Direction
Lower	8-feet in each Direction
4" Vertical Offset	
Upper	20-feet in each Direction
Lower	6-feet in each Direction

MINIMUM RESTRAINED LENGTHS	
<u>Fitting</u>	<u>Restrained Length</u>
20" x 20" x 8" Tee	46-feet along Branch
12" x 12" x 12" Tee	65-feet along Branch
12" x 12" x 8" Tee	46-feet along Branch
12" x 12" x 6" Tee	35-feet along Branch
12" x 12" x 4" Tee	25-feet along Branch
8" x 8" x 8" Tee	46-feet along Branch
8" x 8" x 6" Tee	35-feet along Branch
8" x 8" x 4" Tee	25-feet along Branch
12" Valve or Dead End	65-feet back from valve or dead end
8" Valve or Dead End	46-feet back from valve or dead end
12" x 8" Reducer	35-feet along larger diameter only
6" Valve or Dead End	35-feet back from valve or dead end

3.3 INSTALLATION

A. Piping Support:

1. Furnish and install supports to hold piping at lines and grades indicated or specified.
2. Support pipe and appurtenances connected to equipment to prevent any strain imposed on equipment.

B. Pipe and Fittings:

1. Contractor shall take all necessary precautions to minimize contamination of water mains while storing, handling and installing the water mains prior to disinfection. The interiors of pipes, fittings and valves shall be kept clean and dry.
2. When storing or stringing pipe on-site, Contractor shall take all necessary precautions to ensure no foreign materials enter the water mains. Contractor shall ensure pipe is not stored on-site longer than 1-week prior to installation to minimize the risk of contamination.
3. If dirt enters the water mains upon installation, material shall be removed and the interior of the pipe cleaned with a 1 to 5 percent hypochlorite solution.
4. Remove and replace defective pieces.
5. Clear of all debris and dirt before installing and keep clean until accepted.

6. Lay accurately to lines and grades indicated or required. Provide accurate alignment, both horizontally and vertically.
 7. Provide firm bearing along entire length of buried pipelines.
 8. All water mains and service pipe shall be laid in a trench separate from any other utility. The horizontal distance between water mains or service pipe and any other utility shall be at a minimum of no less than two (2) feet, vertical distance shall be no less than one (1) foot, and no less than ten (10) feet from a sanitary sewer or surface water drain unless pre-approved by the Cambridge Water Department.
- C. Temporary Plugs: When pipe laying not in progress, close open ends of pipe with temporary watertight plugs. If water in trench, do not remove plug until danger of water entering pipe passed.
- D. Appurtenances: Set valves, fittings and appurtenances as indicated.

3.4 JOINTS AND COUPLINGS

A. Push-on Joints:

1. Insert gasket into groove bell. Apply thin film of nontoxic gasket lubricant over inner surface of gasket in contact with spigot end.
2. Insert chamfered end into gasket. Force pipe past it until it seats against socket bottom.
3. Where required, install restraint and secure push-on joint restraint in accordance with manufacturer's instructions.

B. Mechanical Joints:

1. Wire brush surfaces in contact with gasket and clean gasket.
2. Lubricate gasket, bell, and spigot with soapy water.
3. Slip gland and gasket over spigot, and insert spigot into bell until seated.
4. Seat gasket and press gland firmly against gasket.
5. After bolts inserted and nuts made finger-tight, tighten diametrically opposite nuts progressively and uniformly around joint by torque wrench. Torque bolts to values specified above.

C. Sleeve-Type Coupling:

1. Clean pipe ends for distance of 8 in.
2. Use soapy water as gasket lubricant.
3. Slip follower and gasket over each pipe to a distance of 6 in. from end and place middle ring on pipe end until centered over joint.
4. Insert other pipe end into middle ring and bring to proper position in relation to pipe laid.
5. Press gaskets and followers into middle ring flares.
6. After bolts inserted and nuts made fingertight, tighten diametrically opposite nuts by use of torque wrench of size and torque specified below:

3.5 TESTING

- A. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.
- B. Pressure and Leakage Tests. Refer to Section 02704 for requirements.

3.6 DISINFECTING AND FLUSHING

- A. Disinfect potable water lines using procedures and materials conforming to AWWA C651.
- B. Refer to Section 02675 for additional requirements.

3.7 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01701.

PART 4 – COMPENSATION

Item 2630.1 - Pipe – DI (Water) 4-inch

METHOD OF MEASUREMENT:

Measurement for payment for Pipe – DI (Water) 4-inch will be based on the actual linear feet of pipe installed, tested, and accepted, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe with no reduction for fittings, valves, or hydrants.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon

receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:

Payment for Pipe – DI (Water) 4-inch will be based on the unit price bid for this item in the proposal. Under the linear foot price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each pipe complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement; excavation; dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required; transporting material to/from soil staging area; furnish, install, and compact bedding; furnish and install ductile iron pipe, adaptors, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; blow-offs; corporation stops for chlorination, testing, and flushing; chlorination, flushing and testing; disposal of testing materials; furnish and install pipe encasement or insulation as necessary; protective coating; and all work incidental to the installation of Ductile Iron Water Pipe, not specifically included for payment elsewhere.

Item 2630.2 - Pipe – DI (Water) 6-inch

METHOD OF MEASUREMENT:

Measurement for payment for Pipe – DI (Water) 6-inch will be based on the actual linear feet of pipe installed, tested, and accepted, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe with no reduction for fittings, valves, or hydrants.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:

Payment for Pipe – DI (Water) 6-inch will be based on the unit price bid for this item in the proposal. Under the linear foot price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each pipe complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement; excavation; dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required; transporting material to/from soil staging area; furnish, install, and compact bedding; furnish and install ductile iron pipe, adaptors, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; blow-offs; corporation stops for chlorination, testing, and flushing; chlorination, flushing and testing; disposal of testing materials; furnish and install pipe encasement or insulation as necessary;

protective coating; and all work incidental to the installation of Ductile Iron Water Pipe, not specifically included for payment elsewhere.

Item 2630.3 - Pipe – DI (Water) 8-inch

METHOD OF MEASUREMENT:

Measurement for payment for Pipe – DI (Water) 8-inch will be based on the actual linear feet of pipe installed, tested, and accepted, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe with no reduction for fittings, valves, or hydrants.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:

Payment for Pipe – DI (Water) 8-inch will be based on the unit price bid for this item in the proposal. Under the linear foot price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each pipe complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement; excavation; dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required; transporting material to/from soil staging area; furnish, install, and compact bedding; furnish and install ductile iron pipe, adaptors, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; blow-offs; corporation stops for chlorination, testing, and flushing; chlorination, flushing and testing; disposal of testing materials; furnish and install pipe encasement or insulation as necessary; protective coating; and all work incidental to the installation of Ductile Iron Water Pipe, not specifically included for payment elsewhere.

Item 2630.4 - Pipe – DI (Water) 12-inch

METHOD OF MEASUREMENT:

Measurement for payment for Pipe – DI (Water) 12-inch will be based on the actual linear feet of pipe installed, tested, and accepted, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe with no reduction for fittings, valves, or hydrants.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:

Payment for Pipe – DI (Water) 12-inch will be based on the unit price bid for this item in the proposal. Under the linear foot price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each pipe complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement; excavation; dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required; transporting material to/from soil staging area; furnish, install, and compact bedding; furnish and install ductile iron pipe, adaptors, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; blow-offs; corporation stops for chlorination, testing, and flushing; chlorination, flushing and testing; disposal of testing materials; furnish and install pipe encasement or insulation as necessary; protective coating; and all work incidental to the installation of Ductile Iron Water Pipe, not specifically included for payment elsewhere.

Item 2630.5 - Pipe – DI (Water) 20-inch

METHOD OF MEASUREMENT:

Measurement for payment for Pipe – DI (Water) 20-inch will be based on the actual linear feet of pipe installed, tested, and accepted, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe with no reduction for fittings, valves, or hydrants.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:

Payment for Pipe – DI (Water) 20-inch will be based on the unit price bid for this item in the proposal. Under the linear foot price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each pipe complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement; excavation; dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required; transporting material to/from soil staging area; furnish, install, and compact bedding; furnish and install ductile iron pipe, adaptors, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; blow-offs; corporation stops for chlorination, testing, and flushing; chlorination, flushing and testing; disposal of testing materials; furnish and install pipe encasement or insulation as necessary; protective coating; and all work incidental to the installation of Ductile Iron Water Pipe, not specifically included for payment elsewhere.

Item 2630.6 – Fittings, Couplings, and Restraints

METHOD OF MEASUREMENT:

Measurement for payment for Fittings, Couplings, and restraints– All fittings (excluding accessories) will be measured for payment by the pound actually installed in the completed project and accepted by the Engineer. Fittings include tees, crosses, bends, caps, wyes, sleeves, reducers, increasers, couplings, blow fittings, restraints, and other specials. All weights shall be based upon manufacturer catalog data and shipping weight slips furnished from the supplier to the Contractor. No payment will be allowed for weight of cement linings. Payment shall include costs of all labor and materials required for furnishing and installing restrained joints.

BASIS OF PAYMENT:

Payment for Fittings, Couplings, and Restraints – Payment for Item 22630.6 shall be considered full compensation for furnishing all labor, equipment, materials and services including taps with corporations or bleeder valves on plugs for testing of water mains and as relief blow-offs, labor and materials required for furnishing and installing tees, couplings, sleeves, reducers, and restrained joints, and all else incidental thereto for the satisfactory completion of the work.

END OF SECTION 02630

SECTION 02640

VALVES AND APPURTENANCES

2640.1	1 ½-IN TO 2-IN GATE VALVE AND GATE BOX	EACH
2640.2	4-IN GATE VALVE AND GATE BOX	EACH
2640.3	6-IN GATE VALVE AND GATE BOX	EACH
2640.4	8-IN GATE VALVE AND GATE BOX	EACH
2640.5	12-IN GATE VALVE AND GATE BOX	EACH
2640.6	20-IN TAPPING SLEEVE AND VALVE	EACH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01060 – PERMITS AND REGULATORY REQUIREMENTS
 - 1. The Cambridge Water Department (CWD) will not issue new water construction permits until all requirements for previous (i.e., initial CWD permit) CWD permits are met. These requirements ***include accurate and legible swing tie dimensions to all new water main gate valves, Tee's and elbows***, required CWD “sign off’s” on the contractor’s copy of the CWD executed permit (when permitted work is complete), test documentation that includes Massachusetts State certified initial chlorination and bacteria testing of new water main work, and pressure test results of new water main work. The contractor is hereby advised that the CWD will not be responsible for the contractor’s slip in project schedule if these requirements for permits are not followed.”

1.2 SUMMARY

- A. This Section including the following:
 - 1. Providing exterior valves, at the locations indicated and/or as required, complete in place in accordance with the drawings and specifications.

2. All valves, 16-inches and larger, shall be butterfly valves.
3. Valves shall be restrained mechanical joint.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 1. Submit shop drawings and descriptive literature, showing valve dimensions and other details for each type and class of valve to be furnished.
 2. Certification that all brass goods and valve materials in contact with potable water comply with the Safe Drinking Water Act Lead Reduction law and comply with NSF Standard 372.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. All valves furnished under the Contract shall be manufactured only in accordance with the Specifications and the approved drawings.

PART 2 - PRODUCTS

2.1 RESILIENT GATE VALVES AND VALVE BOXES

- A. Resilient gate valves shall be iron body, bronze mounted, resilient seated type. The valves shall be designed for 250 psi working pressure and 300 psi test pressure. Valves shall have corrosion resistant fusion - bonded interior and exterior coatings.
- B. Valve materials in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372.
- C. Valves are to have O-ring seals and a rising stem. Valves shall have a 2-inch operating nut. Bolts on the bonnet and stuffing box shall be stainless steel (304 stainless steel). Valves shall open right (clockwise). Valves installed with greater than 6'-0" of cover shall be provided with valve operating stem extensions per pre-approval of the Cambridge Water Department.
- D. Resilient gate valves shall meet the most recent version of the AWWA standard specification AWWA C509.
- E. Resilient wedge valves shall have mechanical joint ends and shall be equal to ANSI/AWWA C11/A21.11.

- G. Valves shall be Mueller A-2360 or approved equal.
- H. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly.

2.2 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves shall be mechanical joint type and shall be Mueller H-615, American Darling 1004 or approved equivalent.
- B. Valve materials in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372.
- C. Tapping valves shall meet the requirements of AWWA C500. The valves shall be flanged by mechanical joint outlet with non-rising stem and designed for vertical burial. Tapping valves shall be rated at 200 psi working pressure and shop tested at 300 psi. Bolts on bonnet and stuffing box shall be stainless steel (316 stainless steel); stuffing boxes shall be "O" ring type. The operating nut shall be 2-inches square. The valve shall be provided with oversized seat to permit use of full size cutters. Gaskets shall cover the entire flange surface. Valves shall open right (clockwise). Valves installed with greater than 6' of cover shall be provided with valve operating stem extensions per pre-approval of the Cambridge Water Department.

2.3 SAMPLE LINE AND TAPS

- A. Sample line pipe shall be copper tubing, Type K for buried service as required and shall be U.S. made.
- B. Service boxes shall be Erie style, American manufactured, of a telescopic type with a length from four (4) to five (5) feet. The cover shall be made of extra grade gray iron. The arch shall accommodate up to a 1-inch curb stop. The upper section shall be a telescopic pipe made of steel. The cover shall be counter sunk with a brass pentagonal plug that features a coarse "rope" thread to enable quick and easy removal.
- C. Required Brass Goods shall include Corporation Cocks, Curb Stops, and Misc. Couplings and Fittings. Brass good materials in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372. Castings shall be sufficiently heavy to meet all service conditions without springing or leaking and be clean and free from roughness both inside and out. Waterways shall be smooth, full size and free from obstruction. All threads

shall be cut sharp, clean and true. Curb stops shall be Ford Model B44-444-Q or approved equivalent by Mueller. Corporation cocks shall be Ford Model FB-1000-4 or approved equivalent by Mueller.

- D. Washers shall be of cast bronze containing not less than 85 percent copper finished on both sides of true faces.
- E. All curb stops shall be subjected to a sustained hydraulic pressure of 300 pounds and tested in both the open and closed position.
- F. All brass goods shall be individually wrapped to protect threads during shipment. Corporation cocks and curb cocks shall be of the compression type.
- G. Compression fittings for jointing copper tubing shall be Dresser Style 88, or equivalent.
- H. The proper use of tapping equipments, corporations and Polytetra Fluoroethylene (Teflon) thread sealant tape shall be used. Do not use liquid thread sealants.

2.4 VALVE INSULATION

- A. The valve shall be insulated as required by the Engineer and as detailed on the drawings. Insulation shall be cellular glass insulation (Foamglas or equal) with jacketing (Pittwrap, or equal). It shall be structurally strong, corrosion and moisture resistant, vermin proof, fireproof and suitable for burial. The system shall be designed and installed in accordance with manufacturer's recommendations for outside temperature variations from - 40 degrees F to +120 degrees F.
- B. All materials and applications work shall be furnished by Pittsburgh Corning Corporation, or equivalent.

2.5 VALVE BOXES

- A. Valve boxes shall be provided for each valve.
- B. Valve boxes shall be ductile iron and of the telescopic design with two piece construction, a top with a cover and a bottom. The top section shall have a top flange to increase the stability of the box to remain at the present height. The lower section of the box shall have a bell shaped bottom designed to enclose the operating nut and stuffing box of the valve without settling. The valve box shall come complete with a cover on which the word "WATER" shall be cast. The cover of the valve box shall be close fitting and substantially dirt tight and flush with the top of the box rim. Gate boxes shall be installed for each buried valve.
- C. Valve boxes shall be straight, plumb, and centered over valve.

PART 3 - EXECUTION

3.1 CLEANING AND PRIME COATING VALVES AND APPURTENANCES

- A. Prior to shop prime coating, all surfaces of the valves and appurtenances shall be thoroughly clean, dry, and free from all mill-scale, rust, grease, dirt, paint and other foreign substances to the satisfaction of the Engineer.
- B. All ferrous surfaces shall be sand blasted or pickled according to SSPC-SP6 or SSPC-SP8, respectively.
- C. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory to the Engineer through the time of final acceptance.

3.2 INSTALLATION

- A. All valves and appurtenances shall be installed in the location shown on the drawings or where required by the Engineer. Valves shall be true to alignment and rigidly supported. Any damaged items shall be replaced before they are installed.
- B. Care shall be taken to prevent damage to valves and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of valve openings, and all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced.
- C. Restraints shall be installed as per manufacturer's instructions.
- D. Butterfly valves shall be pressure tested for 15 minutes on ground prior to installation.

3.3 TAPPING SLEEVE AND VALVE

- A. Tapping sleeve and valves shall be installed in accordance with specification Section 02647.

3.4 SHOP PAINTING VALVES AND APPURTENANCES

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

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

3.5 BURIED VALVES

- A. Buried valves and boxes shall be set with the operating stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve.

3.6 VALVE BOXES

- A. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform with the finished surface of roadway or other surface at the completion of the contract. Valve box aligners shall be used in the alignment process.

3.7 VALVE BOX ALIGNERS

- A. Valve box aligners shall be installed by removing the operating nut of the valve and sliding it over the valve stem. Care shall be maintained to adequately support system during backfilling to maintain vertical alignment.

PART 4 – COMPENSATION

2640.1 --- 1 1/2-inch to 2-Inch Gate Valve and Gate Box

METHOD OF MEASUREMENT:

Measurement for payment for 1 1/2-inch to 2-inch Gate Valves and Gate Boxes, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 1 1/2-inch to 2-inch Gate Valves and Gate Boxes, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate valve and box complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install gate valve; furnishing and placing backfill by one of the approved methods; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; transporting material to/from soil staging area; furnishing, installing and compacting bedding; furnish and install gate valve and gate box, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the gate box; furnish and install encasement or insulation as necessary; protective coating; support of gate valve during installation; and all incidental work required for the installation of 1 1/2-inch to 2-in gate valves and boxes not specifically included

for payment elsewhere.

2640.2 --- 4-Inch Gate Valve and Gate Box

METHOD OF MEASUREMENT:

Measurement for payment for 4-inch Gate Valves and Gate Boxes, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 4-inch Gate Valves and Gate Boxes, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate valve and box complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install gate valve; furnishing and placing backfill by one of the approved methods; transporting material to/from soil staging area; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; furnishing, installing and compacting bedding; furnish and install gate valve and gate box, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the gate box; furnish and install encasement or insulation as necessary; protective coating; support of gate valve during installation; and all incidental work required for the installation of 6-in gate valves and boxes not specifically included for payment elsewhere.

2640.3 --- 6-Inch Gate Valve and Gate Box

METHOD OF MEASUREMENT:

Measurement for payment for 6-inch Gate Valves and Gate Boxes, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 6-inch Gate Valves and Gate Boxes, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate valve and box complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install gate valve; furnishing and placing backfill by one of the approved methods; transporting material to/from soil staging area; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; furnishing, installing and compacting bedding; furnish and install gate valve and gate box, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the gate box; furnish and install encasement or insulation as necessary; protective coating; support of gate valve during installation; and all incidental work required for the installation of 6-in gate valves and boxes not specifically included for payment

elsewhere.

2640.4 --- 8-Inch Gate Valve and Gate Box

METHOD OF MEASUREMENT:

Measurement for payment for 8-inch Gate Valves and Gate Boxes, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 8-inch Gate Valves and Gate Boxes, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate valve and box complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install gate box; furnishing and placing backfill by one of the approved methods; transporting material to/from soil staging area; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; furnishing, installing and compacting bedding; furnish and install gate valve and gate box, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the gate box; furnish and install encasement or insulation as necessary; protective coating; support of gate valve during installation; and all incidental work required for the installation of 8-in gate valves and boxes not specifically included for payment elsewhere.

2640.5--- 12-Inch Gate Valve and Gate Box

METHOD OF MEASUREMENT:

Measurement for payment for 12-inch Gate Valves and Gate Boxes, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 12-inch Gate Valves and Gate Boxes, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate valve and box complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install gate box; furnishing and placing backfill by one of the approved methods; transporting material to/from soil staging area; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; furnishing, installing and compacting bedding; furnish and install gate valve and gate box, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the gate box; furnish and install encasement or insulation as necessary; protective coating; support of gate valve during installation; and all incidental work

required for the installation of 12-in gate valves and boxes not specifically included for payment elsewhere.

2640.6 --- 20-Inch Tapping Sleeve and Valve

METHOD OF MEASUREMENT:

Measurement for payment for 20-inch Tapping Sleeve and Valve, will be based on the actual number of valves and boxes installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 20-inch Tapping Sleeve and Valve, will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each tapping sleeve and valve complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install tapping sleeve and valve; furnishing and placing backfill by one of the approved methods; transporting material to/from soil staging area; furnish and install filter fabric as required; compaction; compaction testing; temporary excavation support furnished and installed complete; furnishing, installing and compacting bedding, mechanical joint restraints, gaskets and appurtenances; connections to existing and proposed pipes and structures; chlorination, flushing and testing; disposal of testing materials; concrete setting bed for the valve box; furnish and install encasement or insulation as necessary; protective coating; support of tapping sleeve and valve during installation; and all incidental work required for the installation of 20-inch tapping sleeve and valve, not specifically included for payment elsewhere.

END OF SECTION 02640

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SECTION 02645

HYDRANTS

2645.1	NEW HYDRANT	EACH
2645.2	REMOVE AND DISPOSE EXISTING HYDRANT	EACH
2645.3	REMOVE AND RELOCATE EXISTING HYDRANT	EACH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 01060 – PERMITS AND REGULATORY REQUIREMENTS
 - 1. The Cambridge Water Department (CWD) will not issue new water construction permits until all requirements for previous (i.e., initial CWD permit) CWD permits are met. These requirements ***include accurate and legible swing tie dimensions to all new water main gate valves, Tee's and elbows***, required CWD “sign off’s” on the contractor’s copy of the CWD executed permit (when permitted work is complete), test documentation that includes Massachusetts State certified initial chlorination and bacteria testing of new water main work, and pressure test results of new water main work. The contractor is hereby advised that the CWD will not be responsible for the contractor’s slip in project schedule if these requirements for permits are not followed.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Providing hydrants, gate valves and boxes and appurtenant work, complete in accordance with the drawings and specifications.

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 - 1. Submit shop drawings and manufacturers descriptive literature, showing hydrant dimensions and features.

2. Submit certifications that all wetted surface metals in contact with potable water comply with the 2014 Safe Drinking Water Act Lead Reduction law and comply with NSF 372

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – QUALITY ASSURANCE and as specified.
- B. All hydrants furnished under the Contract shall be manufactured only in accordance with the Specifications and the drawings.

PART 2 - PRODUCTS

2.1 HYDRANTS

- A. Hydrants shall conform to the "standard for Dry-Barrel Fire Hydrants" ANSI/AWWA C502-85. Hydrants shall be designed for 150 psi service and for installation in a trench with 5 foot cover (5-1/2 feet bury hydrant). Hydrant barrel extensions shall be furnished and installed as necessary to achieve correct bury depth. The length of the hydrant barrel shall be such that when installed with the proper depth of cover on the branch pipeline, the hydrant will be set with the normal ground line of the barrel within 3-inches of the actual ground grade surface elevation.
- B. Hydrants shall be fabricated to manufacturer's standard pattern and size and shall have one 4-1/2 inch steamer and two 2-1/2 inch hose nozzles all with National Standard Thread (NST). Hydrant inlet opening on shoe shall have mechanical joints for accepting 6-inch ductile or cast iron pipe.
- C. Hydrants shall open clockwise and shall be marked with an arrow and word "OPEN" to indicate the direction of turn of the stem to open the hydrant.
- D. Hydrants shall have a compression type main valve, opening against and closing with water pressure. The main valve opening at the base of the hydrant shall have a minimum area of 39 square inches (5-inch minimum diameter circle). Each hydrant shall have "traffic" type ground line construction (breakaway bolts not acceptable) and permit 360-degree movement of the upper barrel to allow for any alignment without shutting down service and/or removing flange bolts and nuts. Hydrant operating nut shall be 1-1/2 inches, flat to point, pentagonal. Connecting pipe and pipe nipples between the main line tee and hydrant shall be 6-inch ductile iron conforming to the requirements for ductile iron pipe.
- E. Hydrants shall be hydrostatically tested as specified in AWWA C502.
- F. Hydrant tees shall be anchor type. The branch shall have a plain end with an integral gland and rotating mechanical joint restraints. Every hydrant shall be

equipped with a 6-inch shut-off valve, bolted or anchored to the hydrant tee.

- G. Hydrants shall be flow tested and painted per Cambridge Water Department requirements. See 3.1.G this Section.
- H. Materials used for wetted surface metals in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the 2014 Safe Drinking Water Act Lead Reduction law and comply with NSF 372.

2.2 SAFETY FLANGE REPAIR KITS

- A. Safety flange repair kits shall come complete with stem coupling, safety flange, flange gasket, replacement bolts and nuts and hydrant lubricating oil.
- B. Safety flange repair kits shall be compatible with hydrant furnished.

2.3 EXTENSION KITS

- A. Extension kits shall be provided as necessary and shall come complete with extension barrel, extension stem, stem coupling and hardware, flange, flange gasket, 8 bolts and nuts and hydrant lubricating oil.
- B. Extension kits shall be compatible with hydrant furnished.

2.4 RESTRAINTS

- A. Hydrants, valves and pipe shall be restrained with EBAA Mega-Lug, Uni-Flange Series 1400 or approved equivalent.

PART 3 - EXECUTION

3.1 HYDRANTS

- A. Hydrants shall be installed in conformance to AWWA C600, Section 11, latest revision using tie rods and anchored joints.
- B. Hydrants to the bury shall be set line at the locations shown on the Drawings or as designated by the Engineer and shall be bedded on a firm foundation. A 5 cubic foot minimum drainage pit shall be filled with ½-inch crushed stone and satisfactorily compacted. During backfilling, crushed stone shall be brought up around, and 6-inch over, the drain ports.
- C. Each hydrant shall be set in true vertical alignment and shall be properly braced.
- D. Restraints shall be installed in accordance with manufacturer's requirements. Hydrants shall be cleaned, finish painted to match City of Cambridge color scheme, and touched up after installation.

- E. Hydrants set too high or too low shall be excavated and reset to the proper depth as indicated by the bury line. Hydrant extensions shall be installed where required to maintain proper depth.
- F. Remove and stack existing hydrants at as shown on the Drawings or as required by the Engineer. Removed hydrants shall be delivered to the Owner's storage facility. The existing branch line shall be capped and the hydrant branch valve closed and the box removed.
- G. All new hydrants installed by Contractor for the City shall be flow tested by the Contractor in coordination with the City of Cambridge Water Department (CWD). All new hydrants shall be color coded accordingly:
 - 1. Blue/Silver – 1500 gpm or more
 - 2. Green/Silver – 1000 -1499 gpm
 - 3. Orange/Silver – 500-999 gpm
 - 4. Red/Silver – 400-500 gpm
 - 5. Black/Silver – 400 gpm or less

PART 4 – COMPENSATION

Item 2645.1 – New Hydrant

METHOD OF MEASUREMENT:

Measurement for payment for New Hydrant will be based on the actual number of new hydrants furnished and installed, as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for New Hydrant will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install each new hydrant as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; saw cutting bituminous and cement concrete; excavation; transporting material to/from soil staging area; furnish and install backfill per one of the approved methods; furnish and install filter fabric as required; furnish and install gravel pavement sub-base; compaction; compaction testing; coordination with Cambridge Fire Department and Cambridge Water Department; temporary excavation support furnished and installed complete, furnish and install the hydrant; furnish and install all fittings and mechanical joint restraints; all permits and fees; and all incidental work required for the providing and the installation of a new hydrant not included for payment elsewhere.

Item 2645.2 – Remove and Dispose Existing Hydrant

METHOD OF MEASUREMENT:

Measurement for payment for Remove and Dispose Existing Hydrant will be based on the actual number of hydrants removed and disposed, as shown on the Contract Drawings or as directed by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for Remove and Dispose Existing Hydrant will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and dispose each hydrant as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish and install backfill; transporting material to/from soil staging area; furnish and install filter fabric as required; install, grade, and compact gravel pavement sub-base; compaction; compaction testing; coordination with Cambridge Fire Department and Cambridge Water Department; temporary excavation support furnished and installed complete, removal of the hydrant; disposal of the hydrant; all permits and fees; and all incidental work required for the removal and disposal of an existing hydrant not included for payment elsewhere.

Item 2645.3 – Remove and Relocate Existing Hydrant

METHOD OF MEASUREMENT:

Measurement for payment for Remove and Relocate Existing Hydrant will be based on the actual number of hydrants removed and relocated, as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for Remove and Relocate Existing Hydrant will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to remove and relocate each hydrant as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to; saw cutting; excavation; furnish and install backfill; transporting material to/from soil staging area; furnish and install filter fabric as required; install, grade, and compact gravel pavement sub-base; compaction; compaction testing; coordination with Cambridge Fire Department and Cambridge Water Department; temporary excavation support furnished and installed complete, removal of the hydrant; installation of the hydrant; all permits and fees; and all incidental work required for the removal and relocation of an existing hydrant not included for payment elsewhere.

END OF SECTION 02645

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SECTION 02647

CONNECTION TO EXISTING WATER MAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Connecting to existing mains.
- B. Related sections includes the following:
 - 1. Section 02200 - EARTH EXCAVATION, BACKFILL, FILL AND GRADING
 - 2. Section 02615 - DUCTILE IRON PIPE AND FITTINGS
 - 3. Section 02640 – VALVES AND APPURTENANCES

PART 2 - PRODUCTS

- A. Tapping valves shall be flanged by mechanical joint and be as specified in Section 02640.
- B. Tapping sleeves shall be ductile iron with a split horizontal flange. Contractor shall verify existing pipe materials and diameter pipe prior to ordering sleeves.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: The Contractor shall verify field conditions by test pits or other methods prior to construction.

3.2 INSTALLATION

- A. The Contractor shall make all connections to the existing mains as indicated in the Contract Documents.
- B. The Contractor shall develop a program for the construction and putting into service of the new work subject to the approval of the Engineer. All work involving cutting into and connecting to the existing water mains shall be planned so as to interfere with operation of the existing facilities for the shortest possible time.
- C. The Contractor shall have all preparatory work done prior to making the connection and shall provide all labor, tools, material, and equipment required to do the work in one continuous operation.
- D. The Contractor shall have no claim for additional compensation, by reason of delay or inconvenience, for adapting his operations to the requirements of the Owner.
- E. Under no circumstances shall any customer be without water for a period of more than 4 hours without prior written approval of the Owner. Should it appear that any customer will be without water for more than 4 hours, the Contractor shall install temporary water service at no additional cost to the Owner.
- F. The Owner does not guarantee a tight shut-off for existing local community water valves. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed. It shall be the responsibility of the Contractor to provide the means to dewater the excavation if required when making connections.
- G. The Contractor shall be responsible for the following restrictions on shutdown of water mains:
 - 1. Distribution system valves and hydrants to be operated only by City of Cambridge Water Department personnel.
 - 2. One week advance notice for shutdown request shall be given to Cambridge Water Department.
 - 3. Contractor shall notify by flyer all affected water customers a minimum of 72 hours prior to any water main shutdown.
- H. The Contractor shall apply for and receive all necessary permits with the City of Cambridge Water Department prior to making any connections to the existing water system.

3.3 APPLICATION:

A. Special Techniques: Tapping Connections:

1. Tap connections to existing mains shall be made with service pressure in the main, using tapping sleeve and valve and a suitable tapping machine.
2. Other connections to existing mains shall be made with the main out of service, unless otherwise required by the Engineer.

3.4 CLEANING

- A. Contractor shall clean the existing main with wire brush and wash the pipe surface and the tapping sleeve and valve interior with 5% hypochlorite (bleach) solution.

3.5 TESTING

- A. Valve and sleeve shall be leak free. Any visible leakage shall be corrected at no additional cost to the owner.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02647

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SECTION 02660

WATER SERVICES

2660.1	1-IN TO 3-IN WATER SERVICE REPLACEMENT AND RECONNECT	LINEAR FOOT
2660.2	TRANSFER EXISTING WATER SERVICE TO EXISTING MAIN	EACH

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Provide new water services from the new water main to the property line and connect to existing services, including corporation stops, curb stops and boxes, as shown on the Contract Drawings or as directed by the Engineer. In general, a service shall be brought to each developed parcel of property along the water main route.
2. Provide permanent blow-offs at dead-end water mains.
3. Transfer existing services to an existing water main as shown on the Contract Drawings or as directed by the Engineer.
4. Replace services 3/4" and smaller with 1" services as shown on the Contract Drawings or as directed by the Engineer.
5. Replace all lead services as shown on the Contract Drawings or as directed by the Engineer.
6. Contractor shall coordinate with property owners and property owner's contractor for replacement of water services on private property at locations indicated within the utility plans in the Contract Documents.

1.2 SUBMITTALS

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

1. Submit manufacturer's technical product data or descriptive literature, or both, showing services, corporation stops, curb stops, fittings and other details for each type of service to be furnished for the project.
2. For informational purposes only, submit manufacturer's written installation instructions.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 – QUALITY ASSURANCE.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water services materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

PART 2 - PRODUCTS

2.1 SERVICES

- A. Unless otherwise specified, all pipe for services and 2-inch mains shall be copper tubing, type K, drawn temper.
 - a. Type K hard-temper in sizes larger than 1-inch;
 - b. Type K soft-temper for 1-inch services.
- B. Copper type shall conform to ASTM B42.
- C. Fittings shall be cast bronze for copper pipe and cast bronze or copper stream-lined fittings for copper tubing conforming to ASTM B16.18.
- D. Unions shall be bronze with ground joints and shall be semi-finished.
- E. Joints for copper fittings shall be made with solder composed of 95 percent tin and five percent antimony. Connections to ductile iron fittings and pressure reducing valves within valve vaults shall be threaded.
- F. Pipe and fittings in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372.

2.2 CORPORATIONS, CURB STOPS AND SADDLES

- A. The corporation stops shall meet the most recent revision of the AWWA standard "Threads for Underground Service Line Fittings" (AWWA C800). Corporation stops shall be Mueller 110, Model H-15008, designed for 175 psi test pressure and manufactured by Mueller Inc. or approved equivalent. Stops to have full keyway and rigid liners.
- B. Curb stops shall be Mueller H15219 Mark II Oriseal or approved equivalent with drain suitable for use with polyethylene tubing specified hereinbefore. Stops shall have integral checks, O-ring seal and shall be furnished with rigid liners.
- C. Curb stop boxes shall be cast iron Buffalo type with recessed lid with pentagon

bolt, adjustable sliding type.

- D. Service saddles for 2-inch taps shall be Smith-Blair 313 Double Strap or approved equivalent. Bodies shall be ductile iron and straps shall be electrogalvanized carbon steel. Units shall be complete with Buna-N gaskets or approved equivalent.
- E. Pipe and fittings in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372.

2.5 FITTINGS

- A. Unless otherwise approved, only compression type fittings manufactured by Mueller Inc., or approved equivalent, shall be used.
- B. Adapters required to allow connection to existing services shall be provided.
- C. Pipe and fittings in contact with potable water shall be lead free with lead level not exceeding 0.25%. Materials shall comply with the Safe Drinking Water Act Lead Reduction law and with NSF Standard 372.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. After successful testing and chlorination, water services shall be installed as a "wet" tap as shown on the drawings, specified, or required by the Engineer. Exact locations of services shall be located in the field by the Engineer. A service shall be provided to the property line of parcels of property along the water main route. All services shall be installed to a minimum depth of 4'-6" unless specifically shown or directed otherwise by the Engineer.
- B. Water service trenches shall be excavated and backfilled in accordance with Section 02210 of this Specification and in conformance to the details. Services to be installed beneath paved roadways shall be driven beneath the pavement utilizing a pneumatically driven device such as "Hole Hog", or approved equivalent.
- C. Each service shall be flushed thoroughly and the end closed with duct tape prior to backfilling.
- D. Connections to the existing services shall be thoroughly flushed prior to connecting. Contractor shall coordinate and assist Water Department personnel in removal of the household meter and filters and flushing the entire service line to prevent scale-debris from blocking fixtures and appliances when and where

applicable.

PART 4 – COMPENSATION

Item 2660.1 – 1-in to 3-in Water Service Replacement and Reconnect

METHOD OF MEASUREMENT:

Measurement for payment for 1-in to 3-in Water Service Replacement and Reconnect will be based on the actual linear feet of pipe installed, tested, and accepted, from 1-in to 3-in diameter, at all depths, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer along the centerline of the pipe from the centerline of the mainline to the connection with the existing service.

BASIS OF PAYMENT / INCLUSIONS:

Payment for 1-in to 3-in Water Service Replacement and Reconnect will be based on the unit price bid for this item in the proposal. Under the unit price for each pipe item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to reconnect, and replace existing water services between ½-in and 3-in in diameter, which are in elevation or alignment conflict with the proposed Work, which require reconnection to replaced water mains, and which are existing ¾” or less in diameter or lead services, at all depths, complete as shown on the Contract Drawings or as required by the Engineer. This item also includes installation of end of line blow-offs at dead-end water mains. The work includes; saw cutting bituminous or cement concrete; excavation; transporting material to/from soil staging area; furnishing and placing backfill per one of the approved methods; furnish, install, and compact gravel road sub-base; furnish and install filter fabric as required; install, grade, and compact gravel pavement sub-base; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or directed; furnishing, placing and compacting bedding; furnish and install type k water service pipe or ductile iron pipe, fittings, couplings, appurtenances and joints; coordinating with property owner contractor’s at locations shown within the contract documents for replacement of water services on private property; connections to existing and proposed pipes; chlorination; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

Item 2660.2 – Transfer Water Service to Existing Water Main

METHOD OF MEASUREMENT:

Measurement for payment for Transfer Water Service to Existing Water Main shall be based on the each water main service transferred, installed, tested, and accepted, from ½-in to 3-in diameter, at all depths, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer for each water service transfer complete.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Transfer Water Service to Existing Water Main will be based on the unit price bid for this item in the proposal. Under the unit price for each pipe item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to transfer, reconnect, and replace existing water services between ½-in and 3-in in diameter, from an existing water main to another existing water main, at all depths, complete as shown on the Contract Drawings

or as required by the Engineer. The work includes; saw cutting bituminous or cement concrete; transporting material to/from soil staging area; coordinating with property owner to locate water service; abandonment of existing water service connection to existing main; furnishing and placing backfill per one of the approved methods; furnish, install, and compact gravel road sub-base; furnish and install filter fabric as required; install, grade, and compact gravel pavement sub-base; compaction; compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or directed; furnishing, placing and compacting bedding; furnish and install type k water service pipe or ductile iron pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes; chlorination; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

This item does not include reconnection, transfer, or replacement for connections to new water mains. This is paid for under item 2660.1 – ½-in to 3-in Water Service Replacement. This item does not include test pitting to locate existing water service. This item is paid for under 1200.1.

END OF SECTION 02660

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SECTION 02675

DISINFECTION OF WATER MAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Flushing and Disinfection of pipelines.
- B. Related section include the following:
 - 1. Section 02615 - DUCTILE IRON PIPE AND FITTINGS.
 - 2. Section 02704 - PIPELINE PRESSURE AND LEAKAGE TESTING.
 - 3. Section 02711 – CLEANING AND CEMENT MORTAR LINING
 - 4. Section 02736 – TEMPORARY CONNECTIONS

1.3 SYSTEM DESCRIPTION

- A. Disinfect all water mains installed under this contract. Disinfection shall occur subsequent to the installation of the new pipe in accordance with Section 02615.
- B. The location of new main line is shown on the Drawings.
- C. Pipeline disinfection shall be performed in conjunction with the related work items of dewatering, testing, flushing, dechlorination of water with high concentrations of chlorine, and discharge; prior to placing newly installed water main in service. The Engineer will develop the particulars of the "work plan" to accomplish the above tasks, however, the Contractor's responsibility shall include:
 - 1. Provision of the chlorine product for disinfection at the rate and dose specified shall be in accordance with AWWA standards.
 - 2. Provision of pipeline taps for dosing and testing of chlorinated water,

as necessary.

3. Installation and removal of bulkheads required for testing.
 4. Labor and equipment necessary to dispense the dose chlorine at points and rates as required by the Engineer.
 5. Labor and equipment to operate newly installed mainline valves, air release valves, and blowoff valves as necessary and required by the Engineer.
- D. The Contractor shall be responsible for disinfecting and putting into service new water mains that shall become the property of the Owner.
- E. All new water main segments longer than 15' shall be tested between 2 new valves per the Cambridge Water Department requirements, unless pre-approved otherwise by the Cambridge Water Department.
- F. Contractor shall be responsible for coordinating all activities with the Cambridge Water Department (CWD) when using City hydrants or water for disinfection purposes.

1.4 PROJECT/SITE CONDITIONS

- A. All flushing water shall be discharged in accordance with local, state and federal regulations. The DPW shall be contacted prior to flushing. Dechlorination facilities shall be used as required.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate operation of existing valves, timing and duration of shut-down of existing mains, and disinfecting, flushing and re-energizing of the water main with the Engineer and where applicable with the Owner including notification of the following prior to the stated work:
1. Valve Operations: Notify Engineer and CWD three (3) days prior to stated work.
 - a. The opening and closing of existing valves shall be performed by CWD personnel only.
 2. Disinfecting and Flushing: Notify Engineer three (3) days prior to stated work.
 3. Notification shall include location of work, length and diameter of the pipe and other pertinent information.
 4. Contractor shall notify by flyer all affected water customers a minimum

of 72 hours prior to any water main shutdown.

1.6 SUBMITTALS

- A. Contractor to submit written disinfection plan to Engineer for review. Plan to include flushing/swabbing and disinfection protocol, including by not limited to the following: management of water, chemical data, feed rates, dechlorination plan and disposal methods.
- B. Submit data on DEP-certified laboratory to be used for sample collection and testing.
- C. Written laboratory analysis reports.
- D. Test results for chlorine residuals for times as specified in the method of disinfection shall be submitted to the CWD.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Foam pig or swab shall be of soft polyurethane body with hard polyurethane coating and straps (cross-patterned) with a density of 2 lbs./cf. Swab shall be suitable for use in potable water systems and FDA or NSF 61 approved. Shall be sized and shaped appropriately for cleaning water mains to effectively remove soft and loose debris left in the water main during construction. Swab shall be designed such that the maximum velocity needed to propel the swab through the water main is not more than 1700 gpm for 42-inch water mains and 1000 gpm for 24-inch water mains. Foam pig shall be manufactured by Pipeline Pigging Products, Inc., Tomball TX or approved equal.
- B. Calcium hypochlorite shall conform to AWWA B300.
 - 1. Granules with 70 percent available chlorine.
- C. Liquid sodium hypochlorite shall conform to AWWA B300.
- D. Owner-approved backflow preventer devices.
- E. Line purge dechlorinator with dechlorination tablets. Dechlorinator shall have 2-1/2 inch NPT coupling and capacity flow rates of up to 1,600 GPM. Dechlorination tablets shall be sodium sulfite or sodium thiosulfate, capable of dechlorinating the flushed water. Dechlorinator shall be Model LPD-250 as manufactured by J. Pollard Co., Hyde Park, NY or approved equivalent.

2.2 LABORATORY

- A. Contractor shall employ a DEP-certified laboratory to collect samples and perform bacteriological tests.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General:

1. Perform disinfection and flushing in accordance with AWWA C651.
2. The Engineer will review flushing and disinfection procedures, designate dosage and will perform necessary water quality tests to verify that disinfection has been accomplished according to public health standards.
3. If connections are made to municipal water systems, Owner-approved backflow preventer shall be installed in the line to prevent backflow or siphonage of water into the municipal system.

- B. Flushing:

1. Prior to chlorination, mains up to 16-inch in diameter shall be properly flushed by the Contractor. In general, flushing shall be performed at a flow rate required to achieve a minimum velocity of 2.5 feet per second (approximately 3500 GPM in a 24-inch main, approximately 2500 GPM in a 20 inch main, approximately 1600 GPM in a 16-inch main, 900 GPM in a 12-inch diameter main, 400 GPM in 8-inch diameter main and 220 GPM in a 6-inch main, and 30 GPM in a 2-inch main). Flushing shall be performed for a sufficient period of time to allow for a minimum of 3 volume changes of water in the main (approximately 20 minutes per 1000-foot of main at the above flow rate).
2. Mains larger than 16-inch will be cleaned by use of a foam pig or swab. The Contractor shall insert the swab into the section of main to be cleaned upon installation and it shall remain until the pipeline construction is completed. Cleaning and flushing shall be accomplished by propelling the swab through the pipeline to the exit point with use of potable water (maximum flow rate of 1700 gpm for 42-inch water main). Contractor is responsible for furnishing and installing restrained end caps on either end, for the water main to be cleaned, with proper hose/piping connections and vents in order to propel the swab down the water main and vacate air in the process (4-inch tap for water mains up to 24-inch in diameter and 6-inch tap for water mains above 24-inch diameter). Contractor is responsible for providing connections to the

City's hydrant with all necessary permits and appurtenances/backflow preventers to prevent cross contamination of the City's distribution system. Contractor shall manage handling and disposal of water as needed for successful completion of flushing and disinfection procedures in accordance with AWWA standards.

3. Contractor shall be responsible for inserting and removal of swab or pigs from the main. All costs for labor and materials necessary for locating and removal of swabs or pigs which become stuck in the main shall be Contractor's responsibility.

C. Discharge:

1. Following disinfection, water with high concentrations of chlorine shall be discharged as required by the Owner or the Owner's Representative.
 - a. The Contractor shall notify the Engineer of the specific location where chlorinated water will be discharged at least one week in advance of proposed discharge. The Engineer will then inform the Owner.
2. Water with high concentrations of chlorine shall be dechlorinated prior to its discharge to storm drains or natural bodies of water.

3.2 INSTALLATION

A. Calcium Hypochlorite:

1. Use only as a solution.
2. Pump into pipe with a suitable chemical feed pump.

3.3 APPLICATION

A. Special Techniques:

1. Disinfect pipes by the continuous feed or slug method.
 - a. Continuous feed method:
 - (1) Feed chlorine into pipe so water entering contains at least 25 mg/l of available chlorine.
 - (2) Apply chlorine continuously until entire pipe is filled with chlorine solution.
 - (3) Retain treated water in pipe for at least 24 hours.
 - (4) Ensure that chlorine residual at end of test is at least 10 mg/l.
 - (5) Operate all valves and hydrants to insure disinfection.

Manipulate valves to prevent super chlorinated water from entering existing distribution system.

b. Slug Method

- (1) Slowly feed through the main a slug of water having a chlorine concentration of 100 mg/l so that all parts of the main and appurtenances are exposed to the highly concentrated solution for a period of at least three (3) hours.
- (2) Water from existing distribution system or other approved supply source shall be made to flow at a constant measured rate, into the new main.
- (3) At a point not more than ten (10) feet downstream from the beginning of the new main, water entering the new main shall receive a constant dose of free chlorine having a concentration of 100 mg/l.
- (4) The free chlorine shall be measured as it moves through the main. If the level drops below 50 mg/l, flow shall be stopped chlorination equipment shall be relocated to the head of the slug and as flow is resumed, chlorine shall be applied to restore the free available level to 100 mg/l.
- (5) Valves and hydrants shall be operated as the chlorinated water flows past them to insure disinfection occurs.

2. Ensure that appurtenances are fully disinfected.

3.4 FIELD QUALITY CONTROL

A. Tests:

1. Bacteriological test samples shall be collected by a DEP-certified laboratory for the Contractor after the chlorine solution has been flushed out of the pipe.
2. Disinfection shall be repeated, as necessary, to produce satisfactory bacteriological samples.
3. Twenty-four (24) hours after the main has been flushed of chlorinated water, bacteriological samples shall be taken. Water samples shall be taken from corporation stops along the length of the water main as designated by the Engineer. Sampling piping shall be a suitable length of copper pipe, as required by the Cambridge Water Department. A minimum of two (2) samples shall be taken, per 3,000 foot of pipe and on each street, each in duplicate, in sterile bottles and sent to a State approved private laboratory for analyses. The Contractor shall be

responsible for all necessary work including delivery of samples to a certified laboratory, and shall include the cost for sampling and analysis in his bid price. The results of the tests on these samples will determine the acceptance of the work and allow these new mains to be connected to the Owner's system. The failure of any sample to pass the laboratory tests shall require the Contractor to re-flush and rechlorinate the mains and re-sample and test the water until acceptable results are obtained, all at no additional cost to the Owner.

B. Main Activation

1. Upon receipt of satisfactory bacteria sample test results and successful pressure tests, Contractor shall notify Owner to have the Owner's personnel operate all valves required to place mains in service.
2. Contractor shall note that work under this Contract shall not be considered completed until satisfactory installation and testing of the water mains have been completed.

PART 4 – COMPENSATION (NOT USED)

END OF SECTION 02675

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SECTION 02685

TEMPORARY BY-PASS PIPING AND SERVICE
CONNECTIONS FOR WATER MAINS

2685.1 **TEMPORARY WATER BYPASS PIPING** **LINEAR FOOT**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Temporary Water drawings are included within the Contract Documents.

1.2 SUMMARY

- A. This Section includes furnishing all labor, materials, equipment and appurtenant work to satisfactorily maintain water service to customers connected to pipelines being replaced or cement-mortar lined, complete in place, in accordance with the Drawings and Specifications.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES:
 - 1. Submit to the Engineer, the Owner and the Cambridge Fire Department for review, prior to providing temporary service, a complete by-pass piping layout including specific by-pass pipe diameter to be used in specific locations and types of temporary fire hydrants.
 - 2. Submit to the Engineer for review Shop Drawings detailing pipe, hose and temporary fire hydrants to be furnished and utilized for use in conjunction with the temporary by-pass pipe and connections to services and laterals.
 - 3. Submit to the Engineer for review, descriptive literature detailing disinfection procedures relating to the by-pass piping prior to its use.
 - 4. The Cambridge Water Department does not allow temporary water main bypass to occur between November 1st and April 1st without pre-approval from the Cambridge

Water Department.

PART 2 - PRODUCTS

2.1 PIPE AND MATERIALS

- A. Piping and materials to be used by the Contractor shall be PVC or steel and have been previously reviewed by the Engineer and shall be fully adequate to withstand the distribution system pressures in the vicinity of project.
- B. All by-pass piping connected to fire hydrants must be provided with a tee and valve for each hose connection so as to maintain sufficient fire protection during the course of the work.

PART 3 - EXECUTION

3.1 TEMPORARY WATER SERVICE MAINTENANCE

- A. All Pipe and fittings shall be watertight and shall be disinfected prior to being put into service. Disinfection and testing shall be performed by the Contractor and shall comply with Sections 02675 and 02704 of the specifications.
- B. Temporary by-pass facilities shall include hoses and necessary outlets and fittings to each service connection. The Contractor shall furnish, install, and maintain the temporary lines in a safe and operative condition at all times. After service has been restored to a section of water main, the Contractor shall remove the temporary by-pass and related facilities and shall leave the work site in its original condition.
- C. Temporary piping shall be installed adjacent to the roadways where it will cause the least obstruction and where it will be least susceptible to damage. At street intersections or access ways, the pipe shall be installed in a shallow trench to be overlaid with temporary bituminous pavement. At driveways, pipe crossings shall be provided utilizing cold patch cover or other method acceptable to the Engineer.
- D. Contractor to provide 24-hour emergency service personnel to fix and repair any damage to temporary by-pass piping. Contractor to furnish Owner with name and telephone number of person assigned to emergency repair service. Said person shall be capable of arriving at site within 1-hour of notification and providing necessary tools, equipment, and labor to repair damaged by-pass line. If emergency personnel fail to arrive, Owner's forces shall be authorized to take corrective actions, and all costs for labor, materials and equipment shall be backcharged to the Contractor. Minimum charge for Owner's forces shall be two (2) men at 4 hours

minimum, overtime rate, plus materials and equipment costs. All backcharges shall be deducted from payments due the Contractor for work performed under this contract.

- E. Water for temporary servicing shall be taken from the nearest available fire hydrant, or as required by the Engineer and the Owner. If hydrants are unavailable, below ground taps for by-pass connection will be installed by the Contractor under the supervision of the Engineer and the Owner.
- F. All dwellings, whether occupied at the time of the project or not, shall be provided with temporary water service. Prior to activating the service, the Contractor shall disinfect and flush the piping. The Engineer shall review the temporary piping system prior to placing in service.
- G. Prior to installing and activating the temporary service, the Contractor shall notify the Engineer and the Owner in advance to allow the Owner to notify all customers accordingly.
- H. The Contractor shall operate all valves with an Owner's representative present. All necessary safety precautions, including traffic cones and highway safety barriers, shall be provided by the Contractor while operating valves in roadways.
- I. When replacing defective sideline valves, temporary by-pass piping shall not be used for the sole purpose of feeding customers affected by the temporary shut down of service. The shut down shall be coordinated with the Owner and the defective valve shall be replaced.
- J. Temporary fire hydrants shall be furnished, installed and maintained by the Contractor and shall be placed adjacent to existing hydrants while they are out of service procedures. Temporary hydrants shall be maintained by the Contractor until the existing hydrants are restored to service.
- K. Restoration of service to the customer, including disconnection from the by-pass system and reconnection to the new pipeline, is the Contractor's responsibility and shall be performed at his expense.
- L. Contractor shall be responsible for restoring adjacent properties to original condition. All paved roadways, access ways and driveways shall be repaired and repaved to original condition.

3.2 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION

Item 2685.1 – Temporary Water Bypass Piping

METHOD OF MEASUREMENT:

Measurement for payment for Temporary Water Bypass Piping will be based on the actual linear feet of temporary water main furnished and installed under this item as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Temporary Water Bypass Piping will be based on the unit price bid for this item in the proposal. No measurement or payment will be made for services from the temporary mains to the property service connections. Payment shall be considered as full compensation for furnishing all labor, equipment, materials, and services for installing 2-inch, 4-inch, and 6-inch (minimum diameters) temporary water lines for individual services, for installing temporary bypass valves, for locating, excavating, where required and connecting to the temporary service lines to all users whose water service will be disrupted for more than 4-hours, for providing temporary fire protection at all hydrants which will be out of service for more than 4-hours, for constructing necessary trenches across streets and driveways to protect temporary water lines, connections to existing hydrants where required; pressure testing; providing water for pressure and leakage tests; disinfection and dechlorination as specified; sampling; laboratory analyses; emergency repairs and maintenance, for removing and disposing of all temporary water lines, and for restoring all property damaged or altered in the course of providing temporary water; clean up; and all else incidental thereto, for which separate payment is not provided under other items in the Bid Proposal.

Costs related to labor and materials required to allow flushing of the newly connected service to properties shall be included in this item. Costs to include coordination with property owners, removing existing meters, and flushing of the newly connected service lines.

END OF SECTION 02685

SECTION 02704

PIPELINE PRESSURE AND LEAKAGE TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Perform field hydrostatic pressure and leakage testing of water distribution pipes.
- B. Related section includes the following:
 - 1. Section 02630 – DUCTILE IRON PIPE AND FITTINGS
 - 2. Section 02711 – CLEANING AND CEMENT MORTAR LINING

1.2 DEFINITIONS

- A. Leakage - Leakage is defined as total amount of water introduced into pipe during leakage test to maintain test pressure.

1.3 SYSTEM DESCRIPTION

- A. The working pressure of the pipeline ranges between 20 psi and 65 psi.

1.4 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTALS:
 - 1. Testing schedule and test procedure.
 - a. Indicate proposed time and sequence of testing on schedule.
 - b. Indicated test procedure requirements as follows:
 - (1) Limits of each pipe tested.
 - (2) Position of all valves during testing.
 - (3) Location of temporary bulkheads.
 - (4) Meter calibration data.
 - (5) Pressure gauge calibration data.

- (6) A report containing calculations and documentation pertaining to the pressure and leakage testing shall be submitted to the Cambridge Department of Public Works and the Engineer.

1.5 SEQUENCING AND SCHEDULING

- A. Complete pressure and leakage testing of pipes prior to final cleaning and disinfection; Engineer shall be present during all testing.
 1. Notify Engineer of time and place of testing at least 3 days prior to commencement of work.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide test equipment as follows: Piping connections between pipe tested and water source; Equipment, materials, and facilities required to perform specified tests including but not limited to the following:
 1. Pumping equipment
 2. Calibrated water meter
 3. Calibrated pressure gauges
- B. Sectionalizing devices required including but not limited to the following:
 1. Flanges
 2. Valves
 3. Bulkheads
 4. Bracing
 5. Blocking

PART 3 – EXECUTION

3.1 PREPARATION

- A. Provide blocks, anchors, and supports for pipe before test pressure is applied.

3.2 INSTALLATION

- A. Water:

1. Schedule filling of line through Engineer at least three (3) days in advance of testing. Do not allow water to enter other parts of the pipeline, not subject to testing, unless approved by the Engineer. Dispose of test water in a manner approved by the Engineer.

- B. Venting:

1. Ensure that air release valves and other venting devices are properly installed and placed in open position when filling pipe with water. Do not close hand-operated vent valves until water flows in an uninterrupted stream from each valve.

3.3 APPLICATION

- A. Pressure Testing:

1. All pipe and appurtenances installed shall be hydrostatically tested in accordance with ANSI/AWWA C600, latest version unless stated otherwise herein.
2. Test pressure, expressed in terms of feet of water, applied at any point in pipe equals arithmetic difference between specified test pressure plane elevation and elevation of horizontal center line of pipe at selected location. Multiply value by 0.433 to obtain pounds per square inch. Ensure pressure gauges are accurately calibrated. Do not attempt pressure testing until all air has been vented from the mains.
3. All ductile iron pipe shall be pressure tested at 150 psi for a continuous period of two hours.

- B. Leakage Testing:

1. Conduct leakage testing in conjunction with pressure tests. Ensure that joints in piping are watertight and free from visible leaks during leakage test.
2. Leakage Test Pressure: Maintain specified normal operating line

pressure for pressure testing of reach during leakage test. Maintain hydrostatic pressure within plus or minus 5 psi during entire time of leakage measurements.

3. Leakage Measurement: Do not attempt measurement of leakage until trapped air has been vented and constant test pressure has been established. Measure leakage by means of an approved water meter installed in the pressure piping on discharge of the pump. Ensure that water meter is accurately calibrated.
4. Allowable Leakage: Ensure that pipe reach does not exceed the allowable leakage rate. Calculate allowable leakage with following formula:

 $Q = 0.0075 \text{ DLN}$ where
Q = allowable leakage in gallons per hour
D = nominal diameter of pipe in inches
L = length of section tested in thousand feet (304.8 meters)
N = square root of avg test pressure in psi (12.25 kgs/sq. meter)
5. Calculate allowable leakage separately for each diameter and add resulting allowable leakage rates to obtain total allowable leakage for entire reach.

3.4 FIELD QUALITY CONTROL

- A. Inspection: Locate defective joints and pipe materials during pressure testing.
- B. Locate and repair leaking joints and other defective items of work to reduce pipe leakage to an amount acceptable to Engineer, or where applicable, the Owner's requirements. All repairs shall be performed at no additional cost to Owner.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02704

SECTION 02710

REMOVAL OF PROTRUDING SEWER LATERAL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes the following:
 - 1. Furnishing, and performing removal of protruding sewer laterals in accordance with these Specifications.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Description of equipment, sequence, and a schedule for the removal of protruding laterals.
 - 2. Confined Space Entry Certifications for all Contractor's personnel entering pipeline or access structures.

1.4 QUALITY CONTROL

- A. Comply with Section 01400 – QUALITY CONTROL.
- B. Contractor to submit description of construction method for internally grinding of sewer laterals.
- C. All Contractor's personnel entering pipeline or access structures shall be Confined Space Entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.
- D. Grinding operation shall be observed using concurrent Close Circuit Television (CCTV) Inspection to immediately identify the onset of any damage caused by the cutter.

1.5 REPAIR OF DAMAGES

- A. Any damages to service laterals or the host pipe during the removal of protruding sewer laterals shall be repaired or replaced with new materials as

required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this Contract and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- A. Protruding sewer lateral removal equipment shall consist of remote controlled hydraulically driven cutters and reamers, and remotely operated robotic routers or grinders capable of cutting back protruding sewer service laterals without damage to host pipe.

PART 3 – EXECUTION

3.1 GENERAL

- A. Contractor shall perform all work in accordance with municipal, state and federal requirements. Contractor shall obtain all permits required to perform work prior to the commencement of construction.
- B. Internal grinding of protruding sewer services shall be completed prior to cured-in-place pipelining work.
- C. All work associated with removal of protruding sewer laterals shall be accomplished without excavation from existing ground surface, except in areas specifically designated on the Drawings or as approved by the Owner.
- D. At the locations indicated in the Contract Drawing or as required by the Engineer, the existing protruding service laterals shall be internally grinded to the acceptance of the Owner and/or Engineer.
- E. Edges of protruding pipes that have been grinded shall be consistent across the circular face of the edge and parallel to the surface of the host pipe.
- F. The Contractor shall take care to utilize grinding methods that will not break or fracture protruding pipes or the host pipe. The grinded edge of pipes shall not be jagged or fractured. Methods chosen by the Contractor shall not break or damage the portion of a protruding pipe that is to remain.
- H. The Contractor shall arrange the use of CCTV equipment during the removal of protruding services to document the condition of the host pipe before, during and after the procedure.

PART 4 – COMPENSATION (NOT USED)

- END OF SECTION 02710 -

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SECTION 02711

CLEANING AND CEMENT-MORTAR LINING

**2711.1 CLEAN AND CEMENT-MORTAR LINE LINEAR FOOT
EXISTING 20" CI WATER MAIN**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Providing labor, equipment and material to clean and cement-mortar line, disinfect and place back in service potable water mains as indicated and specified.
 - 2. Repairing and replacing existing pipe, fittings and valves as directed and approved by Engineer.
 - 3. Installing new valves and hydrants as authorized and approved by Engineer.
 - 4. Coordinating and cooperating with Cambridge Water Department (CWD) and Fire Department.
 - 5. Permitting use by Owner of each section of completed pipeline as soon as possible after lining and curing of lining.
 - 6. Owner reserves right to have part or all of repair and replacement work done by others.
- B. Related section includes the following:
 - 1. Section 02210 - Earth Excavation, Backfill, Fill and Grading
 - 2. Section 02615 - Ductile-Iron Pipe and Fittings
 - 3. Section 02640 - Valves and Appurtenances
 - 4. Section 02645 – Hydrants

5. Section 02675 – Disinfection of Water Mains
6. Section 02704 – Pipeline Pressure and Leakage Testing
7. Section 02736 - Temporary Connections

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:
 1. Submit detailed information regarding materials and proportions, strength test results of cement-mortar proposed for lining water mains at least ten (10) days before lining pipeline.
 2. Submit detailed information regarding equipment, access openings, disinfection and flushing, testing and operations schedules proposed for cleaning and lining work.
 3. By-pass pipe and fitting information. By-pass plan showing temporary hydrants, valves, services, street locations.
 4. Submit information on by-pass pipe, valves, temporary hydrants and service tubing materials.
 4. Certifications that all newly-furnished or installed wetted surface metals in contact with potable water comply with the 2014 Safe Drinking Water Act Lead Reduction law and comply with NSF 372
 5. Schedule of proposed cleaning, lining and testing activities.

1.4 QUALITY ASSURANCE

- A. Provide in accordance with Section 01400 and as specified.
- B. General:
 1. Perform work under constant supervision of a foreman with at least five (5) years' experience in this type of work.
 2. Minimize interference with operations and maintenance of contiguous potable water distribution systems.
 3. Prepare and submit to the Cambridge Police a Criminal Offender Record Information (CORI) form for each worker who will be entering private property during the work. Only workers cleared by the Police will be allowed to access private property. All costs related to CORI submittal to be paid by Contractor.

- C. Opening and Closing Pipelines: Engineer to determine suitability of existing pipeline sections for reuse as closure pieces.
- D. Cleaning Pipeline: Engineer to inspect for satisfactory cleaning, defects in pipeline and possible repair or replacement.
- E. Cement-Mortar Lining:
 - 1. Engineer's approval required before cement-mortar lining pipeline sections.
 - 2. Lining to be uniform and thickness not less than 3/16-in. and not more than 1/4-in. at any point.
 - 3. Contractor responsible for the proper curing of cement-mortar lining after it is placed.
- F. Required "C" Values:
 - 1. The Contractor shall conduct loss-of-head flow tests to determine the coefficient "C" in the Hazen-Williams formula for the water mains cleaned and lined under this contract after the work has been completed. Contractor shall also conduct fire flow tests at existing hydrant locations to determine available fire flow at a residual pressure of 20 psi. One fire flow test per street where mains have been rehabilitated shall be conducted. Hydrant flow tests shall be in each direction by swapping the flow and static hydrants.
 - 2. Contractor to secure services of qualified Registered Engineer or other approved agency to perform loss-of-head tests and fire flow tests and determine the coefficient "C" in the Hazen-Williams formula and available fire flow for water mains under this contract after cleaning and lining has been completed.
 - 3. Conduct all tests in the presence of the Engineer.
 - 4. The minimum required coefficient "C" in the Hazen-Williams formula for water mains cleaned and lined under this Contract shall be as follows:

<u>Pipe Diameter</u>	<u>C-value</u>
4-inch	90
6-inch	100
8-inch	110
10-inch	115
12-inch	120
14-20-inch	125
> 20-inch	130

- 5.. The coefficient "C" in the Hazen-Williams formula to be determined from the loss-of-head tests and based on nominal pipe diameters with proper allowance being made for bends, fittings and other appurtenances in accordance with accepted practice.
6. The coefficient "C" in the Hazen-Williams formula shall be determined from the loss-of-head test and based on nominal pipe diameters with proper allowance being made for bends, fittings and other appurtenances and reduction of the inside pipe diameter in accordance with accepted practice.
7. For any section of cleaned and lined water main that the coefficient "C", as determined by loss-of-head tests, fails to meet the required value the contract price for payment to be adjusted as follows:
 - a. For drop of 10 points or less below the required coefficient "C" no reduction in the contract prices.
 - b. For drop between 11 and 20 points below the required coefficient "C", contract payments will be reduced 10 percent per point for section failing to meet the required coefficient "C".
 - c. For drop in excess of 20 points below the required coefficient "C", Engineer will decide whether further reduction in payment of 10 percent per point for section will be made, or if cement-mortar lining to be removed and water main properly cement-mortar lined at no additional costs to the Owner.
8. Portions of water main where it is not practical to carry out loss-of-head tests to determine the coefficient "C" through the full extent of cleaned and lined portion, then several sections shall be tested and a weighted average coefficient "C" shall be determined from the tested sections and be considered representative of the entire cleaned and lined water main.
9. All tests for determining the coefficient "C" for water mains cleaned and cement-mortar lined under this contract to be completed prior to final acceptance of the work.

G. Samples:

1. Prepare and provide samples of cement mortar to be used for lining in accordance with AWWA C602 and instructions of Engineer.
2. Samples of cement-mortar used for lining by the Contractor will be used by the Engineer as one standard of comparison for determining acceptability of finished cement-mortar lining.

3. Contractor shall be responsible for taking, making, curing, storing, packing and shipping for testing all samples of cement mortar used for lining.
4. The Contractor shall arrange and pay for tests of cement-mortar samples.
5. Contractor shall take samples from each separate batch of cement-mortar used for lining. Take at least one set of three test samples for each day mortar is used for lining unless otherwise allowed by Engineer.

1.5 SAFETY REQUIREMENTS

- A. Prevent contamination of contiguous potable water distribution system and services.
- B. Coordinate and cooperate with the CWD and fire department to maintain water distribution and fire protection capability.
- C. Ensure precautions taken for public safety.

PART 2 - PRODUCTS

2.1 CEMENT FOR MORTAR

- A. Use single brand of American-made Portland cement, Type I in accordance with AWWA C602 unless otherwise approved in writing by Engineer.
- B. Use pozzolanic materials in accordance with AWWA C602.
- C. Use admixtures with specific written approval of Engineer and in accordance with AWWA C602.

2.2 WATER FOR MORTAR

- A. Use potable water from Owner's system with prior approval via CWD permit or otherwise as acceptable to Engineer.

2.3 SAND FOR MORTAR

- A. Use sand in accordance with AWWA C602. It shall consist of inert granular material having hard, strong, durable grains produced from hard crystalline rock.

2.4 CEMENT-MORTAR MIX STRENGTH

- A. Provide cement-mortar for lining with the following minimum compressive strengths in 28 days: Individual Minimum 4,000 psi; Average Minimum 4,500 psi

2.5 PIPE, FITTINGS, VALVES AND HYDRANTS

- A. Provide water main pipe, fittings, valves and hydrants in accordance with Section 02615.
- B. The Contractor has the option to furnish and install either cast-iron solid sleeves or mechanical or bell-and-spigot joint types, or cast-iron sleeve type couplings to make closures of water main access openings.
- C. Do not reuse pipe, fittings and valves removed unless otherwise approved by the Engineer.
- D. By-pass piping shall be Victaulic pipe or PVC pipe suitable for use in potable water systems. All temporary hydrants shall be fitted with outlets suitable for use by the local fire department. Service tubing shall be same diameter as existing service piping. The minimum diameter of tubing shall be 1-inch. Water main by-pass shall not be permitted between November 1 and May 1.
- E. Temporary hydrants and fire service lines shall be equipped with gate valves. Residential connections shall be furnished with suitable shutoff valves.

2.6 EMERGENCY SERVICES

- A. Contractor shall provide 24-hour, 7-days per week emergency services to repair or replace temporary piping or service connections which are damaged during the work period.
- B. Contractor shall provide Engineer and the CWD with telephone contact information for personnel who will respond within 1-hour of being notified of a leak or break on the temporary systems. If Contractor's personnel do not respond, the CWD may elect to make repairs with his own forces and backcharge the Contractor. Minimum backcharge shall be based on 2 man response for a 4-hour minimum billing period at overtime rates. Additional costs for equipment and materials shall also be backcharged.

PART 3 - EXECUTION

3.1 GENERAL

- A. Furnish, install, maintain and later remove devices necessary to ensure public safety as required and as approved.
- B. Pipe, fittings, valves, hydrants and appurtenances removed and not reused remain property of Owner except as instructed otherwise by the Engineer.

3.2 OPENING AND CLOSING PIPELINES

- A. All existing gate valves are to be operated by CWD personnel only.
- B. Clean and line access openings at each end of pipeline section.
- C. Provide access openings for cement-mortar lining machine. Distance between access opening locations shall not exceed 1,000 ft. except by written consent of the Engineer.
- D. Provide additional access openings at intermediate gates, bends, fittings and obstructions indicated on the drawings and at other locations necessary for satisfactory cleaning and lining.
- E. Make additional openings due to bends, fittings or other obstructions not indicated on the drawings as necessary.
- F. Cut ductile and cast-iron pipe with suitable power-operated saw approved by the Engineer. Take care to prevent damage.
- G. Do not cut ductile and cast-iron pipe by hammer and chisel or by wheel type cutters.
- H. Prevent dirt, debris, groundwater or foreign matter from entering pipeline, except for materials needed for cleaning and lining.
- I. Carefully remove, clean, cement-mortar line and safely store for reuse a suitable closure section of pipe cut to permit access. If pipe section is unsuitable for reuse, provide and install a new piece, properly lined, of sufficient size and strength.
- J. Replace pipe ends with possible cracks or pipe sections damaged by cutting as determined by the Engineer.
- K. Closure of pipeline access shall be suitable for system pressures expected without leakage.

3.3 CLEANING PIPELINE

- A. Perform in accordance with AWWA C602 by means of suitable electric scraping machine.
- B. Move scraping machine through pipeline by power winch or motorized driver, or force by hydraulic pressure as appropriate for section to be cleaned.
- C. Provide clean interior metal surfaces in the water main ready to receive the cement-mortar lining.

- D. Clean interior of the pipe such that it is free of sharp projections that would affect thickness of lining and all matter detrimental to lining.
- E. Assure that cleaning debris will not interfere with operation of air valves, services, laterals, valves and other water main appurtenances.
- F. Remove debris from inside of pipe and dispose of in acceptable manner.
- G. At point where debris is flushed or removed from pipe, provide suitable containment and settling area, acceptable to Engineer, to ensure that sediment, other unsatisfactory material and flushing water do not enter into drains, sewers, waterways or onto private property.
- H. Immediately following each debris removal or flushing operation, clean street and other affected areas to satisfaction of Engineer.
- I. Prevent entry of dirt, debris, groundwater, or other foreign matter into pipeline except materials needed for cleaning and lining of pipe. Keep all pipe openings closed with approved plugs during non-work periods.
- J. Upon completion of cleaning operations in each section of pipeline, furnish suitable lights and mirrors for inspecting the interior of cleaned pipeline section.
- K. Advise Engineer of any evidence encountered during cleaning indicating repair or replacement may be required before pipeline section is lined.
- L. Assist Engineer in making inspection to determine acceptability of cleaning and need for repair and replacement. Final determination of acceptability shall be based on C-factor flow testing as specified hereinbefore.

3.4 REPAIR AND REPLACEMENT

- A. Perform repair and replacement authorized and approved by Engineer.
- B. Repair or replace at Contractor's expense pipe, fittings, valves damaged by Contractor's negligence in manner acceptable to Engineer. Allow Engineer to determine if damage is due to Contractor's negligence.

3.5 CEMENT-MORTAR LINING

- A. Perform work in accordance with AWWA C602.
- B. Proceed as soon as possible after pipeline is cleaned and Engineer has approved pipeline to be lined.
- C. Mix for sufficient time to obtain maximum plasticity. Use mortar for lining before initial set takes place.

- D. Trowel lining conforming to AWWA C602.
- E. At sharp bends, specials and areas closely adjacent to valves, and defective areas, apply cement-mortar lining by hand.
- F. Assure cement-mortar lining does not interfere with operations of air valves, hydrants, service laterals, valves and other appurtenances. Contractor to blow back to clear service connections.
- G. Do not pressurize or place back in service cleaned and lined pipe until cement-mortar lining has been satisfactorily cured and not before 72 hours have passed after completion of lining operations in pipeline section.

3.6 INSTALLATION OF NEW VALVES AND HYDRANT ASSEMBLIES

- A. Perform work in accordance with Sections 02640 and 02645.

3.7 DISINFECTION AND FLUSHING

- A. Disinfect and flush pipeline sections, including connections, valves, hydrant laterals, as specified in Section 02675 after cement-mortar lining completed and cured.
- B. Prevent contamination of water in existing water mains. Dispose of water used in disinfecting and flushing in a manner acceptable to the Engineer.

3.9 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01700.

PART 4 - COMPENSATION

Item 2711.1 --- CLEAN AND CEMENT-MORTAR LINE EXISTING 20" CI WATER MAIN

METHOD OF MEASUREMENT

Payment for Cleaning and Cement-Mortar Lining of the existing 20" CI water main shall be based on the Unit Price bid in the proposal. Measurement for Payment for Cleaning and Cement-Mortar Lining of the existing 20" CI water main shall be based on the actual linear feet of complete and functional cleaned and cement-mortar lined water main as shown on the Contract Documents or as directed by the Owner or Engineer. Measurement shall be taken along the center line of the pipe from the inside face of access openings.

Water main that is cleaned and cement-mortar lined but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit price bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage. All tests for determining the coefficient "C" for water mains cleaned and cement-mortar lined under this contract to be completed prior to final acceptance of the work.

BASIS OF PAYMENT/INCLUSIONS

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Cleaning and Cement-Mortar Lining of the existing 20" DI water main complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: required submittals and work plans; all public notification and coordination; saw cutting pavement and concrete; excavation of bituminous concrete; excavation for access openings as shown on Contract Documents (spacing not to exceed 1,000 feet) and at all intermediate gates, bends, fittings, and obstructions indicated on the Contract Documents; transporting material to and from soil staging area; clean and line access openings at each end of pipeline section; cutting existing water main; removal, cleaning, cement-mortar lining, and storage of closure section of pipe cut to provide access; replacement of pipe if section is unsuitable for reuse with new properly lined pipe of sufficient size and length; replacement of pipe ends cracked or damaged by cutting; cleaning of the pipeline with suitable electric scraping machine; removal and disposal of all debris from pipeline in acceptable manner; inspection of interior of cleaned pipeline section; cement-mortar line pipeline; cement-mortar sharp bends, specials, areas adjacent to valves, and defective areas by hand; disinfection and flushing of pipeline; dechlorination of chlorinated water; disposal of disinfection, flushing, and dechlorinated water; closure of pipeline access; backfill of pipeline access to grade; emergency response costs, and incidental work not indicated for payment elsewhere.

For any section of cleaned and lined water main that the coefficient "C", as determined by loss-of-head tests, fails to meet the required value the contract price for payment to be adjusted as follows:

- a. For drop of 10 points or less below the required coefficient "C" no reduction in the contract prices.
- b. For drop between 11 and 20 points below the required coefficient "C", contract payments will be reduced 10 percent per point for section failing to meet therequired coefficient "C".
- c. For drop in excess of 20 points below the required coefficient "C", Engineer will decide whether further reduction in payment of 10 percent per point for section will be made, or if cement-mortar lining to be removed and water main properly cement-mortar lined at no additional costs to the Owner.
- d. Portions of water main where it is not practical to carry out loss-of-head tests to determine the coefficient "C" through the full extent of cleaned and lined portion, then several sections shall be tested and a weighted average coefficient "C" shall be determined from the tested sections and be considered representative of the entire cleaned and lined water main.

END OF SECTION 02711

SECTION 02712

ILLCIT CONNECTIONS SURVEY

2712.1

**ILLCIT CONNECTION SURVEY
(ENTIRE PROJECT AREA)**

LUMP SUM

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Perform field survey for identification and confirmation of all illicit sanitary sewer discharges and all sanitary sewer cross connections to the storm drain system within the entire Project Area, or as otherwise required in the Contract Drawings, or by the Engineer.
2. Perform dry weather flow sampling, water quality testing, dye testing, or other methods as acceptable by the Engineer. It shall also include visual inspection of manholes, catch basins and adjacent buildings.

1.2 RELATED TECHNICAL SECTIONS

A. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Within 8 weeks after the Notice to Proceed, a Work Plan that includes the following:
 - a. Description of equipment, methods, and sequencing of dry weather sampling of storm drains for the following parameters: fecal coliform, enterococci, oil & grease and surfactants
 - b. Description of methods and products for flow sampling and testing; and dye testing with concurrent Close-Circuit Television (CCTV) Inspection.
 - c. Description of methods and sequencing of dry weather inspection of storm drain manholes.
2. Confined Space Entry Certifications for all Contractor's personnel entering pipeline or access structures.
3. A log tracking and documenting field survey procedures which may

include flow testing, dye testing, or other approved methods. The log shall include the following:

- a. Date, time, weather of test,
 - b. Method(s) of field survey for each test conducted,
 - c. Locations where dye, or flow testing is introduced for testing and observing, and within which pipe the dye was found.
 - d. If applicable, street number where testing is conducted.
 - e. Comments section to log observations and confirmation of illicit connections.
4. Dry Weather Sampling and Testing Log that includes the locations of where dry weather samples are collected, dates of dry weather sampling conducted, date and time samples sent and returned from the lab, and observations during sampling (any visible debris or evidence of odors).
 5. Results from dry weather sampling and testing.
 6. A log of dry weather manhole inspections that includes which manholes were inspected for illicit connections, dates and observations from the inspection (any visible debris or evidence of odors).
 7. At the completion of the survey, a Summary Report indicating the sources of illicit connections and confirmation that said sources have been reconnected to the proper pipe (e.g. sanitary sewer or storm drain).

1.4 QUALITY ASSURANCE

- A. Comply with Section 01400 - QUALITY CONTROL
- B. All Contractor's personnel entering pipeline or access structures shall be Confined Space Entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.
- C. Dry weather flow sampling and testing shall follow best practices per the U.S. Environmental Protection Agency (EPA) Illicit Discharge Detection and Elimination Guidance Manual.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 GENERAL

- A. The field survey shall include tests and observations to identify the source of all illicit sanitary sewer discharges and all sanitary sewer cross connections to the storm drain system in the Project Area, or as otherwise required in the Contract Drawings. The field survey shall be concluded at the completion of pipe and structure installation and cured-in-place pipelining activities, repair, replacement and reconnection of services, and testing of installed systems.
- B. Dry weather sampling of existing or new storm drains shall be conducted after a 72-hour period of no precipitation. Dry weather sampling shall be according to the Contractor's illicit connections survey Work Plan submittal and in the order noted in the Work Plan sampling schedule. In the event that results obtained from a dry weather sample indicate an illicit connection, the Contractor shall further investigate the upstream storm drains, catch basins, and manholes to determine and isolate the source and extent of the illicit discharge.
- C. The Contractor shall investigate and determine the purpose and source of all building service laterals, whether existing, proposed, re-directed or abandoned. Methods shall include, but are not limited to, CCTV inspection of laterals, internal inspections within adjacent buildings, and dye testing. Contractor shall record location, size, material and relative invert elevation of each lateral connection with respect to the pipeline. For each existing or proposed drain lateral, Contractor shall investigate all sanitary fixtures within the associated building to verify connectivity to the sewer lateral. Contractor shall note presence of floor drains or other outlet pipes adjacent to buildings. Contractor shall obtain written approval from the Owner and property owner(s) prior to any testing and/or building entry.
- D. It is the Contractor's responsibility to survey and remove illicit connections within the entire Project Area. The Project Area constitutes the entire limit of work for construction and the Contractor shall assume and rule out the presence of illicit discharges within all aspects of the storm drain system, including but not limited to: newly installed storm drains, existing storm drains, newly installed manholes and catch basins, existing manholes and catch basins, existing sewers converted to drain, newly installed drain laterals, existing drain laterals, existing sewer laterals converted to drain, and all private plumbing and fixtures connected to drain laterals.
- E. During the illicit connections survey, the Contractor shall submit ongoing results of the field survey to the Owner for review. Upon completion of the field survey and removal of illicit connections, the Contractor shall submit in writing to the Owner, a summary of the results of the illicit connections survey and confirmation that illicit connections have been removed from the Project Limits. The Contractor shall obtain Owner approval prior to the commencement of final paving in the Project Area If an illicit connection is

detected in the Project Area after the confirmation has been submitted and prior to Project Closeout, the Contractor shall remove the illicit connection and restore the surface to final conditions at no additional cost to the Owner.

PART 4 – COMPENSATION

Item 2712.1 – Illicit Connections Survey (Entire Project Area)

BASIS OF PAYMENT/INCLUSION

Under the Lump Sum Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to identify illicit connections (laterals and cross connections) complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: dry weather sampling and subsequent visual inspection of each drain manhole listed in the Contractor's Work Plan in order to visually identify illicit sanitary connections to the storm drain within the Project Limit; transportation and processing fees for testing of samples; coordinating with homeowners and residents; introducing dye into plumbing fixture connected to suspected illicit service; introducing dye into upstream manhole of suspected cross-connection; concurrent CCTV inspection during dye testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Illicit Connection Survey shall be based on the Lump Sum Price bid in the proposal. Measurement for payment shall be based on the Schedule of Values for complete and certified confirmation of all illicit connections removed.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: CCTV for purposes of cleaning, Cured-in-Place Pipelining, or post-construction inspection; redirection of illicit services or elimination of cross connections.

- END OF SECTION 02712 -

SECTION 02750

ROOT INTRUSION REMOVAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section includes the following:

1. Furnishing, and performing removal of root intrusions by means of cutting or chemical treatment in accordance with these Specifications.

1.2 RELATED TECHNICAL SECTIONS

A. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete root intrusion removal and testing and sealing operations. Details and description of construction methods, equipment, and process description including all pertinent information for any chemical agents to be used in the operation.
2. Confined Space Entry Certifications for all Contractor's personnel entering pipeline or access structures.
3. Name, business address and telephone number of the firm performing the root intrusion removal (if different from the Contractor).
4. Contractor to submit written evidence that they have obtained pollution liability coverage for the use of chemical agents for root intrusion removal.
5. Contractor to submit qualifications of a Massachusetts State Certified pesticide applicator.

1.4 QUALITY CONTROL

A. The Contractor performing the root intrusion removal shall have completed at least three (3) projects, in the United States, within the past two (2) years and projects that included root intrusion removal. Note: A combination of projects

satisfying each of the above provisions may be acceptable as long as two (2) projects have been successfully completed for each provision.

- B. Supervisory personnel shall have a minimum of five (5) years experience and shall have completed at least two (2) projects of similar size and complexity as this project with the United States within the past five (5) years.
- C. Rejection of any subcontractor and/or manufacturer by the Engineer due to insufficient qualifications shall not be grounds for modifications to the Contract Documents such as change in scope, time of completion or contract amount.
- D. Designated supervisory personnel shall be directly involved with and used on this project. Substitutions of personnel will not be allowed without written authorization of the Engineer.
- E. All Contractor's personnel entering pipeline or access structures shall be Confined Space Entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.

1.5 ACCEPTANCE

- A. The Engineer shall inspect and approve the root intrusion removal work. Any pipes damaged by the Contractor during the root intrusion removal work shall be repaired and/or replaced by the Contractor at no additional cost to the Owner.
- B. Final acceptance of work shall not be granted until all damaged areas have been repaired to the satisfaction of the Owner and Engineer.
- C. Contractor shall perform a post construction internal inspection in accordance with Section 2760 – PIPELINE CLEANING AND INTERNAL INSPECTION. Final acceptance of the work shall not be granted until post installation inspection has been reviewed and approved by the Engineer.
- D. Contractor shall perform testing as specified.

PART 2 – MATERIALS

2.1 COMPOSITION OF CHEMICAL ROOT TREATMENT

- A. The chemical root control agent shall be registered with the EPA and in compliance with all local, state, and federal requirements. The chemical root control shall be labeled for sewer lines. The chemical root treatment material shall not permanently affect the parts of the trees distant from the treated roots.
- B. The chemical root control agent shall contain an active ingredient for controlling root intrusion and deterring their re-growth. The active ingredient

shall meet the following requirements:

1. Shall be a Category “E” compound,
 2. Shall not be considered a carcinogen, tetratogen, mutagen, or oncogene, based on laboratory testing,
 3. Shall be non-volatile,
 4. Products containing the active ingredient(s) metam-sodium or copper sulfate are not allowed.
- C. The chemical root control agent shall contain a surfactant system to deliver the active ingredient to the target root issue. The surfactant system shall meet the following requirements:
1. Shall produce a dense, small bubble, clinging foam, which sustains its shape for a minimum of one hour,
 2. Shall enhance the penetration of herbicide into root masses,
 3. Shall contain an Alkylpolyglucoside (formulations of vegetable oil and carbohydrate from agricultural products),
 4. Surfactants designed to foam chemically, upon contact with water, shall not be accepted.

PART 3 – EXECUTION

3.1 GENERAL

- A. Roots shall be removed by mechanical or hydraulic means and then treated with approved chemical agents to deter re-growth of the roots in the designated sewers where root intrusion is present. Special precautions should be exercised during the cleaning operations to assure virtually complete removal of visible roots from the sanitary sewers and/or storm drains.
- B. Upon application of chemical agents, the Contractor shall wait a minimum of 5 weeks for chemical agent to take effect. After a minimum of five weeks, the Contractor shall observe treated section of pipe, remove any necessary roots by mechanical or hydraulic means, and test and seal treated section of pipe. Upon successful testing of pipe, the Contractor shall then proceed with any other required work including cured-in-place pipelining.

3.2 ROOT INTRUSION REMOVAL

- A. Procedures may include devices such as rodding machines; expanding root

cutters and porcupines; hydraulic procedures such as high-pressure jet cleaners; and chemical agents.

- B. Contractor shall perform all work in accordance with municipal, state and federal requirements. Contractor shall obtain all permits required to perform work prior to the commencement of construction.
- C. All work associated with root intrusion removal operations shall be accomplished without excavation from existing ground surface, except in areas specifically designated on the Drawings or as approved by the Owner.
- D. Application of any approved chemical root treatment shall be in accordance with the Manufacturer's printed instructions.
- E. All roots removed from the sanitary sewers and/or storm drain shall be hauled away and disposed by the Contractor at the Contractors expense.

PART 4 – COMPENSATION (Not used)

- END OF SECTION 02750 -

SECTION 02760

PIPELINE CLEANING AND INTERNAL INSPECTION

2760.1	CLEANING OF DRAIN VAULT NO. 5	LUMP SUM
2760.2	CLEANING OF BOX CULVERT COMBINED SEWER	LUMP SUM

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section includes the following:

1. Furnishing, and performing gravity-flow infrastructure cleaning and inspection work for pipe diameters ranges of 6-in to 36-in in accordance with these Specifications.
2. Work shall include cleaning and videotaping of existing, reconstructed, rehabilitated, or new sewers and drains, as well as flow handling and/or bypass pumping of existing flows as needed to perform the cleaning and inspection.
3. Where indicated, remove deposited material from in-line storm drain sumps or catch basin sumps.
4. Requirements for the testing of removed sediment and its proper disposal.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 01500 – TEMPORARY FACILITIES AND CONTROLS
- B. Section 02080 – SOIL AND WASTE MANAGEMENT
- C. Section 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL.
- D. Section 02761 – FLOW BYPASS

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Sewer and Storm Drain Cleaning Plan at least two weeks prior to the start of any cleaning, in which shall include:

- a. Proposed method of pipe cleaning and dewatering including the equipment to be used and OSHA-compliant confined space entry procedures.
 - b. Proposed method of managing wastewater, erosion controls, solid waste management, and which, if any, additional permits are required,
 - c. A list of lawful disposal sites proposed for dumping debris from cleaning operations.
2. Work Plan including: hours of operation, location of proposed access manholes, sequencing of work description, number of shifts, number of crews, and expected time to complete the work.
 3. Vehicular and Pedestrian Management Plan including: access, avoiding damage to existing trees, preventing leakage from hoses, and minimizing noise from pumps.
 4. Internal Inspection Report including:
 - a. Pre-rehabilitation or pre-cleaning internal inspection logs and video (if required),
 - b. Post-construction, post-rehabilitation, or post-cleaning internal inspections logs and video,
 - c. Summary highlighting results of the investigations. All documentation shall be cross-referenced by footage meter device to enable the reviewer to identify a particular location being viewed.
 1. These records shall be in printed form showing: the Owner's name; type of project; Contractor's name; date; manhole location; depth to invert; section cleaned and televised; the number of lateral connections to the section televised; type (e.g. sanitary sewer, combined sewer, or storm drain); street address and type of all laterals connected to storm drain; diameter of pipe; length of section; exact location(s) of pipeline defects; type of equipment used; and any special remarks concerning the conditions of the pipe line, manholes, and separation plates.
 5. Rehabilitation Report: If the Scope of Work consists of rehabilitation (cured-in-place lining) of existing pipe, the report includes:
 - a. Details and documentation for areas in need of point repairs (as per pipe inspection firm, as directed by the Owner). Point repairs shall

be completed before rehabilitation of the sewer or drain can commence.

- b. The post-rehabilitation inspection report shall detail the condition of rehabilitated items and describe recommendations for repair of any defects.
 - i. All areas where the rehabilitated sewer or drain is defective due to, but not limited to, poor workmanship and/or chemical deterioration, shall be identified by the Contractor. Contractor shall make all the necessary arrangements to repair the defective area.
 - ii. Defective areas shall be repaired in accordance with the manufacturer's recommendations.
 - iii. All repaired areas shall be inspected by the Owner and/or a representative of the manufacturer. Closed-circuit television inspection results shall be provided to the Owner as specified.
 - iv. Once approval of repaired areas has been granted, the Contractor shall return all sewage and/or drain flows to normal, remove all equipment and debris, and restore all disturbed areas to their original conditions, as shown on the Drawings.
- 6. A sample DVD showing the quality of work obtained by the proposed assembly prior to internal inspection work. The quality of work shall be acceptable to the Engineer.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. The sewerage and storm water systems to be cleaned and televised may be equipped with flow metering devices, telemetry hardware or other appurtenant equipment. It is the Contractor's responsibility to verify if this type of equipment is installed within the vicinity of the cleaning and televising operations. If the Contractor encounters this type of equipment, the Contractor shall notify the Owner, so that the Owner may remove this equipment before cleaning and televising operations begin. The Contractor will be responsible for the cost to replace or repair any flow metering devices, telemetry hardware or other appurtenant equipment damaged during his/her operations.
- C. There may be common manholes within the scoped infrastructure (common manholes are defined as one manhole providing access to both the storm drain and sanitary sewer when they are constructed in the same horizontal alignment separated by 6 to 12 inches vertically). Common manholes have a separation

plate placed in the invert of the storm drain for access to the sanitary sewer. This physical arrangement may have a bearing on the methods and equipment used for cleaning, since the access opening to the sewer may not be as wide as the sewer itself for large diametered sewers. The contractor shall remove the separation plate when necessary, replace, and secure the separation plate at the end of the day. If a separation plate is already removed and placed off to the side of the manhole, the Contractor shall contact a City representative and reinstall the plate if instructed. If the separation plate is missing, the exact location of that manhole will be noted in the records and a City representative shall be notified.

- D. The cleaning and inspection of the infrastructure may require manned entry in the sewer or drain to place or remove equipment, or to facilitate manual cleaning of the pipeline. All confined space entry procedures must be in compliance with OSHA regulations.

PART 2 – MATERIALS (Not Used)

PART 3 – EXECUTION

3.1 PIPE CLEANING

- A. The purpose for cleaning of the sewer or drain is to facilitate the inspection and/or rehabilitation of the sewer or drain, or to increase pipe capacity.
- B. It is the intent of this Contract that sewers or drains be cleaned by either hydroflushing with jetting and vacuum truck, or manual scouring using pressure washing and vacuum truck.
 - 1. Hydraulic equipment shall consist of high velocity type equipment, capable of jetting up to 2,000 psi and 125 gpm of water. No hydraulic equipment that operates under a “head of water” or that would cause excessive internal pressure shall be permitted without written approval of the Engineer.
- C. Indicated manhole and catch basin sumps shall be cleaned using a hydraulic clamshell for immediate placement in self contained truck bed or adjacent dump truck. In circumstances where mechanical equipment could damage existing manhole material or where access does not permit, sumps shall be cleaned using manual means.
- D. The sewer or drain shall be cleaned using mechanical, hydraulically-propelled, and/or high-velocity pipe cleaning equipment, which does not exert internal pressures great enough to damage sewer or drain pipe and manholes. Selection of the cleaning equipment shall be based on the condition of the sewer or drain at the time work commences based on the Pre-rehabilitation/cleaning

inspection. The equipment and methods selected shall be reviewed by the Owner.

- E. Satisfactory precautions shall be taken to protect the sewer or drain from damage that could be inflicted by improper use of cleaning equipment. Any damage inflicted upon the sewer or drain due to improper use of cleaning equipment, regardless of the technique used, shall be repaired by the Contractor to the satisfaction of the Owner, at no additional cost to the Owner.
 - 1. If areas of misalignment of pipe, dropped joints, infiltration, structural failures, or other obstructions are suspected during cleaning operations, and confirmed during exploratory televising, the Contractor shall record the approximate location of the defective area and notify the Owner.

- F. All sludge, dirt, sand, rocks, grease, and other solid or semi-solid materials that may cause an obstruction in the sewer or drain or impair the inspection or rehabilitation of the sewer or drain shall be removed from the sewer or drain and site during cleaning operations (at least once each work day) in suitable watertight containers, and disposed of in a manner acceptable to the Engineer and in strict conformance with all applicable federal, state, and local laws and regulations, at no additional cost to the Owner. It shall be the responsibility of the Contractor to secure a legal dump site for the disposal of the material.
 - 1. The Contractor shall collect all data required by all permits or their issued conditions. It shall consist of periodic sampling and analysis of system effluents and discharge quantities.

- G. Clean-up operations shall include all removal of debris out of manholes and off the ground around manholes and access pits. The Contractor shall not be allowed to accumulate debris and cleaning discharge materials on the project site unless stored in totally enclosed watertight containers approved by the Engineer.

- H. Acceptance of the sewer or drain cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Engineer. For the purposes of these specifications cleaning shall be considered complete when eighty-five percent (85%) of the interior pipe surface area is visible during internal inspection in flow or limited flow conditions. Bypass pumping may be required to measure compliance with this standard. If the television inspection indicates that the cleaning has not been completed in accordance with these Specifications, the Contractor shall be required to re-clean and re-inspect the sewer or drain line until the cleaning is shown to be satisfactory, at no additional cost to the Owner. The Engineer may require the Contractor to pull a double squeegee (with each squeegee the same diameter as the sewer or drain) through each manhole section as evidence of adequate cleaning. Particular attention should be given to the adequacy of the cleaning to provide for the proper installation of the lining system.

- I. The Contractor shall be responsible for locating and uncovering all known buried manholes required to complete the work at no additional cost to the Owner.
- J. Maintain flow around the work in a manner that will not cause excessive surcharging of sewers or drains, and that will protect the public and private property from damage and flooding. Bypass pumping may be required to comply with this task. Refer to Section 01010 – SUMMARY OF WORK for the anticipated flow through the system.
- K. No debris, equipment, tools, or other foreign matter shall be left in the sewers, drains and manholes, or at the work sites, as a result of the Contractor's operations.
 - 1. A manhole may be used as a temporary collection point for debris. The debris shall be completely removed from the manhole by a vacuum truck, clamshell or other mechanical means before televising any type of pipe. Sandbags, or suitable equal, may be required to prevent flushed material from continuing downstream.
 - 2. Any debris that migrates past the Contractor's efforts to collect the loosed material and then deposits in downstream MWRA interceptors shall be removed from the MWRA pipes at no additional costs to the Owner per Section 01500 – TEMPORARY FACILITIES AND CONTROLS.
- L. All amounts of sludge, dirt, sand, rock, roots, grease, and other solids or semi-solid material shall be removed from the pipe interior with a collective device and disposed of by the Contractor at no additional cost to the Owner. All such material, may cause an obstruction or impair in the inspection or rehabilitation of the sewer or drain, and shall be flushed downstream and removed at each downstream manhole of the reach being cleaned with a collection device.
- M. All of Contractor's personnel shall be thoroughly familiar with all phases of sewer or drain line cleaning to ensure optimum performance, without causing damage to the sewer, drain, manholes, and appurtenances.
- N. When water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed at any time, nor shall a hydrant be used for the work described in these Contract Documents, unless a reduced pressure backflow preventor is provided by the Contractor and prior approvals have been obtained from the City of Cambridge Water Department for use of the fire hydrant. Use of the backflow prevention device shall be in accordance to Massachusetts Department of Environmental Protection (DEP) Regulation 310. CMR 22.22 and the Cambridge Water Department Cross Connection Control Program.. The Contractor shall be responsible for all related charges for the

set-up, including the water usage bill. All expenses shall be considered incidental to the cleaning of the existing sewer or drain.

- O. During the course of cleaning, when obstructions are encountered, an attempt shall be made to clean from both the upstream and downstream manholes. Should the obstruction(s) prevent the line from being cleaned, the Engineer shall be immediately notified. If, in the opinion of the Engineer, a repair is required to facilitate cleaning, cleaning shall be completed upon satisfactory completion of the repair. The repair may be completed by the Owner or completed by the Contractor as a change order. No additional compensation will be paid to the Contractor for any portion of the sewer/drain, which requires re-cleaning after successful completion of the repair.

- P. Approved type of equipment for pipe cleaning shall include, at a minimum, the following:
 - 1. High velocity equipment shall have a minimum of 800 feet of high-pressure hose and carry its own water tank, auxiliary engines and pumps and hydraulically driven hose reel. Install a gauge to indicate working pressure on the discharge of high-pressure water pumps.
 - a. For unmanned jetting method, two or more high velocity nozzles shall be available. The nozzles shall be capable of producing a scouring action for 15° to 45° in all size lines designated to be cleaned. All controls shall be located so that the equipment can be operated above ground.
 - b. For manned pipe and manhole cleaning method, a high velocity gun shall be capable of producing flows from a fine spray to a long distance solid stream. Hand tools or intrinsically safe power tools may also be required.
 - 2. Mechanical cutting device suitable for root removal shall be available for use as necessary.
 - 3. Footage metering devices shall be used for location of all equipment, devices, points of reference, on measuring target that is known at all times at the ground level. Footage metering device shall be designed so that distance recorder can be set at zero when equipment or device is at entrance of pipe inside manhole. Entering device shall have an occurrence of not less than one-tenth of a foot. Marking of cable, or similar means, that require interpolation of depth of manhole shall not be permitted. The accuracy of the metering devices shall be checked daily by the Contractor by the use of a walking meter, roll-a-tape, or other suitable device.

- Q. The Contractor shall be responsible for removal of any equipment that may become lodged or hung up in the system being cleaned. The Contractor will

not be reimbursed for work, including television inspection, required to retrieve lost equipment.

- R. The walls and inverts of all manholes within the reaches of lines shall be cleaned thoroughly with a high velocity water spray.
- S. Upon completion of the cleaning of each section or in a flooded condition, a full sized brush or scraper shall be pulled through the line to insure complete removal of all debris from the line. Dumping or forcing of debris into a larger diameter line or receiving water body is not permitted.
- T. Do not allow solids removed in the cleaning process to be released onto streets or into ditches, surface waters, catch basins, cleanouts, storm drains, or sewer or drain manholes.
- U. Acceptance of sewer and storm drain cleaning work is subject to review by the Engineer. If visual inspection or internal television inspection shows solids, soil, sand, grit, or other debris remaining in the line, cleaning will be considered unsatisfactory. Repeat cleaning, and inspection of the storm drain line until the Engineer judges cleaning satisfactory.
- V. Repair manholes dismantled or damaged during the cleaning process, and replace manhole frames and covers damaged during the cleaning process.

3.2 CLOSED CIRCUIT TELEVISION

- A. The method of Technicolor internal inspection of pipelines and manholes is dependent on pipe size. The height of the camera shall be a level that is within the middle third of the pipe, preferably at the springline to equally capture the crown and invert of the pipe. The camera shall be at a level that can look up the first 12 inches of service laterals.
 - 1. Where permitted, the preferred method of inspection shall be by use of a robotic camera vehicle assembly, capable of being controlled from an aboveground command center.
 - 2. For larger pipes where the height of the camera crawler can't not be adjusted to the middle of the pipe, the inspection shall be obtained by use of manned entry and "walking the pipe".
- B. The Contractor shall follow all OSHA standards or other applicable regulations related to work in confined spaces.
- C. The Contractor shall provide to the Owner two (2) sets of DVDs of all internal inspections.
 - 1. All field DVDs must be submitted in a casing with the names of all streets displayed on the front and side cover with field reports.

2. All final reports submitted along with the DVD must be bound together using an approved method, have street names with DVD numbers listed in alphabetical order along with the project title on the cover and have a clear plastic cover on the front. DVDs must be clearly labeled so that future viewers will be able to easily identify at any point of the DVD what location and type of sewer line was televised. The street address and type of all lateral connections to the storm drain shall be verbally noted on the DVD and in the report.
- D. The reporting of observations during the TV inspection of sewer and drains from one manhole to the next, and the database shall follow the format published in the Pipeline Assessment and Certification Program (PACP) as developed by the National Association of Sewer Service Companies (NASSCO). The Owner may require additional database fields.
 1. At the beginning and end of each continuous pipeline inspection, the total pipeline shall be described by the narrator stating the size, type, start and end location, street name, intersecting street, invert elevation, and limits of each pipe section.
 - E. The electronic format of reporting data for the work of TV inspections of sewers and drains shall be totally compatible with the City of Cambridge's current standard of the Flexidata Software Program.
 - F. The Contractor shall utilize the City's manhole identification numbering system when reporting the results of TV inspections. Contractor shall also provide written description or site map of each manhole such that the location of the manhole is clearly defined and retrievable. If a buried manhole is discovered during the televising of any mainline, the Contractor should allocate a new manhole number (supplied by Owner) and record it.

3.3 PROCEDURES

- A. Prior to the internal inspection work, the Contractor shall be responsible for diverting all flows from the area to be inspected. Prior review and approval by the Engineer of the Contractor's intended methods shall be required for any flow control, diversion, bypassing, or dewatering activities.
- B. During the internal inspection of pipelines, the Owner shall be able to view the pipe interior as it is being inspected on a TV monitor set up in the command center.
- C. The camera and vehicle assembly shall be an industry standard for internally inspecting pipelines.
 1. The camera shall be a Radial View Camera (RVC) able to view 360° and has the capability to pan and tilt in any direction. Picture quality

1. Infiltration/Inflow Sources
2. Lining Defects
3. Structural Defects, including broken pipe, collapsed pipe, cracks, and all other structural abnormalities.
4. Abnormal joint conditions, such as root intrusion, protruding pipes, in-line pipe size changes, mineral deposits, grease, obstructions, etc.
5. Pipe Connections
6. Obstructions, offset joints, misalignments, or other conditions that may affect pipe bursting, slip-lining or cured-in-place pipe rehabilitation operations.

All such conditions shall be recorded and shall be considered a point repair if the conditions inhibit rehabilitation work. Color photographs of all questionable conditions shall be taken and labeled as to location, condition, and date for subsequent review.

- H. The Contractor will take and label still pictures for all extruding laterals, any locations where sections of the sewer pipe are missing or the pipe is near collapse or whenever directed by a City Representative. The Contractor shall provide a sketch showing tie distances from at least three permanent features to the starting and ending manhole. A distance between the starting and ending manhole, as measured on the ground, shall be provided.
- I. For large pipe that exceed the limits of the mechanical crawler and required manned entry to “walk the pipe”, intrinsically safe 2-way communication must be maintained between entrant(s) and spotter(s) and also between entrant(s) and command center to facilitate procedure in Paragraphs 3.3.G and 3.3.H of this Section.
1. Care shall be taken to accurately measure the footage throughout the inspection. If measurements recorded via cable length is inaccurate due to slack created while “walking the pipe”, distances shall be obtained by alternate means (e.g. intrinsically safe laser measuring) and recorded in the written logs as such. Verbal correction on the audio track shall override any conflicting digital footage on the video display.
- J. The Contractor shall be responsible for access to the sewer or drain system, including; locating, uncovering, and opening manholes, flow control diversion bypassing and/or dewatering within manholes, or pipe reaches, dewatering, surface restoration, and all other work required to perform the specified work to the Engineer's satisfaction.

- K. All internal inspections shall be performed by a firm specializing in large diameter sewer/drain line inspections, and shall be witnessed by representative of the Pipelining Manufacturer (when applicable) and the Owner/Engineer.

3.4. DYE TRACING

- A. In the event that a building or catch basin lateral requires dye tracing confirmation during the time of the television inspection, the Contractor shall coordinate the private property access with the television operations.
- B. The Contractor shall introduce the dye into the system (e.g. catch basin, internal plumbing) and be responsible for recording the test result and providing to the City.

3.5 ACCEPTANCE

- A. Internal inspection operations, both pre- and post-construction/cleaning, shall be considered for approval upon receipt by the Owner of the following:
 - 1. Two (2) copies of the internal inspection reports including: DVD media showing pipelines, manholes, and structure inspections, and photographs complete with location, time, and date stamp depicting all information described in paragraph 3.3.G in this Section.
- B. The rehabilitated sewer or drain shall not receive acceptance until final approval by the Owner.

PART 4 – COMPENSATION

Item 2760.1 --- Cleaning of Drain Vault No. 5

METHOD OF MEASUREMENT:

Payment for Cleaning of Drain Vault No. 5 shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for Cleaning of Drain Vault No. 5 will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Cleaning of Drain Vault No. 5 complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: required submittals and work plans; securing a temporary dump site; storm and sewer flow handling including sand bagging, temporary plugs and bulkheads, dewatering and flow bypassing; making arrangements for a water source; loosening, cleaning, and extracting deposits throughout the structure; transporting material to/from dump site; end-of-day surface cleaning around access manhole; repair of any

damage caused by the Contractor; restoration of surface; and incidental work not indicated for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: characterizing and disposing removed material to be paid under appropriate OHM bid item; pre- and post-television inspection; cleaning of combined sewer; and modifications to Drain Vault No. 5 structure.

Item 2760.1 --- Cleaning of Box Culvert Combined Sewer

METHOD OF MEASUREMENT:

Payment for Cleaning of Box Culvert Combined Sewer shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for Cleaning of Box Culvert Combined Sewer will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Cleaning of Box Culvert Combined Sewer complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: required submittals and work plans; securing a temporary dump site; storm and sewer flow handling including sand bagging, temporary plugs and bulkheads, dewatering and flow bypassing; making arrangements for a water source; loosening, cleaning, and extracting deposits throughout the box culvert; transporting material to/from dump site; end-of-day surface cleaning around access manhole; repair of any damage caused by the Contractor; post-cleaning CCTV inspection; and incidental work not indicated for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: characterizing and disposing removed material to be paid under appropriate OHM bid item.

-END OF SECTION 02760-

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SECTION 02761

FLOW BYPASS

ITEM 2761.1

FLOW BYPASS

LUMP SUM

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing, installing, and testing a temporary system to bypass the flow of the existing infrastructure around the work in accordance with these Specifications.
2. Maintaining flow from main pipelines without interruption of service, and maintaining flow in lateral connections with minimal interruption of service.
3. Performing the work in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons and property.

B. Contractor shall design the bypass flow handling system.

1.2. RELATED TECHNICAL SECTIONS

A. Section 01500 – TEMPORARY FACILITIES AND CONTROLS

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete bypass flow handling operations.
2. Work plan including the following items:
 - a. Location, configuration and routing of bypass flow handling pipes.
 - b. Staging area(s) for pumps and other equipment.
 - c. Upstream flow collection location and/or bulkheads.
 - d. Downstream discharge location.

- e. Method of protecting structures that accept discharge flows.
 - f. Traffic Management Plan.
 - g. Roadway crossing details including hose ramps or trench details.
 - h. Noise Pollution Abatement Plan.
3. List of 24-hour emergency telephone numbers at which the Contractor may be reached.
- B. Contractor shall submit a Certificate of Design (refer to SECTION 01300 – SUBMITTALS) for the bypass flow handling system and shall be responsible for the design of the following system components:
- 1. Pumps,
 - 2. Generators and power sources,
 - 3. Suction and discharge piping,
 - 4. Temporary pipe supports and anchoring,
 - 5. Pipe plugging and bulkheads,
 - 6. Noise control equipment,
 - 7. Calculation of average and maximum daily flows,
 - 8. Calculations of static lift, friction losses, flow velocity and flow rate,
 - 9. Systems testing and start-up,
 - 10. Maintenance of system for off-construction hours,
 - 11. Contingency plan and equipment for system failures,
- C. Contractor shall submit complete documentation of qualifications as specified herein.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. The Contractor designing and installing the bypass flow handling system shall have completed at least five (5) projects of similar size and complexity as this project in the United States within the past three (3) years. Contractor may

employ the services of a subcontractor that specializes in this work to fulfill this requirement.

- C. Rejection of any subcontractor and/or manufacturer by the Engineer due to insufficient qualifications shall not be grounds for modifications to the Contract Documents such as change in scope, time of completion or contract amount.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- A. The bypass flow handling equipment shall be of sufficient size and material to convey existing flows from one access structure to at least the next access structure immediately downstream of the work without overflow, spillage or discharge to the surrounding environment.
- B. Contractor shall be fully equipped to operate and respond to any repair or replacement of the system (24 hours per day and 7 days per week) while the bypass flow handling system is in use.
- C. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of emergency or breakdown. One standby pump for each size pump utilized.
- D. Contractor shall incorporate noise reduction equipment to minimize impact on the surrounding environment. Such measures shall include insulated enclosures, hospital grade silencers or mufflers, equipment modifications and/or special equipment to limit noise to eighty (80) dBA at seven (7) feet or sixty (60) dBA at the nearest residence or business.

2.2 DESIGN CRITERIA

- A. Contractor shall verify flow conditions in the existing system prior to the commencement of construction. The Contractor shall have no claim for additional compensation by reason of delay or inconvenience in adapting its operations to the need for maintaining existing flows.
- B. Estimated flows are as follows. Flows are estimated from hydraulic models. Actual flows might vary and shall be verified by the Contractor.
 - a. Average Daily Flow (dry weather): 0.75 MGD
 - b. 1-Year Storm Event: 21 MGD

c. 10-Year Storm Event: 28 MGD

PART 3 – EXECUTION

3.1 PREPARATION

- A. Contractor shall perform all work in accordance with municipal, state and federal requirements.
- B. Contractor shall obtain all permits required to perform work prior to the commencement of construction, at no additional cost to the Owner.
- C. Prior to the commencement of construction, Contractor shall perform all possible preparatory work. The Contractor shall, at all times, conduct operations to interfere as little as possible with existing flows.
- D. Prior to start-up of bypass flow handling system, Contractor shall notify, in writing each property owner whose service shall be shutdown albeit temporarily. Contractor shall prepare notifications in accordance with Owner's requirements.
- E. The Contractor shall protect water resources, wetlands and other natural resources.

3.2 GENERAL

- A. Contractor shall design the layout and routing of the bypass flow handling system to minimize disturbance to public and private land and to maintain access for pedestrians and traffic. Traffic shall be maintained throughout the bypass operations according to applicable standards and local requirements.
- B. If excavation is required across roadways, all work shall be performed in accordance with municipal and/or state requirements.
- C. Contractor shall furnish, install, maintain and operate all temporary facilities such as dams, pumping equipment, conduits and all other labor and equipment necessary to intercept the flow before it reaches points where it would interfere with the work.
- D. Contractor may utilize pipelines in an existing parallel system as an alternative to installing a full bypass flow handling system pending approval by the Engineer and the Owner. Contractor shall submit a Certificate of Design prior to utilizing the parallel system and shall restore the parallel system to pre-construction conditions upon completion of construction.
- E. Contractor shall design, furnish and install individual bypass flow handling systems for flowing lateral connections or high occupancy buildings.

- F. The Contractor shall protect existing facilities from damage, during pumping activities.
- G. Plugging or blocking of flows shall incorporate a primary and secondary plugging device. When plugging is no longer required for performance of the work, it is to be removed in a manner that permits flows to slowly return to normal without surge, surcharge or other major disturbance.

PART 4 – COMPENSATION

Item 2761.1 --- Flow Bypass

METHOD OF MEASUREMENT:

Measurement for payment for Flow Bypass will be based on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the original Contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT:

Payment for Flow Bypass will be based on the unit price bid for this item in the proposal. Under the Lump Sum price for Flow Bypass, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish, install, move, maintain and remove gravity or pumped flow bypasses complete as required to handle existing flows while completing the required elements of the Work at all locations. The work includes, but is not limited to; design of the bypass systems; pumps; suction hoses; discharge hoses; generators; install and remove temporary bulkheads; gravity bypasses including furnishing and installing pipe of all sizes at all depths; excavation for buried hoses or pipe; furnish and placing backfill around buried hoses and pipe; preparation of subgrade; temporary pavement over buried hoses or pipe; ramps; protection of bypass measures; emergency service during non-work hours; manning pumps or other bypasses as may be required; fittings, couplings and appurtenances; connections to existing and proposed pipes and structures; protection of discharge locations; and all incidental work not specifically included for payment elsewhere required to bypass existing flows in all storm drain, combined sewer or sanitary sewer.

SPECIAL NOTES ON EXCEPTIONS:

Items not included for payment herein include, but are not limited to; permanent bulkheads; bypass for CIPP and cleaning sections of pipe, and water main bypasses.

-END OF SECTION 02761-

SECTION 02767

CURED-IN-PLACE PIPELINING AND SECTIONAL LINING

2767.1	CIPP – 8-INCH SANITARY SEWER	LINEAR FOOT
2767.2	CIPP – 10-INCH SANITARY SEWER	LINEAR FOOT
2767.3	CIPP – 10-INCH STORM DRAIN	LINEAR FOOT
2767.4	CIPP – 15-INCH STORM DRAIN	LINEAR FOOT
2767.5	CIPP – 18-INCH STORM DRAIN	LINEAR FOOT
2767.6	CIPP – 24-INCH BY 26-INCH STORM DRAIN	LINEAR FOOT
2767.7	CIPP – 27-INCH BY 29-INCH STORM DRAIN	LINEAR FOOT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section includes furnishing all plant, labor, equipment, and materials necessary for completing cured-in-place pipelining (CIPP); complete in place. Work shall include light pipe cleaning and Closed Circuit Television (CCTV) inspection of the existing sewer and/or drain lines, as specified in Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION, flow handling and/or bypass pumping of existing flows as specified in Section 02761 – FLOW BYPASS, preparatory-type work inside the pipes, CIPP lining, service connection reinstatement, final CCTV pipe inspection, and all restoration work required for structures, pipes, or surface features.
- B. Work shall be performed in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons or property.
- C. Concord Avenue Internal Inspection Logs from previous CCTV work are provided in Appendix F for information only.

1.2 RELATED WORK

- A. Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION
- B. Section 02761 – FLOW BYPASS

1.3 SUBMITTALS

- A. For the cured-in-place pipelining method(s) of pipe rehabilitation, the Contractor shall submit the following information specific to the proposed project within ten (10) days after the Notice to Proceed:
1. Name(s) of all supervisory personnel to be directly involved with each cured-in-place pipelining method of pipe rehabilitation for this project. Supervisory personnel shall have a minimum of five (5) years experience and two completed projects for the installation of cured-in-place pipelining within the past five (5) years. Attach resumes of each person named. Resume information shall include, as a minimum, educational background, the number of years in a supervisory capacity and a list of projects worked on within the past five years, describing the type of construction, project description, complexity, and contract amounts.
 2. Describe the pipe rehabilitation method(s) proposed on this Contract, including, but not limited to, the following:
 - a. Name, business, address, and telephone number of each cured-in-place pipelining manufacturer of the pipe rehabilitation method proposed; a description of each method, proposed locations of inversion manholes; and any variances that the Contractor may be proposing from the specified methods.
 - b. Any surface activities, including access and staging locations, that will be required and any mitigative measures that will be used to reduce surface impacts as part of each rehabilitation method proposed.
 3. The Contractor must submit a complete work plan including: preferred hours of operation, sequencing of work description, number of shifts, number of crews, and expected time to complete the work for each rehabilitation method proposed. Based on the Work plan, the Contractor may be granted a variance by the Owner to perform the cured-in-place pipelining operations outside the restricted working hours of 7:00 AM to 4:00 PM. The Contractor may also be directed by the Owner to perform the CIPP operations outside the restricted working hours if the Engineer determines a better product will result.
 4. The Contractor shall submit plan for maintaining vehicular and pedestrian access, avoiding damage to existing trees, preventing leakage from hoses, and minimizing noise from pumps.
 5. The Contractor shall sign and date the information provided and certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel and method(s) of pipe rehabilitation proposed will be directly involved with and used on this

project, respectively. Substitutions of personnel and/or methods will not be allowed without written authorization of the Engineer.

- B. Prior to CIPP construction, the Contractor shall submit shop drawings, details, and descriptions to include construction methods and equipment, process description, access locations, inversion/installation and receiving manhole locations, flow handling, bypass pumping, flow diversion, and or dewatering methods, and design calculations to assure that the work can be accomplished as specified. Construction method(s) and equipment used to penetrate blockages and/or partially collapsed sections of the existing pipeline. Method(s) for repair for each location requiring a point repair. Description of techniques used to determine purpose and source of all lateral connections using such methods as smoke testing, dye testing, internal inspection and/or building investigation. Manhole connection details, end seal for the cured-in-place lining system, water source(s), method of water discharge, cleaning methods, traffic management plan, and pre- and post-construction video documentation shall be provided to the Engineer.

- C. The Contractor shall provide design submittals to indicate conformance to the applicable subsections of this section. At a minimum, this submittal shall include structural design calculations for the cured-in-place liner. The design calculations shall provide a cured-in-place liner that shall withstand all loadings subject to the sewer and/or drain independent of the existing pipeline. The submittal shall provide documentation supporting the basis of the values used in the design calculations. The above calculations shall be prepared under and stamped by a Registered Professional Engineer. Submit to Engineer, for review and approval, the curing schedule for the proposed resin system which will become a permanent part of the work under this Contract.

- D. The Contractor shall submit the following documentation:
 - 1. Material Safety Data sheets (MSDS's) for all materials used during preparation and installation.
 - 2. Certification stating that the Contractor is fully licensed by the liner manufacturer (if different).
 - 3. Description of odors anticipated as a result of the curing process and detailed action plan and description of techniques and equipment used to mitigate odors and prevent migration outside of the pipeline.
 - 4. Confined Space Entry Certifications for all Contractor's personnel entering pipeline or access structures.
 - 5. Contractor shall provide a certification stating that the source of all lateral connections identified during internal inspection have been investigated within the pipeline as well as in adjacent building and

structures and that the Contractor has secured these connections to prevent the migration of odors.

- E. The Contractor shall submit the method(s) and equipment he proposes to use for repairs of any uncured areas, defects, test sample section repairs, or other deformities in the completed liner pipe. Such repairs shall be in accordance with the liner manufacturer's recommended written procedures and techniques.
- F. Contractor shall submit curing logs within 24 hours of cool-down completion for each inversion indicating temperature readings at sensors in intervals of at least ½ hour.
- G. Contractor shall submit final CIPP testing reports as specified herein.

1.4 QUALIFICATIONS

- A. The Contractor shall provide documentation supporting the qualification criteria specified herein.
 - 1. The Engineer reserves the right to request, inspect, examine, and review information pertaining to a Contractor's proposed method(s) for compliance with the Contract Specifications.
- B. The qualifications of the Contractor shall be submitted so as to demonstrate that the Contractor meets or exceeds the minimum requirements specified herein. Any Contractor whose qualifications do not meet the minimum qualifications shall be rejected and shall not be permitted to participate in the construction of work specified herein.
- C. It is the responsibility of the Contractor to confirm that any subcontractor or manufacturer proposed for performance of the work under this Section of the Specifications can demonstrate the minimum requirements specified herein. Rejection of any subcontractor and/or manufacturer shall not be grounds for modifications to the Contract Documents. No change in contract time of completion or contract cost will be allowed as a result of such rejection of a subcontractor and/or manufacturer to meet the minimum requirements specified herein.
- D. The Contractor shall meet the minimum qualifications as specified below for the cured-in-place liner.
 - 1. The Contractor installing the CIPP shall have been in a similar type of CIPP installation business for the past two years.
 - 2. The Contractor installing the cured-in-place lining shall have successfully completed at least five projects in the past three years, totaling a minimum of 5,000 feet, in the United States of America, of 18-inch diameter or greater, which included the following provisions:

CIPP installation lengths of at least 300 continuous linear feet and design of the liner tube wall thickness based on a fully-deteriorated condition.

- E. The manufacturer of the CIPP system shall have been in the business of manufacturing cured-in-place linings of equal or greater size for the past two years in the United States.
- F. Designated supervisory personnel shall be directly involved with and used on this project. Substitutions of personnel will not be allowed without written authorization of the engineer.
- G. All Contractor's personnel entering pipeline or access structures shall be Confined Space entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.

PART 2 – MATERIALS

2.1 CURED-IN-PLACE PIPELINING

- A. The liner shall be a smooth, hard, strong and chemically inert internal surface closely following the contours of the existing pipe.
- B. The CIPP shall be designed and constructed in accordance with ASTM F1216 “Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube”, and these Specifications.
- C. The liner shall be fabricated to a size that, when installed, will neatly fit the internal circumference of the sewer and/or drain to be lined. Allowance shall be made for circumferential stretching during insertion.
- D. The Contractor shall be fully licensed by the lining process system manufacturer, if different. A copy of this certification shall be submitted to the Engineer.
- E. The liner shall consist of one or more layers of flexible needled felt, or an equivalent non-woven or woven material, or a combination of non-woven or woven materials, capable of carrying resin, withstanding installation pressures, and curing temperatures. Upon curing, the liner shall form a continuous, hard, impermeable, tight fitting lining between each installed reach.
- F. The Contractor shall furnish a general purpose, unsaturated, styrene-based resin and catalyst system, an epoxy resin and hardener, or an epoxy vinyl ester resin and catalyst system, or other approved material compatible with the inversion/installation process, that provides cured physical strengths and corrosion resistance properties specified herein.

- G. Service laterals indicated on the Drawings shall be CIPP lined from where the lateral is cut to be connected to the new sewer connection to a cleanout located as close to the property line as possible. If no clean out exists, the Contractor shall install a new clean out at the back of sidewalk as close to the property line as possible. The Contractor shall be responsible for locating the connection point in the street and the service where it crosses the property line. Contractor shall contact the property owner for permission to enter private property, if necessary and to locate the cleanout.
- H. The lateral liner shall provide a watertight seal and structural repair providing the required strength to carry 100% of the design load with less than 5% deflection. The Contractor shall verify the length and diameter of the liner required in the field prior to impregnation of the resin.

2.2 DESIGN CRITERIA

- A. The following design requirements shall be met by the Contractor for this method of construction:
1. The cured-in-place liner shall have sufficient structural strength to support all dead loads, live loads, and groundwater load imposed, including 100-year flood elevation requirements, with the assumption that the existing pipe is fully deteriorated and cannot share any loading or contribute to structural integrity of the liner. All cured-in-place liners shall have a wall thickness tested by the parallel plate deflection method in accordance with ASTM D2412. The liner, when cured, shall have the following minimum values:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Initial¹ psi</u>	<u>Long-Term² psi</u>
Flexural Strength	D790	4,500	N/A
Flexural Modulus	D790 and D2990	300,000	150,000

Notes:

¹Initial values are determined by ASTM D790.

²Long-term value is defined as 50 years and is determined by ASTM D2990 test method.

- a. The Contractor shall provide certified copies of all test reports on the properties of the selected resin by the material manufacturer indicating that the supplied materials conform with the above criteria.
- b. The CIPP shall be designed such that the lining shall not fail, collapse, buckle, crack, or delaminate under load. The maximum long-term (50 years) calculated deflection under all loads shall not

exceed five percent (5%). For glass, fiber-reinforced liner pipe, the bending strain (50 years) developed shall not exceed the higher of the minimum long-term value in ASTM D3262 for the pipe stiffness supplied, or that substantiated by long-term strain tests done in accordance with ASTM D3681 using 1.0 N sulfuric acid.

c. The following design parameters shall be used:

Depth of Cover ¹	Varies (refer to Drawings).
Depth of Groundwater Above Pipe	At Ground Surface.
Specific Weight of Soil	120 lbs./ft.
Wheel Load ²	16,000 lbs.
Design Temperature	80°F
Deflection Lag Factor, D _L	1.5 (50 years)
Modulus of Soil Reaction E'	1,000 psi
Ovality Correction Factor	Higher of initial ovality of deteriorated condition (2%) or long term deflection.
Long-Term Modulus of Elasticity	50 years under constant stress, when submerged in water, to be used for constrained buckling resistance design for combined external loads from groundwater and earth cover.
Minimum Safety Factor	2.0, unless otherwise specified (not applicable for maximum bending strain)
Shape Factor	6
Bedding Deflection Coefficient	0.103

Notes:

¹ Design of the CIPP shall be based on prism load on the liner pipe, using the outside diameter of the liner in the calculations.

² Impact factors to be included when depth of cover is less than 3 feet, per values recommended by AASHTO.

2. The minimum thickness of the cured-in-place liner to be installed shall be as determined for the design conditions imposed. Calculations for the determination of the required liner pipe stiffness shall be the largest pipe stiffness for each CIPP installation reach (inversion/installation manhole to termination point), as determined by calculations provided for the following parameters:
 - a. Maximum Deflection;
 - b. Minimum Pipe Stiffness;
 - c. Ring Bending Strain; and

- d. Constrained Buckling Resistance Using Long-Term Modulus of Elasticity
3. For pulled in systems, submit design calculations for the maximum allowable pulling force on the liner tube.
4. The rehabilitation of the sewers and/or drains shall be performed with minimum excavation and demolition of existing structures, and the Contractor shall re-establish connections and minimize the disruptions to neighboring homes, traffic, and wetlands. Excavation for point repairs or emergencies shall be permitted, but only as approved by the Owner and permitting agencies.
5. The rehabilitated sewers and/or drains shall have a no visible and/or measured leakage or infiltration.

PART 3 – EXECUTION

3.1 GENERAL

- A. Contractor shall perform all work in accordance with municipal, state, and federal requirements.
- B. Contractor shall obtain all permits required to perform work prior to the commencement of construction.
- C. The length of the CIPP shall equal the length indicated on the Drawings unless otherwise directed by the Engineer. The Contractor shall verify the lengths in the field prior to liner impregnation.
- D. The CIPP shall be performed with minimal excavation or demolition of existing structures. Excavation for point repairs or emergencies shall be permitted, but only as approved by the Owner.
- E. Individual inversions/installations may be performed via one or more existing access structures as determined by the contractor and as approved by the Engineer. For convenience, contractor may install additional access structures if approved by the Owner and Engineer after inversion/installation of the CIPP system. Additional access structures, if approved, shall be installed at no additional cost to the Owner and the Engineer.
- F. Contractor shall review all existing conditions data prior to the commencement of construction, including TV logs attached in the appendices of these Specifications provided for information only. The Contractor shall still be responsible for performing additional inspections as necessary to properly assess pipe condition and locations of all service laterals and connecting pipes.

- G. Contractor shall commence CIPP operations at the beginning of a period of at least three (3) days of anticipated dry weather and as directed by the Engineer.
- H. The Contractor shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving working with scaffolding and entering confined spaces.

3.2 INSTALLATION

- A. It is the intent of this portion of the Specifications to provide for the reconstruction of the sewer and/or drain lines by the installation of a resin-impregnated, flexible felt tube inverted/installed into the existing sewers and/or drains utilizing a vertical inversion standpipe and hydrostatic head method, air pressure inversion method, pulled in and inflate method, or other method approved by the Engineer. The Contractor shall submit information providing details of the procedure and the steps to be followed for the installation of the CIPP. Submittal information shall include: wet out of tube, insertion method and procedure, curing system, and cool down procedure. Submit process/techniques to be used to progressively round the tube to remove all trapped water between the liner and the existing pipe.
- B. STAGING / SETUP / INTERNAL INSPECTIONS
 - 1. The Contractor shall designate the locations where the reconstruction tube will be vacuum impregnated prior to installation. The Contractor shall allow the Engineer and the Owner to inspect the materials and “wet-out” procedure. A catalyst system compatible with the resin and reconstruction tube shall be used.
 - 2. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes, unless otherwise specified. The Contractor shall verify the lengths in the field before impregnation. Individual inversion/installation runs can be made over one or more manhole sections, as determined in the field by the Contractor and approved by the Engineer.
 - 3. Inspection of pipelines or laterals shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by videotaping. The interior of the pipeline shall be carefully inspected to determine the location of any conditions that may prevent proper installation into the pipelines or laterals, and it shall be noted so that these conditions can be corrected. A videotape and suitable log shall be kept for later reference by the Owner. The Contractor shall also produce and provide copies of pre- and post-service connection photographs. The Contractor shall remove and dispose of all debris in the sewers and/or drains to be rehabilitated. The Contractor shall be advised of the possibility of encountering obstructions in the pipe to be

rehabilitated, including but not limited to wooden floor boards being uplifted, piles protruding through the invert, heavy erosion, and/or large amounts of exposed aggregate.

4. The Contractor shall provide light cleaning of the pipes prior to lining. Light Cleaning is described as approximately 3 to 4 passes with a standard jetter nozzle. Any non-hazardous debris removed from the pipe will be dumped in a container provided by the Contractor, which will be located at a site provided by the Owner.
5. It shall be the responsibility of the Contractor to clear the line of obstructions, such as solids, dropped joints, loose gaskets, protruding service connections, or collapsed pipe, that will prevent the installation. If inspection reveals an obstruction that cannot be removed by conventional sewer/drain cleaning equipment, then the Contractor shall immediately contact the Owner. All repairs and removal of obstructions must be performed from inside the pipe. In the event an obstruction in the pipe is the result of the Contractor's action, it is the Contractor's responsibility to remove or repair the obstruction following requirements by the Owner.
6. The Contractor, when required, shall provide for flow handling and/or bypass pumping around the section or sections of pipe designated for rehabilitation, and sequence work activities in accordance with Section 02761 – FLOW BYPASS. The bypass pumps shall be positioned to reduce noise and muffled to further minimize noise as directed. The bypass piping shall be in good condition and shall be maintained to avoid leakage. The piping must not restrict vehicular or pedestrian traffic. When possible, complete the work during non-precipitation periods such that minimal bypass is required.

C. CIPP INSTALLATION

1. The reconstruction tube shall be inserted through an existing manhole, access pit or cleanout, by approved techniques/process of the installer or the Contractor. It is anticipated that the top of the manhole will be removed prior to insertion of the liner tube. Tubes that are pulled in-place shall be done in a manner that will not damage the tube. The winch shall be equipped with a dynamometer to record the pulling forces required during installation. Pull forces shall not exceed manufacturer's recommendations, which shall be based on a maximum longitudinal stretch of five percent (5%) of the total tube length. Inversion heads for tubes that are inverted in place shall not exceed manufacturer's recommendations, so as not to overstress the tube material or exceed 5% longitudinal stretch. Progressive rounding of the liner shall be performed, prior to curing, to eliminate all trapped water between the liner and the existing pipeline.

D. CIPP CURING

1. After inversion / installation is complete, curing shall be accomplished by circulating hot water, or other approved methods, to cure the resin into a hard, impermeable pipe. The equipment shall be capable of delivering hot water/steam throughout the section by means of a pre-strung hose to uniformly raise the water/steam temperature above the temperature required to effect a cure for the resin. This temperature shall be determined by the lining process system manufacturer and based on the resin/catalyst system employed. When cured, the new material shall extend over the length of the inversion/installation reach in a continuous, tight fitting, watertight pipe-within-a-pipe. The hot water used during the curing process shall not be discharged into the surrounding water bodies or wetlands.
2. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water/steam supply. Another such gauge shall be placed between the impregnated reconstruction tube and the pipe invert at the pipe ends to determine the temperatures during cure. Water/steam temperature in the line during the cure period shall be recommended by the resin manufacturer.
3. The Contractor shall submit procedures and details on the method(s) to be used to obtain water for the installation.
4. When water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed at any time, nor shall a hydrant be used for the work described in these Contract Documents, unless a reduced pressure backflow preventor is provided by the Contractor and prior approvals have been obtained from the Cambridge Water Department for use of the fire hydrant. The Contractor shall be responsible for all related charges for the set-up, including the water usage bill.
5. The Contractor must coordinate notifications to the public and verify multi-family homes. No water services may be shut off without the approval of the Cambridge Water Department and the Engineer.
6. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound, and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place process, during which time the recirculation of the water/steam and cycling of the heat exchangers to maintain the temperature continues.

7. The Contractor shall cool the hardened pipe to a temperature below 100° F before relieving the static head. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water being drained from a small hole made in the downstream end. The Contractor shall not be allowed to discharge this drained water (through the hole in the downstream end) to any storm drain or water body. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed pipe. Contractor shall verify with the Owner that discharging the cure-water directly into the existing system is acceptable. If deemed unacceptable, Contractor shall collect and pump cure-water to a location to be determined by the Owner.

E. ODOR ABATEMENT

1. The Contractor shall mitigate all odors onto public or private property due to renewal operations immediately after notification from the Owner or the Engineer including, but not limited to, forced-air ventilation and/or chemical cleaning of buildings at no additional cost to the Owner.
2. If odors persist on public or private property to a point that air sampling and/or associated testing is required by the Owner, the Engineer or a regulatory agency, the Contractor shall perform this work at no additional cost to the Owner.

F. FINISHING / FINAL INSPECTION

1. The finished pipe shall be continuous over the entire length of an inversion/installation run, and be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, and delamination.
2. The CIPP shall make a tight fitting seal with the existing pipe(s) in the manhole. The top half of the pipe shall be neatly cut off at least 4 inches away from the walls. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels, if any. Channel cross-sections shall be U-shaped.
3. The Contractor shall internally inspect the sewer and/or drain, as specified in Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION, after rehabilitation work is complete. If uncured areas, defects, bulges, or other deformities are present, as determined by the pipe lining manufacturer or the Engineer, after rehabilitation work is complete after each pipe reach, the Contractor shall repair the defective areas, at no extra cost to the Owner.

4. The Contractor shall provide a standard 1-year warranty from date of installation.

3.3 SYSTEM REINSTATEMENT

- A. Once a section of liner has been cured completely, the Contractor shall reinstate all access structures located along its alignment. For intermediate access structures, the Contractor shall cut the top portion of the liner to match the opening in the riser section providing a smooth, clean cut and continuous transition. At inversion/installation or termination access structures, the Contractor shall extend the liner a sufficient distance into the structure to allow for a smooth, clean cut to match the configuration of the riser and base sections.
- B. The Contractor shall minimize the time that an inversion/installation manhole remains open at a particular site. Consideration shall be provided to complete and coordinate all work including cleaning, pre-installation internal inspection, pipe rehabilitation, post-installation internal inspection, and acceptance, so as to minimize surface disruptions.
- C. Upon acceptance of the rehabilitation work by the Engineer, the Contractor shall restore the project area affected by his operations by diverting bypassed flows, including landscaping and clean up, as indicated on the Contract Drawings and in these Specifications.
- D. Service lateral connections shall be reinstated by Remote-Controlled Televised or manually operated Cutting Device and shall be made by experienced operators so that no blind attempts or holes are made in the pipe liner. Exact locations or service laterals shall be determined during internal inspection and re-verified carefully with pre-construction videotapes for accuracy, especially where dimples are not defined or clearly ascertained. The Contractor shall reconnect all lateral connections to the liner pipe, including those unoccupied, abandoned, or from vacant lots, unless otherwise directed by the Engineer. The remote cut shall be smooth and circular in nature with no jagged edges, as seen by a 360-degree television camera. The hole shall be a maximum of 100 percent and a minimum of 95 percent of the service pipe inside diameter. It shall be properly aligned and be concentric to the existing connection. Excess wrong holes or trial cuts shall not be made and must be repaired at no cost to the Owner.

3.4 LATERAL LINING

- A. The property owners serviced by the sewer shall be notified of the Work.
- B. Excavate access pit at the appropriate upstream point on the service lateral as shown on the Drawings and approved by the Engineer.
- C. The Contractor shall clean and CCTV inspect the lateral line immediately prior

to reconstruction and determine the overall structural condition of the lateral, as well as the suitability of the lateral for CIPP lining. All roots, debris, and other protrusions shall be removed prior to lining, if required. The Owner shall receive a video recording of the inspection and a written report documenting the inspection. All costs associated with lateral cleaning and surface preparation shall be considered incidental to the Work.

- D. Inspect the liner tube for torn or frayed sections. The tube shall then be vacuum impregnated with the thermoset resin.
- E. No open pans or uncontrolled open-air pouring of resin shall be allowed during tube saturation. All resin shall be contained within the inflation bladder during vacuum impregnation and insertion. No public or private property shall be exposed to contamination by liquid resin compounds or components.
- F. The saturated tube along with the inflation bladder shall be inserted into the launching device and the end closed. The entire launching device is placed in the service lateral access pit and aligned with the exposed end of the service lateral.
- G. The resin and tube shall be completely protected during the placement. The resin shall not be contaminated or diluted by exposure to dirt, debris, or water during the placement.
- H. The tube shall be inverted out of the launching device by controlled air or water pressure. The inversion shall be stopped when the tube protrudes into the collector pipe. The tube is held tightly in place against the wall of the host pipe by the pressure until the cure is complete.
- I. When the curing process is complete, the pressure shall be released and the inflation bladder reverted back into the launching device, and the launching device shall be removed from the pit.
- J. No barriers, coatings, or any material other than the cured tube/resin composite, specifically designed for desirable physical and chemical resistance properties, shall be left in the host pipe. Any materials used in the installation other than the cured tube/resin composite shall be removed from the pipe by the Contractor.
- K. Any cured tube/resin composite pipe left protruding from the service connection shall be trimmed back using a hydraulic-powered robotic cutting device specifically designed for cutting cured-in-place pipe made from these materials.
- L. A second CCTV inspection shall be performed to verify the proper cure of the material, the proper trim of service connection, and the integrity of the seamless pipe. The Owner shall receive a video recording of the final inspection and a written report documenting the inspection. All costs associated with the final

CCTV inspection shall be considered incidental to the Work.

- M. Service flows shall be restored to normal flow conditions. The service lateral pipe shall be coupled together, and the excavation properly backfilled. The property owner of the service connection shall be informed when the work is complete.
- N. All cut surfaces shall be treated and/or sealed with additional application of resin material or as otherwise directed. All rehabilitated laterals that are connected into mainline sewer pipelines shall be sealed to ensure that groundwater is not permitted to enter the pipeline via the interface between the lining and the existing host pipe at the connection of the lateral to the mainline.
- O. Deviations: If the pre-installation inspection reveals conditions in the sewer to be substantially different than those used in the design of the liner wall thickness, tube construction, tube length, or resin system, then the Contractor shall request appropriate changes, supporting such request with a video recording of existing conditions and design data.
- P. Following the installation, curing, testing and inspection of liners in service laterals, the Contractor shall connect the existing lateral to a new connection on the sewer as shown on the Plans. Any access pits shall be backfilled as specified and the cleanout and connection to existing lateral completed and backfilled at the property line. Private and public property shall be restored to pre-existing conditions or as specified.

3.5 TESTING

- A. For each separate length of CIPP installed, the Contractor shall prepare at least one (1) “flat plate” sample in accordance with ASTM F1216, Section 8.1.1 for testing at a laboratory approved by the Engineer. For each separate length of CIPP installed, the Contractor shall also prepare at least one (1) “restrained” sample in accordance with ASTM F1216 Section 8.1.1, Section 8.1.2 for testing at a laboratory approved by the Engineer.
- B. Samples tested in accordance with ASTM F1216, Section 8.1.1 shall be considered as passing if the arithmetic mean of the samples, as defined in ASTM D790, is greater than or equal to parameters set forth in this Section after the arithmetic means is reduced to 80% of its original calculated value.
- C. Samples secured as specified shall be tested to verify that the pipe flexural modulus and flexural strength of the CIPP is at least equal to that required by the approved design submittal, and the wall thickness is at least equal to that required in the approved design submittal.
- D. If any sample fails the verification tests specified, the Contractor shall take five (5) additional samples throughout the length of the inversion/installation and

retest to ensure the specified criteria has been met. If any sample fails these retests, the entire inversion/installation length shall be rejected.

- E. Any rejected inversion/installation shall be relined or replaced by the Contractor at no additional cost to the Owner. The Contractor shall submit method of repair of the rejected inversion/installation length for review and approval by the Owner prior to construction any repair work. Any samples taken from within the final completed liner pipe shall be repaired by the Contractor, in accordance with the shop drawings, at no expense to the Owner.

3.6 ACCEPTANCE

- A. Pipeline shall be true to line and grade, with no visual bulges, sags, protrusions, deflections, offset joints, leaking joints, or other visible infiltration, or other defects that would impair the intended use of the completed pipeline.
- B. Contractor shall perform a post construction internal inspection in accordance with Section 02760 – PIPELINE CLEANING AND INTERNAL INSPECTION. Final acceptance of rehabilitation work shall not be granted until all defective areas are repaired to the pipe lining manufacturer's and Engineer's satisfaction.
- C. Contractor shall perform testing as specified. Final acceptance of the work shall not be granted until the appropriately formatted testing results have been reviewed and approved by the Engineer.
- D. Any repairs required by the Engineer as a result of the post construction internal inspection shall be performed by the Contractor, at the Contractor's expense.

PART 4 – COMPENSATION

Cured-In-Place Pipeliner

Item 2767.1 --- CIPP – 8-inch Sanitary Sewer

Item 2767.2 --- CIPP – 10-inch Sanitary Sewer

Item 2767.3 --- CIPP – 10-inch Storm Drain

Item 2767.4 --- CIPP – 15-inch Storm Drain

Item 2767.5 --- CIPP – 18-inch Storm Drain

Item 2767.6 --- CIPP – 24-inch by 26-inch Storm Drain

Item 2767.7 --- CIPP – 27-inch by 29-inch Storm Drain

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, and inspection of Cured-in-Place Pipeliner in existing pipes complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: all homeowner notification and coordination; sawcutting pavement and concrete; excavate bituminous concrete; excavation; transporting material to and from soil staging area; remove, and replace approximately 5-feet of manhole cone, frame and cover as required to insert CIPP; flow handling and bypass pumping; repair of defects (including but not limited to piles protruding through the pipe invert); pipe liner as described in the Contract Specifications; reinstating building service laterals; pipeline cleaning; transportation of the material removed during cleaning operations to a temporary stockpile area; temporary storage and control of stockpiling; pre- and post-installation inspection by closed circuit television; providing inspection photos and logs, sealing around manhole connections; placing and compacting suitable backfill material; grade and compact gravel pavement sub-base; compaction testing; brick and mortar to raise frames and covers to grade; new cleanouts on sanitary sewer laterals, and all incidental work.

METHOD OF MEASUREMENT:

Payment for Cured-In-Place Pipeliner shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual linear feet of complete and functional cured-in-place pipeliner as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures.

Cured-In-Place Pipeliner installed but not successfully tested and accepted shall be paid for at a maximum of 95 percent of the unit prices bid under this item. The remaining 5 percent shall be paid upon receipt of successful test results by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of bituminous concrete and construction debris; procurement, installation, and compaction of CDF; adjusting castings for paving.

-END OF SECTION 02767-

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SECTION 02890

TRAFFIC SIGNALS

2890.1	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 1 HURON AVENUE AT CONCORD AVENUE	LUMP SUM
2890.2	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 2 WALDEN STREET AT CONCORD AVENUE	LUMP SUM
2890.3	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 3 ALPINE STREET AT CONCORD AVENUE	LUMP SUM
2890.4	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 4 WALDEN STREET AT GARDEN STREET	LUMP SUM
2890.5	MAST ARM FOOTING COST ADJUSTMENT	VERTICAL FOOT

PART 1 - GENERAL

WHERE REFERENCE IS MADE HEREIN TO THE “MASSDOT STANDARD SPECIFICATIONS”, THIS SHALL BE CONSTRUED TO MEAN THE LATEST EDITION, INCLUDING STANDARD SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS, OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES (English Units Version).

Work under the above items shall be performed according to the provisions of Section 800 of the MassDOT Standard Specifications. Traffic signal work includes the following locations:

LOCATION NO. 1 – Huron Avenue at Concord Avenue

Proposed traffic signal reconstruction

LOCATION NO. 2 – Walden Street at Concord Avenue

Proposed traffic signal reconstruction

LOCATION NO. 3 – Alpine Street at Concord Avenue

Proposed traffic signal reconstruction

LOCATION NO. 4 – Walden Street at Garden Street

Proposed traffic signal reconstruction

The work consists of furnishing and installing traffic control signals at the intersections listed above complete and ready for operation, as shown on the plans.

TRAFFIC SIGNALS

02890-1

Included in the work is the furnishing and installing of traffic control signal equipment, local traffic controller, cabinet and foundation, signal housings, backplates, red, amber and green LED signal modules, posts and bases, anchor bolts and foundations, loop detectors and amplifiers, service connections, wire and cables, conduit, pull boxes, hand holes, ground rods, saw cuts, electrical connections, and providing all incidental materials necessary for operating and controlling the traffic control signal, as shown on the plans and specified herein.

PART 2 – PRODUCTS AND EXECUTION

3 Inch Electrical Conduit Type NM – Plastic (UL) – Single and Double Runs

The 3 inch Electrical Conduit, Type NM shall be installed as indicated on the plans and as directed by the Engineer.

Conduit to be installed into signal bases, pull boxes, traffic signal control box foundations, and mast arm foundations shall be installed in accordance with the plans and details shown on the MassDOT Standard Drawings.

Conduit in grass or in planted areas

Where new conduits are installed in grass and planted areas, work shall include placement of a minimum of 6 inches of loam borrow, seed, and any other materials replaced in kind to restore disturbed areas to their original condition. Any existing plants (bushes, flowers, etc.) removed or damaged as a result of this project shall be replaced in kind. No separate payment shall be made for this work, but all costs in connection therewith shall be included in Items 2890.1 through 2890.4.

Conduit under sidewalk

Where conduit is installed in sidewalk areas, the work shall include excavating and restoring the existing surface in kind. No separate payment shall be made for this work, but all costs in connection therewith shall be included in Items 2890.1 through 2890.4.

Conduit in Roadways

Trenches in existing bituminous concrete pavements shall be sawcut to 18 inches wide. The existing pavement shall be sawcut through its full depth and the pavement removed.

Trench bed shall be prepared in accordance to MassDOT and City standards. After conduit installation, the trench shall be backfilled with controlled density fill (CDF). CDF shall be Type 2E and shall be as specified in Section M4.08.0 of the MassDOT Standard Specifications. The finished grade of the CDF shall be 4 inches below existing pavement surface or at the sidewalk subgrade elevation, as appropriate. Two 2-inch lifts of hot mix asphalt (top course material) shall be placed over the CDF when hardened in roadway locations.

Electric Handhole – SD2.022 (Traffic)

Work under this section shall consist of furnishing and installing 24"x13" traffic signal handholes in accordance with the Contract Drawings, as specified in these Specifications, and as directed by the Engineer.

Materials and methods shall comply with Section 801.40 and 801.61 of the MassDOT Standard Specifications with the exception of excavation. All excavation relative to this item shall be included as part of Items 2890.through 2890.4. Units shall be precast concrete as shown on MassDOT Standard Drawings SD2.022. Handhole covers shall be clearly marked "TRAFFIC".

Traffic Signal System

A list of the major traffic signal items required is included on the plans.

The top of the concrete base for the control cabinet shall be 18 inches above grade. The top of all other foundations not in sidewalk or paved areas shall be a minimum of 2 inches above grade. The top of all foundations in sidewalk areas shall be located 3 inches \pm below finish grade. The top of each mast arm foundation shall not be exposed in the sidewalk.

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20 of the MassDOT Standard Specifications.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

Flashing Operation

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Sections 4D.28 through 4D.31 of the MUTCD.

Controller and Cabinet

The controller, malfunction management unit, detector amplifiers, bus interface units and all other ancillary traffic signal control components included in the Type 6 traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2, Traffic Controller Assemblies.

The controller cabinet foundation shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired. Anchor bolts shall be internal to the cabinet.

A slide-in/slide-out shelf or swing-out/swing-in shelf appropriate for the size and load of a laptop computer shall be installed in each controller cabinet to allow maintenance personnel to work in the cabinet in a safe, effective, and comfortable manner.

TS 2 Type 1 Controller and Type 6 Cabinet Assemblies:

Controller shall conform to Section 3, Controller Units of NEMA No. TS 2, Traffic Controller Assemblies. The controller and cabinet assemblies shall be supplied in an 8 phase TS 2 Type 1 configuration. Controller shall utilize an input/output interface conforming to Section 3.3.1 of the NEMA TS 2 Standard for all input/output functions with the backpanel terminals and facilities, the malfunction management unit, detector rack assemblies and auxiliary devices. Controller cabinet shall be size "M" type box.

The TS 2 Type 1 cabinet shall meet the requirements of Configuration 3 as defined in Table 5.3.1-1, "Type 1 Configurations" of the NEMA TS 2 Standard. The cabinet shall be fabricated of sheet aluminum to size six (6) dimensions as specified in Table 7.3-1 of the NEMA TS 2 Standards. The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinet's door open status.

The local traffic controller shall be capable of being operated in the full-actuated mode, in the free mode and as semi-actuated in the coordinated mode. The controller shall be Type 8DW, keyboard entry, menu-driven unit mounted in an eight-phase cabinet. The controller unit shall meet all applicable requirements of the NEMA Standard Publication No. TS 2, Type 1, the MassDOT Standard Specifications and include the following as minimum requirements for the "Keyboard Entry Controller Unit."

1. The Keyboard Entry Controller Unit must be type-tested and approved by the City.
2. The controller shall have hard-wire interconnect capability and internal time base coordination logic. The coordination control shall have the capabilities to operate as described under Section 815.41 of the MassDOT Standard Specifications.
3. The controller shall have a data transfer/printer port for data transfer to another controller, printer or laptop PC computer. A port shall be provided for uploading or downloading controller operating parameters from a laptop PC computer.
4. The controller shall have a security code function.
5. The phase or phases selected for "call to non actuated" (C.N.A.) modes shall be determined as needed by keyboard entries.
6. The controller shall have an Ethernet port for coordination.

The Contractor's attention is directed to Table 2, Required Signal Light Switching Assemblies, Section 815.41 of the MassDOT Standard Specifications. The Contractor shall furnish the appropriate type and number of load switches and flash transfer relays and place unutilized load switches and flash transfer relays in the control cabinet for future use. Load relays shall be easily replaced using a screwdriver. Component relays requiring soldering are not acceptable.

In addition to the convenience outlet as described under Subsection 815.41, a lamp with an on/off switch shall be installed in the controller cabinet.

Bus Interface Units

The Bus Interface Unit (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in

TRAFFIC SIGNALS

a NEMA TS 2 Type 1 cabinet assembly. In addition to the number of BIU's required for the detector racks, and terminals and facilities, two (2) spare Bus Interface Units shall be supplied with each controller cabinet.

The BIU shall perform the interface function between Port 1 at the controller unit, the malfunction management unit, loop detector rack assembly, and the backpanel terminal and facilities.

As a minimum, two (2) LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

Note Well: 2 Spare BIU's shall be provided for each location.

TS 2 Cabinet Power Supply

A separate power supply shall be supplied and installed in the TS 2 cabinet. The unit shall be AC line powered and provide regulated DC power, unregulated AC power, a line frequency reference for the rack mounted loop amplifiers, bus interface units, load switches, and other auxiliary cabinet equipment as required. As a minimum, the power supply shall meet all requirements of Section 5.3.5 of the NEMA TS 2 Standard.

The power supply shall be either shelf mounted or wall mounted utilizing keyhole slots for ease of replacement or installed as part of the rack assembly.

The unit shall contain four LED indicators on the front panel to indicate the four outputs; +12VDC \pm @ 2.0 amps, + 24VDC \pm 2VDC @ 2.0 amps, 12VAC @ 250 milliamps, and 60 Hz line frequency reference. A test point terminal shall also be located on the unit's front panel for + 24VDC and logic ground testing.

Malfunction Management Unit

The malfunction management unit (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 1 cabinet or a NEMA TS 1 cabinet without loss of functionality.

Load Switches

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 Standard. All load switches shall utilize optically isolated encapsulated modular solid state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device

Flash Transfer Relays

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 standard.

The field electrical loading for flash operation shall be wired through the transfer relays such that the load on a 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

Flasher

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 standard and be equipped with tow output indicator lights which will show flashing power out to the cabinet assembly.

Testing of Grounding System

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications. A ground rod shall be installed in each controller cabinet.

Data Base Programming

Each programmable local hardware component (controller, malfunction management unit, and detector amplifier) shall be initially programmed by the Contractor based on information contained on the plans. Three (3) sets of hard copy programming per device shall be supplied and stored in the controller cabinet.

Labels

All time settings, switches, harnesses, relays, terminals and fuses shall be clearly and permanently labeled.

Vehicle Signal Heads

All proposed vehicle signal heads shall be aluminum. When, in the judgment of the Engineer, the visibility of existing or proposed signal faces will be obstructed by trees and other vegetation, the Contractor shall clear the obstructions for proper sight distance. Any clearing necessary shall be done within the City layout, as directed by the Engineer.

Pedestrian Signal Heads, Indications, and Appurtenances

All pedestrian signal heads shall be LED types with the ITE international symbolic displays, including the hand symbol for *flashing don't walk* and *don't walk* indications and the walking person for *walk* indications.

Each pedestrian push button shall be equipped with a tactile indicator to provide visually impaired pedestrians with an indication of pedestrian actuations. In addition, the pedestrian pushbutton shall be equipped with an indicator light, provided through the use of an LED, which will provide pedestrians with confirmation of a pending pedestrian phase. The confirmation LED shall meet or exceed the specifications of the model PPB-LED or approved equal.

Tactile pedestrian push buttons shall be 4-wire accessible pedestrian signal with vibro-tactile and directional (right or left) arrow with Red LED confirmation light, ped head control unit and 12' harness – painted yellow with rapid tock walk sound. 5x7 saddle, NO SIGN.

Each visual pedestrian indication shall be complemented by an audible pedestrian indication. The audible indication shall meet or exceed the specifications for the BPC type indication.

1. Each separately phased pedestrian movement shall have its own distinctive audible emanation in order for visually impaired pedestrians to discriminate which phase is appropriate given his or her destination and/or direction of travel.
2. The audible emanation shall be a cowbell type sound. No buzzer or ringing type sounds will be acceptable. The output level of the audible pedestrian signal shall vary in intensity with significant fluctuations in ambient noise conditions. At a minimum, the output level shall vary in intensity from daytime to nighttime operations.
3. The housings of both the visible and audible pedestrian indicators shall be painted matte black.

Each visual pedestrian indication shall be complemented by a time display indication. Each time display indication shall be self-programming and microprocessor based, with red LEDs used in the display. The time display will countdown the amount of time remaining in each *walk* and *flashing don't walk* time interval for viewing by the ambulatory public. The time display pedestrian indication shall meet or exceed the specifications of the TASSIMCO Countdown Pedestrian Signal.

Red, Amber and Green LED Vehicle Signal Modules

All Red, Amber and Green signal housings with the exception of optically-programmed and fiber optic housings shall conform to the following:

The LED signal module shall conform to "Interim LED Purchase Specification of the Institute of Transportation Engineers, Vehicle Traffic Control Signal Heads - Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules", July, 1998, or most current version, Institute of Transportation Engineers (ITE), 1099 14th St., N.W., Suite 300 West, Washington, DC 20005-3438, Telephone: (202) 289-0222, FAX: (202) 289-7722, and shall conform to the following: (In the case of a conflict, the following special provision shall overrule.)

An independent laboratory shall certify that the LED signal module complies with Section 6 Quality Assurance of the above stated ITE LED Purchase Specification.

LED signal modules must be type-tested and approved by the Department according to the requirements of Subsection 815.21 of the Standard Specifications for Highways and Bridges.

On the backside of the LED signal module there shall be a permanently marked "up" arrow to aid in the proper orientation of the module during installation.

The manufacturer's name, trademark, serial number and other necessary identification shall be permanently marked on the backside of the LED signal module.

Physical and Mechanical Requirement

LED signal modules shall fit without modifications into existing traffic signal housings conforming to "Vehicle Traffic Control Signal Heads" (VTCSH) published in the Equipment and Materials Standards of the Institute of Transportation Engineers. The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation. The LED signal assembly construction shall conform to the applicable ASTM specifications for the materials used to fabricate the module.

Each LED signal module shall comprise a smooth surfaced red, amber, or green UV stabilized polycarbonate outer shell, multiple LED light sources, a power supply, and a polycarbonate back cover assembled in a gasketed or silicon sealed unit.

Optical and Light Output Requirements

The minimum luminous intensity values and light output shall be maintained within the rated input voltage of 117 Volts AC. LED signal modules shall not be allowed to fall short of the minimum intensity values at any of the 44 measuring points of the standard when lamp is turned on cold for measurements and after a 30 minute warm-up time period at 100% duty cycle.

Electrical

The maximum wattage for 12" ball shall be 20 Watts and 10 Watts for the 12" arrow.

The LED sources shall not be powered above 70% of the manufacturer's specified rated load. This shall be clearly shown in layman's terms through calculations, schematics, catalogue cuts, etc.

Red and Yellow LED sources shall be made of the AlInGaP (Aluminum Indium Gallium Phosphide) type shown clearly in a catalogue cut or similar literature.

Green LED sources shall be made of the InGaN (Indium Gallium Nitride) type shown clearly in a catalogue cut or similar literature.

Warranty

The LED signal module will be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation.

The LED signal module will be replaced by the manufacturer if it exhibits any partial outage before the final inspection or it exhibits either a greater than 40 percent light output degradation or a fall below the minimum intensity levels within the first 36 months of field operation.

Backplates

Backplates shall have a louvered profile. Backplates shall have a 5 inch border width and a dull flat black color. Only backplates that are listed in the latest MassDOT "Approved Equipment List" will be used on this project.

Mast Arm Poles and Foundations

Mast arm poles and foundations shall be fabricated and constructed in conformance with the MassDOT Standard Drawings.

All mast arm poles shall be galvanized steel monolevers with shoe bases.

Acceptance of Type II mast arm poles will be contingent upon review and approval of shop drawings submitted by the Contractor. Long-hand design calculations shall be submitted by the Contractor with the shop drawings for all Type II mast arm poles.

The lump sum prices bid should assume the dimensions shown on the MassDOT Standard Drawings for a four-foot (4') diameter foundation. Soil exploration borings shall be conducted by the Contractor and paid for under Item 2210.1. The lump sum bid prices should assume wet sandy soil.

Where soil conditions are such that, in the opinion of the Engineer, the typical foundation design is not suitable, the Engineer will provide a modified design for the foundation.

Mast arm foundations shall not obstruct a sidewalk or crosswalk so that pedestrian accessibility is impaired.

Mast Arm Footing Cost Adjustment

The contract lump sum price for Items 2890.1 through 2890.4 includes the cost of the mast arm footing based on an assumed soil type of "Wet Sandy Soil" for a four foot (4') diameter footing as shown on the plans.

Mast arm foundation depths as shown on the plans may be increased or decreased based on the actual existing soil types determined by the Engineer from soil borings taken by the Contractor under Item 2210.1. If the Engineer determines that the soil classification requires the use of a deeper foundation, the Contractor shall construct the foundation at the dimensions shown on the Foundation Design Chart as included on the Plans and the Contractor shall be paid for the difference in depth at the nominal unit price per foot. Conversely, if the Engineer determines that the soil classification requires the use of a shallower foundation, the City shall be credited for the difference in depth at the contract unit price per foot under Item 2890.5. The difference in depth calculation shall be based on the dimensions shown on the Mast Arm Foundation Detail Sheet for a 4'-0" diameter foundation.

Posts and Bases

All traffic signal posts and bases shall be aluminum. Bases shall be of the square shape and include a cast iron threaded insert for strength. Signal post foundations in grass areas shall be exposed ± 2 inches. In sidewalk or paved areas, the top of all signal post foundations shall not be exposed.

Meter Boxes

The meter boxes shall include a by-pass meter switch.

Intersection Wiring

All cable shall meet the requirements of IMSA Specifications or 20-1 and shall be twisted copper conductors. A minimum of five spare conductors shall be installed to all signal heads.

Wiring Diagrams

Five sets of wiring diagrams with both internal and external wiring for the control cabinet and all accessories as actually used in the field shall be furnished, including one mylar reproducible copy for the control cabinet when installed. All actual and potential terminal strip connections shall be shown. Accessory equipment includes flashers, switches, relays, logic, modules, pre-empt, phase selector, detectors, etc. All identification on the diagrams shall be as installed, and all field labeling shall be consistent with the diagrams. Before acceptance of the job, four copies of all operation and maintenance manuals and complete, accurate parts lists shall be supplied.

Service Connection

The service connection shown on the plans is approximate only. The contractor shall determine the exact location from the servicing utility, arrange and coordinate with the utility company to complete the service connection, and be responsible for all charges incidental thereto.

Electric Service

An approved meter socket shall be mounted on the side of the cabinet of the controller. The Contractor shall furnish and install the meter socket and the utility company shall furnish and install the meter. A separately fused, 60 amp, grounded duplex outlet and a light receptacle shall be installed. A separate fused disconnect switch shall be provided with lightning protection. Adequate 120 VAC power terminals shall be provided within the controller cabinet.

Cooling Fan

The thermostatically controlled fan shall be sized and set as to limit the upper interior cabinet temperature to a difference of 30 degrees Fahrenheit above the exterior ambient temperature.

Duplex Convenience Receptacle

The duplex receptacle container within the controller cabinet shall be rated for 120 vac, 15 amp and shall be of the Ground Fault Circuit Interrupter (G.F.C.I.) Type.

Work Light

The work light contained within the controller cabinet shall be toggle switch controlled. This toggle switch shall be mounted on the inside of the cabinet door.

Painting

Vehicle signal housings, Visors	-	black
Signal housing supports (posts)	-	black
Mast Arms, posts and bases	-	galvanized
Controller cabinet (exterior) & Meter Socket	-	black
Controller cabinet (interior)	-	aluminum
Front of Signal Housings, and Backplates	-	flat black

Keys

Two controller cabinet door keys and police door keys shall be supplied for each controller cabinet on the project.

Removing and Stacking Existing Signal Equipment

Existing traffic signal equipment within the project limits shall be removed and stacked by direction of the Engineer. Existing traffic signal equipment to be removed and stacked shall include, but not be limited to, traffic signal heads, backplates, pedestrian push buttons, signs and saddles, traffic signal posts, mast arms, traffic signal controller, cabinet, loop detector amplifiers, hangers or brackets, and any other materials not necessary for the final signal operation.

All traffic signal equipment to be removed and stacked shall be delivered to the City of Cambridge DPW yard, or an alternate location as designated by the Engineer.

As-built Traffic Layout Plans

It will be the responsibility of the Contractor to provide the Design Engineer with as-built traffic signal layout plans at a scale of 1"=20' indicating all changes made during the construction. The plans shall indicate the final location of all traffic signal equipment

installed including detectors, signal posts, mast arms, pedestrian and vehicular signal heads, controller cabinets, conduit, pull boxes, hand holes and service connections. The plans shall also indicate the final as-built timing and sequence, major item list, power-pole number and meter number. Upon receipt of the above as-built information from the Contractor, the Design Engineer will field verify the as-built information and plans. Following field verification, the Design Engineer will prepare the as-built Traffic Signal Layouts and/or Permits for submission to the City of Cambridge Traffic Engineer prior to the final acceptance of the project.

Miscellaneous Requirements

Because this is often overlooked, the Contractor's attention is drawn to the requirements of the following sections of the MassDOT Standard Specifications: Section 813.60C Splicing, relative to four optional methods of splicing in signal bases, Section 813.40C Ground Electrodes, relative to Requirement 1 - connection to a water piping system, and Section 813.61 Equipment Grounding.

The Contractor shall make all necessary arrangements with the electric company for the service connections or for any main power cut off when necessary, and bear all charges incurred thereby.

PART 4 - COMPENSATION

2890.1	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 1 HURON AVENUE AT CONCORD AVENUE	LUMP SUM
2890.2	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 2 WALDEN STREET AT CONCORD AVENUE	LUMP SUM
2890.3	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 3 ALPINE STREET AT CONCORD AVENUE	LUMP SUM
2890.4	TRAFFIC SIGNAL RECONSTRUCTION – LOCATION 4 WALDEN STREET AT GARDEN STREET	LUMP SUM

The lump sum price bid for Item 2890.1 through 2890.4 shall constitute full compensation for all labor, materials and equipment necessary or incidental to the installation of a complete intersection traffic control signal system functioning as specified and as shown, including local traffic controller, controller cabinet, electrical conduit and wiring, electric handholes, frames and covers, vehicle signal heads, loop detectors and amplifiers, mast arms/bases, signal posts/bases, signal wiring and electrical connections, phasing and timing adjustments, removal and stacking of existing equipment, foundations, excavation and backfill, service connections, and all charges therefore.

No separate payment shall be made for sand bedding, marking tape, controlled density fill, temporary top course hot mix asphalt pavement, or any incidental materials, but all costs in connection therewith shall be included in the Contract unit price for Items 2890.1 through 2890.4.

2890.5

MAST ARM FOOTING COST ADJUSTMENT VERTICAL FOOT

Payment (or credit) for mast arm footing adjustments shall be paid at the Contract unit price per vertical foot of adjustment under Item 2890.5, which shall include all labor, material, equipment and incidental costs required to complete the work.

NOTES ON EXCLUSIONS: Disposal of any excavated soil not suitable for re-use is not included for payment under this item and shall be paid for separately.

SECTION 02900

LANDSCAPING

2900.1	PLANTING AREA: BIRCH STREET AREA A	LUMP SUM
2900.2	PLANTING AREA: BIRCH STREET AREA B	LUMP SUM
2900.3	PLANTING AREA: BIRCH STREET AREA C	LUMP SUM
2900.4	PLANTING AREA: BIRCH STREET AREA D	LUMP SUM
2900.5	PLANTING AREA: FERN STREET AREA A	LUMP SUM
2900.6	PLANTING AREA: FERN STREET AREA B	LUMP SUM
2900.7	PLANTING AREA: FERN STREET AREA C	LUMP SUM
2900.8	PLANTING AREA: CORPORAL BURNS ROAD AREA D	LUMP SUM
2900.9	PLANTING AREA: HAZEL STREET/ FIELD STREET AREA A	LUMP SUM
2900.10	PLANTING AREA: HAZEL STREET/ FIELD STREET AREA B	LUMP SUM
2900.11	PLANTING AREA: ALPINE STREET/ FIELD STREET AREA C	LUMP SUM
2900.12	PLANTING AREA: WALDEN STREET/ GARDEN STREET AREA A	LUMP SUM
2900.13	PLANTING AREA: WALDEN STREET/ GARDEN STREET AREA B	LUMP SUM
2900.14	PLANTING AREA: FAYERWEATHER STREET/ SAVILLE STREET AREA A	LUMP SUM

PART 1 – GENERAL

1.1 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting, seeding and sodding work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:

1. Trees
2. Shrubs
3. Perennials, grasses and ferns
4. Grades and standards of plants
5. Root systems for all plants
6. Seeded Lawn
7. Wood cellulose fiber mulch
8. Planting soil mix

9. Soil additives
10. Mycorrhizal fungal inoculant
11. Fertilizer
12. Mulch
13. Water
14. Antidessicants
15. Limestone

1.2 RELATED WORK

- A. Section 01630 – RESTORATION OF GROUNDS AND CLEANING UP
- B. Section 02100 – SITE PREPARATION AND TREE PRUNING
- C. Section 02901 – PLANTING SOILS
- D. Section 02905 – BIOBASIN
- E. Section 02910 – TREE PLANTING

1.3 SHOP DRAWING SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTALS:
 1. Certify, invoice, and order plants for each shipment grown, free of disease and insect pests. Submit certificates to Engineer.
 2. Prior to placement of any mulch, deposit, at a location on site suitable to Engineer, 1/2 cu. yd. sample of mulch for examination. After mulch sample is reviewed by the Engineer, provide mulch conforming to accepted sample.
 3. Submit to Engineer project literature for each type of fertilizer, anti-desiccant and mycorrhizal fungal inoculant.
 4. Submit with seed, certificates concerning seed mixture, purity, germinating value, and crop year identification.
 5. Submit test samples of loam to a certified soils consultant to determine fertilizer and lime requirements and return two copies of results for implementation.
 6. For hydroseeding, provide written description containing seed analysis, fertilizer, and lime addition data.
 7. Submit list of plant material to be used and source.

8. Prior to end of maintenance period, furnish two copies of written maintenance, instructions for maintenance and care of installed plants and lawn areas.

1.4 QUALITY ASSURANCE

- A. Investigate sources of supply and make assurances that plants will be supplied as indicated in Schedule of Plant Material in sizes, variety and quality noted and specified before submitting bid. Failure to take this precaution will not relieve responsibility for furnishing and installing plant material in accordance with Contract requirements and without additional expense to Owner.
- B. Upon delivery and before planting, Engineer will observe plants. Evaluation and approval by Engineer of plants is for quality, size and variety only and in no way impairs the right of rejection for failure to meet other requirements during progress of work.
- C. General:
 1. Provide only nursery grown plants having been transplanted at least once and growing in a nursery for at least two years. Allow Engineer to determine fitness of any plant.
 2. Provide container-grown stock in containers long enough for root system to develop sufficiently to hold soil together firm and whole when removed from container. Use no plants loose in the container.
 3. Check plant material prior to commencing of planting operations. Plant no material prior to inspection by Engineer. Notify Engineer at least 48 hours in advance of all planned planting operations and identify specific material and its location.
 4. Furnish suitable quantities of water, hose and appurtenances.
 5. Use loam, having prior vegetative growth that did not contain toxic amounts of either acid or alkaline elements.
 6. Begin maintenance after each portion of lawn is seeded and continue for minimum of 45 days.
 7. Correct defective work as soon as possible within guarantee period. Repair or replace seeded areas, plants, and shrubs which, in judgment of Engineer, have not survived and grown in a satisfactory manner, for a period of one year after acceptance.

8. Provide as specified seedings or plantings replacements of the same type and size as specified.
9. Dry loam test samples to constant weight at temperature of 230 deg. F, plus or minus 9 degrees.
10. The Engineer reserves the right to test and reject any material not meeting specifications by utilizing tests in accordance with methods adopted by the Association of Official Agricultural Chemists. Costs for these tests shall be paid by the Contractor.

1.5 STORAGE AND HANDLING OF MATERIALS

- A. Store plants in ground or other acceptable media if not to be planted within 4-hrs. Protect roots of plant material from drying or other possible injury. Water plants as necessary until planted.
- B. Do not drop plants. Do not pick up container or B & B (ball and burlap) plants by stem or trunks.

1.6 WARRANTY

- A. Provide as specified.
- B. Guarantee new plant material through one full growing season after plants are installed. Guarantee plants replaced under this for one full growing season from date of replacement.
- C. Repair damage to plants or lawns during plant replacement. Guarantee lawn areas for duration of one full year after seeding to be alive and in satisfactory growth at end of guarantee period.
- D. For purpose of establishing an acceptable standard, scattered bare spots, none of which is larger than 1 sq. ft. will be allowed up to a maximum of 3% of lawn area.

PART 2 – PRODUCTS

2.1 TREES

- A. Species as noted and specified in the PLANT SCHEDULE.
- B. Trees shall be as specified in Section 02910, TREE PLANTING.

2.2 SHRUBS

- A. Species as noted and specified in the PLANT SCHEDULE.
- B. All shrubs shall meet the following standards

1. All shrubs shall be healthy and vigorous plants which are very well shaped, heavily branched, densely foliated, and true to form for the variety.
2. Canes or Trunk(s) and Branches:
 - a. Well formed and sturdy.
 - b. Branching shall be uniformly distributed close to the ground.
 - c. Scars shall be free of rot and not exceed 1/4 the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).
 - d. Pruning scars shall be clean cut and shall leave little or no protrusion from the trunk or branch.
 - e. Graft unions shall be completely healed.
 - f. No suckers or water sprouts.
 - g. Contain no dead wood.
 - h. Free of cracks, splits, or cambium peeling.
3. No shrub with pest or mechanical damage will be accepted.
4. Shrubs shall show no signs of frost or winter damage to the foliage. Foliage shall not be in a state of drought stress. Leaves or needles shall show no signs of wilt or desiccation due to weather stress at any season of the year.

2.3 PERENNIALS, GRASSES AND FERNS

- A. Species as noted and specified in the PLANT SCHEDULE.
- B. All perennials, grasses and ferns shall meet the following standards:
 1. Perennials, grasses and ferns shall be healthy and well cared for, with no evidence of insects or diseases present. Insect-ridden or diseased plants shall be rejected. Plants shall have a deep green foliage and dense, compact growth. Perennials, grasses and ferns shall have multi-stemmed bases and shall be two year potted stock minimum, one year in cutting bench and one year in pots.

2.4 GRADES AND STANDARDS OF PLANTS

- A. The Contractor shall furnish all plants shown on the Contract Documents, as specified, and in quantities listed on the PLANT SCHEDULE. No substitutions will be permitted, without written approval by the Landscape Architect. All plants shall be nursery grown unless specifically authorized to be collected as noted on the PLANT SCHEDULE.
- B. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Only plant stock

grown within Hardiness Zones 1 through 6b, as established by the USDA Plant Hardiness Zone Map, latest edition, will be accepted.

- C. Plants shall be in accordance with ASNS Standards of the American Association of Nurserymen except as noted in this Section. Botanical plant names shall be in accordance with plant designations included in Hortus III.
- D. If, at any time during the performance of the Contract, any plant shows signs of graft incompatibility, as determined by the Landscape Architect, then the tree or shrub and all other similarly grafted plants of the same Genus/Species/Variety shall be rejected and removed from the site. Visual symptoms of graft incompatibility as cause for rejection include:
 - 1. Development of over-growths by rootstock or scion resulting in the development of shoulders or inverted shoulders.
 - 2. Suckering of the rootstock combined with poor growth or dieback of scion.
 - 3. Any mechanical weakness between scion and rootstock.
 - 4. Any marked difference in bark pattern and structure between scion and rootstock.

2.5 ROOT SYSTEMS FOR ALL PLANTS

- A. Each plant shall have an extensive, symmetrically balanced fibrous root system. Any root ball which shows signs of asymmetry, injury, or damage to the root system shall be rejected.
- B. Curling or spiraling of the roots along the walls of rigid containers will not be accepted.
- C. All parts of the fibrous root system of all plants shall be moist and fresh with a white color when washed of soil. When the plant is removed from the container, the visible root mass shall be healthy with white root tips. The root systems of all plants shall be free of disease, insect pests, eggs, or larvae.
- D. All trees and all shrubs which are not grown in containers must be moved with the root systems as solid units with balls of earth firmly wrapped with untreated 8 ounce natural, biodegradable fabric burlap, firmly laced with stout, natural biodegradable cord or twine. The base of the tree trunks shall be wrapped with a protective burlap layer, surrounded by a cardboard trunk protector, and loosely tied with twine.
- E. The diameter and depth of the balls of earth must encompass the fibrous and root feeding system necessary for the healthy recovery of the plant. Minimum root ball diameters and depths shall be in accordance with ASNS standards.
- F. No plants shall be loose in the container.

- G. Container grown plants which have roots growing out of the container will be rejected.

2.6 SEED

- A. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Chewings fescue, hard fescue, tall fescue and ryegrass shall contain Acromonium endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.

1. Lawn Seed Mixture Composition:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>Germination Minimum</u>	<u>Purity Minimum</u>
Creeping Red Fescue	50%	85%	95%
Kentucky Bluegrass	25%	85%	90%
Perennial Rye	25%	90%	90%

- a. Bluegrass and ryegrass varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Massachusetts or the University of Rhode Island.
- b. Seeding rate for the Lawn Seed Mix shall be 6 pounds per 1,000 square feet.

2.7 WOOD CELLULOSE FIBER MULCH

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

- D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

2.8 PLANTING SOIL MIX

- A. Planting soil mix shall be an approved amended native soil specified, provided, installed and paid for under Section 02901 PLANTING SOILS, and that has been pH adjusted according to particular planting applications and improved through the addition of organic matter as directed below. Planting soil shall conform to the following pH levels:
 - 1. For broad-leaved evergreens requiring an acid soil, planting soil mix shall have a true pH of 4.5 to 5.5. Planting soil mix shall be amended by the Contractor at his own expense to the proper pH range by mixing with sulfur as specified, provided, installed and paid for under Section 02901 PLANTING SOILS. Broad-leaved evergreens include but are not limited to the following genuses: Kalmia and Ilex.
 - 2. Planting soil mix for general planting of non-acid loving plants shall have a true pH value of 6.0 to 6.5. Planting soil mix shall be amended by the Contractor at his own expense to the proper pH range by mixing with dolomitic limestone as specified, provided, installed and paid for under Section 02901, PLANTING SOILS.
 - 3. The amount of either sulfur or limestone required to adjust the planting soil mix to the proper pH range shall be approved by the Landscape Architect on the basis of soil tests as specified, provided, installed and paid for under Section 02901 PLANTING SOILS.

2.9 SOIL ADDITIVES

- A. Soil additives shall be specified, provided, installed and paid for under Section 02901 PLANTING SOILS.

2.10 MYCORRHIZAL FUNGAL INOCULANT

- A. Mycorrhizal fungal inoculant shall be live spores packaged in plastic packets. At a minimum each packet of inoculant shall contain the following:
 - 1. Live spores of VA Endomycorrhizal fungi: Vesicular-Arbuscular mycorrhizae fungi, minimum of 8 species.
 - 2. Live spores of Ectomycorrhizal fungi: including *Pisolithus tinctorius*.
- B. Mycorrhizal fungal inoculant shall be manufactured by:
 - 1. Plant Health Care Incorporated, 440 William Pitt Way, Pittsburgh, PA 15238, telephone: (800) 421-9051;
 - 2. Horticultural Alliance, 2946 Louise Street, Sarasota, FL 34237, (800) 628-6373;

3. BioPlex Organics, 2213 Huber Drive, Manheim, PA 17545 (800) 441-3573,
4. Or approved equal.

2.11 FERTILIZER

- A. Fertilizer shall be the unique feeder 16-8-16 controlled, slow-release fertilizer packets (8 yr), as manufactured by Osmocote, or approved equal.

2.12 MULCH

- A. Mulch shall be high quality, double-ground, premium bark mulch of 70 percent hemlock bark with the balance spruce and pine bark. Mulch shall have been aged for a minimum of six months and not longer than two years. Bark mulch shall be shredded to a uniform size; free of dirt, debris and foreign matter; with pieces no thicker than 1/4 in. Mulch must be free of stringy material or chunks over 3 inches in size and shall not contain, in the judgment of the Landscape Architect, an excess of fine particles. Bark Mulch shall be a well-graded material conforming to the following:
 1. pH between 4.0 – 8.0
 2. Particle size 100% passing a 50mm (2 inch) screen
 3. Soluble salt content < 4.0 mmhos/cm

2.13 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

2.14 ANTIDESICCANTS

- A. Antidesiccants shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Manufacturer of antidesiccant shall be subject to the Landscape Architect's approval and shall be used only after approval by the Landscape Architect. Antidesiccant shall be delivered in containers of the manufacturer and shall be mixed and applied according to the manufacturer's instructions.

2.15 LIMESTONE

- A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40

percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

PART 3 – EXECUTION

3.1 GENERAL

- A. It is the intent of this specification that existing trees within grading and seeding limits, not disturbed by building operations, be saved and protected, except where specified to be removed. Tree clearing, protection, and planting shall be performed based on the applicable specification sections and as indicated in the drawings or by the Engineer. Engineer requires variations required in grading on the job.

3.2 PLANTING

- A. Furnishing and planting of plant material shall include, but shall not be limited to, the digging of planting pits and plant beds, amendment of loam as required to produce planting soil mix, provision of soil additives required to adjust for pH requirements of specific plants, furnishing the plants as specified as well as the labor of planting, fertilizing, and maintenance.
- B. Prior to spreading of loam, subgrades shall have been tested to determine if they are too compact to drain water as specified, performed and paid for under the work of Section 02901, PLANTING SOILS, of this Specification.
- C. The Contractor shall locate plant material sources and ensure that plants are shipped in timely fashion for installation.
- D. Contractor shall locate all existing underground utilities that are within 10 feet of the proposed planting pits and notify the Landscape Architect of any conflicts prior to digging plant pits.
- E. Seasons for Planting:
 - 1. Spring: Deciduous materials - March 31 through June 15; Evergreen materials - April 27 through June 15.
 - 2. Fall: Deciduous materials – August 15 through October 1; Evergreen materials - August 15 through October 1.
- F. Plant Material Inspection:
 - 1. At least one month prior to the expected planting date, the Contractor shall request that the Landscape Architect provide a representative to select and tag stock to be planted under this Section 02900, LANDSCAPING. The Contractor shall pay for the transportation,

subsistence and overnight accommodations, if necessary, for the Landscape Architect's representative during the period of time required to select and tag the plant material.

2. The Contractor shall be responsible to certify the availability of quality plants in specified sizes from his/her sources of supply prior to requesting that the Landscape Architect make plant source inspections. In the event that plants at the inspection location are found to be unavailable or of insufficient size, the Contractor shall be liable to reimburse the Owner for all costs of the Landscape Architect's hourly services which are incurred during unproductive inspection trips.
3. Unless specifically designated otherwise, a representative of the Contractor shall accompany the Landscape Architect on all plant material selection field trips.
4. All trees for the project shall be individually tagged for approval with the Landscape Architect's seals, and no trees shall be accepted for delivery to the site without such seals. Representative samples only of shrubs and ground cover plants may be tagged or marked for approval as an "Approved Typical Sample" and shipped to the site. Any shrub or groundcover plant that arrives at the construction site that does not meet the Approved Typical Sample will be rejected by the Landscape Architect.
5. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work if the Landscape Architect finds that plants do not meet the requirements of the PLANT SCHEDULE or this Contract, have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the Contractor.

G. Placement of Loam for planting soil shall be specified, performed and paid for under the work of Section 02901, PLANTING SOILS, of this Specification. Obtain Landscape Architects written approval of work of rough grading and finish grading prior to starting the work of planting.

H. Planting:

1. Notify the Landscape Architect three working days prior to the proposed arrival of plant material on the site. If not planted within 24 hours of delivery to the site, all plants shall be maintained in an on-site nursery. Container grown shrubs stored on site shall be shaded from direct sunlight at all times and shall not be stored directly on paved surfaces. All plants delivered to the site and not planted within 24 hours of delivery shall have their root balls covered with mulch and shall be watered on a daily basis such that root balls are kept moist throughout.

2. Locations for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Landscape Architect before any plant pits or plant beds are dug. Notify the Landscape Architect no less than 3 days prior to desired date of inspection of staking to schedule site visit.
3. All plant pits dug with a machine shall have the sides of the holes scraped with hand shovels to prevent glazing or compaction of the sides of the hole. Remove and stockpile excavated loam for reuse as backfill for plant pit. All subsoil excavated from the bottoms of planting pits shall be removed from the site.
5. Plant pits shall be dug to the dimensions shown on the Contract Documents.
 - a. Plant pits for trees shall be a minimum three times the diameter of the root ball. Place root ball directly on subgrade. Slope sides of tree pits at a 45 degree angle.
 - b. Plant pits for shrubs shall be 2 feet greater in diameter than the diameter of the root ball. Place root ball directly on subgrade. Slope sides of tree pits at a 45 degree angle.
 - c. Shrub planting beds shall be excavated and backfilled with planting soil mix to a minimum uniform depth of 24 inches below final grade, or as shown on the Contract Documents.
 - d. Plant pits shall be dug to the depth of the rootball to be planted. Remove all soil from around the root flare of the stem of the plant and from the top of the rootball to determine the true depth of the rootball. All plants that have been planted and have root flares that are buried will be rejected.
6. Perennial, grass and fern beds:
 - a. Perennial, grass and fern beds shall be dug to a continuous depth of 1 foot below final grade, or as shown on the Contract Documents. Place sufficient planting soil mix to provide 1 foot deep beds. Remove groundcover and perennials from their pots immediately before planting. Handle plants carefully to prevent damaging roots. Place each plant in individual hole and firm the planting mix around the roots. Water thoroughly and mulch as shown on the Contract Documents. Groundcover plants may be planted after the planting mulch is placed.
7. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation, and at the site until the final planting.
8. Remove container plants from containers prior to planting.
9. Trees and shrubs shall be placed in the center of plant pits, plumb, with the crown of their roots exposed and located above the surrounding finish grade.

10. Prior to completion of planting installations, remove rope and cut wire baskets from the top 1/3 of the root balls. Pull burlap away from the trunk or stem of the plant and cut burlap from the top 1/3 of the root balls.
 11. Contractor shall 'butterfly' the root system for all container grown perennials immediately prior to planting them. Butterflying shall consist of vertically cutting the containerized root ball with a spade through the bottom half of the rootball followed by gently pulling the rootball open at the cut while placing it into the planting hole. The butterflied root system shall be placed over a small ridge of soil in the planting pit in order to assure as much soil to root ball contact as possible and to keep the halves apart.
 12. Existing loam excavated from the planting pit and new loam meeting the requirements of these specifications shall be reused for backfilling the rootball. Existing loam and new loam shall be wedged under the curve of the rootball sufficiently to support the rootball and to keep the trunk of the tree plumb during planting soil placement. Under no circumstances shall depth of backfilled material be such that the remaining volume left for backfilling the planting soil is less than 18 inches. Do not use excavated subsoil in backfill.
 13. Planting soil shall be backfilled in layers of not more than 6 inches. Compact each layer of planting soil by foot tamping prior to placing next layer of planting soil backfill. Eliminate all air pockets in the backfill material. Enough planting soil shall be used to bring the finished surface of the planting pit to 2 inches above finished grade at plant stem when planting soil backfill has settled. A saucer shall be formed around each plant at a depth of 6 inches for trees and 4 inches for shrubs.
 14. Fertilizer shall be spread over the plant saucer or plant bed between the saucer and the edge of the rootball. Till the fertilizer into the soil to a depth of four inches prior to the placement of the planting mulch. Fertilizer shall be provided, spread and paid for under the Section 02901, PLANTING SOILS, of this Specification. Do not mulch until placement of the fertilizer has been verified by the Landscape Architect. Fertilizer application rates shall be as determined by soil testing, analysis, and testing laboratory recommendations specified, performed and paid for under the Section 02901, PLANTING SOILS, of this Specification.
- I. All plants shall be watered immediately following planting as necessary to thoroughly moisten rootball and plant pit loam and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit. The Contractor shall inspect tree pits 24 hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately notify the Landscape Architect. The Landscape Architect will recommend remedial measures based upon site conditions.

J. Keeping Trees Plumb:

1. Contractor shall keep trees plumb and upright at all times. To this end the Contractor shall either;
 - a. Stake, guy, or anchor all trees; or
 - b. Monitor plants on a regular basis and, if a tree is moved out of plumb, then straighten the tree to a vertical, upright condition.

2. If Contractor chooses to keep trees plumb and upright by staking, guying, or anchoring, then the work of this item shall be performed at the time of planting, unless otherwise approved or directed by the Landscape Architect. Stakes shall be of even height, plumb and neat in appearance and they shall not injure plant balls. Anchoring devices shall be applied as follows:
 - a. Soft steel guy wires shall be double stranded and secured to each stake with a central tightening loop. Thread wires through reinforced rubber hose at tree trunk.
 - b. Drive anchors shall be installed in accordance with manufacturer's instructions.
 - c. Diagonal cables shall receive one flag per cable to promote visibility and prevent tripping hazards.
 - d. Elastic webbing, belting or tape shall be installed in accordance with manufacturer's instructions.

3. If Contractor chooses to keep trees plumb and upright by resetting trees that move out of vertical alignment, then the work of this item shall include:
 - a. Tree inspections on a weekly basis and after storms or abnormally windy days to determine if the trees have shifted out of vertical alignment and require resetting.
 - b. Reset trees that have moved out of plumb by carefully excavating the soil from the base of the rootball facing away from the direction of tilt and easing the tree upright into a vertical, plump position. Upon righting the tree, firmly press the soil around the base of the rootball to reset the tree.
 - c. The Contractor shall retain the right to stake, guy, or anchor the tree into place in accordance with the requirements of this Section 02900, LANDSCAPING .
 - d. Mulch and water the tree in accordance with the requirements of this Section 02900, LANDSCAPING, immediately after the work of resetting.

- K. Mulch material shall be placed over entire saucer areas of individual trees and shrubs and over the entire area of planting beds to a depth of 3 inches after

settlement, not later than one week after planting. Do not apply mulch prior to the first watering of plant materials. Do not apply mulch prior to placement of surface applied fertilizer and verification of placement by the Landscape Architect.

- L. The trunks of all deciduous trees over 1-1/2 inches in diameter shall be wrapped by the Contractor immediately after the inspection of the trees by the Landscape Architect. Wrapping shall extend from the ground line to the height of the second branches or to the height directed. The specified wrapping shall be wound spirally, starting from the base and overlapping 1-1/2 inches in order to shed water. Wrapping shall be securely taped to prevent loosening and unraveling. If trees are planted in springtime, do not apply any tree wrapping. If deciduous trees are planted in the autumn, wrap the trees and then remove wrapping the following spring.
 - 1. Trees delivered to the site wrapped for protection shall be unwrapped at the site for inspection of the trunk by the Contractor and Landscape Architect.
- M. Antidesiccant shall be applied to all evergreen and broadleaf evergreen plants in December and again in February, according to manufacturer's application recommendations and as directed by the Landscape Architect.
- N. If planting is done after turf and grass preparation or installation, proper protection of seeded areas shall be provided. Any damage resulting from planting operations shall be repaired immediately at no cost to the Owner.
- O. In the event that rock or underground construction work or obstructions are encountered in any plant pit or bed excavation work, alternate locations will be selected by the Landscape Architect. Relocation of plant pits or beds shall be provided at no additional cost to the Owner. Provide the Landscape Architect with no less than 48 hours notice of obstruction so that a site visit can be scheduled to establish new locations for plants.
- P. Absolutely no debris may be left on the site. Repair any damage to site as directed by the Landscape Architect, at no additional cost.
- Q. All replacements shall be plants of the same kind and size specified in the PLANT LIST. The cost shall be borne by the Contractor, except for possible replacements due to vandalism or neglect on the part of others.

3.3 SEEDING

- A Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any seeding.
- B Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.

- C The season for seeding shall be from April 1 to June 1 and from August 15 to September 30. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 Days of spreading the planting soil.
- D Seed only when the bed is in a friable condition, not muddy or hard.
- E Seeding of lawn shall be by Hydroseeding Method specified as follows:
 - 1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.
 - 2. Hydroseed with wood cellulose fiber mulch at a rate of 46 pounds per 1,000 square feet or 2000 pounds per acre.
 - 3. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank. Apply the slurry by a centrifugal pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.
 - 4. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any hydroseeding.
 - 5. Limit of grading and earthwork shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All lawn areas disturbed outside the limit of hydroseeding shall be hydroseeded.
 - 6. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified in the Standard Specification.
 - 7. Hydroseeding shall consist of spreading 100 percent of the required seed uniformly over the prepared loam bed so that the seed comes into direct contact with the soil. To mark the progress of the hydroseeding operation the Contractor may add 10 percent of the wood cellulose fiber mulch to the slurry.
 - 8. Excessive hydroseeding of planting areas, walkways and driveways shall not be permitted. Contractor shall remove all hydroseed from non-seeded areas.

3.4 PLANT MAINTENANCE

- A. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum 30-day Monitoring Period and until the end of the fall planting season following Final Acceptance.

- Plants shall be inspected for watering needs at least twice each week and watered to promote plant growth and vitality. The following watering rates assume that the soil is free draining. If the on site conditions do not ensure a free draining soil, then notify the Landscape Architect in writing of this condition. Watering rates for trees, shrubs, ground cover, vines and perennials in free draining soils are presented here as guidelines to ensure that the top six inches of plant bed soil remains moist at all times. Actual watering rates may vary depending upon soil conditions. Guideline rates shall be as follows:

<u>Type of Plant/Size</u>	<u>Weekly Watering Rate</u>
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Deciduous Trees:

1 - 1-1/2 in. caliper	40 gallons
1-1/2 - 2 in. caliper	54 gallons
2 - 2-1/2 in. caliper	61 gallons
2-1/2 - 3 in. caliper	70 gallons
3 - 3-1/2 in. caliper	80 gallons
3-1/2 - 4 in. caliper	90 gallons
4 - 4-1/2 in. caliper	100 gallons
4-1/2 - 5 in. caliper	110 gallons
5 - 5-1/2 in. caliper	120 gallons
5-1/2 - 6 in. caliper	130 gallons

<u>Type of Plant/Size</u>	<u>Weekly Watering Rate</u>
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Evergreen Trees:

1 - 2 ft. height	25 gallons
2 - 3 ft. height	30 gallons
3 - 4 ft. height	35 gallons
5 - 6 ft. height	40 gallons
6 - 7 ft. height	45 gallons
7 - 8 ft. height	50 gallons
8 - 9 ft. height	60 gallons
9 - 10 ft. height	70 gallons
10 - 11 ft. height	80 gallons
11 - 12 ft. height	90 gallons

Shrubs:

Up to 2 ft. height	10 gallons
2 - 4 ft. height	20 gallons
4 - 6 ft. height	30 gallons
6 - 8 ft. height	40 gallons

Perennials, Grasses and Ferns:

5 gallons

- a. Water shall be applied by 1 inch diameter hose with an attached metering gauge.
 2. For trees in lawn or mulched beds, apply water to the ground surface directly under the canopy. Water shall be applied at a sufficiently slow rate to prevent run off from the soil surface but great enough to equal 0.2 inches of water per square foot of canopy area per hour for 5 hours per week.
 3. Stakes shall be kept plumb and neat in appearance. Guys, wires and anchoring cables shall be tightened and repaired weekly.
 4. Planting beds and individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
 5. Plants that die during the maintenance period shall be removed and replaced by the Contractor within one week of notification and replaced during that growing season, unless directed otherwise by the Landscape Architect.
 6. Spraying of insecticides or herbicides shall be done by State-licensed professionals. Spraying for insects, pests and diseases shall conform to the National Arborist Association Standards under the section entitled "Standards for Pesticide Application Operations", as currently adopted and as approved by the Landscape Architect. All insecticides, pesticides, and herbicides shall be EPA-approved and shall conform to the requirements MCRG: Massachusetts Control Recommendation Guide for Insect, Disease, and Weed Pests of Shade Trees and Woody Ornamentals, latest edition, University of Massachusetts, Amherst, College of Food and Natural Resources.
 7. Work of pruning, fertilizing, spraying, and similar activities shall be undertaken only by Certified Arborists and licensed chemical applicators, as pertinent to the work being performed.
- B. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures. The Landscape Architect shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Landscape Architect.

3.5 LAWN MAINTENANCE

- A Maintenance shall begin immediately after any area is seeded and shall continue for a 60 day active growing period for seeded areas or until Final Acceptance,

whichever is longer; following the completion of all lawn construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring for the minimum 60 Day period. In addition, install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples to the Owner's Representative for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.

- B Maintenance shall be specified, provided, installed and paid for under this Section 02900, LANDSCAPING, of this Specification.

3.6 PLANT ACCEPTANCE

- A. Upon completion of all planting work, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work.
- B. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Conditional Acceptance to the Contractor.
- C. Following the issuance of the Certificate of Conditional Acceptance to the Contractor, the Contractor shall maintain the plants for a minimum 30 day Monitoring Period. At the end of the Monitoring Period, the plant material will be inspected by the Landscape Architect to determine whether or not all planting work has been performed to the requirements of this Section 02900, LANDSCAPING.
- D. Acceptance Standards at end of the Monitoring Period: If plant material is reviewed when it is in full leaf, leaves shall be plump with water with a shape indicative of the species and shall be free of insect, pest and disease damage. Twigs shall have living cambium for their full length. Twigs and branches shall have a full bud set for their full length, including terminal buds. Trunks and branches shall be free of frost cracks; sun scald; damage due to insects, pests, and disease; structural defects; and damage resulting from machinery or tools. Plant material inspected and reviewed when the plants are not in full leaf shall have twigs, branches and trunks meeting the above requirements. All plants regardless of the season of review shall have a minimum of 75 percent healthy, balanced branching structure with a healthy terminal leader(s) with viable terminal bud(s).
- E. If any numbers of plants do not meet these Acceptance Standards at the time of inspection, or if in the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or other deficiencies are corrected. All plants that do not meet these Acceptance Standards shall be removed from the project within seven days of

receipt of the punch list. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner

- F. Following the correction of all Punch List deficiencies, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Final Acceptance to the Contractor.

3.7 LAWN ACCEPTANCE

- A Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Owner's Representative in writing for a formal inspection of the completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.
- B Acceptance Requirements
 - 1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section 02900, LANDSCAPING.
 - 2. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.
- C Furnish full and complete written instructions for maintenance of the lawns to the Owner at the time of acceptance in conformance with Submittals requirements.
- D Owner's Representative's inspection shall determine whether maintenance shall continue in any part.

3.8 PLANT GUARANTEE

- A. The date of the Certificate of Final Acceptance shall establish the beginning of the maintenance period and the commencement of the required **one-year guarantee** and establishment period for planting work.
- B. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall be plumb, shall have a character that is natural for its species as determined by the Landscape Architect, and shall conform to the Acceptance Standards described in this Section 02900, LANDSCAPING. Plants found to be unacceptable shall be removed promptly from the site and replaced according to this Section 02900, LANDSCAPING. A final inspection will be made after the replacement plants have lived through one year.

- C. At the end of the one-year guarantee and establishment period, remove all tree stakes, guys, or anchors installed on trees during the course of the work of this contract.

3.9 CLEAN-UP

- A. Remove soil or similar material which has been brought onto paved areas, keeping these areas clean. Upon completion of planting, remove excess soil, stones and debris which has not previously been cleaned up and legally dispose of off-site.
- B. Prepare lawns and planting areas for final inspection. Protect slopes and embankments against erosion until work is accepted. Repair eroded portions of seeded areas by refilling, remulching and reseeding as required by condition and as required by the Engineer. Protection may be by installation of sod strips or other methods.

PART 4 – COMPENSATION

2900.1	PLANTING AREA: BIRCH STREET AREA A	LUMP SUM
2900.2	PLANTING AREA: BIRCH STREET AREA B	LUMP SUM
2900.3	PLANTING AREA: BIRCH STREET AREA C	LUMP SUM
2900.4	PLANTING AREA: BIRCH STREET AREA D	LUMP SUM
2900.5	PLANTING AREA: FERN STREET AREA A	LUMP SUM
2900.6	PLANTING AREA: FERN STREET AREA B	LUMP SUM
2900.7	PLANTING AREA: FERN STREET AREA C	LUMP SUM
2900.8	PLANTING AREA: CORPORAL BURNS ROAD AREA D	LUMP SUM
2900.9	PLANTING AREA: HAZEL STREET/ FIELD STREET AREA A	LUMP SUM
2900.10	PLANTING AREA: HAZEL STREET/ FIELD STREET AREA B	LUMP SUM
2900.11	PLANTING AREA: ALPINE STREET/ FIELD STREET AREA C	LUMP SUM
2900.12	PLANTING AREA: WALDEN STREET/ GARDEN STREET AREA A	LUMP SUM
2900.13	PLANTING AREA: WALDEN STREET/ GARDEN STREET AREA B	LUMP SUM
2900.14	PLANTING AREA: FAYERWEATHER STREET/ SAVILLE STREET AREA A	LUMP SUM

METHOD OF MEASUREMENT:

Measurement for payment for Planting Areas shall be made on a lump sum basis for each planting area as shown in these Contract Documents or as otherwise approved by the Engineer.

BASIS OF PAYMENT:

Payment for Planting Areas shall be based on the unit price bid for this item in the proposal. Under the Unit Price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required. The work includes but is not limited to: furnishing planting soil; preparation of planting soil; furnishing, placing and planting trees, shrubs, and containerized plants; seeding; mulching; staking trees; applying fertilizer, lime and mycorrhizael inoculants; watering; replacement and protection of planted areas during the establishment period.

EXCLUSIONS AND SPECIAL NOTES:

Payment for Street Trees shall not be paid for under this item and are paid for elsewhere.

END OF SECTION 02900

SECTION 02901

PLANTING SOILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:

1. Sampling and testing of loam borrow
2. Sampling and testing of existing on-site topsoil
3. Modifying, screening, placing, spreading and grading of loam borrow
4. Modifying, screening, placing, spreading and grading of existing, on-site topsoil
5. Providing all other sampling, testing, supplying, placing, spreading and grading of planting soils as required by this Section

- B. Related work:

1. Division 1 Section 01560, TEMPORARY ENVIRONMENTAL CONTROLS
2. Division 2 Section 02100, SITE PREPARATION AND TREE PRUNING
3. Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING
4. Division 2 Section 02900, LANDSCAPING
5. Division 2 Section 02902, STRUCTURAL PLANTING MEDIUM
6. Division 2 Section 02910, TREE PLANTING

1.3 PROJECT CONDITIONS

- A. At least 30 days prior to ordering materials, the Contractor shall submit to the Landscape Architect samples, certifications, manufacturer's product data and certified test results for materials as specified below for approval.

1. Existing Topsoil: Sample and test the stockpiled soils.

1.4 REFERENCES

- A. Commonwealth of Massachusetts Highway Department (MHD): Standard Specifications for Highways and Bridges, 1988, or latest edition.

- B. American Society for Testing and Materials (ASTM): D75, D422, D1557
- C. A.O.A.C.: Association of Official Agricultural Chemists.
- D. USDA, MADEP Bio Solids Reference Sheets.

1.5 SAMPLING, TESTING, AND SUBMITTALS

- A. At least 30 days prior to ordering materials, the Contractor shall submit to the Owner's Representative samples, certifications, manufacturer's product data and certified test results for materials as specified below for approval. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner's Representative. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner's Representative reserves the right to reject, on or after delivery, any material that does not meet these Specifications. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Existing Topsoil: Sample and test the stockpiled soils. The Contractor shall sample the soils of the construction site in the following manner:
 - a. The Contractor shall provide a one cubic foot representative sample per each 1,000 cubic yard on-site stockpile of existing topsoil for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.
 - b. Stockpiles shall be as described in Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING, and labeled in the field with a numbering system referenced in all soil samples and test results.
 - c. Preparation of Samples: Contractor shall take one cup of soil from each representative sample and dry it at room temperature (do not dry samples in an oven or on a stove or radiator). Once soil is dry, place soil in sandwich size zip-type plastic bag and close it tightly. Label each sample on outside of bag, identifying sample by reference number. Provide an approved site plan showing locations of stockpiles cross-referenced to soil samples and test results.
- B. Testing will be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Owner's Representative. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, University of Massachusetts, Amherst, MA 01003, (413) 545-2311, or another professional testing laboratory approved by the Owner's Representative. Testing reports shall include the following tests and recommendations. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Owner's Representative from the Soil and Plant Tissue Laboratory. Testing reports shall include the following tests and recommendations.
 - 1. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D

422 after destruction of organic matter by H₂O₂. To facilitate review and approval of sieve analysis, provide a computer generated gradation curve from UMASS Soil & Plant Tissue Laboratory.

2. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit.
3. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, pH, and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.
4. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish planting work as specified.
5. If biosolid compost (Massachusetts Department of Environmental Protection-permitted material) is used as an organic component of the proposed planting soil mixture, the amount of organic material used shall not exceed agronomic rates for nitrogen and phosphorus for trees and shrubs, or herbaceous material for wetland plantings. Provide certificates of agronomic rates from vendor for organic matter used in Upland Planting Soil manufacturing process. Biosolid compost shall be tested by an approved testing laboratory to determine that the compost is mature, stable and suitable for use in a growing medium.
6. Leaf Mulch: Submit a one cubic foot sample and supplier's certification of contents.
7. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
8. Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications.
9. Gypsum: Submit manufacturer's product data and one (1) pound sample.
10. All additives needed to amend the existing soils in order to meet these specifications.

PART 2 – PRODUCTS

2.1 LOAM - GENERAL

- A. The Contractor shall provide sufficient loam borrow to complete all loaming operations required of the Contract Documents, as specified, provided, installed and paid for under this Division 2 Section 02901, PLANTING SOILS, and as directed by the Landscape Architect. Loam Borrow shall comply with the following specifications.

Loam Borrow shall be obtained from one of the following sources:

1. Naturally well-drained areas that have never been stripped before and have a history of satisfactory vegetative growth. Comply with all City and Town bylaws or regulations concerning the removal of topsoil from their boundaries.
2. On-site topsoil stripped, stockpiled and paid for under the work of the Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING, of this Specification and meeting the requirements of this Division 2 Section 02901, PLANTING SOILS.
3. A commercial processing facility specializing in the manufacturing of loam.
4. On-site granular material stripped and stockpiled on the site may be used as the basis for an on-site, manufactured loam. Submit method and schedule of manufacturing process to the Landscape Architect for review and approval.
5. All sources shall be acceptable provided that, after testing and the addition of necessary soil additives specified in this Division 2 Section 02901, PLANTING SOILS, the loam borrow meets the following specifications.

2.2 LOAM

- A. Loam borrow for planting trees, shrubs, groundcover, and perennials shall be one of the following sandy loams; “course sandy loam “, “sandy loam”, and “fine sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil.

It shall be free of stones greater than one and one-quarter inches, lumps, plants and their roots, debris and other extraneous matter as determined by the Landscape Architect. Planting soil for trees, shrubs, groundcover and vines, and perennials shall have the following grain size distribution for material passing the #10 sieve:

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
2	-----	100
1	100	80
0.5	87	67
0.25	78	48
0.10	68	30
0.05	55	22
0.002	7	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.
2. The ratio of the particle size for 80% passing (D80) to the particle size for 30%

passing (D30) shall be 6.0 or less. (D80/D30 < 6.0)

- B. Loam borrow for seeded areas and grasses as described in the Division 2 Section 02900, LANDSCAPING, of this Specification, shall be one of the following loamy sands and sandy loams; “loamy sand”, “loamy fine sand”, “loamy very fine sand”, or “coarse sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil.

Planting soil for seeded areas and grasses shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
2	-----	100
1	100	82
0.5	87	65
0.25	72	49
0.10	45	30
0.05	32	22
0.002	5	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.

- C. Organic content and pH for specific planting use shall be as follows:

1. Areas planted with seed mix and grasses per the Division 2 Section 02900, LANDSCAPING, of this Specification:
 - a. pH: 6.0 through 7.0
 - b. Organic Content 4.0 - 6.0 percent as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)
2. Top 18 inches of areas planted with tree and shrub as described in the Division 2 Section 02900, LANDSCAPING, of this Specification:
 - a. pH: 5.5 through 6.5 for non-acid loving plants
 - b. pH: 4.5 through 5.5 for acid-loving plants
 - c. Organic Content 4.0 - 6.0 percent as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)
3. Below 18 inches in tree and shrub beds when details call for depths of loam borrow to exceed 18 inches:
 - a. pH: 5.5 through 6.5 for non-acid loving plants

- b. pH: 4.5 through 5.5 for acid-loving plants
 - c. Organic Content 1.0 - 3.0 percent as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)
4. Loam borrow shall be pH adjusted for particular planting applications and shall be adjusted prior to delivery to the Project sites as recommended by UMASS Soil & Plant Tissue Laboratory test results.
- a. When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.
 - b. When pH of loam borrow is less than 7 use either sulfur or ferrous sulfate to adjust pH downward to required levels.
 - c. When pH of loam borrow must be raised to the required levels use limestone.
 - d. Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by seeding and/or planting time.
- D. Loam borrow shall be free of plants and their roots, debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 milliohms/cm. (Test minus sieve #4 material.) Loam borrow shall not have levels of extractable aluminum greater than 200 parts per million except for acid-loving plants.
- E. Loam borrow may be the manufactured product of a commercial processing facility specializing in the production of manufactured soils and loam borrow. Loam borrow shall be manufactured from sands, silts, clays, peat moss, and biosolids as specified, performed and paid for under the work of this Division 2 Section 02901, PLANTING SOILS. Loam borrow may be manufactured outside the project area and delivered to the project for spreading or the component soils and organics may be delivered to project site and mixed in situ.
- 1. Manufactured loam borrow shall be manufactured sufficiently in advance of spreading on the project so that ammonium, pH, soluble salts and the Carbon/Nitrogen ratio will have stabilized at the time of sampling and testing by the Contractor. On-site testing of loam borrow will be performed by the Contractor to verify that delivered material meets the requirements of this Division 2 Section 02901, PLANTING SOILS.
 - 2. Manufactured loam borrow shall contain equal amounts of biosolid compost and peat moss to establish the required organic levels.
- F. On-site topsoil stripped, stockpiled, and paid for under the work of the Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING, may be re-used if, with or without amending or blending with other material, it meets the above requirements. On-site topsoil and amendments shall be tested in accordance with requirements for loam borrow and submittals shall be made for review and acceptance as specified, performed and paid for under this Division 2 Section 02901, PLANTING SOILS. The Contractor shall provide additional loam borrow as required to complete the required work.

- G. All loam borrow proposed for use shall be tested for conformance to the specifications.
- H. The Landscape Architect reserves the right to reject on or after delivery to the project site any material which does not, in his opinion, meet these specifications.

2.3 SOIL ADDITIVES

- A. General: Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for lawn construction as specified herein.
- B. Acidulant for adjustment of loam borrow pH shall be commercial grade flours of sulfur, ferrous sulfate, or aluminum sulfate that are unadulterated. Acidulants shall be delivered in unopened containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- C. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to meet the requirements of the testing lab recommendations.
- D. Organic component of the manufactured loam borrow shall be compost and peat moss used in equal proportions. Compost shall be a stable humus-like material produced from the aerobic decomposition of organic residues. The residues, if biosolids, shall consist of compost meeting MA-DEP Type 1 requirement or approved equal. The residues shall be dark brown or black in color, with no visible free water or dust and no unpleasant odor, meeting the following criteria certified by the producer.

1. carbon-nitrogen ratio	minimum 10:1 maximum 25:1
2. stability CO2 evolution test or Dewar self-heating test or Woods End Laboratory's Compost Test Kit	<10 mg CO2 - C/g BVS/day <10 degrees C above room temp.
3. organic content	40 percent minimum dry weight (Loss on Ignition; minus #10 Sieve, 430 degrees C)
4. particle size	90 percent passing 0.5 inch screen, 100 percent passing one-inch screen
5. inorganic debris	1 percent maximum (dry weight)
6. pH	minimum 5.5 - maximum 8.0
7. Soluble Salts	>2 and <4.0 mmhos/cm (ds/m)

8. density 850-1,050 lb./cy

E. Peat moss shall not be used.

F. Sand, as required for mixing with topsoil to meet Specification requirements shall be uniformly graded coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation.

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
5	-----	100
2	100	80
1	86	58
0.5	50	18
0.25	24	7
0.10	0	10
0.05	0	4.5
0.002	0	0.3

1. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 4.0 or less. (D70/D20 < 4.0)

PART 3 – EXECUTION

3.1 FILLING AND COMPACTION

A. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents and specified and paid for under Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING, of this Specification. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.

B. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents. Provide a written report to the Onwer and the Landscape Architect that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified, performed and paid for under this Division 2 Section 02901, PLANTING SOILS. Perform no work of placing and spreading loam until elevations have been confirmed and written report has been accepted by the Landscape Architect.

C. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed

from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

- D. Do not proceed with the installation of loam borrow until all utility work in the area has been installed.
- E. Protect adjacent walls, walks and utilities from damage or staining by the loam borrow. Use 0.5-inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

3.2 FINE GRADING

- A. Immediately prior to dumping and spreading loam borrow, the subgrade shall be cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried.
- B. After removal of all stones greater than 2 inches in size is completed, the subgrade shall be “scratched” to a depth of 4 inches with a backhoe to break up compaction caused by construction vehicles. Notify the Landscape Architect that the subsoil has been cleaned and “scratched” to request his/her attendance on site to review and approve subgrade conditions prior to spreading of loam borrow.
- C. Planting soil delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Landscape Architect and surrounded by silt fence as specified under the work of the Division 1 Section 01560, TEMPORARY ENVIRONMENTAL CONTROLS, of this Specification and installed and paid for under the work of the Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING, of this Specification.
- D. No planting soil shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist loam borrow is desirable.
- E. Soil additives shall be spread and thoroughly incorporated into the layer of loam borrow by harrowing or other methods reviewed by the Landscape Architect. The following soil additives shall be incorporated:
 - 1. Ground limestone or acidulant as required by soil analysis to achieve the required pH as described in this Division 2 Section 02901, PLANTING SOILS. Spread limestone at the rate required by soil analysis up to a maximum limit of 200 pounds per 1,000 square feet. Should recommendations of soil analysis require greater rates of application than 200 pounds per 1,000 square feet, a surface application of limestone not in excess of 50 pounds per 1,000 square feet shall be made to the established lawn during the season after Final Acceptance. This second application of limestone shall be performed and paid for under the work of the Division 2 Section 02900, LANDSCAPING at rates determined under the testing requirements of this Division 2 Section 02901, PLANTING SOILS.
 - 2. Fertilizer at the rate and of analysis recommended by the soil analysis.

3. Biosolid compost, sand or other soil amendments as required by soil analysis.
- F. After loam borrow and required additives have been spread, carefully prepare the loam borrow by scarifying, harrowing, or tilling the loam to integrate soil additives into the top 6 inches of the loam. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove from unscreened soils all stones over 1 inch in diameter from the top 6 inches of the loam bed. Loam borrow shall also be free of smaller stones in excessive quantities as determined by the Landscape Architect.
- G. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- H. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional loam borrow and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.
- I. The Contractor shall install planting soil in successive horizontal lifts no thicker than 6 inches in turf areas and 12 inches in plant bed areas to the desired compaction as described in this Division 2 Section 02901, PLANTING SOILS. The Contractor shall install the soil at a higher level to anticipate any reduction of loam borrow volume due to settling, erosion, decomposition, and other similar processes during the warranty period. The Landscape Architect will ensure that the full 6 inches of loam borrow are obtained by digging holes in the loam borrow at the same frequency as for compaction testing.
- J. Select equipment and otherwise phase the installation of the loam borrow to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Landscape Architect. If it is determined by the Landscape Architect that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and uncompacted as the work progresses or place one-inch thick steel plate ballast (or equivalent ballast approved by the Landscape Architect) over the length and width of any travel way to cover loam borrow to protect it from compaction.
- K. Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The loam borrow in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the loam borrow installation, the soil should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:
1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter. Holes in 6-inch lift in turf areas shall be 4 inches deep. Holes in 12-inch lifts in plant beds shall be 8 inches deep. Do not penetrate through the lift being tested.
 2. Fill the hole with water and let it drain completely. Immediately refill the hole with

- water and measure the rate of fall in the water level.
3. In the event that the water drains at a rate less than one inch per hour, till the soil to a depth required to break the over compaction.
 - 4 Perform a minimum of one soil percolation test per 10,000 square feet area of turf area and 2,500 square feet of tree and shrub planting area as directed by the Landscape Architect.
- L. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of loam borrow to the finished grade.
- M. Contractor shall be responsible for maintaining all stockpiles of existing, on-site topsoil on the site until final placement of existing on-site topsoil and loam borrow. Upon written approval by the Landscape Architect, Contractor shall remove all excess, unused existing on-site topsoil from the site and dispose of it in a legal manner.

3.3 ACCEPTANCE

- A. Confirm that the final grade of the loam borrow is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Landscape Architect to inspect final grade. Do not proceed with the remaining work of this Contract until the Landscape Architect has given his/her written approval of the final grade.

END OF SECTION 02901

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SECTION 02902

STRUCTURAL PLANTING MEDIUM

2902.1

STRUCTURAL PLANTING MEDIUM

CUBIC YARD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.2 SUMMARY

- A. The work of this Section consists of providing all equipment and materials and do all work necessary to supply and place structural planting soils in areas adjacent to new street tree plantings beneath new sidewalks, as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:
 - 1. Sampling and testing of Structural Planting Medium.
 - 2. Sampling and testing of existing on-site topsoil.
 - 3. Supplying, placing, spreading and grading of Structural Planting Medium system.

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
 - 1. Division 2 Section 02100, SITE PREPARATION AND TREE PRUNING
 - 2. Division 2 Section 02210, EARTH EXCAVATION, BACKFILL, FILL AND GRADING
 - 3. Division 2 Section 02524, CURBS, WALKS, AND DRIVEWAYS
 - 4. Division 2 Section 02900, LANDSCAPING
 - 5. Division 2 Section 02901, PLANTING SOILS
 - 6. Division 2 Section 02910, TREE PLANTING

1.4 REFERENCES

- A. Commonwealth of Massachusetts Highway Department (MHD):
 - Specifications Standard Specifications for Highways and Bridges
- B. American Society for Testing and Materials (ASTM):
 - D 75 Practice for Sampling Aggregates
 - D 422 Test Method for Particle-Size Analysis of Soils
 - D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in. Drop
- C. A.O.A.C.: Association of Official Agricultural Chemists.

1.5 SUBMITTALS

- A. At least 30 days prior to ordering materials, the Contractor shall submit to the Owner's Representative representative samples, certifications, manufacturer's literature and certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner's Representative. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner's Representative reserves the right to reject, on or after delivery, any material which does not meet these Specifications.
 - 1. Existing On-Site Topsoil: Sample and test existing on-site topsoil. The Contractor shall sample the existing loam soils of the construction site in the following manner:
 - a. The Contractor shall provide a one cubic foot representative sample per each 1,000 cubic yard on-site stockpile of existing topsoil for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.

Stockpiles shall be separated into 1,000 cubic yard piles and labeled in the field with a numbering system referenced in all soil samples and test results.
 - b. Sampling Locations: Unless otherwise indicated, samples shall be taken at the following locations and frequency:

One (1) location under each designated tree on the site as directed by the Owner's Representative.
 - c. Preparation of Samples: Contractor shall place these soil slices into a large, clean plastic container and mix thoroughly. Contractor shall take one cup of soil mixture and dry it at room temperature (do not dry samples in an oven or on a stove or radiator). Once soil is dry, place soil in sandwich size zip-type plastic bag and close it tightly. Label each sample on outside of bag, identifying sample by soil type and acre. Provide an approved site plan showing locations of stockpiles cross referenced to soil samples and test results.

2. Base Loam, Sand and Compost for use in manufacturing Structural Planting Medium, and the final, manufactured Structural Planting Medium shall be sampled and tested in accordance with the following:

The Contractor shall provide a one cubic foot representative sample from each proposed source of Base Loam, Sand, Compost and the Structural Planting Medium for testing, analysis, and approval. Additionally, the Contractor shall provide one cubic foot representative samples of Structural Planting Medium delivered to the site and stockpile for use. Samples from on-site stockpiles of Structural Planting Medium shall be taken as directed by the Owner's Representative and packaged in the presence of the Owner's Representative.

Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Owner's Representative. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, University of Massachusetts, Amherst, MA 01003, (413) 545-2311. Testing reports shall include the following tests and recommendations. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Owner's Representative. Testing reports shall include the following tests and recommendations.

- a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by H₂O₂. To facilitate review and approval of sieve analysis, provide a computer generated gradation curve from UMASS Soil & Plant Tissue Laboratory.
 - b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees.
 - c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.
 - d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish the planting work as specified.
3. If biosolid compost (Massachusetts Department of Environmental Protection-permitted material) is used as an organic component of the proposed planting soil mixture, the amount of organic material used shall not exceed agronomic rates for nitrogen and phosphorus for trees and shrubs, turf or ornamental perennials. Provide certificates of agronomic rates from vendor for organic matter used in loam borrow manufacturing process.
 4. Peat Moss: Not allowable.

5. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
6. Crushed Stone: Provide mechanical gradation (sieve analysis) of crushed stone showing that the product meets the requirements of this Specification.
7. Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications.
8. Fertilizer:
 - a. Submit product data of planting fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as described in this Section.
 - b. Submit the purchasing receipt showing the total quantity purchased for the Project prior to installation.
 - c. All additives needed to amend a specific soil in order to meet these specifications.

1.6 EXAMINATION OF CONDITIONS

- A. All areas of the existing site where topsoil is to be sampled for testing shall be inspected by the Contractor before starting work and any issues that might inhibit or prevent the sampling operation shall be reported to the Owner's Representative prior to beginning this work.
- B. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section shall review and confirm in writing that the subsoil elevations have been brought to the proper subgrade elevations prior to proceeding with the spreading of Structural Planting Medium.
- C. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to sampling and testing of on-site stockpiles of delivered off-site loam borrow prior to final planting installation.

PART 2 - PRODUCTS

2.1 BASE LOAM

- A. Base Loam gradation shall be determined by the Soil and Plant Tissue Laboratory, University of Massachusetts, Amherst, using H₂O₂ to destroy organic matter.

Base Loam for mixing shall conform to the following grain size distribution for material passing the #4 sieve:

<u>U.S. Sieve No.</u>	<u>Percent Passing by Weight</u>	
	Maximum	Minimum
# 4	---	100

#10	85	100
#20	71	100
#40	60	85
#100	38	60
#200	28	40
0.002 mm	01	05

Maximum size shall be one inch largest dimension. The maximum retained on the #4 sieve shall be 20% by weight of the total sample.

The ratio of the particle size for 80% passing (D80) to the particle size for 40% passing (D40) shall be 5.0 or less. (D80/D40 < 5.0)

Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

The organic content shall be between 4.0 and 8.0 percent.

2.2 SAND

- A. Sand gradation shall be determined by the Soil and Plant Tissue Laboratory, University of Massachusetts, Amherst, using H₂O₂ to destroy organic matter.

Sand for Structural Planting Medium shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials with the following gradation.

<u>U.S. Sieve No.</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
#4	----	100
#10	80	100
#20	50	85
#40	15	50
#100	0	15
#200	0	

Maximum size shall be one inch largest dimension. The maximum retained on the #4 sieve shall be 10% by weight of the total sample.

The ratio of the particle size for 80% passing (D80) to the particle size for 40% passing (D40) shall be 3.0 or less. (D80/D40 < 3.0)

2.3 COMPOST

- A. Compost shall be a stable humus-like material produced from the aerobic decomposition of organic residues. The residues, if biosolids, shall consist of compost meeting MA-DEP Type 1 requirement or approved equal. The residues shall be dark brown or black in color, with no visible free water or dust and no unpleasant odor, meeting the following criteria certified by the producer.

1. carbon-nitrogen ratio	minimum 10:1 maximum 25:1
2. stability CO2 evolution test or Dewar self-heating test or Woods End Laboratory's Compost Test Kit	<10 mg CO2 - C/g BVS/day <10 degrees C above room temp.
3. organic content	40 percent minimum dry weight (Loss on Ignition; minus #10 Sieve, 430 degrees C)
4. particle size	90 percent passing one-half inch screen 100 percent passing one inch screen
5. inorganic debris	1 percent maximum (dry weight)
6. pH	minimum 5.5 - maximum 8.0
7. Soluble Salts	>2 and <4.0 mmhos/cm (ds/m)
8. density	850-1,050 lb./cy

2.4 STRUCTURAL PLANTING MEDIUM

- A. In areas designated on the Contract Documents the soil underlying the pavement cross section and the granular base material has been designed to structurally support the pavement slab and to promote root growth of trees planted in openings in the pavement. This soil will be called Structural Planting Medium in this Section and shall be a mixture of Sand, Base Loam and Compost. Structural Planting Medium shall be the manufactured product of a commercial processing facility specializing in the production of manufactured soils and loam borrow. Structural Planting Medium shall be manufactured from sands, loams and compost, in accordance with the requirements of this Section. Structural Planting Medium shall be manufactured outside the Project limits and transported onto the Project for placement.
- B. The Structural Planting Medium shall consist of a blend of four parts by volume of Sand, one part by volume of Base Loam and one part by volume of Compost. Blending of the components shall be carried out with earth moving equipment prior to placement. The components shall be blended to create a uniform mixture as determined by the Owner's Representative.

Structural Planting Medium gradation shall be determined by the Soil and Plant Tissue Laboratory, University of Massachusetts, Amherst, using H₂O₂ to destroy organic matter.

Structural Planting Medium shall conform to the following grain size distribution for material passing the #4 sieve:

U.S. Sieve No.	Percent Passing by Weight	
	Maximum	Minimum
#4	----	100
#10	81	100
#20	57	88
#40	27	57
#100	11	24
#200	08	12
.002mm	01	02

- C. Structural Planting Medium shall not contain less than 1.5 percent nor more than 3.0 percent organic matter as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours).
- D. The acidity range of the Structural Planting Medium shall be pH 5.5 to 6.5. Structural Planting Medium shall have a starting pH of no lower than 5.0 at the manufacturing site.
- E. Structural planting medium shall be pH adjusted as required for planting of trees and shall be adjusted prior to delivery to the Project sites in accordance with recommendations by UMASS Soil & Plant Tissue Laboratory.
 - 1. When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.
 - 2. When pH of loam borrow is less than 7 use either sulphur or ferrous sulfate to adjust pH downward to required levels.
 - 3. When pH of loam borrow must be raised to the required levels use limestone.
 - 4. Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by planting time.
- F. Structural Planting Medium shall be free of debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve Number 10 material). Soil shall not have levels of Aluminum greater than 200 parts per million.
- G. No Structural Planting Medium shall be delivered to the site until the review and approval of soil test results and recommendations by the Owner's Representative, but such approval shall not constitute final acceptance. The Owner's Representative will reject any material delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

2.5 SOIL ADDITIVES

- A. General: Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for construction as specified herein.
- B. Soil additives shall conform to Section 02901 – PLANTING SOIL.

PART 3 EXECUTION

3.1 EXCAVATION, FILLING AND COMPACTION

- A. Perform percolation tests on existing subsoils or placed fill prior to placing and spreading Structural Planting Medium:
1. Perform percolation testing of subsoil or placed fills to determine whether or not the subgrade will drain properly. Perform percolation tests in accordance with the requirements for percolation testing for each lift of loam borrow described in this Section.
 2. In the event that percolation testing indicates that the subsoil, placed fills or ordinary borrow has been over compacted and will not drain, the Contractor shall loosen up the top 36 inches of the subsoil, ordinary borrow, special borrow or gravel borrow by ripping or other mechanical means. Re-compact the borrow by driving a small, tracked bulldozer over the area at low speeds so that the tracks of the bulldozer pass over the affected area and the soil is compacted to a density that will percolate in accordance with this Section.
 3. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as directed by the Owner's Representative to ensure that these underlying soils do not drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.
- B. Excavate or fill subsoil or ordinary borrow as required by the Owner's Representative to achieve the elevations of the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures.
- C. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents. Provide a written report to the Owner's Representative and the Owner's Representative that the subgrade has been placed to the required elevations and that the subgrade drains water in accordance with the required percolation tests. Perform no work of placing and spreading Structural Planting Medium until elevations have been confirmed and written report has been accepted by the Owner's Representative.
- D. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.
- E. Do not proceed with the installation of Structural Planting Medium until all utility work in the area has been installed.
- F. Protect adjacent walls, walks and utilities from damage or staining by the Structural Planting

Medium. Use one-half inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

3.2 PLACEMENT OF STRUCTURAL PLANTING MEDIUM

- A. Immediately prior to dumping and spreading the Structural Planting Medium, the subgrade shall be cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Owner's Representative that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading Structural Planting Medium.
- B. Structural Planting Medium delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Owner's Representative and surrounded by silt fence installed in accordance with the Division 1 Section 01560, TEMPORARY ENVIRONMENTAL CONTROLS, of this Specification.
- C. Structural Planting Medium shall be sampled and tested in accordance with the requirements of this Section to verify application and incorporation of limestone, fertilizer and other soil amendments.
- D. Soil additives shall be spread and thoroughly incorporated into the layer of Structural Planting Medium by harrowing or other methods reviewed by the Owner's Representative.
- E. No Structural Planting Medium shall be handled or installed in any way if it is in a wet or frozen condition. A moist Structural Planting Medium is desirable.
- F. Sufficient grade stakes shall be set for checking the finished grades. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- G. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional Structural Planting Medium and the surface shall be re-graded and rolled until presenting a smooth and even finish corresponding to the required grades.
- H. Structural Planting Medium shall be spread in lifts not greater than 6 inches and compacted with a minimum of 2 passes of vibratory compaction equipment to a density between 92 and 94 percent Modified Proctor Maximum Dry Density in accordance with compaction standards of ASTM D1557 Method D. During the compaction process, all depressions caused by settlement or compaction shall be filled with additional Structural Planting Medium and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.
 - 1. Phase the installation of the Structural Planting Medium such that wheeled equipment does not have to travel over already installed soil. If it is determined by the Owner's Representative that equipment must travel over already installed Structural Planting Medium, provide one inch thick steel plate ballast over the length and width of travel

to cover Structural Planting Medium and protect it from compaction.

- I. Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The Structural Planting Medium in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the Structural Planting Medium installation, it should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:
 1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter, 4 inches deep. Do not penetrate through the lift being tested.
 2. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
 3. In the event that the water drains at a rate less than one inch per hour, till the Structural Planting Medium to a depth required to break the over compaction.
 4. Perform a minimum of one percolation test per location as directed by the Owner's Representative.

3.3 INSTALLATION OF SIDEWALK

- A. Install sidewalks, including subbase, setting beds etc, per plans and contract details and as specified in Division 2 Section 02524, CURBS, WALKS, AND DRIVEWAYS

3.4 ACCEPTANCE

- A. Confirm that the final grade of Structural Planting Medium is at the proper finish grade elevations. Adjust grade as required to achieve finished sidewalk elevations noted on the Plans. Request the presence of the Owner's Representative to inspect final grade.

PART 4 - COMPENSATION

2902.1

STRUCTURAL PLANTING MEDIUM

CUBIC YARD

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the cubic yardage of Structural Planting Medium installed by the Contractor as shown on the Contract Drawings and as directed by the Engineer, complete and in place. Structural Planting Medium shall have a standard section as shown on the Contract Drawings.

BASIS OF PAYMENT:

Payment for Structural Planting Medium shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete installation of Structural Planting Medium as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to the following; testing, furnishing and installing Structural Planting Medium; and all incidental work not included for payment elsewhere required to furnish and install Structural

Planting Medium whether included here or not.

EXCLUSIONS AND SPECIAL NOTES:

Payment for street tree planting and walks (including gravel subbase) shall not be paid for under this item and are paid for elsewhere.

END OF SECTION 02902

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SECTION 02905

BIOBASIN

2905.1

BIOBASIN

LUMP SUM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, titled "Related Documents."

1.2 SUMMARY

- A. Biobasins are infiltration (internal) BMP systems designed to use soils and both woody and herbaceous plants to remove pollutants from stormwater runoff. They are not intended as exfiltration systems.

- B. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to construct the Biobasin. Constructing biobasin shall include, but not be limited to:

1. Perforated PVC pipe
2. Precast concrete catch basin
3. Beehive grate with frame
4. Rigid PVC cleanout with threaded cap
5. Concrete basin inlet sump
6. Concrete basin inlet sump frame and cover
7. Basin inlet trench grate and frame
8. Concrete head wall
9. 12" reinforced concrete pipe
10. Pea gravel
11. Biobasin planting soils
12. Plantings and mulch
13. Non-woven geotextile fabric
14. Monitoring well
15. Granite landscape edge
16. Placed boulders

- C. Related Sections:

1. SECTION 02010 – SUBSURFACE INVESTIGATION
2. SECTION 02100 – SITE PREPARATION AND TREE PRUNING
3. SECTION 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
4. SECTION 02524 – CURBS, WALKS, AND DRIVEWAYS
5. SECTION 02604 – CATCH BASINS
6. SECTION 02609 – REINFORCED CONCRETE PIPE

7. SECTION 02622 – POLYVINYL CHLORIDE PIPE
8. SECTION 02900 – LANDSCAPING
9. SECTION 02901 – PLANTING SOILS
10. SECTION 03300 – CONCRETE
11. SECTION 03410 – PLANT-PRECAST STRUCTURAL CONCRETE
12. SECTION 05500 – MISCELLANEOUS METALS

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM): D448, D3034
- B. Commonwealth of Massachusetts Highway Department (MHD): Standard Specifications for Highways and Bridges, 1988
- C. Volume 2 Chapter 2: Structural BMP Specifications for the Massachusetts Stormwater Handbook, current edition.

1.4 SUBMITTALS

- A. Contractor shall provide shop drawings and technical specifications of the following for review and approval by the Engineer: (a) piping (PVC, RCP), (b) appurtenances (couplings, fittings, and valves), (c) trench grate and frame, (d) planting materials (as mentioned in appropriate parts of SECTION 02900 – LANDSCAPING and (e) filter fabric. Only materials that are approved by the Engineer after review shall be used for construction.
- B. Washed Gravel: Submit three (3) copies of certificates signed by the material producer and Contractor certifying that the material complies with or exceeds the specified requirements and one (1) sample.

PART 2 - PRODUCTS

2.1 PERFORATED PVC PIPE

- A. Perforated pipe for use as an underdrain shall conform to Section 02622 – POLYVINYL CHLORIDE PIPE, 2.1 B (3).

2.2 PRECAST CONCRETE CATCH BASIN

- A. Catch basins shall conform to Section 02604 – CATCH BASINS.

2.3 BEEHIVE GRATE WITH FRAME

- A. Beehive grate with frame shall conform to Section 02604 – CATCH BASINS, Section 2.1 C (9).

2.4 RIGID PVC CLEANOUT WITH THREADED CAP

- A. Cleanout for biobasins shall be assembled as shown in the Contract drawing details using 6" PVC pipe, 6" x 6" PVC elbows with a 6" threaded PVC cap. PVC piping shall conform to Section 02622 – POLYVINYL CHLORIDE PIPE.

2.5 CONCRETE BASIN INLET SUMP

- A. Concrete basin inlet sump shall conform to Section 03410 – PLANT-PRECAST STRUCTURAL CONCRETE.

2.6 CONCRETE BASIN INLET SUMP FRAME AND COVER

- A. Concrete basin inlet sump frame and cover shall conform to Section 02252 – MANHOLES.

2.7 BASIN INLET TRENCH GRATE AND FRAME

- A. Basin inlet grate and frame shall conform to Section 05500 – MISCELLANEOUS METALS.
- B. Grate and frame shall be cast iron with natural finish.
- C. Grate shall be rated for H₂O loading with a non-slip surface having a static coefficient of friction between 0.60 and 1.0 per ASTM C1020. Grates on inclines greater than 4% shall have a coefficient of 0.80 to 1.0.
- D. Grate shall have wavy pattern with no opening greater than 3/8-inch.

2.8 CONCRETE HEAD WALL

- A. Concrete head wall shall conform to Section 03300 – CONCRETE.
- B. Concrete head wall shall be constructed as shown in the Contract drawings.

2.9 12" REINFORCED CONCRETE PIPE

- A. 12" Reinforced Concrete Pipe shall conform to Section 02609 – REINFORCED CONCRETE PIPE.

2.10 PEA GRAVEL

- A. Pea gravel should be washed, river-run, rounded diameter, ASTM D448 size No. 6.

2.11 BIOBASIN PLANTING SOILS

- A. Planting soils for biobasins and mulch layer shall be in accordance with Section 02901, PLANTING SOILS.

2.12 PLANTINGS

- A. Plantings and mulch for biobasins shall be in accordance with appropriate sections of Section 02900 - LANDSCAPING.

2.13 NON-WOVEN GEOTEXTILE FABRIC

- A. Non-woven geotextile fabric shall be composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. The fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids

<u>Mechanical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Minimum Average Roll Value</u>	
			<u>MD</u>	<u>CD</u>
Grab Tensile Strength	ASTM D 4632	kN (lbs)	712 (160)	712(160)
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	267 (60)	267(60)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2100	(305)
CBR Puncture Strength	ASTM D 6241	N (lbs)	1780	(400)
Apparent Opening Size (AOS)	ASTM D 4751	mm (U.S. Sieve)	0.212	(70)
Permittivity	ASTM D 4491	sec-1	1.4	
Permeability	ASTM D 4491	cm/sec	0.22	
Flow Rate	ASTM D 4491	l/min/m ² (gal/min/ft ²)	4481	(110)
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

<u>Physical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Typical Value</u>
Weight	ASTM D 5261	g/m ² (oz/yd ²)	220 (6.5)
Thickness	ASTM D 5199	mm (mils)	1.7 (65)
Roll Dimensions (w x l)	-	m (ft)	4.5 x 91 (15 x 300)
Roll Area	-	m ² (yd ²)	418 (500)
Estimated Roll Weight	-	kg (lb)	97 (215)

- B. Non-woven geotextile fabric shall be as supplied by:

1. Mirafi ® 160N by TenCate 365 South Holland Drive Pendergrass, GA 30657, phone:706-693-1701, fax: 706-693-2083.
2. AEF 680HS by Boom Environmental Products P.O. Box 600619 - Newtonville, MA 02460 phone: 800-770-2666 Fax: 617-965-0097
3. US 120NW by US Fabrics 3904 Virginia Avenue Cincinnati, OH 45227, phone: 513-271-6000, fax: 513-271-4420
4. or approved equal.

2.14 MONITORING WELL

- A. For Monitoring well information, see Section 02010 – SUBSURFACE INVESTIGATION.

2.15 GRANITE LANDSCAPE EDGE

- A. Granite cobble for landscape edge shall be granite cobblestone meeting ASTM standard requirements for granite.

- B. Cobble stone shall be 10”x7”x4” size. Color shall be as approved by Owner’s Representative.

2.16 PLACED BOULDERS

- A. Boulders shall be 10-15 cubic foot granite boulders with reasonably rounded edges in the opinion of the Owner's Representative.
- B. Boulders should be buff to light grey in color and similarly matched for each Biobasin.
- C. Boulders shall be selected by the Owner's Representative from local boulder stockpiles identified by the Contractor. Contractor shall continue to identify sources until a sufficient number of satisfactory boulders have been selected.

PART 3 - EXECUTION

- 3.1 Biobasin shall be constructed by excavating the designated areas, installing the under drain, and adding a gravel layer separated from the existing subgrade by a pea gravel filter layer. Cover the gravel layer with the Biobasin Planting Soil mixture: a mixture of sand, loam, and compost (as described in Section 02901, PLANTING SOILS), and install plants as specified on Contract Drawings. The sequence of construction steps is as follows.
- 3.2 Excavate Biobasin to proposed depth, and install catch basin and the trench for the conveyance pipe. Install the bedding sand and the conveyance pipe in the trench connected to the storm drain system. Install inlet and channel, inlet sump and splash pad. Backfill and compact the soil in the trench up to grade at the basin bottom. Fill, regrade and compact to 98% standard Proctor any areas damaged by erosion, ponding, or traffic compaction before the placing of the filter fabric and stone subbase. Verify bottom of biobasin subgrade elevation.
- 3.3 Place an initial 2" of gravel backfill for bedding the underdrains (when necessary) adjusting the slope of the underdrain to be at least 0.5% towards the catch basin, then add the remaining 10" of gravel backfill at the bottom of the biobasin. When underdrains are not needed, place the full 12" layer of gravel backfill material.
- 3.4 Install the biobasin cleanout, when underdrain is necessary, with cap being visible above grade, and the other end of the cleanout pipe connecting with the perforated PVC underdrain.
- 3.5 Install the pea gravel layer over the gravel. Lightly compact with a landscaping roller.
- 3.6 Install Granite Landscape Edge
 - A. Granite edge work shall not be performed during rainy weather.
 - B. Dig trench to sufficient depth to allow for flush condition (no reveal) at street side edge, and 4" minimum gravel base in trench.
 - C. Place cobbles on dense graded gravel base.

- D. Cuts should not occur at edges to maintain consistency of finish.
 - E. Fill behind cobble with gravel, as indicated in Contract Drawings.
- 3.7 Install Placed Boulders
- A. All placed boulders shall be set according to the Construction Documents.
 - B. The contractor shall have the approval of the Engineer for each boulder location and orientation prior to final setting.
 - C. All stone work shall be cleaned thoroughly to remove stains, excess mortar, dirt and other discoloration or blemishes.
- 3.8 After confirmation that the manufactured soil meets specs by performing the requisite gradation and chemical tests, fill the biobasins with manufactured soil as shown in the plans.
- 3.9 Install planting as shown in the planting plan for the biobasins. Plants shall be as described in Section 02900 - LANDSCAPING.
- 3.10 Install mulch layer.
- 3.11 The biobasin shall be isolated from direct runoff until determination by the Landscape Architect that the new plants are rooted sufficiently into the adjacent soil such that they can not easily be uprooted with a gentle pull.
- 3.12 To minimize sediment loading in the treatment area, direct runoff to the biobasin area only from areas that are stabilized.
- 3.13 ACCEPTANCE:
- A. The Engineer shall review and confirm the performance of the biobasin components. The Acceptance Period for the biobasins shall be one (1) year after substantial completion of the biobasin has occurred. Any deviations from the plans and specifications resulting in a decrease or decreasing performance shall be corrected by the Contractor at no additional cost to the Owner.
- 3.14 MAINTENANCE DURING CONSTRUCTION
- A. During construction maintenance of all erosion and sediment control devices will be the sole responsibility of the Contractor. During construction, no soil shall be left without vegetative cover for more than 7 days. In the event it becomes necessary to remove the existing vegetative cover for an extended period of time, the Contractor shall apply clean straw mulch such that no bare soil is visible (approx. 2" thickness).

The erosion and sediment control devices should be inspected on a minimum weekly basis. In addition, they should be inspected after any precipitation event totaling greater than 0.25 inches.

3.15 POST - CONSTRUCTION MAINTENANCE

- A. Responsibility for the health and condition of all plantings will be the responsibility of the Contractor for the first one year after installation as provided in the Contract Documents. After this one year has expired, all vegetation maintenance responsibilities shall pass to the City of Cambridge, or their appointee.
1. Remove all trash and debris from biobasin (monthly).
 2. Inspect inlet sump and channel beneath sidewalk (once every two months). Remove any debris within concrete channel that might impede flow. Remove sediment in sump as necessary.
 3. Inspect catch basin in biobasin (once every two months). Remove sediment from sump as necessary.
 4. Underdrains in the biobasins are equipped with a clean-out consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a water-tight cap. Inspect cleanouts for obstructions and trash (once every two months). Remove all trash and debris and dispose of according to state and local regulations.
 5. Inspect plantings and remove all weeds and invasive species by hand (May through September, monthly). Includes the removal of all plants not associated with the original planting plan.
 6. Inspect mulch. Apply clean mulch to a depth of 2-inches in the basin being careful not to smother or damage the plants (once every four months).
 7. Inspect for the development of hardpan at the bottom of the basin (once, end of first year maintenance). Hardpan occurs when the soil becomes cemented, forming an impervious layer. Where this has occurred, scarify the soil to a depth of 6 inches.

PART 4 – COMPENSATION

Item 2905.1-BIOBASIN

METHOD OF MEASUREMENT:

Measurement for payment for Biobasin shall be on a lump sum basis paid by the schedule of values as measured by the Engineer.

BASIS OF PAYMENT/INCLUSIONS:

Payment for the Biobasin will be based on the unit price bid for this item in the proposal. Under the unit price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to furnish and install the Biobasin. The work shall include but is not limited to: furnishing and installing the basin inlet sump including concrete, reinforcing steel, formwork, frame and cover and concrete splash pad; furnishing and installing the concrete headwalls and 12" RCP, furnishing and installing the metal trench grate and frame; furnishing and installing the precast catch basin with beehive grate; furnishing and installing perforated PVC underdrain pipe; connections to proposed and existing catch basins within the roadway; preparation of subgrade; furnishing and installing bedding; furnishing and installing biobasin planting soil; perennial plantings; infiltration testing; excavation; sawcutting; placing backfill; compaction; compaction testing; concrete testing; construction dewatering; brick masonry; and all incidental work.

END OF SECTION 02905

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SECTION 02910

TREE PLANTING

2910.1	STREET TREE (TYPE I)	EACH
2910.2	STREET TREE (TYPE II)	EACH
2910.3	PRIVATE BACK OF SIDEWALK TREE	EACH
2910.4	PRIVATE BACK OF SIDEWALK SHRUB/BUSH	EACH

PART 1 – GENERAL

- 1.1 The tree planting will be by the requirements of the City Arborist. The Arborist will make any changes or instruct the Contractor if any omission, contractual or otherwise, is noticed during the planting operation.
- 1.2 All work shall be done in a safe and workman-like manner, in compliance with the rules and regulations of the Division of Industrial Safety and all other City and State agencies and authorities having jurisdiction of the types of work included in this Contract.
- 1.3 A Massachusetts Certified Arborist or Massachusetts Certified Nursery person will carry out the planting of City of Cambridge Public Shade Trees. These persons will be at the work site for all planting operations.
- 1.4 Names of Massachusetts Certified Arborist (MCA) or Massachusetts Certified Nurserymen (MCN) will be submitted and approved by the City Arborist before any planting occurs.
- 1.5 RELATED WORK UNDER OTHER SECTIONS
 - A. The following items of related work are specified and included in other Sections of the Specifications:
 1. Division 2 Section 02100, SITE PREPARATION AND TREE PRUNING
 2. Division 2 Section 02900, LANDSCAPING
 3. Division 2 Section 02901, PLANTING SOILS
 4. Division 2 Section 02902, STRUCTURAL PLANTING MEDIUM
- 1.6 DEFINITIONS
 - A. Whenever used in any of the Contract Documents, the following meanings shall be given to the terms herein defined:
 1. The term "Contract" means the agreement executed by the Owner and the Contractor, consisting of these Contract Documents.
 2. The term "Owner" means the City of Cambridge acting through its authorized

representative, the Commissioner of Public Works, whose responsibility it shall be to coordinate review and approval by City, State and Federal departments and agencies which have jurisdiction over the various types of work to be carried out under this Contract.

3. The term "Public Works Department (PWD)" means those persons employed by the Commissioner of Public Works for the purpose of directing or having charge of the work of this Contract or a portion thereof, limited by the particular duties entrusted to that person.
4. The term "Local Public Agency" means the Public Works Department.
5. The term "Awarding Authority" means the Public Works Department.
6. The term "Contractor" means the person, firm or corporation entering into the Contract with the Owner to construct and install improvements embraced in this Contract.
7. The term "Contract Documents" means and shall include the following: Invitation to Bid; Bid Requirements; Contract Forms; Bonds and Certificates; Conditions of Contract; Addenda; if any; Technical Specifications; and Drawings.
8. The words "required", "permitted", "ordered", "designated", "prescribed", or words of like import shall mean the direction, requirement, permission, order, designation, prescription, etc. of the Owner or the Owner's representatives, and similarly, the words "approved", "acceptable", "satisfactory", or words of like import, shall mean approved by, or acceptable or satisfactory to the Owner's authorized representative, subject in each case to the final determination of the Owner unless otherwise expressly stated.
9. The terms "City" means the City of Cambridge, Massachusetts, within which the work of this Contract is to be carried out.
10. The term "MHD Standard Specifications" or "Standard Specifications" refers to the latest edition of the Massachusetts Highway Department Standard Specifications for Highways and Bridges, including supplements and amendments.

1.7 DESCRIPTION OF WORK

- A. Contractor is to furnish all labor, materials, equipment and transportation required to complete all the tree planting work in strict accordance with these specifications and applicable drawings. Work shall include but not be limited to:
 1. Submitting samples of materials and/or analyses for approval.
 2. Securing necessary permits and approvals.
 3. Excavating, removing unsuitable material and back-filling of tree planting area.

4. Furnishing specified tree plant materials for installation and all necessary tree planting operations including fertilizing, mulching, watering, staking and guying.
5. Cleaning up of sites at the end of planting operations.
6. Maintaining, protecting, weeding, pruning damaged or broken limbs, and replacing dead trees during the guarantee period.

PART 2 – PRODUCTS

2.1 PLANTING SOILS

- A. Planting soils shall be in accordance with Section 02901, PLANTING SOILS.

2.2 FERTILIZER

- A. Fertilizer shall be a complete, slow-release, root contact packet, 16-8-16, or equal, and a standard product complying with State and Federal Fertilizer Laws. Name of supplier and sample to be approved by the City Arborist.

2.3 WATER

- A. Water furnished by the Contractor will be free of ingredients harmful to humans and plant life. The Contractor will supply hoses and other watering equipment required for the work. Watering for trees shall be provided through use of a drip irrigation type bag which shall be approved by the City Arborist.

2.4 MULCH

- A. Mulch shall be in accordance with Section 02900, LANDSCAPING.

2.5 STAKING

- A. Stakes will be wood, 10' x 2" x 3" in size, pointed at one end. Tree ties shall be black polyester straps. Both must be approved by the City Arborist.

2.6 TREE PLANTING MATERIALS

- A. Plant Identification and Standards: The nomenclature used in the plant list generally conforms to that of the current edition of Standardized Plant Names, as adopted by the American Joint Committee on Horticultural Nomenclature. All tree plantings shall conform to the varieties and sizes specified in the Plant List, and to the code of standards set forth in the current edition of American Standard for Nursery Stock. Substitutions will not be permitted without the consent of the City Arborist.

- B. Plant List: The Contractor shall supply the plants necessary to complete the work as intended. Where the size of a plant on the Plant List is a variation between a minimum and maximum dimension, the sizes of the plants furnished will be equal to the average of the two dimensions. Where a single dimension is given, this dimension represents the minimum size of the plants to be furnished.
- C. General Trees: All tree plantings shall be nursery-grown whether balled and burlapped or container grown. The tree plantings shall be typical of their species and variety. Trees shall be straight, symmetrical with a crown having a persistent main leader, be growing from a single, healthy root system with no girdling roots. All tree plantings shall be sound and healthy free from defects, disfiguring knots, sun scald, and injuries or abrasions of the bark. They shall be free of plant diseases, pests, scale and all forms of infestations, and possess a normal balance between height and spread. Pruning wounds over ¾ inch in diameter must be completely callused over.
- D. Tree Limb Structure: All limbs on large trees maturing over 30 feet must originate on the trunk at 7 feet above the top of root ball. Small trees maturing less than 30 feet must have limbs that start no lower than 5 feet. All trees will be selected by the City Arborist.

2.7 PLANT ROOT BALLS

- A. All tree plantings either balled and burlapped or container grown shall retain root systems as solid units. The diameter and depth of the balls of soil must be sufficient to encompass the fibrous and feeding root system necessary for the healthy development of each tree planting. No tree planting shall be accepted when the ball of earth surrounding its roots has been badly cracked or broken, either before or during the process of planting. The tree plantings and root balls shall remain intact as a unit during all operations. All tree plantings that cannot be planted right away must be protected and watered.

2.8 PLANT LABELS

- A. Plant labels shall be provided by the Contractor for each tree and shall be durable, legible labels, stating the correct tree name and size, in weather resistant ink or embossed process lettering, and can be removed at end of Contract.

PART 3- EXECUTION

3.1 TREE PLANTING SEASON

- A. Tree planting can occur under normal, favorable weather conditions. Tree planting will not be permitted as determined by the City Arborist under adverse weather conditions such as when the ground is frozen or during extreme heat.

3.2 TREE PLANT SELECTION

- A. The City Arborist will select and tag all specified tree planting material at the nursery locations.

3.3 TREE PLANT DELIVERY

- A. The Contractor will inspect and approve all trees at the nursery(ies) prior to pick up. However, this does not alter the right of the City Arborist to inspect and reject unsuitable trees delivered to the planting site.

3.4 TREE PLANT STORAGE

- A. Tree plantings shall be delivered to the Contractor's storage site and to the tree planting site in a well-watered and vigorous condition. All unplanted tree plantings shall be protected at all times from sun and drying winds. Care must be taken so as not to damage bark, break branches, or cause injury to the tree.

3.5 GENERAL TREE PLANTING

- A. Prior to tree planting, the City Arborist will supply in writing to the Contractor specified tree planting locations showing the tree selected and approved.
- B. Immediately after planting, Contractor shall provide one informational door hanger to residence directly adjacent to new tree planting. Door hangers to be provided by the City of Cambridge.
- C. Tree planting areas may need pavement removal as required by the City Arborist. All materials excavated from the tree planting areas and considered detrimental to the growth of the trees, such as an existing tree or stump, sidewalk paving, rocks, sub-soil and debris, shall not be reused for fill or in the planting operation, and must be removed from the site.
- D. Any unexpected obstructions at the site that interfere with the tree planting operation will be communicated to the City Arborist to determine a solution before planting occurs.
- E. Soil of very poor quality or heavy clay encountered by the Contractor must be reported to the City Arborist for removal and amended as required.

3.6 TREE INSTALLATION

- A. Trees shall be plumb, faced to give best appearance, and planted at the center of the planting areas.
- B. Trunk flare must be visible and free of adventitious roots.
- C. Place the tree in the planting hole so that the top of the root ball where the trunk flare is visible is 2" above the established sidewalk level.
- D. Any non-degradable materials used in wrapping the root ball must be entirely and carefully removed so as not to disturb the roots. Cut and remove 1/3 to 1/2 of burlap and

wire basket from root ball. Carefully cut containers and remove plant balls keeping the root ball intact. All materials cut away from the root balls must be removed from the site.

3.7 FERTILIZING

- A. Insert approved slow-release plant packets, number according to the caliper of the tree with the approval of the City Arborist before back-filling.

3.8 BACK-FILLING

- A. Carefully backfill by hand the approved topsoil in layers and water each layer thoroughly to fill all voids and allow to settle. Finish back-filling to a depth that finished grade level at settlement will be at established sidewalk level.
- B. Surround each tree with a shoulder of topsoil to form a temporary saucer, 3 inches deep and equal to the diameter of the planting hole.

3.9 WATERING

- A. At the time of planting judiciously flood plants with water. The Contractor will also include in his base bid costs for watering trees once a week for a period of 60 days from the date of planting. Watering shall be provide through use of a drip irrigation bag which shall be furnished and installed immediately on each tree following planting per the manufacturer's instructions.

3.10 MULCHING

- A. Immediately after tree planting operations are complete, the planting areas shall be covered with 2 inches of approved mulch. Keep mulch away from the base of the tree so that the mulch is not in contact with the trunk flare.

3.11 STAKING

- A. Place 2 or 3 wood stakes equally spaced, not higher than $\frac{1}{2}$ the height of the tree, to avoid root damage or damage to the watering/aeration loop. Line up stakes parallel to the curb line and planting area and at a reasonable distance from the trunk to prevent movement of the tree and root system.

3.12 PRUNING

- A. Prune only badly bruised, broken, or crossing limbs.

3.13 CLEAN UP

- A. After completion of the work, the Contractor shall remove all debris, materials, rubbish, and excess soil from the site and dispose of them as required by the City Arborist.

3.14 BACKFLOW PREVENTION DEVICES

- A. When hydrants are being used, the Cambridge Water System must be protected with backflow prevention devices as per Massachusetts Department of Environmental Protection (DEP) Regulations 310 CMR 22.22 and as per the Cambridge Water Department Cross Connection Control Program. Backflow prevention devices must also be used during street sweeping, sewer flushing, paving operations and hookups for any other purpose.

3.15 MAINTENANCE

- A. Maintenance shall begin immediately after tree planting and shall continue until final inspection and acceptance. Maintenance will include: watering, re-mulching, weeding, repositioning stakes, removal of dead or broken limbs, maintaining the planting saucer, etc. Watering by the Contractor for the remainder of the guarantee period should be at least once a week or as acceptable to the City Arborist.

3.16 GUARANTEE

- A. Trees will be guaranteed for a minimum period of time of one (1) year after the initial acceptance. Trees planted in spring shall be alive and in satisfactory growth on June 1 of the following year. If planted in the fall, trees shall be alive and in satisfactory growth on October 1 of the following year.

3.17 REPLACEMENTS

- A. During the guarantee period, dead, unsightly or unhealthy trees should be removed promptly and replaced by the Contractor as required by the City Arborist.
- B. Vandalized trees should be brought to the attention of the City Arborist.

3.18 INSPECTION AND ACCEPTANCE

- A. Written notices requesting all inspections must be received by City Arborist at least five days prior to anticipated inspection dates. All work in the Contract shall be found in neat, clean and safe condition.

3.19 SEMI-FINAL INSPECTION

- A. The Contractor may offer for acceptance the entire project or a completed readily defined area, if approved by the City Arborist. Semi-Final inspection will be made by the City Arborist upon completion of all work included herein.

3.20 SEMI-FINAL ACCEPTANCE

- A. The City Arborist will notify Contractor in writing of acceptance in whole or in part of work, exclusive of maintenance and possible replacement of trees subject to guarantee, or of requirements for completion if deficiencies exist. Work will not be submitted for payment without the City Arborist's written acceptance.

3.21 FINAL INSPECTION AND ACCEPTANCE

- A. At end of maintenance and Guarantee Period, and upon written application from the Contractor, the City Arborist shall determine acceptability of completed work.
- B. Dead, missing or unhealthy trees shall be replaced during next planting season. If a substantial number of plants are unsatisfactory, missing or dead, acceptance will not be granted until replacements are made and the Contractor's responsibility for the maintenance and guarantee will be extended.

PART 4 – COMPENSATION

2910.1	STREET TREE (TYPE I)	EACH
2910.2	STREET TREE (TYPE II)	EACH
2910.3	PRIVATE BACK OF SIDEWALK TREE	EACH
2910.3	PRIVATE BACK OF SIDEWALK SHRUB/BUSH	EACH

METHOD OF MEASUREMENT:

Measurement for payment for Item 2910.1 Street Tree (Type I), Item 2910.2 Street Tree (Type II), Item 2910.3 Private Back of Sidewalk Tree, and Item 2910.4 Private Back of Sidewalk Shrub/Bush will be for the number of trees or shrubs/bushes of the specified kind and size furnished and planted by the Contractor and accepted in accordance with these Specifications. Payment for these items will not occur until the tree or shrub/bush is planted and accepted.

BASIS OF PAYMENT:

The unit price for existing street tree treatment shall be full compensation for all labor tools, equipment, materials, transport and all incidental labor and materials necessary to complete the work, including water and fertilizer, as specified herein, as directed by the Engineer, and as shown and detailed on the Contract Drawings.

The unit price per tree planted shall be full compensation for purchasing and delivering, offloading, receiving, handling and caring for all trees, shrubs, bushes in the laydown area and work sites, transportation between the laydown area and work sites, furnishing and delivering prepared planting soil, mulch, and fertilizer packets, removal of existing surface material at tree pit location, digging of pits, removal of excavated materials, planting of trees, shrubs and bushes, pruning, staking, guying, wrapping, mulching, weeding, watering, cleanup, tree planting establishment work and care, maintenance replacement, and for all labor, equipment, tools and incidentals necessary to complete the work, and for the Contractor's and Owner's representative costs of selecting and tagging the trees, and for the one (1) year guarantee and replacement if required.

EXCLUSIONS AND SPECIAL NOTES:

Payment for tree plantings in planting areas as identified in the Plant Schedule shall not be paid for

under this item and are paid for elsewhere. An additional 30 Back of Sidewalk Trees (Item 2910.3) not located on the plans shall be provided to accommodate future resident requests. Locations to be determined in the field. Private Back of Sidewalk Shrubs/Bushes (item 2910.4) are for Private Inflow Removal related work. Locations to be determined in the field.

END OF SECTION 02910

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SECTION 02950

BACK OF SIDEWALK RESTORATION

2950.1	HARDSCAPE BACK OF SIDEWALK RESTORATION	SQUARE YARD
2950.2	ASPHALT BACK OF SIDEWALK RESTORATION	SQUARE YARD
2950.3	LANDSCAPE BACK OF SIDEWALK RESTORATION	SQUARE YARD

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered under this Section includes the furnishing of all labor, equipment, appliances and materials, and in performing all operations in connection with restoration and reconstruction of back of sidewalk site features to their original condition and location including matching the original patterns of walkway and driveways such as herringbone, basket weave, running bond, etc. Back of Sidewalk material may consist of, but not limited to, brick, flagstone, concrete, gravel, cobble stone, wood, and limestone walkways and driveways, and all other necessary appurtenant work to reconstruct back of sidewalk areas to their original condition, as directed by the engineer, complete and accepted in accordance with the Drawings and Specifications and as required.

1.2 RELATED WORK

- A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- B. Section 02500 – PAVING AND SURFACING
- C. Section 02524 – CURBS WALKS, AND DRIVEWAYS
- D. Section 02590 – BRICK MASONRY
- E. Section 02900 – LANDSCAPING
- F. Section 02910 – TREE PLANTING

1.3 SUBMITTALS

- A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS.
- B. Certify, invoice, and order plants for each shipment grown, free of disease and insect pests. Submit certificates to Engineer.

PART 2 - MATERIALS

2.1 General

- A. Materials for all Non-Standard Back of Sidewalk Restoration shall be of the type, size, grade, and class to match the existing material and pattern as directed by the engineer.

PART 3 - EXECUTION:

- 3.1 All workmanship shall conform to the best standard practice, and all work shall be conducted by skilled workmen. The contractor shall repair/reconstruct all areas.
- 3.2 Landscape restoration shall be completed between April and October.
- 3.3 Refer to Section 02900- Landscaping for landscaping maintenance requirements.

PART 4 – COMPENSATION

Item 2950.1 – Hardscape Back of Sidewalk Restoration

METHOD OF MEASUREMENT:

Measurement for Hardscape Back of Sidewalk Restoration shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Hardscape Back of Sidewalk Restoration shall be based on the square yard of Hardscape Back of Sidewalk installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the Restoration of all Hardscape Back of Sidewalk areas as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; the furnishing of all labor, equipment, appliances and materials, and in performing all operations in connection with restoration and reconstruction of private property site features to their original condition and location including matching the original patterns of walkways and driveways such as herringbone, basket weave, running bond, etc. Back of Sidewalk material may consist of, but not limited to, brick, flagstone,

cobble stone, concrete, wood, limestone, and gravel walkways and driveways, removing and resetting curbing, walls, stairs, as directed by the engineer and all other work not included for payment elsewhere.

SPECIAL NOTES ON INCLUSIONS/EXCLUSIONS:

The following items are not included for payment under this item; sidewalks, walkways, driveways and all other back of sidewalk areas installed to replace areas damaged by the Contractor during construction. Hot mix asphalt driveways and walkways within the right of way are not included for payment under this item and are paid for elsewhere. This item includes restoration related to private property inflow removal work and private property restoration related to adjacent sidewalk and driveway restoration work within the right of way. Private fence remove and reset is not included for payment under this item and is paid for elsewhere.

Item 2950.2 – Asphalt Back of Sidewalk Restoration

METHOD OF MEASUREMENT:

Measurement for Asphalt Back of Sidewalk Restoration shall be based on the square yard installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Asphalt Back of Sidewalk Restoration shall be based on the square yard of Asphalt Back of Sidewalk installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the Restoration of all Asphalt Back of Sidewalk areas as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; the furnishing of all labor, equipment, appliances and materials, and in performing all operations in connection with restoration and reconstruction of hot mix asphalt walkways and driveways located on private property, and all other necessary appurtenant work to reconstruct back of sidewalk areas to their original condition, as directed by the engineer and all other work not included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:

The following items are not included for payment under this item; sidewalks, walkways, driveways and all other back of sidewalk areas installed to replace areas damaged by the Contractor during construction. Hot mix asphalt driveways and walkways within the right of way are not included for payment under this item and are paid for elsewhere. This item includes restoration related to private property inflow removal work and private property restoration related to adjacent sidewalk and driveway restoration work within the right of way.

Item 2950.3 – Landscape Back of Sidewalk Restoration

METHOD OF MEASUREMENT:

Measurement for Landscape Back of Sidewalk Restoration shall be based on the square yard

installed, complete, within the payment limits, as shown on the Contract Drawings or as required by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Landscape Back of Sidewalk Restoration shall be based on the square yard of landscape Back of Sidewalk installed complete for this item in the proposal. Under the square yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the Restoration of all Landscape Back of Sidewalk areas as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; the furnishing of all labor, equipment, appliances and materials, and in performing all operations in connection with restoration and reconstruction of grass, mulched, and planting areas located on private property, and all other necessary appurtenant work to reconstruct back of sidewalk areas to their original condition, as directed by the engineer and all other work not included for payment elsewhere.

SPECIAL NOTES ON INCLUSIONS/EXCLUSIONS:

The following items are not included for payment under this item; landscape, grass, and mulch areas located within the right of way, and locations installed to replace areas damaged by the Contractor during construction; trees and shrubs removed and replaced on private property are paid for elsewhere. This item includes restoration related to private property inflow removal work and private property restoration related to adjacent sidewalk and driveway restoration work within the right of way.

END OF SECTION 02950

SECTION 02980

SITE IMPROVEMENTS

2980.1	WARNING- REGULATORY AND ROUTE MARKER – ALUMINUM PANEL (TYPE A)	SQUARE FOOT
2980.2	STREET NAME SIGN	EACH
2980.3	SIGN POST	EACH
2980.4	PARKING METER POST	EACH
2980.5	REMOVE AND REPLACE CHAIN LINK FENCE	LINEAR FOOT
2980.6	REMOVE AND REPLACE ORNAMENTAL FENCE	LINEAR FOOT
2980.7	PRIVATE FENCE REMOVE AND RESET	LINEAR FOOT
2980.8	SIDE FOLDING GATE	LUMP SUM
2980.9	TRASH/RECYCLING COMBINATION	EACH
2980.10	BICYCLE RING AND POST	EACH
2980.11	PEDESTRIAN BUS SHELTER	LUMP SUM
2980.12	BOLLARD	EACH
2980.13	REMOVABLE ALUMINUM BOLLARD	EACH
2980.14	FERN STREET ARTSCAPE INSTALLATION AND COORDINATION	ALLOWANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this Section consists of furnishing and installing all site improvements and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:
1. Warning Regulatory and Route Marker – Aluminum Panel (Type A)
 2. Street Name Sign

3. Sign Post
4. Parking Meter Post
5. Remove and Replace Chain Link Fence
6. Remove and Replace Ornamental Fence
7. Private Fence Remove and Reset
8. Side Folding Gate
9. Trash/Recycling Combination
10. Bicycle Ring and Post
11. Pedestrian Bus Shelter
12. Bollard
13. Removable Aluminum Bollard

1.2 RELATED WORK

- A. Section 02210, EARTH EXCAVATION, BACKFILL, FILL, AND GRADING
- B. Section 02500, PAVING AND SURFACING
- C. Section 02524, CURBS WALKS, AND DRIVEWAYS
- D. Section 03300, CONCRETE
- E. Section 03410, PLANT-PRECAST STRUCTURAL CONCRETE

1.3 REFERENCES

- A. Unless otherwise specified or indicated, materials and workmanship shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:
- B. Standard Specifications: The Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges, latest edition.
- C. American Society for Testing and Materials (ASTM):
 - A36 Structural Steel
 - A53 Pipe, Steel, Black and Hot-dipped, Zinc-coated
 - A120 Standard Galvanized Steel Pipe
 - A153 Zinc Coating (Hot-dip) on Iron and Steel Hardware
 - A386 Zinc Coating (Hot-dip) on Assembled Steel Products
 - A325 High Strength Bolts
 - B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded

	Bars, Rods, Wire, Profiles, and Tubes.
F626	Fence Fittings
F668	Polyvinyl Chloride Coated Steel Chain Link Fence Fabric
F900	Industrial and Commercial Swing Gates
F934	Standard Colors for Polymer Coated Chain Link Fence Materials
F1043	Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

- D. American Steel and Iron Institute (ASI)
- E. American Welding Society (AWS):
 - D1.1 Structural Welding Code
- F. Steel Structures Painting Council (SSPC)
- G. American Welding Society (AWS):
 - D1.1 Structural Welding Code
- H. Steel Structures Painting Council (SSPC)

1.4 SUBMITTALS

- A. At least thirty (30) days prior to intended use, the Contractor shall provide the following submittals for approval.
- B. Shop Drawings, Manufacturer's Literature, and installation instructions for each item included within this specification section. Refer to Specification Section 01300-SUBMITTALS for submittal requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store work under this Section in a manner to prevent warping or stress of components, and to prevent mechanical damage or damage by the elements.
- B. Items which become rusted or damaged because of non-compliance with these conditions will be rejected and shall be replaced without additional cost to the Owner.
- C. Deliver bolts and other small items required for erection of work under this Section bundled with their respective items.

1.6 GUARANTEE

- A. Furnish and deliver standard written manufacturer's guarantee in Owner's name covering all materials and workmanship under this Section, in addition to, and not in lieu of, guarantee requirements set forth under GENERAL CONDITIONS and SPECIAL PROVISIONS, and other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

- B. Supplier shall guarantee, in writing, the satisfactory condition of the metal finish of his work in all parts for a period of twenty (20) years after date of final acceptance, and shall agree to promptly repair or replace any finish work which is found to be defective during this period.
- C. Supplier shall pay for repairs of any damage to any part of the project caused by defects in his work and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Engineer.
- D. Any part of the work installed under this contract requiring excessive maintenance shall be considered as being defective, and shall be replaced by the Supplier during the one year period at no cost to the Owner.

PART 2 - PRODUCTS

2.1 REGULATORY SIGNAGE

- A. Signs shall be fabricated per Contract Document requirements and conform to MUTCD, latest edition, standards.
- B. The legend, border, and background of sign panels (except as modified below) shall be Type "C", permanently applied legend, or Type "D", silk screen processed, according to the requirements of Section M9.30.0 of the MassDOT Standard Specifications, Type III or Type IV.
- C. Legends and dimensions for City of Cambridge Standard Regulatory signs are included in Appendix "G" of these Specifications.

2.2 STREET NAME SIGN

- A. Street name signs shall conform to City of Cambridge specifications, and shall be 9" high. Signs shall be 24" to 36" long, depending on the length of legend required.) Lettering shall be 5"-6" height FHWA series B lettering. Signs shall have white high intensity lettering on green EC film.

2.3 SIGN POST

- A. New traffic sign posts shall be galvanized steel "U-channel" posts conforming to Section M8.18.6 of the MassDOT Standard Specifications, in particular the Standard Special Provisions dated December 16, 2011, except minimum post weight shall be 3 lbs/foot.

2.4 PARKING METER POST

- A. Parking meter posts shall be Schedule 40 galvanized steel pipe; 2 inches inside diameter; 2 3/8 inches outside diameter. Length shall be 50 to 51 inches. Weep hole and anti-deformation bolt shall be provided as shown on the Cambridge Standard Details.

2.5 CHAIN LINK FENCE

- A. Fence shall be made of galvanized steel.

1. Steel pipe dimensions and weights: ASTM A53, Schedule 40. Dimensions specified are nominal pipe sizes.
 2. Dimensions and weight tolerances: Plus or minus five percent.
 3. Zinc Coating: Minimum 2.0 ounces per sq. ft.
 4. Provide posts with tops of same material, and designed to fit securely over post and carry top rail. Carry apron around outside of post at base of top fitting.
 5. Ferrous metal fittings, posts, fence, gate framework, and accessories galvanized with heavy coating of 2.0 oz. pure zinc spelter per sq. ft., use hot-dip process. Thinner zinc coatings, electro-galvanizing, zinc paint or cold galvanizing compounds shall not be used as substitute for hot-dipped galvanized finish.
 6. Fabricate and weld before hot-dip galvanizing. Weld conforming to American Welding Society standards.
 7. Hot-dip galvanized gate frame, after welding, if bolted or riveted corner fittings not used.
 9. Single and double leaf locking swing gates with center bolt, center stop, and automatic backstops.
- C. All chain-link steel fence fabric, gates, posts, rails, fittings, miscellaneous hardware, and other metallic items shall be PVC coated. PVC Color shall be selected by the Engineer at time of shop drawing review.
- D. Galvanized steel chain-link fence fabric conforming to ASTM A392, with Class 2 zinc coating (2.0 oz. of zinc per sq. ft. of uncoated wire surface); Fabric woven in 2-in. mesh from No.9 gage wire in a 6-ft. height with barbed selvages top and bottom.
- E. Tension Wires - No. 7-gage coil spring steel wire with galvanized finish having minimum of 0.80 oz. of zinc coating per sq. ft. of uncoated wire surface.
- F. Tie Wires - Tie wires, for fastening fence fabric to line posts and rails, not less than No. 6 gage aluminum wire. Tie wires, for fastening fence fabric to line posts and rails, not less than 9 gage (outside diameter) color matched PVC coated galvanized steel wire.
- G. Line Posts - 2-3/8 in outside diameter steel pipe weighing not less than 3.65 lb. per ft., or 1-7/8 in. high carbon steel H-beams weighing not less than 2.70 lb. per ft.
- H. End, Corner and Pull Posts - 2-7/8 in. outside diameter steel pipe weighing not less than 5.79 lb. per ft., or 2-1/2 in. square steel tube weighing not less than 5.14 lb. per ft., or 3-1/2 in. by 3-1/2 roll-formed, steel corner section weighing not less than 5.14 lb. per ft.
- I. Gate Posts - 2-7/8 in. outside diameter steel pipe and gate posts, for gate leaves up to

and including 6 ft. wide, weighing not less than 5.79 lb. per ft., or 2-1/2 in square steel tube weighing not less than 5.14 lb. per ft., or 3-1/2 in. by 3-1/2 in. roll-formed, steel corner section weighing not less than 5.14 lb. per ft.

1. 4 in. outside diameter steel pipe, gate posts for gate leaves over 6 ft. wide and up to and including 13 ft wide and weighing not less than 9.10 lb. per ft.
 2. 6-5/8 in. outside diameter steel pipe, gate posts for gate leaves over 13 ft. wide and up to and including 18 ft. weighing not less than 18.97 lb. per ft.
- J. Railings - 1-5/8 in outside diameter steel pipe with minimum weight of 2.27 lb. per ft. or 1-5/8 in. by 1-1/4 in., 14-gage roll-form section, for top railing and railings for top middle and bottom braces between terminal posts and adjacent line posts.
- K. Truss - 2-7/8 diameter steel rod diagonal truss braces between terminal and adjacent line posts and for gate framework.
- L. Fittings - Heavy-duty malleable iron or pressed steel fittings of suitable size to produce strong construction.
- M. Stretch Bars - Flat bars with minimum cross section dimensions of 1/4 in. by 3/4 in, full height of fabric, secured with bar bands of minimum 11-gage sheet steel, spaced approximately 15 in. on centers and bolted with 3/8 in. diameter bolts, for attaching fabric to terminal posts.
- N. Gate Leaf Frame work - 1-7/8 in. outside diameter steel pipe weighing 2.72 lb. per ft, minimum. Corners of gate frames shall be welded. Where the PVC coating has been removed for welding, the metal shall be cleaned thoroughly then coated with a zinc rich primer. The primed area shall then be painted with a long-lasting, durable, weather and sunlight resistant, outdoor paint of a color to match the PVC coating
- O. Gate Hinges - Heavy pattern of adequate strength for gate size, with large bearing surfaces for clamping or bolting in position.
- P. Latch - Gates with suitable latch, accessible from both sides and with provision for padlocking.
- Q. Gate Padlock - The Town will provide gate padlocks.
- R. Concrete Footings - Class A concrete, conforming to Section 03300 - Concrete.
- S. Grout - One part Portland cement and three parts of clean, sharp, well-graded sand with minimum water for proper workability for posts set in solid rock.

2.6 ORNAMENTAL FENCE

- A. Ornamental fence shall be Aberdeen style as manufactured by Iron World, 9390 Davis Avenue, Howard County, Maryland, 20723, phone 866/310-2747, or approved equivalent

product. Aberdeen style ornamental fence panels to be 4' high, 3 rail, flat top with 1/16" gauge pickets. Terminal post to be 3" square, 12 gauge, set in 3,000 psi concrete 42" in the ground. Line posts to be 2-1/2" square, 14 gauge, set in 3,000 psi concrete 36" in the ground. Color shall be black, as approved by the Engineer.

2.7 SIDE FOLDING GATE

- A. The work shall consist of removing and disposing of the existing chain link fence from Station 3301+04 to 3302+12 including the concrete foundations, and installing new side folding gates and support structures at new locations on Fern Street at the Cambridge Self Storage property at the locations shown on the Plans or as directed by the Engineer between Stations 3301+04 to 3302+00.
- B. The existing chain link fence shall be removed in its entirety including chain link mesh, all posts, rails, hardware and concrete bases. Materials shall be recycled to the extent possible.
- C. The side folding gates shall be S126 S model as manufactured by Dynamic Closures Corporation or approved equal. The side folding gates shall include all mounting tracks, locking posts and associated hardware.
- D. Side Folding Gate
 - 1. Aluminum Extrusions: ASTM B221, 6063-T5 or T6 alloy and temper.
 - 2. S126S rod link curtain:
 - a. 6-5/16 inches wide with 5-1/4 inch high bottom and top plates, truss-like aluminum.
 - b. Panels connected with 1/8 x 5/8 inch x 6 inch aluminum links vertically spaced 12 inches apart on 5/16 inch aluminum rods spaced horizontally 3 inches apart; every other rod covered with 1/2 inch aluminum tubes.
 - c. Pattern: Straight
 - 3. Curtain Carriers: Dual bearing trolleys with 1-1/8 inch diameter tires.
 - 4. Operation: Manual push/pull. Provide pull straps – standard on openings over 9 feet in height and countertop applications.
 - 5. Overhead Track: Extruded aluminum, 1-3/8 inches wide x 1-5/8 inches high, continuous profile seamed with alignment bars and track pins at splices. Refer to drawing for layout
 - 6. Curves: None.
 - 7. Post: Provide manufacturer's standard locking posts of aluminum extrusions:

- a. Lead Post – Hook bolt/wall channel
 - b. End Post – Hook bolt/wall channel
 - c. Intermediate Post – Standard spacing
8. Locking: All thumb turn locking on Grilles will require protection panels
- a. Lead Post - Interior keyed cylinder Exterior: keyed cylinder
 - b. Intermediate Post - Interior keyed cylinder drop bolt
 - c. End Post - Interior keyed cylinder Exterior: keyed cylinder
 - d. Locking for more than one Grille/Closure keyed alike
 - e. Key type: manufacturers standard mortise cylinder acceptable
9. Emergency Egress Door: None.
10. Finishes: Aluminum: Anodized, clear.
- E. Support structure – The support structure shall include all hardware, gusset plates, base plates, and concrete foundation with anchor bolts.
- 1. Materials
 - a. Steel shall meet ASTM standards.
 - b. Concrete shall be 3,000 psi and shall be poured in place on undisturbed soils or compacted soils with anchor bolts embedded in the pour and shall meet ASTM standards.
 - c. Reinforcing steel shall meet ASTM standards.
 - d. Hardware shall be galvanized A370 bolts and shall meet ASTM standards.
 - e. Anchor bolts shall be swedge bolts and shall meet ASTM standards
 - 2. Components
 - a. The steel square tubing shall be 6 inch by 6 inch by ½ inch tubing meeting ASTM standards.
 - b. The caps on top of the posts shall be ¼ inch by 6 inches meeting ASTM standards.
 - c. Base plates shall be 1 inch by 12 inches meeting ASTM standards

d. Gusset plates shall be ½ inch by dimensions shown on the drawings meeting ASTM standards.

3. Concrete foundations for the support structure shall be poured in place on undisturbed or compacted soils including anchor bolts (swedge bolts). Reinforcing steel shall be #4 and #5 and shall be installed as depicted on the Plans. Hardware shall be A307 galvanized ¾ inch bolts, washers and nuts. Anchor Bolts shall be ¾ inch swedge bolts.

2.8 TRASH COMPACTOR AND TRASH/RECYCLING COMBINATION

- A. Trash compactors shall be Big Belly Solar Intelligent Waste and Recycling System as manufactured by BigBelly Solar, 85 Wells Avenue, Suite 305, Newton MA, 02459, phone 888/820-0300, or approved equivalent product. Color shall be black, as approved by the Engineer. Volume of each unit (trash and recycling) shall be 50 gallons. City of Cambridge Standard.

2.9 BICYCLE RING AND POST

- A. Bicycle Ring and Post shall be “Bike Hitch” model as manufactured by DERO Bike Racks or approved equivalent product. Centerbeam shall be 2” schedule 40 pipe (2.375” OD) and the ring shall be 1.5” OD, 11 gauge tube with an outside diameter of 16.5”. Finish shall be hot dip galvanized. All attachment hardware shall be hot dip galvanized. City of Cambridge Standard.

2.10 PEDESTRIAN BUS SHELTER

- A. The work shall consist of furnishing and installing a pedestrian bus shelter at the locations shown the Plans or as directed by the Engineer.
- B. Shelter - Shelter shall have a nominal 2’ x 12’ footprint, nominal manufactured by Daytech, Type: BBC04X12N “Avanti” Dome Roof, or approved equivalent product.
- C. The shelter shall be surface mounted on adjustable feet for leveling on a 12-inch reinforced concrete pad with thickened edges 18-inches around entire perimeter, with steel fasteners at ground and other key connections.
- D. Shelter shall have aluminum extrusion framework with premium polyester powder cost finish in standard black.
- E. Walls shall be tempered safety Glass, 3/8” thick clear, with fired-in 2-inch yellow safety dots. Wall panels shall be continuous over back of shelter and both 2’ sides. The front of the shelter shall be open. The shelter will not have a wall ad/display panel.
- F. The roof shall be an overhanging dome roof composed of aluminum roof ribs and ¼-inch clear multiwall polycarbonate sheeting. The roof frame shall have 3-way keyed corners with 4-inch deep sockets for corner posts, integral gasketed glazing channel in underside of the

roof framework, and pressure-fit glazing on vertical posts with no exposed fasteners.

- G. The shelter shall have a bench installed and secured per manufacturers recommendations. The bench along the back wall shall be 88-inch "Easy Access" benches, 4-seater with dividers.
- H. No interior lighting will be provided.
- I. Concrete Pad - No separate concrete pad for anchoring shelter is required, as shelter may be anchored directly to cement concrete sidewalk conforming to the requirements for concrete sidewalk construction as found elsewhere in the Contract Documents.

2.11 BOLLARD

- A. See Sheet RG-4 for bollard product requirements.
- B. Concrete footing materials shall be 4,000 psi concrete as specified in Section 03300, CEMENT CONCRETE MASONRY.

2.12 REMOVABLE ALUMINUM BOLLARD

- A. The removable aluminum bollard shall be the "Salem M9023" model, a cast aluminum removable bollard with base tab, color black, as manufactured by Ironsmith, P.O. Box 10868, Palm Desert, CA 92255-0868, phone # 800.338.4766, or approved equal.
- B. Locking mechanism to be a key and padlock system to be supplied by Owner.
- C. Concrete footing materials shall be 4,000 psi concrete as specified in Section 03300, CEMENT CONCRETE MASONRY.

PART 3 - EXECUTION

3.1 PERMANENT SIGNAGE AND PARKING METER POSTS

- A. The location, number and legend of new signs which are required shall be as shown on the Drawings or as directed by the Engineer. Signs will be mounted on posts which are furnished and paid for under Item 2980.3.
- B. The Contractor shall lay out the proposed locations of parking meter posts for review and approval by the Engineer prior to installation. Proposed parking meter posts shall be installed in a 4,000 psi concrete base in accordance with the City of Cambridge Department of Traffic, Parking and Transportation specifications and detail drawings.

3.2 REMOVE AND REPLACE CHAIN LINK AND ORNAMENTAL FENCE

- A. The work under these Items shall include the removal and replacement of fence in order to allow for performance of the work of the project.

B. Installation of Footings

1. Maintain vertical sides to minimize up-lift.
2. Rod and compact concrete around posts. Slope top of footings above level of adjacent grade, and trowel finish.
3. Size: 6 in. minimum dia, plus outside dimension of post. Set corner, end, pull, and gate posts 42 in. into concrete. Set line posts 36 in. into concrete. Total depth of concrete 6 in. greater than required for post embedment.
4. Time of Set: 48-hrs before rails are erected or before fabric is applied or stretched.

C. Installation of Framing

1. Install line posts not more than 10 ft apart. Install pull posts not more than 600 ft. apart where a straight run of fence exceeds 600 ft. (183m) and where fence line changes direction by more than 15° but less than 30°. Install corner posts where the fence line changes direction by more than 30°.
2. Set posts in concrete footings, plumb and true to line.
3. Brace and truss end, pull, corner, and gate posts to adjacent line posts. Provide brace to match top rail spaced midway between top rail and tension wire and extending to adjacent line posts. Provide brace to match top rail spaced midway between top rail and tension wire and extending to adjacent line post. Truss diagonally with 5/16 in. (.79cm) dia tension rod with turnbuckle.
4. Fasten top rail to end, pull, gate and corner posts. Pass top rail through fittings of line posts. Provide expansion and contraction joints in top rail for each 100 lin ft. of fence.
5. Fasten bottom tension wire to end, pull, gate, corner, and line posts.
6. Maximum area of unbraced fence shall not exceed 1500 square feet.
7. Use galvanized sleeve and grout posts or install with suitable galvanized flange casings and galvanized anchor bolts as directed by Engineer.
8. When rock is encountered, set posts into rock a minimum depth of 12 in. for line posts and 18 in. for terminal posts. If solid ledge is encountered without overburden of soil. Provide post holes at least 1 in. greater in diameter than post, fill post holes with concrete, work post into hole taking care not to cause voids, remove excess concrete and crown remainder at top to shed water. Where solid rock is covered by overburden, do not exceed total setting depth required for setting in earth, grout posts into rock as described.

D. Installation of Fabric

1. Place fabric on outside of posts and stretch to avoid bulging or buckling. Fasten at line posts, top rail, and bottom tension wire with aluminum or zinc coated ties. Space ties not more than 15 in apart on line posts and not more than 24 in apart on rail and tension wire.
 2. Fasten at terminal posts at intervals not exceeding 15 in. using flat or beveled galvanized steel bands with 5/16 in. x 1-1/4 in. galvanized carriage bolts and nuts.
 3. Make tie connections on interior side of fence.
 4. Provide steel angle metal closures where finished ground surface is more than two inches below bottom tension wire. Bolt steel angle to fence posts, and install reinforcing rods and bracing members as approved. Install rods of accepted length vertically where drainage ditches cross fence line, provide concrete ditch lining and steel reinforcing bar grill.
 5. Install gates plumb, level, and secure for full width of opening and hardware adjusted for smooth operation.
 6. Electrical Ground: Where a power line carrying more than 600 volts passes over fence, install ground rod at nearest point directly below each point of crossing.
- E. Examine conditions under which fence and gates are to be installed. Notify Engineer, in writing, of improper conditions of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- F. Check location of underground work to make sure fence footings clear utilities and drainage work.
- G. Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated. Repair damaged components as recommended by manufacturer.

3.3 PRIVATE FENCE REMOVE AND RESET

- A. The work under this Item shall include careful removal, temporary storage, and resetting of existing fence in order to allow for performance of the work of the project. The work will include fencing of various types, including but not limited to wooden, chain link and ornamental.
- B. Fencing shall be removed in the presence of the Engineer. Where damage is caused to the fencing by the Contractor's operations, the Contractor shall be required to replace damaged components with new components of similar type and composition at no additional cost to the City.
- C. Reset fencing shall be set true to line and grade. Location and layout of fencing shall be approved by the Engineer prior to installations.

3.8 SIDE FOLDING GATE

- A. The contractor shall submit manufacturer's descriptive literature for materials specified and shop drawings showing procedures for installation of the sliding grilles.
- B. Prior to installation of the structural supports and side folding gates the contractor shall survey the site for proper relocation of the support structure and side folding gates.
- C. The Contractor shall be responsible for coordination with any embedment's which may be required, and all other items requiring coordination between field and factory items.
- D. The Contractor shall be responsible for timing the delivery of all items so as to minimize storage time prior to installation. All stored items must be protected from weather, careless handling and vandalism. Material damaged due to the Contractor's negligence shall be replaced with new materials at no cost to the City.
- E. The Contractor shall coordinate the work with the City and the property owner.
- F. Existing chain link fence – The existing chain link fence shall be removed in its entirety including chain link mesh, all posts, rails, hardware and concrete bases. Materials shall be recycled to the extent possible. Temporary fencing shall be provided until the new side folding gates and support structures are installed. Temporary fencing shall consist of 6 feet tall by 8 feet long chain link panels on portable rubber or concrete bases.
- G. Installation of side folding gates
 - 1. Install assembly in accordance with manufacturer's instructions.
 - 2. Anchor to adjacent construction without distortion or stress.
 - 3. Fit and align assembly including hardware, level and plumb, to provide smooth operation.
- H. Adjusting of side folding gates
 - 1. Adjust side folding gates for smooth operation throughout full operating range.
- I. Side folding gates support structures shall be installed level and plumb.
- J. The location where the fence and posts are removed shall be filled with gravel and compacted immediately after removal. Upon completion of the removal, relocation and replacement of the fencing the site shall be paved. The limits for paving shall be the entire area from the storage facility to the sidewalk and shall go 1 foot beyond any disturbed areas. Paving shall match existing grades. Pavement shall be a minimum of 2.5 inches of state binder and 1.5 inches of state top or equal to existing pavement, whichever is greater. The paving shall be a single monolithic pavement structure.

3.5 TRASH COMPACTOR AND TRASH/RECYCLING COMBINATION

- A. The Contractor shall provide five (5) two-unit waste and recycling stations as directed by the engineer. Each two-unit waste and recycling unit shall be located as indicated by Engineer and approved by City.
- B. The Contractor shall lay out the proposed locations of the two unit waste and recycling stations for review and approval by the Engineer prior to installation.
- C. Coordinate and furnish anchorages and setting drawings, diagrams, templates, instructions and directions for installing items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the site.
- D. Provide concrete foundations and install at proper elevation to allow paving to be installed over foundations. Install in accordance with manufacturer's recommendations. Grout anchorages and seal joint at pavement surface. Install plumb.
- E. Corrosion Protection - Coat concealed surfaces of metal that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- F. Items shall be positioned in the required location and firmly secured to the pavement in accordance with manufacturer's recommendations.

3.5 BICYCLE RING AND POST

- A. Coordinate and furnish anchorages and setting drawings, diagrams, templates, instructions and directions for installing items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the site.
- B. Corrosion Protection - Coat concealed surfaces of metal that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- C. Provide concrete foundations and install at proper elevation to allow paving to be installed over foundations. Install in accordance with manufacturer's recommendations and shown on Drawings. Grout anchorages and seal joint at pavement surface. Install plumb.
- D. Items shall be located as indicated on the Drawings.
- E. Items shall be positioned in the required location and firmly secured to the pavement in accordance with manufacturer's recommendations.

3.6 PEDESTRIAN BUS SHELTER

- A. The Contractor shall submit manufacturer's descriptive literature for materials specified and shop drawings showing procedures for installation of the bus shelter and all specified components.

- K. Prior to placement of concrete sidewalk in the areas where shelters are to be located, the Contractor shall stakeout the locations of shelters for view and approval by the Engineer. Concrete shall be placed in accordance with the requirements for concrete found elsewhere in the Contract Documents. Shelters shall be installed in accordance with manufactures instructions and recommendations. Shelters shall be installed plumb, level, and in proper alignment. Damaged or abraded finishes shall be touched-up, and damaged sections which cannot be repaired shall be replaced.
- L. The Contractor shall be responsible for coordination of sidewalk construction with any embedments which may be required, and all other items requiring coordination between field and factory items.
- M. The Contractor shall be responsible for timing the delivery of all items so as to minimize on-site storage time prior to installation. All stored items must be protected from weather, careless handling and vandalism. Material damaged due to the Contractor's negligence shall be replaced with new materials at no cost to the City.

3.7 BOLLARD

- A. Contractor shall obtain Engineer's approval for location of bollards.
- B. Fabricate and install bollards in conformance to Contract Documents and approved Shop Drawings.
- C. Bollards shall be set plumb and at height indicated on the Drawings.
- D. Concrete footings shall be installed as per the Drawings and as specified in Section 03300, CONCRETE.
- E. Install all backfill and base materials as shown on the Drawings and in conformance with Section 02210, EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

3.8 REMOVABLE ALUMINUM BOLLARD

- A. Contractor shall obtain Engineer's approval for location of removable bollard.
- B. Fabricate and install removable aluminum bollard in conformance to Contract Documents and approved Shop Drawings.
- C. Bollards shall be set plumb and at height indicated on the Drawings.
- D. Concrete footings shall be installed as per the Drawings and as specified in Section 03300, CONCRETE.
- E. Install all backfill and base materials as shown on the Drawings and in conformance with Section 02210, EARTH EXCAVATION, BACKFILL, FILL, AND GRADING.

PART 4 - COMPENSATION

Item 2980.1 Warning Regulatory and Route Marker – Aluminum Panel (Type A)

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the area (in square feet) of each sign installed as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work and construction methods to furnish and install signs.

Item 2980.2 Street Name Sign

Item 2980.3 Sign Post

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of each street name and sign post installed as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work and construction methods to furnish and install street name signs and sign posts.

Item 2980.4 Parking Meter Post

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of each parking meter post installed as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work and construction methods to furnish and install parking meter posts. No separate payment will be made for restoration of sidewalk areas which shall be considered incidental to the appropriate sidewalk item.

Item 2980.5 Remove and Replace Chain Link Fence

Item 2980.6 Remove and Replace Ornamental Fence

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of linear feet removed and replaced as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment under this Item shall be based on the unit price bid per foot of removal and replacement of fencing, complete in its final location. Payment shall also include removal of existing cement concrete foundations, and placement of new cement concrete foundations, where required.

EXCLUSIONS:

The following items are not included for payment under this item: Payment under Private Fence Remove and Reset and Side Folding Gate.

Item 2980.7 Private Fence Remove and Reset

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of linear feet removed and reset as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment under this Item shall be based on the unit price bid per foot of removal and resetting of existing fencing located on the private property or at the back of sidewalk, complete in its final location. Payment shall also include removal of existing cement concrete foundations, and placement of new cement concrete foundations, where required.

Item 2980.8 Side Folding Gate

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on a lump sum basis complete in place as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be lump sum and shall be paid upon the removal and disposal of the existing chain link fence and posts with concrete bases and the completion and proper operation of the side folding gates and the support structure. The lump sum price shall constitute full payment for furnishing and installing the side folding gates and support structure including excavation, removal and disposal of the fence between Stations 3301+04 to 3302+12 on Fern Street in its entirety, coordination with property owners and City, excavation and placement of concrete bases with anchor bolts, erection of steel, replacement of existing concrete bases with compacted gravel, paving, temporary fencing and survey. The Contractor shall also furnish all labor, materials, tools, equipment and incidentals to coordinate and/or temporarily support all utilities exposed during the excavation for the installation of the work.

Item 2980.9 Trash Compactor and Trash/Recycling Combination

Item 2980.10 Bicycle Ring and Post

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of each trash compactor and trash/recycling unit and each bicycle ring and post installed as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price shall constitute full compensation for installation complete-in-place including excavation; removal of existing bicycle ring and post; surface mounting appurtenances, pipe, hardware, concrete, reinforcement, concrete slab and footings, blocking, solid surfacing; cleaning and touch-up painting, protecting the items from damage, and cutting and patching required to complete the installation as indicated and specified.

EXCLUSIONS:

No separate payment will be made for restoration of sidewalk areas which shall be considered incidental to the item.

Item 2980.11 Pedestrian Bus Shelter

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on a lump sum basis complete in place as indicated in the Contract Documents or as required by the Engineer.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price bid per each shall constitute full compensation for furnishing and installing the shelter, including excavation, coordination and placement of required embedment in concrete sidewalk, and furnishing and installation of shelter including seating. This work shall also include modifications to landscaping adjacent to the pedestrian bus shelter to alter the path to Tobin Fields. This includes removal of the existing mulch area, furnishing and installing a new mulch area, removing and relocating a boulder, including all labor, equipment, materials, tools, incidental work. This work shall be completed as shown on contract drawings or as required by the engineer.

Item 2980.12 Bollard

Item 2980.13 Removable Bollard

METHOD OF MEASUREMENT:

Measurement for Payment shall be based on the actual number of individual items installed, including, the bollard and removable aluminum bollard.

BASIS OF PAYMENT:

Payment shall be based on the unit price bid for each item. The unit price shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work and construction methods. No separate measurement and payment shall be made for excavation, backfill and base materials, and concrete footings.

EXCLUSIONS:

No separate payment will be made for restoration of sidewalk areas which shall be considered incidental to the item.

Item 2980.14 Fern Street Artscape Coordination and Installation Allowance

METHOD OF MEASUREMENT:

Payment will be made against the allowance based on invoices submitted by the General Contractor on a monthly basis. Labor, professional services, technician, and other invoices shall include a breakdown of hours, labor rates, direct expenses all sub-consultant and contractor mark-ups, material costs, shipping, taxes and all other costs included in the request. Incomplete or incorrect invoices will not be approved.

The General Contractor is allowed up to a 5% Mark-up on labor, professional service, technician, and other costs related to construction layout and baseline and as-builts and as approved by the resident engineer.

BASIS OF PAYMENT:

The allowance for this item shall be reimbursement to the General Contractor to furnish all labor, professional services, technician, equipment, and incidentals for the Contractor to coordinate and install features that will be incorporated into the restoration design on Fern Street. Design will be provided to the contractor from an Artist during Construction.

END OF SECTION 02980

SECTION 03300

CONCRETE

**3300.1 CIP CONCRETE PIPE CONNECTIONS EACH
GREATER THAN 24-INCH THROUGH 36-INCH DIAMETER
(CIP FIELD CLOSURES)**

1.1

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing, installing, and testing of cast-in-place concrete including formwork, reinforcement concrete, materials, mix design, placement procedures, and finishes.
 - 2. Class A concrete is for reinforced concrete structures, including Drain Vault No.2, manhole bases, special structures, reinforced concrete fills, and similar items as applicable.
 - 3. Class B concrete is for non-reinforced concrete including cradles, encasements, thrust blocks, plugs, and base for pavements and similar concrete whether reinforced or not.
- B. Concrete for sidewalks is described in Section 02524 – CURBS, WALKS AND DRIVEWAYS.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 03315 – GROUT
- B. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Product Data: For each type of manufactured material and product indicated.
 - 2. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

- a. Indicate amounts of mix water to be withheld at plant for later addition at Project site. However, addition of water at project site shall be limited to maximum amount printed on the concrete delivery ticket. Absent this information, no water shall be permitted to be added at project site.
3. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
4. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - a. Cementitious materials and aggregates,
 - b. Form materials and form-release agents,
 - c. Steel reinforcement and reinforcement accessories,
 - d. Admixtures,
 - e. Waterstops,
 - f. Curing materials,
 - g. Bonding agents,
 - h. Adhesives,
 - i. Ready-mix concrete producer,
 - j. Repair materials,
5. Detailed cold-weather protection methods.
6. Qualifications of concrete installer, manufacturer, and testing agency as specified in this Section.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.

- B. **Installer Qualifications:** An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- D. **Testing Agency Qualifications:** Contractor shall employ a testing agency, acceptable to the Engineer and qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
- E. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- F. **ACI Publications:** Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, Light Pole Piers, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, $\frac{3}{4}$ inch by $\frac{3}{4}$ inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 2 inch to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing and for walls which are part of water containing tanks or structures.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Materials shall have a recycled content of 30% or greater and shall conform to the following standards:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
3. Plain-Steel Wire: ASTM A 82, as drawn.
4. Plain-Steel Welded Wire Reinforcing: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
5. Reinforcing shall be uncoated unless indicated otherwise on the Contract Drawings.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 1. Class: Severe weathering region, but not less than 3S.
 2. Nominal Maximum Aggregate Size: 3/4 inch..
- C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- F. High Range Water Reducing Admixture: ASTM C494, Type F.
- G. Crystalline Waterproofing Admixture: Xypex C-Series or approved equal.

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Ribbed.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Greenstreak.
 - b. Meadows: W. R. Meadows, Inc.
 - c. Vinylex Corporation.
- B. Hydrophilic Waterstops: Manufactured as self-adhesive strips or caulk, for adhesive bonding to concrete.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Earth Shield Type 23 by J.P. Specialties, Inc..
 - b. Hydrotite by Greenstreak.
 - c. Ultra Seal by Adeka Corporation.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. This product shall not be used as a substitution for curing compounds.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Volatile Organic Compounds (VOC) shall meet maximum emission limits of authorities having jurisdiction at project site.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Evaporation Retarder:
 - i. Eucobar; Euclid Chemical Co.
 - ii. E-Con; L&M Construction Chemicals, Inc.
 - iii. Confilm; BASF Construction Chemicals, LLC.
 - b. Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids:
 - i. Klear-Kote WBII 20 percent; Burke Chemicals.
 - ii. Dress & Seal WB; L&M Construction Chemicals, Inc.
 - iii. Vocomp-20; W. R. Meadows, Inc.
 - c. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:
 - i. Res-Cure; Atlas Tech Products.
 - ii. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
 - iii. Vocomp-30; W. R. Meadows, Inc.

2.8 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Fly ash and blast furnace slag shall not be used.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Concrete mixes shall be designed for the classes indicated below and in accordance with the requirements indicated.

Design Mix Schedule								
Class	Specified Compressive Strength (psi)	Minimum Cement Content (lb/cy)	*Maximum Water/Cementitious Ratio	Admixture				Density and Aggregate Size
				% Air Entrainment	Corrosion Inhibitor (gal./cy)	Fiber Reinforcement (lb/cy)	Silica Fume (% wt. Cement)	
A	4,500	565	0.42	5+/-1	N/A	N/A	N/A	NW-3/4"
B	4,000	565	0.44	5+/-1	N/A	N/A	N/A	NW-3/4"

* Total water in mix at time of mixing, including free water in aggregates.

1. Mix Classifications: The design mix classes indicated above shall be used as indicated on the Drawings and as follows:
 - Class A: Class A shall be used on all areas indicated on the drawings as follows: Structural (S Series) and Civil (C Series). Concrete shall be integral with high-range water reducer.
 - Class B: Class B shall be used where ever low strength concrete fill is indicated.
2. Slump at point of placement shall be limited to 4"+/- 1". With addition of high-range water reducer, slump at point of placement shall be limited to 7"+/- 2".

2. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in work.
- D. Admixtures: Subject to Engineer's approval, use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use crystalline waterproofing admixture where indicated in the drawing details and specifications. Bituminous damp-proofing shall not be used as an alternate unless approved by the ENGINEER on a case-by-case basis.

2.10 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch, for concrete surfaces exposed to view.
 - 2. Class B, 1/4 inch, for other concrete surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete where indicated on Drawings.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use

Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50°F for 72 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. When cold weather concrete requirements apply, formwork shall be left-in-place for a minimum of 7 days.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 1. At least 70% of 28-day design compressive strength.
 2. Determine compressive strength of in-place concrete by testing representative field cured test specimens according to ACI 301.
 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain required concrete cover. Do not tack weld crossing reinforcing bars, unless indicated on the Drawings.
 - 1. Shop- or field-weld reinforcement according to AWS D1.4, only where indicated on the Drawings.
 - 2. Do not install reinforcement into previously placed concrete.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
 - 2. Form using bulkhead forms with keys, unless otherwise indicated. Leave-in-place bulkhead forms are prohibited.
 - 3. Use a bonding agent at locations where indicated on Drawings, and where fresh concrete is placed against hardened concrete surfaces.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and

protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

- B. Hydrophilic Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable and in accordance with manufacturer's typical installation details. Provide minimum depth of concrete cover per manufacturer written instructions.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved in writing by Engineer.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Limit drop height of concrete off of chute to 48-inches.
 - 2. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
 - 4. Concrete shall be carefully consolidated on each side of waterstop.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
 6. Pulling of welded wire fabric through wet concrete from subgrade is prohibited.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90°F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is

calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. The finish of formed surfaces shall proceed concurrently with, or immediately after the repair of surface defects. The selection of finishes shall be as indicated in the table below.

Concrete Finishes (Formed Surfaces) Location	Finish
Footings, exterior walls, pile caps, portions of grade beams below grade and all other concrete not exposed to view	Rough-Formed Finish
Walls, portions of grade beams above grade, and all other concrete surfaces exposed to view. Surfaces to be coated or covered with waterproofing, dampproofing, plaster or paint	Smooth-Formed Finish

- B. **Rough-Formed Finish:** As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- C. **Smooth-Formed Finish:** As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
- D. **Smooth Rubbed Finish to Permanently Exposed Surfaces:** Apply the following to smooth-formed finished concrete:
1. **Smooth-Rubbed Finish:** Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

- A. **Defective Concrete:** Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. **Patching Mortar:** Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. **Repairing Formed Surfaces:** Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching

mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall employ qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Section.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete, plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40°F and below and when 80°F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 6. Cast and field cure one additional set of four standard cylinder specimens for each composite sample, when outside air temperature is below or expected to fall below 40°F that night. Also provide field cured cylinders to determine strength for form removal.
 7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days, two at 28 days, and one at 56 days.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- E. Test results shall be reported in writing via FAX to Engineer, Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency shall conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer. Petrographical analysis to determine water/cement ratio cement content, hydrated cement content, etc. shall be performed by the testing and inspection agency as directed by the Engineer when test results indicate requirements have not been met.

PART 4 – COMPENSATION

Cast-In-Place Concrete Pipe Collar

Item 3300.1 --- CIP Concrete Pipes Connection Greater than 24-inch Through 36-inch Diameter (CIP Field Closures)

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, and leakage testing/inspection of CIP Field Closures, complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: exposure and protection of existing underground infrastructure; waterseal/waterstop; reinforcement and doweling; formwork (with removal); Class A and B concrete, and admixtures; brick masonry; dampproofing; concrete testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Cast-In-Place Concrete Pipe Collar shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the actual numbers of pipe collars installed complete and functional as shown on the Contract Drawings or as directed by the Owner or Engineer.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: trenching (paid under installed pipe item); proposed pipe to be connected; disposal of material.

-END OF SECTION 03300-

SECTION 03315

GROUT

3315.1 PRIVATE CAP EXTERIOR ELBOWS EACH

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes the following:
 - 1. Furnishing, installing, and testing all materials for grout including formwork, materials, mix design, placement procedures, and finishes
 - 2. The following types of grout shall be covered in this Section:
 - a. Cement Grout
 - b. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced.
 - c. Epoxy Grout
 - d. Topping Grout

1.2 RELATED TECHNICAL SECTIONS

- A. Section 03300 – CONCRETE

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the work.
 - 2. Certified testing lab reports for tests indicated herein.
 - 3. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.
 - 4. Certifications that grouts used on the project contain no chlorides or other chemicals that cause corrosion.

5. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, curing, and appropriate uses for each type of grout used in the WORK, and location of use. The current ICC-ES or IAPMO-UES report shall be submitted for all epoxy anchor grouts for adhesive anchors.
6. Manufacturer's certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.
7. Submit manufacturer's written warranty as indicated herein.
8. Name and telephone number of grout manufacturer's representative who will give on-Site service. The representative shall have at least one year of experience with the indicated grouts.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified
- B. Field Tests:
 1. Cement Grout and Topping Grout
 - a. Compressive strength of cement grout and topping grout shall be tested in accordance with the requirements of ASTM C 1107. The frequency of tests shall conform to the requirements of Section 03300 – CONCRETE.
 2. Prepackaged Grout
 - a. Compression test specimens shall be taken during construction from the first placement of each type of grout, and for each different batch number of each type of grout thereafter. The specimens will be made by the Owner or its representative.
 - b. Compression tests and fabrication of specimens for non-shrink grout shall be performed as specified in ASTM C 109. A set of three specimens shall be made for testing at 24 hour, 28 days, and each additional time period as appropriate.
 - c. Compression tests and fabrication of specimens for epoxy grout shall be performed as specified in ASTM C 579, Method B. A set of three specimens shall be made for testing at 24 hours, and each earlier time period as appropriate.

3. All grout, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at no cost to the Owner.
 4. The cost of all laboratory and field tests on grout shall be borne by the Contractor, and the Contractor shall assist the Owner in obtaining specimens for testing. The Contractor shall supply all materials necessary for fabricating the test specimens.
- C. Construction Tolerances: Construction tolerances shall be as specified in the Section 03300 – CONCRETE, except as modified herein and elsewhere in the Contract Documents.

PART 2 – PRODUCTS

2.1 CEMENT GROUT

- A. Cement Grout: Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4500 psi.
- B. Cement grout materials shall be as specified in Section 03300 – CONCRETE.

2.2 PREPACKAGED GROUTS

- A. Non-Shrink Grout:
 1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.
 2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0%) and a maximum 4.0% expansion in the plastic state when tested in accordance with ASTM C-827; and shall have no shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with ASTM C 1090.
 3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of ASTM C 1090.
 4. Application:

- a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
- b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

B. Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100% solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
2. Available Products: Subject to compliance with regulations, products that maybe incorporated into the work include, but not limited to, the following:
 - a. Five Star DP Epoxy Grout; Five Star Products,
 - b. Sikadur 42 Grout-Pak; Sika Corporation
 - c. Materflow 648 CP Plus; BASF
 - d. or equal.
3. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
4. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75° F.
5. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with

ASTM C 579, Method B. There shall be no shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C 827.

6. The epoxy grout shall exhibit a minimum effective bearing area of 95%. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface of the grout shall be probed with a sharp instrument to locate all voids.
7. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95°F when tested with 75°F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of 30×10^{-6} inches/inch/degree F when tested according to ASTM C 531 or ASTM D 696.
8. Application: Epoxy grout shall be used for all other applications required in the Contract Documents, unless specified in drawings.

C. Epoxy Anchor Grout:

1. Epoxy anchor grout for use in concrete shall be certified for use in accordance with ICC-ES AC 308.
2. Epoxy anchor grout shall conform to ASTM C 881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class B & C, Grade 3 with the exception of gel time.
3. Heat deflection temperature per ASTM D 648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position shall be a minimum 120 degrees F.
4. Manufacturer shall certify that the epoxy anchor grout will maintain 100 percent of its capacity up to a short term temperature of 110 degrees F and 50 percent of its capacity up to a short term temperature of 150 degrees F.
5. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.
6. Epoxy anchor grout shall be capable of being used in submerged applications once cured.

7. Compressive strength per ASTM D 695 – Standard Test Method for Compressive Properties of Rigid Plastics shall be 10,000 psi minimum.
8. Whenever possible, overhead anchors subject to vibration, anchors in fire-resistive construction or high fire risk areas, and anchors subject to working or operating temperatures above 100 degrees F shall be cast-in-place anchors. Whenever cast-in-place anchors cannot be used in these applications, use cement based non-shrink grout and oversized holes.
9. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar unless otherwise noted on the Contract Documents.. Embedment shall not exceed 67 percent of the member depth.
10. Epoxy anchor grout shall be **PE1000+ by Powers Fasteners; HIT-RE 500-SD by Hilti, SET-XP by Simpson Strong-Tie**, or equal.

2.3 TOPPING GROUT

- A. Grout for topping of slabs shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. All materials and procedures specified for normal concrete in Section 03300 – CONCRETE shall apply except as noted otherwise herein.
- B. Topping grout shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45.
- C. Coarse aggregate shall be graded as follows:

<u>US Standard Sieve Size</u>	<u>Percent By Weight Passing</u>
1/2"	100
3/8"	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- D. Final mix design shall be as determined by trial mix design under supervision of the approved testing laboratory.
- E. Strength: Minimum compressive strength of topping grout at the end of 28 days shall be 4000 psi.

2.4 CURING MATERIALS

- A. Curing materials shall be as specified in Section 03300 – CONCRETE, for cement grout and as recommended by the manufacturer of prepackaged grouts.

2.5 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application.
- B. The slump for topping grout shall be adjusted to match placement and finishing conditions but shall not exceed 4 inches.

2.6 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 – EXECUTION

3.1 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300 – CONCRETE. The finish of the grout surface shall match that of the adjacent concrete.
- B. The manufacturer of non-shrink grout and epoxy grout shall provide on-site technical assistance.
- C. Base concrete or masonry must have attained its design strength before grout is placed, unless authorized by the Engineer.

0.1 GROUTING PROCEDURES

- A. Prepackage Grouts: All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- B. Base Plate Grouting:
 - 1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a 1-inch thickness of grout or a thickness as shown on the drawings.

2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The mixture shall be of a trowelable consistency and tamped or rodded solidly into the space between the plate and the base concrete. A backing board or stop shall be provided at the back side of the space to be filled with grout. Where this method of placement is not practical or where required by the Owner, alternate grouting methods shall be submitted for acceptance by the Engineer.

C. Topping Grout:

1. All mechanical, electrical, and finish work shall be completed prior to placement of topping. The base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing the aggregates to ensure bonding to the base slab.
2. The minimum thickness of grout topping shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45° with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3 ½ inches wide by 1 ½ inches deep.
3. The base slab shall be thoroughly cleaned and wetted prior to placing topping. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat Type II cement grout shall be broomed into the surface of the slab just before topping of fill placement. The topping shall be compacted by rolling or tamping, brought to established grade, and floated.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

3.3 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

PART 4 – COMPENSATION

Item 3315.1 – Private Cap Exterior Elbows

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete installation of pipe plugs or caps on existing exterior pipe elbows connected to the interior of private buildings, including any excavation, backfill, labor, and materials incidental to the work not specifically covered under another item.; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Polyvinyl Chloride Pipe shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the quantity of plugs or caps placed on existing elbows less than 8-inches in diameter as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken as each elbow capped or plugged.

-END OF SECTION 03315-

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SECTION 03410

PLANT-PRECAST STRUCTURAL CONCRETE

3410.1 **CONCORD AVE DIVERSION STRUCTURE (5.5'X6.5')** **LUMP SUM**

3410.2 **PRECAST CONCRETE INLET**
 OIL/SEDIMENT SEPARATOR **EACH**

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing, installing, and testing of underground precast concrete structures, complete and in place, within the limits and to the lines and grades indicated.

B. Refer to Section 02252 – MANHOLES for requirements relating to the following:

1. Jointing and gaskets,
2. Coatings,
3. Castings,
4. Masonry and building inverts,
5. Flexible manhole seals,
6. Installation regarding placing structure in trench, connecting pipes, building inverts, and backfilling,
7. Inspection and testing of completed structures.

1.2 RELATED TECHNICAL SECTION

- A. Section 02140 – DEWATERING
- B. Section 02160 – TEMPORARY EXCAVATION SUPPORT SYSTEMS
- C. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING
- D. Section 02252 – MANHOLES

- E. Section 02590 – BRICK MASONRY
- F. Section 03300 – CONCRETE
- G. Section 03315 – GROUT
- H. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Complete shop drawings which show details in accordance with ACI 315 and ACI 318 for all precast structural concrete units, cast iron frames and covers and appurtenances including:
 - a. Details of structures, joints and gaskets, construction details, tolerances, and other information as required by the Owner. Indicate member locations, plans, elevation, dimensions, shapes, cross sections, openings, and types of reinforcement, including special reinforcement.
 - b. Product Data: For each type of product indicated.
 - c. Design Mixes: For each concrete mix. Prior to commencing operations, including fabrications of the precast for any mock-up, a statement shall be submitted giving the nominal maximum aggregate size and proportions of all ingredients that will be used in the manufacture of concrete. The statement shall include test results from an approved testing laboratory, certifying that the proportions selected will produce concrete of the properties required. No substitutions shall be made in materials used in the concrete mix without approval and additional tests to verify that the concrete properties are satisfactory. A copy shall be submitted of concrete mix with each set of samples.
 - d. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
 - e. Indicate locations and details of anchorage devices to be embedded in other construction.
 - 2. Design drawings and calculations signed and sealed by a Professional Structural Engineer registered in the Commonwealth of Massachusetts to the Engineer.

3. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - a. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - i. Concrete materials.
 - ii. Reinforcing materials.
 - iii. Admixtures.
4. Certificates of Compliance: Certificates of compliance shall be submitted attesting that materials and products meet or exceed specified requirements.
5. Qualification Data: List of projects/orders completed in the last 5 years demonstrating capabilities and experience as specified in the Quality Control paragraph of this Section. Include project name and addresses, and other information specified.
6. Submit manufacturer's recommended installation procedures for informational purposes.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
 1. Installer Qualifications: An experienced installer who has completed precast structural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
 2. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance.
 - a. Assumes responsibility for engineering precast structural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified Professional Engineer.
 - b. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services

of the kind indicated. Engineering services are defined as those performed for installations of precast structural concrete that are similar to those indicated for this Project in material, design, and extent.

- c. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group C, Category C1.
 - d. Has sufficient production capacity to produce required units without delaying the Work.
- 3. Testing Agency Qualifications: An independent testing agency, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 4. Design Standards: Comply with ACI 318 and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
 - 5. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."
 - 6. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered.
 - 7. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- B. Owner reserves right to inspect and test by independent services at manufacturer's plant or elsewhere at his own expense.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

1.6 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Dead Loads: 130 pcf soil load on roof.

2. Live Loads: AASHTO HS-20.
3. Lateral Earth Pressure; 90 psf/ft below ground level.
4. Internal Fluid Pressure: Based on unit weight of 63 pcf filled from invert to finished grade with no external soil pressure.
5. Traffic Surcharge:
 - a. Vertical Load: 240 psf at the ground surface level.
 - b. Lateral Load: 120 psf at the side of the wall applied over the full height of the wall.
6. Seismically induced earth pressure is not required by Geotechnical Design recommendations from Brierley Associates, LLC.
7. Maximum allowable bearing pressure at the bottom of foundation support shall be 2000 psf. Provide 12 inches of compacted crushed stone over the compacted bearing surface.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Each structure section shall be constructed with a bell-and-spigot or tongue-in-groove joint.
- B. Structure flat tops shall be reinforced and not less than 8 inches thick. Manhole openings shall have a minimum inside diameter of 24 inches.
- C. All exterior concrete surfaces shall be coated with bituminous dampproofing as per Section 07160 – BITUMINOUS DAMPPROOFING.
- D. Jointing shall be O-ring gaskets or butyl rubber molding sealants. All joints shall be provided so as to be watertight under all conditions of service. The ends of base, riser, and top sections to be jointed using neoprene “O-ring” type joints shall be designed to enclose the gasket on four surfaces when the joint is in its final position.
- E. Mortar for Brickwork shall be provided per Section 02590 – BRICK MASONRY.
- F. Bricks shall be provided per Section 02560 – BRICK MASONRY.
- G. Structure castings shall be provided per Section 02252 – MANHOLES.

2.2 MOLD MATERIALS

- A. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood, or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.

2.3 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Steel Bar Mats: ASTM A 184, assembled with clips, as follows:
 - 1. Steel Reinforcement: ASTM A 615, Grade 60, deformed bars.
- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Plain-Steel Welded Wire Fabric: ASTM A 85, fabricated from as-drawn steel wire into flat sheets.
- F. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "PCI MNL 116, and as follows:
 - 1. For uncoated reinforcement, use all-plastic CRSI Class 1 plastic-protected bar supports.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 4S.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Water-Reducing Admixture: ASTM C 494, Type A.
- F. Retarding Admixture: ASTM C 494, Type B.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

- H. Ground Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or better.
- 2.5 STEEL CONNECTION MATERIALS
- A. Carbon-Steel Shapes and Plates: ASTM A 36.
 - B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
 - C. Malleable Steel Castings: ASTM A 47.
 - D. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706.
 - E. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
 - F. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - G. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123, after fabrication.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94% zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
 - H. Welding Electrodes: Comply with AWS standards.
 - I. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

2.6 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Plate: ASTM A 666, Type 316L, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, alloy 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers.
- C. Stainless-Steel Headed Studs: ASTM A 276.

2.7 CONCRETE MIXES

- A. Prepare design mixes for each type of concrete required.

- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318.
- D. Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Specified Compressive Strength (28 Days): f'_c 5,000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.440.
 - 3. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent:
 - a. Air Content: 6% for 1-inch nominal maximum aggregate size.
 - b. Air Content: 6% for 3/4-inch nominal maximum aggregate size.
 - c. Air Content: 7% for 1/2-inch nominal maximum aggregate size.
- E. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's written instructions.
- F. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.8 FABRICATION

- A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.
 - 1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.

- B. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Engineer.
- C. Cast-in openings larger than 10 inches in diameter or 10 inches square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Engineer.
- D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
 - 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 - 3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.
- F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.
- G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
- H. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- I. Comply with ACI 305R recommendations for hot-weather concrete placement.
- J. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop

Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.

- K. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- L. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.
- M. Finish formed surfaces of precast structural concrete as indicated for each type of unit, and as follows:
 - 1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
- N. Screed finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections.
 - 1. Apply scratch finish to precast concrete units that will receive concrete fill after installation. After initial strikeoff, transversely scarify surface to provide ridges approximately 1/4 inch deep.
- O. Repair of damaged epoxy coating, when required, shall be made with patching material conforming to ASTM A 775. Repair shall be in accordance with the material Manufacturer's recommendations.

2.9 GASKETS

- A. Gaskets for sealing joints using the "O-ring" type gaskets shall conform to ASTM C443, latest revision, and shall be of rubber of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of neoprene gaskets for pipe joints, or shall be vulcanized butyl rubber sealants meeting or exceeding Federal Specifications SS-S-210.
- B. Each gasket shall be a continuous ring of round solid cross-section having smooth surfaces free from blisters, porosity and other imperfections. The joint sealing gasket shall be of a composition and texture which shall be resistant to sewage, industrial wastes including gasoline, oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,200 psi. The elongation shall be such that 2-inch gauge marks shall stretch to not less than 9 inches. The compression set (constant deflection) shall not exceed 25 percent of the

original gauge length. The tensile strength after accelerated aging shall be not less than 80 percent of the original strength.

- C. The butyl rubber sealant shall have a self adhesive nature and shall have a diameter of 1 inch and shall be furnished in coils. The sealant shall meet the following properties:

<u>DESCRIPTION</u>	<u>SEALANT PROPERTY</u>
Base	Vulcanized Butyl Rubber
Percent of Solids	100%
Shore "A" Durameter:	
- Initial	10
- Aged	20
Adhesion to Clean Surfaces	Excellent
Temperature Range:	
- Application	-20° F to 120° F
- Service	-65° F to 200° F
Water Absorption after 14 days immersion:	Less than 5%
Chemical Resistance after 7 days immersion in 5% Potassium Hydroxide and 5% Hydrochloride Acid	Excellent
Resistance to Water and Organic Solvents	Excellent
Resistance to Shock, Heat, and Cold	Excellent
Color	Black
Shelf Life	Excellent
Elongation	
- Initial	30%
- 2 weeks at 190° F, drying	250%
- 2 weeks in water	300%
Weather Resistance	Excellent
Moisture Diffusion Resistance	Excellent
Specific Gravity	1:18
Flash Point	None
Fire Point	Over 620° F

2.10 FLEXIBLE MANHOLE SEALS

- A. Flexible manhole seals shall be:
1. New Lok Joint Flexible Sleeve by Interpace,
 2. A-Lok Manhole Sleeve by L & L Concrete Products,
 3. Press Wedge II by Pre-Seal Basket Corporation,
 4. or approved equal.

- B. Field applied seals shall be similar to a style typified by Kor-N-Seal boot or an approved equal.
- C. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

2.11 SOURCE QUALITY CONTROL

- A. Contractor will employ an independent testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
 - 1. Allow Contractor's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.
- C. Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:
 - 1. Units fail to comply with compressive-strength test requirements.
 - 2. Reinforcement of units do not comply with fabrication requirements.
 - 3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
 - 4. Units are damaged during handling and erecting.
- D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 16 requirements, Engineer may employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
 - 1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Engineer.
 - 2. Cores will be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
 - 3. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75% of the 28-day design compressive strength.

4. Test results will be made in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.
 1. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.
- G. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

2.12 INLET OIL/SEDIMENT SEPARATOR

- A. The precast concrete inlet oil/sediment separator shall remove oil and sediment from storm water during frequent wet weather events. It should treat a minimum of 75 to 90 percent of the annual runoff volume and be capable of removing 50 to 80 percent of the total suspended sediment load as well as more than 90 percent of floatable free oil. The separator shall be capable of trapping silt and clay size particles, in addition to large particles.
- B. The precast concrete inlet oil/sediment separator shall be installed underground as part of the storm drain system and be structurally designed

for HS-20 loading. The separator shall be maintained from the surface from one access point.

- C. The inlet oil/sediment separator shall be equipped with an internal high flow bypass that regulates the flow rate into the treatment chamber and conveys high flows directly to the outlet so the scour and/or re-suspension of material previously collected in the separator does not occur. External bypasses are not acceptable. The bypass area shall be physically separated from the separation area to prevent mixing with the separator circular and constructed from either fiberglass or precast concrete risers.
- D. The inlet oil/sediment separator shall be designed and manufactured in accordance with ASTM C-478.
- E. The concrete joints shall be oil resistant, water tight, and meet the design criteria according to ASTM C-443.
- F. In the precast concrete inlet oil/sediment separator, a fiberglass insert, bolted and sealed watertight to the inside of the bypass chamber, shall divert low to normal storm water flows into the treatment chamber. A minimum of 12 inches of oil storage shall be lined with fiberglass to provide secondary containment of any hydrocarbon materials.
- G. The difference between the separator inlet pipe elevation and the separator outlet pipe elevation shall be 1 inch.
- H. The inlet oil/sediment separator shall be capable of floatable substance spills including free oil and shall not be comprised by temporary backwater conditions. The capabilities of the separator shall be documented with scientific studies and reports and have been verified by a state or federal storm water verification program.
- I. Manufacturers:
 - 1. Stormceptor, Model STC-450i
 - 2. CONTECH Engineered Solutions, Model CDS2015.4
 - 3. Or Equal

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions

affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
 - 1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - 2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.
- B. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Engineer.
- C. Erection Tolerances: Install precast concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Standards and Guidelines for the Erection of Precast Concrete Products".
- D. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joints as follows:
 - 1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

3.3 FIELD QUALITY CONTROL

- A. Testing: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Field welds and connections using high-strength bolts will be subject to tests and inspections.
- C. Testing agency will report test results promptly and in writing to Contractor and Engineer.
- D. Remove and replace work that does not comply with specified requirements.

- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

3.5 PROTECTION

- A. Adjacent surfaces shall be protected from damage during sealing and cleaning operations and against damage, disfiguration or discoloration from subsequent operations. Noncombustible shielding shall be used during welding operations.

PART 4 – COMPENSATION

Item 3410.1 --- Concord Ave Diversion Structure (5.5'x6.5')

METHOD OF MEASUREMENT:

Payment for the Concord Ave Diversion Structure (5.5'x6.5') shall be based on the Lump Sum Price bid in the proposal. Measurement for payment for the Concord Ave Diversion Structure (5.5'x6.5') will be on a percent of the Lump Sum bid calculated by dividing the elapsed time to date by the contractual construction time limit as approved by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:

Under the Lump Sum Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of precast concrete Concord Ave Diversion Structure (5.5'x6.5') complete as indicated on the Contract Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: pavement or sidewalk sawcutting; excavation of bituminous concrete roadway; excavation; transporting material to/from soil staging area; abandonment, removal and disposal of existing, abandoned, or relocated utilities; temporary excavation support furnished and installed complete consisting of trench boxes, or timber or steel sheeting left in place and cut off below grade as per the Contract Specifications; dewatering operations; filter fabric as required; bedding, including compaction; precast reinforced concrete slabs and sections with frames, covers, metalwork and appurtenances; concrete rings, brick and mortar work under frames and

covers; grout, brick and mortar work for inverts; excavatable concrete and sand fill; exterior bituminous damp proofing; placing and compacting suitable backfill soil; compaction testing; and all incidental work not specifically included for payment elsewhere.

EXCLUSIONS

The following item(s) are not included for payment under this item and are included for payment elsewhere: disposal of construction debris and unsuitable soil; installation of masonry plugs or bulkheads; temporary and permanent surface restoration; procurement of off-site common fill; utility support and relocations; flow bypass; and pipe connections.

Item 3410.2 --- Precast Concrete Inlet Oil/Sediment Separator

METHOD OF MEASUREMENT:

Measurement for payment for Precast Concrete Inlet Oil/Sediment Separator will be for the number of precast concrete inlet oil/sediment separators as shown on the Contract Drawings or as required by the Engineer furnished and installed complete. Payment for these items shall be payable upon completion of work under this bid item.

BASIS OF PAYMENT / INCLUSIONS:

Payment for Precast Concrete Inlet Oil/Sediment Separator shall be based on each precast concrete inlet oil/sediment separator installed complete for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Precast Concrete Inlet Oil/Sediment Separator. The work includes, but is not limited to; furnish and install Precast Concrete Inlet Oil/Sediment Separator complete with all pre-cast bases, fiberglass and/or precast concrete riser sections, precast chambers and walls, precast cones and top slabs, and precast sumps; saw cutting bituminous and cement concrete; excavation; construction dewatering; furnishing and placing backfill per one of the approved methods; furnish, install and compact gravel road sub-base; furnish and install filter fabric as required; compaction and compaction testing; temporary excavation support furnished and installed complete, left in place, and cut off below grade, where required or directed; furnish, install and compact bedding; bituminous dampproofing; furnish and install internal piping; flexible pipe sleeves; fiberglass inserts; concrete, mortar; testing of the completed separator; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required to raise frames and covers to grade; and connections to new and existing pipes and laterals; and all incidental work not specifically included for payment elsewhere.

-END OF SECTION 03410-

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SECTION 05500

MISCELLANEOUS METALS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section includes the following:
 - 1. Furnishing, installing, and testing all miscellaneous metalwork and appurtenances complete in accordance with the Contract Documents.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT
- B. Section 02980 – SITE IMPROVEMENTS
- B. Section 03300 – CONCRETE
- C. Section 03315 – GROUT

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Show Drawings of all miscellaneous metalwork used in the Work showing materials, sizes, finishes, locations, attached hardware and fittings, and details for manufactured items and fabricated metalwork, including grating span charts, field erection details showing cuts, copes, connections, holds, thread fasteners and welds. Indicate welds, both shop and field, by symbols conforming to AWS standards. Indicate coatings or other protection against corrosion.
 - 2. Manufacturer's literature describing standard items.
 - 3. Setting diagrams, erection plans, templates and directions for installing of backing plates and anchors.
 - 4. Statement stating that all materials, finishes and load requirements conform to the Contract Documents.
 - 5. Anchor Submittals

- a. Submit an ICC-ES or IAPMO-UES report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
- b. Submit an ICC-ES or IAPMO-UES report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
- c. Upon review by the ENGINEER, these instructions shall be followed specifically.
- d. No substitution for the indicated anchors will be considered unless accompanied with an ICC-ES or IAPMO-UES report verifying strength and material equivalency.
- e. Complete structural calculations and anchorage details shall be prepared and submitted by the Contractor for all anchors and anchor groups that are shown but not completely detailed (type, size, location, spacing and embedment) on the Contract Documents. Calculations and anchorage details shall be signed and stamped by a Professional Engineer registered in the state in which the project is located.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified
 1. Welders Qualifications: All weld procedures and welder qualifications shall be available in the Contractor's field office for the Owner's review.
 2. All welding shall be inspected by a Contractor-provided inspector qualified in accordance with AWS requirements and approved by the Owner.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Steel:
 1. Wide Flange Shapes: ASTM A992
 2. Shapes, Plates, Bars: ASTM A36
 3. Pipe, Pipe Columns: ASTM A 53, Type E or S, Grade B Standard weight unless noted otherwise

4. Tubes: ASTM A 500 Grade B
5. Unless otherwise indicated, miscellaneous metalwork of fabricated steel, which will be submerged shall be hot-dip galvanized after fabrication. All other miscellaneous steel metalwork shall be coated or protected from corrosion with a specified protective coating.

B. Stainless Steel:

1. Unless otherwise indicated, stainless steel metalwork and bolts shall be of Type 316 stainless steel and shall not be galvanized.
2. Shapes and Bars: ASTM S276
3. Type (or Grade) 316L for Welding

C. Aluminum: Unless otherwise indicated, aluminum metalwork shall be of Alloy 6061-T6. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have coated contact surfaces.

D. Cast Iron: Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B or better.

2.2 IRON CASTINGS

- A. Iron castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. They shall be smooth and well cleaned by shotblasting.
- B. Covers shall fit within their respective frames so that the cover fits flush with the surrounding finish surface and so that the cover does not rock or rattle when loading is applied. Covers and frames shall have machined bearing surfaces.
- C. Covers with matching frames shall be designed to support the following loadings:
 1. Where located within a structure, the design loading shall match that required for the adjacent floor area, or, if no loading is given, a minimum of 300 pounds per square foot, unless indicated otherwise.
 2. Exterior covers and grates shall be designed for AASHTO HS20 loading unless indicated otherwise.

2.3 BAR GRATES

- A. Provide bar grates as indicated and fabricated from hot dipped galvanized steel shapes and bars. Welded joints shall be ground smooth. Allow for gasketing and hardware as indicated.

2.4 BOLTS AND ANCHORS

- A. Corrosive Service: All bolts, nuts, and washers shall be Type 316 stainless steel for all areas indicated below.

- 1. All buried locations.
- 2. All submerged locations.
- 3. All locations subject to seasonal or occasional flooding.
- 4. Inside hydraulic structures below the top of the structure.
- 5. Inside buried vaults, manholes, and structures which do not drain through a gravity sewer or to a sump with a pump.
- 6. All locations subject to continuous or intermittent wetting or spraying other than weather.
- 7. All locations indicated by the Contract Documents or designated by the Owner to be provided with stainless steel bolts.

- B. Non-Corrosive Service: All bolts nuts and washers used in locations not identified in Paragraph 2.4.A, shall satisfy the following.

- 1. All bolts, anchor bolts, nuts, and washers shall be Type 304 stainless steel, class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts.

- C. Bolt Requirements:

- 1. The bolt and nut material shall be free-cutting steel.
- 2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
- 3. All bolts and nuts shall be installed with washers fabricated of material matching the base material of bolts, except that hardened washers for high strength bolts shall conform to the requirements of the AISC Specification. Lock washers shall be installed with washers where indicated and shall be fabricated of material matching the bolts.

4. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.
 5. All threads on stainless steel bolts shall be protected with an anti-seize lubricant, shall be classified as acceptable for potable water use by NSF and suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E.
 6. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.
- D. Adhesive Anchors: Unless otherwise indicated, all drilled, concrete or masonry anchors shall be adhesive anchors. Any substitutions must be accompanied by an ICC-ES or IAPMP-UES report verifying strength and material equivalency.
1. Epoxy adhesive anchors are required for drilled anchors where exposed to weather, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring pumps and other equipment. Epoxy anchor grout shall comply with Section 03315 – GROUT. Threaded rod shall be Type 316 stainless steel.
- E. Expanding-Type Anchors: Expanding-type anchors, if indicated or permitted, shall be steel expansion type (lead caulking anchors will not be permitted) and the size indicated. Expansion type anchors which are to be embedded in grout may be steel. Non-embedded, buried, or submerged anchors shall be stainless steel. Expanding-type anchors shall be similar to a style typified by Kwik Bolt TZ by Hilti Corporation, Strong-Tie Strong Bolt 2 by Simpson, Power-Stud+SD1 by Powers or an approved equal.

PART 3 – EXECUTION

3.1 FABRICATION AND INSTALLATION REQUIREMENTS

- A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

3.2 WELDING

- A. Method: All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
- B. Quality: In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for

control of dimensions. Weld reinforcement shall be as indicated by the AWS Code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

3.3 GALVANIZING

- A. All structural steel plates shapes, bars and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

3.4 DRILLED ANCHORS

- A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dry. Drilled anchors shall not be installed until the concrete has reached the specified 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.
- B. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes shall be adjusted to avoid drilling through or cutting any existing reinforcing bars.
- C. All abandoned drilled holes shall be filled with Epoxy Anchor Grout.

PART 4 – COMPENSATION (Not Used)

- END OF SECTION 05500-

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Cold-applied, cut-back (asbestos-free) bituminous dampproofing applied to the following surfaces:
 - a. Apply dampproofing to exterior below grade surfaces of new concrete walls and slabs.
 - b. Exterior, below-grade surfaces of all new manholes and drain structures.
 - c. Exterior, below-grade surfaces of other concrete items specified.
- B. Bituminous dampproofing can be factory applied, providing the application meets coating manufacturer's requirements. Additional field coatings must be applied, as directed by Engineer, to repair any coating imperfections, and chipped or damaged areas.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS.
 - 1. Product Data: For each type of product indicated.
 - 2. For informational purposes only, submit recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
 - 3. Material Certificates signed by manufacturers.

1.3 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified.
- B. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.
- C. Allow a minimum of 48 hours for drying before backfilling, unless a greater drying period is recommended by manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cold-Applied, Cut-Back (Solvent-Based) Bituminous Dampproofing shall be:
 - a. Karnak 83 AF by Karnak Corporation,
 - b. Sealmastic by Meadows, W. R., Inc.,
 - c. Waterban 50 by Lambert Corporation,
 - d. or equal.

2.2 BITUMINOUS DAMPPROOFING (ASBESTOS-FREE)

- A. Cold-Applied, Cut-Back (Solvent-Based) Bituminous Dampproofing:
 - 1. Brush and Spray Coats: ASTM D 4479, Type I.
 - 2. Trowel Coats: ASTM D 4586, Type I.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated and shall be applied to subsequent coat(s).
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coat(s).
- B. Apply dampproofing to all exterior below grade concrete surfaces.
 - 1. For application on structures extending above grade, apply from finished-grade line down.

3.4 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. On all dampproofing applications: Apply two brush or spray coats at not less than 1.25 gallons/100 feet². for first coat and 1 gallons/100 feet². for second coat, or one trowel coat at not less than 4 gallons/100 feet².

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

PART 4 – COMPENSATION (Not Used)

-END OF SECTION 07160-

SECTION 07631

GUTTERS AND DOWNSPOUTS

7631.1	PRIVATE GUTTER MODIFICATIONS	LINEAR FOOT
7631.2	PRIVATE EXTERIOR DOWNSPOUT CUT AND SPLASH	EACH
7631.3	PRIVATE EXTERIOR NEW DOWNSPOUT	LINEAR FOOT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Pre-finished aluminum gutters and downspouts.
- B. All related accessories necessary for the installation of gutters and downspouts.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 02534 –BUILDING INFLOW REMOVAL

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01300 – SUBMITTALS:
 - 1. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations and installation details.
 - 2. Product Data: Provide data on prefabricated components.

1.4 QUALITY CONTROL

- A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified:
 - 1. American Society for Testing and Materials (ASTM); ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. Federal Specifications (FS); FS TT-C-494 – Coating Compound, Bituminous, Solvent Type, Acid Resistant.
 - 3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA); SMACNA Architectural Sheet Metal Manual.

4. Conform to applicable code for size and method of rain water discharge.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion and to provide ventilation. Slope to drain.
- B. Handle materials with care. Do not dump off of trucks or delivery vehicles nor handle in any manner likely to cause damage.
- C. Prevent contact with materials during storage that may cause discoloration, staining or damage.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Pre-finished Aluminum Sheet: ASTM 8209, alloy, 0.050 inch thick; plain finish shop pre-coated with acrylic coating; color to match trim.
- B. Primer: Zinc Molybdate.
- C. Protective Backing Paint: Zinc Molybdate alkyd.

2.2 COMPONENTS

- A. Gutters: Seamless, 5” K shape gutter with end caps, miters, elbows, outlets and all other required components for a complete installation.
- B. Downspouts: Rectangular aluminum pipe.
- C. Accessories: End caps, miters, elbows, outlets, strainer baskets, roof hangers, and continuous waterfall gutter guard, and all other required accessories for a complete installation.
- D. Anchors and Supports: Profiles to suit gutters and downspouts.
 1. Anchoring Devices: Type recommended by fabricator.
 2. Gutter Supports: Roof hangers.
 3. Downspout Supports: Straps.
 4. Fasteners: Aluminum with soft neoprene washers.
- E. Gutters shall be provided with standard neoprene expansion joints spaced not more than 40 feet O.C. Sections of gutters shall be joined together not less

than 3 inches; joints shall be thoroughly sealed with component sealant and shall be rivet-set. All ends of gutters shall be provided with a standard closure piece and shall be thoroughly sealed with component and rivet-set. Provide gutters with tail piece extending not less than 3 inches into the downspout; tail pieces shall be properly connected to gutter and shall be thoroughly sealed with compound in a manner standard with the manufacturer.

F. Cleanouts

2.3 FACTORY FINISHING

- A. Acrylic polyester coating: Baked enamel system conforming to AAMA 603.8.
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Fabricate with required connection pieces.
- C. Form sections square, true and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; watertight.

3.2 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Install gutters, downspouts and accessories in accordance with manufacturer's instructions.
- B. Join lengths with formed seams sealed watertight. Flash and seal gutters to roof conductors and accessories.
- C. Connect downspout to drain service connection or modify discharge to splash pad as indicated on the Drawings.

PART 4 – COMPENSATION

Item 7631.1 --- Private Gutter Modifications

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall adjust pitch of existing gutters and remove and dispose of existing material and as detailed on the Drawings and/or specified herein. The unit price for this item shall constitute full compensation for the tasks identified above, including hangers and supports, and restoration of siding and trim, etc. and other work incidental to the said tasks but not specifically included for payment under other items.

METHOD OF MEASUREMENT:

Payment for Private Gutter Modifications shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the quantity of gutter to be modified measured as the linear foot of gutter modified, actual linear feet of complete.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: new downspouts associated with the gutter modifications.

Item 7631.2 --- Private Exterior Downspout Cut and Splash

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include removal and disposal of existing material and installation of new downspouts where disturbed or re-routed, as indicated by the Drawings and/or specified herein including hangers and supports, and restoration of siding and trim, etc. This item also includes other work incidental to the said tasks but not specifically included for payment under other items.

METHOD OF MEASUREMENT:

Payment for Private Exterior Downspout Cut and Splash shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on each downspout cut and modified for discharge to the surface measured as each downspout modified.

Item 7631.3 --- Private Exterior New Downspout

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include installation of new downspouts, as indicated by the Drawings and/or specified herein including hangers and supports, and restoration of siding and trim, etc. This item also includes other work incidental to the said tasks but not specifically included for payment under other items.

METHOD OF MEASUREMENT:

Payment for Private Exterior New Downspout shall be based on the Unit Price bid in the proposal. Measurement for payment shall be based on the quantity of new downspout measured as the linear foot of actual downspout installed.

SPECIAL NOTES ON EXCLUSIONS:

The following item(s) are not included for payment under this item and are included for payment elsewhere: cast iron wye assembly for connecting a downspout to a building lateral.

-END OF SECTION 07631-

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SECTION 15150

BUILDING INTERIOR PLUMBING

15150.1	BUILDING INTERIOR PIPE AND FITTINGS	LINEAR FOOT
15150.2	SUMP PUMP DISCONNECTION/RECONNECTION	EACH
15150.3	INSTALL NEW SUMP	EACH

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the interior plumbing work to separate or disconnect stormwater inflow sources from sanitary connections of existing buildings as generally shown on the Drawings and as provided in the Appendices of the Specifications. The work shall include, but shall not be limited to the following:
1. Coordination with representatives from the Owner, including the Engineer, various City of Cambridge departments, Building Owner, other City contractors etc., throughout the implementation of the work to obtain written permission and approval to access the building and to inspect and document required separation work including:
 - a) Pipe and fittings
 - b) Pipe hangers and supports
 - c) Valves and backwater flow control
 - d) Final restoration
 2. Contractor provision of a State licensed plumber to perform the portion of the separation work governed by 248 CMR 10.00: Uniform State Plumbing Code.
- B. It is the intent of the related items of work that the groundwater and surface water sources from downspouts (roof leaders), exterior yard drains, interior and exterior footing drains, and basement floor and sump pump drain piping of each building be separated from the building's waste plumbing. As currently exists, it is typical for waste and drainage piping to be combined in each building before it discharges to the existing combined sewer in the street.
- C. The Owner shall arrange for each Building Owner's consent for entry and to construct on the private property. The Contractor shall be provided with copies of consent approvals and any special considerations of the consent which will be incorporated into the work as directed by the Owner.

- D. All Contractor representatives who will be visiting or working on private property shall be screened through the Massachusetts Criminal Offender Record Information (CORI) process. CORI records shall be submitted to the Owner for review. The Owner may prohibit Contractor representatives from visiting and/or working on private property based on CORI records.
- E. Prior to beginning any work on private property, the Contractor shall coordinate with Owner's Resident Engineer and the Building Owner to obtain written authorization to enter the Building Owner's premises to perform the building separation work. Owner makes no guarantees that the premises will be available in any certain order or condition with any degree of timeliness. Existing interior basement and exterior site property conditions are provided in the Appendices of the Specifications to aid the Contractor in the preparation of the Bid and in the preparation of any initial coordination of the work. Contractor shall have no basis for claim(s) related to delays associated with the order in which permission is obtained or delays related to existing interior basement or exterior site conditions.
- F. The Contractor shall furnish and install all separation piping, provide existing drain modifications and install required drain appurtenances including cleanouts as herein specified and as indicated on the drawings. The Contractor shall provide a licensed plumber to perform all required plumbing connections governed by 248 CMR 10.00 to new and existing sanitary building sewer or building drain as indicated on the drawings. Where the new building sewer and drains cross abandoned piping connected to cess pools, the abandoned piping shall be cut and capped.
- G. All materials shall be as specified or approved herein. The workmanship level required shall be of the highest quality commensurate with the location of the improvements. All restoration work shall be coordinated with the Building Owner and Owner's Resident Engineer ahead of the work to ensure that necessary restoration work equals or exceeds existing conditions and is completed in a professional manner.
- H. The Drawings provided show the general arrangement, direction, and anticipated sizes of pipes and drainage facilities required for inflow removal/disconnection from sanitary connections. The Drawings are not intended to show every fitting, or account for every condition or circumstance to be encountered by the Contractor. The Contractor shall furnish all necessary resources including a licensed plumber, experienced and qualified labor, materials and equipment to build new work to suit existing conditions. All required piping and appurtenances shall be installed to avoid interference with existing fixtures, equipment, or other piping including make any necessary repairs to the existing piping to accommodate the new work. All measurements shall be field verified and approved at the job site ahead of the work.

1.2 RELATED TECHNICAL SECTIONS

- A. Section 02534 – BUILDING INFLOW REMOVAL
- B. Section 02604 – CATCH BASINS
- C. Section 02622 – POLYVINYL CHLORIDE PIPE
- D. Section 02950 – PRIVATE PROPERTY RESTORATION
- E. Section 07631 – GUTTERS AND DOWNSPOUTS

1.3 REFERENCE STANDARDS

- A. Refer to 248 CMR 10.00: Uniform State Plumbing Code, section 10.06(c) for reference standards.

1.3 SUBMITTALS

- A. Submittals shall include manufacturer's cut sheets or catalogs cuts, descriptive literature and applicable product data with applicable reference (s) to the 2003 International, State and local plumbing codes.
- B. Shop drawings of the following equipment and materials shall be submitted for review:
 - 1. Internal and external piping and fittings; including, but not limited to, backwater valves and appurtenances, concrete plugs, mechanical plugs and threaded caps, cleanout plugs, tees, wyes, elbows or bends, pipe sleeves, floor drains, mechanical joints, solvents, etc.
 - 2. Internal piping supports and hangers; including but not limited to sway bracing, and anchorage, etc.
 - 3. Interior basement finish/restoration repairs; including but not limited to concrete patching, painting, floor tile replacements, carpet replacements, repair or replacement of any drop ceilings, materials for filling in annular spaces between pipe sleeve and pipe, and waterproofing, etc.
 - 4. Repairs or replacements of existing basement pipe, and fittings and supports to ensure proper connection(s) to new work.
- C. Submit interior plumbing pre-construction inspection results with Building Site Pre-Inspection submittal required by Section 02534.

1.4 QUALITY CONTROL

- B. The Contractor shall do all work required by and in accordance with applicable state and local building or plumbing codes; shall arrange for all

permits, inspections, and tests required by those codes; and shall do everything necessary including coordination with the Building Owner, Owner and the Owner's Resident Engineer to provide complete systems which will be ready for use without further expense to the Owner or the Building Owner.

C. Work and materials shall conform to applicable codes, utility company standards, and the rules and regulations of authorities having jurisdiction.

D. Inspections

1. The Contractor shall not enclose, cover, or put into operation sanitary or drainage piping systems until inspected and approved by the authority having jurisdiction.
2. During the progress of the installation, the Contractor shall notify the Owner's Resident Engineer and/or Code Official having jurisdiction, at least 24 hours prior to the time such inspection must be made. The Contractor shall perform tests specified below in the presence of the Code Official or authorized representative.
3. Rough-in Inspection - The Contractor shall arrange for Code Official inspection of the piping system before concealed or closed-in and prior to setting fixtures.
4. Final Inspection - The Contractor shall arrange for a final inspection by the Code Official or authorized representative to observe the tests specified below and to ensure compliance with the requirements of the 248 CMR 10.00: Uniform State Plumbing Code.
5. Re-inspections - Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for re-inspection by the Code Official or authorized representative.
6. Reports - The Contractor shall assist with preparation of inspection reports, signed by the Code Official at no additional cost to the Owner.
7. Piping System Test - Soil, vent, waste, and roof or other drain piping shall be visually inspected and tested as deemed appropriate by the City of Cambridge Code Official, or their designated agent, prior to acceptance by the Owner.
8. Upon completion of plumbing modifications, new pipelines shall be tested by the Contractor in the presence of the Owner's Resident Engineer and the Code Official, and in accordance with the requirements of 248 CMR 10.00: Uniform State Plumbing Code, section 10.04. General test procedures are as follows:

- a. The Contractor shall test for leaks and defects all new piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 - b. The Contractor shall leave uncovered and unconcealed all new, altered, extended, or replaced piping until it has been tested and approved in accordance with section 10.04 of 248 CMR 10.00: Uniform State Plumbing Code. If covered or concealed by the Contractor, the work shall be re-exposed for testing and approval.
 - c. Rough Plumbing Test Procedure - Except for outside leaders and perforated or open jointed drain tile, the Contractor shall test the piping of plumbing drainage systems upon completion of the rough piping installation and before the new piping is connected to the existing plumbing system.
 - d. The Contractor shall tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. The Contractor shall inspect all joints for leaks.
 - e. Contractor shall modify, repair, reinstall, or make any other corrections or repairs required by such inspection and/or testing. The Contractor shall repair all leaks and defects using new materials and retest the system or portion thereof until satisfactory results are obtained. Should leaks be found, faulty joints shall be repaired by the Contractor, even to the extent of disassembling and remaking the joint at no additional cost to the Owner. Caulking of threads or the use of chemical compounds to correct leaks will not be permitted. The Contractor shall replace defective pipe or fittings, and the tests shall be repeated until test requirements are met to the satisfaction of the Code Official or authorized representative.
 - f. The Contractor shall prepare reports for all tests and required corrective action.
- E. The Contractor shall provide a State licensed plumber with the following qualifications and experience:
- 1. Specialization in residential and commercial plumbing installations.
 - 2. Ability to demonstrate a minimum of 5 years of plumbing experience.

3. Ability to demonstrate that employment competent workers for the execution of the work.
 4. Work performed by apprentices shall be overseen by the State licensed plumber described above.
 5. The Contractor shall perform all work required by and in accordance with applicable state and local plumbing codes; shall arrange for all permits, inspections, and tests required by those codes; and shall do everything necessary including coordination with the Building Owner, Code Officials and Owner's Resident Engineer to provide complete separated building drain and sanitary systems ready for connection to the public sanitary sewer or storm drain.
- D. Work and materials shall conform to applicable codes, utility company standards, and the rules and regulations of authorities having jurisdiction.
 - E. Should work or material called for in the Specifications or on the Drawings conflict with the requirements of the previous paragraphs above, the Contractor shall so notify the Owner when submitting the bid. Failure to do so requires the Contractor to comply with the more stringent requirements at his own expense.
 - F. All materials, equipment, tools and labor for testing shall be furnished by the Contractor.
 - G. As Built Sketches – The Contractor shall prepare as-built record sketches of all new interior piping modifications.

1.5 DEFINITIONS

- A. Approved: Approved by the Code Official or other authority having jurisdiction.
- B. Driveway: A private right of way that provides the principal means of vehicular access from a public right of way to a private parcel.
- C. Code: 248 CMR 10.00: Uniform State Plumbing Code, subsequent amendments thereto, or any emergency rule or regulation that the administration authority having jurisdiction has lawfully adopted.
- D. Code Official: The officer or other designated authority charged with the administration and enforcement of the code, or a duly authorized representative.
- E. Combined Facilities: Building drain or sewer that conveys both sewage and storm water or other drainage.
- F. Drain Facilities: Anything designed or created to transport rainfall or run-off.

- G. Sanitary Facilities: Anything designed or created to transport sanitary (waste) flows.
- H. Roof Leaders: An drainage pipe for conveying storm water from roof downspout to an approved means of disposal.
- I. Refer to Section 10.03 of 248 CMR 10.00: Uniform State Plumbing Code for additional definitions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials are designated in the Construction Details included in the Drawings. The following is an abbreviated list of materials.
 - 1. PVC (Polyvinyl-Chloride) Schedule 40 pipe and fittings as specified under 248 CMR 10.06 (2)(o).
 - 2. Furnish adapter couplings as necessary to connect one pipe material to another or to connect one pipe size to another. Fittings used to connect PVC to other Product-approved materials shall meet the proper standard and comply with the requirements of 248 CMR 3.04.
 - 3. Joints shall be made with fittings by solvent weld connections. Solvent weld connections shall be made only with solvent cement manufactured specifically for the materials to be joined.
 - 4. Hangers and supports shall be provided in accordance with 248 CMR 10.11.
 - 5. Valves shall be provided in accordance with 248 CMR 10.06: Table 1.

PART 3 – EXECUTION

3.1 PRECONSTRUCTION INSPECTIONS

- A. Contractor shall inspect every property designated on the Drawings for Inflow Removal work prior to construction. The intent of this inspection is to:
 - 1. Identify any change of conditions since the Owner's building inspection during the design phase.
 - 2. Make initial contact with the Building Owner to obtain acceptance of the proposed activities and begin coordination and scheduling of work.

3. Identify any alternative disconnection options and coordinate alternative options with the Engineer.
 4. Verify connection elevations and identify any conflicts with the proposed public separation work before the public work commences.
 5. Determine extent of work to which 248 CMR 10.00 applies.
- B. The Contractor shall verify existing interior and exterior grades, existing and proposed inverts, location and elevation of existing utilities, (interior and exterior) obstacles, and topographical conditions prior to implementing interior and exterior work. This work shall be done in conjunction with plans to install or layout proposed main line sewers in the street or public right-of-way.
- C. The Contractor shall also examine the condition of roof, soffit, trim, exterior trim, walls, floors, and piping to ensure adequate preparation is provided ahead of the work.
- D. If conflicts or existing conditions prevent the execution of the work, the Contractor shall not proceed until unsatisfactory conditions have been corrected or addressed at no additional cost to the Owner.

3.2 COORDINATION OF THE WORK

- A. The Contractor shall coordinate the new work with the Building Owner and/or building resident(s) to minimize the temporary interruption of drain or sanitary services or other utility services impacted by the work.
- B. The Contractor shall coordinate the relocation of existing obstacles with the Building Owner and/or building resident(s) to get access to proposed interior pipe routes at no cost to the Owner.
- C. Prior to final installation of modifications and/or repairs, the Contractor shall also examine rough-in requirements for new or proposed plumbing fixtures and other equipment including required gutter and leader work having sewer or drain connections to verify confirm the installation of proposed vertical and horizontal locations of new piping and proposed connections prior to installation.
- D. The Contractor shall verify the requirements for backwater valve installation. Backwater valves shall be installed only for plumbing fixtures where the overflow rim of the lowest plumbing fixtures are below the next upstream manhole in the public storm drain. Plumbing fixtures with flood rims above the next upstream manhole shall not discharge through the backwater valve.

3.3 INSTALLATION

- A. Contract Drawings (i.e. plan details and diagrams and field sketches) indicate the general location and arrangement of proposed piping systems. Actual location and arrangement of proposed piping layout shall take into account applicable 248 CMR 10.00 requirements, existing conditions and proposed plumbing system modifications indicated on the preliminary field sketch prepared during the examination phase.
- B. All piping shall be installed in a neat, workmanlike manner, and shall be installed parallel to building walls wherever possible. New piping shall be installed to the lines and grades verified during the examination phase, and shall be supported by anti-sway and hangers of the type and spacing specified in applicable sections of 248 CMR 10.00. Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe. Suitable provisions shall be made for expansion where necessary. Diagonal runs are not permitted, unless expressly indicated and acceptable to the Building Owner.
- C. Whenever possible, every attempt shall be made to conceal pipe installations in walls, pipe chases, utility spaces, above ceiling panels when working in finished basements. When working in unfinished basements every attempt shall be made to install new pipes as high as possible to avoid interference with living areas. New pipe shall be placed between 1st floors joists or directed towards outer walls as soon as possible. No cutting or drilling through joists will be allowed.
- D. Install new pipe runs free of sags or bends. The minimum slope of horizontal sanitary and storm drainage pipe shall be 1/4-inch per foot wherever possible, but under no circumstances shall drain pipe be installed with a slope less than 1/8-inch per foot.
- E. Use fittings for all changes in direction and all branch connections. Cleanouts shall be installed in accordance with 248 CMR 10.00. The Contractor shall ensure proper access, location and installation of cleanouts to maximize functionality and compliance.
- F. Install above floor piping close to beams, joists, columns, walls, and other permanent elements of the building to avoid or minimize disruption to living areas. The Contractor shall comply with the requirements of 248 CMR 10.00 to ensure the structural safety of the building.
- G. All piping and equipment shall be supported rigidly from the building structure by approved hangers and supports. Piping shall be supported to maintain the necessary pitch, to prevent vibration, and to provide for expansion and contraction. Hangers shall be secured to beams or floor joists wherever practicable. Hangers shall be adjustable wrought-band, or wrought-clevis hangers with iron rods. Hangers and supports shall be installed in compliance with 248 CMR 10.00.

- H. Vertical pipes shall be supported at each floor level by means of steel friction clamps. Long vertical drops shall be suitably braced at the top and at the base of the stack to prevent vibration.
- I. Extend interior drain to connect to building drain lateral of size, location and in accordance with the details indicated on the Drawings.

3.4 SUMP PUMP DISCONNECTION AND RECONNECTION

- A. The Contractor shall disconnect existing sump pumps from the existing combined or sanitary sewer and reconnect them to the proposed separated drain. The Contractor shall verify that existing sump pump check valve is operational and replace existing check valve if not operational.

PART 4 – COMPENSATION

Item 15150.1 --- Building Interior Pipe and Fittings

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete procurement, installation, cleaning, and leakage testing/inspection of polyvinyl chloride pipe complete as indicated on the Drawings and Specifications, or as directed by the Owner or Engineer. This work shall include furnishing, installing, and/or performing the following: cutting and/or removal of existing pipe and fittings; cap or plug of existing open pipe; connection of new pipe to existing pipe; installation of pipe hangers, anchors, stabilizers; sanitary sewer and storm drain flow handling; polyvinyl chloride pipe, fittings, couplings, and appurtenances; valves; connections to structures; coring of the foundation wall; installation of foundation wall penetrations; temporary and final restoration of interior and exterior of building where impacted by the work; coordination with Building Owner and Code Officials; inspection and testing; and all appurtenances and incidental work.

METHOD OF MEASUREMENT:

Payment for Polyvinyl Chloride Pipe shall be based on the Unit Price bid in the proposal. Measurement for payment of item 15150.1 shall be based on the actual linear feet of complete and functional pipes as shown on the Contract Drawings or as directed by the Owner or Engineer. Measurement shall be taken along the centerline of the pipe from the inside face of structures to inside face of structures, or to the points of connection with existing pipes.

EXCLUSIONS:

This item is NOT used for the vertical run of discharge pipe above sump pumps.

Item 15150.2 --- Sump Pump Disconnection and Reconnection

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include all labor, equipment, and materials, including but not limited to sump pump piping, fittings, and valves required for or incidental to the work.

METHOD OF MEASUREMENT:

Payment for Sump Pump Disconnection and Reconnection shall be based on the count of the number of buildings where sump pump reconnection to the drain lateral or interior building drain as required. Measurement shall include the installation of vertical run of discharge pipe above sump pumps, installation of valves, abandonment (including cutting and capping where necessary) and/or demolition and disposal of existing sump pump connections, and work required to return the interior and exterior of the building to pre-construction condition or better.

Item 15150.3 --- Install New Sump Pump

BASIS OF PAYMENT/INCLUSIONS:

Under the Unit Price bid for this item, the Contractor shall include all labor, equipment, and materials, including but not limited to sump pump piping, fittings, and valves required for or incidental to the work.

METHOD OF MEASUREMENT:

Payment for Install New Sump Pump shall be based on the count of the number of buildings where a new sump pump is required to connect to the drain lateral or interior building drain as required. Measurement shall include the installation of vertical sump pump discharge piping, installation of valves, abandonment (including cutting and capping where necessary) and/or demolition and disposal of existing sump pump connections, and work required to return the interior and exterior of the building to pre-construction condition or better.

-END OF SECTION 15150-

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SECTION 15252

FLAP GATES

15252.1 15-INCH FLAP GATE

EACH

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Furnish and install flap gates in the locations shown, complete and operable, including frames, wall thimbles, bracing, mountings, gaskets or sealant, coatings, as indicated and specified.

1.2 RELATED WORK

- A. Division 1 - General Requirements
- B. Section 05500 – Miscellaneous Metalwork

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Section 01300 – Submittals.
 - 1. Shop and erection drawings stamped and signed by a Massachusetts Registered Professional Engineer.
 - 2. Data regarding valve characteristics and performance.
 - 3. Shop drawing data for accessory items.
 - 4. Manufacturer's literature as needed to supplement data.
 - 5. Operating and maintenance manuals.
 - 6. Recommendations for short and long term storage.

1.4 SPECIAL REQUIREMENTS:

- A. Refer to applicable specification Sections with regard to providing the following:
 - 1. Lubricants.
 - 2. Special Tools.

3. Bolts, Anchor Bolts, and Nuts as specified in Section 05500 – Miscellaneous Metalwork.

1.5 QUALITY ASSURANCE

A. Equipment Field Testing

1. The CONTRACTOR shall coordinate and conduct a hydrostatic test for each flap gate in the presence of a manufacturer's factory service representative. Attendance by the manufacturer's factory service representative shall be furnished by the CONTRACTOR.
2. The hydrostatic test shall maintain a downstream head pressure equal to the maximum possible condition of service (i.e. flooded manhole) and an upstream head pressure of zero for a minimum of 60 minutes. Excessive leaks shall be corrected by adjusting and servicing the gate. The gate shall be retested until found to be satisfactory.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Provide in accordance with the General Conditions.

B. Shipping:

1. Ship equipment and material fully assembled except where partial disassembly is required by transportation regulations or for protection of components.

PART 2 - PRODUCTS

2.1 FLAP GATES

A. Type:

1. Hinged, single flap type design to close tight whenever downstream pressure exceeds upstream pressure with fully-adjustable top pivot points and bronze sealing surfaces.
2. Gate frames shall have flat backs for attachment to wall thimbles, unless otherwise shown.
3. Bronze seats pneumatically impacted into dove-tail grooves machined to a 63 micro-inch finish.
4. Unless otherwise shown, flap gates shall be mounted against wall thimbles with Type 316 stainless steel bolts and sealant or gaskets.

B. Materials:

1. Body and Flap: Cast iron construction, ASTM A126-B.
2. Seat: Bronze, ASTM B21-CA464 or B133-CA110 or neoprene as indicated or specified.
3. Hinge Arms: Bronze, ASTM B584-CA865.
4. Hinge Pins: Designed in double shear, silicon bronze ASTM B98-CA655 or Type 316 stainless steel.

C. Fabrication:

1. Flap: Spherical dished design, size to withstand maximum operating loads.
2. Hinge Arm: Provide two pivot points. Provide an adjustable lower pivot with limited rotation and a threaded upper hinge post to adjust flap valve sensitivity.
3. Provide a lubrication fitting for each pivot.
4. Ends: 125lb. ANSI standard drilling.

D. Wall Thimbles:

1. Material: Cast Iron, ASTM A126.
2. The thimbles shall be of the cast iron F-pattern type, to match the thickness of the walls in which they are installed, and they shall be supplied by the manufacturer of the valves, to match the bolt dimensions of the valves.
3. One piece construction, of section to withstand all operational and installation stresses.
4. Provide a water stop cast around the periphery of the thimble.
5. Provide a machined front flange and provide tapped holes for the flap valve attaching studs.
6. Provide a permanent gasket of uniform thickness or mastic between the flap valve and the wall thimble.
7. Alternatively, wall thimbles may be installed with a wall mount or on to a flanged end of pipe.

E. Protective Coatings:

1. Provide all ferrous metals except stainless steel with a high solids epoxy coating for submerged service. Prep surfaces in accordance with SSPC-SP-10 and apply one primer coat and one top coat. Total dry film thickness shall be a minimum of 8 mils.

F. Manufacturers:

1. Hydro Gate Corp., Model 20C or 10C for round openings.
2. Rodney Hunt Company, Series FV-AC.
3. Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Flap gates shall be installed in strict accordance with the manufacturer's printed recommendations and the requirements herein.
- B. Mounting of Gates
1. Shortly before setting each gate, apply a 1/8-inch-thick layer of mastic grade polysulfide elastomeric sealant to the back of the gate frame.
 2. After setting the gate, the nuts shall be turned down on the anchor bolts far enough only to make them snug and to cause the rubber sealant to begin to ooze out, but not far enough to produce any significant stress to the frame.
 3. Excess sealant at the edges shall be removed.
 4. The sealant shall be allowed to cure for at least 7 Days, after which the anchor bolt nuts shall be tightened to their final positions.
 5. If gaskets are being used, they shall be installed over the studs in one piece, or dovetailed and cemented with a liquid-type gasket material.
- C. Damage to surface coatings incurred during shipment or installation shall be repaired.

PART 4 - COMPENSATION

Item 15252.1 – 15-Inch Flap Gate

METHOD OF MEASUREMENT:

Measurement for payment for 15-Inch Flap Gate will be based on the actual number of gates

installed, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT:

Payment for 15-Inch Flap Gates will be based on the unit price bid for this item in the proposal. Under the per each unit price bid for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to install each gate complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to: furnish and install gate, wall thimble or mounting, gaskets and appurtenances; connections to existing and proposed pipes and structures; flushing and testing; disposal of testing materials; protective coatings; supports; and all incidental work required for the installation of gates not specifically included for payment elsewhere.

- END OF SECTION 15252 -

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