CONFORMED SET

SPECIFICATIONS FOR THE CITY OF CAMBRIDGE, MASSACHUSETTS

FROST STREET AREA SEWER SEPARATION AND SURFACE IMPROVEMENTS PROJECT PRENTISS STREET

THE WORKS CAMBRIDGE DEPARTMENT OF PUBLIC

In the City of Cambridge, Massachusetts

December 2009

Prepared By:

S E A Consultants Inc and
MWH Americas, Inc.

COMMONWEALTH OF MASSACHUSETTS
JOHN J. STRUZZIERY
No. 30434
REGISTERED PROFESSIONAL ENGINEER

12/11/09

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SECTION 00020

INVITATION TO BID

The City of Cambridge, Massachusetts, the Awarding Authority, invites sealed bids for the project: City of Cambridge, Massachusetts – Frost Street Area Sewer Separation and Surface Improvements Project – Prentiss Street

Nature and scope of work: The major components of work to be performed under this project include the construction of sewers and drain ranging in size from 8-inch to 36-inch in diameters; the construction of manholes and catch basins; the replacement of existing water mains; relocation of existing utilities; and the reconstruction of sidewalks and streets.

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: $4.0 million dollars.

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 Thursday, September 10, 2009 upon payment of a nonrefundable 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 or at the plan room of Dodge Reports, 24 Hartwell Avenue, Lexington, MA 02173.

Sealed bids will be received at the Purchasing Department, City Hall, 795 Massachusetts Avenue, Room 303, Cambridge, MA 02139 until Thursday, October 1, 2009 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 on September 21, 2009 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.

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

No less than the minimum wage rates as set forth in the schedule contained in the Contract Documents must be paid on this project.

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

1. Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program;

2. Minority Business Enterprise Program;

3. Cambridge Employment Plan: minority/women/resident hiring ordinance.

4. Cambridge Responsible Employer Plan

5. Living Wage Ordinance

6. Occupational Safety and Health Administration (OSHA)

7. CORI City Policy

8. Women Business Enterprise Participation Plan (MWRA)

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:	Thursday, September 17, 2009.
Time:	2:00 p.m.
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

Article1, 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 Manuel, 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. STATE WAGE RATE REQUIREMENTS

The minimum prevailing wage rates are included with the Bidding Documents and apply to this Project.

4. 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 the end of the business day seven calendar days before the date herein set for the opening of Bids. 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.

5. 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); and
- Statement of Bidder's Qualifications (City of Cambridge form).
- OSHA Certification Form
- CREP General Contractor Certification Form
- CREP Subcontractor Certification Form
- Women Business Enterprise Participation Plan (MWRA)

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 on, 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. Bid prices must be stated in both dollar figures and words. In the case of a conflict, written amounts shall control over numbers. All blank spaces must 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.

6. 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.

7. 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.

8. 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 and shall fully complete project within 364 days from the date in the Notice to Proceed thereafter. Bidder must agree also to pay as liquidated damages the sum of $2,500.00 for each consecutive calendar day thereafter that the work remains unfinished.

END OF INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

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

SECTION 00213

SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM

I. DEFINITIONS

For the purpose of this Contract, "minority" refers to Asians, Blacks, Hispanics, North American Indians, and Cape Verdeans.

II. NONDISCRIMINATION AGREEMENT

During the performance of this Contract, the **Contractor** and all of the Subcontractors (hereinafter, in this Article, collectively referred to as the **Contractor**), all assignees, and successors in interest, agree as follows:

1. In connection with the performance of work under this Contract, the **Contractor** shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin or ancestry, age, sexual orientation, marital status, family status, military status, source of income, or sex. The aforesaid provision shall include, but not be limited to the following: employment upgrading, demotion or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The **Contractor** shall post notices in conspicuous places, available for employees and applicants for employment, to be provided by the **City** setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (M.G.L. c. 151B).

2. In connection with the performance of Work under this Contract, the **Contractor** shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin or ancestry, age, sexual orientation, marital status, family status, military status, source of income, or sex and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons regardless of race, color, religious creed, national origin or ancestry, age, sexual orientation, marital status, family status, military status, source of income, or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradespersons for this and future **City** public construction projects.

III. NEGOTIATIONS WITH MINORITY SUBCONTRACTORS

If the **Contractor** shall use any subcontractor on any Work performed under this Contract, it shall take affirmative action to negotiate with qualified MBE subcontractors that are certified by SOMWBA. This affirmative action shall cover both pre-bid and post-bid periods. It shall include notification to the Affirmative Action Officer or its designee, while bids are in preparation, of all products, work, or services for which the **Contractor** intends to negotiate bids.

IV. COMPLIANCE WITH REQUIREMENTS

The **Contractor** shall comply with the provisions of Executive Order No. 74, as amended by Executive Order No. 116 dated May 1, 1975, M.G.L. c. 151B, as amended, and Chapters 2.66

(Cambridge Employment Plan) of the Cambridge Municipal Code, all of which are herein incorporated by reference and made a part of this Contract.

As part of its obligation of remedial action under the foregoing section the **Contractor** shall maintain on its Project a not less than 25% ratio of minority employee work hours to total work hours in each job category, including, but not limited to, bricklayers, carpenters, cement, masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in M.G.L. c. 149, §44C.

V. NON-DISCRIMINATION

The **Contractor**, in the performance of all Work after the award, and prior to completion of the Contract Work, will not discriminate on grounds of race, color, religious creed, national origin or ancestry, age, sexual orientation, marital status, family status, military status, source of income, or sex in employment practices, in the selection or retention of Subcontractors, or in the procurement of materials and rentals of equipment.

VI. SOLICITATION FOR SUBCONTRACTS AND FOR THE PROCUREMENT OF MATERIALS AN EQUIPMENT

In all solicitations either by competitive bidding or negotiation made by the **Contractor** either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the **Contractor** of the **Contractor's** obligations under this Contract relative to non-discrimination and affirmative action.

VII. COMPLIANCE-INFORMATION, REPORTS AND SANCTIONS

The **Contractor** will provide all information and reports required by the **City** and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the **City** to affect the employment of personnel. Whenever the **City** believes the **Contractor** may not be operating in compliance with the terms of this Contract, the **City** directly, or through its designated agent, shall conduct an appropriate investigation, and may confer with the parties, to determine if such **Contractor** is operating in compliance with the terms of this Contract. If the **City** or its agent finds the **Contractor** not in compliance, it shall make a preliminary report on the non-compliance and notify such **Contractor** in writing of such steps as will the judgment of the **City** or its agent bring such **Contractor** into compliance. In the event that such **Contractor** fails or refuses to fully perform such steps, the **City** shall make a final report on non-compliance and may impose of one or more of the sanctions listed or permitted by law. If, however, the **City** believes the **Contractor** has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance.

3. Within fourteen (14) days of the issuance of the report, the **City** shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

a. The recovery by the **City** from the General **Contractor** of 1/100 of 1% of the Contract award price or $1,000 whichever sum is greater, in the nature of liquidated damages or if a Subcontractor is in non-compliance, the recovery by the **City** from the **Contractor**, to be assessed by the **Contractor** as a back charge against the Subcontractor of 1/10 of 1% of the subcontract price, or $400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

b. The suspension of any payment or part thereof due under the Contract until such time as the **Contractor** is able to demonstrate its compliance with the terms of the Contract;

c. The termination, or cancellation, of the Contract, in whole or in part, unless the **Contractor** is able to demonstrate within a specified time its compliance with the terms of the Contract; or

d. The denial to the **Contractor** of the right to participate in any future contracts awarded by the **City** for a period of up to three (3) years.

If at any time after the imposition of sanctions as **Contractor** is able to demonstrate that it is in compliance with this Contract, it may request the **City** to suspend the sanctions conditionally, pending a final determination by the **City** as to whether the **Contractor** is in compliance. Upon final determination, the **City** shall either lift the sanctions or reimpose them.

VIII. SEVERABILITY

The provisions of this Article are severable and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

END OF SECTION 00213

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.

END OF SECTION 00215

SECTION 00216

LIVING WAGE ORDINANCE FACT SHEET

CITY OF CAMBRIDGE
LIVING WAGE ORDINANCE
FACT SHEET
CHAPTER 2.121 OF THE CAMBRIDGE MUNICIPAL CODE

[Note: This fact sheet is a summary of several provisions of the Cambridge Living Wage Ordinance intended to provide an introduction to the matters regulated by the ordinance. All determinations regarding the application of the ordinance to particular individuals or circumstances should be made by reference to the ordinance itself.]

Effective date: The Cambridge City Council enacted the Living Wage Ordinance effective July 2, 1999.

Purpose: The purpose of the ordinance is to assure that employees of the City and employees of contractors, subcontractors, and beneficiaries of assistance from the City earn an hourly wage needed to support a family.

Application: The ordinance applies to (a) City employees, (b) employees of contractors and subcontractors who have Service Contracts with the City in amounts over $10,000, (a Service Contract does not include contracts for the purchase of goods, products, equipment, supplies, or other property, and does not apply to services which are incidental to the delivery of such products, equipment or commodities), and (c) employees of Beneficiaries of Assistance in the form of grants, loans, tax incentives, bond financing, subsidies, or other forms of assistance over $10,000, received by or through the authority or approval of the City, including but not limited to, c. 121A tax abatements, industrial development bonds, Community Development Block Grant (CDBG) loans or grants, Enterprise Zone designations awarded after the effective date of the ordinance, and the lease of City owned land or buildings below market value.

Covered Employers: The ordinance applies to the City, any contractor or subcontractor on a Service Contract with the City over $10,000, and any Beneficiary of Assistance over $10,000.

Covered Employees: The ordinance applies to any person employed by a Covered Employer, and to any 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 service contract or the activities for which the Beneficiary received Assistance.

Living Wage: $10.00 per hour subject to annual upward CPI adjustments.

Cuts in non-wage benefits prohibited: No Covered Employer may fund any wage increase required by the ordinance by reducing health, insurance, pension, vacation, or other non-wage benefits of any of its employees.

Waivers: The City Manager may grant waivers to the requirements of the ordinance. There are three types of waivers: (a) *General Waiver*: if the City Solicitor finds that application of the ordinance would violate a specific federal or state statute or regulation; (b) *Hardship Waiver*: a non-profit employer may apply to the City Manager for a waiver if payment of the Living Wage

would cause a substantial hardship; and (c) *Chapter 30B Waiver*: prior to issuing an invitation to bid for a services contract a department may ask the City Manager for a Living Wage waiver if it would make the contract inordinately expensive or would result in a significant loss of services.

Exceptions: Certain positions are excepted from the ordinance upon certification in an affidavit signed by the principal officer of a Covered Employer that the positions are as follows: (1) youth hired pursuant to a City, state, or federally funded program during the summer or as part of a school to work program or other related seasonal or part-time work; (2) work-study or cooperative educational programs; (3) trainees who are given a stipend or wage as part of a job training program; (4) persons working in recognized supported employment programs that provide workers with additional services such as 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 where such employment is intended primarily to provide a benefit or subsidy to such individuals, although they are paid for work performed.

Notification Requirements: All persons who have signed a service contract with the City or a contract for Assistance are required to forward this Fact Sheet to any person submitting a bid for a subcontract on the contract. All Covered Employers must provide this Fact Sheet to each Covered Employee and must post this Fact Sheet in a conspicuous location visible to all employees.

Complaint Procedures: Any 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 the employer is not complying with the requirements of the Living Wage Ordinance may file a complaint with:

For City Employees:	Personnel Director City Hall 795 Massachusetts Avenue Cambridge, MA 02139 (617) 349-4332
For Non-City Employees:	Purchasing Agent City Hall 795 Massachusetts Avenue Cambridge, MA 02139 (617) 349-4310

END OF SECTION 00216

SECTION 00220

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

The Americans with Disabilities Act (the "Act") applies to all employers of fifteen or more employees. All vendors 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 record of such impairment; and discrimination against an individual regarded - even if inaccurately - as having such an impairment. The Act also expressly prohibits 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.

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, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals

As required by M.G.L. c. 62C, §49A, the undersigned certifies under the penalties of perjury that the bidder has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

Date: _____

_____
(Print Name of person signing bid)
(Signature & Title)

END OF SECTION 00220

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

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 yea 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 00300
FORM FOR GENERAL BID

To the Awarding Authority: CITY OF CAMBRIDGE, MASSACHUSETTS

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

Frost Street Area Sewer Separation and Surface Improvements Project – Prentiss Street

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.

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 respond to any of the following quality requirements will result in a rejection of your bid.

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.

The bidder must provide references including telephone number and contact names from at least three locations where they are currently providing the same services. References will be used in determining the responsibility of the bidder. The city reserves the right to use itself as a reference.

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 five (5) 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

C. This bid includes addenda numbered _____

Bidder's Name _____

D. The Proposed Contract Price for the **Base Bid plus Bid Alternate No. 1** is

_____
DOLLARS

($_____)

The Proposed Contract Price for the **Base Bid plus Bid Alternate No. 2** is

_____
DOLLARS

($_____)

E. The subdivision of the Proposed Contract Price is as follows: **(All quantities are approximate)**

F. **Items 2080.1 through 2095.10 and 2890.1 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 _____

BASE BID ITEMS

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
1200.1	1	Lump Sum	Temporary Utility Support and Coordination _____Dollars ($_____) Per Lump Sum	$_____
1505.1	1	Lump Sum	Mobilization (Maximum 5% Base Bid) _____Dollars ($_____) Per Lump Sum	$_____
1570.1	1	Lump Sum	Traffic and Pedestrian Management _____Dollars ($_____) Per Lump Sum	$_____
1570.2	310	Square Foot	Safety Signing for Construction Operations _____Dollars ($_____) Per Square Foot	$_____
1570.3	72	Unit Week	Variable Message Boards _____Dollars ($_____) Per Unit Week	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2015.1	20	Day	Geotechnical Instrumentation and Monitoring _____Dollars ($_____) Per Day	$_____
2051.1	140	Ton	Disposal of Construction Debris as Solid Waste _____Dollars ($_____) Per Ton	$_____
2051.2	2,830	Ton	Disposal of Bituminous Concrete _____Dollars ($_____) Per Ton	$_____
2051.3	12	Each	Demolition or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure _____Dollars ($_____) Each	$_____
2051.4	8	Each	Abandon In Place Manhole, Catch Basin or Other Structure _____Dollars ($_____) Each	$_____
2051.5	275	Linear Foot	Abandon In Place Pipe – 15-in to Less Than 36-in Diameter _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2080.1	1	Lump Sum	OHM – Soil and Waste Management Twenty Thousand and 00/100 + _____ = _____ Dollars ($20,000.00 + _____ = _____) Per Lump Sum	$_____
2080.2	10	Cubic Yards	OHM – Handling Asbestos-Contaminated Soil/Fill Fifty and 00/100 + _____ = _____ Dollars ($50.00 + _____ = _____) Per Cubic Yard	$_____
2080.3	10	Cubic Yards	OHM – Handle/Characterize Unknown Materials Fifty and 00/100 + _____ = _____ Dollars ($50.00 + _____ = _____) Per Cubic Yard	$_____
2095.1	940	Tons	OHM – Disposal of Soil – Impacted <RCS-1 (Class A-2) Ten and 00/100 + _____ = _____ Dollars ($10.00 + _____ = _____) Per Ton	$_____
2095.2	5,600	Tons	OHM – Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) Fifteen and 00/100 + _____ = _____ Dollars ($15.00 + _____ = _____) Per Ton	$_____
2095.3	2,010	Tons	OHM – Disposal of Soil – Daily Cover Lined Landfill (Class B-2) Twenty and 00/100 + _____ = _____ Dollars ($20.00 + _____ = _____) Per Ton	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2095.4	520	Tons	OHM – Disposal of Soil - Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) Twenty and 00/100 + _____ = _____ Dollars ($20.00 + _____ = _____) Per Ton	$_____
2095.5	60	Tons	OHM – Disposal of Soil - Non Hazardous Solid Waste Thermal Treatment (Class B-4) Thirty and 00/100 + _____ = _____ Dollars ($30.00 + _____ = _____) Per Ton	$_____
2095.6	60	Tons	OHM – Disposal of Soil - Non Hazardous Solid Waste Recycling (Class B-5) Thirty and 00/100 + _____ = _____ Dollars ($30.00 + _____ = _____) Per Ton	$_____
2095.7	40	Tons	OHM – Disposal of Soil - Non Hazardous Solid Waste (Class B-6) Forty and 00/100 + _____ = _____ Dollars ($40.00 + _____ = _____) Per Ton	$_____
2095.8	40	Tons	OHM – Disposal of Soil – Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (Class C-1) Eighty and 00/100 + _____ = _____ Dollars ($80.00 + _____ = _____) Per Ton	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2095.9	40	Tons	OHM – Disposal of Soil - RCRA Hazardous Waste (Class C-2) One Hundred and 00/100 + _____ = _____ Dollars ($100.00 + _____ = _____) Per Ton	$_____
2095.10	40	Tons	OHM – Disposal of Asbestos Waste Eighty and 00/100 + _____ = _____ Dollars ($80.00 + _____ = _____) Per Ton	$_____
2095.11	40	Tons	OHM – Disposal of PCB/TSCA Contaminated Soils Hundred and 00/100 + _____ = _____ Dollars ($100.00 + _____ = _____) Per Ton	$_____
2100.1	1	Lump Sum	Tree Protection and Maintenance _____ Dollars ($_____) Per Lump Sum	$_____
2140.1	20	Day	Treatment of Construction Dewatering _____ Dollars ($_____) Per Day	$_____
2210.1	250	Cubic Yard	Test Pits _____ Dollars ($_____) Per Cubic Yard	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2210.2	250	Cubic Yard	Control Density Fill for Backfill _____Dollars ($_____) Per Cubic Yard	$_____
2252.1.1	103	Vertical Foot	Manhole – Pre-cast 4-Foot Diameter _____Dollars ($_____) Per Vertical Foot	$_____
2252.1.2	27	Vertical Foot	Manhole – Pre-cast 5-Foot Diameter _____Dollars ($_____) Per Vertical Foot	$_____
2252.1.3	24	Vertical Foot	Manhole – Pre-cast 6-Foot Diameter _____Dollars ($_____) Per Vertical Foot	$_____
2252.1.4	8	Vertical Foot	Manhole – Pre-cast 8-Foot Diameter _____Dollars ($_____) Per Vertical Foot	$_____
2252.2.1	10	Vertical Foot	Manhole – Pre-cast 6-Foot Diameter Drop Over _____Dollars ($_____) Per Vertical Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2252.3.1	10	Vertical Foot	Manhole – Pre-cast 3-ft x 4-ft Rectangular _____Dollars ($_____) Per Vertical Foot	$_____
2500.1.1	1,530	Ton	Bituminous Concrete Base Course – Trench Width _____Dollars ($_____) Per Ton	$_____
2500.1.2	970	Ton	Bituminous Concrete Base Course – Full Width _____Dollars ($_____) Per Ton	$_____
2500.1.3	660	Ton	Bituminous Concrete Top Course – Full Width _____Dollars ($_____) Per Ton	$_____
2500.1.4	240	Ton	Hand Placed Bituminous Concrete _____Dollars ($_____) Per Ton	$_____
2500.2.1	1,740	Square Yard	Cold Plane 2-in, Full Width _____Dollars ($_____) Per Square Yard	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2500.2.2	4,190	Square Yard	Pavement Reclamation/Pulverizing, Full Width, 8-In Depth _____Dollars ($_____) Per Square Yard	$_____
2500.3	4,190	Square Yard	Final Grading Sub-Base Under Roadways _____Dollars ($_____) Per Square Yard	$_____
2500.4	230	Linear Foot	Hot Poured Rubberized Asphalt Sealer _____Dollars ($_____) Per Linear Foot	$_____
2500.5	230	Linear Foot	Bituminous Concrete Infrared Pavement Sealing _____Dollars ($_____) Per Linear Foot	$_____
2524.1.1	510	Square Yard	4" Cement Concrete Sidewalks _____Dollars ($_____) Per Square Yard	$_____
2524.1.2	200	Square Yard	6" Cement Concrete Sidewalks at Driveways _____Dollars ($_____) Per Square Yard	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2524.1.3	292	Square Yard	6" Cement Concrete Wheelchair Ramps _____Dollars ($_____) Per Square Yard	$_____
2524.2.1	1011	Square Yard	Wire Cut Bricks on 4-in Bituminous Concrete Base (Sidewalks and Driveways) _____Dollars ($_____) Per Square Yard	$_____
2524.3.1.1	1,141	Linear Foot	Remove and Reset Granite Curb (Straight and Curved) _____Dollars ($_____) Per Linear Foot	$_____
2524.3.1.2	210	Linear Foot	Remove and Reset Granite Transition Curb for Wheelchair Ramps (Straight and Curved) _____Dollars ($_____) Per Linear Foot	$_____
2524.3.2.1	1,141	Linear Foot	New Granite Curb Type VA3 (Straight and Curved) _____Dollars ($_____) Per Linear Foot	$_____
2524.3.2.2	285	Linear Foot	New Granite Transition Curb for Wheelchair Ramps (Straight and Curved) _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2577.1	2,000	Linear Foot	4-in to 8-in Reflectorized Pavement Markings – Yellow & White Thermoplastic _____Dollars ($_____) Per Linear Foot	$_____
2577.2	1,240	Linear Foot	12-in Reflectorized Pavement Markings – White Thermoplastic _____Dollars ($_____) Per Linear Foot	$_____
2604.1	98	Vertical Foot	Catch Basin – Type I Single Grate (4-ft Diameter) _____Dollars ($_____) Per Vertical Foot	$_____
2604.2	20	Vertical Foot	Catch Basin – Type II Double Grate (5-ft Diameter) _____Dollars ($_____) Per Vertical Foot	$_____
2604.3	32	Vertical Foot	Catch Basin – Type III Single Grate (3-ft x 4-ft Rectangular) _____Dollars ($_____) Per Vertical Foot	$_____
2604.4	51	Vertical Foot	Catch Basin – Type IV Double Grate (3-ft x 4-ft Rectangular) _____Dollars ($_____) Per Vertical Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2604.5	3	Each	Catch Basin – Type V Direct Inlet _____Dollars ($_____) Each	$_____
2609.1	210	Linear Foot	Pipe – RCP (Gravity) 18-inch _____Dollars ($_____) Per Linear Foot	$_____
2609.2	92	Linear Foot	Pipe – RCP (Gravity) 24-inch _____Dollars ($_____) Per Linear Foot	$_____
2609.3	440	Linear Foot	Pipe – RCP (Gravity) 30-inch _____Dollars ($_____) Per Linear Foot	$_____
2609.4	70	Linear Foot	Pipe – RCP (Gravity) 36-inch _____Dollars ($_____) Per Linear Foot	$_____
2615.1	30	Linear Foot	Pipe – DI (Gravity) 10-inch _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2615.2	240	Linear Foot	Pipe – DI (Gravity) 12-inch _____Dollars ($_____) Per Linear Foot	$_____
2615.3	210	Linear Foot	Pipe – DI (Gravity) 16-inch _____Dollars ($_____) Per Linear Foot	$_____
2615.4	30	Linear Foot	Pipe – DI (Gravity) 20-inch _____Dollars ($_____) Per Linear Foot	$_____
2615.5	10	Linear Foot	Pipe – DI (Gravity) 24-inch _____Dollars ($_____) Per Linear Foot	$_____
2622.1	110	Linear Foot	Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services _____Dollars ($_____) Per Linear Foot	$_____
2622.2	8	Each	Lateral Connections to CIP Lined Pipe on Oxford St _____Dollars ($_____) Each	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2622.3	660	Linear Foot	Pipe – PVC (Gravity) 8-inch _____Dollars ($_____) Per Linear Foot	$_____
2622.4	370	Linear Foot	Pipe – PVC (Gravity) 10-inch _____Dollars ($_____) Per Linear Foot	$_____
2622.5	270	Linear Foot	Pipe – PVC (Gravity) 15-inch _____Dollars ($_____) Per Linear Foot	$_____
2630.1	40	Linear Foot	Pipe – DI (Water) 6-inch _____Dollars ($_____) Per Linear Foot	$_____
2630.2	520	Linear Foot	Pipe – DI (Water) 8-inch _____Dollars ($_____) Per Linear Foot	$_____
2630.3	1,010	Linear Foot	Pipe – DI (Water) 12-inch _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2640.1	3	Each	6-in Gate Valve and Gate Box _____Dollars ($_____) Each	$_____
2640.2	6	Each	8-in Gate Valve and Gate Box _____Dollars ($_____) Each	$_____
2640.3	8	Each	12-in Gate Valve and Gate Box _____Dollars ($_____) Each	$_____
2645.1	3	Each	New Hydrant _____Dollars ($_____) Each	$_____
2645.2	3	Each	Remove and Dispose Existing Hydrant _____Dollars ($_____) Each	$_____
2660.1	220	Linear Foot	½-in to 3-in Water Service Replacement _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2660.2	21	Each	Tie Over Existing Water Service to New Water Main _____ Dollars ($_____) Each	$_____
2685.1	2,700	Linear Foot	Pipe – Temporary By-Pass Piping _____ Dollars ($_____) Per Linear Foot	$_____
2761.1	1	Lump Sum	Flow Bypass _____ Dollars ($_____) Per Lump Sum	$_____
2767.1	285	Linear Foot	Cured-in-place Pipelining – 20-in x 15-in _____ Dollars ($_____) Per Linear Foot	$_____
2767.2	250	Linear Foot	Cured-in-place Pipelining – 35-in x 27-in _____ Dollars ($_____) Per Linear Foot	$_____
2910.1	14	Each	Tree Planting _____ Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
3300.1	1	Each	CIP Concrete Pipe Connection Greater Than 18-in Through 36-in Diameter _____Dollars ($_____) Each	$_____

Bidder's Name _____

BID ALTERNATE 1 ITEMS – OPEN CUT OPTION

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
1505.1A	1	Lump Sum	Bid Alt 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1) _____Dollars ($_____) Per Lump Sum	$_____
2051.1A	110	Ton	Disposal of Construction Debris as Solid Waste _____Dollars ($_____) Per Ton	$_____
2051.2A	130	Ton	Disposal of Bituminous Concrete _____Dollars ($_____) Per Ton	$_____
2051.3A	2	Each	Demolition and/or Removal of Lamp Hole, Manhole, Catch Basin or Other Structure _____Dollars ($_____) Each	$_____
2051.6	410	Linear Foot	Demolition or Removal of Pipe – 15-in to Less Than 36-in Diameter _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2080.1A	1	Lump Sum	Bid Alt 1 Additional OHM – Soil and Waste Management Two Thousand and 00/100 + _____ = _____ Dollars ($2,000.00 + _____ = _____) Per Lump Sum	$_____
2095.1A	110	Tons	OHM – Disposal of Soil – Impacted <RCS-1 (Class A-2) Ten and 00/100 + _____ = _____ Dollars ($10.00 + _____ = _____) Per Ton	$_____
2095.2A	620	Tons	OHM – Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) Fifteen and 00/100 + _____ = _____ Dollars ($15.00 + _____ = _____) Per Ton	$_____
2095.3A	210	Tons	OHM – Disposal of Soil – Daily Cover Lined Landfill (Class B-2) Twenty and 00/100 + _____ = _____ Dollars ($20.00 + _____ = _____) Per Ton	$_____
2095.4A	110	Tons	OHM – Disposal of Soil - Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) Twenty and 00/100 + _____ = _____ Dollars ($20.00 + _____ = _____) Per Ton	$_____
2252.1.1A	17	Vertical Foot	Manhole – Pre-cast 4-Foot Diameter _____ Dollars ($_____) Per Vertical Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2500.1.1A	180	Ton	Bituminous Concrete Base Course – Trench Width _____Dollars ($_____) Per Ton	$_____
2622.1A	100	Linear Foot	Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services _____Dollars ($_____) Per Linear Foot	$_____
2622.3A	440	Linear Foot	Pipe – PVC (Gravity) 8-inch _____Dollars ($_____) Per Linear Foot	$_____
2622.4A	440	Linear Foot	Pipe – PVC (Gravity) 10-inch _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

BID ALTERNATE 2 ITEMS – TRENCHLESS OPTION

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
1505.1B	1	Lump Sum	Bid Alt 2 Additional Mobilization (Maximum 5% Total Bid Alternate 2) _____Dollars ($_____) Per Lump Sum	$_____
2051.2B	40	Ton	Disposal of Bituminous Concrete _____Dollars ($_____) Per Ton	$_____
2767.3	40	Linear Foot	Cured-in-Place Pipelining – 8-inch _____Dollars ($_____) Per Linear Foot	$_____
2769.1.1.1	280	Linear Foot	8-in HDPE Sliplining of Existing 10-in Pipe _____Dollars ($_____) Per Linear Foot	$_____
2769.1.1.2	140	Linear Foot	8-in HDPE Sliplining of Existing 12-in or 14-in Pipe _____Dollars ($_____) Per Linear Foot	$_____

Bidder's Name _____

Item #	Estimated Quantity	Units	ITEM DESCRIPTION Description of the Work and Unit Price Bid Written in Words and Numbers	Amount
2769.1.2.1	440	Linear Foot	10-in HDPE Sliplining of Existing 18-in Pipe _____Dollars ($_____) Per Linear Foot	$_____
2769.2	30	Each	Reinstate Lateral After Sliplining _____Dollars ($_____) Each	$_____

Bidder's Name _____

Total amount of **BASE BID** based on Engineer's estimate of quantities for Items 1200.1 through 3300.1, inclusive:

_____
(Amount in Words)

_____
(Amount in Figures)

Total amount of **BID ALTERNATE NO. 1- OPEN CUT OPTION** based on Engineer's estimate of quantities for Items 1505.1A through 2622.4A, inclusive:

_____
(Amount in Words)

_____
(Amount in Figures)

Total amount of **BID ALTERNATE NO. 2 – TRENCHLESS OPTION** based on Engineer's estimate of quantities for Items 1505.1B through 2769.2, inclusive:

_____
(Amount in Words)

_____
(Amount in Figures)

Total amount of **BASE BID <u>PLUS</u> BID ALTERNATE NO. 1 – OPEN CUT OPTION** based on Engineer's estimate of quantities **(Evaluated for Basis of Award)**:

_____
(Amount in Words)

_____
(Amount in Figures)

Bidder's Name _____

Total amount of **BASE BID <u>PLUS</u> BID ALTERNATE NO. 2 – TRENCHLESS OPTION** based on Engineer's estimate of quantities **(Evaluated for Basis of Award)**:

_____
(Amount in Words)

_____
(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.

<u>Basis of Award will be on the prices bid for Base Bid plus Bid Alternate 1 or Base Bid plus Alternate 2, and as most favorable to the Owner, and at the sole discretion of the Owner.</u>

F. 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; S E A Consultants Inc; and MWH Americas, Inc as **<u>Additional Insured</u>**, complying with the Insurance requirements set forth herein in the General Terms and Conditions of the contract, Article 8.

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

H. Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

I. The bidder hereby certifies it shall comply with the minority workforce ratios and specification contained in the Cambridge Employment Plan, the Cambridge Responsible Employer Plan, the Living Wage Ordinance, the Supplemental Equal Employment Opportunity Program, the Americans with Disabilities Act, and the MWRA WBE Participation Plan. 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.

J. 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.

Bidder's Name _____

K. The bid security attached in the sum of _____

_____($_____) 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.

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.

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.

"I certify under the penalties of perjury that I have 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".

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provision of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date_____

BY:_____
(Signature)

_____
(Name of General Bidder)

_____
(Title)

_____
(Business Address)

_____
(City and State)

Bidder's Name _____

CITY OF CAMBRIDGE, MASSACHUSETTS

BID BOND

We, the undersigned _____ as Principal, and _____ _____ 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 _____ Dollars ($_____), for the payment of which, well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, _____.

THE CONDITION OF THE ABOVE OBLIGATION is such that whereas the Principal has submitted to the City of Cambridge, Massachusetts, a certain bid attached hereto and hereby made a part hereof to enter into a contract in writing for the **Cambridge, Massachusetts, Frost Street Area Sewer Separation and Surface Improvements Project – Prentiss Street**.

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.

CONTRACTOR AS PRINCIPAL	SURETY
_____	_____
(Signature)	(Signature)
_____	_____
Name and Title:	Name and Title:
SEAL	SEAL

SECTION 00311

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 ONM UNSUCCESSFUL MBE CONTRACT.

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

FORM 1 M.B.E.

CONTRACTOR CERTIFICATION OF COMPLIANCE

Minority Business Enterprise Requirements

Name and Address of Participating Minority Bus. Enterprise	Name of Participant	Dollar Value
1.		
2.		
3.		
4.		
5.		
6.		

7. GRAND TOTAL FOR MINORITY BUSINESS COMMITMENT

$_____

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

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.

_____
Date

_____
General Contractor

_____
Authorized Signature

_____

_____
Business Address

FORM 2 M.B.E.

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

_____
MBE Name

_____
MBE Authorized Signature

_____

_____
Business Address

FORM 3 M.B.E.

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. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
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 " " _____

TELEPHONE NO. " " _____

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

SECTION 00312

STATEMENT OF BIDDER'S QUALIFICATIONS

STATEMENT OF BIDDER'S QUALIFICATIONS

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

1. The names, titles, residences 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

_____

_____

_____

_____

_____

2. When organized.

_____

3. If a corporation, where incorporated.

_____

4. How many years have you been engaged in the **construction of drainage and sewerage** business under your present firm or trade name?

_____

_____

Bidder's Name _____

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

Name and Address of Owner for Whom Work is Being Done	Whether Work Being Done as Contractor or Sub-contractor	Description of Work	Approximate Amount of Contract	Approximate Completion Date of Work

_____

_____

_____

_____

_____

_____

_____

6. What is the general nature of work normally performed by your company?

_____

_____

_____

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

_____

_____

_____

Bidder's Name _____

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

_____

_____

_____

9. What project has your present organization completed of character similar to that proposed? Provide the following information:

Name and Address of Owner for Whom Work is Being Done	Whether Work Being Done as Contractor or Sub-contractor	Description of Work	Approximate Amount of Contract	Approximate Completion Date of Work

_____

_____

_____

_____

_____

10. 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

_____

_____

_____

_____

Bidder's Name _____

(b) Rented

_____

_____

_____

_____

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

_____

_____

_____

_____

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

_____

_____

_____

13. Who will be the contractor's full time on-site superintendent? Submit such person's resume for review by Owner/Engineer. The Project Superintendent must have a minimum of 10 years construction experience; demonstrate ability to manage a budget, schedule, and crew coordination; demonstrate experience in traffic management in heavily traveled streets, community relations with local businesses and residents, utility coordination, contaminated soil management, and permit compliance. Also list names of employees who will be participating in this contract and their qualifications (years of experience, etc.).

_____

_____

_____

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

_____

_____

15. Federal Identification No.

_____

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

Name _____

Signature _____

Title _____

Bidder's Name _____

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 _____ this _____day of _____, 20____

_____
(Signature)

Tel. No._____

BY_____

Title_____

State of _____)

As:

County of_____)

_____, being duly sworn,

deposes and says that he is

_____ of

_____
(Name of Organization)

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

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

_____
(Notary Public)

My commission expires _____, 20____

Bidder's Name _____

SECTION 00313

GENERAL CONTRACTOR'S CERTIFICATION

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

_____(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 has read, understands and shall comply with all the provisions of the Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program and will be subject to sanctions for failure to do so.

Signed under the penalties of perjury.

_____
Signature of authorized representative of contractor

_____
Print name of authorized representative of contractor

_____
Dated

SECTION 00314
SUBCONTRACTOR'S CERTIFICATION

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 ¤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 has read, understands and shall comply with all the provisions of the Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program and will be subject to sanctions for failure to do so.

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.

SECTION 00315

PROJECTED WORKFORCE CERTIFICATION

THIS FORM MUST BE SUBMITTED WITH YOUR BID

PROJECTED WORKFORCE CERTIFICATION

I, _____

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

GENERAL CONTRACTOR	ESTIMATED # OF NEW HIRES

SUBTRADE	ESTIMATED # OF NEW HIRES

Signed under penalties of perjury,

_____

General Contractor

SECTION 00316

CREP GENERAL CONTRACTOR'S CERTIFICATION FORM

CAMBRIDGE RESPONSIBLE EMPLOYER PLAN

GENERAL CONTRACTOR'S CERTIFICATION - BID FORM

_____ hereby certifies that it, (Name of General Bidder) and all its subcontractors who are not filed subbidders 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 and11I 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 GENERAL BIDS OVER $100,000 INCLUDING ALL ALTERNATES, IF ANY.

RETURN THIS FORM WITH YOUR BID

SECTION 00317

CREP GENERAL CONTRACTOR'S CERTIFICATION – WEEKLY FORM

Project: _____
Contract#: _____

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

_____ 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 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

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

SECTION 00321

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

SECTION 00322

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.

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

_____ **Signature**

_____ **(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

SECTION 00323

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

_____ (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. _____(date)

_____
Signature of authorized representative of contractor

_____
Print name of authorized representative of contractor

RETURN THIS FORM WITH YOUR BID

SECTION 00324

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 subbidders 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 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

Women Business Enterprise Participation for Goals Established by Massachusetts Water Resources Authority

The Massachusetts Water Resources Authority (MWRA) is funding a portion of the work of this Contract through its I/I Local Financial Assistance Program. The Women Participation Policies of the MWRA are therefore applicable to the total dollars paid under this Contract. The MWRA "Fair Share" construction goal for this Contract is a minimum of two and 09/100 percent (2.09%) WBE participation by state-certified Women's Business Enterprises (WBE).

Schedule of Participation

Project Title: _____ **Project Location:** _____

Name & Address of WBE	Nature of Participation	Dollar Value of Participation
1.		
2.		
3.		
	Total Anticipated WBE Participation:	**$**
Percentage WBE Participation = (Total WBE Participation)/(Total Bid) Show as percentage *(Goal is 2.09%)*		**%**

The anticipated MWRA funded eligible amount for this project is $415,000. Based on the WBE Participation Goal of 2.09%, the resulting WBE Participation Goal amount for this project is $12,035.

The Bidder agrees to furnish monthly reports indicating the names and dollar value of WBS Subcontracts implemented during the previous month and the total of WBE subcontracts implemented to date.

Name of General Bidder: _____

Date:_____ By:_____
Signature

Note: Participation of Minority owned or Women owned enterprises may be counted in only their category. The same dollar participation cannot be used in computing the percentage of Minority participation and again as Women participation.

Only SOMWBA certified WBEs are to be listed.

(This form to be included as part of bid)

File No. _____

AGREEMENT BETWEEN THE CITY OF CAMBRIDGE AND CONTRACTOR

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

_____("the contractor"),

_____(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:

Prentiss Street Storm Water Management, Sewer Separation and Surface Improvements Project

CONTRACT TIME

The Contract Time shall be no later than 365 days commencing on or before seven (7) days following the date set forth in the Notice to Proceed.

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, taking all factors into consideration.

BIDDER's NAME _____

CONTRACT SUM

The City will pay the Contractor for performance of the Work in accordance with the Contract Documents the sum of $ _____ 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 $2,500.00 per day for each calendar day of delay until the Work is completed. The Contractor agrees to allow the City to deduct any such amounts from progress payments and retainage.

This Contract is effective as of _____, the date the Agreement is signed by the City Manager.

THE CITY OF CAMBRIDGE

_____

Robert W. Healy, City Manager

THE CONTRACTOR

_____

Signature

APPROVED AS TO FORM:

_____

Donald Drisdell., City Solicitor

BY: _____

Print Name and Title

(Corporate Seal)

APPROVED AS TO THE AVAILABILITY OF APPROPRIATION OF FUNDS:

Budget Code: _____

_____

James D. Monagle, City Auditor

_____

Cynthia H. Griffin,

Purchasing Agent

BIDDER's NAME _____

SECTION 00550
NOTICE OF AWARD

TO: _____

_____

PROJECT DESCRIPTION : FROST STREET AREA
SEWER SEPARATION AND SURFACE
IMPROVEMENTS PROJECT – PRENTISS STREET

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 _____

SECTION 00560

NOTICE TO PROCEED

To: _____ Date: _____
(Contractor)

Project: FROST STREET AREA
SEWER SEAPARTION AND
SURFACE IMPROVEMENTS
PROJECT – PRENTISS STREET

You are hereby notified to commence the Work in accordance with the Agreement dated _____, 200__, on or before _____, 200__, and you are to complete all work within 365 calendar days thereafter. The date of completion of all work is therefore, _____,200_____.

_____
(Owner)

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged, this the _____ day of _____, 200_.

By _____

Title _____

SECTION 00610
PERFORMANCE BOND

We, the undersigned, _____

_____,

(Name of Contractor)

_____

(Address of Contractor)

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

_____,

(Name of Surety)

_____,

(Address of Surety) hereinafter called Surety, are held and firmly bound unto the CITY OF CAMBRIDGE, 795 Massachusetts Avenue, Cambridge, MA 02139, hereinafter called Owner, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, a copy of which is attached hereto and made a part hereof, for the project known as "PRENTISS STREET STORM WATER MANAGEMENT, SEWER SEPARATION, AND SURFACE IMPROVEMENTS PROPJECT", 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

_____, _____.

CONTRACTOR AS PRINCIPAL	SURETY
_____	_____
(Signature) Name and Title:	(Signature) Name and Title:
SEAL	SEAL
	_____
	Address
	_____
	_____
	Telephone No.
	_____
	Fax No.

SECTION 00620
PAYMENT BOND

We, the undersigned, _____

_____,

(Name of Contractor)

_____

(Address of Contractor)

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

_____,

(Name of Surety)

_____,

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the CITY OF CAMBRIDGE, 795 Massachusetts Avenue, Cambridge, MA 02139, hereinafter called Owner, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made. We hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of this obligation is such that the Principal entered into a certain contract with the Owner, dated the ____ day of _____ 20___, a copy of which is attached hereto and made a part hereof, for the project known as "PRENTISS STREET STORM WATER MANAGEMENT, 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 _____, _____.

CONTRACTOR AS PRINCIPAL	SURETY
_____	_____
(Signature)	(Signature)
Name and Title:	Name and Title:
SEAL	SEAL
	_____
	Address
	_____
	_____
	Telephone No.
	_____
	Fax No.

SECTION 00630

CERTIFICATE OF AUTORITY

MEETING OF THE BOARD OF DIRECTORS

CERTIFICATE OF AUTHORITY

At a meeting of the Directors of the _____

_____ duly called and

held at _____ on the _____ day of

_____ 20____, at which a quorum was present and acting, it was VOICED

THAT _____ the

_____ of this corporation is hereby authorized and

empowered to make, enter into, sign, seal and deliver, in behalf of this corporation, a Contract for

_____

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

_____ is duly elected

_____ of this corporation.

ATTEST:

_____

Clerk or Secretary of the Corporation

(Affix Corporate Seal Here)

SECTION 00670

DIVISION OF LABOR AND WAGE RATES

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

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DIVISION OF OCCUPATIONAL SAFETY

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
Construction						
(2 AXLE) DRIVER - EQUIPMENT	12/01/2008	$42.260				
(3 AXLE) DRIVER - EQUIPMENT	12/01/2008	$42.330				
(4 & 5 AXLE) DRIVER - EQUIPMENT	12/01/2008	$42.450				
ADS/SUBMERSIBLE PILOT	08/01/2009	$102.480	08/01/2010	$107.460	08/01/2011	$112.980
AIR TRACK OPERATOR	06/01/2009	$46.850	12/01/2009	$47.850	06/01/2010	$48.850
	12/01/2010	$50.100	06/01/2011	$51.100	12/01/2011	$52.350
ASBESTOS REMOVER - PIPE / MECH. EQUIPT.	06/01/2009	$39.250	12/01/2009	$40.250		
ASPHALT RAKER	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
BACKHOE/FRONT-END LOADER	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
BARCO-TYPE JUMPING TAMPER	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
BLOCK PAVER, RAMMER / CURB SETTER	06/01/2009	$46.850	12/01/2009	$47.850	06/01/2010	$48.850
	12/01/2010	$50.100	06/01/2011	$51.100	12/01/2011	$52.350
BOILER MAKER	10/01/2008	$54.800				

APPRENTICE: BOILERMAKER - Local 29

Ratio	Step	1	2	3	4	5	6	7	8
1:5	%	65.00	65.00	70.00	75.00	80.00	85.00	90.00	95.00

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING)	08/01/2009	$67.120	02/01/2010	$68.010	08/01/2010	$69.910
	02/01/2011	$70.900	08/01/2011	$73.000	02/01/2012	$73.990

APPRENTICE: BRICK/PLASTER/CEMENT MASON - Local 3 Boston

Ratio	Step	1	2	3	4	5
1:5	%	50.00	60.00	70.00	80.00	90.00

BULLDOZER/GRADER/SCRAPER	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
CAISSON & UNDERPINNING BOTTOM MAN	06/01/2009	$47.250	12/01/2009	$48.250	06/01/2010	$49.250
	12/01/2010	$50.500	06/01/2011	$51.500	12/01/2011	$52.750
CAISSON & UNDERPINNING LABORER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
CAISSON & UNDERPINNING TOP MAN	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
CARBIDE CORE DRILL OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
CARPENTER	03/01/2009	$58.120				

This wage schedule must be posted at the work site in accordance with M.G.L. ch. 149, sec. 27
Failure of the employer to pay "prevailing wage rates," which are the minimum wage rates listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Employees not receiving such rates should report the violation to the Office of Fair Labor and Business Practices, 100 Cambridge Street, Boston, MA 02108; Tel: 617-727-3465.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DIVISION OF OCCUPATIONAL SAFETY

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
APPRENTICE: CARPENTER - Zone 1 Metro Boston						
Ratio / Step	1	2	3	4	5	6	7	8
1:5 / %	50.00	60.00	70.00	75.00	80.00	80.00	90.00	90.00
CEMENT MASONRY/PLASTERING	08/01/2009	$65.510	02/01/2010	$66.200	08/01/2010	$67.670		
	02/01/2011	$68.440	08/01/2011	$70.060	02/01/2012	$70.830		
CHAIN SAW OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350		
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850		
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780		
	12/01/2010	$61.030						
COMPRESSOR OPERATOR	06/01/2009	$47.070	12/01/2009	$47.890	06/01/2010	$48.810		
	12/01/2010	$49.740						
DELEADER (BRIDGE)	07/01/2009	$62.260	01/01/2010	$63.410				
DEMO: ADZEMAN	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100		
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600		
DEMO: BACKHOE/LOADER/HAMMER OPERATOR	06/01/2009	$47.100	12/01/2009	$48.100	06/01/2010	$49.100		
	12/01/2010	$50.350	06/01/2011	$51.350	12/01/2011	$52.600		
DEMO: BURNERS	06/01/2009	$46.850	12/01/2009	$47.850	06/01/2010	$48.850		
	12/01/2010	$50.100	06/01/2011	$51.100	12/01/2011	$52.350		
DEMO: CONCRETE CUTTER/SAWYER	06/01/2009	$47.100	12/01/2009	$48.100	06/01/2010	$49.100		
	12/01/2010	$50.350	06/01/2011	$51.350	12/01/2011	$52.600		
DEMO: JACKHAMMER OPERATOR	06/01/2009	$46.850	12/01/2009	$47.850	06/01/2010	$48.850		
	12/01/2010	$50.100	06/01/2011	$51.100	12/01/2011	$52.350		
DEMO: WRECKING LABORER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100		
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600		
DIRECTIONAL DRILL MACHINE OPERATOR	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430		
	12/01/2010	$60.680						
DIVER	08/01/2009	$75.600	08/01/2010	$78.890	08/01/2011	$82.740		
DIVER TENDER	08/01/2009	$60.240	08/01/2010	$62.590	08/01/2011	$65.340		
DIVER TENDER (EFFLUENT)	08/01/2009	$79.440	08/01/2010	$82.960	08/01/2011	$87.090		
DIVER/SLURRY (EFFLUENT)	08/01/2009	$102.480	08/01/2010	$107.410	08/01/2011	$113.190		
ELECTRICIAN	09/01/2009	$64.780	03/01/2010	$66.020	09/01/2010	$67.260		
	03/01/2011	$68.490						
APPRENTICE: ELECTRICIAN - Local 103								
Ratio / Step	1	2	3	4	5	6	7	8	9	10
2:3*** / %	40.00	40.00	45.00	45.00	50.00	55.00	60.00	65.00	70.00	75.00
					App Prior 1/1/03: 30/35/40/45/50/55/65/70/75/80					
ELEVATOR CONSTRUCTOR	01/01/2009	$63.690	01/01/2010	$65.190	01/01/2011	$66.690		
	01/01/2012	$68.190						

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THE COMMONWEALTH OF MASSACHUSETTS
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DIVISION OF OCCUPATIONAL SAFETY

DEVAL L. PATRICK
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TIMOTHY P. MURRAY
Lieutenant Governor

Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
APPRENTICE: ELEVATOR CONSTRUCTOR - Local 4						
Ratio / Step / 1 / 2 / 3 / 4 / 5						
1:1 / % / 50.00 / 55.00 / 65.00 / 70.00 / 80.00						
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year						
ELEVATOR CONSTRUCTOR HELPER	01/01/2009	$49.830	01/01/2010	$51.330	01/01/2011	$52.830
	01/01/2012	$54.330				
FENCE & GUARD RAIL ERECTOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
FIELD ENG. - INST. PERSON (BLDG, SITE, HVY CONST)	05/01/2009	$54.780	11/01/2009	$55.890	05/01/2010	$56.990
	11/01/2010	$58.230	05/01/2011	$59.470		
FIELD ENG. - ROD PERSON (BLDG, SITE, HVY CONST)	05/01/2009	$40.260	11/01/2009	$40.910	05/01/2010	$41.560
	11/01/2010	$42.290	05/01/2011	$43.020		
FIELD ENG.-CHIEF OF PARTY (BLDG, SITE, HVY CONST)	05/01/2009	$56.140	11/01/2009	$57.250	05/01/2010	$58.360
	11/01/2010	$59.610	05/01/2011	$60.860		
FIRE ALARM INSTALLER	09/01/2009	$64.780	03/01/2010	$66.020	09/01/2010	$67.260
	03/01/2011	$68.490				
FIRE ALARM REPAIR / MAINTENANCE	09/01/2009	$52.540	03/01/2010	$53.470	09/01/2010	$54.410
	03/01/2011	$55.330				
FIREMAN (ASST. ENGINEER)	06/01/2009	$51.780	12/01/2009	$52.740	06/01/2010	$53.810
	12/01/2010	$54.890				
FLAGGER & SIGNALER	06/01/2009	$35.800	12/01/2009	$35.800	06/01/2010	$36.800
	12/01/2010	$36.800	06/01/2011	$37.800	12/01/2011	$37.800
FLOORCOVERER	03/01/2009	$58.380				
APPRENTICE: FLOORCOVERER - Local 2168 Zone I						
Ratio / Step / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8						
1:1 / % / 50.00 / 55.00 / 60.00 / 65.00 / 70.00 / 75.00 / 80.00 / 85.00						
Steps are 750 hrs.						
FORK LIFT/CHERRY PICKER	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
GENERATOR/LIGHTING PLANT/HEATERS	06/01/2009	$47.070	12/01/2009	$47.890	06/01/2010	$48.810
	12/01/2010	$49.740				
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)	07/01/2009	$57.550	01/01/2010	$58.700		
APPRENTICE: GLAZIER - Local 35 Zone I						
Ratio / Step / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8						
1:1 / % / 50.00 / 55.00 / 60.00 / 65.00 / 70.00 / 75.00 / 80.00 / 90.00						
Steps are 750 hrs.						

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TIMOTHY P. MURRAY
Lieutenant Governor

Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
HOISTING ENGINEER/CRANES/GRADALLS	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				

APPRENTICE: HOIST/PORT. ENG.- Local 4

Ratio	Step	1	2	3	4	5	6	7	8
1:6	%	55.00	60.00	65.00	70.00	75.00	80.00	85.00	90.00

HVAC (DUCTWORK)	08/01/2009	$62.260	02/01/2010	$63.510	08/01/2010	$64.760
	02/01/2011	$66.010	08/01/2011	$67.260	02/01/2012	$68.510
	08/01/2012	$69.760	02/01/2013	$71.010		
HVAC (ELECTRICAL CONTROLS)	09/01/2009	$64.780	03/01/2010	$66.020	09/01/2010	$67.260
	03/01/2011	$68.490				
HVAC (TESTING AND BALANCING - AIR)	08/01/2009	$62.260	02/01/2010	$63.510	08/01/2010	$64.760
	02/01/2011	$66.010	08/01/2011	$67.260	02/01/2012	$68.510
	08/01/2012	$69.760	02/01/2013	$71.010		
HVAC (TESTING AND BALANCING -WATER)	09/01/2009	$67.480	03/01/2010	$68.730		
HVAC MECHANIC	09/01/2009	$67.480	03/01/2010	$68.730		
HYDRAULIC DRILLS	06/01/2009	$46.850	12/01/2009	$47.850	06/01/2010	$48.850
	12/01/2010	$50.100	06/01/2011	$51.100	12/01/2011	$52.350
INSULATOR (PIPES & TANKS)	09/01/2009	$59.260	09/01/2010	$61.660		

APPRENTICE: ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Ratio	Step	1	2	3	4
1:4	%	50.00	60.00	70.00	80.00

Steps are 1 year

IRONWORKER WELDER	03/16/2009	$58.230	09/16/2009	$59.580	03/16/2010	$60.980

APPRENTICE: IRONWORKER - Local 7

Ratio	Step	1	2	3	4	5	6
	%	60.00	70.00	75.00	80.00	85.00	90.00

Structural 1:6; Ornamental 1:4

JACKHAMMER & PAVING BREAKER OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
LABORER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600

APPRENTICE: LABORER - Zone 1

Ratio	Step	1	2	3	4
1:5	%	60.00	70.00	80.00	90.00

LABORER. CARPENTER TENDER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600

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GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
LABORER: CEMENT FINISHER TENDER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
LABORER: MASON TENDER	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
LABORER: MULTI-TRADE TENDER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
LABORER: TREE REMOVER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600

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.

LASER BEAM OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
MARBLE & TILE FINISHERS	08/01/2009	$56.240	02/01/2010	$56.950	08/01/2010	$58.470
	02/01/2011	$59.270	08/01/2011	$60.950	02/01/2012	$61.740

APPRENTICE: MARBLE-TILE-TERRAZZO FINISHER - Local 3 Marble & Tile

Ratio	Step	1	2	3	4	5
1:3	%	50.00	60.00	70.00	80.00	90.00

Steps are 800 hrs.

MARBLE MASONS,TILELAYERS & TERRAZZO MECH	08/01/2009	$67.160	02/01/2010	$68.050	08/01/2010	$69.950
	02/01/2011	$70.940	08/01/2011	$73.040	02/01/2012	$74.030

APPRENTICE: MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Ratio	Step	1	2	3	4	5
1:3	%	50.00	60.00	70.00	80.00	90.00

MECH. SWEEPER OPERATOR (NON-CONSTRUCTION)	07/01/2009	$28.300	07/01/2010	$29.000	07/01/2011	$29.700
MECH. SWEEPER OPERATOR (ON CONST. SITES)	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
MECHANICS MAINTENANCE	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
MILLWRIGHT (Zone 1)	03/01/2009	$54.400				

APPRENTICE: MILLWRIGHT - Local 1121 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:5	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00

MORTAR MIXER	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
OILER (OTHER THAN TRUCK CRANES,GRADALLS)	06/01/2009	$41.090	12/01/2009	$41.750	06/01/2010	$42.480
	12/01/2010	$43.220				

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

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Secretary of Labor and Workforce Development

GEORGE NOEL
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LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
OILER (TRUCK CRANES, GRADALLS)	06/01/2009	$43.990	12/01/2009	$44.720	06/01/2010	$45.550
	12/01/2010	$46.380				
OTHER POWER DRIVEN EQUIPMENT - CLASS II	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
PAINTER (BRIDGES/TANKS)	07/01/2009	$62.260	01/01/2010	$63.410		

APPRENTICE: PAINTER - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	90.00

Steps are 750 hrs.

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2009	$58.950	01/01/2010	$60.100

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.

APPRENTICE: PAINTER - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	90.00

Steps are 750 hrs.

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2009	$57.010	01/01/2010	$58.160

APPRENTICE: PAINTER - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	90.00

Steps are 750 hrs.

PAINTER (TRAFFIC MARKINGS)	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
PAINTER / TAPER (BRUSH, NEW) *	07/01/2009	$57.550	01/01/2010	$58.700		

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.

APPRENTICE: PAINTER - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	90.00

Steps are 750 hrs.

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2009	$55.610	01/01/2010	$56.760

APPRENTICE: PAINTER - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	90.00

Steps are 750 hrs

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Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
PANEL & PICKUP TRUCKS DRIVER	12/01/2008	$42.090				
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	08/01/2009	$60.240	08/01/2010	$62.590	08/01/2011	$65.340
PILE DRIVER	08/01/2009	$60.240	08/01/2010	$62.590	08/01/2011	$65.340

APPRENTICE: PILE DRIVER - Local 56 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8
1:3	%	60.00	65.00	70.00	75.00	80.00	85.00	90.00	95.00

PIPEFITTER & STEAMFITTER	09/01/2009	$67.480	03/01/2010	$68.730

APPRENTICE: PIPEFITTER - Local 537

Ratio	Step	1	2	3	4	5
**	%	40.00	45.00	60.00	70.00	80.00

** 1:3; 3:15; 1:10 thereafter — Steps are 1 yr; Refrig/AC Mechanic Steps & Hrs Same as above

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)

PIPELAYER	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
PLUMBERS & GASFITTERS	09/01/2009	$66.250	03/01/2010	$67.500		

APPRENTICE: PLUMBER - Local 12

Ratio	Step	1	2	3	4	5
**	%	35.00	40.00	55.00	65.00	75.00

** 1:2; 2:6; 3:10; 4:14; 5:19 — Steps are 1 year; Step 4 w/ license-70; Step 5 w/ license-80

PNEUMATIC CONTROLS (TEMP.)	09/01/2009	$67.480	03/01/2010	$68.730		
PNEUMATIC DRILL/TOOL OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
POWDERMAN & BLASTER	06/01/2009	$47.100	12/01/2009	$48.100	06/01/2010	$49.100
	12/01/2010	$50.350	06/01/2011	$51.350	12/01/2011	$52.600
POWER SHOVEL/DERRICK/TRENCHING MACHINE	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
PUMP OPERATOR (CONCRETE)	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
PUMP OPERATOR (DEWATERING, OTHER)	06/01/2009	$47.070	12/01/2009	$47.890	06/01/2010	$48.810
	12/01/2010	$49.740				
READY-MIX CONCRETE DRIVER	05/01/2009	$42.470	05/01/2010	$43.040	05/01/2011	$43.650
RECLAIMERS	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
RESIDENTIAL WOOD FRAME CARPENTER **	04/01/2009	$38.870				
** 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.						
RIDE-ON MOTORIZED BUGGY OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850

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Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
ROLLER/SPREADER/MULCHING MACHINE	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
ROOFER (Inc.Roofer Waterproofing &Roofer Damproofg)	02/01/2009	$53.860				

APPRENTICE: ROOFER - Local 33

Ratio	Step	1	2	3	4	5
**	%	50.00	60.00	65.00	75.00	85.00

** 1.5, 2:6 -10 thereafter 1:10 (or portion thereof) Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Roofer (Reroofing). Same Steps and Hours as Above ** 1.4; Thereafter 1.1

SHEETMETAL WORKER	08/01/2009	$62.260	02/01/2010	$63.510	08/01/2010	$64.760
	02/01/2011	$66.010	08/01/2011	$67.260	02/01/2012	$68.510
	08/01/2012	$69.760	02/01/2013	$71.010		

APPRENTICE: SHEET METAL WORKER - Local 17-A

Ratio	Step	1	2	3	4	5	6	7
1:4	%	40.00	45.00	50.00	60.00	65.00	75.00	85.00

Steps 1-3 are 1 year; Steps 4-7 are 6 mos.

SIGN ERECTOR	06/01/2009	$37.780

APPRENTICE: SIGN ERECTOR - Local 35 Zone 1

Ratio	Step	1	2	3	4	5	6	7	8	9
1:1	%	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00	90.00

Steps are 4 mos.

SLATE / TILE / PRECAST CONCRETE ROOFER	02/01/2009	$54.110				
SPECIALIZED EARTH MOVING EQUIP < 35 TONS	12/01/2008	$42.550				
SPECIALIZED EARTH MOVING EQUIP > 35 TONS	12/01/2008	$42.840				
SPRINKLER FITTER	03/16/2009	$66.950	09/16/2009	$68.450	03/16/2010	$69.700

APPRENTICE: SPRINKLER FITTER - Local 550

Ratio	Step	1	2	3	4	5	6	7	8	9	10
1:1	%	40.00	45.00	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00

STEAM BOILER OPERATOR	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
TELECOMMUNICATION TECHNICIAN	09/01/2009	$52.540	03/01/2010	$53.470	09/01/2010	$54.410
	03/01/2011	$55.330				

APPRENTICE: TELECOMMUNICATION TECHNICIAN - Local 103

Ratio	Step	1	2	3	4	5	6	7	8
1:1	%	40.00	45.00	50.00	55.00	60.00	65.00	75.00	80.00

This wage schedule must be posted at the work site in accordance with M.G.L. ch. 149, sec. 27
Failure of the employer to pay "prevailing wage rates," which are the minimum wage rates listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Employees not receiving such rates should report the violation to the Office of Fair Labor and Business Practices, 100 Cambridge Street, Boston, MA 02108; Tel: 617-727-3465.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DIVISION OF OCCUPATIONAL SAFETY

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

GEORGE NOEL
Director of Labor

LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates					
TERRAZZO FINISHERS	08/01/2009	$66.060	02/01/2010	$66.950	08/01/2010	$68.850
	02/01/2011	$69.840	08/01/2011	$71.940	02/01/2012	$72.930

APPRENTICE: MARBLE-TILE-TERRAZZO FINISHER - Local 3 Marble & Tile

Ratio	Step	1	2	3	4	5
1:3	%	50.00	60.00	70.00	80.00	90.00

Steps are 800 hrs.

TEST BORING DRILLER	06/01/2009	$47.500	12/01/2009	$48.500	06/01/2010	$49.500
	12/01/2010	$50.750	06/01/2011	$51.750	12/01/2011	$53.000
TEST BORING DRILLER HELPER	06/01/2009	$46.220	12/01/2009	$47.220	06/01/2010	$48.220
	12/01/2010	$49.470	06/01/2011	$50.470	12/01/2011	$51.720
TEST BORING LABORER	06/01/2009	$46.100	12/01/2009	$47.100	06/01/2010	$48.100
	12/01/2010	$49.350	06/01/2011	$50.350	12/01/2011	$51.600
TRACTORS/PORTABLE STEAM GENERATORS	06/01/2009	$57.090	12/01/2009	$58.190	06/01/2010	$59.430
	12/01/2010	$60.680				
TRAILERS FOR EARTH MOVING EQUIPMENT	12/01/2008	$43.130				
TUNNEL WORK - COMPRESSED AIR	06/01/2009	$58.430	12/01/2009	$59.680	06/01/2010	$60.930
	12/01/2010	$62.180	06/01/2011	$63.430	12/01/2011	$64.680
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	06/01/2009	$60.430	12/01/2009	$61.680	06/01/2010	$62.930
	12/01/2010	$64.180	06/01/2011	$65.430	12/01/2011	$66.680
TUNNEL WORK - FREE AIR	06/01/2009	$50.500	12/01/2009	$51.750	06/01/2010	$53.000
	12/01/2010	$54.250	06/01/2011	$55.500	12/01/2011	$56.750
TUNNEL WORK - FREE AIR (HAZ. WASTE)	06/01/2009	$52.500	12/01/2009	$53.750	06/01/2010	$55.000
	12/01/2010	$56.250	06/01/2011	$57.500	12/01/2011	$58.750
VAC-HAUL	12/01/2008	$42.550				
WAGON DRILL OPERATOR	06/01/2009	$46.350	12/01/2009	$47.350	06/01/2010	$48.350
	12/01/2010	$49.600	06/01/2011	$50.600	12/01/2011	$51.850
WASTE WATER PUMP OPERATOR	06/01/2009	$57.410	12/01/2009	$58.530	06/01/2010	$59.780
	12/01/2010	$61.030				
WATER METER INSTALLER	09/01/2009	$66.250	03/01/2010	$67.500		

This wage schedule must be posted at the work site in accordance with M.G.L. ch. 149, sec. 27
Failure of the employer to pay "prevailing wage rates," which are the minimum wage rates listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Employees not receiving such rates should report the violation to the Office of Fair Labor and Business Practices, 100 Cambridge Street, Boston, MA 02108; Tel: 617-727-3465.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DIVISION OF OCCUPATIONAL SAFETY

DEVAL L. PATRICK
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Prevailing Wage Rates

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

SUZANNE M. BUMP
Secretary of Labor and Workforce Development

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LAURA M. MARLIN
Commissioner of Division of Occupational Safety

Awarding Authority: City of Cambridge Purchasing Department

Contract Number:

City/Town: CAMBRIDGE

Description of Work: Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street

Job Location: Frost St Area & Prentiss Street

Classification	Effective Dates and Total Rates

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.
*** The job site ratio of 2 apprentices (APP) for every 3 journeymen (JM) is allowed as follows:
1 JM: 1 APP; 2-3 JM: 2 APP; 4-6 JM: 4 APP; 7-9 JM: 6 APP; 10-12 JM: 8 APP; 13-15 JM: 10 APP; etc.
**** The job site ratio of 2 apprentices (APP) for every 3 journeymen (JM) is allowed as follows:

This wage schedule must be posted at the work site in accordance with M.G.L. ch. 149, sec. 27
Failure of the employer to pay "prevailing wage rates," which are the minimum wage rates listed above, on public works projects is a violation of M.G.L. ch. 149, sec. 27. Employees not receiving such rates should report the violation to the Office of Fair Labor and Business Practices, 100 Cambridge Street, Boston, MA 02108; Tel: 617-727-3465.

COMMONWEALTH OF MASSACHUSETTS

Division of Occupational Safety

Minimum wage rates for apprentices employed on public works projects are listed below 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 Apprentice Training pursuant to M.G.L. c. 23, ss. 11E-11L.

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

City/Town: CAMBRIDGE

All steps are 6 months (1000 Hours) unless otherwise specified**

Classification	Ratio*	1	2	3	4	5	6	7	8	9	10
ASBESTOS INSULATOR (Pipes & Tanks)	1:4	50	60	70	80						
				Steps are 1 year							
BOILERMAKER	1:5	65	65	70	75	80	85	90	95		
BRICK/PLASTER/CEMENT MASON	1:5	50	60	70	80	90					
CARPENTER	1:5	50	60	70	75	80	80	90	90		
CARPENTER (Residential Wood Frame)	1:5	60	60	65	70	75	80	85	90		
ELECTRICIAN	2:3***	40	40	45	45	50	55	60	65	70	75
				App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80							
ELEVATOR CONSTRUCTOR	1:1	50	55	65	70	80					
				Steps 1-2 are 6 mos.; Steps 3-5 are 1 year							
FLOORCOVERER	1:1	50	55	60	65	70	75	80	85		
				Steps are 750 hrs.							
GLAZIER	1:1	50	55	60	65	70	75	80	90		
				Steps are 750 hrs.							
HOIST/PORT. ENG.	1:6	55	60	65	70	75	80	85	90		
IRONWORKER		60	70	75	80	85	90				
Structural 1:6; Ornamental 1:4											
LABORER	1:5	60	70	80	90						
MARBLE-TILE-TERRAZZO FINISHER	1:3	50	60	70	80	90					
				Steps are 800 hrs.							
MARBLE-TILE-TERRAZZO MECHANIC	1:3	50	60	70	80	90					
MILLWRIGHT	1:5	50	55	60	65	70	75	80	85		
PAINTER	1:1	50	55	60	65	70	75	80	90		
				Steps are 750 hrs.							
PILE DRIVER	1:3	60	65	70	75	80	85	90	95		
PIPEFITTER	**	40	45	60	70	80					
** 1:3; 3:15; 1:10 thereafter				Steps are 1 year							

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in comment field.
*** The job site ratio of 2 apprentices(App) for every 3 journeymen(JM) is allowed as follows:
1 JM: 1 App; 2-3 JM:2 App; 4-6 JM: 4 App; 7- 9 JM: 6 App; 10- 12 JM: 8 App; 13-15 JM: 10 App; etc
**** The job site ratio of 2 apprentices(App) for every 3 journeymen(JM) is allowed as follows:
1-2 JM: 1 App; 3-4 JM: 2 App; 5 JM: 3 App; 6-7 JM: 4 App; 8 JM: 5 App; etc

Issue Date: 6/29/2009 **Rate Sheet:** CAMBRIDGE **Job ID:** 130026

COMMONWEALTH OF MASSACHUSETTS

Division of Occupational Safety

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

City/Town: CAMBRIDGE — All steps are 6 months (1000 Hours) unless otherwise specified**

PLUMBER	**	35	40	55	65	75					
** 1:2; 2:6; 3:10; 4:14; 5:19				Steps are 1 year; Step 4 w/ license-70; Step 5 w/ license-80							
REFRIGERATION / AC MECHANIC	**	40	45	60	70	80					
** 1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(				Steps are 1 year							
ROOFER	**	50	60	65	75	85					
** 1:5, 2:6 -10 thereafter 1:10 (or portion thereof)				Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.							
ROOFER (REROOFING)	**	50	60	65	75	85					
** 1:4; Thereafter 1:1				Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.							
SHEET METAL WORKER	1:4	40	45	50	60	65	75	85			
				Steps 1-3 are 1 year; Steps 4-7 are 6 mos.							
SIGN ERECTOR	1:1	50	55	60	65	70	75	80	85	90	
				Steps are 4 mos.							
SPRINKLER FITTER	1:1	40	45	50	55	60	65	70	75	80	85
TELECOMMUNICATION TECHNICIAN	1:1	40	45	50	55	60	65	75	80		

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.
** Multiple ratios are listed in comment field.
*** The job site ratio of 2 apprentices(App) for every 3 journeymen(JM) is allowed as follows:
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1-2 JM: 1 App; 3-4 JM: 2 App; 5 JM: 3 App; 6-7 JM: 4 App; 8 JM: 5 App; etc

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.

MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:	Payroll No.:

Employer's Signature:	Title:	Contract No:	Tax Payer ID No.	Work Week Ending:

Awarding Authority's Name:	Public Works Project Name:	Public Works Project Location:	Min. Wage Rate Sheet No.

General / Prime Contractor's Name:	Subcontractor's Name:

Employee Name & Complete Address	Employee is OSHA 10 Certified (?)	Work Classification:	Appr. Rate (%)	Hours Worked Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	Project Hours (A) / All Other Hours	Hourly Base Wage (B)	"Employer" Hourly Fringe Benefit Contributions: Health & Welfare Insurance (C)	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (F) (B+C+D+E)	Project Gross Wages (G) (A x F) / Total Gross Wages	Check No. (H)

NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Date recieved by awarding authority
/ /

WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

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 that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____

Title _____

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 Mechanical, Electrical, and Fire Protection Plans. The mechanical, electrical, and fire protection Plans are diagrammatic only and are not intended to show the alignment, physical locations, or configurations of such Work. Such Work shall be installed without additional cost to the City to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare Coordination Drawings and demonstrate to the Engineer's satisfaction that the installations will comply with the preceding sentence. The Contractor shall be solely liable and responsible for any costs and/or delays resulting from the Contractor's failure to prepare such Coordination Drawings.

2.3.8 Locations of Fixtures and Outlets. Exact locations of fixtures and outlets shall be obtained from the Engineer as provided in Article 5 before the Work is roughed in. Work installed without such information from the Engineer shall be relocated at the Contractor's expense.

2.3.9 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.

2.3.10 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 Account" 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 purposed 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.

5.19.10.1The 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.

5.19.10.2All costs associated with delivery of Samples will paid by the Contractor.

5.19.11 Contractor's Verifications. Before submitting each Submittal, the Contractor shall have determined and verified:

5.19.11.1All field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

5.19.11.2All materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

5.19.11.3All 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
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 15% of any net increase or decrease of Cost of any Work performed by the Contractor's own forces plus 5% of any net increase or decrease in the Cost for all other Work covered by the change. 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 15% 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 dated 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, §39O, 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, §39O). (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 that 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, of 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 that 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 Joiner. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation or joiner 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 joiner 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 of 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.

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 Appendix A, 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 A 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 kings 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.

SECTION 00825A

SPECIAL CONDITIONS

FOR CONSTRUCTION, RECONSTRUCTION, INSTALLATION, DEMOLITION, MAINTENACE OR REPAIR OF ANY CITY OF CAMBRIDGE PUBLIC WORK

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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. Kelly Writer, 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 2008 and 2009 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:

MIT Spring Term Final Examination Period – May 19-23, 2010
MIT graduation – June 6, 2010
Harvard Spring Term Final Examination Period – May 15-23, 2010
Harvard graduation – June 5, 2010

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 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 P3, Version 2.0B 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 plowing within the areas of work delineated by the Contract Documents. 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 P3, Version 2.0B 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 Contractor shall provide to the Owner record drawings in AutoCAD format. 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 certified by a Professional Land Surveyor registered in 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 contractors 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 niether 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 Contract 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.

END OF SECTION 00825A - SPECIAL CONDITIONS

(ATTACHMENTS I AND II TO SECTION 00825A FOLLOW)

Attachment I

City of Cambridge Department of Public Works
Division of Urban Forestry
Tree Protection During Construction

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 tress 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 tress 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

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.

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. The Work to be done under this contract consists of the installation of new storm drain pipe and structures; the installation of new sanitary sewer pipe and structures; the relocation of existing water mains; and surface improvements including curb, sidewalk and roadway construction/restoration.

B. The Work includes, but is not limited to; installation of approximately 1700 linear feet of main line storm drains on Prentiss Street, Frost Street and Oxford Street. Storm Drain Pipe includes Reinforced Concrete Pipe (RCP) 12-inch to 36-inch. The work also includes the installation of 4-foot; 5-foot, 6-foot; and 8-foot diameter storm drain manholes with 6-foot deep sumps. The work includes the installation of approximately 813 linear feet of Slipline/Open Cut Sewer on Prentiss Street, 361 linear feet of Open Cut Sewer on Prentiss Street, 118 linear feet of CIPP/Open Cut Sewer on Frost Street, 22 linear feet of Open Cut Sewer on Oxford Street and 548 linear feet of CIPP Sewer on Oxford Street. Water relocations include 1255 linear feet on Prentiss Street, 75 linear feet on Frost Street and 90 linear feet on Oxford. The work includes the reconnection and relocation of sanitary sewers, water services and sewer services; curb, roadway and sidewalk construction restoration; and restoration all disturbed areas.

C. 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 of existing water mains.

3. Installation of RCP and DI storm drains with related manholes; PVC sanitary sewer relocation with related manholes; and the relocation of DI water mains with related hydrants and valves.

4. Removal of Illicit Connections

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. Demolition and abandonment of existing structures and pipe

7. Disposal of excess geotechnically; analytically; and logistically unsuitable excavated material

8. 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.

9. Remove and Reset or furnish and install new granite curb; cold planing and overlay paving; trench pavement restoration; and installation of new cement concrete sidewalks and wheelchair ramps.

10. Pavement reclamation and installation of pavement markings.

D. 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.

E. 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.

F. 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

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 on the Contract Drawings as well as those identified 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. Surface and utility restoration including but not limited to completion of sidewalk and curb work; paving; fence; water main; tree planting; and striping of roadway.

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.

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 and the City of Cambridge and Cambridge Department of Public Works Holidays.

B. During non-work hours (4:00 p.m. – 7:00 a.m. weekdays; weekends and holidays), the Contractor shall make the following provisions:

1. Prentiss Street and Frost Street – Access to all properties shall be maintained. Work zones shall be cleaned, protected and made safe. The Contractor shall minimize the amount of parking restrictions.

2. Oxford Street – 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 and the Cambridge Department of Public Works prior to any mobilization activities.

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.

1.6 LIST OF DRAWINGS

A. The location, general characteristics, and principal details of the work are indicated on a set of drawings entitled Frost Street Area Sewer Separation and Surface Improvements Project - Prentiss Street.

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. Dust control

c. Construction photographs

d. Attending Owner meetings, neighborhood meetings, and all other Construction meetings

e. Submitting work plans and shop drawings

f. Concrete encasement of impacted utilities

g. Street sweeping and removing snow from streets and sidewalks where work is ongoing

h. Transporting trash and recyclables out of the work area where municipal pickup is hindered

i. Providing certificates of design where required

j. Submitting monthly CPM schedules and narratives

k. Submitting weekly and bi-weekly construction schedule projections and updates

l. Fulfilling all reporting requirements

m. Preparation and submission of monthly and final as-built drawing information

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

o. Loam and seeding

q. Obtain all permits including payment of fees

r. Tree protection and pruning

s. Cast-in-Place Concrete Collars for Pipe to Pipe Connections for Pipe Smaller than 15-in Diameter

t. Demolition and Removal of Pipe Smaller than 15-in Diameter

u. Permanent Masonry Plugs for Pipe Abandonment smaller than 15-in Diameter

v. CDF for pipe abandonment for Pipe Smaller than 15-in Diameter

w. 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.

x. 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. Furnish and install imported suitable sub-base material

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 sub-base area of equal or greater contamination, where geotechnically suitable.

y. Remove and reset all signs, meters, or any other site feature or furnishing not specifically listed for separate payment elsewhere.

z. Rodent Control

aa. Pre- and Post- Construction Video

bb. Protection of private property including walls at the back of sidewalk.

cc. 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.

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.

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. 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.

C. The Owner or Engineer or their representative will make arrangements for meetings, and record minutes.

D. The Owner or Engineer or their representative will prepare the agenda and preside at meetings.

E. Contractor shall provide required information and be prepared to discuss each agenda item.

F. 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

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01040

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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. Contractor shall comply with all laws, rules, 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, 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. Excavation Permit

2. Street Obstruction Permit

3. Sidewalk Obstruction Permit

4. Street Closing Permit

5. Curb Cut Permit

6. Traffic Management Plans including Detours

7. Pedestrian Management Plans

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. There are no permits that the Owner have obtained. All 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 and 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

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
MBMA	Metal Building Manufacturer's Association
MIL	Military Standards (DoD)
MBTA	Massachusetts Bay Transit Assocation
MHD	Massachuestts 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 Ellimination
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" 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 no 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 Oils and Hazardous Materials Findings and Soil and Groundwater Management Recommendations, Upper Oxford Sewer Separation, Cambridge, Massachusetts dated September 26, 2008 are attached as an Appendix 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**

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies general requirements for construction, protection, support, maintenance, and restoration for underground and overhead utilities affected by construction of the Project. The Work includes new construction, reconstruction, relocation, and abandonment.

B. The utility works and services that may be affected include, but are not limited to:

1. Storm drain, sanitary sewer, and combined sewer
2. Water distribution
3. Gas distribution
4. Electric power and street lighting
5. Telephone
6. Traffic signals
7. Fiber optic communications
8. Cable Television
9. Signal communication
10. City fire signal lines

C. This Section shall be used in conjunction with the specific underground utility work sections that apply to the Contract.

1.2 WORK BY UTILITY COMPANIES

A. Certain parts of the utility work shall be performed, where shown or specified, by the utility company.

B. For all utilities, with the exception of storm drains; sanitary sewers; combined sewers; and water disconnecting and connecting of service shall be performed by the respective utility companies. Disconnecting and connecting of storm drains; sanitary sewers; and combined sewers services shall be the Contractor's responsibility as required in the Specifications or after having notified the Cambridge Department of Public Works. Disconnecting and

connecting of water services shall be the Contractor's responsibility as required in the Specifications or after having notified the Cambridge Water Department.

C. Contact the utility companies in advance of construction to allow sufficient time for the utility companies to accomplish the work they are required to perform. Provide the utility company at least thirty (30) days advance notice of scheduled date for commencement of work by the utility company.

D. Work performed by utility companies as part of the Work of this Contract, in order to facilitate the Work of this Contract, and other work performed by utility company solely for the Contractor's convenience, shall be at no additional cost to the Owner.

1.3 DEFINITIONS

A. Abandoned means that use has been discontinued by the utility company.

B. To be abandoned means that use will be discontinued as part of the Work of this Contract.

C. Maintenance means providing continuous and 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 of this Contract; interferences which these facilities present to the new work; location of settlement markers; method proposed to proceed with the construction; and, if applicable, method of testing and procedure for restoration.

2. Submit to the Engineer specifications and drawings describing the method to be used to temporarily support existing 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, including possible removal of Contractor's individuals from the site.

4. 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 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. 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.

2. Immediately notify the Gas Company Engineering Department if surface or subsurface settlement or movement in excess of the design amount is observed, regardless of the proximity to an existing gas facility.

1.7 STANDARD SPECIFICATIONS OF UTILITY OWNERS

A. Specifications and construction methods from each utility owner apply to individual utility specification sections.

B. It is the Contractor's responsibility to ensure that, unless otherwise specified, the standards for materials and construction methods required by the utility owner are met.

PART 2 - MATERIALS

2.1 GENERAL

A. Materials for temporary and permanent work shall be of the type, grade, and class specified by reference to utility company standards.

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.

3.2 UNSAFE AND UNSUITABLE UTILITY STRUCTURES

A. If, upon exposure, the condition of a facility to be maintained complete-in-place is found to be unsafe, by the 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.

3.3 ABANDONED FACILITIES

A. Demolish and remove abandoned utility facilities located within areas of the Work of this Contract. Abandoned facilities that do not interfere with the Work of this Contract may remain.

B. Do not undertake demolition or removal until written permission for such Work has been obtained from the utility company.

C. When abandoned facilities are to be left in place, plug or cap the ends of conduits and pipes, and fill with control density fill (CDF) unless otherwise indicated. Remove abandoned utility manholes, junction boxes, and similar structures to a minimum depth of 4 feet below finish grade, and puncture or break the bottom slabs of manholes and similar structure to allow drainage. Backfill and compact excavations resulting from removal of utility facilities as required to restore original grade.

3.4 SETTLEMENT OR MOVEMENT

A. In case of settlement or other movement that causes or could cause damage, take immediate remedial measures to correct the conditions and repair the damage.

3.5 ACCESS

A. At all times permit free and clear access to the affected facilities by personnel of the utility companies.

B. Throughout the construction period, maintain access to all utility vaults and structures.

3.6 SERVICE CONNECTIONS

A. Work required for maintaining, supporting, relocating, restoring, and constructing all service connections is included as part of the Work of this Contract, even though some existing service connections, for which record information is not available, may not be shown on the Contract Drawings.

3.7 REPAIR AND RESTORATION

A. Repair all damage to utilities caused by Work of this Contract. Clean all utility structures of dirt caused by Work of this Contract. Immediately notify the Engineer and the utility company of damage to utilities.

3.8 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 WASTE MATERIAL.

3.9 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 put the project area and adjacent affected areas in a neat and clean condition.

3.10 AS-BUILT UTILITY LOCATION SURVEY

A. For each new or relocated utility installed, 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 survey 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 survey 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 data shall be obtained by Global Positioning Survey (GPS) and certified by a Professional Land Surveyor registered in Massachusetts.

D. A complete digital base plan shall be provided in AutoCAD DWG format Release 2000i or later on a Compact Disk (CD), properly referenced to the coordinate system established in the contract. The following standards shall be applicable:

1. Text as indicated below:
   All text shall be drawn using a STYLE of "L100-XX" (where XX refers to the plotted scale) and a font file of "SIMPLEX" as defined in the AutoCAD survey template provided by S E A Consultants Inc. The style shall be defined as a "fixed height" style, and have a height of 0.10 times the drawing plotted scale. (i.e. 4.0 for 40 scale plan, 2.0 for 20 scale etc.).

2. Precision and Accuracy as indicated below:
   Horizontal survey:
   Precision: Horizontal control and surveyed points shall maintain a minimum precision of 1:10,000.
   Accuracy: No more than 10% of the survey points shall be in error by more than 1/100 inch or 0.25 mm when viewed at the requested scale.

   Vertical survey:
   Precision: Vertical Control shall have a maximum error of closure no greater than 0.075 feet or 0.02 meters.
   Accuracy: No more than 10% of elevations when interpolated from a Surface shall be in error of more than 1/2 a contour interval.

3. Surface Data:
   The data format shall conform to Autodesk Land Development Desktop Project files. If the Contractor uses a different software product to create a surface, then the surface must be represented as a TIN (Triangulated Irregular Network) of 3D lines on a separate, distinct layer within the AutoCAD drawing file. 3D faces or 2 dimensional lines are NOT acceptable.

PART 4 - COMPENSATION

Item 1200.1 – Utility Support and Coordination

METHOD OF MEASUREMENT:
Measurement for payment for 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 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, and privately owned utilities. The work includes all trunk, supply, transmission, service 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, 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.

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. The Contractor shall submit for review by the Engineer eight copies of all shop drawings, setting schedules and such other drawings as may be necessary for the prosecution of the work in the shop and in the field as required by the Drawings, Specifications or the Engineer's instructions. Deviations from the Drawings and Specifications shall be called to the attention of the Engineer at the time of the first submission of shop drawings and other drawings for consideration. The Engineer's review of any drawings shall not release the Contractor from responsibility for such deviations. Shop drawings shall be submitted with such promptness as to cause no delay in his work or the work of any other Contractor.

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.

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

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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.

3. 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.

4. The total value of site civil work inclusive of full depth roadway reconstruction, cold planning, regrading, paving, grading, curbs and sidewalks, and landscaping.

5. The total value of all other work not specifically included in the above items.

6. The total value of the two Diversion Structure Lump Sums including support of excavation; excavation; bedding; pre-cast concrete structures furnished and installed; backfill; compaction; interior concrete and other work and mechanical systems, if any.

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 Monitoring

4. Soil and Waste Management

5. Pre / Post Construction Survey

6. Utility Coordination

7. Traffic and Pedestrian Management

8. 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

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 P3, Version 2.0B software. Where submittals are required hereunder, the Contractor shall submit four 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 3 Version 2.0B 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 a 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 be a time-scaled network diagram of the "i-j" activity-on-arrow or precedence type. The Network Diagram shall describe the activities to be accomplished and their logical relationships and show the 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. Report of activities sorted by Activity Number.

2. Report of activities sorted by Early Start date.

3. Report of activities sorted by Total Float.

4. 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 Network Diagram.

5. A successor-predecessor report which shall identify the successor and predecessor activities for each activity and ties between schedule activities.

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 Superintendent, 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 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 the weekly construction progress

meetings. 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 and to determine the amount of Work completed since the last month's schedule update. The status of the Work will be determined by the percent complete of each activity shown in the Network Diagram. These meetings are considered a critical component of the overall monthly schedule update submittal and the Contractor shall have appropriate personnel attend. As a minimum, these meetings shall be attended by the Contractor's Project Manager and General Superintendent.

J. The Contractor shall submit the revised CPM Network Diagram, the revised successor/predecessor report, 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. 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." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. 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 "i-j" activity-on-arrow or 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. 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.

E. 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.

F. 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. Activity's Percent Completion.

7. Early Start Date (Calendar Dated).

8. Early Finish Date (Calendar Dated).

9. Late Start Date (Calendar Dated).

10. Late Finish Date (Calendar Dated).

11. Status (Whether Critical).

12. Total Float for Each Activity.

13. Free Float for Each Activity.

14. Cost Value for Each Activity.

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 1.4. 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 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 Contractors 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 (Not Used)

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. Five 8-inch by 10-inch glossy face prints of each photograph plus negatives shall be furnished on a monthly basis. The Owner shall receive two sets with negatives, the Engineer shall receive two sets, and the Contractor shall receive one set. Each print shall be mounted on cloth with a flap for three ring binders. Each print shall be identified with project name, job number, and location of photograph and dated.

C. Monthly photographs shall be inserted in three ring binders identified with project name, job number and date.

D. Contractor shall submit photographic negatives with photographs to the Owner.

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

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the performance of pre-construction surveys of the conditions of existing above and below grade structures to be conducted by an independent Consultant employed by the Contractor.

B. Pre-construction surveys shall be completed for all structures and locations within the project, identified by the Owner or Engineer.

1.2 PERFORMANCE REQUIREMENTS

A. The independent Consultant under the supervision of their Massachusetts Registered Professional Civil/Structural Engineer shall make a detailed examination of the interior and exterior or exterior only of the above grade structures, buildings and areas between structures as indicated on the Contract Drawings, and record their conditions no earlier than four weeks before construction begins in the area.

B. The Registered Professional Engineer shall have at least five years experience and three projects in performing pre-construction surveys of heavy civil construction projects similar to this project, including work in urban areas, and a record of performance in completing condition surveys of similar types of structures and buildings. The Contractor shall submit such qualifications for review and acceptance prior to beginning work.

C. The pre-construction survey of the conditions of the existing above grade structures, buildings and outside areas shall each include the following:

1. The independent Pre-Construction Survey Consultant shall obtain the necessary permission from the owners and tenants as may be required for entry.

2. If the Pre-Construction Survey Consultant is unable, after at least three repeated attempts, to obtain permission from owners and tenants for entry, then the Consultant shall immediately notify the Engineer.

D. Notify the Engineer, both orally and in writing, 48 hours prior to surveying each property.

E. Detailed examination of the above grade structures, buildings and outside areas shall include documentation of exterior and interior visual survey of the property and on-site improvements and plantings; detailed video inspection of the exterior and interior of building; color photographs of the exterior and interior showing visually evident structural faults, and including but not limited to:

1. exterior and interior façades to not less than ten (10) feet back from facade(s) facing the Work for structures indicated in the Contract Drawings.

2. locations and sizes of cracks in interior and exterior walls within the defined survey areas;

3. damaged masonry or roofing within the defined survey areas;

4. damaged windows or doorways (including interior doorways) within the defined survey areas;

5. interior and exterior walls which are not vertical within the defined survey areas;

6. interior and exterior evidence of floors which are not horizontal within the defined survey areas;

7. damage to foundations, including interior and exterior basement walls; and tightness of fit of interior and exterior doors and windows in their respective jambs.

8. sidewalks, driveways, paved areas, utility poles, stairways, patios and landscaped areas.

F. Interview owners and tenants of properties regarding existing conditions and structural faults, and determine dates and extent of recent repairs.

G. The pre-construction surveys shall be done and approved before construction work begins, but no sooner than four weeks before construction in the area.

H. Contractor shall video tape the entire limits of work, both side of the street. The video shall provide a record of all existing conditions within the right-of-way and the abutting private properties. Detailed focus and verbal

descriptions shall be given to special items of interest including existing damage to the right-of-way and abutting properties. A minimum of two CD copies shall be given the Owner and Engineer for their records. This activity shall be completed and the CD submitted prior to mobilization and any construction on this Project.

1.3 SUBMITTALS

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

1. The qualifications of the independent Pre-Construction Survey Consultant and their Massachusetts Registered Professional Engineer supervising the preconstruction survey shall be submitted to the Engineer for review and acceptance.

2. Three copies of the draft pre-construction survey report shall be submitted to the Engineer for review and acceptance prior to the start of construction. Separate reports shall be submitted for each property. Each report shall include as a minimum the following:

   a. location and description of on-site property and improvements;

   b. results of visual inspection;

   c. sketches as required; and

   d. results of interviews

3. Points where deterioration has occurred shall be noted and color photographs to show deterioration or other deficiencies. The absence of deficiencies shall also be recorded. The Engineer shall review the draft reports, and may indicate additional information that is required. This information shall be included in the final report.

4. Four copies of the final report shall be made two of which shall be the for the Engineer one of which will be the original; one copy shall be delivered to the building / property owner upon request, and one copy shall be retained by the independent Pre Construction Survey Consultant and Contractor. The final report shall include the results of the pre construction surveys for each property.

5. Color photographs shall be taken as required indicating building conditions and included with the final report. Prints shall have gloss

finish, shall be furnished in a plastic holder suitable for placing in an 8 1/2-inch x 11-inch loose-leaf binder, and shall be 4-inches x 5-inches in size exclusive of a binding margin. The photographs shall be made by a professional photographer or other person experienced in such work that is accepted by the Engineer. Photographs which, in the opinion of the Engineer, produce unsatisfactory prints or negatives shall be retaken by the Consultant at his own expense. Each photograph shall have permanently written on the back an identification number for reference and a legible description indicating name of project, title of contract, number of contract, building or structure, owner, date taken, location identification, description data, and Contractor's name. The prints shall be accompanied by the original film stock negatives. Glass plate negatives are not acceptable. The negatives will be available to the independent Consultant for additional prints if he so desires, but the negatives will remain the property of the Owner. Photographs taken with digital camera are acceptable. Digitized photographs contained on computer files shall be submitted with the final report.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01390

SECTION 01400

QUALITY CONTROL

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 ordered by the Engineer.

1.3 LAYOUT OF WORK

A. The Contractor shall employ at his own expense a 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 (Not Used)

END OF SECTION 01400

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

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 structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him 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, caution signs, concrete barriers, protective 7' tall fencing, lights and other means to prevent accidents to persons, 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 at the requirements of the Engineer and/or as shown on the Drawings. Test pits shall be backfilled 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. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities. Services to buildings shall be maintained and all costs or charges resulting from damage thereto shall be paid by the Contractor.

C. Protection and temporary removal and replacement of existing utilities and structures as described in this section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit prices established in the Contract. 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 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.

B. Subcontractors shall furnish all sleeves, inserts, hangers, anchor bolts, etc., required for the execution of their work. It shall be their responsibility before the work of the Contractor is begun to furnish him with the above items and with templates, drawings or written information covering chases, openings, etc., which they require, and to follow up the work of the Contractor as it progresses, making sure that their drawings and written instructions are carried out. Failing to do this, they shall be responsible for the cost of any corrective measures which may be required to provide necessary openings,

etc. If the Contractor fails to carry out the requirements given him, covering details and locations of openings, etc., he shall be responsible for any cutting and refinishing required to make the necessary corrections. In no case shall beams, lintels, or other structural members be cut without the approval of the Engineer.

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 trailers 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.

C. Temporary Telephone: The Contractor shall have installed at his own expense a job telephone for his use, one for the Engineer, a fax line for the Engineer, and a computer dedicated phone line for the Engineer. The Contractor shall pay all phone charges.

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 SEDIMENTATION AND EROSION CONTROL

A. The Contractor shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to minimize the amount of excavated and exposed fill or other foreign material that is washed or otherwise carried into waterways. The water quality of waterways shall not be degraded due to construction operations. For the purposes of this Specification Section, the term waterways shall include all conveyance system taking drainage and runoff to an eventual waterway.

B. The Contractor's plan for siltation control shall be submitted to the Engineer for review and authorization to proceed prior to implementation.

C. The Contractor shall line all catch basins with filter fabric and other materials necessary for erosion and sedimentation control as required. Filter fabric used to line catch basins must be removed prior to any inclement weather and reinstalled at the requirements of the Engineer.

D. Hay bales shall consist of hay from acceptable grasses and legumes, free from weeds, reeds, twigs, chaff, debris, other objectionable material or excessive amounts of seeds and grain. It shall be free from rot or mold and the moisture content shall not exceed 15 percent by weight at the time of

weighing.

E. Baled hay shall be placed to form temporary water stops, dams, diversions, dikes, berms and for other uses connected with water pollution control; bales shall be disposed of by the Contractor upon completion.

F. The hay shall be securely baled with biodegradable twine of adequate size to allow for possible rusting while in use and to permit rehandling when the bale is in a saturated condition.

G. Individual bales shall be of a longitudinal shape not exceeding 100 pounds when weighed.

H. 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.

I. The Contractor shall keep waterways clear of mud, silt, debris and other objectionable materials resulting from his construction operations.

J. Existing natural drainage patterns and vegetative cover shall be preserved to the maximum possible extent.

K. 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.

L. On sloping terrain, hay bales may be used to trap sediment until vegetation has become established. The details of their placement shall be as approved by the Engineer.

M. 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.

N. 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.

1.19 ENGINEER'S FIELD OFFICE

A. The Contractor shall provide and maintain at an approved location at or near the site, for the duration of the Contract, a separate office trailer, minimum dimension 13' – 8" x 64' feet for the exclusive use of the Engineer and Owner. The office trailer shall include two 14' to 15' offices at either end of the trailer with a 35' +/- center common space. The office trailer will not be shared with the Contractor. The plans and construction of the office shall be approved by the Engineer and Owner. Trailers shall have a plywood "Skirt" installed around the lower exterior perimeter.

B. The office shall be equipped with electric lights, heating facilities, air conditioners, eight telephone services (two telephone, two fax, and four DSL internet connections), water and sanitary conveniences (flush toilet) complete with water and sewer service hook-up. Doors and windows shall be equipped with locks and the windows shall have security bars and horizontal blinds. The office shall be equipped with the following furniture and accessories:

2 flat top desks with drawers
4 desk lamps
2 tables at least 2 feet 8-inches wide and 6 feet long
2 drafting tables with lamps
4 desk chairs with casters and 2 adjustable drafting stool with casters
(4) 4-section fireproof lockable file case
12 metal folding chairs
1 dustpan
1 corn broom
2 wall clocks
(3) 10 gallon wastepaper baskets
2 NEW cordless telephones
1 locker for survey equipment
Minimum (2) 5000 BTU air conditioners
2 NEW telephone answering machines with time and date stamp
2 NEW 4-cubic foot refrigerator and microwave
(3) 5-pound fire extinguisher
2 industrial type first aid kit
(4) 36" x 48" Dry Erase Boards with Cleaner, Erasers, and Markers
DSL Service for the trailer (see above)
1 photocopy machine Konica 7130 or approved equal, capable of scanning to remote e-mail locations and capable of being used as a fax

machine.

1 NEW color scanner, Epson GT 15000 Flatbed (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION)

2 NEW Digital Cameras, Sony DSC-W70 7 MP Cybershot with 7.2 Mpix; 3x optical zoom; 2.5" LCD screen with clear photo LCD Design; and 58 mb internal memory and no flash card needed (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION)

Shelving, closets and plan racks as may be required

1 Automatic electric calculator with printer

1 potable water cooler with hot and cold taps

2 NEW Automatic levels equal to TOPCON AT G6 with aluminum dome head tripod (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION)

2 NEW 25-foot fiberglass level rod (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION)

2 NEW printers (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION). Printers shall be Hewlett-Packard LaserJet All-In-One Network-Ready Black-and-White Printer/ Copier/ Scanner/ Fax, Model 3390.

2 NEW Lap Top Computers (TO BE TURNED OVER TO THE OWNER AFTER CONTRACT COMPLETION) meeting the following requirements:

Computers shall be NEW Panasonic Toughbook 51

2 GHz Intel Core Duo T2500 w/ Centrino Technology
2GB RAM
Hard Drives : 80GB Hard Drive
DVD Multi Recorder
10/100/1000 Ethernet
WiFi 802.11a/b/g
Bluetooth Module
Microsoft Widows XP Professional
Microsoft Office XP Professional
15" UXGA Display
Mouse : USB 2-Button Optical Mouse with Scroll including mouse pad
Carrying Cases: Large Nylon Carrying Case
Verizon Wireless Broadband Service V620 Air Card (PCMCIA) including all monthly charges for the duration of the Contract.

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 and remove it upon completion of the work. The cost for operation of the Engineer's field office shall be the responsibility of the Contractor and included into his Bid price. Operation and maintenance shall include: supplying toilet paper, paper towels, liquid hand soap, paper, calculator paper, bottled water, marking paint in assorted colors, monthly utility costs, heating, cooling costs, restocking the first aid kit, cleaning of the copier on a monthly basis, and cleaning of 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. The Engineer's field office shall be delivered to the site and fully set-up as described above two weeks prior to work beginning on the site.

F. As part of the field office cost, the Contractor shall supply two Nextel Direct Connect Phones of a model to be selected by the Owner during Construction. Contractor shall be responsible for buying and paying for the service for the duration of the Contract. Contractor shall carry, at a minimum, the 4000 hour plan and shall pay for all monthly charges for the duration of the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01500

SECTION 01505

MOBILIZATION

1505.1	**MOBILIZATION**	**LUMP SUM**
1505.1A	**BID ALTERNATE 1 ADDITIONAL MOBILIZATION (MAXIMIM 5% TOTAL BID ALTERNATE 1)**	**LUMP SUM**
1505.1B	**BID ALTERNATE 2 ADDITIONAL MOBILIZATION (MAXIMIM 5% TOTAL BID ALTERNATE 2)**	**LUMP SUM**

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes mobilization consisting of obtaining all permits; moving all plant and equipment onto the site required for the first month's operations; furnishing and erecting plants, temporary buildings, and project and other construction facilities; erecting project signs and traffic management signs; implementing security features and requirements; all as required for the proper performance and completion of the Work. Mobilization shall further include the following principal items:

1. Installing temporary construction power, wiring, and lighting facilities.

2. Developing construction water supply.

3. Providing 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 Nextel 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 at the job site full time.

9. Submitting initial submittals.

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 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 5 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; furnishing office trailers fully equipped and supplied; furnishing Nextel Phones for the Owner and Engineer; furnishing and paying for all utilities, broadband, and Nextel Phone services for the duration of the Contract; furnishing and installing pre-construction traffic management signage; fabrication and installation of project sign; furnishing water, sewer, power and communication services for the office trailers; distributing contact numbers for Contractor's staff to Owner and Engineer; submission and approval of initial shop drawings; submission and approval of CPM schedule; submission and approval of Traffic Management Plans; submission and approval of initial work plans and sequencing plans; obtaining all necessary permits; installing temporary power, lighting and water for construction purposes; implementing security features; furnishing and installing temporary sanitary facilities; transporting all necessary trucks and construction equipment to the site necessary to begin construction; and all other work necessary to start Construction.

Item 1505.1A – Bid Alternate 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1)

METHOD OF MEASUREMENT:

Payment for Bid Alternate 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1) will be at lump sum price bid for this item in the proposal and shall be payable 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 5 percent of the Total Amount of Bid Alternate 1.

BASIS OF PAYMENT:
Under the Lump Sum price bid for Bid Alternate 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1), the Contractor shall move his additional equipment to the site and prepare to begin construction. Bid Alternate 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1) shall include all additional costs of initiating the Contract, exclusive of the cost of materials. Bid Alternate 1 Additional Mobilization (Maximum 5% Total Bid Alternate 1) includes securing and constructing additional staging area(s) for materials and office trailers; furnishing office trailers fully equipped and supplied for additional time; furnishing Nextel Phones for the Owner and Engineer for additional time; furnishing and paying for all utilities, broadband, and Nextel Phone services for the additional duration of the Contract; furnishing and installing additional pre-construction traffic management signage; furnishing water, sewer, power and communication services for the office trailers for additional time; distributing additional contact numbers for Contractor's staff to Owner and Engineer; submission and approval of additional initial shop drawings; submission and approval of CPM schedule reflecting the additional work; submission and approval of additional Traffic Management Plans; submission and additional approval of initial work plans and sequencing plans; obtaining all additional necessary permits; installing temporary power, lighting and water for additional construction purposes; implementing security features for additional time; furnishing and installing temporary sanitary facilities for additional time; transporting all additional necessary trucks and construction equipment to the site necessary to begin construction; and all other additional work necessary to start Construction.

Item 1505.1B – Bid Alternate 2 Additional Mobilization (Maximum 5% Total Bid Alternate 2)

METHOD OF MEASUREMENT:
Payment for Bid Alternate 2 Additional Mobilization (Maximum 5% Total Bid Alternate 2) will be at lump sum price bid for this item in the proposal and shall be payable 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 5 percent of the Total Amount of Bid Alternate 2.

BASIS OF PAYMENT:
Under the Lump Sum price bid for Bid Alternate 2 Additional Mobilization (Maximum 5% Total Bid Alternate 2), the Contractor shall move his additional equipment to the site and prepare to begin construction. Bid Alternate 2 Additional Mobilization (Maximum

5% Total Bid Alternate 2) shall include all additional costs of initiating the Contract, exclusive of the cost of materials. Bid Alternate 2 Additional Mobilization (Maximum 5% Total Bid Alternate 2) includes securing and constructing additional staging area(s) for materials and office trailers; furnishing office trailers fully equipped and supplied for additional time; furnishing Nextel Phones for the Owner and Engineer for additional time; furnishing and paying for all utilities, broadband, and Nextel Phone services for the additional duration of the Contract; furnishing and installing additional pre-construction traffic management signage; furnishing water, sewer, power and communication services for the office trailers for additional time; distributing additional contact numbers for Contractor's staff to Owner and Engineer; submission and approval of additional initial shop drawings; submission and approval of CPM schedule reflecting the additional work; submission and approval of additional Traffic Management Plans; submission and additional approval of initial work plans and sequencing plans; obtaining all additional necessary permits; installing temporary power, lighting and water for additional construction purposes; implementing security features for additional time; furnishing and installing temporary sanitary facilities for additional time; transporting all additional necessary trucks and construction equipment to the site necessary to begin construction; and all other additional 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.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 01560

SECTION 01570

MAINTENANCE AND PROTECTION OF TRAFFIC

1570.1	**TRAFFIC MANAGEMENT AND COORDINATION**	**LUMP SUM**
1570.2	**SAFETY SIGNING FOR CONSTRUCTION OPERATIONS**	**SQUARE FOOT**
1570.3	**VARIABLE MESSAGE BOARDS**	**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. 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.

E. 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.

F. "Approved by the Owner" throughout this Section shall mean the approval of the Cambridge Department of Public Works and Traffic and Parking Department.

G. 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.

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, the MHD, 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 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-feet 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 trucksn 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 nights 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.

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 MHD 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 MHD 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 MHD and MUTCD requirements or as directed by the Owner, City and Engineer.

2. Portable barricades shall conform with Standard Plate No. 40612 of the MHD (Metric Edition). Reflectorized sheeting shall conform to Section M9.30.2, of the MHD 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 MHD, 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.

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.

PART 4 – COMPENSATION

Item 1570.1 - Traffic Management and Coordination

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 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 Management and Control 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 Management Plan, by the MUTCD, ADA, MA AAB, and MHD standards; and as further required by the Owner and Engineer. 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; furnishing, installing, and maintaining traffic management devices based on approved traffic management and control plans including precast concrete 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; safety signing for construction operations; variable message boards; and Police Details. Police Details will be paid directly by the Owner.

Item 1570.2 - Safety Signing for Construction Operations

METHOD OF MEASUREMENT:
Measurement for payment for Safety Signing for Construction Operations shall be based on the square foot of safety sign fabricated; furnished; installed ; maintained; moved and removed, complete as indicated in the Contract Specifications, per the approved Traffic Management Plan, and approved or requested by the Owner, City and Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Safety Signing for Construction Operations shall be based on the square foot price bid 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 to fabricate, furnish, install, secure, maintain, relocate and remove Safety Signing for Construction Operations as required for the management of traffic and pedestrians and as further directed by the Owner, City and Engineer. The work includes, but is not limited to; fabrication of the signs; furnishing and installing signage; mounting and securing signage; maintaining signage; protecting and storing signage not in use; relocating signage; removal of signage; and all incidental work required to fabricate, furnish, install, maintain, relocate, and remove the Safety Signing for Construction Operations

SPECIAL NOTES ON EXCLUSIONS:
The following items are not included for payment under this item; "No Parking" signs; signs not specified or requested or approved by the Owner or Engineer, installed for the convenience of the Contractor; and signs not fabricated by a professional shop specializing in the fabrication of Signage for Construction Operations, i.e. hand painted or fabricated. Signage damaged as a result of misuse or improper handling shall be replaced by the Contractor at no additional cost to the Owner.

Item 1570.3 - Variable Message Board

METHOD OF MEASUREMENT:
Measurement for Payment for Variable Message Board (VMB) shall be based on the number of weeks each variable message board is provided, moved, removed and

maintained, complete, as required by the Owner or Engineer. VMBs which are on site but not requested or approved by the Owner or Engineer shall be at the Contractor's expense, i.e. VMBs 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 Variable Message Board (VMB) 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 variable message boards 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 variable message board locations; furnishing and setting-up variable message boards, power supply, programming equipment and appurtenances; maintaining message boards throughout project; relocating message boards 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 VMBs.

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.

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 walks, fences of all types, railings, signs and sign posts, signal posts, 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.

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

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.

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. 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.

C. 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.

D. 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.

E. 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.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02010

SECTION 02015

GEOTECHNICAL INSTRUMENTATION AND MONITORING

2015.1 GEOTECHNICAL INSTRUMENTATION AND MONITORING **DAY**

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. 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.

2. Furnish, install, protect, replace, monitor and report on ground surface and building deformation monitoring points as indicated and shown on the Contract Drawings. The Engineer will assist the Contractor in determining the final locations.

3. 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 and building deformation monitoring points, crack gauges, groundwater levels 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 required by the Engineer or specified. Monitoring includes; crack gauges, temporary earth support monitoring points, surface and building monitoring points, and groundwater monitoring wells. Vibration monitoring shall be performed continuously during all excavation, backfill, and

compaction and installation of temporary earth support.

4. 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.

2. Contractor submittals shall be acceptable to the Engineer prior to undertaking the work. The Contractor shall forward submittals in advance considering that re-submittals may be required.

B. 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.

C. 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 or depicted graphically on plots and show incremental and cumulative movement since the start of excavation.

D. 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.

1.3 QUALITY CONTROL

A. 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, groundwater monitoring wells, crack gauges 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 groundwater wells, surface settlement and lateral deformation points, crack gauges, 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. Geotechnical Monitoring Consultants shall be GeoComp of Boxboro, MA, or approved equivalent.

B. 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.

C. The Contractor may conduct additional testing or monitoring for its own information, at no additional cost to the Owner.

D. 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.

E. 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.

F. Measure and report all data on movements of all instrumentation monitoring points to the nearest 0.01 ft.

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 CRACK GAUGES

A. Crack gauges on existing and new cracks developing during construction shall be monitored using a device such as the Avongard Calibrated Crack Monitor (Avongard Products, Waukegan, IL or approved equal) shall be bolted or epoxied to the surface. For uneven surfaces, such as stone, pairs of flat washers should be used, with the distance between the washers measured with a caliper.

2.3 VIBRATION MONITORING

A. Construction vibrations shall be monitored at the approximate locations shown on the Drawings 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.

2.4 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.

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. Install excavation wall monitoring points at the locations proposed by the Contractor and accepted by the Engineer but not less than 20 feet on-center on all sides of the excavation. Surface and building monitoring points

shall be installed at the locations shown on the Drawings. Locations of existing building cracks shall be identified during the Pre-Construction Condition Survey. The base bid allows for a minimum of 33 existing monitoring locations.

3.3 MONITORING

A. During and following the installation of the excavation support wall, the Geotechnical Monitoring Consultant shall be responsible for monitoring the horizontal position of individual components of the lateral earth support systems until the structures are installed and the trench backfilled to the original street surface grade.

B. Immediately following installation of each element of the lateral support system, the Geotechnical Monitoring Consultant shall establish a baseline parallel to each side of the excavation from which offset (horizontal displacement) measurements shall be made to the pile.

C. Offset (horizontal position) monitoring of the temporary lateral earth support systems shall be made at least twice per week until the excavation is backfilled to within 2-ft of final grade, or as required by the Engineer. A minimum accuracy of 0.01 ft. shall be maintained.

D. Obtain the first initial baseline readings on excavation wall, building and surface monitoring points no later than seven days prior to the start of installation of the temporary excavation support or excavation operations. Obtain two sets of initial readings at least one day apart.

E. 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.

F. The Geotechnical Monitoring Consultant shall monitor all instrumentation specified. Instrumentation data obtained by the Geotechnical Monitoring Consultant shall be provided to the Engineer.

G. 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 twice 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.

H. 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.

I. 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.

J. 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.

K. 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 area shown in the Contract Drawings.

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 area shown in the Contract Drawings.

L. Criteria for "threshold" and "limiting" values for groundwater monitoring wells within 10 feet outside the excavation limits have been established as follows:

1. "Threshold" groundwater level: No lower than 3 feet below the historic low as determined during the previous 12 month period.

2. "Limiting" groundwater level: No lower than 4 feet below the historic low as determined during the previous 12 month period.

M. 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). Movements of adjacent structures, utilities or other facilities are detected.

N. 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.

O. 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 the start of construction.

P. These criteria are intended to establish a minimum basis for the Contractor's design and procedures and does not relieve the Contractor of its responsibility for preventing detrimental movements and damage to adjacent structures, utilities or other work.

Q. The Contractor shall pay a penalty of $5,000 for each scheduled day the Geotechnical Monitoring Consultant is not on site, $5,000 for each day the data is not delivered to the Engineer at the specified time, and $5,000 for each day the Contractor works in violation of any threshold or limiting values being reached or exceeded as determined by the Engineer.

R. 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.

S. 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 - Geotechnical Instrumentation and Monitoring

METHOD OF MEASUREMENT:
Measurement for payment for Geotechnical Instrumentation and Monitoring shall be based on the actual number of days when geotechnical instrumentation or monitoring activities are conducted on site, as determined in the field by the Engineer. Payment will not be made until all required submittals have been approved by the Engineer. Further, payment will be contingent upon the Contractor meeting the requirements in the specifications for monitoring, maintenance, and submission of reports. Payment may be withheld, at the Engineer's discretion, for late submission of reporting requirements. Costs for additional monitoring done for the Contractor's convenience shall not be compensated for.

BASIS OF PAYMENT/ INCLUSIONS:
Under the Unit Price for Geotechnical Instrumentation and Monitoring, the Contractor shall furnish all labor, materials, instrumentation, tools, equipment, and incidentals required to perform all geotechnical 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 earth support settlement and deformation monitoring points; monitoring earth support settlement and deformation monitoring points and submission of all data to the Engineer; furnishing, installation and maintenance of ground surface, building, and utility monitoring points; monitoring ground surface, building, and utility monitoring points and submission of all data to the Engineer; furnishing, installation, and maintenance of crack monitoring gauges; monitoring crack monitoring gauges and submission of all data to the Engineer; furnishing, installation and maintenance of seismographs; monitoring seismograph data and submission of all data to the Engineer; furnishing, installation and maintenance of groundwater monitoring wells; monitoring of groundwater monitoring wells installed by the Contractor and those installed by the Owner and 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**
2051.1A	**DISPOSAL OF CONSTRUCTION DEBRIS AS SOLID WASTE (BID ALTERNATE 1)**	**TON**
2051.2	**DISPOSAL OF BITUMINOUS CONCRETE**	**TON**
2051.2A	**DISPOSAL OF BITUMINOUS CONCRETE (BID ALTERNATE 1)**	**TON**
2051.2B	**DISPOSAL OF BITUMINOUS CONCRETE (BID ALTERNATE 2)**	**TON**
2051.3	**DEMOLITION OR REMOVAL OF, LAMP HOLE, MANHOLE CATCH BASIN OR OTHER STRUCTURE**	**EACH**
2051.3A	**DEMOLITION OR REMOVAL OF, LAMP HOLE, MANHOLE CATCH BASIN OR OTHER STRUCTURE (BID ALTERNATE 1)**	**EACH**
2051.4	**ABANDON IN PLACE MANHOLE, CATCH BASIN OR OTHER STRUCTURE**	**EACH**
2051.5	**ABANDON IN PLACE PIPE – 15-IN TO LESS THAN 36-IN DIAMETER**	**LINEAR FOOT**
2051.6	**DEMOLITION OR REMOVAL OF PIPE – 15-IN TO LESS THAN 36-IN DIAMETER (BID ALTERNATE 1)**	**LINEAR FOOT**

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 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

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.

B. 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.

C. Owner assumes no responsibility for condition of the utilities, structures, properties or other facilities to be selectively demolished.

D. If materials suspected of containing hazardous or asbestos materials are encountered, do not disturb; immediately notify Engineer.

E. 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

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 flowable fill or 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.

F. Fill excavations with solid fill resulting from earth removal operations and/or with select borrow material in accordance with Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING. Final grade to be restored in kind unless otherwise noted.

G. Exercise precautions for fire prevention. Make fire extinguishers approved for Class A, B and C fires available at all times in areas where performing demolition or abandonment work with burning torches. Do not burn demolition debris on site.

3.8 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 watertightness 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.

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.

PART 4 – COMPENSATION

Item 2051.1 - Disposal of Construction Debris as Solid Waste
Item 2051.1A – Disposal of Construction Debris as Solid Waste (BID ALTERNATE 1)

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.

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
Item 2051.2A – Disposal of Bituminous Concrete (BID ALTERNATE 1)
Item 2051.2B – Disposal of Bituminous Concrete (BID ALTERNATE 2)

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
Item 2051.3A - Demolition or Removal of Lamp Hole, Manhole, Catch Basin, or Other Structure (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for payment for Demolition or Removal Manhole, Catch Basin or Other Structure shall be on the basis of the number of individual manholes, catch basins or other structures demolished or removed complete as measured by the Engineer. Manholes, catch basins or other structures 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 and/or Removal of Manholes, Catch Basins or Other Structures shall be based on the number of individual 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 to Demolish or Remove a 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 elewhere; disposal of construction debris as solid waste; demolition and removal of pipes; manholes, catch basins or other structures abandoned in place, not fully demolished or removed. 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 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; 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; 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; 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 and compact Controlled Density Fill or Sand in the manhole, catch basin or structure to be abandoned.

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 pipes, 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-In to Less Than 36-In Diameter

METHOD OF MEASUREMENT:
Measurement for payment for Abandon In Place Pipe – 15-In to Less Than 36-In Diameter shall be on the basis of the linear foot of pipe within the diameter range indicated, abandoned in place using bulkheads and CDF, as specified herein and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Abandon In Place Pipe – 15-In to Less Than 36-In Diameter shall be based on linear foot of pipe within the diameter range indicated, abandoned in place using bulkheads and CDF, 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 Abandon In Place Pipe – 15-In to Less Than 36-In Diameter. 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; masonry plugs and bulkheads in the disconnected pipe; and furnish, install and compact Controlled Density Fill in the pipe to be abandoned.

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. 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. Abandonment in place of pipe smaller than 15-in in diameter is not included for payment herein or elsewhere but is considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

Item 2051.6 - Demolition and/or Removal of Pipe 15-in To Less Than 36-in Diameter (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for payment for Demolition and/or Removal of Pipe 15-in to Less Than 36-in Diameter shall be on the basis of the linear feet of pipe, 15-in to less than 36-in diameter, demolished and/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 and/or Removal of Pipe 15-in to Less Than 36-in Diameter shall be based on the linear feet of pipe, 15-in to less than 36-in diameter, demolished or removed complete for this item in the proposal. Under the per unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to Demolish and/or Remove pipe 15-in to less than 36-in diameter. The work includes, but is not limited to; saw cutting existing bituminous or cement concrete; 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; construction dewatering; disconnecting existing pipe, services and other connections; verify function of all existing connections including those that are abandoned or those to be transferred to an active and functioning pipe; demolition and removal of the pipe; salvage of materials specified; masonry plugs or bulkheads; 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; and demolition and removal 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. Demolition and/or Removal of Pipe less than 15 inches in diameter not included for payment herein or elsewhere but is considered incidental to the Contract and the Contractor shall carry costs in the base bid as necessary.

END OF SECTION 02051

SECTION 02080

SOIL AND WASTE MANAGEMENT

2080.1	**OHM - SOIL AND WASTE MANAGEMENT**	**LUMP SUM**
2080.1A	**BID ALTERNATE 1 ADDITIONAL 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 OBJECTIVE AND OVERVIEW

A. It is the objective of soil/fill management practices specified here to handle all soil/fill excavated from the site during the course of this contract in a cost-effective manner and in accordance with applicable state and federal regulations. The Contractor shall reuse geotechnically suitable excavated materials prior to using imported fill in order to reduce the volume of material to be disposed off-site.

B. The specifications detailed herein require the Contractor to segregate soil/fill strata of varying geotechnical and contaminant levels during excavation. The excavated soil/fill material shall then be reused within the *area of excavation* to the maximum extent possible provided the material is geotechnically suitable as backfill and does not result in spreading contamination to other areas or soil/fill strata. Excavated soil/fill, which is displaced by design features, (e.g. pipe and manholes), may be used as backfill elsewhere on the project provided the soil/fill is geotechnically suitable and does not result in spreading contamination or degrading the environmental quality at the location of reuse. Excavated soil/fill, which cannot be reused on site, shall be subject to reuse or disposal off-site.

C. The Contractor shall be responsible for coordinating waste disposal, and as such, shall be responsible for identifying an appropriate facility which can receive the material and, if necessary, collect additional characterization samples to satisfy local, state, and federal regulations as well as the Contractor selected disposal facility's acceptance criteria.

D. In general, excavation and soil/fill management is expected to substantially occur as follows:

1. Excavate and remove road surfacing material and road sub-base material (asphalt, railroad ties, brick and cobbles, rails, concrete road base, etc.) and recycle/dispose as appropriate. These materials are to be kept separate from the soil/fill and disposed or reused accordingly. Removal of road surfacing and road sub-base materials are separate from soil/fill management.

2. Generally, the soil/fill strata anticipated includes: (1) urban fill; (2) gravel and sand; (3) clayey silt; and (4) till and rock. The urban fill is generally present immediately beneath the ground surface and extends approximately six feet to a natural gravel, sand and silt layer (Glacial Outwash) beneath which is a sand and silt soil layer (Glaciomarine Deposit). The gravel and sand and clayey silt soil strata may or may not contain cobbles and boulders. The clayey silt layer may or may not contain sand and gravel lenses. Till and bedrock are encountered at greater depth. Each strata shall be segregated as it is encountered, field screened and stockpiled separately. Refer to the Contract Specific Special Provisions supplement to this section for additional requirements.

1.2 DESCRIPTION

A. This Section describes the general parameters and requirements for testing, excavation, handling, storage, tracking, removal, transport, and disposal of contaminated urban fill and natural soils.

B. The Contractor shall handle excavated soil/fill in accordance with all applicable federal, state, and local laws and regulations.

C. The Contractor shall examine all other sections of the specifications for additional work requirements, which affect this Section whether or not specifically mentioned in this section.

D. In the course of the work, it shall 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. It is the objective of soil/fill management practices to handle all soil/fill excavated from the site during the course of this contract in a cost-effective manner and in accordance with applicable state and federal regulations. The Contractor shall reuse geotechnically suitable excavated 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.

E. The Contractor shall hire an environmental professional qualified to prepare and implement all required plans detailed in the specification section including but not limited to the: Soil and Fill Management Plan; Dust, Vapor

and Odor Control Plan; Personnel and Equipment Decontamination Plan; Contingency Materials Plan; and Spill and Discharge Control Plan.

F. The Contractor is solely responsible for developing a HASP suitable for workers on site and the Contractor's use. The Owner and/or their representative are not responsible for establishing or enforcing the health and safety requirements of the Contractor, and nothing herein shall relieve the Contractor from its exclusive responsibility for the health and safety of its employees and/or its representatives and/or subcontractors. The Contractor shall be required to defend, indemnify, and hold the CITY OF CAMBRIDGE and the Engineer harmless against any and all claims, liabilities, fines, or penalties arising out of actual or alleged failure of the Contractor and/or its agents, employees, or subcontractors to comply with any health or safety regulation, rule, ordinance, legislation, and/or health and safety plan.

G. The Contractor shall hire an Environmental Professional qualified to coordinate all soil/fill-handling activities with the Owner or Engineer and/or their representative. The Contractor shall properly handle waste materials, including, but not limited to, construction debris, municipal waste, boulders, soil, fill, ash, rubble, and empty or crushed drums and/or drum parts. The Contractor shall institute procedures to protect site workers and the public from these materials.

H. Any material which is an unknown, material (as defined in this specification section), requiring special handling and which can not be readily identified as a non-hazardous waste material shall be handled separately in order to characterize its nature as specified herein.

1.3 RELATED WORK

A. Section 02010 – SUBSURFACE INVESTIGATION

B. Section 02095 – TRANSPORTATION AND DISPOSAL OF WASTE MATERIAL

C. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

1.4 DEFINITIONS

A. Authorized Excavation: Earth Excavation or "Excavation" consists of removal of materials encountered to the elevations and widths indicated in the Contract Drawings, Specifications, or as required by the Engineer.

B. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined for the purposes of the Contract as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix.

C. Peat: A substance of vegetable origin, consisting of roots and fibers, moss, etc., in various stages of decomposition, and found, as a kind of turf or bog. Peat shall be considered natural soil or urban fill when it is encountered in small amounts (layers 1-foot (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.

D. Soil/Fill suitable for on-site reuse: Natural soil and urban fill, which contains sufficient geotechnical properties, to be reused as backfill, as specified in Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING and on the Contract Drawings, shall be reused on site to the maximum extent practical provided it is not reused in an area, which is less contaminated. Natural soils that are free of contaminants and foreign materials or any indication of contamination, can be reused throughout the site.

E. Unauthorized Excavation: Consists of removal of materials beyond indicated sub-grade elevations or Contract defined trench limits without specific direction of the Engineer. Unauthorized excavation, handling material, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for excavations of the same class, unless otherwise required by the Engineer.

F. Area of Excavation: For the purposes of reusing soil/fill on-site, the *area of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristics. Soil/fill returned to the *area of excavation* shall be returned to approximately the same horizontal and vertical location from which it originated provided that it is not placed in an area that differs substantially in physical or chemical characteristics as can be observed and measured during excavation.

G. Unknown Materials: Any material, that is not readily identifiable as non-hazardous waste, and has not been previously characterized or encountered during site investigation activities. Such wastes include:

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 cannot be readily identified as a non-hazardous substance shall be handled as an unknown potentially hazardous substance as specified herein. Urban fill and miscellaneous debris (such as brick, ash, glass, metal, lead and petroleum impacted soil and fill regardless of the level of contamination present) or natural soil or urban fill which is impacted or contaminated with petroleum product

from a known or probable source shall not be considered unknown materials.

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.

4. The Unknown material classification shall be used only in the event that an unexpected, unusual material is encountered for which special handling procedures shall be required in order to handle and characterize the material safely and in accordance with applicable regulations.

The Owner reserves the right to apply generator knowledge to classify and profile the material as a previously encountered waste or as a known waste. In the event that a material is encountered which the Contractor is uncertain as to its nature, the Owner or their representative shall inspect the material with the Contractor and direct the Contractor as to the nature of the material being known or unknown.

H. Fill (Urban Fill): Fill, also known as urban fill or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Material commonly associated with urban fill includes, but are not limited to; glass, brick, ash, wood fragments and other similar granular materials. Urban fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials which would preclude the disposal of the urban fill as daily cover at a landfill. Material containing less than 10%, by volume, solid waste/debris, as determined by the Engineer, shall be classified as urban fill. Material that contains 10% or more solid waste/debris by volume, as determined by the Engineer, shall be classified as solid waste.

I. Unless specifically stated otherwise terms used in this specification are as defined in the MCP, 310 CMR 40.0006. The following definitions apply to these specifications:

1. Background Conditions (Class A-1): Background is defined in 310 CMR 40.0006 as those levels of oil and hazardous material that would exist in the absence of the disposal site of concern which are:

   a. ubiquitous and consistently present in the environment at and in the vicinity of the disposal site of concern; and

   b. attributable to geologic or ecologic conditions, atmospheric deposition of industrial process or engine emissions, fill materials containing wood or coal ash, releases to groundwater

from a public water supply system and/or petroleum residues that are incidental to the normal operation of motor vehicles.

Any soil or fill material which meets the regulatory definition of "background" as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in the Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING. For record keeping purposes soil/fill that meet the definition of background, shall be transported under a Material Shipping Record.

As used above, the term "disposal site of concern" is defined as that location where material is being either excavated from (on site) or transported to and disposed (disposal facility/location). In other words, the excavation location, on site, will have its own background levels. The location which the Contractor has selected for the disposal of this less than impacted material will also have its own, independent, background levels. The two are not necessarily the same. It is the Contractor's responsibility to determine what the background levels are at the point of excavation are. It is also the Contractor's responsibility to find 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 does not delay or adversely affect Construction operations.

2. Impacted <RCS-1 Soil/Fill (Class A-2): Any soil or fill material which contains oil or hazardous materials at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused at the *area of excavation* or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in the Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING. For record keeping purposes soil/fill that meet the definition of impacted soil/fill and do not meet the definition of contaminated soil/fill or remediation waste, shall be transported under a Material Shipping Record.

3. Contaminated Soil/Fill (Class B): Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, except where the presence of the material is consistent with the regulatory definition of "background" as defined in 310 CMR 40.0006.

Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials shall be handled as potentially

contaminated soils. Soil which does not have any evidence of contamination can be reused within the *area of excavation* without first performing laboratory analyses. Soil/fill which may be contaminated should be set aside by the Contractor for inspection by the Owner'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. Any excavated soil/fill material which is not reused within the *area of excavation*, must be characterized prior to reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill. Natural soils may be suitable for disposal/reuse off-site as fill provided it is tested as specified herein and demonstrated to be consistent with background conditions at the receiving site.

Contaminated soil/fill (including petroleum-contaminated soil/fill) which can not be reused on site shall be reused off-site, recycled, or disposed as a solid waste at an appropriately permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR part 261 or contains PCBs or asbestos. Subcategories of Class B are defined as follows:

a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills.

b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.

c. Class B-3: Soil and Fill that meet all applicable criteria for in-state recycling (i.e., WSC-94-400) and/or the specific licensing requirements for the proposed in-state recycling facility.

d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state recycling acceptance criteria, but do meet the criteria for regional thermal treatment facilities or out-of-state recycling facilities, and are not classified as a RCRA Hazardous Waste.

e. Class B-5: Soil and Fill that contain concentrations of contaminants that require removal to 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.

4. Hazardous Waste (Class C): A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, subpart C and/or that is listed in 40 CFR 261, subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Subcategories of Class C shall be as follows:

a. Class C-1: Soils classified as hazardous waste that can be readily treated on-site to eliminate the toxicity characteristic for lead.

b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be readily treated on-site. This material must be transported to an out-of-state approved RCRA Subtitle C hazardous waste disposal or treatment facility under Uniform Hazardous Waste Manifest

5. Unknown Materials: Any material, soil or fill, that is not readily identifiable as non-hazardous waste, and has not been previously characterized or encountered during site investigation activities. Such wastes include, unlabelled drums or containers containing material which is not readily identifiable as a non-hazardous substance.

Any material which varies significantly from material previously observed on site and can not be readily identified as a non-hazardous substance shall be handled as an unknown potentially hazardous substance as specified herein. 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 material may include buried

containers, waste material of unusual color or odor or material with indications of hazardous levels (i.e. 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 inspect the material with the Contractor and require the Contractor as to the nature of the material being known or unknown.

6. Special Waste: means any solid waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the solid waste. Asbestos and PCB-contaminated soils/fill are examples of special waste categories.

1.5 WORK INCLUDED

A. The work to be done under this section includes managing excavated soil and fill material from areas of known contamination, areas consistent with background conditions (i.e. areas which are not contaminated), and from other areas where contamination becomes evident during excavation. All soil/fill material excavated within the limits of the project area shall be handled in accordance with the provisions set forth in 310 CMR 40.0000 where applicable, and in accordance with all other applicable state and federal regulations and as specified herein and as indicated below. The work includes characterization for disposal/reuse purposes, field screening and segregation, staging and characterization, managing and disposing of soil and fill material excavated in the course of constructing the facilities and appurtenances including excavate from utilities and site grading.

B. If contaminated groundwater is encountered, it shall be handled in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Any construction dewatering wastes which are discharged are subject to applicable, city, state, and federal regulations. Treatment of the groundwater shall be performed by the Contractor as required by the regulatory body (e.g. MWRA, DEP, EPA/NPDES).

C. All work at the site must be performed in accordance with all applicable federal, state, and local regulations, including, but not limited to:

1. The applicable parts of 40 CFR pertaining to the Comprehensive Environmental Response and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and the National Emission Standards for Hazardous Air Pollutants (NESHAPs) as regulated by the Environmental Protection Agency;

2. State regulations specified in the MCP (310 CMR 40.0000), and Massachusetts General Law 21E - Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, and in 310 CMR 30.0000 State Hazardous Waste Regulations.

3. DEP Policy #COMM-97-001 (Reuse and Disposal of Contaminated Soil at Massachusetts Landfills) and DEP Waste Site Cleanup Policy #WSC 94 – 400 (Interim Remediation Waste Policy for Petroleum Contaminated Soils).

4. 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 Nationwide 404 permit.

9. General Contractor's license.

10. Water effluent discharge Notice of Intent (NOI) to discharge and permits.

11. Excavation and/or grading permits.

12. Special use permits.

13. Special waste haulers certificate.

14. Wetlands Protection Act, and local ordinances.

15. The Contractor's Soil and Fill Management Plan and Health and Safety Plan to protect the workers and the public.

D. The Contractor shall prepare a work plan that generally describes the work to be performed under this Section and it shall include, but not be limited to, the following construction operations:

1. Submitting a site-specific Health and Safety Plan (HASP) for the Contractor's employees, in accordance with the minimum standards set forth in OSHA 29 CFR 1910.120 and 1926. The Plan and a statement of certification shall be submitted to the Owner or Engineer and/or their representative for their records prior to mobilization.

2. Submitting all required plans, including but not limited to; the Health and Safety Plan, Soil and Fill Management Plan, Equipment and Personnel Decontamination Plan, Dust Vapor and Odor Plan, Air Monitoring and Quality Control Plan, a Spill and Discharge Control Plan and a Contingency Management Plan, to the Owner or Engineer and/or their representative for review at least two weeks prior to beginning any excavation work at the site.

3. Implementation of the submitted and approved plans including the establishment of the work zones (e.g., support zone, contamination reduction zone, exclusion zone (defined in OSHA 1910.120)), preparing the decontamination pad and staging areas, performing the appropriate environmental monitoring, training and medical monitoring of personnel, coordinating waste disposal and waste characterization as needed.

4. The contractor shall hire the services of an environmental professional to develop, implement, maintain, supervise, and be responsible for all soil/fill management and disposal practices during the course of this contract. The environmental professional shall be present during all excavation, backfilling, field screening, segregating, handling, disposal, and characterization of all soil/fill excavated in the course of completing this contract to ensure that soil/fill is managed in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000).

5. Construction of a secure soil/fill staging area sized to adequately segregate soil/fill in accordance with the conditions specified without impeding construction-related activities. The Contractor shall use existing information and obtain additional information as may be needed to minimize the need for a staging area. If a staging area is required to characterize any unknown material or any soil/fill material for any reason, the Contractor shall be responsible for locating, selecting, preparing and securing the area as specified herein.

6. Managing all excavated soil/fill which originates from the elements of work included in the contract and grading activities.

7. All excavated soil and fill that is geotechnically suitable shall be reused within the *area of excavation* to the maximum extent possible.

8. Soil/fill which can not be reused immediately within the *area of excavation* shall either have been pre-characterized for disposal by the Contractor's hired environmental professional and directly loaded for off-site transport (provided the excavated soil/fill is consistent in visual, olfactory and field screening characteristics with subsurface investigations conducted prior to construction); or it shall be staged at a location determined and secured by the contractor pending analytical characterization. The contractor shall make all attempts to reuse excavated soil/fill within the *area of excavation* to the degree possible such that soil/fill characterization is not necessary.

9. The Contractor shall hire an environmental professional qualified to characterize all excavated soil and fill material prior to reuse or disposal. Characterization requirements may vary depending on disposal facility permits and policies. The Contractor shall be responsible for final waste characterization and shall determine in advance of submitting a bid what, if any, additional waste characterization beyond what is specified herein shall be required by the disposal facility. Transportation of soil/fill from URAM designated areas must be accompanied by a Massachusetts DEP Bill of Lading, or manifest as required in 310 CMR 40.0000. All other soil/fill shall be tracked under a Material Shipping Record.

10. Excavating unknown, previously uncharacterized material which may be classified as RCRA hazardous waste and disposal at an approved facility.

11. Excavating soil, fill and waste containing suspect asbestos-containing material if encountered (e.g., transite board, transite pipe) and disposal at an approved landfill/facility.

12. Handling, characterizing, transporting, reusing, and disposing soil/fill material.

13. Placing and grading of certified clean backfill (including all backfill from on site which is determined to be suitable for re-use). The Contractor shall maximize the reuse of on site materials by using soil/fill suitable for reuse prior to importing material on site. Proposed use of imported material shall be reviewed with and be acceptable to the Engineer prior to placement.

14. Protecting all waste material exposed by excavation activities at the end of each day by using a removable and reusable cover capable of

preventing dust generation and windblown transport of waste and/or contaminants.

15. Demobilizing the site, including, but not limited to, removing and disposing of construction-related equipment and materials used for personnel and equipment decontamination and related waste such as personal protective equipment, decontamination water/solids, temporary covers, and washwater storage tanks; disconnection of temporary utilities; and final clean-up to pre-construction conditions.

16. In the event that an unknown material is encountered, the Contractor shall immediately contact the Owner or the Owner's representative to discuss the nature of the unknown material and appropriate handling procedures. Unknown material shall be managed separately and shall be staged separately pending sampling and testing as specified herein.

E. All incidentals, Contractor-generated waste (such as Personal Protective Equipment, decon wash, etc.,) resulting from the services hereunder shall be the property and responsibility of the Contractor and shall be disposed of by manifest and/or by a Massachusetts Bureau of Waste Site Cleanup Bill of Lading (BWSC Form 012) by the Contractor. All waste removal and transportation from the project site shall remain the obligation of the Contractor. All samples and laboratory by-products shall be returned to the Contractor for disposal.

F. In all cases, including soil and fill disposal, except where otherwise specified by law, the Contractor shall be responsible for the signing of manifests. Should the Owner need to sign disposal documentation, the Contractor shall be responsible for preparing the documentation (including LSP Opinions prepared at the request of disposal facilities, manifests and Bills of Lading) and obtaining all necessary information and signatures required to complete the documentation. The Contractor shall be responsible for the storage and disposal of these materials in accordance with applicable laws and regulations, including the terms and conditions in this contract.

1.6 PROGRESS REPORTS

A. The Contractor shall prepare and submit to the Engineer for review progress reports, records, data, shop drawings, samples, and other submittals, as outlined in Section 01330 – Submittal Procedures of the Main Library Expansion Project, Cambridge, Massachusetts Volume 1 Specifications. The Engineer's review of any submittals shall not release the Contractor from the responsibility to perform the work as detailed in these specifications and in accordance with applicable local, state and federal regulations.

1. Soil and Waste Management Plan (SWMP): The SWMP shall outline measures for sampling, analysis, disposal, and shall identify a waste staging area in the event that soil is stockpiled for subsequent reuse

and/or disposal or unknown materials are encountered. The Contractor's procedures shall be described in the Soil and Fill Management Plan. At a minimum, this plan shall address the following:

a. A list of all transporters and waste facilities, complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor utilizes for waste disposal. In addition, a copy of a memorandum of understanding between the contractor and each disposal facility shall be attached to the Soil and Waste Management Plan. The memorandum of understanding shall detail that the disposal facility agrees to accept a specified quantity of waste as characterized in the contract specifications at an agreed upon price and detail what if any restrictions may apply. A copy of the facility's operating permit shall be provided in the Soil and Waste Management Plan.

b. Disclose a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.

c. Storage provisions for waste material.

d. Procedures for securing the staging area, controlling dust and soil/fill migration, preventing damage to uncontaminated areas via contaminant migration and for decontaminating vehicles and personnel exiting the staging area.

e. Methods and procedures for identifying stockpiled material (e.g., labeling, marking containers) and procedures for identification and tracking.

f. Methods, procedures, and equipment used for obtaining the necessary information needed to satisfy the off-site reuse/disposal facility requirements specified herein an/or by the facility.

g. Methods, procedures, and equipment used for excavating, characterizing, segregating, reusing/backfilling, loading and transportation of contaminated soil/fill materials encountered during excavation operations.

h. Methods, procedures, and equipment proposed for assessing and handling unknown materials in accordance with the contractor-prepared contingency management plan.

i. Provisions for separation of incompatible materials.

j. Protocol for overpacking drums (if encountered).

k. Procedures for consolidating (i.e., bulking) compatible materials for disposal.

l. Procedures for entering the storage area(s) (e.g. sampling stockpiled waste materials in staging area.

m. Prior to off-site disposal or reuse, the Contractor shall provide to the owner a letter from the disposal facility indicating that the facility has reviewed the available data relative to the soil/fill to be delivered and agrees that the soil/fill meets their acceptance criteria. The letter shall be signed by a duly authorized representative of the receiving facility.

2. Contingency Management Plan (CMP): The CMP shall provide details on construction methods, and site location and availability of the staging area(s) for approval by the Owner or Engineer and/or their representative. At a minimum, the CMP shall include provisions for the following:

a. Details on the Contractor's CMP for temporarily staging unknown materials pending characterization. The staging area shall be prepared, tested, lined and bermed as specified.

b. Maintenance requirements for the staging area(s).

c. Any additional storage, handling, characterization and disposal requirements.

d. The Contractor's plan for notifying the Owner and Engineer in the event of an emergency or in the event that an unknown material as defined in this specification is encountered. The plan shall include the phone numbers and names of the Owner's representative(s) that the Contractor would contact in such an event.

3. Spill and Discharge Control Plan (SDCP): This SDCP shall provide contingency measures and reporting responsibilities for potential uncontrolled spills and discharges of contaminated and/or hazardous materials, including, but not limited to, leachate, decontamination

water, sewage, and other on-site waste materials. In addition to the above listed items, the SDCP shall specifically contain:

a. Procedures for containing dry and liquid spills.

b. Absorbent material available on site.

c. Storage of spilled materials.

d. Reporting (i.e., notification) procedures.

e. Decontamination procedures.

f. Discharges of sanitary or combined sewers into storm drains either by flow handling/bypassing or accidental or unintentional discharge.

g. Procedures for protecting wetlands and surrounding public and private property.

At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials sufficient to address a release of fuel oil, hydraulic oil or any other hazardous materials that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site. The Spill and Discharge Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries must be performed in a designated which has either secondary containment or upon an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

4. Spill Incident Report: A written report detailing the uncontrolled spill or discharge shall include, at a minimum, the cause and resolution of incident, outside agencies involved, and date occurred. The report shall be submitted to the Owner within 48 hours of the incident. The Contractor shall document all spills on the as-built Drawings and submit the Drawings to the Owner at project completion. The Contractor shall be responsible for remediating any spills or releases of oil or hazardous materials as a result of the Contractor's activities.

The site shall be remediated to pre-release conditions at no additional cost to the Owner.

5. Notification Procedures: The Owner shall be notified immediately of an uncontrolled spill or discharge. If human health or the environment is threatened, the Contractor shall take immediate action to abate the conditions and notify emergency personnel. In the event of an emergency, the Contractor shall contact the following entities at the earliest possible opportunity:

   a. Owner's designated representatives.

   b. City of Cambridge, DPW

   c. City of Cambridge Fire Department

   d. Engineer

   e. Massachusetts DEP.

   The Contractor shall prepare in advance of work activities a notification list, complete with phone numbers, addresses, and contact names for all parties to be notified (including, but not limited to, the parties listed above) in the event of a spill.

6. Dust, Vapor, and Odor Control Plan (DVOCP): The DVOCP shall include measures to control objectionable dust, vapors, and odors originating from the site. The DVOCP shall describe procedures to minimize the creation of dust, and the control of objectionable vapors and odors originating from the site.

7. Equipment and Personnel Decontamination Plan (EPDP): The EPDP shall indicate the means and methods for decontaminating all equipment and personnel. The EPDP shall also include provisions for installing the equipment decontamination pad in accordance with the Contract Specifications.

1.7 QUALIFICATIONS

A. The Contractor shall demonstrate the necessary skills, experience, training, and qualifications to conduct the work herein specified. In addition the Contractor shall provide the qualifications of each disposal facility that the Contractor intends to use to dispose of non-hazardous solid waste; and if necessary to dispose of hazardous waste (due to lead toxicity); PCB impacted waste and asbestos-containing waste. The Contractor shall hire an Environmental Professional to be assigned to this project to execute the responsibilities detailed in these specifications. The Environmental Professional shall be sufficiently versed in soil characterization, DEP

regulations and policies to execute the work as specified. The Contractor shall provide the qualifications of the Environmental Professional to be assigned to this project. The Environmental Professional shall be at a minimum certified, registered or licensed as an Environmental Professional or equivalent and contain a Bachelor of Science Degree in Environmental Science, or Environmental Engineering, or Public Health or related degree and have sufficient experience in similar work to perform the responsibilities detained herein.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Clean Backfill - Analytical Results: The Contractor shall provide certification that imported topsoil and backfill is free of contaminants. Certification must indicate the point of origin (i.e. where the material was excavated or originated from) and include laboratory analytical results as specified in Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING. The Contractor shall provide a statement that the sample results are representative of the material being provided and that the material is free of organic, or any other unsuitable contaminants and that metal concentrations are consistent with background levels.

B. Stockpile Covers: Excavated materials shall be completely covered with a minimum 10 mil thickness polyethylene tarp and secured with tires, ropes, anchors or equivalent material. The covered system shall be capable of resisting actual wind gusts at the site, with a minimum wind capacity of 40 miles per hour. The stockpile covers shall be installed and secured at the end of each working day and at all times when earthwork is not taking place on site. Stockpile covers shall be immediately recovered should wind forces expose any of the excavated materials. Stockpiles shall also be covered at times as directed by the Engineer. Excavated materials shall be completely covered with a minimum 10-mil-thick layer of polyethylene tarp at the end of each working day.

C. 20 mil Polyethylene Liner: Staging areas for all excavated material shall be lined with 20-mil-thick polyethylene liner in an area designated by the Contractor and agreed to by the Owner, unless paved or concrete surface.

D. Waste Disposal Documentation: Completed Bills of Lading, manifests, certificates of disposal and all other documentation relative to disposal of waste material.

E. Decontamination Pad: The Contractor shall provide all materials and labor to complete a decontamination pad as specified herein. Liner materials, and collection system shall be selected by the Contractor to perform as specified.

PART 3 – EXECUTION

3.1 GENERAL

A. All work in this section shall be performed in accordance with the Contractor's Soil and Waste Management Plan and Health and Safety Plan.

B. The primary concern of the Contractor in the excavating, handling, sampling, bulking, disposal, and on-site storage of soil/fill and/or drummed material (if encountered) shall be to protect the health and safety of the site workers, public, and the environment.

C. The Contractor shall keep a copy of the Health and Safety Plan (HASP) on site during all operations and shall conduct routine health and safety meetings. Failure to keep a copy of the HASP on-site, or any other breach of the Contractor's Plan, shall be cause for stopping work. Delays caused by the Contractor's failure to comply with the health and safety regulations or any health and safety plan shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are implemented and accepted by the Engineer and/or their representative.

D. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site (who are subject to exposure to potentially contaminated soil/fill) shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer and/or their representative.

E. The Contractor shall make available Level C personal protective equipment and clothing, not including respirators, to the Engineer or Owner and/or their representative for use during site visits by the Engineer and/or their representative, up to a maximum of three complete sets per day. These shall be supplied and maintained at no cost to the Owner, and shall be returned to the Contractor upon completion of the work (except for expendable disposal protective clothing). The Contractor shall provide a repository for collection of expendable and disposed health and safety materials. Collection and disposal of contaminated expendable supplies shall be the Contractor's responsibility.

F. The level of dermal and respiratory protection shall be determined based upon continuous air monitoring to be performed by an environmental professional hired by the Contractor. The Engineer or Owner or their representatives may conduct duplicate air monitoring for quality control purposes. As air monitoring indicates the levels of contaminants in the air, the required personal protective equipment shall be determined based upon established standards and the standards set forth in the Contractor's health and safety

plan. Regardless, Level D protection for all on-site personnel is the minimum project requirement.

G. The Contractor shall be aware of site-specific requirements, such as site security during non-working hours, limited work space, and minimizing the effects of soil/fill excavation, in preparing its health and safety program.

3.2 SOIL/FILL CHARACTERIZATION

A. Initial Characterization, Excavation and Handling of Soil/Fill Material Program

1. A summary of existing conditions and investigation findings performed by the Engineer during design are presented in the special provisions supplement to this section. The Contractor shall review the information provided in the special provisions supplement.

2. Soil/fill, which cannot be reused on site, shall be subject to reuse off site or disposal as specified herein. During construction activities excavated soil/fill shall be field-screened by the Contractor hired environmental professional and either loaded directly for off-site disposal (provided the excavated material is consistent with previously conducted investigations); or stockpiled in a soil/fill staging area located by the Contractor and approved by the Owner. (Note: The soil/fill shall not be staged within 100 feet (30.5 meters) of a Reservoir or Area of Critical Environmental Concern nor does the Owner intend to provide a staging area. Soil/fill shall not be staged in the work area over night). Contaminated material requiring additional waste characterization due to waste disposal facility requirements or in order to assess unknown materials, shall be staged pending analytical sampling and characterization by the Contractor's hired environmental professional. All stockpiles shall be covered and maintained as specified herein.

3. Distinctive soil/fill strata shall be segregated based on geotechnical properties, visual, olfactory, and field characterization results utilizing a Photo-Ionization Detector (PID) and DEP jar headspace measurement protocols by the Contractor's environmental professional. Similar material shall be grouped together. Soil/fill which can be reused within the *area of excavation* shall be returned to the *area of excavation*. Soil/fill which cannot be immediately reused at the within the *area of excavation* shall be staged until such time that it can be reused within the *area of excavation*. Soil/fill which can not be reused within the *area of excavation* shall either be pre-characterized or staged pending characterization. Depending upon the analytical test results, the soil/fill shall either be reused on site or disposed/reused off-site. Soil/Fill strata shall be initially segregated as follows:

a. Probable Class A-1 Material: Soil/Fill that does not have any visual or olfactory indication of contamination and has a jar headspace screening result less than 5 parts per million (ppm), as measured by a PID calibrated to benzene equivalents. This material can be reused at the point of origin without additional testing. If it is to be reused as fill on-site at a location other than the point of origin or off-site as fill it must be staged and tested by the Contractor. This material is to be sampled separately due to the probability of an absence of contamination. If test results confirm the absence of contamination this material is to be segregated during construction activities as suitable for re-use on site as backfill (provided it meets Contract Specifications) or it may be used at any location where it is consistent with background conditions. Provided analytical results support the determination of no contamination this material does not have to be disposed or transported under a Massachusetts Bill of Lading.

b. Probable Class A-2 Material: Soil/Fill that exhibits low visual or olfactory indications of contamination (i.e. less than 5% by volume of foreign materials or by a faint foreign odor) and is suspected of containing low levels of contamination (i.e., impacted soil/material which has constituent(s) above background levels but below DEP Reportable Concentrations [RCS-1]) shall be separated as probable Class A-2 material. Soil with jar headspace results between 6 and 10 ppm, and/or contains a low level of foreign material as evidenced visually or by olfactory techniques shall be placed in this category. This material is to be sampled separately due to the probability of containing either low or no levels of contamination. The analytical results shall determine the final reuse/disposal option.

c. Probable Class B-1/B-2 Material: Soil/Fill suspected of having moderate levels of contamination (i.e., equal to or greater than the applicable reportable concentration but suitable for reuse at a licensed in state landfill as daily cover. Soil with jar headspace results between 10 ppm and 100 ppm or soil containing significant visual (i.e. > 5% foreign material by volume) or olfactory evidence of contaminants. This material is to be sampled separately due to the potential of exceeding DEP's reportable concentrations but within the guidelines for reuse as daily cover at a landfill. The analytical results shall determine the final reuse/disposal option.

d. Probable Class B-3 through B-6 Material: Soil/Fill suspected of having high levels of contamination (i.e., equal to or

greater than the applicable reportable concentration but suitable for disposal at a licensed non-hazardous solid waste facility). Soil with jar headspace results greater than 100 ppm or soil containing significant visual (i.e. > 5% foreign material by volume) or strong olfactory evidence of contaminants. This material is to be sampled separately due to the potential of exceeding DEP's guidelines for reuse as daily cover at a landfill and requiring either recycling at an asphalt batch plant or as solid waste at an appropriately permitted disposal facility. The analytical results shall determine the final reuse/disposal option.

e. Probable Class C Material: Soil/Fill suspected of being a hazardous waste as defined by the Resource Conservation and Recovery Act or the Toxic Substances and Control Act. Material with visually gross levels of contamination, including free product or containing evidence of hazardous constituents including but not limited to indications of tannery wastes or coal tar or any other waste which may contain elevated levels of pollutants, shall be placed in this category. This material is to be sampled separately due to the potential of exceeding RCRA or TSCA hazardous waste thresholds requiring disposal at an appropriately permitted hazardous waste facility.

f. Probable Asbestos Containing Material: Soil/Fill suspected of containing asbestos as evidence by the presence of suspect asbestos-containing building debris such as cementitious piping, vinyl floor tiling, roofing paper or paper-like insulation materials or any other suspect asbestos containing material observed in the soil/fill.

g. Unknown Material. Any material, soil or fill, that is not readily identifiable as non-hazardous waste, and has not been previously characterized or encountered during site investigation activities. Such wastes include; unlabelled drums or containers containing material which is not readily identifiable as non-hazardous substances, any material which varies significantly from material previously observed on site and can not be readily identified as a non-hazardous substance shall be handled as an unknown potentially hazardous substance as specified herein. Previously encountered material shall include but not be limited to urban fill and miscellaneous debris (such as brick, ash, glass, metal, lead and petroleum impacted soil and fill regardless of the level of contamination present).

h. If there is more than one type of soil/fill strata with varying degrees of geotechnical properties, additional segregation shall be performed.

B. Final Waste Characterization of Soil/Fill Material

Final waste characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the disposal facility(ies) characterization requirements in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements, Disposal or reuse of the material shall depend on sampling and characterization analytical results. At a minimum, each stockpile shall be sampled for Total Petroleum Hydrocarbons, Volatile and Extractable Petroleum Hydrocarbons with Polyaromatic hydrocarbon (PAH) quantification and for Total RCRA 8 Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag) in accordance with current industry standards for waste analysis.

C. Contingent Materials Characterization (i.e. Characterization of Unknown Materials)

If unknown material is encountered during excavation, the Contractor or the contractor-hired environmental professional shall immediately contact the Owner and Owner's representative to discuss the nature and extent of the unknown material and to assess potential hazards and appropriate handling procedures. The material shall be segregated from other soil and solid waste material. Prior to handling and removing the unknown material from the excavation area, the Contractor and Owner and/or its representatives, shall visually assess the material and its potential hazards. Drummed material shall be assessed to determine whether it is leaking, bulging, crushed, or empty. Crushed, empty, and/or skeletal parts of drums shall be handled as solid waste, as specified. In addition, the drums shall be inspected for signs of reactive waste (e.g., bulging drum, specialty metal drum). The Contractor shall record any identification or markings on the drummed materials. An information sheet shall be developed as part of the Contractor's Soil and Waste Management Plan, upon which the Contractor shall record information such as container type, size, and condition; type of materials being stored; and any identifying characteristics of the material being stored. The format of the information sheet shall be as approved by the Owner and/or its representatives.

1. If additional characterization is required because unknown materials are encountered or temporary staging is needed for any reason the staging area shall be secured and prepared as specified herein. Stockpiles shall be characterized as necessary by the Contractor's environmental professional to comply to the disposal facility's pre-characterization requirements. In addition, stockpiles of unknown material shall require characterization, as specified below:

2. Unknown material shall be fully characterized prior to disposal. At a minimum, the Contractor shall use the following EPA methods (unless more current methods have been adopted and approved by the EPA) for characterizing potentially hazardous or unknown material samples:

   a. Ignitability - EPA 1010
   b. Corrosivity - EPA 9040/9045
   c. Reactivity:
      1) Cyanide - EPA 9012
      2) Sulfide - EPA 9030
   d. Free Liquids - EPA 9095
   e. Pesticides for liquid drummed material only - EPA 8081/8140
   f. PCBs - EPA 8082
   g. Solid Waste Profile Characterization:
      1) Total Semi-Volatiles - EPA 8270
      2) Total Volatiles - EPA 8260
      3) Total Pesticides - EPA 8081
      4) Total Herbicides - EPA 8150
      5) Total RCRA 8 Metals - EPA 6000 and 7000 series
      6) Total Petroleum Hydrocarbons (EPA 8100)
      7) VPH/EPH Methodology as specified by MA DEP Policy.
   h. RCRA Toxicity:
      1) Toxicity Characteristic Leaching Procedure (TCLP) Preparation - EPA 1311
      2) TCLP Semi-Volatiles - EPA 8270
      3) TCLP Volatiles - EPA 8260
      4) TCLP Pesticides - EPA 8081. Only solid drummed material shall be analyzed for the TCLP pesticides because liquid drummed material is tested for pesticides using EPA 8081/8140.
      5) TCLP Herbicides - EPA 8150
      6) TCLP Metals - EPA 6010 and 7470

3. Stockpiles within the staging shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner including the cost of imported fill material used in its place.

D. <u>Disposal Facility Characterization Requirements:</u>

1. Additional characterization requirements may vary, depending on disposal facility permits and policies. The Contractor shall be responsible for determining the disposal facility(ies) characterization

needs in advance to facilitate timely disposal and to adequately estimate the disposal costs. Transportation of the wastes shall be accompanied by the appropriate manifests such as a Massachusetts DEP Bill of Lading, as required in 310 CMR 40.0030, a Waste Material Shipping Record or by a Uniform Hazardous Waste Manifest.

E. Characterization of Potential Asbestos-Containing Material:

1. Although no asbestos-containing material has been discovered on site to date, it is not uncommon to encounter such material at sites consistent with the historical development of the area. To the degree that suspect asbestos-containing materials (e.g., tiles, asbestos-cement pipe or shingle, or any other suspect asbestos-containing material) are encountered, it shall be segregated, stockpiled separately, and tested for asbestos content using Polarized Light Microscopy. Workers handling suspect asbestos-containing materials shall be properly trained and equipped to handle asbestos materials.

2. Materials which test positive for asbestos (i.e. greater than 1% asbestos) shall be handled in accordance with the provisions set forth in Cambridge Ordinance 8.61.040. The contractor shall include one or more of the dust mitigation and assurance measures specified in the Ordinance. At a minimum the Contract shall adequately wet soil/fill during soil/fill disturbance activities. Additional mitigative measures as specified in 8.61.040c shall be initiated if the conditions set forth in the ordinance become present. Asbestos-containing material shall be disposed at an appropriately permitted facility.

3.3 FINAL CHARACTERIZATION OF SOIL AND FILL MATERIAL

A. All excavated soil/fill that is geotechnically suitable for reuse shall be reused within the *area of excavation* or elsewhere on site to the maximum extent possible before being stockpiled or disposed off-site. Reuse of geotechnically suitable material at the *area of excavation* will not require analytical characterization. However, in no case can potentially contaminated material be used in an area which is either clean or not as contaminated as the material being used for backfill. The Contractor-hired environmental professional shall be present to direct soil/fill handling activities including segregating soil/fill consistent with field observations and/or the findings of the pre-characterization program. Excavated material shall be tracked to avoid cross-contamination of non-impacted areas. If contaminated material must be moved from the *area of excavation*, it shall be staged and handled in accordance with field screening observations and characterization data.

B. Following receipt of analytical test results, excavated soil/fill are expected to be segregated into the following categories:

Class A-1
Class A-2
Class B-1
Class B-2
Class B-3
Class B-4
Class B-5
Class B-6
Class C-1
Class C-2
Asbestos-Containing Soil/Fill
PCB-Contaminated Soil/Fill

C. The Contractor shall perform additional segregation based on disposal facility requirements.

3.4 STAGING AREA

A. Excavated material requiring additional waste characterization shall be staged in a designated area(s) selected by the Contractor and agreed to by the Owner. The Contractor shall select an area(s) that will not impair or impede construction activities. The staging area(s) shall be readily accessible and sized to adequately stage material pending either transport to an interim staging area(s) for characterization sampling and analysis or transported directly to the disposal facility.

B. Prior to staging any materials the Contractor shall pre-characterize the surface soils (0-6") at the staging area(s) to document the existing conditions. A minimum of two surface soil samples or one surface soil sample for every 2000 square feet (185.8 square meters) of staging area (whichever is greater) shall be collected by the contractor prior to staging materials at the location unless the staging area is comprised of an impervious surface material such as asphalt or concrete; in which case the Contractor shall sample an equivalent area as determined by the Engineer. Equivalent areas may include adjacent areas or nearby catch basins/storm drains. The samples shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), and petroleum hydrocarbons (EPA Method 8100).

C. The Contractor shall re-sample the staging area(s) at the same location, depth and frequency as conducted prior to staging materials, after removal of all staged materials, to assess any impact from using the area to stage soil/fill or unknown materials. The sample(s) shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082).

D. If there is a significant increase in contamination reported in the staging area following use by the Contractor, the Contractor shall remediate the staging area to pre-existing conditions. For the purposes of this contract a significant increase shall be defined as any detection of a contaminant that was not previously detected and was a known constituent in the soil stockpiled within the staging area, or a ten-fold increase in any contaminant, or an increase of any contaminant that was previously below a DEP reportable concentration but is later reported above the reportable concentration.

E. Stockpiles located within the soil/fill staging areas shall be placed on a 20-mil HDPE liner/filter fabric unless soil is placed on asphalt or concrete surface and bermed to prevent any contamination of the staging area. The berms shall be made a minimum of 2 feet (609.6 mm) above the existing grade with concrete barriers, hay bales or equivalent berm material. Berms shall not be constructed of excavated soil/fill. Waste characterized as RCRA hazardous waste shall not be stored on site for a period greater than sixty (60) days. All other waste must be disposed off-site within ninety (90) days of excavation. At the end of each working day, contaminated soil/fill shall be covered with 10-mil polyethylene to minimize the potential for release of contaminants.

F. Stockpiles shall be segregated based on visual, olfactory, and field screening results. Similar material may be stockpiled together; however, no stockpile shall be greater than 1000 cubic yards (764.555 cu. meters). Each stockpile shall be clearly separable from adjacent stockpiles.

G. Stockpiles shall be clearly designated by a signpost or marker that can be cross-referenced with samples collected from the pile for characterization purposes. The signs/markers shall not be moved, except by authorized personnel and not until the soil/fill is ready to be either reused on site or loaded for off-site disposal.

H. Separate staging areas shall be constructed to handle potentially hazardous soil/fill, debris and drummed materials or unknown materials encountered during the project. The Contractor's Soil and Fill Management Plan shall provide construction details of the dimensions and protective measures proposed for the staging area(s). The construction details and protective measures shall be subject to the approval of the Owner and/or its representatives. The Contractor shall select the area to facilitate handling of the material and to minimize interference with other ongoing construction activities.

3.5 UNKNOWN MATERIALS AND SUSPECTED HAZARDOUS WASTE STORAGE AREA

A. If necessary, the Contractor shall construct a separate staging area for unknown materials. The staging area shall be prepared pre-characterized, lined and bermed as specified above. The Contractor shall use 10-mil-thick

polyethylene to cover potentially contaminated waste stockpiles or use approved roll-off containers.

B. The Contractor shall use only rubber-tired equipment when handling drummed or suspect asbestos containing material. Drummed material shall be staged such that cleaning, labeling, opening, sampling, bulking, and initial storage of materials occurs in the drum staging area. Drummed waste shall be segregated (i.e., organized into different areas within the drum/material staging area) to facilitate opening, sampling, characterization, and bulking. Individual drums shall be handled in accordance with EPA drum handling procedures and positioned such that the labels are clearly visible.

C. The Contractor shall furnish the necessary monitoring, emergency, and material handling equipment for the drum handling area, as required. The Contractor shall submit for approval, as part of the Soil and Fill Management Plan, a detailed description with drawings, if necessary, of the proposed location and construction and covering procedures for the drum/material handling and staging area. All spill control measures shall be implemented as specified in the Contractor-prepared, Spill Discharge and Control Plan.

D. This area shall be used for preliminary assessment of the unknown materials. The Contractor shall furnish this staging area with the necessary monitoring, emergency, and material handling equipment (e.g., overpacks, absorbent, shovels, fire suppressants), as required. Water tight hazardous waste roll-off containers may be used in lieu of establishing a lined and bermed staging area provided the containers are covered and do not accumulate rain water.

3.6 EQUIPMENT AND PERSONNEL DECONTAMINATION

A. The Contractor shall establish a site-specific decontamination protocol for personnel and equipment utilized at the subject site. The Contractor shall construct and maintain personnel and equipment decontamination areas for the proposed work. The Contractor shall decontaminate personnel and all construction and ancillary equipment in the Contamination Reduction Zone (CRZ) as it leaves the contaminated zone, prior to it entering the Clean/Support Zone (SZ). The Contractor shall have the decontamination protocol as part of its site-specific HASP.

B. The decontamination protocol shall include;

1. The means, methods, and materials for the proposed decontamination procedures;
2. The procedures employed to contain and store the wash or rinse liquids/sludges;
3. Procedures used to sample, analyze, and characterize the contaminated wash or rinse liquids/sludges;

4. Procedures to contain or clean contaminated personal protective equipment and clothing;

5. The procedures for handling and disposing of solid wastes generated from site decontamination activities;

6. Provide a sketch showing how the decontamination area will be set up and where it will be located.

C. All sample analysis or sample compositing shall be completed by a Massachusetts-certified laboratory. The Contractor shall be responsible for the cost of this analytical work. The Contractor shall submit a copy of the analytical results and laboratory certifications to the Owner for review prior to proceeding with disposal. The Contractor shall be responsible to properly manifest and dispose of all residual wastes generated from on-site activities in conformance with federal, state, and local environmental and transportation regulations. The Contractor shall be responsible for the manifests and procedures to be used to package and dispose of contaminated solid wastes, wash, or rinse liquids at an EPA or state-approved treatment or disposal facility. The Contractor shall be responsible for any releases from site or decontamination activities due to its work, and shall remediate any release for which the Contractor is responsible to pre-existing conditions at the contractor's expense.

D. An equipment and personnel decontamination area, conforming with the Contractor's HASP and these Specifications, shall be constructed in such a manner to protect existing site surfaces, materials, and structures from contamination. The area shall be sized adequately to provide for the decontamination of the largest piece of equipment to be decontaminated. Filter fabric shall be placed over an impermeable liner to protect the liner from rips, punctures, or tears from traffic and heavy equipment.

E. Provisions for collecting decontamination water shall be incorporated into the maintenance of the decontamination pad and shall include placing an impermeable liner over a sloped surface such that water is directed, if necessary, into an area for subsequent pumping to 55-gallon drums or other appropriate tankage. Following completion of the work, the wash water shall be characterized by the Contractor and disposed off-site, in accordance with federal, state, and local regulations.

3.7 ENVIRONMENTAL FIELD MONITORING

A. During construction, the Contractor shall conduct environmental air monitoring immediately around the areas where construction activities involve soil/fill handling such as excavation, re-location, staging, loading or grading of soil/fill and/or waste materials. Air monitoring shall involve direct

reading instruments capable of providing real-time indications of air contaminants to protect on-site personnel and the local population. The frequency of air monitoring shall be determined by an Industrial Hygienist or qualified environmental health professional hired by the Contractor. The Contractor's Site Health and Safety Officer and Superintendent shall be responsible for ensuring that monitoring is conducted in an appropriate manner, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.

B. The air-monitoring program shall be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind, and two downwind conditions from each location where there is a potential for dust being generated. The air monitoring information including air monitoring in the vicinity of all site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health and Safety Plan. The Contractor shall submit an air quality monitoring program for review and comment prior to commencement of site activities.

C. Air monitoring shall be performed by the Contractor during all soil/fill-handling operations. At a minimum, detectors for organic contaminants and dust should be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g. excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information by the Contractor. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions and personnel protection measures.

D. The Contractor shall hire an environmental professional to keep accurate documentation of all air monitoring, which shall be made available to the Engineer or Owner upon request.

3.8 DUST CONTROL

A. 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.

B. 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.

C. 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. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.

D. 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.

E. Access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

F. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall inspect the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.

G. All stockpiles of waste material shall be covered at the end of the day with a polyethylene sheeting, a minimum of 10-mil-thick, to eliminate the generation of dust. The Contractor shall be responsible for inspecting the covers daily to ensure the covers are in place and effectively eliminating the generation of dust. Water shall not be used on stockpiles to reduce the generation of dust.

3.9 VAPOR AND ODOR CONTROL

A. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's Vapor and Odor control Plan. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants, or other methods to reduce off-site odors to acceptable levels. The Contractor shall not use suitable soil material as cover to control vapor and odors.

3.10 BULKING

A. Following characterization and compatibility testing of waste material, the Contractor shall place compatible materials into common containers to reduce transport and disposal costs. In addition, materials that are improperly contained shall be transferred into the appropriate containers. Drums and containers used during this project shall meet the appropriate DOT, OSHA,

and EPA regulations for the materials contained. The Contractor shall describe the bulking procedures in the Soil and Fill Management Plan.

3.11 CONTAMINATED LIQUIDS

A. The Contractor shall collect and properly dispose of contaminated liquids and other liquids generated or encountered on site during construction. Contaminated liquid sources include groundwater encountered during excavation, decontamination water, and drummed liquids encountered during excavation. Contaminated liquids shall be handled in accordance with the Massachusetts Contingency Plan (MCP), 310 CMR 40.0040 as well as all other applicable regulations. Any construction dewatering wastes which are discharged shall be subject to applicable state and federal regulations. The Contractor shall be responsible for treating the groundwater as required by applicable regulations depending upon the discharge method utilized by the Contractor.

3.12 SEDIMENTATION AND EROSION CONTROL

A. The Contractor shall plan and execute all operations, particularly those associated with excavation and backfilling, in such a manner as to prohibit excavated and exposed soil/fill or other foreign material to be washed or otherwise carried into streets, drains or waterways. The water quality of waterways, or storm drains shall not be degraded due to construction operations.

B. It is the intent of these Specifications to prevent the unnecessary occurrence of sedimentation or siltation of storm drains and watercourses. In the event that sedimentation or siltation prevention measures used by the Contractor prove to be inadequate the Contractor shall be required to adjust his operations to the extent necessary to prevent any such sedimentation or siltation from occurring. Any damage or degradation caused by inadequate controls shall be repaired and restored to pre-existing conditions by the Contractor at no additional cost to the Owner.

C. The Contractor shall keep drains, streams and other water crossings clear of mud, silt, debris, or other objectionable materials resulting from construction operations.

D. The Contractor shall use temporary vegetation and mulching to protect areas exposed during construction. The contractor shall minimize the amount of bare earth exposed at any one time during construction, and minimize the length of time bare earth is exposed.

E. Baled hay and filter materials shall be placed to form temporary water stops, dams, diversions, dikes, berms, and for other uses connected with water pollution control. As required by the Owner and/or their representative, bales

shall be disposed by the Contractor as best suits field conditions and requirements.

F. On sloping terrain, hay bales shall be used to trap sediment until vegetation has become established. The details of their placement shall be incorporated into the Erosion and Sedimentation Control Plan, as approved by the Owner or Engineer.

G. Sediment-laden water that is being pumped from the trenches or excavations shall not be pumped directly into storm drains or watercourses. Sedimentation tanks or other means acceptable to the Owner or Engineer shall be used for this purpose.

H. All excavated soil/fill shall be handled in accordance with the Contractor-prepared, Owner or Engineer -accepted, Soil and Fill Management Plan.

3.13 OFF-SITE DISPOSAL OF WASTE MATERIALS

A. Material determined to be unsuitable for on-site reuse shall be transported and disposed as specified in Section 02095 – TRANSPORTATION AND DISPOSAL OF WASTE MATERIAL by a licensed hauler to an appropriately permitted disposal facility. The waste shall be accompanied by the appropriate manifests and bills of lading as required by state and federal regulations. No payments shall be issued for waste which is not fully documented and certified as disposed. Disposal shall be in conformance with all local, state, and federal regulations, particularly EPA and DEP waste disposal regulations.

B. The Contractor shall provide for the proper collection, handling, and disposal of decontaminated materials and liquids resulting from construction operations at the site. Disposal shall be in conformance with federal, state, and local regulations.

3.14 BACKFILLING AND COMPACTION

A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Any off-site backfill used in excavated areas shall be in accordance with these specifications, and which has been tested and certified as free of contaminants and as specified in Section 02210 – EXCAVATION, BACKFILL, FILL AND GRADING. In order to minimize the volume of imported clean fill used on the site the Contractor shall use on-site soil/fill to the maximum extent possible which has been determined suitable for reuse.

PART 4 – COMPENSATION

4.1 GENERAL

A. Measurement and Payment for Soil/Fill Management 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; furnishing, installing, constructing, and testing the work covered under that item; 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 soil/fill management 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 managing and characterizing 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 excavating, handling and characterizing soil and fill other than allowed for in the following payment items shall be incorporated into the Contractor's lump sum bid price for soil and fill management. A minimum unit bid cost has been established for each unit price bid item. The Contractor is directed to review the minimum unit bid price and increase it within the FORMS FOR GENERAL BID as the Contractor sees fit. The Contractor is not obligated to accept the minimum unit price indicated but shall not reduce it. The minimum unit price established may be below actual market cost and is provided to avoid unbalanced bidding. The Contractor is directed to review the minimum unit price presented and develop a competitive unit price for inclusion in the FORMS FOR GENERAL BID. Any bids received which do not present a unit price entered by the Contractor within the FORMS FOR GENERAL BID 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 cubic yards shall be subject to verification by the Engineer by calculation of the in-place volume using the horizontal and vertical trench pay limits defined in the Contract 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. 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.

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 asbestos contaminated material; 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.

Item 2080.1A – Bid Alternate 1 Additional 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 Bid Alternate 1 Additional OHM - Soil and Waste Management shall be based on the lump sum price complete for this item in the proposal. The Contractor shall furnish all additional labor, materials, tools, equipment, and incidentals required for Soil and Waste Management. The work includes, but is not limited to the additional level of effort associated with; the Environmental Professional; the 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 asbestos contaminated material; 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

SECTION 02095

TRANSPORTATION AND DISPOSAL OF SOIL AND FILL

2095.1	**OHM - DISPOSAL OF SOIL – IMPACTED <RCS-1 (CLASS A-2)**	**TON**
2095.1A	**OHM - DISPOSAL OF SOIL – IMPACTED <RCS-1 (CLASS A-2) (BID ALTERNATE 1)**	**TON**
2095.2	**OHM - DISPOSAL OF SOIL – DAILY COVER UNLINED LANDFILL (CLASS B-1)**	**TON**
2095.2A	**OHM - DISPOSAL OF SOIL – DAILY COVER UNLINED LANDFILL (CLASS B-1) (BID ALTERNATE 1)**	**TON**
2095.3	**OHM - DISPOSAL OF SOIL – DAILY COVER LINED LANDFILL (CLASS B-2)**	**TON**
2095.3A	**OHM - DISPOSAL OF SOIL – DAILY COVER LINED LANDFILL (CLASS B-2) (BID ALTERNATE 1)**	**TON**
2095.4	**OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE ASPHALT BATCHING IN-STATE (CLASS B-3)**	**TON**
2095.4A	**OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE ASPHALT BATCHING IN-STATE (CLASS B-3) (BID ALTERNATE 1)**	**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 RECYCLING (CLASS B-5)**	**TON**
2095.7	**OHM - DISPOSAL OF SOIL – NON-HAZARDOUS SOLID WASTE (CLASS B-6)**	**TON**
2095.8	**OHM - DISPOSAL OF SOIL – TREAT AND DISPOSE OF TOXIC LEAD SOIL RCRA HAZARDOUS WASTE (CLASS C-1)**	**TON**
2095.9	**OHM - DISPOSAL OF SOIL – RCRA HAZARDOUS WASTE (CLASS C-2)**	**TON**
2095.10	**OHM - DISPOSAL OF ASBESTOS WASTE**	**TON**
2095.11	**OHM - DISPOSAL OF PCB/TSCA CONTAMINATED SOILS**	**TON**

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals required to transport waste material off site, and dispose, reuse or recycle excess soil or waste materials at a licensed facility approved by the Owner.

B. All personnel involved in the transportation of waste from the site shall have the required 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 and bills of lading for all waste disposed off site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Copies of all waste manifests shall be provided to the Owner within 10 days. It is the responsibility of the Contractor to complete all waste manifests and bills of lading completely and accurately prior to submitting them to the Owner. The Contractor shall be responsible for preparing Licensed Site Professional (LSP) opinion letters to disposal facilities and providing Qualified Environmental Professional signatures on Material Shipping Records and coordinating disposal documentation with all parties. The Owner's LSP and the Owner

shall the sign any DEP Bill of Lading forms where required only after the Contractor has properly prepared and submitted the DEP forms. The Contractor shall reimburse the Owner for any and all fines associated with inaccurate, incorrect, or improperly completed waste manifests, including fines resulting from late or untimely submittals.

3. Disclose a summary of the history of compliance for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.

4. Prior to transporting any soils or fill material to a disposal facility the Contractor shall submit a letter from the disposal facility indicating that the facility has reviewed the available data and the generator's profile of the material and the facility agrees that it meets the facility's acceptance criteria.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide completed Bills of Lading, Material Shipping Records, manifests, certificates of disposal, weight slips and all other documentation relative to disposal, reuse or recycling of soil and waste material.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall reuse, recycle or dispose of all excess soil and wastes resulting from excavation activities in accordance with federal, state and local regulations and these specifications. Transport shall be by a permitted and licensed waste transporter. The Contractor shall be responsible for supplying the proper manifests to be approved and signed by a representative of the Owner.

B. Prior to disposal, it shall be the responsibility of the Contractor to maintain segregated waste stockpiles in conformance with all applicable federal,

state, and local waste disposal regulations and as specified in Section 02080 - SOIL AND WASTE MANAGEMENT.

C. The Contractor shall be responsible for preparing and keeping in proper order all waste manifests, and shall designate one person who shall be made available to sign all transportation documentation. The Contractor shall be responsible for obtaining the generator's signature and all other signatures required for the proper completion of the manifests. The Contractor shall allow a minimum of five working days from the date of the submittal for any documents requiring the signature of the Owner and/or the 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, asbestos cement, tree stumps, brush, and grass cuttings will utilize truck or dumpsters specifically designed to ensure that material, dust, or liquid is not released in transit. No truck shall be allowed to exit the site until all free liquids are drained from soil/fill being transported off-site. Material shall be covered at all times. The vehicle in which the waste is transported shall be driven directly to the intended destination without any stops or detours in between, except those necessary in response to road conditions, vehicle service needs, or emergencies. Discharge or release of material during transport shall be immediately reported to the Owner. Transporters shall clean up any discharge that occurs in transit, at the Contractor's expense.

B. The disposal site shall be permitted by the state in which the facility is located to receive and dispose of solid waste, and shall be approved for use by the Owner. The Contractor shall provide copies of the disposal facility's operating permit.

C. Manifesting of solid waste shall be required and shall include vehicle identification; date of loading and disposal; tonnage, as measured at the disposal site; and signature of the Owner and/or its representative, transporter, and disposal facility's representative. Transportation of the wastes shall be accompanied by the appropriate manifests such as a Massachusetts DEP Bill of Lading, as required in the Code of Massachusetts Regulations (CMR) 310 CMR 40.0030, a Waste Material Shipping Record or by a Uniform Hazardous Waste Manifest. The original shall be returned to the Owner, and/or their representative, within ten (10) working days of disposal.

D. All solid waste shall be disposed in accordance with all applicable federal, state and local laws and regulations, as well as all other state laws through which the waste material is being transported.

3.3 HAZARDOUS WASTES

A. Transporters of hazardous wastes shall be in conformance with 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 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 lump sum bid price for soil and fill 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.

2095.1 – OHM - Disposal of Soil – Impacted <RCS-1 (Class A-2)
2095.1A – OHM - Disposal of Soil – Impacted <RCS-1 (Class A-2) (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Impacted <RCS-1 (Class 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 DEP BWSC Bill of Lading form. Measurement shall be verified as described above and the lesser weight, 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 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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Impacted <RCS-1 (Class 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 – Impacted <RCS-1 (Class A-2). The work includes, but is not limited to; load, transport, and dispose soil/fill which has been tested and determined to be above background conditions but less than Massachusetts Contingency Plan Reportable Concentrations for S-1 soils (<RCS-1).

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.

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)
2095.2A – OHM - Disposal of Soil – Daily Cover Unlined Landfill (Class B-1) (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

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 DEP 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 or 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)
2095.3A – OHM - Disposal of Soil – Daily Cover Lined Landfill (Class B-2) (BID ALTERNATE 1)

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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

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 DEP 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)
2095.4A – OHM - Disposal of Soil – Non-Hazardous Solid Waste Asphalt Batching In-State (Class B-3) (BID ALTERNATE 1)

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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

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 DEP 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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

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 Recycling (Class B-5)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Recycling (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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste Recycling (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 Recycling (Class B-5). The work includes, but is not limited to; handle, load, transport, and dispose at an appropriately permitted, solid waste facility; and all soil/fill that contain concentrations of contaminants that require removal to a solid waste recycling facility and are not classified as RCRA Hazardous Waste (Class C-2); 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 – Non-Hazardous Solid Waste Disposal (Class B-6)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil – Non-Hazardous Solid Waste (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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of Soil – 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 – 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, 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 – Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (Class C-1)

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Soil - Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (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 DEP 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 – Treat and Dispose of Toxic Lead Soil RCRA Hazardous Waste (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 DEP 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 Asbestos Waste

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal of Asbestos 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 DEP 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 Asbestos 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 Asbestos 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.

2095.11 - OHM - Disposal of PCB/TSCA Contaminated Soils

METHOD OF MEASUREMENT:
Measurement for Payment for OHM - Disposal PCB/TSCA Contaminated Soils 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 DEP 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.

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 regardless of whether the Contractor chooses to dispose of as one of the higher unit price options.

BASIS OF PAYMENT / INCLUSIONS:
Payment for OHM - Disposal of PCB/TSCA Contaminated Soils 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 PCB/TSCA Contaminated Soils. The work includes, but is not limited to; handle, load, transport and dispose at an approved PCB/TSCA receiving facility all soil and fill determined through testing to be contaminated with PCB/TSCA; 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; and disposal of construction debris.

END OF SECTION 02095

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SECTION 02100

SITE PREPARATION AND TREE PRUNING

2100.1 TREE PROTECTION AND MAINTENANCE LUMP SUM

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.

1.2 DESCRIPTION

A. Clear and grub City and private trees designated for removal within the limit of work as required and prune City trees within the limit of work and private trees as needed within the limit of work, under the direction of a Massachusetts Certified Arborist. 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.

B. Conduct site clearing and pruning operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

C. 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.

D. The "Tree Assessment" dated March 25, 2009 in the Appendix C includes an evaluation of the existing trees within the project limits and tree requirements during construction.

E. The Contractor shall take the utmost care to avoid unauthorized, unnecessary or improper wounding of public 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.

1.3 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 02900 – Landscaping

PART 2 – PRODUCTS

2.1 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, and which can potentially be damaged by construction operations, shall be boxed and protected. 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" which is included in the Special Conditions.

B. Protect trees and improvements on adjoining properties and on Owner's property. Restore improvements damage by Contractor's clearing and construction activities to their original condition, at no additional expense to the Owner. Remove and replace trees damaged by Contractor's clearing and construction activities at no additional expense to the Owner.

2.2 PROTECTION OF EXISTING TREES

A. Protect existing trees and other vegetation indicated to remain in place or

outside of the clearing/grading limit lines indicated on the drawings in accordance with Article 56 of the Special Conditions.

B. Erect and maintain temporary rigid fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. At sidewalk tree pits, the entire perimeter of the tree pit shall be fenced. At a minimum, and only if the Engineer determines that the preceding measures are not feasible, wrap the trunks of all trees with a durable material such as two by four lumber sufficient to protect tree trunks from mechanical damage. Remove fence and wrapping when construction is complete.

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.

3.2 TREE PROTECTION

A. Roots that cannot be avoided during construction shall be carefully and cleanly cut or shaved. Only hand methods for grubbing roots will be accepted inside drip lines of trees to be left standing. All root pruning and shaving must be completed under the supervision of the City Arborist. Root pruning shall include application of root treatment or fertilizer as required.

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.

3.3 MAINTENANCE PRUNING

A. The primary objective is to maintain or improve tree health and structure, and includes hazard reduction pruning. Maintenance pruning shall consist of one or more of the following pruning types:

1. *Crown Cleaning*: Crown cleaning shall consist of the selective removal of dead, dying diseased, weak branches and water sprouts from the tree's crown.

2. *Crown Thinning:* Crown thinning shall consist of the selective removal of branches to increase light penetration air movement, and reduce weight. No more than 25% of the tree's living branches shall be removed.

3. *Crown Raising:* Crown raising shall consist of the removal of the lowering branches to a height no greater than fourteen feet (14') above the roadway and eight feet (8') above the 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

4. *Crown Reduction:* Crown reduction shall consist of reducing the height and/or spread of a tree.

5. *Crown Restoration:* Crown restoration shall be used to improve the structure, form and appearance of trees that have been severely headed, vandalized or storm damaged.

3.4 YOUNG TREE PRUNING

A. During the First Three Years After Planting:

1. 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.

B. Between Four and Six Years After Planting:

1. 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.

3.5 PRUNING TECHNIQUES

A. Thinning:

1. A thinning cut shall be used to remove a branch at its point of attachment or to shorten it to a lateral large enough (at least one-half the diameter of the cut being made) to assume the terminal role, also called drop crotching. This also applies to crown reduction pruning. Thinning cuts shall be used to effectively direct growth and retain the natural form of the tree.

B. Heading:

1. A heading cut shall be used to remove a branch to a stub, a bud or a lateral not large enough to assume the terminal role. This type of cut shall be avoided.

C. Location of Pruning Cuts

1. When removing a live branch, make the pruning cut just outside the branch collar. When removing a dead branch, the final cut shall be made outside the collar even if the collar has grown out along the dead branch.

2. To prevent tearing or stripping the bark when removing a large

branch, remove most of the branch by making two cuts, the first from below and the second from above, close to the first cut. The remaining stub shall be removed just outside the collar. This is the "Three Point Cut."

D. Pruning Severity

1. 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). No more than one-third of the live foliage of a tree shall be removed at one time without good reason.

2. Pruning cuts shall be clean and smooth with the bark at the edge of the cut firmly attached to the wood.

3. Large or heavy branches that cannot be thrown clear shall be lowered on ropes to present injury to the tree and other property.

4. Climbing and pruning practices shall not injure the tree except for pruning cuts. The use of climbing spurs shall be avoided. Spurs may be used to reach an injured climber or when removing a tree.

5. Rope injury to trees from leading out heavy wood shall be avoided by using a cambium guard or installing a false crotch.

3.6 TEMPORARY REMOVAL OF TOPSOIL, SHRUBS AND VEGETATION

A. Topsoil, shrubs, and vegetation to be temporarily removed shall be carefully removed over all 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 Owner.

3.7 DISPOSAL OF WASTE MATERIALS

A. Remove waste materials and unsuitable topsoil from Owner's property 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.

3.8 SPECIAL REQUIREMENTS

A. The Contractor is required to notice 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 Owner's requirements. See Special Conditions.

B. For definitions and pruning standards, the Contractor is required to the enclosed ANSI A300, American National Standard for Tree Care Operations "Tree, Shrub and Other Woody Plant Maintenance Standard Practices". See Exhibits of these Specifications.

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 Engineer.

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; tree maintenance; root and branch pruning; furnishing, installing, maintaining, and removing drip line or tree pit fencing and/or tree wrap; and covering exposed roots with moist burlap, mulch, or soil.

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.

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. 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.

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), the Wetlands Protection Act Order of Conditions, 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: Found attached to these documents.

   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 structure.

   g. A description of erosion/sedimentation control measures.

   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. Employ the services of a Dewatering Professional and a Massachusetts Registered Professional Engineer in firms 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 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 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. 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 the Dewatering Professional is on site and has begun the duties specified herein.

B. Furnish, install, operate, and maintain dewatering, reinfiltration, 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 no to impede construction activities.

C. Carry out dewatering program in such a manner as to prevent undermining or disturbing foundations of existing structures or of work ongoing or previously completed.

D. 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, tolulene, 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/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 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 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.

1.3 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 and instrumentation monitoring during construction in accordance with Section 02015 – GEOTECHNICAL INSTRUMENTATION AND MONITORING.

1.4 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.

1.5 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.

1.6 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.

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.

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. Install settlement and lateral deformation monitoring points on the temporary support of excavation system as specified in Section 02015 – GEOTECHNICAL INSTRUMENTATION AND MONITORING. Notify the Engineer immediately if any monitoring points are damaged. Repair or replace damaged monitoring points and re-establish new baseline for damaged points at no additional cost to the Owner prior to construction of excavation and support of excavation work. The Contractor shall allow the Engineer access to monitor the points along the support system.

I. The independent Geotechnical Monitoring Consultant specified in Section 02015 – GEOTECHNICAL INSTRUMENTATION AND MONITORING shall continuously monitor movements of the excavation support system. In events of the measured movements approaching or exceeding the allowable movements indicated in Section 02015 - GEOTECHNICAL INSTRUMENTATION AND MONITORING, take immediate steps to arrest further movement by revising procedures such as providing supplementary bracing, filling voids behind the trench box, supporting utilities or other measures (Construction Contingency Plan) as required.

J. 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 wales 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. Allow 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 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.

E. 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 MONITORING

A. Install vertical and horizontal instruments in accordance with the criteria in section 02015 – GEOTECHNICAL INSTRUMENTATION AND MONITORING. The independent Geotechnical Monitoring Consultant shall conduct monitoring of the excavation support system.

3.6 REMOVAL OF EXCAVATION SUPPORT SYSTEM

A. Except as otherwise noted on the Drawings or specified herein, leave in place the excavation lateral support system outside the limits of the permanent structure 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.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02160

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SECTION 02210

EARTH EXCAVATION, BACKFILL, FILL AND GRADING

2210.1	**TEST PITS**	**CUBIC YARD**
2210.2	**CONTROL DENSITY FILL FOR BACKFILL**	**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.

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.

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 total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8260), semi-volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA Method 8100), and Total PCBs and pesticides (EPA Method 8081 and 8082). On-site soils 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.

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 Springfield, the Springfield Water and Sewer Commission, 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)	---
½-inch (12.7 mm)	10-50
3/8-inch (37.5 mm)	0-20
No. 4	0-5
No. 8	---

2.4 CONTROLLED DENSITY FILL (CDF)

A. Controlled density fill shall consist of a cementatious 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 and around the excavation support systems as required by the Engineer.

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.

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

Sieve Size	Percent Passing by Weight
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.

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 - below landscaped areas	 95% 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 think lifts and compacted up to the bottom of the gravel subbase layer.

D. 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.

E. 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.

F. 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.

G. 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 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.

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.

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 actual 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 exaction 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.

Item 2210.3 - 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, 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.

END OF SECTION 02210

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SECTION 02252

MANHOLES

2252.1.1	**MANHOLE -PRECAST 4-FOOT DIAMETER**	**VERTICAL FOOT**
2252.1.1A	**MANHOLE -PRECAST 4-FOOT DIAMETER (BID ALTERNATE 1)**	**VERTICAL FOOT**
2252.1.2	**MANHOLE - PRECAST 5-FOOT DIAMETER**	**VERTICAL FOOT**
2252.1.3	**MANHOLE - PRECAST 6-FOOT DIAMETER**	**VERTICAL FOOT**
2252.1.4	**MANHOLE – PRECAST 8-FOOT DIAMETER**	**VERTICAL FOOT**
2252.2.1	**MANHOLE - PRECAST 6-FOOT DIAMETER DROP OVER**	**VERTICAL FOOT**
2252.3.1	**MANHOLE – PRECAST 3' X 4' RECTANGULAR**	**VERTICAL FOOT**

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes all labor, equipment, appliances, and materials required for construction of precast concrete sanitary sewer manholes and storm drain manholes, including manhole drops and drop over manholes, complete and in place, 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 02590 – BRICK MASONRY

C. Section 03300 – CONCRETE

D. Section 03315 – GROUT

E. Section 03411 – PLANT PRE-CAST STRUCTURAL CONCRETE

F. Section 07160 – BITUMINOUS DAMPPROOFING

1.3 SUBMITTALS

A. General: Submit the following in accordance with General Conditions of Contract and 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 manhole tops and flat slab manhole tops, joints and gaskets, construction details, tolerances, and other information as required by the Owner.

3. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Precast Bases and Risers:

1. Precast reinforced concrete manhole bases, risers and top sections shall be of the sizes and types indicated or as required.

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 2, 3, and 4-foot lengths.

6. Manhole tops of the eccentric cone type shall be 3 or 4 foot lengths with 30-inch inside diameter opening at top, unless otherwise noted as shown in the details.

8. Manhole tops of the flat slab type, where space restrictions exist or where required, shall be not less than 8 inches thick and reinforced as indicated, and shall have an opening having an inside diameter of 30-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. All exterior concrete surfaces shall be coated with bituminous dampproofing as per Section 07160 – BITUMINOUS DAMPPROOFING.

11. Precast machine-made solid segments shall conform to ASTM C139.

B. Concrete:

1. All concrete shall conform to the requirements of Section 03411 – PLANT-PRECAST STRUCTURAL CONCRETE.

2. Not less than two concrete strength tests shall be made for each 100 vertical feet of manhole sections used and the test results submitted to the Owner and Engineer. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.

C. Frames and covers shall be heavy-duty Type A Massachusetts Standard and conform to the "Construction Standards" and "Standard Specifications for Highways and Bridges", of the Commonwealth of Massachusetts. All frames shall have a minimum clear opening of 30 inches unless otherwise noted. Submit shop drawings to Owner for approval before fabrication. Cast 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.

1. Frames and covers to be as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), Neenah Foundry Company, Campbell Foundry Company or approved equivalent.

2. Covers for all structures shall have the word "DRAIN", "SEWER" or other appropriate designation cast upon them.

D. Jointing:

1. 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.

2. 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:

DESCRIPTION	SEALANT PROPERTY
Base	Vulcanized Butyl Rubber
Percent of solids	100%
Shore "A" Durameter:	
Initial	10
Aged	20
Adhesion to clean surfaces	Excellent
Temperature Range:	
Application	-20 degrees F to 120 degrees F
Service	-65 degrees F to 200 degrees F
Water Absorption after 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 deg F, drying	250%
2 weeks in water	300%
Weather Resistance	Excellent
Moisture Diffusion Resistance	Excellent
Specific Gravity	1:18
Flash Point	None
Fire Point	Over 620 degrees F

F. Grout for Sealing Joints:

1. Grout for sealing grout-type joints or grouting field made pipe openings, shall be a non-shrink type grout, factory-mixed ready-to-use product, containing especially prepared aggregate, cement and sand and other components which will produce a 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

2. Mortar and Brick for Raising Castings is prohibited.

H. Brick

1. Per Section 02590 – BRICK MASONRY

2. Mortar and Brick for Raising Castings is prohibited.

I. Bituminous Dampproofing

1. Per Section - 07160 – BITUMINOUS DAMPPROOFING

J. Flexible Manhole Seals

1. Flexible manhole seals shall be "New Lok Joint Flexible Sleeve" by Interpace, "A-Lok Manhole Sleeve" by L & L Concrete Products, "Press Wedge II" by Pre-Seal Basket Corporation, or approved equivalent.

2. Field applied seals shall be "K or N Seal" boot or equivalent.

3. Manhole sleeves, gaskets and sealants shall be furnished complete with lubricants, stainless steel stops, inserts, clamps, etc.

4. All flexible manhole seals shall be capable of meeting a 10 psi internal hydraulic pressure.

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 and replaced 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 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.

B. Manhole sections shall be installed level and plumb.

C. Manholes shall be constructed on a 12-inch compacted crushed stone or gravel base as indicated.

D. 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.

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 precast concrete risers and rings only. Brick and mortar

shall not be used. Precast concrete manhole riser rings or approved equal shall be used. Interior and exterior joints shall be mortared. 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.

F. Opening in precast manhole sections to extent indicated on the drawings to receive entering pipes shall be made at the place of the manufacturer; where opening cannot be determined they shall be cut in the field. Depending upon the type of pipe seals to be furnished, pipe openings shall be provided with manhole seals of proper sizes to accommodate pipe sizes and shall be cast into the manhole at the time of manufacture. When openings are made in the field, the openings for entering pipes shall be of a size to provide a uniform annular space between the outside of pipe wall and the opening in the manhole section of 3/4 inch, and after the pipe is in position the annular space shall be solidly filled with non shrink grout. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Openings which are cut in the manhole sections in the field shall be carefully made so as not to damage the sections; damaged sections will be rejected and shall be replaced at no additional expense to the Owner. Field cut openings shall be circular, not square and shall be made by the appropriate cutting or coring operation.

G. 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.

C. Manhole sections shall not be shipped for at least five days after manufacture when cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 150 degrees F for a period of not less than 8 hours, or when necessary, for such additional time as may be required to enable the manhole sections to meet specification requirements.

D. Leakage Tests

1. The manholes shall be made as nearly watertight as practicable.

2. The Contractor shall perform leakage tests on each manhole installed using an approved low air pressure testing system. This type of test shall be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each manhole shall be tested under 10-inch Hg vacuum. The test shall pass if the vacuum remains at 10-inch Hg or drops no lower than 9-inch Hg after 60 seconds for 4 or 5 foot manholes from 0 to 10 feet deep; 75 seconds for 4 or 5 foot manholes from 10 to 15 feet deep and for 6 or 8 foot manholes from 0 to feet deep; or 90 seconds for 4 or 5 foot manholes from 15 to 25 feet deep, 6 ot 8 foot manholes 10 to 15 feet deep, and 10 foot manholes 0 to 10 feet deep; and 120 seconds for 4 or 5 foot manholes over 25 feet deep, 6 or 8 foot manholes 15 to 25 feet deep, and 10 foot manholes 10 to 15 feet deep.

PART 4 – COMPENSATION

Item 2252.1.1 – Manhole - Precast 4-Foot Diameter
Item 2252.1.1A – Manhole - Precast 4-Foot Diameter (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 4-Foot Diameter shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 4-Foot Diameter shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required

for the installation of Manhole - Precast 4-Foot Diameter. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; 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; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals.

Item 2252.1.2 – Manhole - Precast 5-Foot Diameter

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 5-Foot Diameter shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 5-Foot Diameter shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 5-Foot Diameter. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; 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; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals.

Item 2252.1.3 – Manhole - Precast 6-Foot Diameter

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 6-Foot Diameter shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract

Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 6-Foot Diameter shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 6-Foot Diameter. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; 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; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals. The reducing cones which transition from 6-ft bases and risers to 4-ft or 5-ft risers and top sections shall be paid herein.

Item 2252.1.4 – Manhole - Precast 8-Foot Diameter

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 8-Foot Diameter shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 8-Foot Diameter shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 8-Foot Diameter. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast cones and top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; 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; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal

required raise frames and covers to grade; and connections to new and existing pipes and laterals. The reducing cones which transition from 8-ft bases and risers to 4-ft, 5-ft or 6-ft risers and top sections shall be paid herein.

Item 2252.2.1 – Manhole – Precast 6-Foot Diameter Drop Over

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 6-Foot Diameter Drop Over shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as directed by the Engineer. Measurement shall be from the outside bottom of the footing to finished grade. Payment will be the same whether the Contractor elects or is required to furnish a Precast or a Cast-in-place Base.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 6-Foot Diameter Drop Over shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 6-Foot Diameter Drop Over. The work includes, but is not limited to; furnish and install Pre-cast Concrete Drop Over Manholes complete with all pre-cast dog house sections or cast-in-place dog house sections including footings (furnish and install concrete, reinforcing, appurtenances, and forms; curing, and testing), precast manhole riser sections, and precast cones and top slabs; selective demolotion of the existing pipe; water stop between the existing pipe and drop over structure; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous and cement concrete; excavation; 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; protection of the existing utility; furnish, install and compact bedding; bituminous dampproofing; flexible pipe sleeves; concrete; mortar; brick masonry; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals.

Item 2252.1.5 – Manhole - Precast 3' x 4' Rectangular

METHOD OF MEASUREMENT:
Measurement for Manhole - Precast 3' x 4' Rectangular shall be based on the vertical feet of complete and functional manholes installed by the Contractor, as shown on the Contract Drawings or as required by the Engineer. Measurement shall be from the inside bottom of the structure to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Manhole - Precast 3' x 4' Rectangular shall be based on the vertical foot complete for this item in the proposal. Under the vertical foot price for this item, the

Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the installation of Manhole - Precast 3' x 4' Rectangular. The work includes, but is not limited to; furnish and install Pre-cast Concrete Manholes complete with all pre-cast bases, precast manhole riser sections, precast top slabs, and precast sumps; local flow by-pass and pumping not included for payment elsewhere; saw cutting bituminous or cement concrete; excavation; 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; flexible pipe sleeves; concrete, mortar; testing of the completed manhole; grout; frames and covers; cast-in-place concrete, pre-cast concrete riser rings or approved equal required raise frames and covers to grade; and connections to new and existing pipes and laterals.

END OF SECTION 02252

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SECTION 02500

PAVING AND SURFACING

2500.1.1	**BITUMINOUS CONCRETE BASE COURSE –TRENCH WIDTH**	**TON**
2500.1.1A	**BITUMINOUS CONCRETE BASE COURSE – TRENCH WIDTH (BID ALTERNATE 1)**	**TON**
2500.1.2	**BITUMINOUS CONCRETE BASE COURSE – FULL WIDTH**	**TON**
2500.1.3	**BITUMINOUS CONCRETE TOP COURSE – FULL WIDTH**	**TON**
2500.1.4	**HAND PLACED BITUMINOUS CONCRETE**	**TON**
2500.2.1	**COLD PLANE 2-IN, FULL WIDTH**	**SQUARE YARD**
2500.2.2	**PAVEMENT RECLAMATION/PULVERIZING, FULL WIDTH, 8-IN DEPTH**	**SQUARE YARD**
2500.3	**FINAL GRADING SUB-BASE UNDER ROADWAYS**	**SQUARE YARD**
2500.4	**HOT POURED RUBBERIZED ASPHALT SEALER**	**LINEAR FOOT**
2500.5	**BITUMINOUS CONCRETE INFRARED PAVEMENT SEALING**	**LINEAR 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 Massachusetts Highway Department, 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.

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."

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 DRIVEWAY APRONS -- HAND PLACED HOX MIX ASPHALT

A. Driveways shall be paved to full widths specified or as required by the Engineer and shall consist of 4-in of asphalt binder and 2-in of asphalt top course pavement.

3.6 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 planning 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 PAVEMENT RECLAIMATION/PULVERIZING

A. Temporary trench patch and existing road pavement shall be scarified and mixed with equal amount of the gravel base existing in the roadway foundation. Pulverization will be by means of a traveling pulvi-miller or equivalent machine capable of ripping through existing asphalt at depths up to 8" with one pass. The machine shall be self-propelled and be equipped with an adjustable grading blade, thus leaving its path generally smooth for traffic equipment. Road planers or cold milling machines, which are designed to mill or shred the existing bituminous concrete pavement rather than to crush or fracture it, are not considered capable of achieving specification gradation. The required and necessary scraping action of the milling will increase the percentage of fine aggregate. Existing bituminous

concrete and gravel base must be ripped and mixed so as to form a homogeneous mass of uniformly processed base material, which will bond together when compacted.

3.9 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.

PART 4 – COMPENSATION

Item 2500.1.1 --- Bituminous Concrete Base Course – Trench Width
Item 2500.1.1A --- Bituminous Concrete Base Course – Trench Width (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for Payment for Bituminous Concrete 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' (trench width) x L' (trench length) x D' (trench depth) x 0.075 ton/cf = 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 Bituminous Concrete 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; compaction testing; 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 full roadway width; hot mix asphalt for permanent top course; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.1.2 --- Bituminous Concrete Base Course – Full Width

METHOD OF MEASUREMENT:
Measurement for Payment for Bituminous Concrete 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' (trench width) x L' (trench length) x D' (trench depth) x 0.075 ton/cf = 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 Bituminous Concrete 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; compaction testing; 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; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.1.3 --- Bituminous Concrete Top Course – Full Width

METHOD OF MEASUREMENT:
Measurement for Payment for Bituminous Concrete 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' (trench width) x L' (trench length) x D' (trench depth) x 0.075 ton/cf = 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 Bituminous Concrete 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; compaction testing; 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; and pavement installed to replaced asphalt damaged by the Contractor.

Item 2500.1.4 --- Hand Placed Bituminous Concrete

METHOD OF MEASUREMENT:
Measurement for Payment for Hand Placed Bituminous Concrete 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' (trench width) x L' (trench length) x D' (trench depth) x 0.075 ton/cf = 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 Bituminous Concrete 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; compaction testing; 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 ramps; sidewalks; driveways; walks;

and aprons only.

SPECIAL NOTES ON EXCLUSIONS:
This item is NOT used for hand placement of hot mix asphalt in trenches. Hand placement of hot mix asphalt in trenches shall be paid for under Item 2500.1.1. 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 2524.2.1. 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 2500.2.1

Item 2500.2.1 --- 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 2500.2.2 --- Pavement Reclamation/Pulverizing, Full Width, 8-In Depth

METHOD OF MEASUREMENT:
Measurement for the Pavement Reclamation/Pulverizing, Full Width, 8-In Depth will be based on the square yards of asphalt pavement reclaimed/pulverized to a depth of 8-inches, as measured by the Engineer to the payment limits described in the Contract Drawings and Specifications.

BASIS OF PAYMENT:
Payment for Pavement Reclamation/Pulverizing, Full Width, 8-In Depth 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 reclaim/pulverize existing asphalt pavement, to a depth of 8-in, to the pay limits indicated

on the Drawings and as specified. The work includes removing, hauling, stockpiling, and disposing or reusing of pulverized/reclaimed asphalt material; sweeping after the pulverizing/reclaim operation; removal of asphalt from around existing structures and castings; providing transitions at the limits of the pulverizing/reclaiming; providing and maintaining temporary hot mix asphalt aprons at transitions and castings until final paving; maintaining the reclaimed/pulverized surface until final paving; grading of reclaimed surface prior to asphalt placement; and all incidental work not included for payment elsewhere.

Item 2500.3 --- 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 2500.4 --- 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 2500.5 --- Bituminous Concrete Infrared Pavement Sealing

METHOD OF MEASUREMENT:
Measurement for Payment for Bituminous Concrete Infrared Pavement Sealing shall be based on the linear feet of Bituminous Concrete 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 Bituminous Concrete Infrared Pavement Sealing shall be based on the unit price bid for this item in the proposal. Under the Unit Price for Bituminous Concrete 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.

END OF SECTION 02500

SECTION 02524

CURBS, WALKS AND DRIVEWAYS

2524.1.1	**4-IN CEMENT CONCRETE SIDEWALKS**	**SQUARE YARD**
2524.1.2	**6-IN CEMENT CONCRETE SIDEWALKS AT DRIVEWAYS**	**SQUARE YARD**
2524.1.3	**6-IN CEMENT CONCRETE WHEELCHAIR RAMPS**	**SQUARE YARD**
2524.2.1	**WIRE CUT BRICKS ON 4-IN ON BITUMINOUS CONCRETE BASE (SIDEWALKS AND AT DRIVEWAYS)**	**SQUARE YARD**
2524.3.1.1	**REMOVE AND RESET GRANITE CURB (STRAIGHT AND CURVED)**	**LINEAR FOOT**
2524.3.1.2	**REMOVE AND RESET GRANITE TRANSITION CURB FOR WHEELCHAIR RAMPS (STRAIGHT AND CURVED)**	**LINEAR FOOT**
2524.3.2.1	**NEW GRANITE CURB TYPE VA4 (STRAIGHT AND CURVED)**	**LINEAR FOOT**
2524.3.2.2	**NEW GRANITE TRANSITION CURB FOR WHEELCHAIR RAMPS (STRAIGHT AND CURVED)**	**LINEAR FOOT**

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies the following: cement concrete, hot mix asphalt, and brick sidewalks, driveways, and wheelchair ramps; the removal and resetting of curb and edging; and the construction of new granite and asphalt curbs, berms, and edging.

1.2 RELATED WORK

A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

B. Section 02500 – PAVING AND SURFACING

C. 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 wheelchair 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 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 wheelchair ramps and sidewalks shall conform to the most current applicable details of the Massachusetts Highway Department (MHD); to the latest 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 Wheelchair Ramps: Cement concrete shall conform to the Standard Specifications, M4.02.00 through M4.02.12 and be 4000 PSI at 28 day test, ¾-inch coarse aggregate, 610 pounds cement per cubic yard, 6% air entrained (AASHTO - M154), Type A water reducing admixture (AASHTO - M194), 3 to 4-inch slump, and Type II dark-colored by adding 1-1/2 to 2 lbs. of lamp black per cubic yard at the plant. Cement concrete shall contain micro-fiber added during batching at the plant to insure uniform distribution.

B. Micro-fiber: The cement concrete shall contain 1 pound of polypropylene micro-fiber per cubic yard. Fibers shall be 1/2" or 3/4" 100% polypropylene fibers, maximum 3 denier, complying with ASTM C 1116, Type III, Par. 4.1.3. Fibers per pound shall be not less than 50 million individual fibers. The micro-fiber shall be used in accordance with the manufacturer's specifications.

C. Curing Compound: Shall conform to Section 03300 – CAST-IN-PLACE CONCRETE for Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids.

D. Alkaline Resistant Protective Penetrating Concrete Sealer: Sealers shall be clear, VOC compliant and solvent-based. Sealer shall be deep penetrating.

E. Expansion Joints: Shall be 3/8" thick polyethylene foam and ¼" thick polyethylene foam conforming to ASTM D1751.

F. Hot Mix Asphalt for driveways: Shall conform to the applicable subsections of Section 02500 – PAVING AND SURFACING.

G. Granite curb, granite curb inlets, granite curb corners, granite edging, and granite curb transitions at wheelchair 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 Curb Inlet, Granite Curb Corner, Granite Transitions for Wheelchair 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 back of 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.

P. Spikes: Are to be galvanized steel spiral not less than 10" in length.

PART 3 – EXECUTION

3.1 PREPARATION

. 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 wheelchair ramps, the Contractor shall review the location with the Engineer to determine what is necessary to allow for the installation to be compliant with the standards referenced above. Fixed objects such as utility poles and fire hydrants must be considered in location of pedestrian ramps. The type of wheelchair ramp may vary based on sidewalk width and slope.

3. Removed cement concrete 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, wheelchair ramps, driveways, and curbs shall be graded to required elevations and proof rolled.

H. Gravel subbase under sidewalks, wheelchair ramps, driveways, 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 wheelchair 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 ¼" 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 not 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 bled water and water sheen has left the surface and concrete has started to stiffen.

2. Between the expansion joints at 30 foot spacings, 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 ¼-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 50ºF 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 WHEELCHAIR RAMPS

A. Concrete shall be installed to a depth of 6" depth.

B. The Contractor shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths as shown on the Contract Drawings and as per ADA and MA AAB requirements.

C. All wheelchair ramps joints and transition sections which define grade changes shall be formed, staked, and checked prior to placing cement concrete. All grade changes are to be made at joints.

D. At intersections, wheelchair ramps shall be located in front of vehicle stop lines and within the crosswalk. The ramp shall be constructed so that the finished elevation of the concrete (curb removed) will meet the roadway flush (less than ½" lip) for a width no less than 42 inches. The elevation at this meeting point shall be properly designed to meet the gutter elevation of the road. The Contractor shall install wheelchair ramps and road grades in a manner which minimizes the potential for puddles in front of them.

E. The Contractor shall use a digital "Smart Level" to check all subbase grades for compliance prior to installation of concrete. The Contractor shall not proceed with concrete installation on a ramp that is out of compliance.

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 CURB CORNER, GRANITE CURB INLET GRANITE CURB TRANSITION AT WHEELCHAIR RAMPS, AND GRANITE EDGING

A. Granite Curb, Granite Curb Corners, Granite Curb Inlets, Granite Curb Transitions at Wheelchair 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 Wheelchair 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.

3.4 ASPHALT CURBS, BERMS, WALKS, DRIVEWAYS, AND WATERWAYS

A. Hot mix asphalt driveways shall be placed in accordance with the Standard Specifications Section 701.63.

PART 4 – COMPENSATION

Item 2524.1.1 – 4-In Cement Concrete Sidewalks

METHOD OF MEASUREMENT:
Measurement for 4-in 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-in 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 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; sidewalks installed to replace sidewalks damaged by the Contractor during construction; and 6-in sidewalks at driveways and wheelchair ramps.

Item 2524.1.2 – 6-In Cement Concrete Sidewalks at Driveways

METHOD OF MEASUREMENT:
Measurement for 6-in 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-in Cement Concrete Sidewalks at Driveways shall be based on the square yard of 6-in 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-in 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 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; sidewalks installed to replace sidewalks damaged by the Contractor during construction; and 4-in sidewalks; wheelchair ramps.

Item 2524.1.3 – 6-In Cement Concrete Wheelchair Ramps

METHOD OF MEASUREMENT:
Measurement for 6-in Cement Concrete Wheelchair Ramps 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-in Cement Concrete Wheelchair Ramps shall be based on the square yard of 6-in Cement Concrete Wheelchair Ramps 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 Wheelchair 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 wheelchair 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 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; sidewalks installed to replace sidewalks damaged by the Contractor during construction; 4-in sidewalks; and 6-in sidewalks at driveways.

Item 2524.2.1 – Wire Cut Bricks on 4-in Bituminous Concrete Base (Sidewalks and at Driveways)

METHOD OF MEASUREMENT:
Measurement for Wire Cut Bricks on 4-in Bituminous Concrete Base (Sidewalks and 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 Wire Cut Bricks on 4-in Bituminous Concrete Base (Sidewalks and at Driveways) shall be based on the square yard of Wire Cut Bricks on 4-in Bituminous Concrete Base 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 Wire Cut Bricks on 4-in Bituminous Concrete Base (Sidewalks and 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; 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; removal and disposing existing bricks; furnish and install hot mix asphalt base; compaction of the hot mix asphalt base; protect the asphalt after placement; furnish and install wire cut bricks; furnish and install iron edge with spiral galvanized steel spikes; furnish and install ¾" sand dust setting bed; applying asphalt tack coat and neoprene modified asphalt tack coat; sweeping with dry sand/ cement mix; compaction of bricks; 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; brick installed to replace bricks damaged by the Contractor during construction.

Item 2524.3.1.1 --- Remove and Reset Granite Curb (Straight and Curved)

METHOD OF MEASUREMENT:
Measurement for Remove and Reset 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 Rest Granite Curb (Straight and Curved) shall be based on the linear foot of granite curb removed and reset 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 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 wheelchair ramps.

Item 2524.3.1.2 --- Remove and Reset Granite Transition Curb for Wheelchair Ramps (Straight and Curved)

METHOD OF MEASUREMENT:
Measurement for Remove and Reset Granite Transition Curb for Wheelchair Ramps (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 Granite Transition Curb for Wheelchair Ramps (Straight and Curved) shall be based on the linear foot of Granite Curb removed and reset 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 remove and reset existing granite transition curb at wheelchair ramps 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 transition curb at wheelchair ramps; 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; removing and resetting granite curb (straight and curved); and removing and resetting granite curb corners.

Item 2524.3.2.1 --- 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; remove existing damaged and unsalvageable curb; 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); 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 wheelchair ramps and curb corners; furnishing imported gravel sub-base; and removing and resetting granite curb.

Item 2524.3.2.2 --- New Granite Transition Curb at Wheelchair Ramps (Straight and Curved)

METHOD OF MEASUREMENT:
Measurement for New Granite Transition Curb at Wheelchair Ramps (Straight and Curved) shall be based on the linear foot of granite transition curb installed at wheelchair 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 Wheelchair Ramps (Straight and Curved) shall be based on the linear foot of Granite Transition Curb at Wheelchair Ramps (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 wheelchair ramps as detailed and where indicated or required by the Owner or Engineer. The work includes, but is not limited to; remove existing damaged and unsalvageable curb; 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 wheelchair ramps (straight and curved); 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 corners and curb corners; furnishing imported gravel sub-base; and removing and resetting granite curb.

END OF SECTION 02524

SECTION 02577

PAVEMENT MARKINGS

2577.1	**4-IN TO 8-IN REFLECTORIZED PAVEMENT MARKINGS – YELLOW AND WHITE THERMOPLASTIC**	**LINEAR FOOT**
2577.2	**12-IN REFLECTORIZED PAVEMENT MARKINGS – WHITE THERMOPLASTIC**	**LINEAR 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

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 12 inches, and applied within a tolerance of five percent. Deviation of straight strips shall not exceed ½-inch in 50 feet.

F. Existing pavement markings no longer required shall be completely removed, by grinding method, prior to placement of any temporary lines.

D. Pavement markings for crosswalks, fog lines, and stop lines shall be white. Pavement markings for centerlines shall be yellow.

E. All temporary pavement markings and parking lot markings shall be traffic paint. All permanent pavement markings shall be thermoplastic.

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 ¼ 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 - 12-in Reflectorized Pavement Markings – White Thermoplastic

METHOD OF MEASUREMENT:
Measurement for payment for Reflectorized Pavement Markings shall be per linear foot of lines applied with thermoplastic painted. Broken lines shall be paid by deducting ¼ of the total linear foot of roadway painted with full deductions for breaks greater than 10-feet. Crosswalks shall be paid by the sum of the length of all 12-inch lines, across the width of the crosswalk, as they cross the roadway.

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: Painted lines for temporary or traffic management, and lines other than 12-in will not be paid for under this item but are considered incidental to other items.

END OF SECTION 02577

SECTION 02590

BRICK MASONRY

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, manhole risers, and for all other necessary appurtenant work complete and accepted in accordance with the Drawings and Specifications and as required.

1.2 RELATED WORK

A. Section 02252 - MANHOLES

B. Section 02615 – REINFORCED CONCRETE PIPE

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS.

1. Submit manufacturer specification sheets for and shop drawings for all masonry items, mortar and appurtenances.

PART 2 - MATERIALS

2.1 Bricks

A. 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. Brick for extending manhole frames to grade shall be concrete brick conforming to ASTM C139, latest revision.

2.2 Cement

A. Cement shall conform to the standard specifications for Portland cement of ASTM C150, latest revision, Type II, unless otherwise directed. Whenever directed by the Owner, a quick-setting cement (Type III) shall be used for any desired purpose at no additional expense to the Owner.

2.3 Sand

A. Sand for mortar shall be graded uniformly from fine to coarse and when dry shall pass a No. 8 sieve. Sand shall consist of aggregate having clean, hard, durable, strong, uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances. The sand shall be washed clean before loading on delivery trucks. Natural sand which shows a color darker than the standard color when tested in accordance with the Colorimetric Test for Sands as described in ASTM C40, latest revision, will be cause for rejection.

2.4 Lime

A. Lime shall be hydrated lime conforming to ASTM C207, latest revision.

2.5 Water

A. Mixing water for concrete and mortar shall be clean and free from oil, acid, alkali, injurious amounts of vegetable matter and other impurities. Potable water obtained from a municipal supply is preferable.

2.6 Mortar

A. 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 Masonry shall include brick masonry for 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 8 inches thick, unless otherwise shown or required. Other brick masonry shall

be provided to the details and the dimensions specified, indicated or as directed.

3.2 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.

3.3 All workmanship shall conform to the best standard practice, and all brick masonry shall be laid by skilled workmen. 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.

3.4 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 (Not Used)

END OF SECTION 02590

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SECTION 02604

CATCH BASINS

2604.1	**CATCH BASIN - TYPE I SINGLE GRATE (4-FT DIAMETER)**	**VERTICAL FEET**
2604.2	**CATCH BASIN – TYPE II DOUBLE GRATE (5-FT DIAMETER)**	**VERTICAL FEET**
2604.3	**CATCH BASIN – TYPE III SINGLE GRATE WITH (3' x 4' SQUARE)**	**VERTICAL FEET**
2604.4	**CATCH BASIN – TYPE IV DOUBLE GRATE (5'X4' SQUARE)**	**VERTICAL FEET**
2604.5	**CATCH BASIN – TYPE V DIRECT INLET**	**EACH**

PART I – GENERAL

1.1 WORK INCLUDED

A. The work covered under this Section includes the furnishing of all plant, labor, equipment, appliances and materials, and performing all operations in connection with installing catch basins, frames and grates, and hoods at the locations and to the details indicated and/or directed, including pre-cast concrete sections, bases, and tops; brick, grout, and mortar; catch basin hoods; and frame and grate; as well as repairing sidewalks, pavement and curbs affected by catch basin installation.

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 required by the owner to dispose off site.

1.2 SUBMITTALS

A. The Contractor shall furnish complete shop drawings for all pre-cast sections, cast iron frames, grates and other appurtenances in accordance with Section 01300 – SUBMITTALS

B. Shop drawings and manufacturers data showing dimensions, reinforcing, and materials for all items furnished under this section.

PART 2 – PRODUCTS

2.1 CATCH BASINS

A. Catch basins shall be constructed as detailed. Single grate catch basins shall

be a minimum of 4 feet inside diameter or 4-ft x 3-ft inside dimensions. Catch basins shall be designed for a minimum of H-20 loading. Double grate catch basins shall be a minimum of 5 feet inside diameter or 4-ft x 3-ft inside dimensions. Catch basins shall have a minimum of 6 ft sump depth, unless otherwise noted and shall conform to ASTM C478-72.

B. Pre-cast concrete catch basins and sump manholes shall further conform to the applicable requirements of Section 02252 – MANHOLES and applicable details.

C. Mortar where required shall conform to Section 02590 – BRICK MASONRY.

2.2 FRAMES

A. Single Catch Basin Frames shall be as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), model LK120D for three flange, Neenah Foundry Co., Campbell Foundry Co., or equivalent.

B. Double Catch Basin Frames shall be as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), model LV2448-2 with longside flange removed, Neenah Foundry Co., Campbell Foundry Co., or equivalent.

2.3 GRATES

A. Single and Double Catch Basin Grates shall be cascade type, as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), model L24SG18, by Neenah Foundry Co., by Campbell Foundry Co., or equivalent unless otherwise shown on the Drawings.

2.4 HOODS

A. Catch Basin Hoods shall be as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), model L-202, Neenah Foundry Co., Campbell Foundry Co., or equivalent for Type 1 and Type 2 Catch Basins.
Catch Basin Hoods for Type 3 Catch Basins shall be as manufactured by East Jordan Iron Works (formerly E. L. LeBaron Foundry Co.), model L-203, Neenah Foundry Co., Campbell Foundry Co., or equivalent.

PART 3- EXECUTION

3.1 SETTING PRECAST CONCRETE CATCH BASIN SECTIONS

A. Catch basins shall be constructed with a pre-cast concrete base placed on a firm compacted ¾-in crushed stone sub-base as specified and as detailed on the Drawings. Catch basins shall be installed level, plumb and in accordance with the provisions of Section 02252 - MANHOLES.

B. Catch basins shall be installed with specified joint sealant as specified in Section 02252 - MANHOLES.

C. 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 required and also to accommodate the correct outside diameter of the pipe.

D. All holes in sections used for handling shall be thoroughly plugged with non-shrink grout.

E. Cutting or tampering of cast basin structures in the field, for the purpose of creating new openings or modifying existing openings, will not be permitted.

3.2 LAYING BRICKWORK

A. Only clean bricks shall be used in brickwork for catch basins. The brick shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

3.3 SETTING CATCH BASIN FRAMES AND GRATES

A. Catch Basin frames shall be set with tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be set concentric with the top of the manhole and in a full bed of mortar so that the space between the top of the brick and mortar and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to a height of 4-inches above the flange.

3.4 INSTALLING HOODS

A. Hoods shall be built into the catch basin wall, shall be watertight, and shall be installed in conformance with the manufacturer's instructions.

3.5 CLEANING

A. All excess material including dirt, loose concrete, bricks, grit, stones and any other material, shall be removed from all manholes prior to final review by the Engineer. 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 2604.1 --- Catch Basin - Type I Single Grate (4-ft Diameter)

METHOD OF MEASUREMENT:
Catch Basin - Type I Single Grate (4-ft Diameter) shall be paid per vertical foot of Catch Basin - Type I Single Grate (4-ft Diameter) installed complete. Measurement shall be from the inside bottom of the sump to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Catch Basin - Type I Single Grate (4-ft Diameter) 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 Catch Basin - Type I Single Grate (4-ft Diameter) as shown and indicated in the Contract Documents, at the requirements of the Engineer and as specified. The work includes but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install pre-cast sections and structures; furnish and install temporary support of excavation; for vertical wood sheeting or soldier piles and lagging, cut off 5-ft below grade and leave in place where required or directed; furnish, install and compact bedding; furnish and install backfill per one of the approved methods; furnish, install and compact gravel road sub-base; compaction and compaction testing; frames and grates; hoods; dampproofing; testing; grouting; gaskets; pipe connections, including flexible sleeves; and all other work required for the installation of Catch Basin - Type I Single Grate (4-ft Diameter), not included for payment elsewhere.

Item 2604.2 --- Catch Basin - Type II Double Grate (5-Ft Diameter)

METHOD OF MEASUREMENT:
Catch Basin - Type II Double Grate (5-Ft Diameter) shall be paid per vertical foot of Catch Basin - Type II Double Grate (5-Ft Diameter) installed complete. Measurement shall be from the inside bottom of the sump to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Catch Basin - Type II Double Grate (5-Ft Diameter) 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 Catch Basin - Type II Double Grate (5-Ft Diameter) as shown and indicated in the Contract Documents, at the requirements of the Engineer and as specified. The work includes but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install pre-cast sections and structures; furnish and install temporary support of excavation; for vertical wood sheeting or soldier piles and lagging, cut off 5-ft below grade and leave in place where required; furnish, install and compact bedding; furnish and install backfill per one of the approved methods; furnish, install and compact gravel road sub-base; compaction and compaction testing; frames and grates; hoods; dampproofing; testing; grouting; gaskets; pipe connections, including flexible sleeves; and all other work required for the installation of Catch Basin - Type II Double Grate (5-Ft Diameter) not included for payment elsewhere.

Item 2604.3 --- Catch Basin - Type III Single Grate (3' x 4' Square)

METHOD OF MEASUREMENT:
Catch Basin - Type III Single Grate (3' x 4' Square) shall be paid per vertical foot of Catch Basin - Type III Single Grate (3' x 4' Square) installed complete. Measurement shall be from the inside bottom of the sump to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Catch Basin - Type III Single Grate (3' x 4' Square) 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 Catch Basin - Type III Single Grate (3' x 4' Square) as shown and indicated in the Contract Documents, at the requirements of the Engineer and as specified. The work includes but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install pre-cast sections and structures; furnish and install temporary support of excavation; for vertical wood sheeting or soldier piles and lagging, cut off 5-ft below grade and leave in place where required or directed; furnish, install and compact bedding; furnish and install backfill per one of the approved methods; furnish, install and compact gravel road sub-base; compaction and compaction testing; frames and grates; hoods; dampproofing; testing; grouting; gaskets; pipe connections, including flexible sleeves; and all other work required for the installation of Catch Basin - Type III Single Grate (3' x 4' Square), not included for payment elsewhere.

Item 2604.4 --- Catch Basin - Type IV Double Grate (4' x 5' Square)

METHOD OF MEASUREMENT:
Catch Basin - Type IV Double Grate (4' x 5' Square) shall be paid per vertical foot of Catch Basin - Type IV Double Grate (4' x 5' Square) installed complete. Measurement shall be from the inside bottom of the sump to finished grade.

BASIS OF PAYMENT / INCLUSIONS:
Catch Basin - Type III Single Grate (4' x 5' Square) 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 Catch Basin - Type III Single Grate (4' x 5' Square) as shown and indicated in the Contract Documents, at the requirements of the Engineer and as specified. The work includes but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install pre-cast sections and structures; furnish and install temporary support of excavation; for vertical wood sheeting or soldier piles and lagging, cut off 5-ft below grade and leave in place where required or directed; furnish, install and compact bedding; furnish and install backfill per one of the approved methods; furnish, install and compact gravel road sub-base; compaction and compaction testing; frames and grates; hoods; dampproofing; testing; grouting; gaskets; pipe connections, including flexible sleeves; and all other work required for the installation of Catch Basin - Type IV Double Grate (4' x 5' Square), not included for payment elsewhere.

Item 2604.5 --- Catch Basin - Type V Direct Inlet

METHOD OF MEASUREMENT:

Catch Basin - Type V Direct Inlet shall be paid per Catch Basin - Type V Direct Inlet installed complete.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Catch Basin - Type V Direct Inlet 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 Type V Direct Inlet as shown on the Contract Drawings, at the direction of the Engineer and as specified. The work includes but is not limited to; saw cutting bituminous and cement concrete; excavation; furnish and install pre-cast inlet box; pre-cast or concrete frame and grate raising rings; concrete fill; furnish and install temporary support of excavation; furnish and install bedding; furnish and place backfill per one of the approved methods; furnish, install and compact gravel road sub-base; frames and grates; compaction and compaction testing; dampproofing; testing; grouting; gaskets; pipe connections, including flexible sleeves; furnish and install pipe to connect the sump manhole with the inlet box, regardless of size and/or pipe material and/or length; and all other work required for the installation of Catch Basin - Type V Direct Inlet, not included for payment elsewhere.

END SECTION 02604

SECTION 02609

REINFORCED CONCRETE PIPE

2609.1	**PIPE – RCP (GRAVITY) 18-IN**	**LINEAR FOOT**
2609.2	**PIPE – RCP (GRAVITY) 24-IN**	**LINEAR FOOT**
2609.3	**PIPE – RCP (GRAVITY) 30-IN**	**LINEAR FOOT**
2609.4	**PIPE – RCP (GRAVITY) 36-IN**	**LINEAR FOOT**

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish and install reinforced concrete pipe as indicated and specified.

1.2 RELATED WORK

A. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

B. Section 02252 – MANHOLES

C. Section 03300 – CONCRETE

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Submit shop drawings of pipe and fittings.

2. Submit product data and certified dimensional drawings of all pipes, fittings, and appurtenances.

3. Submit gasket and pipe manufacturer's joint assembly directions.

4. Submit 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. Submit certification with each delivery, that pipe complies to this specification.

7. Submit anticipated production and delivery schedule.

1.4 DELIVERY AND STORAGE

A. Arrange for the delivery of the pipe sections at approved locations in the vicinity of the location in which the pipe sections are to be laid. Pipe shall be stored in an approved orderly manner so that there will be a minimum of handling from the storage area into the final position in the work, and so that there is a minimum of obstruction and inconvenience to any kind of traffic. Deliveries shall be scheduled so that the progress of the work is at no time delayed, and also so that large quantities of pipe shall not be stored on areas over structures of utilities which might be damaged by the superimposed load, and storage of pipe will be restricted to approved or permitted areas. Pipe shall be strutted, if necessary, for proper protection of the pipe during storage or handling. Pipe shall be handled and stored in such a manner and by such means as recommended by the pipe manufacturer, and so that the pipe, including the interior pipe, will not be damaged.

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, con-

struction 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. 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 or Profile type gaskets meeting requirements of ASTM C443, latest revision, 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.

4. Where new Elliptical RCP pipe joints with existing Elliptical pipe of any material, in addition to the cast-in-place concrete collar, the Contractor shall seal the exterior joints with an elastomeric joint wrap of not less that 9" wide, manufactured by Hamilton Kent, Co., Henry Co., Cadilloc External Joint Pipe, Concrete Sealants, Inc., or approved equal.

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: Before load test, take 3 cores from each unit. Test by boiling. Average absorption : Maximum 8 percent of dry weight, no single test more than 9 percent.

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.

2.2 INSPECTION AND REJECTION OF REINFORCED CONCRETE PIPE

A. General

1. Acceptance of pipe shall be made on the basis of certificates of compliance that the pipe meets all material specifications.

2. The quality of all materials, the process of manufacture, and the finished pipe may be subject to the inspection and approval of the Owner. Such inspection may be made at the place of manufacture or on the work after delivery, or at both places, and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements even though sample pipe may have been accepted as satisfactory. The Owner reserves the right to apply such tests as deemed necessary, and to take samples of the concrete after it has been mixed or as it is being placed in the forms or molds and to make such tests thereof as deemed necessary. All pipe will be inspected upon delivery prior to and after installation of the pipelines, and pipe which has been damaged or which does not meet the requirements of these Specifications will be rejected and shall be immediately removed from the site and replaced with sound pipe meeting specification requirements at no additional expense to the Owner. Furnish such labor and assistance to the Owner as he may require for inspection purposes.

PART 3 – EXECUTION

3.1 GENERAL

A. Pipe and Pipe Fittings

1. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

2. 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.

3. Laying Pipe: Except where a concrete cradle or envelope is required, all pipe greater than or equal to 18-inches (450 mm) 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.

4. Jointing Pipe: After the pipe are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned.

5. 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.

6. 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.

7. 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.

8. Place plugs in end of uncompleted conduit at end of day or whenever work stops. Flush lines between manholes if required to remove collected debris.

9. 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 required. 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.

B. Leakage Tests

1. Leakage tests will be required by the Owner for all pipe and manhole installations. Tests shall meet all requirements of this paragraph. Leakage into or from the piping and structures, except storage tanks, will be determined respectively by infiltration tests or by exfiltration tests, as specified herein and as required. The maximum allowable amount of infiltration into the piping or exfiltration from the piping as determined respectively by the infiltration tests or by the exfiltration tests, including manholes,

shall be at a rate of not greater than 150 gallons per inch of pipe diameter per mile of pipe per 24 hours, and there shall be no gushing or spurting streams of water into or from the piping or manholes. The phrase, "per mile of pipe" shall refer to the total length of pipe 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 pipe being tested for leakage, the leakage into the piping and manholes shall be determined as specified under "Infiltration Tests." Where the groundwater 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 pipe being tested, the leakage from the piping and manholes shall be determined as specified under "Exfiltration Tests." Perform all work, provide all necessary weirs or such other measuring devices as required, do all pumping and furnish all equipment necessary for the proper performance of leakage tests at no additional cost to the Owner. Leakage testing of piping shall be satisfactorily performed in sections as the work progresses, and as required.

C. Infiltration Tests:

1. 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 the pipe being tested. The groundwater leakage into the pipe will be measured by the Owner at such point or points as required. Construct such weirs or other means of measurement as required and pump as necessary for the tests to be properly made.

D. Exfiltration Tests:

1. Where exfiltration tests are required, the section of pipe to be tested shall be subjected to an internal pressure. The lower end of the section of pipe to be tested shall be closed and the entire section of the pipe, including manholes, shall be filled with clean water so as to obtain a minimum head of 2 feet above the crown of the pipe at the upper end. The length of the section of pipe being tested is limited to the amount of pipe that can be tested without exceeding 8 feet above the crown of the lowest portion of the pipe. The rate of leakage from each section of the pipe 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 pipe for the full length of each section of the pipes being tested.

2. Should the infiltration or exfiltration test on any section of the pipelines, including manholes, show a rate of leakage into or from the pipeline exceeding the maximum allowable rate of infiltration or exfiltration specified herein, locate, repair, or replace defective joints and work per the Owner's requirements and retest at no additional cost to the Owner until the rate of infiltration into or exfiltration from each section of the pipeline being tested does not exceed the rate specified herein for infiltration or exfiltration.

3. The completed pipe and joints shall be visually observed by the Engineer. If the Contractor is unable to pass a pressure test because lines are "live", the Contractor shall perform closed circuit television inspections of the lines 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

Item 2609.1 - Pipe – RCP (Gravity) 18-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – RCP (Gravity) 18-inch will be based on the actual linear feet of pipe installed, of all classes and at all depths, 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 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.

BASIS OF PAYMENT:
Payment for Pipe – RCP (Gravity) 18-inch 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 install 18-in Reinforced Concrete Pipe (Gravity) 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; furnishing and placing backfill per one of the approved methods; preparation of subgrade; 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 as required or where required; furnishing, installing and compacting

bedding; furnishing and installing reinforced concrete pipe, fittings, couplings and appurtenances; connections to existing and proposed pipes and structures; testing by infiltration / exfiltration or by CCTV; construction dewatering; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2609.2 - Pipe – RCP (Gravity) 24-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – RCP (Gravity) 24-inch will be based on the actual linear feet of pipe installed, of all classes and at all depths, 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 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.

BASIS OF PAYMENT:
Payment for Pipe – RCP (Gravity) 24-inch 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 install 24-in Reinforced Concrete Pipe (Gravity) 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; furnishing and placing backfill per one of the approved methods; preparation of subgrade; 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 as required or where required; furnishing, installing and compacting bedding; furnishing and installing reinforced concrete pipe, fittings, couplings and appurtenances; connections to existing and proposed pipes and structures; testing by infiltration / exfiltration or by CCTV; construction dewatering; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2609.3 - Pipe – RCP (Gravity) 30-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – RCP (Gravity) 30-inch will be based on the actual linear feet of pipe installed, of all classes and at all depths, 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 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.

BASIS OF PAYMENT:
Payment for Pipe – RCP (Gravity) 30-inch 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 install 30-in Reinforced Concrete Pipe (Gravity) 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; furnishing and placing backfill per one of the approved methods; preparation of subgrade; 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 as required or where required; furnishing, installing and compacting bedding; furnishing and installing reinforced concrete pipe, fittings, couplings and appurtenances; connections to existing and proposed pipes and structures; testing by infiltration / exfiltration or by CCTV; construction dewatering; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2609.4 - Pipe – RCP (Gravity) 36-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – RCP (Gravity) 36-inch will be based on the actual linear feet of pipe installed, of all classes and at all depths, 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 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.

BASIS OF PAYMENT:
Payment for Pipe – RCP (Gravity) 36-inch 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 install 36-in Reinforced Concrete Pipe (Gravity) 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; furnishing and placing backfill per one of the approved methods; preparation of subgrade; 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 as required or where required; furnishing, installing and compacting bedding; furnishing and installing reinforced concrete pipe, fittings, couplings and appurtenances; connections to existing and proposed pipes and structures; testing by infiltration / exfiltration or by CCTV; construction dewatering; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02609

SECTION 02615

DUCTILE IRON PIPE FOR SANITARY
AND STORM DRAIN GRAVITY AND FORCEMAINS

2615.1	**PIPE – DI (GRAVITY) 10-INCH**	**LINEAR FOOT**
2615.2	**PIPE – DI (GRAVITY) 12-INCH**	**LINEAR FOOT**
2615.3	**PIPE – DI (GRAVITY) 16-INCH**	**LINEAR FOOT**
2615.4	**PIPE – DI (GRAVITY) 20-INCH**	**LINEAR FOOT**
2615.5	**PIPE – DI (GRAVITY) 24-INCH**	**LINEAR FOOT**

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Furnishing, installing, and testing ductile-iron pipe and fittings for sanitary and storm drain service, as indicated and specified.

B. Options:

1. For joints in buried pipelines, provide either push-on, flanged or mechanical-joint as shown on the Drawings. All fittings shall be mechanical joint.

C. Related sections include the following:

1. Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING

2. Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING

3. Section 03300 - CONCRETE

1.2 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 Certificates of Compliance with these Specifications and certification that the ductile iron pipe and fittings have been manufactured and tested in accordance with AWWA/ANSI specifications.

3. Submit a detailed description of proposed testing and flushing procedures to be used for this project. The description shall contain the name of the person responsible for the testing and flushing work, equipment to be used, chemical to be used and method of measuring flow during flushing procedures. 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.

1.3 QUALITY CONTROL

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.

1.4 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 type, restrained joint, or mechanical joints, as required.

2. All ductile iron pipe shall conform to ANSI A21.50 (1976) (AWWA C150) and ANSI A21.51 (AWWA C151).

3. The ductile iron pipe shall be Pressure Class 350 and furnished in nominal 18-foot lengths, with Push-on, Flanged, or Mechanical Joints as manufactured by U.S. Pipe and Foundry Company, Griffin Pipe Co., Clow Corporation, or equal with gaskets conforming to AWWA C111 ANSI A21.11 "Rubber Gasket Joints".

4. The ductile iron pipe shall be double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to AWWA C104 ANSI A21.4. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

2.2 FITTINGS

A. Fittings shall be compact ductile iron Class 350 Mechanical Joint, conforming to ANSI Specification A21.53 (AWWA C153), latest edition, for pipe sizes 16-inches and smaller, and Class 350 standard Mechanical Joint fittings conforming to AWWA C110/ANSI A21.10, latest edition except as specified, for pipe sizes 16 through 24-inches, unless specifically stated otherwise in the specifications or on the drawings. Fittings shall be suitable for use with restraints as specified hereinafter. Fittings shall be manufactured in the United States. Fittings shall be of the same material and have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends.

1. 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.

2. Solid sleeves shall be ductile iron with 350 psi rating. Sleeves shall conform to ANSI/AWWA C110.

2.3 GASKET MATERIALS

A. Push-on and mechanical joint gaskets shall be Nitrile (NBR) (Acrylonitrile Butadiene) or equal gasket acceptable for use in an environment which will handle fats, oils and greases unless otherwise noted or approved.

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.

2.5 JOINTS

A. Provide mechanical joint, flanged or push-on joint pipe with necessary accessories, conforming to ANSI A21.11.

B. Restrained joints for force mains shall be furnished for installation on all fittings, sleeves, and valves. Restraints for mechanical joints shall be Series 1100 Megalug as manufactured by Ebaa Iron Co., MJ Field Lok Gasket as manufactured by US Piping Company, Uni-flanged Series 1400 Mechanical Joint Restraint or equal.

C. Restraints for force main for push-on joints shall be Series 1700 as manufactured by Ebaa Iron Co., or Series 1390 as manufactured by Uni-Flange. Restraint systems for push-on pipe utilizing steel-wedge gaskets will be acceptable.

2.6 STANDARD LINING AND COATING

A. Inside of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to ANSI A21.4.

B. Outside of pipe and fittings within structures: Clean and apply one shop coat of Koppers Pug Primer made by Koppers Co., Inc., Pittsburgh, PA; Chem-Prime 37-77 made by Tnemec Co., North Kansas City, MD; 13-R-50 Chromax Primer made by Valspar Corp. Short Hills, NJ; or acceptable equivalent.

C. Outside of other pipe and fittings: Standard bituminous coating conforming to appropriate ANSI Standard.

PART 3 - EXECUTION

3.1 HANDLING PIPE

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

B. Pipe shall be stored above ground at a height no greater than 5 feet, and with even support for the pipe barrel.

C. Only nylon-protected slings shall be used for handling the pipe. No hooks or bare cables will be permitted.

D. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone producing electric motors.

3.2 ALIGNMENT AND PLACEMENT OF PIPE

A. Jointing of ductile iron pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8-inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to insure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.

B. Installation and jointing of push-on ductile iron pipe shall be in accordance with AWWA C600 Sections 9b and 9c, latest revision, as applicable.

C. Mechanical joints on force mains shall be installed with Mega-Lug, Uni-Flange or MJR restraints. Restraints shall be installed in full accordance with the manufacturers' instructions. All bolt heads on Mega-Lugs or Uni-flanged shall be tightened sufficiently so that they shear off to provide indication that proper tightening torque was achieved.

D. Restrained push-on joints for force mains shall be installed with specified gasket joint restraints. Restraints shall be installed in full accordance with the manufacturers' instructions.

E. Fittings and valves shall be restrained as shown on the drawings.

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. 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.

3.5 TESTING

A. Clean of all dirt, dust, oil, grease and other foreign material, before conducting pressure and leakage tests.

B. Gravity lines shall be tested in accordance with Specification Section 02622.3.1 C, D, and E

3.6 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01701 – PROJECT CLOSEOUT.

PART 4 – COMPENSATION

Item 2615.1 - Pipe – DI (Gravity) 10-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – DI (Gravity) 10-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 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.

BASIS OF PAYMENT:
Payment for Pipe – DI (Gravity) 10-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 concrete; excavation; 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 or required; bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, restraints, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; flushing and testing; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2615.2 - Pipe – DI (Gravity) 12-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – DI (Gravity) 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 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.

BASIS OF PAYMENT:
Payment for Pipe – DI (Gravity) 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; 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 or required; bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, restraints, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; flushing and testing; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2615.3 --- Pipe – DI (Gravity) 16-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – DI (Gravity) 16-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 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.

BASIS OF PAYMENT:
Payment for Pipe – DI (Gravity) 16-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 concrete; excavation; 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 or required; bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, restraints, transitions, gaskets and

appurtenances; connections to existing and proposed pipes and structures; flushing and testing; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2615.4 --- Pipe – DI (Gravity) 20-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – DI (Gravity) 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 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.

BASIS OF PAYMENT:
Payment for Pipe – DI (Gravity) 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 concrete; excavation; 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 or required; bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, restraints, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; flushing and testing; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

Item 2615.5 --- Pipe – DI (Gravity) 24-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – DI (Gravity) 24-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 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.

BASIS OF PAYMENT:

Payment for Pipe – DI (Gravity) 24-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 concrete; excavation; 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 or required; bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, restraints, transitions, gaskets and appurtenances; connections to existing and proposed pipes and structures; flushing and testing; dye testing to verify proper service connections; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02615

SECTION 02622

POLYVINYL CHLORIDE GRAVITY PIPE

2622.1	**RECONNECT AND RELOCATE EXISTING SANITARY SEWER AND STORM DRAIN LATERALS**	**LINEAR FOOT**
2622.1A	**RECONNECT AND RELOCATE EXISTING SANITARY SEWER AND STORM DRAIN LATERALS (BID ALTERNATE 1)**	**LINEAR FOOT**
2622.2	**LATERAL CONNECTIONS TO CIP LINED PIPE ON OXFORD STREET**	**EACH**
2622.3	**PIPE – PVC (GRAVITY) 8-INCH**	**LINEAR FOOT**
2622.3A	**PIPE – PVC (GRAVITY) 8-INCH (BID ALTERNATE 1)**	**LINEAR FOOT**
2622.4	**PIPE – PVC (GRAVITY) 10-INCH**	**LINEAR FOOT**
2622.4A	**PIPE – PVC (GRAVITY) 10-INCH (BID ALTERNATE 1)**	**LINEAR FOOT**
2622.5	**PIPE – PVC (GRAVITY) 15-INCH**	**LINEAR FOOT**

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish, install, and test PVC pipe and fittings for sanitary and storm gravity sewer piping as indicated and specified.

B. Where the work "pipe" is used it shall refer to pipe fittings, connections, or appurtenances unless otherwise note.

1.2 RELATED WORK

A. Section 02210 - EARTH EXCAVATION, BACKFILL, FILL AND GRADING

B. Section 02252 – MANHOLES

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Submit shop drawings, product data sheets, and laying diagrams of all pipe, joints, bends, special fittings, and piping appurtenances.

2. Submit anticipated production and delivery schedule.

3. Submit manufacturer's certificates for all materials indicating conformance to the Contract Documents.

4. For informational purposes only, submit manufacturer's printed installation instructions.

5. Submit detailed testing procedures as specified.

1.4 QUALITY ASSURANCE

A. Testing: All materials testing will be based upon applicable ASTM Test Methods and AWWA Standards referenced herein for the materials specified.

B. All costs of such inspection and tests shall be at no additional cost to the Owner.

C. Certificates: Manufacturer's notarized certificates of compliance shall be furnished by the Contractor.

D. The pipe shall be subjected to the specified hydrostatic strength tests, flexure tests, and crushing tests. The crushing tests shall be made on samples taken from the center of full-length sections of pipe.

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:

   a. 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. Elastomeric seals for compression type joints for PVC pipe and fittings shall conform to the requirements of ASTM D 3212.

4. Service pipes for storm services shall be minimum of 8-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 not acceptable.

D. Connections

1. Sanitary services shall be connected to new, parallel or replacement sanitary sewer lines with full bodied tees or wye fittings.

2. Storm services shall be connected to new, parallel, or replacement storm sewer lines with full bodied tees or wye fittings for all pipes up to 18-inches in diameter. Connections to pipes larger than 18-

inches in diameter or odd sizes shall be made with saddle tap connections, as approved by Engineer.

3. Connections of storm and sanitary service lines to existing storm and sanitary main lines shall be made with full bodied tees or wye fittings wherever possible for existing lines less than 18-inches in diameter and with tapping saddles as approved by Engineer for existing lines greater than 18-inches in diameter and in odd sizes.

E. 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.

F. Gaskets

1. Gaskets shall be flexible elastomeric rings conforming with ASTM F 477.

G. Acceptance of Pipe

1. Acceptance will be on the basis of tests specified hereinbefore. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to review by the Engineer. Inspection may be made at the place of manufacture, or on the work site after delivery or at both places and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.

2.2 DELIVERY AND STORAGE

A. Arrange for the delivery of the pipe sections at approved locations in the vicinity of the location in which the pipe sections are to be laid. Pipe shall be stored in an approved orderly manner so that there will be a minimum of handling from the storage area into the final position in the work, and so that there is a minimum of obstruction and inconvenience to any kind of traffic. Deliveries shall be scheduled so that the progress of the work is at no time delayed, and also so that large quantities of pipe shall not be stored on areas over structures of utilities which might be damaged by the superimposed load, and storage of pipe will be restricted to approved or permitted areas. Pipe shall be strutted, if necessary, for proper protection of the pipe during storage or handling. When unit packages of PVC pipe

are stacked, ensure that the weight of upper units does not cause deformation to pipe in lower units. Pipe shall be handled and stored in such a manner and by such means as recommended by the pipe manufacturer, and so that the pipe, including the interior pipe, will not be damaged.

PART 3 – EXECUTION

3.1 GENERAL

A. Installation

1. 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.

2. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified in Section 02210 – EARTH EXCAVATION, BACKFILL, FILL AND GRADING.

3. 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.

4. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.

5. Pipe and fittings shall be installed to the lines and grades indicated on the Drawings. Care shall be taken to ensure true alignments and gradients.

6. 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.

7. 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.

8. 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.

9. Details of gasket installation and joint assembly shall follow the directions of the manufacturers of the joint materials and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.

10. 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.

11. Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

12. After each pipe has been properly bedded, enough crushed stone 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 crushed stone and compacted, and then crushed stone shall be placed and compacted to complete the pipe bedding.

13. 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.

14. 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. Install PVC pipe and fittings in accordance with manufacturer's printed instructions.

B. 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.

C. 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.

D. Testing of Pipe

1. If the visual inspection of the completed pipe or any part thereof shows any pipe, manhole or joint which allows infiltration of water

in a noticeable stream or jet, the defective work or material shall be replaced or repaired as required.

2. After completing installation and backfill of pipe, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air.

3. Equipment used shall meet the following minimum requirements: Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected; Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking; All air used shall pass through a single control panel.

4. Three individual hoses shall be used for the following connections.

   a. From control panel to pneumatic plugs for inflation.

   b. From control panel to sealed line for introducing the low pressure air.

   c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

5. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs per plug manufacturer's requirements. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

6. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be installed in the line at each manhole and in accordance with the plug manufacturer's requirements. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

7. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back

pressure of any groundwater that may be over the pipe) is not less than the time shown for the given diameter in the following table.

Pipe Diameter	Specification Time for Length Shown (min:sec)			
Inches	100 ft.	200 ft.	300 ft.	400 ft.
6	5:40	5:40	5:40	5:42
8	7:34	7:34	7:36	10:08
10	9:26	9:26	11:52	15:49
12	11:20	11:24	17:05	22:47
15	14:10	17:48	26:42	35:36
18	17:00	25:38	38:27	51:16
21	19:50	34:54	52:21	69:48
24	22:47	45:34	68:22	91:10

8. In areas where groundwater is known to exist, the Contractor shall install a 1/2-inch diameter capped pipe nipple, approximately 10-inches long, through the manhole wall adjacent to one of the sewer lines entering the manhole. This shall be done at the time the line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This increases the 3.5 psig to 8.5 psig, and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same). In no case shall the starting pressure exceed 9.0 psig.

9. If the Contractor is unable to pass a pressure test because lines are "live", the Contractor shall perform closed circuit television inspections of the lines 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.

E. Test Failure

1. If the section of pipe fails to pass the leakage and pressure test, or if there is any visible leakage, the Contractor shall locate, uncover and repair or replace the defective pipe fitting or joint and retest all at his own expense. Pipe will be considered passing only when the leakage does not exceed the above standard. Passing the test does not absolve the Contractor from his responsibility if leaks develop later within the period of warranty.

PART 4 – COMPENSATION

Item 2622.1 – Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services
Item 2622.1A – Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for payment for Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services will be based on the actual linear feet of pipe installed, tested, and accepted, regardless of size or depth, 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 Relocate Existing Sanitary Services in Conflict With the Proposed Work or Reinstate Existing Sanitary Services 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 relocate existing sanitary or storm drain services which are in conflict with the proposed Work or to reconnect existing storm drain or sanitary services to the new storm drain or sanitary sewer main, regardless or size or depth, complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes; saw cutting bituminous and cement concrete; excavation; 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 or required; furnishing, placing and compacting bedding; removal and disposal of existing pipe; furnish and install PVC or DI pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes and structures; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:
Relocations required to facilitate the Contractor's means and methods or where broken by the Contractor are not included for payment herein but are to be considered incidental to the Contract and to be carried by the Contractor in his Total Bid Price.

Item 2622.2 – Lateral Connections to CIP Lined Pipe on Oxford Street

METHOD OF MEASUREMENT:
Measurement for payment for Lateral Connections to CIP Lined Pipe on Oxford Street will be based on the actual number of connections installed, tested, and accepted, regardless of size or depth, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Lateral Connections to CIP Lined Pipe on Oxford Street 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 connect existing laterals to the proposed CIP Lined Pipe on Oxford Street regardless of size or depth, complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes; saw cutting bituminous and cement concrete; excavation; 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 or required; furnishing, placing and compacting bedding; removal and disposal of existing pipe; furnish and install PVC or DI pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

Item 2622.3 - Pipe – PVC (Gravity) 8-inch
Item 2622.3A - Pipe – PVC (Gravity) 8-inch (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – PVC (Gravity) 8-in will be based on the actual feet of pipe installed at all depths, 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 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.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Pipe – PVC (Gravity) 8-in 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 install 8-in PVC pipe, complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes; saw cutting bituminous and cement concrete; excavation; 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, compaction; compaction testing temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or required; furnishing, placing and compacting bedding; furnish and install PVC pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes and structures; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

Item 2622.4 - Pipe – PVC (Gravity) 10-inch
Item 2622.4A - Pipe – PVC (Gravity) 10-inch (BID ALTERNATE 1)

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – PVC (Gravity) 10-in will be based on the actual feet of pipe installed at all depths, 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 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.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Pipe – PVC (Gravity) 10-in 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 install 10-in PVC pipe, complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes; saw cutting bituminous and cement concrete; excavation; 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, compaction; compaction testing temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or required; furnishing, placing and compacting bedding; furnish and install PVC pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes and structures; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

Item 2622.5 - Pipe – PVC (Gravity) 15-inch

METHOD OF MEASUREMENT:
Measurement for payment for Pipe – PVC (Gravity) 15-in will be based on the actual feet of pipe installed at all depths, 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 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.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Pipe – PVC (Gravity) 15-in 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 install 15-in PVC pipe, complete as shown on the Contract Drawings or at the requirements of the Engineer. The work includes; saw cutting bituminous and cement concrete; excavation; 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, compaction; compaction testing temporary excavation support furnished and installed complete, left in place, and cut off below grade where required or required; furnishing, placing and compacting bedding; furnish and install PVC pipe, fittings, couplings, appurtenances and joints; connections to existing and proposed pipes and structures; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02622

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SECTION 02630

DUCTILE-IRON PIPE AND FITTINGS

2630.1	**PIPE – DI (WATER) 6-INCH**	**LINEAR FOOT**
2630.2	**PIPE – DI (WATER) 8-INCH**	**LINEAR FOOT**
2630.3	**PIPE – DI (WATER) 12-INCH**	**LINEAR FOOT**

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Furnishing and installing ductile-iron pipe and fittings, as indicated and specified.

B. Options:

1. For joints in buried exterior pipelines, provide push-on joint. All fittings and valves shall be mechanical joint.

C. Related sections includes 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

5. Section 02704 – PIPELINE PRESSURE AND LEAKAGE TESTING

D. Existing 6-in diameter water mains in horizontal or vertical conflict with the proposed work, in locations approved by the Owner and Engineer; where indicated in the Contract Drawings; or as otherwise required or approved by the Owner and Engineer shall be replaced with 8-in ductile iron pipe and fittings.

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. Submit a detailed description of proposed testing, flushing and disinfection procedures to be used for this project. The description shall contain the name of the person responsible for the testing, flushing and disinfection work, equipment to be used, chemical to be used, method of measuring flow during flushing procedures and the name of the laboratory to be used for analysis. Review of the description shall not be construed as approval of any methods to be used, the Contractor shall be fully responsible for achieving the specified test results.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 – QUALITY ASSURANCE 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.

2. All ductile iron pipe shall conform to ANSI A21.50 (1976) (AWWA C150) and ANSI A21.51 (AWWA C151).

3. The ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths, with Push-on Joints as manufactured by U.S. Pipe and Foundry Company, Griffin Pipe Co., or equal with gaskets conforming to AWWA C111 ANSI A21.11 "Rubber Gasket Joints".

4. The ductile iron pipe shall be at least 8-inches diameter, double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to AWWA C104 ANSI A21.4. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

2.2 FITTINGS

A. Ductile iron fittings shall be used 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 12-inch shall be ductile iron compact fittings and rated for 350 psi working pressure. 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 350 psi rating. Sleeves shall conform to ANSI/AWWA C110.

2.3 JOINTS

A. Provide mechanical joint or push-on joint pipe with necessary accessories, conforming to ANSI A21.11.

1. Provide gasket composition suitable for exposure to liquid within pipe.

2. Provide gasket composition suitable for exposure to potable water.

3. Provide mechanical joint gaskets with copper tips to provide electrical continuity.

4. Provide serrated brass wedges for push-on joints to provide electrical continuity; two per joint for pipe 12-in. and smaller and four per joint for larger pipe.

B. Provide pipe flanges and accessories conforming to ANSI A21.15.

1. Provide flat faced flanges.

2. Provide 1/8 in. thick, full faced gaskets suitable for exposure to liquid within pipe.

C. Restrained joints shall be furnished for installation on all fittings, sleeves, hydrants and valves. Restraints for mechanical joints shall be Megalug Series 1100 as manufactured by 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 of pipe and fittings: Provide double thickness cement lining and bituminous seal coat conforming to ANSI A21.4.

B. Outside of pipe and fittings within structures: Clean and apply one shop coat of Koppers Pug Primer made by Koppers Co., Inc., Pittsburgh, PA; Chem-Prime 37-77 made by Tnemec Co., North Kansas City, MD; 13-R-50 Chromax Primer made by Valspar Corp. Short Hills, NJ; or acceptable equivalent.

2.8 GASKETS, BOLTS, AND NUTS

A. Provide ring rubber gaskets with cloth insertion for flanged joints, neoprene faced phenolic for insulating gaskets.

1. Gaskets 12 in. in diameter and smaller, 1/16 in. thick.

2. Larger than 12 in., 1/8 in. thick.

B. Make flanged joints with:

1. Bolts.

2. Bolt studs with nut on each end.

3. Studs with nuts where flange is tapped.

4. Plastic bolt sleeves and washers for insulating joints.

C. Number and size of bolts conform to same ANS as flanges.

D. Provide bolts and nuts, except as specified or indicated, Grade B, ASTM A307.

E. Provide bolt studs and studs of same quality as machine bolts.

F. Flanged joints for wall castings flush with masonry made up with Type 316 stainless steel stud bolts and nuts.

G. Submerged flanged joints made up with Type 316 stainless steel bolts and nuts.

2.9 POLYETHYLENE PIPE ENCASEMENT

A. Material: Virgin polyethylene conforming to ANSI/ASTM D1248.

B. Thickness: Minimum nominal thickness of 8 mils.

C. Material and installation methods to conform to requirements of AWWA C105.

2.10 INSULATION

A. Insulation shall be manufactured by Thermal Pipe Systems, Braintree, Massachusetts, Atlas Insulation, Ayer, Massachusetts or Insulated Piping Systems, Inc., Canton, Massachusetts, or 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.

2.11 THRUST BLOCKING

A. Where applicable, reaction or concrete thrust blocks shall be furnished at all 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:

MINIMUM RESTRAINED LENGTHS

FITTING	RESTRAINT LENGTH
12" – 45° Bend	13-feet in each Direction
8" – 45° Bend	9-feet in each Direction
6" - 45° Bend	7-feet in each Direction
12" – 22-1/2° Bend	6-feet in each Direction
10" - 45° Bend	11-feet in each Direction
8" - 90° Bend	23-feet in each Direction
8" – 22-1/2° Bend	4-feet in each Direction
8" – 11-1/4° Bend	2-feet in each Direction
6" – 22-1/2° Bend	3-feet in each Direction
6" – 11-1/4° Bend	2-feet in each Direction
12" – 11-1/4° Bend	3-feet in each Direction
12" Vertical Offset	
Upper 45° Bend	27-feet in each Direction
Lower 45° Bend	12-feet in each Direction
8" Vertical Offset	
Upper 45° Bend	19-feet in each Direction
Lower 45° Bend	8-feet in each Direction
6" Vertical Offset	
Upper 45° Bend	14-feet in each Direction
Lower 45° Bend	6-feet in each Direction
12" x 12" x 12" Tee	42-feet in Branch

12" x 12" x 10" Tee	29-feet in Branch
12" x 12" x 8" Tee	16-feet in Branch
12" x 12" x 6" Tee	1-foot in Branch
8" x 8"x 8" Tee	25-feet in Branch
8" x 8" x 6" Tee	10-feet in Branch
8" x 8" x 4" Tee	1-foot in Branch
6" x 6" x 6" Tee	15-feet in Branch
6" x 6" x 4" Tee	1-foot in Branch
16" x 12" Reducer	32-feet Larger Direction only
12" x 10" Reducer	28-feet Larger Direction only
12" x 8" Reducer	31-feet Larger Direction only
12" x 6" Reducer	42-feet Larger Direction only
8" x 6" Reducer	17-feet Larger Direction only
8" x 4" Reducer	29-feet Larger Direction only
6" x 4" Reducer	16-feet Larger Direction only
12" Valve or Dead-end	58-feet in each Direction
10" Valve or Dead-end	49-feet in each Direction
8" Valve or Dead-end	41-feet in each Direction
6" Valve or Dead end	31-feet in each Direction
4" Valve or Dead-end	22-feet in each Direction
2" Valve or Dead-end	18-feet in each Direction

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.

5. 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 frm a sanitary sewer or surface water drain. DEP regulation #310CMR22.19 distribution system requirements.

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) 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; 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 or required; furnish, install, and compact bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, mechanical joint restraints, 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) 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; 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 or required; furnish, install, and compact bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, mechanical joint restraints, 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) 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; 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 or required; furnish, install, and compact bedding; furnish and install ductile iron pipe, couplings, fittings, adaptors, mechanical joint restraints, 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.

END OF SECTION 02630

SECTION 02640

VALVES AND APPURTENANCES

2640.1	**6-IN GATE VALVE AND GATE BOX**	**EACH**
2640.2	**8-IN GATE VALVE AND GATE BOX**	**EACH**
2640.3	**12-IN GATE VALVE AND GATE BOX**	**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.

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, 12-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.

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. 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.

C. Resilient gate valves shall meet the most recent version of the AWWA standard specification AWWA C509.

D. Resilient wedge valves shall have mechanical joint ends and shall be equal to ANSI/AWWA C11/A21.11.

E. Valves shall be Mueller A-2360 or approved equal.

F. Valve boxes shall be provided for each gate valve and tapping sleeve and valve.

G. Valve boxes shall be plastic or 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 gate box shall come complete with a cover on which the word "WATER" shall be cast. The cover of the gate 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. Plastic valve boxes shall be C.P. Test Services, Inc. or approved equivalent. Cast iron boxes shall be general foundry Buffalo Boxes or approved equivalent.

H. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull out as pressure or eternal forces increase. The device shall be capable of full mechanical joint deflection during assembly.

2.2 BUTTERFLY VALVES

A. Butterfly valves for buried service shall conform to AWWA C504, except as hereinafter provided. Butterfly valves shall be rated for Class 150b and both valve operators shall be especially designed for service buried in ground and shall be of the totally enclosed type. The unit shall be permanently lubricated with grease or oil. A standard AWWA 2-inch square operating nut shall be provided on the input shaft. Valves shall open to the right (clockwise).

B. Butterfly valves shall have interior and exterior coated with 8-mm epoxy coating. Valve body shall be ASTM A-126 cast iron. Valve to be seat-in body design and furnished with through disc pinning. Valve disc shall be ASTM A-126 cast iron. Disc edge shall be stainless steel. Packing to be chevron "V" type, self-adjusting. Bearings shall be non-metallic to prevent galvanic corrosion.

2.3 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. 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).

2.4 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 course "rope" thread to enable quick and easy removal.

C. Required Brass Goods shall include Corporation Cocks, Curb Stops, and Misc. Couplings and Fittings. 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 Mueller Mark II Oriseal or approved equivalent and corporation cocks shall be Mueller 110, H15008 or approved equivalent.

D. Washers shall be of cast bronze containing not less than 85 percent copper finished on both sides of true faces.

E. All curb cocks shall be subjected to a sustained hydraulic pressure of 200 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.

2.5 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.

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 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.

3.4 BURIED VALVES

A. Buried valves and boxes shall be set with the operating stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve.

3.5 VALVE BOXES

A. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform with the finished surface of roadway or other surface at the completion of the contract. Valve box aligners shall be used in the alignment process.

3.6 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.

3.7 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION

2640.1 --- 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; 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.

2640.2 --- 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; 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.

2640.3 --- 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; 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.

END OF SECTION 02640

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SECTION 02645

HYDRANTS

2645.1	**NEW HYDRANT**	**EACH**
2645.2	**REMOVE AND DISPOSE 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.

1.2 SUMMARY

A. This Section includes the following:

1. Providing hydrants, gate valves and boxes and appurtenant work, complete in accordance with the drawings and specifications.

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 - SUBMITTAL PROCEDURES:

1. Submit shop drawings and manufacturers descriptive literature, showing hydrant dimensions and features.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 – 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.

2.2 SAFETY FLANGE REPAIR KITS

A. Safety flange repair kits shall come complete with stem coupling, safety flange, flange gasket, replacement bolts and nuts and hydrant lubricating oil.

B. Safety flange repair kits shall be compatible with hydrant furnished.

2.3 EXTENSION KITS

A. Extension kits shall come complete with extension barrel, extension stem, stem coupling and hardware, flange, flange gasket, 8 bolts and nuts and hydrant lubricating oil.

B. Extension kits shall be compatible with hydrant furnished.

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.

3.2 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01701 – PROJECT CLOSEOUT.

PART 4 – COMPENSATION

<u>Item 2645.1 – New Hydrant</u>

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; 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; remove and dispose of or remove and salvage existing hydrant as requested by the Owner or Engineer; transportation of salvaged hydrant to the Cambridge Water Department or other location in Cambridge as required by the Owner or Engineer; 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; 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.

END OF SECTION 02645

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

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.

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.

3.6 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02647

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SECTION 02660

WATER SERVICES

2660.1	**1/2-IN TO 3-IN WATER SERVICE REPLACEMENT**	**LINEAR FOOT**
2660.2	**TIE OVER EXISTING WATER SERVICES TO NEW WATER 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 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.

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 and as specified.

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water services materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 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. Type K hard-temper in sizes larger than 1-inch and Type K soft-temper for smaller sizes.

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.

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.

2.5 FITTINGS

A. Unless otherwise approved, only compression type fittings manufactured by Mueller Inc., or approved equivalent, shall be used.

B. Mueller brass tees shall be used to provide 1-inch services off of 2-inch

polyethylene tubing.

C. Adapters required to allow connection to existing services shall be provided.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. After successful testing and chlorination, water services 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.

3.2 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION

Item 2660.1 – ½-in to 3-in Water Service Replacement

METHOD OF MEASUREMENT:
Measurement for payment for ½-in to 3-in Water Service Replacement will be based on the actual linear feet of pipe 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 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 ½-in to 3-in Water Service Replacement 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 replace existing water services between ½-in and 3-in in diameter, which are in elevation or alignment conflict with the proposed Work or which are existing lead services, 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; excavation; 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 includes the relocation of only those pipes in direct elevation or alignment conflict with the proposed work or as indicated in the Contract Documents. This item also includes the replacement of lead water services encountered during construction, where required by the Owner or Engineer, or where indicated in the Contract Documents.

Item 2660.2 – Tie Over Existing Water Services to New Water Main

METHOD OF MEASUREMENT:
Measurement for payment for Tie Over Existing Water Services to New Water Main will be based on the actual number of water services tied over, tested, and accepted, regardless of size, at all depths, complete as shown on the Contract Drawings or as required by the Engineer and as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for Tie Over Existing Water Services to New 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 tie over existing water services regardless of size, which are in elevation or alignment conflict with the proposed Work or which are existing lead services, 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; excavation; 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 corporations and curb stops, fittings, couplings, appurtenances and joints; furnish and install valve or service boxes; connections to existing and proposed pipes; tapping; chlorination; flushing/cleaning and testing; and all incidental work not specifically included for payment elsewhere.

SPECIAL NOTES ON EXCLUSIONS:
This item includes the relocation of only those pipes in direct elevation or alignment conflict with the proposed work or as indicated in the Contract Documents. This item also includes the replacement of lead water services encountered during construction, where required by the Owner or Engineer, or where indicated in the Contract Documents.

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.

1.3 SYSTEM DESCRIPTION

A. Disinfect all water main 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 and discharge of water with high concentrations of chlorine, 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. Contractor shall be responsible for coordinating all activities with the Cambridge Water Department (CWD) if it is intended to use 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. Dechlorinization 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.

1.6 SUBMITTALS

A. Contractor to submit written disinfection plan to Engineer for review. Plan to include chemical data, feed rates, 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. Calcium hypochlorite shall conform to AWWA B300.

1. Granules with 70 percent available chlorine.

B. Liquid sodium hypochlorite shall conform to AWWA B300.

C. Owner-approved backflow preventer devices.

D. 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 disinfection procedure, 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 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 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).

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. 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.

3.5 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION (NOT USED)

END OF SECTION 02675

SECTION 02685

TEMPORARY BY-PASS PIPING AND SERVICE CONNECTIONS FOR WATER MAINS

2685.1 TEMPORARY BYPASS PIPING LINEAR FEET

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.

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] [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.

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 Bypass Piping

METHOD OF MEASUREMENT:
Measurement for payment for Temporary 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 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

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 120 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.

3.4 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 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.

3.5 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 02750

ROOT INTRUSION REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. The 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 and property.

B. This section includes furnishing all plant, labor, equipment and materials as well as performing all operations associated with the cutting, removal, and chemical treatment of root intrusion in the existing 18-inch pipe on Prentiss Street approximately between Stations 202+20 and 202+30 or otherwise as required by the Engineer and in accordance with these Specifications.

1.2 RELATED WORK

A. Division 1 – General Requirements

B. SECTION 01570 – Maintenance and Protection of Traffic

C. SECTION 02100 – Tree Protection and Maintenance

1.3 SUBMITTALS

A. Submit each item in this article according to the conditions of the Contract and Division 1, SECTION 5.01 – SUBMITTALS:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete Root Intrusion removal operations. Details and description of construction methods, equipment, and process description including all pertinent information fro 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. Description of surface activities including access structures, staging and inversion locations.

5. Contractor to submit written evidence that they have obtained pollution liability coverage for the use of chemical agents for root intrusion removal.

6. Contractor to submit qualifications of a State Certified pesticide applicator.

1.4 QUALITY ASSURANCE

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.

1.4 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 271. 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 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 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 sewers.

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 sewers 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

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with pipeline cleaning within the pipelines indicated on the Drawings in accordance with these Specifications.

2. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with pre and post construction closed-circuit television inspection of the pipelines indicated on the Drawings in accordance with these Specifications.

3. Performing the work in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons and property.

B. Related Sections include the following:

1. Section 02761 – FLOW BYPASS

1.3 SUBMITTALS

A. General: Submit each item in this article according to the conditions of the Contract and Division 1, SECTION 01300 – SUBMITTALS:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete pipeline cleaning operations.

2. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete internal inspection operations to complete internal inspection operations.

3. A representative sample DVD showing the quality of work obtained by the assembly prior to internal inspection and cleaning.

4. Two copies of inspection reports for both pre and post construction internal inspections.

5. Confined Space Entry certifications for all personnel entering pipeline or access structures.

B. Contractor shall submit complete documentation of qualifications as specified herein.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 – QUALITY CONTROL and as specified herein.

B. The Contractor cleaning and internally inspecting the pipeline shall have completed at least three projects of similar size and complexity as this project in the United States within the past three years. Contractor may employ the services of a subcontractor that specializes in this work to fulfill this requirement.

C. Rejection of any subcontractor and/or manufacturer by the Engineer due to insufficient qualifications shall not be grounds for modifications to the Contract Documents such as change in scope, time of completion or contract amount.

D. All Contractor's personnel entering pipeline or access structures shall be Confined Space Entry trained per OSHA, Title 29 CFR 1910.46 and shall have a copy of their certification available on site at all times.

1.5 PRODUCTS, MATERIALS AND EQUIPMENT

A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS, AND EQUIPMENT.

PART 2 - PRODUCTS

2.1 CLEANING

A. Contractor shall use mechanical, hydraulically-propelled, and/or high-velocity cleaning equipment, which does not exert internal pressures great enough to damage the pipelines and associated structures. Selection of the

cleaning equipment shall be based on the condition of the pipeline at the time work is scheduled to commence.

B. Equipment shall include the following systems:

1. High pressure water of sufficient capacity and volume to remove debris from the pipe and structure walls as approved by the Engineer.

2. Motorized equipment complete with belt booster clutch, overload clutch or other means or devices that shall prevent damage to the pipeline and associated structures. Direct drive shall not be permitted.

3. Standard mechanical equipment including a combination of rodding machines, boring machines, bucket machines, hydraulic balls, B-liners, cones, ferrets or similar equipment. Direct drive shall not be permitted.

4. High pressure, hydraulically-propelled equipment and chemical compounds as approved by the Engineer.

5. Mechanical cutting devices suitable for the removal of roots, gaskets, protruding services, etc.

6. Footage metering devices for location of all equipment, devices and points of reference on measuring target that is known at all times at the ground level.

2.2 CLOSED CIRCUIT TELEVISION INSPECTION

A. Camera and vehicle assembly:

1. Industry standard for internally inspecting pipelines within the range of diameters applicable to this project.

2. Remote–controlled, robotic assembly capable of view 360° of pipeline interiors. At areas of interest, camera shall be capable of rotating its lens to obtain a more direct viewing angle.

3. Capable of operation in 100 percent humidity conditions.

4. Capable of being moved through the pipeline in either direction at a slow rate by means of manual cable winches or motorized mechanical equipment of indirect drive type.

5. Capable of slowing down and stopping at areas of interest.

6. Provide high intensity light feature for recording purposes.

7. Capable of measuring the camera's position within the pipeline accurate 0.10 feet.

B. During the internal inspection of pipelines, the Owner and the Engineer shall have the ability to view the pipe interior as it is being inspected on a TV monitor set up in a command center.

C. DVD:

1. DVD recordings shall, by electronic means, display continuously and simultaneously generated transparent digital information to include the date, time, pipeline section number, corresponding station numbers and direction of camera relative to flow.

Example: Time: 4:14:08 PM
Date: 5/7/02

ELM ST.
MH #2 to MH #3 (Downstream)
STATION 2+50.7

2. Inspections shall be documented on DVD formatted discs. The DVD shall be in color and capable of being played on a DVD player.

PART 3 – EXECUTION

3.1 GENERAL

A. Contractor shall perform all work in accordance with municipal, state and federal requirements including OSHA.

B. Contractor shall obtain all permits required to perform work prior to the commencement of construction at no additional cost to the Owner.

C. Contractor shall locate and uncover all manholes and/or access structures required to complete the work in accordance with this Section.

D. Contractor shall maintain existing flows around the work during cleaning operations in accordance with Section 02761 – FLOW BYPASS.

3.2 PIPELINE CLEANING

A. Contractor shall clean the pipeline to facilitate inspection and construction.

B. Contractor shall protect the pipeline from damage that could be inflicted by use of cleaning equipment. Any damage inflicted, regardless of technique, shall be repaired by the Contractor to the requirements of the Owner, at no additional cost to the Owner.

C. All sludge, dirt, sand, rocks, grease, and other solid or semi-solid materials that may cause an obstruction or impede the inspection and/or construction shall be removed and disposed off site during cleaning operations in watertight containers in conformance with all applicable federal, state and municipal laws and regulations, at no additional cost to the Owner. All materials that will not cause an obstruction or impede the inspection and/or construction shall be flushed downstream.

D. Contractor shall manage, transport and dispose of waste materials collected and removed from the pipeline during cleaning operations in accordance with Section 02080 – SOIL AND WASTE MANAGEMENT and Section 02095 – TRANSPORTATION AND DISPOSAL OF SOIL AND FILL MATERIAL.

E. If during cleaning operations an obstruction is encountered, the Contractor shall prosecute cleaning operations and supplement with either high pressure water or needle hammer to remove. Contractor shall limit the amount of water pressure used to prevent any structural damage to the existing pipelines and structures. Should the obstruction prevent the pipeline from being cleaned, the Engineer shall be notified immediately. If, in the opinion of the Engineer, a point repair is required to facilitate cleaning, Contractor shall perform the repair and clean through said repair upon its completion. No additional compensation shall be paid to the Contractor for any portion of the pipe which requires re-cleaning after successful completion of the repair.

F. Contractor shall limit the use of water from hydrants to operations pertaining only to pipeline cleaning or other operations allowed in these Specifications. If water from fire hydrants is deemed necessary by the Contractor to avoid delay in normal work procedures, the water shall be conserved.

G. No fire hydrants 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 furnished and installed by the Contractor and prior approvals have been obtained from the Owner and Municipal Fire Department. The Contractor shall be responsible for all related charges for the set-up, including the water usage bill.

H. Contractor shall re-clean the pipeline, if in the opinion of the Engineer, materials have washed into the pipeline after acceptance of the cleaning and prior to construction at no additional cost to the Owner.

3.3 CLOSED CIRCUIT TELEVISION INSPECTION

A. Contractor shall stop and focus the camera at locations where one or more of the following points of interest are observed:

1. Inflow/Infiltration sources.

2. Construction defects, discolorations, wrinkles, etc.

3. Structural defects including broken pipe, collapsed pipe, cracks or abnormalities.

4. Abnormal joint conditions such as root intrusion, protruding lateral connections, in-line pipe size changes and/or material changes.

5. Mineral deposits, grease, obstructions, etc.

6. Lateral connections; plugged or open.

7. Offset joints or misalignments:

8. Manholes, access structures, etc.

9. Any other locations where the conditions may affect construction operations.

10. Any other location as required by the Engineer.

B. If, in the opinion of the Engineer, certain conditions may impede construction, Contractor shall perform a point repair.

C. The Contractor shall provide and maintain access to the system, including inflow control and dewatering within pipelines and associated structures as

well as all other work required to perform the internal inspections to the satisfaction of the Engineer.

3.4 INSPECTION REPORTS

A. At the conclusion of each internal inspection, the Contractor shall provide a summary report highlighting results of the investigations and summarizing conditions and points of interest as specified herein. All documentation shall be cross-referenced by stationing to enable the reviewer to identify a particular location.

B. The pre construction inspection report shall detail and document areas requiring point repairs. Recommendations for repairs as described by the Contractor shall be submitted to the Engineer.

C. The post construction inspection report shall detail the condition of constructed items and describe recommendations for repairs of any defects.

1. All areas where the construction is defective due to workmanship, chemical deterioration, or other, shall be identified by the Contractor.

2. If repairs are required, the Contractor shall produce a second post construction inspection report.

3.5 ACCEPTANCE

A. Acceptance of the pipeline cleaning shall be made upon the successful completion of the television inspection. If, in the opinion of the Engineer, cleaning has not been completed in accordance with these Specifications, the Contractor shall be required to re-clean and re-inspect the pipe until the cleaning is shown to be satisfactory, at no additional cost to the Owner.

B. Internal inspection operations, both pre and post construction, shall be considered for acceptance upon receipt by the Engineer of the following:

1. Two copies of the internal inspection reports

2. Two copies of the DVD discs showing pipelines and associated structures inspections.

3.6 PROJECT CLOSEOUT

A. Provide in accordance with SECTION 01701 – PROJECT CLOSEOUT.

PART 4 – COMPENSATION (NOT USED)

END OF SECTION 02760

SECTION 02761

FLOW BYPASS

2761.1 **FLOW BYPASS** **LUMP SUM**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Furnishing all plant, labor, equipment and materials, as well as performing all operations associated with handling bypass flows from the existing system around the work indicated on the Drawings in accordance with these Specifications.

2. Maintaining flow from main pipelines without interruption of service, and maintaining flow in lateral connections with minimal interruption of service.

3. Performing the work in a sequence that is the least disruptive to vehicular and pedestrian traffic and in a manner that shall protect the public from damage to persons and property.

B. Related Sections include the following:

1. Section 01500 - TEMPORARY FACILITIES AND CONTROLS

C. Contractor shall design the bypass flow handling system.

1.2 SUBMITTALS

A. General: Submit each item in This Article according to the Conditions of the Contract and Division 1, SECTION 01300 – SUBMITTALS:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete bypass flow handling operations.

2. Work plan including the following items:

a. Location, configuration and routing of bypass flow handling pipes and hoses.

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. Gravity Bypass

2. 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.

1.3 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 – QUALITY ASSURANCE and as specified.

B. The Contractor designing and installing the bypass flow handling system shall have completed at least five projects of similar size and complexity as this project in the United States within the past three 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.

1.4 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 the designated discharge 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 80 dBA at seven feet or 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.

PART 3 – EXECUTION

3.1 PREPARATIONS

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.

3.3 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01701.

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; and water main bypasses.

END OF SECTION 02761

SECTION 02767

CURED-IN-PLACE PIPELINING

2767.1	**CURED-IN-PLACE PIPELINING (20-inch x 15-inch)**	**LINEAR FOOT**
2767.2	**CURED-IN-PLACE PIPELINING (35-inch x 27-inch)**	**LINEAR FOOT**
2767.3	**CURED-IN-PLACE PIPELINING (8-inch)**	**LINEAR FOOT**
	(BID ALTERNATE 2)	

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. Furnishing all plant, labor, equipment and materials as well as performing all operations associated with the installation of cured-in-place pipelining (CIPP) inside the existing pipeline where indicated on the Drawings and in accordance with municipal, state and federal requirements, including OSHA, and these Specifications.

2. 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 within the limits and the duration of the work.

3. Handling and disposal of discharge water from CIPP curing operation.

B. Related Sections include the following:

1. Section 01060 – Permits and Regulatory Requirements

2. Section 02760 – Pipeline Cleaning and Internal Inspection.

3. Section 02761 – Flow Bypass.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 – SUBMITTAL PROCEDURES:

1. Shop drawings and/or manufacturer's descriptive literature indicating materials, equipment and methods to complete CIPP operations.

a. Details and description of construction methods, materials, equipment, and process description, including on-site and off-site tube wet out, insertion procedure, curing and cool down procedure, access structures and lateral connection details, method of cutting lateral connections, method for sealing ends of liner and lateral cut-outs, water sources and method of cure-water/steam discharge.

b. Material Safety Data Sheets (MSDS's) for all materials used during preparation and installation.

c. Certification stating that the Contractor is fully licensed by the CIPP manufacturer (if different).

d. Method(s) and equipment for repairs of any uncured areas, defects, test sample section repairs or other deformities in the completed product.

e. 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 design criteria.

f. Description of odors anticipated as a result of the curing process and methods to mitigate odors to prevent migration outside of the pipeline.

g. Confined Space Entry Certifications for all Contractor's personnel entering pipeline or access structures.

B. Contractor shall submit design calculations. The submittal shall provide documentation supporting the basis of the values used in the design calculations. The calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. For pulled-in systems, the Contractor shall submit design calculations for the maximum allowable pulling force on tube.

C. 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 1/2 hour.

D. Contractor shall submit final CIPP testing reports as specified herein.

E. Contractor shall submit a work plan to include the following items:

1. Name, business address and telephone number of the CIPP installer and/or manufacturer (if different from the Contractor).

2. List of names and phone numbers of all supervisory personnel involved with the CIPP installation.

3. Description of the method and any intended variances from the specified methods.

4. Description of surface activities including access structures, staging and inversion locations.

5. Construction method(s) and equipment used to penetrate blockages and/or partially collapsed sections of the existing pipeline.

6. Method(s) of repair for each location requiring a point repair.

7. 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.

8. Detailed action plan and description of techniques and equipment used in the event of odor migration into public and/or private property (indoors as well as outdoors).

9. Traffic and pedestrian management plan.

F. Contractor shall provide a certification stating that the sources of all lateral connections identified during internal inspection have been investigated within the pipeline as well as in adjacent buildings and structures and that the Contractor has secured these connections to prevent the migration of odors.

G. Contractor shall submit complete documentation of qualifications as specified herein.

H. The Contractor shall submit a written description of curing water disposal method.

1.4 QUALITY ASSURANCE

A. Provide in accordance with Section 01400 and as specified herein.

B. The Contractor installing the CIPP system shall have completed at least three (3) projects, in the United States, within the past two (2) years and projects that included CIPP installation lengths of at least 300 continuous linear feet, on-site or off-site wet-out or resin impregnation of the liner tube, and design of at least 36-inch diameter CIPP with wall thickness based on a fully deteriorated condition. 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.

C. 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. Attach résumés of each person named. Résumé information shall include, at a minimum, educational background, the number of years in a supervisory capacity and a list of completed projects within the past five (5) years, including project description, complexity and contract total amounts.

D. 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.

E. 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.

F. 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 PRODUCTS, MATERIALS, AND EQUIPMENT

A. Provide in accordance with Section 01600.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cured-In-Place Liner

1. Designed and constructed in accordance with ASTM F1216 for "Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube", and these Specifications.

2. Fabricated to a size that, when installed, shall neatly fit the internal circumference of the existing pipeline. Allowances shall be made for circumferential stretching during installation.

3. Consisting of one or more layers of flexible needled felt, or an equivalent woven, nonwoven or combination material.

4. Capable of carrying resin withstanding installation pressures and curing temperatures. Curing the liner shall form a continuous, hard, impermeable, tight-fitting lining between each installed reach.

5. The finished product in place shall meet the minimum chemical resistance requirements for domestic sanitary sewer applications as listed in table X2.1 of ASTM F1216. Exposure shall be for a minimum of 30 days at 73.4°F (23°C). During this period, CIPP test specimens shall lose no more than 20 percent of their initial flexural strength and

flexural modulus when tested in accordance with Section 8 of ASTM F1216.

6. For glass fiber reinforced liner materials, the Contractor shall provide chemical resistance test reports required under ASTM 3681 "Chemical Resistance of 'Fiberglass' (Glass-Fiber, Thermosetting-Resin) Pipe in a Deflected Condition" as indicated herein.

B. Resin

1. 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 strength properties specified herein.

C. Lateral Connection and End Sealing

1. The sealing material shall be an acrylamide based gel with a minimum of ten (10) percent acrylamide base material by weight in the total sealant mix. The chemical sealing material shall have a viscosity of approximately two (2) centipoises, which can be increased with additives, and a controllable reaction time from ten (10) seconds to one (1) hour. The application of the sealant shall be through a lateral sealing packer. Joint sealing shall be accomplished by forcing chemical sealing materials through the lateral packer into the surrounding soil through the leaking joint, crack or other lateral defect. Final acceptance of the sealed lateral will be accomplished via an air test of the joint or a visual inspection to verify that water is not leaking through the repaired lateral connection.

2.2 DESIGN CRITERIA

A. General

1. The CIPP shall be designed to 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 pipeline is fully deteriorated and cannot share any loading or contribute to structural integrity of the CIPP.

2. The properties of the CIPP, when cured, shall have the following minimum values:

Property	ASTM Test Method	Initial[1] psi	Long Term[2] psi
Flexural Strength	D790	4,500	NA
Flexural Modulus	D790 & D2990	300,000	150,000

Notes: [1]Initial values are determined by ASTM D790.

[2]Long term value is defined as fifty (50) years and is determined by ASTM D2990.

B. Design Performance Limits and Design Parameters

1. The CIPP shall be designed such that the lining shall not fail, collapse, buckle, crack or delaminate under load. The maximum long-term fifty (50) years calculated deflection under all loads shall not exceed five (5) percent. For glass fiber reinforced liner pipe, the bending strain fifty (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:

1.	Depth Cover Above Crown of Pipe	The greatest of actual depth for each pipe reach.
2.	Depth of Groundwater Above Crown (Perm.)	Ground surface
3.	Specific Weight of Soil	120 lb. ft.
4.	Wheel Load[2]	16,000 lbs.
5.	Railroad Load[3]	N/A
6.	Design Temperature	80°F
7.	Deflection Lag Factor, D_L	1.0 (Initial) 1.5 (50 years)
8.	Modulus of Soil Reaction E'	1,200 psi
9.	Ovality Correction Factor	Higher of initial ovality of deteriorated condition or long term deflection.
10.	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.
11.	Minimum Factor of Safety	2.0; N/A for maximum bending strain (Permanent groundwater condition).
12.	Deflection Coefficient, Kx	0.103
13.	Manning's Roughness Coefficient,n	0.010

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 three (3) feet per values recommended by AASHTO.
[3]Impact factors to be included when depth of cover is less than ten (10) feet per criteria established by AREA "Manual of Recommended Practice".

D. The minimum thickness of the CIPP 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: (1) Maximum Deflection; (2) Minimum Pipe Stiffness; and (3) Constrained Buckling Resistance Using Long Term Modulus of Elasticity.

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall perform all work in accordance with municipal, state and federal requirements.

B. Contractor shall obtain relevant permits required to perform work prior to the commencement of construction.

C. The length of the CIPP shall equal the length indicated on the Drawings unless otherwise required by the Engineer. The Contractor shall verify the internal pipe diameter/dimension(s) and lengths in the field prior to liner impregnation.

D. All work associated with CIPP operations shall be accomplished without excavation from existing ground surface, except in areas specifically designated on the Drawings or 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 Owner.

F. 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.

G. Contractor shall review all existing conditions data prior to the commencement of construction including TV logs attached in the appendices of these Specifications.

H. Contractor shall commence CIPP operations at the beginning of a period of at least three (3) days of anticipated dry weather and as required by the Engineer.

3.2 PREPARATION

A. Contractor shall perform all preparation operations in accordance with Section 02760 and Section 02761.

B. Contractor shall clear the line of obstructions such as solids, dropped joints, protruding lateral connections or collapsed pipe that will hinder the installation. If inspection reveals an obstruction that cannot be removed by conventional cleaning equipment, then the Contractor shall make a "point repair" excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Engineer prior to the commencement of the work.

Point repairs shall be defined as repairs to the existing pipeline that are required to facilitate renewal work. Point repairs shall be identified during internal inspection. The Contractor shall perform point repairs after cleaning and pre-installation internal inspection has been complete. The Contractor shall notify the Engineer not less than 48 hours in advance of making any such point repairs.

C. Contractor shall investigate and determine the purpose and source of all lateral connections. Methods shall include, but are not limited to, internal inspections within adjacent buildings, smoke testing and dye testing. Contractor shall record location, size, material and relative invert elevation of each lateral connection with respect to the pipeline. Contractor shall note presence of floor drains or other outlet pipes in adjacent buildings. Contractor shall obtain written approval from the Owner and property owner(s) prior to any testing and/or building entry. Contractor shall verify that lateral connections have been installed according to plumbing codes and have traps to prevent the migration of odors into buildings.

3.3 INSTALLATION

A. Contractor shall install a resin impregnated flexible felt tube inverted/installed into the existing pipe 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.

B. Curing shall be accomplished by circulating hot water, steam or other approved methods to cure the resin into a hard, impermeable pipeline. 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.

C. 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.

D. The wet-out reconstruction tube shall be inserted through an existing access structure or other access point by approved techniques/processes of the Contractor. Tubes that are pulled in place shall be done in a manner that shall not damage the tube. The winch shall be equipped with a dynometer to record the pulling forces required during installation. Pull forces shall not exceed manufacturer's recommendations that shall be based on a maximum longitudinal stretch of five (5) percent 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.

E. After inversion/installation is completed, the Contractor shall supply a suitable heat source and fluid recirculation equipment or other approved methods. 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 CIPP manufacturer and based on the resin/catalyst system employed.

F. 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 terminating manhole to determine the temperatures during cure. Water/steam temperature in the line during the cure period shall be recommended by the resin manufacturer.

G. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured liner 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 CIPP process, during which time the recalculation of the water/steam and cycling of the heat exchangers to maintain the temperature continues.

H. The Contractor shall cool the hardened pipe to a temperature below 100 degrees 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. If Contractor elects to drain cure-water via the upstream end, the water shall be pumped to a discharge location approved by the Owner at no additional cost to the Owner. Care shall be taken in the release of the static head so that a vacuum shall not develop that could damage the newly installed pipeline. 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 Contractor and approved by the Owner.

I. After completion of pipe line curing, the Contractor shall dispose of curing water in accordance with all federal, state, and local requirements. Curing water discharged to a municipal or MWRA sewer shall be in accordance with the requirements of 360 CMR 10: MWRA Sewer Use Regulations. The Contractor shall note all time requirements that may be needed for approval by MWRA. The point of discharge to the MWRA sewer system shall be designated by the MWRA Field Operations Department. Alternatively, the Contractor may elect to transport the curing water off site for disposal utilizing a uniform hazardous waste manifest. The transporter shall be appropriately licensed and the disposal facility shall be a licensed wastewater treatment facility. The Contractor shall sample and analyze appropriate samples as required by the disposal facility.

J. 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.

K. 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.

L. Contractor shall repair all uncured areas, defects, test sample section repairs or other deformities in the liner during inversion operations in accordance with the manufacturer's recommendations.

M. The finished CIPP 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, wrinkles, delamination, or other deformities.

3.4 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. Any nominal annular gap between the liner and the host pipe shall be filled with a resin mixture and/or epoxy compatible with the CIPP liner and the terminated ends of the liner shall be beveled to allow for a smooth transition.

B. Lateral connections shall be reestablished with a cutting device specifically designed for cutting CIPP. The exact location and number of lateral connections shall be determined during the internal inspection(s) and/or in the field. The Contractor shall reconnect all lateral connections to the liner pipe, including those unoccupied, abandoned, or from vacant lots, unless otherwise required by the Engineer. Shape of pipeline cut-out shall match shape of lateral connection.

C. Lateral connections shall be reinstated by experienced operators so that no blind attempts are made in the liner. Location shall be re-verified carefully with pre-construction videotapes for accuracy, especially where dimples are not defined or clearly ascertained. The cut shall be smooth and circular with no jagged edges. The hole shall be a maximum of 100 percent and a minimum of 95 percent of the lateral pipe inside diameter. It shall be properly aligned and be concentric to the existing connection.

D. The Contractor shall minimize the time that an inversion/installation access point remains open. Consideration shall be provided to complete and coordinate all work including pipeline cleaning, pre installation internal inspection, pipeline renewal and post installation internal inspection to minimize disturbance to adjacent property owners.

3.5 TESTING

A. For each individual 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 8.1.2 for testing at a laboratory approved by the Engineer.

B. "Flat Plate" 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 mean 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. Wall thickness shall be verified at each inversion, intermediate manhole(s), and termination access at four equidistant points around the perimeter.

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 retested 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 constructing 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.

F. Contractor shall submit curing water test reports as required by any discharge permit requirements.

G. Contractor shall submit the names, addresses and EPA identification number of the transporter and disposal facility in the event a disposal facility is used. Test results and disposal documentation from this facility shall also be submitted.

3.6 ACCEPTANCE

A. Prior to final acceptance, any defects that may affect the integrity or strength of the pipeline in the opinion of the Engineer shall be repaired by the Contractor at no additional cost to the Owner.

B. Pipeline shall be true to line and grade, with no visual bulges, sags, protrusions, wrinkles transverse to the flow, deflections, offset joints, leaking joints, or other visible infiltration, or other defects that would impair the intended use of the completed pipeline.

C. Final acceptance of work shall not be granted until all defective areas are repaired in accordance with the CIPP manufacturer's recommendations and to the Owner's satisfaction.

D. Any repairs required by the Engineer as a result of the post construction internal inspection shall be performed by the Contractor.

E. Contractor shall perform a post construction internal inspection in accordance with Section 02760. Final acceptance of the work shall not be granted until post installation inspection has been reviewed and approved by the Engineer.

F. 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.

3.7 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700.

PART 4 – COMPENSATION

Item 2767.1 Cured-in-Place Pipelining (20-inch x 15-inch)

METHOD OF MEASUREMENT:
Measurement for payment for Cured-in-Place Pipelining (20-inch x 15-inch) will be based on the actual linear feet of 20-inch x 15-inch pipe cured-in-place pipelining rehabilitation system installed, cured, tested, and inspected, complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for Cured-in-Place Pipelining (20-inch x 15-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 furnish and install the cured-in-place pipelining rehabilitation system in the 20-inch x 15-inch pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; mobilization and demobilization of the cured-in-place pipelining operation and equipment; flow handling to facilitate the installation of the cure-in-place pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; reconnecting and sealing around service connections or other pipe penetrations; connections and sealing around manhole and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

Item 2767.2 Cured-In-Place Pipelining (35-inch x 27-inch)

METHOD OF MEASUREMENT:
Measurement for payment for Cured-in-Place Pipelining (35-inch x 27-inch) will be based on the actual linear feet of 35-inch x 27-inch pipe cured-in-place pipelining rehabilitation system installed, cured, tested, and inspected, complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for Cured-in-Place Pipelining (35-inch x 27-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 furnish and install the cured-in-place pipelining rehabilitation system in the 35-inch x 27-inch pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; mobilization and demobilization of the cured-in-place pipelining operation and equipment; flow handling to facilitate the installation of the cure-in-place pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; reconnecting and sealing around service connections or other pipe penetrations; connections and sealing around manhole

and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

Item 2767.3 Cured-in-Place Pipelining 8-inch (BID ALTERNATE 2)

METHOD OF MEASUREMENT:
Measurement for payment for Cured-in-Place Pipelining (8-inch) will be based on the actual linear feet of 8-inch pipe cured-in-place pipelining rehabilitation system installed, cured, tested, and inspected, complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for Cured-in-Place Pipelining (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 furnish and install the cured-in-place pipelining rehabilitation system in the 8-in pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; mobilization and demobilization of the cured-in-place pipelining operation and equipment; flow handling to facilitate the installation of the cure-in-place pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; reconnecting and sealing around service connections or other pipe penetrations; connections and sealing around manhole and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02767

SECTION 02769

HDPE SLIPLINING

2769.1.1.1	**8-IN HDPE SLIPLINE OF EXISTING 10-IN PIPE (BID ALTERNATE 2)**	**LINEAR FOOT**
2769.1.1.2	**8-IN HDPE SLIPLINE OF EXISTING 12-IN OR 14-IN PIPE (BID ALTERNATE 2)**	**LINEAR FOOT**
2769.1.2.1	**10-IN HDPE SLIPLINE OF EXISTING 18-IN PIPE (BID ALTERNATE 2)**	**LINEAR FOOT**
2769.2	**REINSTATE LATERAL AFTER SLIPLINING (BID ALTERNATE 2)**	**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.

1.2 SUMMARY

A. This Section includes the following:

1. Furnishing all plant, labor, equipment and materials, cleaning, internal inspection, point repairs, and performing all operations in connection with the furnishing and the insertion of high density polyethylene pipe (HDPE) by means of a replacement pipe inside the existing host pipe using sliplining. Work shall include cleaning and videotaping the existing drain lines, as specified in Section 02760 - Internal Inspection, of these specifications, flow handling and/or bypass pumping of existing flows (if required), maintaining surface water drainage services, and any restoration work needed to replace damaged structures and landscaping or ground conditions.

2. It shall be the responsibility of the Contractor to perform the work under this contract in a sequence which is the least disruptive to the normal flow of vehicular and pedestrian traffic, and in a manner which will protect the public from damage to person and property within the limits of and for the duration of the Contract.

3. Host Pipe is defined as the existing sanitary, storm drain and/or combined sewer to be renewed by sliplining.

4. Renewal Pipe is defined as new High Density Polyethylene pipe (HDPE) to be installed inside the host pipe.

B. Related Sections include the following:

1. Section 02210 – Earth Excavation, Backfill, Fill and Grading
3. Section 02760 – Pipeline Cleaning and Internal Inspection

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. For the sliplining method(s) of pipe rehabilitation, the Contractor shall submit the following information specific to the proposed project.

1. Name(s) of all supervisory personnel to be directly involved with each sliplining method of pipe rehabilitation for this project. Supervisory personnel shall have a minimum of two years experience and two completed projects for the installation of sliplining replacement pipe within the past five years. Attach resumes of each person named. Resume information shall include, as a minimum, 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, contract amounts, and educational background.

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 sliplining manufacturer of the pipe rehabilitation method proposed; a description of each method; and any variances that the Contractor may be proposing from the specified methods.

b. 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.

c. Describe any surface activities that will be required and any mitigative measures that will be used to reduce surface impacts as part of each rehabilitation method proposed.

d. Describe rehabilitation method, manufacturer, including sequencing of operations, scheduling, time of completion, hours of operation, surface impacts, access and staging location(s), and other considerations that may be pertinent to the proposed work.

3. 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 construction of the sliplining repair, the Contractor shall submit shop drawings, details, and descriptions to include construction methods and equipment, process description, access locations, 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 in this section. Pre- and post-construction video documentation, shall be provided to the Engineer as specified in Section 02760.

C. The Contractor shall submit for review shop drawings and/or descriptive literature, providing the manufacturer's specific product data with information on the new HDPE pipe physical and mechanical properties of the pipe, pipe dimensions, joint configuration, and other details of pipe to be furnished, design calculations showing structural adequacy of pipe selected, allowable grout pressure, allowable pushing or pulling forces for the pipe, method of pipe insertion, method of handling wastewater flows, dewatering methods, bulkhead design and details, insertion pit or shaft locations, method of support of excavation, connection details to transition systems for manholes and structures, and the grouting plan.

D. The grout submittal shall include, but shall not be limited to, the following:

1. A grout mix shall be submitted, including the proportioning of cement, water, mineral admixtures and fillers, and chemical admixtures; and grout properties, including grout density, initial grout set time, 24 hr./28 day compressive strengths, maximum injection pressure, and floatation calculations.

2. A detailed description of the mixing equipment operational procedures, including annular space dewatering procedure, number and location of grout injection and vent ports, and grout pressure regulating equipment.

3. Shop drawing showing details of the bulkheads, grout injection piping, including pressure gauges and regulators, vent piping, and excess grout recovery system.

4. Statement from the liner pipe manufacturer indicating the proposed annular space grouting procedures, including the grouting pressure to

be used and the number of grouting stages and frequency of grout injection and vent points are consistent with the liner pipe design.

E. The Contractor shall submit cleaning methods and pre- and post-construction video documentation as specified herein.

1. The Contractor shall submit the particular method by which he plans to maintain traffic, signing-schedule, access roads, and locations of access shafts/pits and receiving pit locations to the Owner for review and approval prior to commencement of construction.

2. Prior to commencement of work, the Contractor shall submit a detailed plan outlining how the Contractor intends to accomplish the proposed sliplining work, including the equipment set-up, grouting of annular space, schedule, and sequence of construction. The Contractor shall notify all affected services prior to commencement of work..

3. The Contractor shall submit written descriptions of the construction method(s) and equipment to be used, and access shaft sizes and locations required for equipment and material access.

4. The Contractor shall submit written descriptions of the construction method(s) and equipment to be used to penetrate blockages and/or partially collapsed sections of the host pipe.

5. Hours of operation, sequencing of work description, number of shifts, number of crews, and expected time to complete the work for the rehabilitation method proposed shall be described.

6. The Contractor shall describe any surface activities that will be required, and any mitigation measures that will be used to reduce surface impacts as part of the rehabilitation method proposed.

7. The Contractor shall describe the method(s) proposed for annular space grouting, including grouting subcontractor qualifications, type of grout, method(s) of grout installation, quality control aspects of the grouting operation, and grout injection locations.

F. The location and number of access shafts shall be submitted for review and approval by the Owner. This submittal shall include any appropriate sketches deemed necessary by the Owner. The Contractor shall be responsible for obtaining all necessary permits as they relate to the location, should they be accepted by the Owner.

1. The size of the access shaft shall be as small as possible, but sufficient to allow access for the Contractor's work. The Contractor

shall be responsible for support of excavation and dewatering of each shaft. The shaft(s) shall be removed and backfilled as soon as practical upon completion of the liner pipe, and the surface restored in accordance with the applicable provisions of these Specifications.

2. The Contractor shall minimize the time that a shaft remains open at a particular site. Considerations shall be provided to complete and coordinate all work, including cleaning, pre-installation internal inspection, pipe and manhole/catchbasin rehabilitation (as needed), grouting, post-installation internal inspection, and acceptance, so as to minimize surface disturbances.

G. The Contractor shall submit the particular method by which he plans to maintain traffic, signing schedule, access roads, and locations of access locations and receiving manhole to the Owner for review and approval prior to commencement of construction.

H. 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 slipliner. The design calculations shall provide a liner which shall withstand all loadings subject to the sewer 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 in the Commonwealth of Massachusetts.

I. 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.

1.4 QUALIFICATIONS

A. The Contractor shall provide documentation supporting the qualification criteria specified herein in Paragraphs 1.4A through 1.4D.

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 installing the sliplining pipe shall have completed at least five (5) similar projects, in the United States of America, in the past three (3) years on pipeline projects that included slipline pipe installation of at least the maximum pipe diameter proposed for the project and lengths of at least 300 continuous linear feet and annular space grouting using a flowable grout.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Solid Wall High Density Polyethylene Pipe (HDPE)

1. The HDPE replacement pipe shall be manufactured from a high density, high molecular weight polyethylene resin, which conforms to ASTM D-1248 and meets the requirements for Type III, Class B, Grade P34, Category 5, and has a PPI rating of PE 3408, when compounded. The pipe produced from this resin shall have a minimum cell classification of 345434C or D under ASTM D 3350.

2. The wall thickness of the HDPE pipe shall be as determined by the Contractor for the minimum thickness required to meet the structural requirements listed under Design Criteria below, and shall meet the following:

Depth	Minimum Wall Thickness
0 - 12 Feet	SDR 26
Over 12 Feet	SDR 21

3. All pipe shall be made of virgin material. No re-work, except that obtained from the manufacturer's own production of the same formulation shall be used.

4. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

5. The interior surface of the HDPE pipe shall not be dark or non-reflective in nature that could inhibit proper television inspection.

6. The finished HDPE pipe shall be continuous over the entire length of an insertion run between the insertion pit and reception pit. The HDPE pipe shall be impervious and free of any leakage from the rehabilitated host pipe to surrounding ground, or from the surrounding ground to the inside of the pipe.

7. The manufacturer of the pipe shall supply the OWNER with certificates of compliance indicating conformance for all material and testing requirements furnished under these Specifications.

8. Each standard pipe unit shall be clearly and permanently marked with the date of manufacture, class, production code, and manufacturer's trademark.

9. The Contractor and manufacturer shall exercise extreme care during transportation, handling, storing, and installation of the HDPE pipe to ensure that the pipe is not gouged or otherwise damaged in any way. The Contractor shall store the pipe with a cover to block ultraviolet light in accordance with the manufacturer's recommendations. If the HDPE pipe becomes gouged or otherwise damaged, before or during installation, it shall be replaced or repaired by the Contractor at no additional cost to the Owner.

B. Annular Space Grout

1. The annular space (void between the existing host pipe and the sliplined pipe) shall be grouted to support the sliplined pipe and provide long-term stability. The slipliner annular space grout shall be low density (between 50 to 60 pcf) and consist of Portland cement, fly ash, and additives, and have a low heat of hydration. The minimum compressive strength of the grout at 28 days shall be 50 psi minimum. Expansive material shall meet ASTM C869. The grout shall possess good flow characteristics with minimum shrinkage, and permit a pumping time adequate to complete the grouting stage between injection points. The grout shall have an ability to flow freely without stiffening through the annular space.

2.2 DESIGN CRITERIA

A. General

1. All renewal pipe used to slipline existing pipelines shall be designed for a minimum service life of 50 years. All renewal pipe shall be designed to withstand the jacking or pulling forces, total vertical and lateral loads, including, but not limited to, dead load, live loads, hydrostatic loads, and grout pressure. Long-term, 50-year design shall be based on the assumption that the existing carrier pipe and subsequent grouting of the annual space provide no structural support to the replacement pipe, except for transmitting loads.

2. The CONTRACTOR shall submit design calculations for the pipe proposed. The submittal shall provide documentation supporting the

basis of the values used in the design calculations. The design calculations shall be prepared and stamped by a Registered Professional Engineer in the Commonwealth of Massachusetts.

B. Design Performance Limits and Design Parameters

1. The renewal pipe shall be designed such that the pipe shall not fail, collapse, buckle, crack, or delaminate under loads. The maximum long-term (50 years) calculated deflection under all loads shall not exceed five percent (5%). The maximum bending strain (50 years) developed in the wall shall not exceed three percent (3%) for HDPE pipe.

C. The following parameters shall be used:

Minimum Annular Space	1.25-inch difference between the inside diameter of the existing host pipe and the outside diameter of the proposed renewal pipe.
Maximum Allowable Design Grouting Pressure	5 psi minimum and based on the renewal pipe design submittal
Depth of Cover Above Pipe Crown	Actual
Depth of Groundwater Above Pipe Crown	Ground Surface
Specific Weight of Soil	120 lbs./ft.
Wheel Load[2]	16,000 lbs.
Railroad Load[3]	N/A
Design Temperature	80°F
Ovality Correction Factor	As applicable to pipe material for short-term and long-term deflection
Deflection Lag Factor	1.0 (initial) 1.2 (50 years)
Modulus of Soil Reaction	1,200 psi
Short-Term Modulus of Elasticity	Seven (7) days under constant stress when submerged in water, to be used for unconstrained hydrostatic collapse resistance design for highest external pressure resulting from grout or groundwater above pipe.
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 Factor of Safety	2.0, unless otherwise specified.

Notes: [1]Design of the replacement pipe shall be based on prism load on the replacement pipe, using the outside diameter of the replacement pipe in the calculation.

[2]Impact factors to be included when depth of cover is less than 3 feet per values recommended by AASHTO.

[3]Impact factors to be included when depth of cover is less than 10 feet per criteria established by AREA *"Manual of Recommended Practice"*.

D. The minimum thickness of the slipline pipe to be installed shall be as determined for the design conditions imposed. Calculations for the determination of the required liner pipe stiffness or DR shall be the largest pipe stiffness or smallest DR for each slipline pipe installation reach (insertion pit to receiving pit), as determined by calculations provided for the following parameters: (1) maximum deflection; (2) minimum pipe stiffness or maximum DR; (3) hydrostatic collapse resistance using short-term modulus of elasticity; and (4) constrained buckling resistance using long-term modulus of elasticity.

E. The Contractor shall submit test results with respect to the physical characteristics of the slipline pipe. These tests shall be at no additional cost to the Owner. These tests shall include the following:

F. Tests for Tensile Strength of HDPE pipe material shall be in accordance with ASTM D638. The minimum tensile strength shall be 3,100 psi.

1. Tests for the Determination of Environmental Stress Crack Resistance (ESCR) shall be in accordance with ASTM F1248, with a ESCR test equal to 2,000 hours.

2.2 SERVICE CONNECTIONS

A. Service connections shall be INSERTA TEE as manufactured by Fowler Manufacturing Co., Hilsboro, Oregon, or approved equal. New service lateral pipe shall conform to ASTM D 3034 SDR 21 PVC pipe.

PART 3 - EXECUTION

3.1 CONSTRUCTION PROCEDURE

A. Sliplining 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.

B. Prior to construction and delivery of materials, the Contractor shall obtain the necessary permits and details or traffic flag persons, as appropriate.

1. It is the intent of this contract that traffic be maintained at all times in the areas of construction. The Contractor may be required to halt operations and/or transport material to areas beyond immediate work locations in order to allow minimum traffic disruptions. Access to the site by emergency vehicles, school buses, and residents shall be maintained at all times.

C. The Contractor shall submit a work plan to address the items specified below, unless approved otherwise by the Owner.

1. Safety - The Contractor shall carry out operations under this Section in strict accordance with all applicable OSHA, State, and local standards. Particular attention is drawn to those safety requirements involving work with entry into a confined space. It shall be the Contractor's responsibility to comply with OSHA standards and regulations pertaining to all aspects of the work.

2. Pre-Installation Television Inspection - It shall be the responsibility of the Contractor to video (TV) inspect the drain pipe immediately before sliplining, to assure that the existing pipe conditions are acceptable for sliplining, and to locate all active service line connections. This inspection, as well as the video (TV) inspection after the installation, shall be paid for as per bid item, or as required by the Owner.

3. Cleaning - The Contractor shall clean the host pipe prior to commencing sliplining operations. The cleaning shall be sufficient to conduct sliplining operations and to televise the host pipe to identify and locate service connections. No additional compensation will be made if the pipe is not sufficiently cleaned. The Contractor shall be responsible for the proper transport and disposal of all debris and material cleaned from the drain.

4. Flow Bypassing - When required for acceptable completion of the sliplining, the Contractor shall provide for continuous flow around the section(s) of pipe designated for the installation of replacement pipe. The pump bypass lines shall be of adequate capacity and size to handle flow.

5. Sags in Line - If pre-installation video (TV) inspection reveals a sag in the existing drain that is greater than one-half the diameter of the existing pipeline, it shall be the Contractor's responsibility to install the replacement pipe to result in an acceptable grade without the sag. The Contractor shall take in necessary measures to eliminate these sags, as approved by the Owner by pipe replacement; digging a sag elimination pit and bringing the bottom of the pipe trench to a

uniform grade in line with the existing pipe invert or by other measures that shall be acceptable to the Owner.

6. Point Repairs - Point repairs are repairs to the existing pipeline required prior to rehabilitation work. Point repairs shall be located during the internal inspection of the pipeline. The Contractor shall repair areas requiring "point repair" after cleaning and pre-construction internal inspection is complete and prior to commencement of rehabilitation work. Contractor shall submit to the Owner the proposed method(s) of point repair for each area requiring a point repair for review and approval. Point repairs also include the joint and pipe infiltration which may affect the sliplining and grouting installation. The Contractor shall notify the Owner not less than 48 hours in advance of making any particular point repair. Work shall include supplying necessary materials, equipment, excavation, sewage diversion in bypassing, dewatering, and labor.

3.2 INSERTION PITS

A. Prior to commencing any excavation, Contractor shall submit a detailed Plan of Construction to identify the location and number of all proposed insertion pits to the Owner for review. The pits shall be spaced in conformance with the Liner Pipe Manufacturer's recommended maximum allowable insertion force that can be exerted onto the liner pipe.

B. The Contractor shall locate access shafts or insertion pit(s) as shown on the drawings. The use of additional pits or different locations, as shown, must be approved, in writing, by the Engineer prior to construction. Receiving pit locations are not shown on the drawings. Receiving pits shall be located at manholes or structures only and no excavation shall be allowed unless a new manhole is designated on the Drawings or as otherwise approved in writing by the Engineer. Access for receiving pits shall be through existing manholes or structures. All insertion or receiving pits shall be designed to be constructed with wood or steel sheeting, steel plates or steel trench boxes. Shafts or pits shall be designed in conformance with Section 02210 - Earthwork.

C. The size of access/receiving shafts shall be as small as possible but sufficient to allow access for the Contractor's work. The Contractor is responsible for dewatering of each shaft. The shaft(s) shall be removed and backfilled as soon as practical upon completion of the liner pipe and the surface restored in accordance with the applicable provisions of these specifications.

D. The Contractor shall minimize the time that a shaft remains open at a particular site. Considerations shall be provided to complete and coordinate all work including cleaning, pre-installation internal inspection, pipe and manhole rehabilitation, grouting, post-installation internal inspection and

acceptance so as to minimize disturbances. The Contractor shall recognize that shafts shall not be removed/closed until the rehabilitation pipe has been internally inspected and accepted by the Engineer and it is intended that each shaft shall be removed/closed and backfilled within 60 calendar days from the installation of the shaft.

3.3 PIPE JOINTS

A. The HDPE shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures shall be used in strict compliance with the manufacturer's recommendations. Fusion shall be preformed by technicians certified by a manufacturer of pipe fusion equipment.

B. The butt-fused joint shall be true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to or greater than that of the pipe. All joints shall be subject to acceptance by the Owner prior to insertion.

C. The Contractor shall cut out and replace defective joints at no additional cost to the Owner. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness (ASTM 585), shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by the Owner shall be discarded and not used.

3.4 INSTALLATION PROCEDURES

A. Prior to sliplining pipe installation, the Contractor shall insert a length of liner pipe test section to ensure that the existing pipe is free of obstructions. The test section shall have an outside diameter equal to or approximating the maximum allowable tolerance for each reach and class of liner pipe and a length equal to that of the proposed liner pipe for each reach of pipeline to be sliplined.

1. Upon successful completion of the insertion of the test section, the existing host pipe shall be considered ready to receive the liner pipe and commencement of the sliplining operation. The proposed liner pipe shall be lowered down into the insertion pit and inserted into the

existing host pipe. The Contractor shall submit details for the pushing or pulling head to be used, including the maximum allowable pushing or pulling force that can be exerted on the pipe without damaging the integrity of the pipe or pipe joints. The installation head or mechanism shall incorporate a gauging system, which will provide a continuous monitor of the force being applied during the liner insertion operations. The insertion force used by the Contractor shall in no case exceed the maximum allowable pushing or pulling force as calculated in the liner pipe design.

B. Annular Space Grouting

1. Grout shall be placed from manhole to manhole from insertion pit through grout injection ports, with no intermediate injection points from the surface, unless otherwise approved by the Owner.

2. The Contractor shall completely dewater the annular space prior to commencement of grouting. To prevent build-up of debris which could be trapped in the annular space, upon completion of the sliplining of a pipeline reach, and prior to annular space grouting, the Contractor shall immediately construct an acceptable bulkhead between the existing carrier pipe and the inserted liner pipe at the downstream end of the upstream-most manhole. The bulkheads shall be constructed complete, with all the required grout injection and venting ports. All bulkheads constructed shall be leaktight and shall be tested to withstand the maximum allowable grouting pressure, per the accepted design calculations, to test the integrity of the liner pipe installed and the bulkheads constructed. Grout shall be injected and completely fill the annular space. Length of grouting run shall be determined by the Contractor, consistent with the grout manufacturer's recommendation based on the maximum allowable grouting pressure, as stipulated by accepted design.

3. The grouting operation shall be conducted in one stage or as deemed necessary by the Contractor, and shall be consistent with the liner pipe manufacturer and/or grout manufacturer's recommendations. Venting provided shall prevent the grout from attaining pressure higher than the maximum allowable grouting pressure(s) specified by the accepted design calculations. Grouting pressure for each stage shall be continuously monitored and controlled, to insure that the maximum allowable grouting pressure, as specified by the accepted design calculations, is not exceeded. All waste grout shall be removed by pumping or vacuum truck method; no grout will be allowed to be dumped into the existing sewer at anytime.

4. The Contractor shall be consistent in the annular space grout placement in maintaining invert control. Contractor shall provide

design calculation to show at what point flotation will occur, based on his grouting methods. The method to be used to insure that grout placement pressures do not exceed allowable limits shall be presented in the submittal, and shall consider both the grout static head and the static head of displaced wastewater and groundwater above the liner pipe. Contractor shall consider liner stiffness loss as it relates to creep, time, and temperature affects of grouting. It shall be the Contractor's responsibility to see that the allowable grout pressure of the liner pipe is not exceeded. Prior to commencement of grouting operations, the Contractor shall insure approval of all grouting procedure and grout mix submittals by the Owner.

5. For each grouting operation, a minimum of three grout samples shall be taken for each stage of grout injected into the annular space. Each grout sample shall be tested for compressive strength at 24 hours, 7 days, and 28 days, shrinkage, bleeding, density, and consistency. All sampling and testing shall be performed by an independent testing agency approved by the Owner, and all costs shall be borne by the Contractor.

6. All voids in the annular space shall be filled and be subjected to re-verification, at no additional cost to the Owner, to ensure that full support to be provided for the completed sliplined pipe.

C. When the slipline pipe passes through an existing manhole or terminates at an existing manhole, the top half of the pipe within the existing manhole shall protrude at least four inches into the manhole and shall be neatly cut off and not broken or sheered off. 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. Benches and channel cross-sections shall be constructed of mortar and brick to provide a smooth transition between inlet and outlet.

3.4 SERVICE CONNECTIONS

A. After the slipline pipe has been completely installed and tested, all existing active services, as indicated on the Contract Drawings or as indicated by the Engineer, shall be reconnected to the slipline pipe. Service connections shall be no greater than one half the diameter of the main line sanitary, unless otherwise approved by the Owner.

B. Connection of the existing service laterals to the new sewer main shall be accomplished by the use of the watertight, compression-fit service connection. The connection shall be specifically designed for connection to the HDPE sewer main being installed.

3.5 TESTING

A. Testing shall be required after the slipline pipe has been installed. The slipline pipe shall be tested before it has been sealed in-place at the manholes, and before any service reconnections have been made. The purpose of this test is to check the integrity of the joints that have been made and to verify that the slipline pipe has not been damaged by inserting it through the host pipe.

1. Low Pressure Air Test Procedure - After a manhole-to-manhole section of the pipe has been replaced, and prior to any service lines being connected to the slipline pipe, the pipe shall be plugged at each manhole with pneumatic plugs.

2. The design of the plugs shall be such that they will hold against the test pressure without requiring external blocking or bracing. One of the plugs shall have three air hose connections; one to inflate the plug, one to attach a gauge for reading the air pressure in the sealed line, and one to introduce air into the sealed line.

3. Low pressure air shall then be introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure (the design groundwater pressure) on the pipe. At least two minutes shall elapse to allow the pressure to stabilize.

4. The time required for the internal pressure to decrease from 3.5 to 2.5 psig greater than the average back pressure (groundwater pressure) on the pipe shall not be less than the time shown for a given pipe diameter in the following table:

NEW PIPE DIAMETER (INCHES)	MINIMUM ELAPSED TIME (MINUTES)
8 and smaller	4
10	5
12	6
15 and larger	7

3.6 POST-TELEVISION INSPECTION OF COMPLETED SECTIONS

A. The Contractor shall provide to the Owner a color videotape, taken by a 360 degree view camera for close-up view, showing the completed work, including the condition of the restored pipes and service connections, prior to requesting payment.

1. Pipe 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. Any repairs necessary as a result of this inspection shall be performed by the Contractor, at no additional

expense to the Owner. Final acceptance of rehabilitation work shall not be granted until all defective areas are repaired to the Owner's satisfaction.

3.7 CLEAN-UP

A. Upon completion of the sliplining operation, the Contractor shall restore all areas disturbed by these operations.

PART 4 – COMPENSATION

Item 2769.1.1.1 - 8-in HPDE Slipline of Existing 10-in Pipe (BID ALTERNATE 2)

METHOD OF MEASUREMENT:
Measurement for payment for 8-in HDPE Slipline of Existing 10-in Pipe will be based on the actual linear feet of 8-inch HDPE slipline pipelining rehabilitation of an existing 10-inch pipe system installed complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for 8-in HDPE Slipline of Existing 10-in Pipe 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 furnish and install the 8-inch HDPE slipline pipelining rehabilitation system in the 10-in pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; excavation, backfill, compaction, and support of excavation for insertion pits; dewatering; slipline pipe material; joining or flushing the pipe lengths; permanent bulkheads where required; pipe support for prevention of floatation; liner pipe insertion; filling of annular voids around HDPE sliplined pipe as specified; flow handling to facilitate the installation of the HDPE sliplining pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; connections and sealing around manhole and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

Item 2769.1.1.2 - 8-in HPDE Slipline of Existing 12-in or 14-in Pipe (BID ALTERNATE 2)

METHOD OF MEASUREMENT:
Measurement for payment for 8-in HDPE Slipline of Existing 12-in or 14-in Pipe will be based on the actual linear feet of 8-inch HDPE slipline pipelining rehabilitation of an existing 12-inch or 14-inch pipe system installed complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for 8-in HDPE Slipline of Existing 12-in or 14-in Pipe 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 furnish and install the 8-inch HDPE slipline pipelining rehabilitation system in the 12-in or 14-in pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; excavation, backfill, compaction, and support of excavation for insertion pits; dewatering; slipline pipe material; joining or flushing the pipe lengths; permanent bulkheads where required; pipe support for prevention of floatation; liner pipe insertion; filling of annular voids around HDPE sliplined pipe as specified; flow handling to facilitate the installation of the HDPE sliplining pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; connections and sealing around manhole and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

Item 2769.1.2.2 - 10-in HPDE Slipline of Existing 18-in Pipe (BID ALTERNATE 2)

METHOD OF MEASUREMENT:
Measurement for payment for 10-in HDPE Slipline of Existing 18-in Pipe will be based on the actual linear feet of 10-inch pipe HDPE slipline pipelining rehabilitation of an existing 18-inch pipe system installed complete as shown on the Contract Drawings and as measured by the Engineer along the centerline of the pipe between the centers of manholes or the defined limits of the rehabilitation.

Pipe installed but not successfully tested and accepted shall be paid for at a maximum of 75 percent of the unit prices bid under this item. The remaining 25 percent shall be paid upon receipt of successful test results by the Engineer and acceptance by the Engineer. All reductions in payment due to unsuccessful testing shall be made prior to normal retainage.

BASIS OF PAYMENT:
Payment for 10-in HDPE Slipline of Existing 18-in Pipe 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 furnish and install the 10-inch HDPE slipline pipelining rehabilitation system in the 18-in pipe as shown on the Contract Drawings or at the requirements of the Engineer. The work includes, but is not limited to; excavation, backfill, compaction and support of excavation for insertion pits; dewatering; slipline pipe material; joining or flushing the pipe lengths; permanent bulkheads where required; pipe support for prevention of floatation; liner pipe insertion; filling of annular voids around HDPE sliplined pipe as specified; flow handling to facilitate the installation of the HDPE sliplining pipelining; homeowner notifications and coordination; heavy duty or light duty pipeline cleaning as may be required by existing conditions; root intrusion removal; root intrusion chemical treatment; pre and post-installation inspection by closed circuit television; providing photographic documentation; connections and sealing around manhole and structure penetrations; testing; and all incidental work not specifically included for payment elsewhere.

Item 2769.2 – Reinstate Lateral After Sliplining (BID ALTERNATE 2)

METHOD OF MEASUREMENT:
Measurement for payment for Reinstate Lateral After Sliplining will be based on each lateral service connections reconnected to the rehabilitated host pipe, complete as shown on the Contract Drawings.

BASIS OF PAYMENT:
Payment for Reinstate Lateral After Sliplining will be based on the unit price bid for this item in the proposal. Under each price for the item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the reconnection of existing sewer services to the rehabilitated host pipe as shown on the Contract Drawings or at the requirements of the Engineer. Two or more service laterals from several houses coming at one point to the host pipe, through stacks, wyes, and/or tees, shall be considered as one service connection. However, the Owner may move/relocate such service connections so as not to exceed more than two houses per each new connection. The work includes, but is not limited to; excavating or remote cut method for service reconnection; reconnecting the service lateral with the approved liner and fittings; providing service connections, wyes, chimneys, and adaptors homeowner notifications and coordination; backfill, compaction; testing; and all incidental work not specifically included for payment elsewhere.

END OF SECTION 02769

SECTION 02900

LANDSCAPING

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes providing loam, fertilizer, seed, plants and related work as indicated and specified. Refer to section 02910 for tree planting requirements.

1.2 RELATED WORK

A. Section 01630 – RESTORATION OF GROUNDS AND CLEANING UP

B. Section 02100 – SITE PREPARATION

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 a sample of proposed soil separator mat and manufacturer's specification for mat.

4. Submit with seed, certificates concerning seed mixture, purity, germinating value, and crop year identification.

5. Submit test samples of loam to a certified soils consultant to determine fertilizer and lime requirements and return two copies of results for implementation.

6. 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 STAKES

A. Wood stakes, minimum of 2-in. by 2-in. square and 8 in length, of uniform size, straight, reasonably free from knots, treated with wood preservative and painted green.

2.2 METAL EDGE STRIPS AND STEEL STAKES

A. 1/4-in. by 5-inch steel plate edge strips, painted green.

B. 16-in. tapered steel stakes.

2.3 MAT

A. 1/4-in. to 1/2-in. thick mat consisting of lime or silicate glass fibers with average fiber diameter to 9 microns and 2-in. to 4-in. strands of fiber bonded with phenol formaldehyde resin, 100 percent textile glass fiber, roll type, water permeable with a minimum thickness of 1/4-in., a maximum thickness of 1/2-in, and a density of not less than 3 pounds per cubic foot.

2.4 LOAM

A. Fertile, friable, natural topsoil typical of locality, without admixture of subsoil, refuse or other foreign materials, and obtained from well-drained arable site. Free of stumps, roots, heavy or stiff clay, stones larger than 1 inch in diameter, lumps, coarse sand, noxious weeds, sticks, brush or other deleterious matter.

B. Not less than 4 percent nor more than 20 percent organic matter as determined by loss on ignition of oven-dried samples.

2.5 LIME, FERTILIZER AND SEED

A. Ground agricultural limestone containing not less than 85 percent of total carbonates.

B. Commercial type fertilizer, uniform in composition, free flowing, conforming to state and federal laws, and at least 50 percent of nitrogen derived from natural organic sources of ureaform and containing following percentages by weight: Nitrogen 10 percent, Phosphorus 10 percent, Potash 10 percent.

C. Turf grass seed, clean, high in germinating value and latest year's crop mixture as follows:

Name	Minimum proportion by weight	Percent purity	Percent germination
Kentucky bluegrass	20%	87%	85%
Merio Kentucky bluegrass	20%	87%	85%
Red Chewings Fescue	45%	98%	85%
Manhattan Rye	15%	98%	90%

D. Turf grass seed, clean high in germinating value and of the latest year's crop mixed as follows:

Name	Minimum proportion by weight
Creeping Red Fescue	50%
Domestic Ryegrass	20%
Redtop	5%
Kentucky Bluegrass	25%

E. Weeds shall not exceed 0.25 percent.

2.6 SOD

A. Established, nursery grown Kentucky or Merion Bluegrass sod, vigorous, well rooted, healthy turf, free from disease, insect pests, weeds, other grasses, stones, and any other harmful or deleterious matter.

B. Sod harvested by machine at uniform soil thickness of approximately 1 inch but not less than 3/4 of an inch. Measurement for thickness excludes top growth and thatch. Prevent tearing, breaking, drying or any other damage.

2.7 CRUSHED STONE

A. Crushed stone made from light colored granite. Stone screened to insure uniformity of size. No flat, elongated stone used. Size of stone in mowing strips and other areas as indicated on drawings, conforming to following requirements:

Size of square screen	Percent passing
1-1/4 inch	95% minimum
¾ inch	15% maximum

2.8 PEAT MOSS

A. Shredded, loose, substantially free of mineral and waste matters. Minimum organic matter by weight on a dry basis: 80 percent.

2.7 MULCH

A. Shredded pine bark free of wood chips, stones, branches, or other deleterious material. Bark shredded in strips not larger than 3-inches in any dimension and aged for a period of not less than six months after removal from original logs.

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 SEASON

A. Recommended Spring Planting Season: From time soil can be worked until following dates at end of planting season:

1. Lawns - April 15.

B. Recommended Fall Planting Season: Commence and terminate at time listed below:

1. Lawns - August 1 to October 1.

C. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

3.3 PROTECTION

A. Protect seeded and planted areas against damage by trespass and other causes. Protect work until accepted. Replace, repair, restake, or replant as required by Engineer, and at own expense, seeding or planting which is damaged.

B. If planting is done after lawn preparation, protect lawn areas, repair damage resulting from planting operations.

C. Wherever landscape work must be executed in conjunction with construction of other work, arrange a schedule of procedures that will permit execution of landscape work as specified.

3.4 PLANTING PITS

A. Excavate with vertical sides and in accordance with following requirements:

1. Plant shrubs in pits 12 inches greater in width than diameter of root ball or container and minimum of 18 inches deep below finished grade, or as necessary to properly set plant at finished grade.

2. Adjust depth of planting beds and pits to provide minimum of 8 inches of planting soil mixtures under roots of all plants.

3. Set plants in center of pits, plumb and straight and at level that top of root ball is 1 inch lower than surrounding finished grade after settlement.

B. Compact topsoil mixture thoroughly around base of root ball to fill all voids, when plant material is set. Cut all burlap and lacing and remove from top 1/3 of root ball. Do not pull burlap from under any root ball. Backfill tree and shrub pits halfway with planting soil mixture and thoroughly puddle before backfilling tree or shrub pit. Water tree or shrub again, when each backfill operation is complete.

3.5 PLANTING SOIL MIXTURE

A. Thoroughly mix all loam used in backfilling planting pits, with peat moss at rate of 2 parts loam to 1 part peat moss, to obtain required planting soil mixture.

3.6 PLANTING

A. Thoroughly compact topsoil planting mixture around root balls and water. Immediately after plant pit is backfilled, form a shallow saucer slightly larger than pit with ridge of soil to facilitate and contain watering. After planting, cultivate soil in all shrub beds between shrub pits. Grub out sod or other growth and remove from bed area. Rake bed area smooth and neat and outline. Mulch all tree pits and shrub beds with a minimum of 3

inches of shredded pine bark mulch as indicated on drawings. Do not use admixture of wood chips in mulch.

3.7 BARK MULCH SURFACES

A. Mulch, with shredded pine bark, all tree pits, shrub pits and beds, and all areas planted with ground cover, immediately after planting operations are completed.

1. For tree and shrub pits and beds, provide a minimum 3 in. of mulch.

2. For ground cover beds, provide a minimum 2 in. of mulch.

B. Limit mulching for trees and individual shrubs to pit area inside of saucer and for shrub, tree and ground cover beds and panels planted with multiple trees. Define limits of beds in turf areas or where no building wall or curb exists by installed metal edging as indicated.

3.8 METAL EDGE STRIPS

A. Install metal edge strips around all edges of mowing strips and planting beds as indicated. Fasten metal edge strips securely in place with tapered steel stakes driven through slots punched in strip at 30-in. (76.2cm) intervals. Set edge strips to finished grades indicated.

3.9 MOWING STRIPS AND AREAS OF CRUSHED STONE

A. Construct mowing strips adjacent to all exterior building and structure walls where indicated on drawings. Provide mowing strips with metal edge strips.

B. Install mat under crushed stone and pin in place.

C. Place 6-in. minimum layer of crushed stone between edge strip and building or structure. Consolidate stone as required by the Engineer.

3.10 LOAM

A. Spread loam on areas to be seeded, to required depth indicated on Contract Drawings or as required by Engineer, fine grade and compact. Specified depth shall be that after compaction.

3.11 LIME, FERTILIZER AND SEEDING

A. Apply lime by mechanical means at rate of 50 pounds per 1,000 sq. ft., or as soil analysis recommends. Apply fertilizer at rate of 50 pounds per 1,000 sq. ft., or as soil analysis recommends.

B. If any delays in seeding lawn areas cause weeds to grow on surface or loam is washed out prior to sowing seed, remove weeds or replace loam and reestablish finish grades without additional compensation. Sow seed at rate of 4 pounds per 1,000 sq. ft. on calm day, by mechanical means. Sow one-half of seed in one direction, and other half at right angles to original direction. Rake seed lightly into loam, to depth of not more than 1/4 inch and compact by means of an acceptable lawn roller weighing 100 to 150 pounds per linear foot of width.

C. Water lawn areas adequately at time of sowing and daily thereafter with fine spray, and continue throughout maintenance and protection period. Loam, lime, fertilize and seed required areas outside of perimeter same as lawn areas. Apply seed at rate of 80 pounds per acre. Rake seed lightly, after sowing, into top 1/4 in. of loam, and compact by suitable rollers weighing 100 to 150 pounds per linear foot of width.

3.12 SOD

A. Install sod not more than 48 hours after cutting. Provide lime, fertilizer, etc, preparation for sod same as stated above for seed.

3.13 CRUSHED STONE

A. Place crushed stone to depth of 6 inches, and thoroughly consolidate by means of suitable vibrator or mechanical tamper. Add stone, as necessary, after tamping or vibrating to finish depth of 6 inches.

3.14 CLEAN-UP

A. Remove soil or similar material which has been brought onto paved areas, keeping these areas clean. 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 or sodded areas by refilling, resodding, remulching and reseeding as required by condition and as required by the Engineer. Protection may be by installation of sod strips or other methods.

3.15 MAINTENANCE

A. Maintain lawn areas and other seed areas at maximum height of 2-1/2 inches by mowing at least three times. Weed thoroughly once and maintained until time of final acceptance. Reseed and refertilize with original mixtures, watering or whatever is necessary to establish over entire area of lawn and other seeded areas a close stand of grasses specified, and reasonably free of weeds and undesirable coarse native grasses.

B. Begin maintenance immediately after each portion of lawn is seeded and continue for minimum of 45 days or until final acceptance of work. Water, mulch, weed, prune, spray, fertilize, cultivate and otherwise maintain and protect all plants.

C. Reset settled plants to proper grade and position, and restore planting saucers and remove dead material. Tighten and repair guys.

3.16 FINAL INSPECTION

A. Upon written request by the Contractor, the Engineer shall inspect all lawn areas to determine completion of contract work. This request must be submitted at least 10 days prior to the anticipated date. The lawns will become acceptable if they show a uniform, thick, well developed stand of grass that may be occupied by the Owner for their intended use. When acceptance is made in writing to the Contractor, the Contractor's responsibility for maintenance shall terminate.

B. The Contractor shall furnish to the Owner complete written instructions for maintenance of all lawn areas at time of acceptance. Acceptance of the lawn area shall not occur before acceptance of the entire facility.

PART 4 – COMPENSATION (Not Used)

END OF SECTION 02900

SECTION 02910

TREE PLANTING

2910.1 TREE PLANTING 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 Mass 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 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.

1.6 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 (omit spraying).

5. Furnishing and installing Iron Edge along the edge of tree pits located within brick sidewalk areas. The Iron Edge shall meet the specifications contained in section 02524 "Curbs, Walks, and Driveways."

6. Cleaning up of sites at the end of planting operations.

7. Maintaining, protecting, weeding, pruning damaged or broken limbs, and replacing dead trees during the guarantee period.

PART 2 – PRODUCTS

2.1 TOPSOIL

A. Contractor shall provide all topsoil required to complete the tree planting operation. Topsoil shall be a natural, fertile, friable loam typical of cultivated topsoil of the locality, containing at least 10% and not more than 20% decayed organic matter (humus). Topsoil shall be free of sub-soil, large stones, earth clods, sticks, stumps, clay lumps, roots, or other objectionable, extraneous matter or debris. Topsoil shall not be by test either excessively acid or alkaline nor contain toxic substances. Topsoil shall not be delivered or used for planting while in a frozen or muddy condition. Name of supplier and sample to be approved by the City Arborist.

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.

2.4 MULCH

A. Mulch shall consist of clean, organic plant material. The mulch must be free of dirt and materials deleterious to plant life. Name of supplier and sample to be approved by the City Arborist.

2.5 STAKING

A. Stakes will be wood, 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 AERATION/WATERING DEVICE

A. Aeration/watering device shall be model RWS-G Root Watering System by RainBird, Inc. or approved equivalent product. Devices shall consist of a grate retainer constructed from high-grade polymer with UV resistant thermoplastic inhibitors. The

grate retainer shall fasten to a basket weave canister. The canister shall be a high grade polymer rigid mesh cylinder 34" in length. Canisters shall be fitted with a sand sock filter.

2.7 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.

2.8 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.

2.9 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 SECTION

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. 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.

C. 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.

D. 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 as much of the degradable burlap and rope from around the top of the ball as possible. If a wire basket is present after the root ball is securely in place, cut off as much wire as possible. 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.

E. Install watering/aeration loop before back-filling according to the requirements and approval of the City Arborist.

3.7 AERATION/WATERING DEVICES

A. Devices shall be evenly spaced and positioned against the root ball or root mass. Two units shall be provided per tree. Units shall be placed vertically with the top even with the ground surface. Areas surrounding the devices shall be backfilled with soil after placement.

3.8 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.

3.9 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.

3.10 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 twice a week exclusive of Saturdays, Sundays and holidays for a period of 30 days from the date of planting.

3.11 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.

3.12 STAKING

A. Place 2 or 3 wood stakes equally spaced, not higher than ½ 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.

3.13 PRUNING

A. Prune only badly bruised, broken, or crossing limbs.

3.14 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.

3.15 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 devised must also be used during sweet sweeping, sewer flushing, paving operations and hookups for any other purpose.

3.16 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.

3.17 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.

3.18 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.

3.19 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.

3.20 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.

3.21 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.

3.22 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

Item 2910.1 --- Tree Planting

METHOD OF MEASUREMENT:
Measurement for payment for tree planting will be for the number of trees 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 is planted and accepted.

BASIS OF PAYMENT:
The unit price per tree planted shall be full compensation for purchasing and delivering, offloading, receiving, handling and caring for all trees in the laydown area and work sites, transportation between the laydown area and work sites, furnishing and delivering prepared backfill soil, mulch, and fertilizer packets, removal of existing surface material at tree pit location, digging of pits, removal of excavated materials, planting of trees, installation of aeration/watering devices, 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.

END OF SECTION 02910

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SECTION 03300
CONCRETE

3300.1 CIP CONCRETE PIPE CONNECTION GREATER THAN 18-IN THROUGH 36-IN DIAMETER **EACH**

PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.2 DEFINITIONS

A. Cementitious Materials: Shall be a combination of Portland cement and Blast Furnace slag.

1.3 SUBMITTALS

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

1. Product Data: For each type of manufactured material and product indicated.

2. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

a. Indicate amounts of mix water to be withheld at plant for later addition at Project site.

3. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

4. Welding Certificates: Copies of certificates for welding procedures and personnel.

5. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

   a. Cementitious materials and aggregates.

   b. Form materials and form-release agents.

   c. Steel reinforcement and reinforcement accessories.

   d. Admixtures.

   e. Waterstops.

   f. Curing materials.

   g. Bonding agents.

   h. Adhesives.

   i. Ready-mix concrete producer.

   j. Repair materials.

   k. Grout.

6. Minutes of preinstallation conference.

7. Detailed cold-weather protection methods.

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."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixes.

c. Ready-mix concrete producer.

d. Concrete subcontractor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Section 01600 – PRODUCTS, MATERIALS AND EQUIPMENT and as specified.

B. Deliver, store, and handle steel reinforcement to prevent bending and damage.

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, 3/4 by 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 1-1/2 inch to the plane of the exposed concrete surface.

2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing and for walls which are part of water containing tanks or structures.

2.2 STEEL REINFORCEMENT

A. Reinforcing 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/A 706M, deformed.

3. Plain-Steel Wire: ASTM A 82, as drawn.

4. Plain-Steel Welded Wire Fabric: 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/A 615M, 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. Ground Granulated Blast-furnace slag: ASTM C 989, Grade 100 or better.

C. Normal-Weight Aggregate (NW): 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.

D. Water: Potable and complying with ASTM C 94.

2.5 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.6 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.

2.7 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed with center bulb.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. PVC Waterstops:

a. Greenstreak.

b. Meadows: W. R. Meadows, Inc.

c. Vinylex Corporation.

C. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.

b. Hydrotite; Greenstreak.

c. Adeka Ultra Seal; Mitsubishi International Corporation.

2.8 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:

1) Eucobar; Euclid Chemical Co.
2) E-Con; L&M Construction Chemicals, Inc.
3) Confilm; Master Builders, Inc.
4) Waterhold; Metalcrete Industries.

b. Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 percent Solids:

1) Klear-Kote WBII 20 percent; Burke Chemicals.
2) Dress & Seal WB; L&M Construction Chemicals, Inc.
3) Vocomp-20; W. R. Meadows, Inc.

c. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:

1) Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
2) Lumiseal WB Plus; L&M Construction Chemicals, Inc.
3) Vocomp-30; W. R. Meadows, Inc.

2.9 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.

2.10 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. Ground Granulated Blast-furnace slag shall be substituted for a portion of the total cement mix up to 50%.

3. Fly ash shall not be used.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Concrete mixes shall be designed for the classes indicated below and in accordance with the requirements indicated.

Design Mix Schedule								
				Admixture				
Class	Specified Compressive Strength (psi)	Minimum Cement Content (lb/cy)	*Maximum Water/ Cementitious Ratio	% Air Entrainment	Corrosion Inhibitor (gal./cy)	Fiber Reinforcement (lb/cy)	Silica Fume (%/wt. Cement)	Density and Aggregate Size
A	4,000	565	0.48	5.5+/-1	N/A	N/A	N/A	NW-3/4"
B	4,000	611	0.44	5.5+/-1	N/A	N/A	N/A	NW-3/4"
C	1,500	N/A	0.76	N/A	N/A	N/A	N/A	NW-3/4"
D	5,000** (min.) (pre-cast)	Set by Manufacturer	0.44	5.5+/-1	N/A	N/A	N/A	NW -3/4"

* Total water in mix at time of mixing, including free water in aggregates.
** Concrete strength to be determined by Manufacturer as required by Design.
NW = Normal Weight Aggregate – Refer to 2.4(C)

1. Mix Classifications: The design mix classes indicated above shall be used as indicated on the Drawings and as follows:

   Class A: All other areas on Structural (S Series), Civil (C Series), Architectural (A Series) and Landscape (L Series)
   Drawings, not included above.
   Class B: Water, wastewater, and other environmental structures
   Class C: Where ever low strength concrete fill is indicated
   Class D: Pre-cast Concrete

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 the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in work.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Other concrete: Not more than 4 inches.

E. Admixtures: Subject to Engineer's approval, use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch, for concrete surfaces exposed to view.

2. Class C, 1/2 inch, for other concrete surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete where indicated on Drawings.

I. Do not chamfer corners or edges of concrete.

J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

3.3 GROUTING OF EQUIPMENT

A. Set equipment accurately in locations and to elevations indicated and according to manufacturer's recommendation.

B. Clean concrete and equipment bearing surfaces of bond-reducing materials and roughen surfaces prior to setting.

1. Set equipment on wedges, shims, or setting nuts as required by the manufacturer.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and equipment so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

a. Comply with manufacturer's instructions for proprietary grout materials:

3.4 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 72 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. When cold weather concrete requirements apply, formwork shall be left-in-place for a minimum of 7 days.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. At least 75 percent of 28-day design compressive strength.

2. Determine compressive strength of in-place concrete by testing representative field cured test specimens according to ACI 301.

3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.5 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.

3.6 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 required 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.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the 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.

3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved in writing by the 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.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

6. Pulling of welded wire fabric through wet concrete from subgrade is prohibited.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. The finish of formed surfaces shall proceed concurrently with, or immediately after the repair of surface defects. The selection of finishes shall be as indicated in the table below.

Concrete Finishes (Formed Surfaces)Location	**Finish**
Footings, exterior walls, pile caps, portions of grade beams below grade and all other concrete not exposed to view	Rough-Formed Finish
Walls, portions of grade beams above grade, and all other concrete surfaces exposed to view. Surfaces to be coated or covered with waterproofing, dampproofing, plaster or paint	Smooth-Formed Finish

B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.

D. Smooth Rubbed Finish 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.

3.11 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.

3.12 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.

3.13 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.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall employ qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete, plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of

each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

   a. Cast and field cure one additional set of four standard cylinder specimens for each composite sample, when outside air temperature is below or expected to fall below 40°F (4.4°C) that night. Also provide field cured cyclinders to determine strength for form removal.

6. 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

required by the 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 required 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 required by the Engineer when test results indicate requirements have not been met.

3.15 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01701 – PROJECT CLOSEOUT.

PART 4 - COMPENSATION

Item 3300.1 – CIP Concrete Pipe Connection Greater Than 18-in Through 36-in Diameter

METHOD OF MEASUREMENT:
Measurement for payment for CIP Concrete Pipe Connection Greater Than 18-in Through 36-in Diameter shall be on the basis of the number of individual collars, of this size, complete as measured by the Engineer.

BASIS OF PAYMENT / INCLUSIONS:
Payment for CIP Concrete Pipe Connection Greater Than 18-in Through 36-in Diameter 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 concrete collars greater than 18-in through 36-in in diameter as detailed in the Contract Drawings. The work shall include, but is not limited to: furnishing and installing rebar; furnishing, installing and removing formwork; furnishing and installing waterstops and seals; furnishing and installing Class A and B concrete; jointing; preparation of subgrade; furnishing, installing and compacting bedding; saw cutting; excavation; temporary excavation support installed, left in place and cut off below grade where required or required; furnishing and placing backfill per one of the approved methods; compaction; compaction testing; concrete testing; construction dewatering; dampproofing; brick masonry and all incidental work required to construct the collar as detailed and specified.

EXCLUSIONS
Items not included for payment herein include, but are not limited to; pipe collars for sizes other than greater than 18-in through 36-in Diameter. Pipe collars less than 18-in are not paid for separately and are considered incidental to all the Work included in this Contract and shall be carried by the Contractor is his Total Bid Price.

END OF SECTION 03300

SECTION 03315

GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all materials for grout in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other work as required to produce finished grout, in accordance with the requirements of the Contract Documents.

B. The following types of grout shall be covered in this Section:

1. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced.

2. Cement Grout

3. Epoxy Grout

4. Topping Grout

1.2 RELATED WORK

A. Section 03300 - CONCRETE

1.3 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 – SUBMITTALS:

1. Submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the work.

1.4 QUALITY CONTROL

A. Field Tests:

1. Cement Grout and Topping Grout

   a. Compressive strength of cement grout and topping grout shall be tested in accordance with the requirements of ASTM C 109. The frequency of tests shall conform to the requirements of Section 03300 - 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 the cost of the Contractor.

4. The cost of all laboratory and field tests on grout shall be borne by the Contractor, and the Contractor shall assist the Owner in obtaining specimens for testing. The Contractor shall supply all materials necessary for fabricating the test specimens.

B. Construction Tolerances: Construction tolerances shall be as specified in the Section 03300 - CONCRETE except as modified herein and elsewhere in the Contract Documents.

PART 2 - PRODUCTS

2.1 CEMENT GROUT

A. Cement Grout: Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white Portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4000 psi.

B. Cement grout materials shall be as specified in Section 03300 - CONCRETE.

2.2 PREPACKAGED GROUTS

A. Non-Shrink Grout:

1. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.

2. Class A non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C-827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

3. Class B non-shrink grouts shall have a minimum 28 day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.

4. Application:

a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at all locations where grout is specified in the contract documents; except, for those applications for Class B non-

shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.

b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all base plates for structural steel members, and grouting railing posts in place.

B. Epoxy Grout:

1. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged. Epoxy grout shall be Burk Epoxy Anchoring Grout by The Burke Company, Sikadur 32 Hi-Mod by Sika Corporation, Richmond, VA, Sikadur 32, Hi-Mod Gel by Sika Corporation, Richmond, VA, or approved equivalent.

2. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.

3. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.

4. The epoxy grout shall develop a compressive strength of 5000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C 579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C 827.

5. The epoxy grout shall exhibit a minimum effective bearing area of 95 percent. This shall be determined by a test consisting of filling a 2-inch diameter by 4-inch high metal cylinder mold covered with a glass plate coated with a release agent. A weight shall be placed on the glass plate. At 24 hours after casting, the weight and plate shall be removed and the area in plan of all voids measured. The surface

of the grout shall be probed with a sharp instrument to locate all voids.

6. The peak exotherm of a 2-inch diameter by 4-inch high cylinder shall not exceed 95 degrees F when tested with 75 degree F material at laboratory temperature. The epoxy grout shall exhibit a maximum thermal coefficient of 30 x 10^{-6} inches/inch/degree F when tested according to ASTM C 531 or ASTM D 696.

7. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.

2.3 TOPPING GROUT

A. Grout for topping of slabs shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed as specified herein. All materials and procedures specified for normal concrete in Section 03300 shall apply except as noted otherwise herein.

B. Topping grout shall contain a minimum of 564 pound of cement per cubic yard with a maximum water cement ratio of 0.45.

C. Coarse aggregate shall be graded as follows:

US Standard Sieve Size	Percent By Weight Passing
1/2"	100
3/8"	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

D. Final mix design shall be as determined by trial mix design under supervision of the approved testing laboratory.

E. Strength: Minimum compressive strength of topping grout at the end of 28 days shall be 3000 psi.

2.4 CURING MATERIALS

A. Curing materials shall be as specified in Section 03300 - 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 Class A non-shrink grout and epoxy grout shall provide on-site technical assistance upon request.

C. Base concrete or masonry must have attained its design strength before grout is placed, unless authorized by the Engineer.

3.2 GROUTING PROCEDURES

A. Prepackage Grouts: All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Base Plate Grouting:

1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a one-inch thickness of grout or a thickness as shown on the Drawings.

2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout. The mixture shall be of a trowelable consistency and tamped or rodded solidly into the space between the plate and the base concrete. A backing board or stop shall be provided at the back side of the space to be filled with grout. Where this method of placement is not practical or where required by the Owner, alternate grouting methods shall be submitted for acceptance by the Engineer.

C. Topping Grout:

1. All mechanical, electrical, and finish work shall be completed prior to placement of topping. The base slab shall be given a roughened textured surface by sandblasting or hydroblasting exposing the aggregates to ensure bonding to the base slab.

2. The minimum thickness of grout topping shall be one inch. Where the finished surface of concrete fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2-inches wide by 1-1/2-inches deep.

3. The base slab shall be thoroughly cleaned and wetted prior to placing topping. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat Type II cement grout shall be broomed into the surface of the slab just before topping of fill placement. The topping shall be compacted by rolling or tamping, brought to established grade, and floated.

4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the

topping has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement or mixture of dry cement and sand shall be applied to the surface.

3.3 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

PART 4 – COMPENSATION (NOT USED)

END OF SECTION 03315

SECTION 05500

MISCELLANEOUS METALS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections,

2. Shelf angles,

3. Loose bearing and leveling plates,

4. Steel weld plates and angles for casting into concrete not specified in other Sections,

5. Miscellaneous steel trim including steel angle corner guards and steel edgings,

6 Pipe guards,

B. Products furnished, but not installed, under this Section include the following:

2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Section 01045 – CUTTING AND PATCHING

2. Section 01630 – RESTORATION OF GROUNDS AND CLEANING UP

3. Section 02524 – CURBS, WALKS, AND DRIVEWAYS

4. Section 02590 – BRICK MASONRY

5. Section 03300 – CONCRETE

5. Section 03315 – GROUT

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): ambient - 120 F; material surfaces - 180°F.

1.4 SUBMITTALS

A. Furnish submittals in accordance with Section 01300 – SUBMITTALS.

B. Product Data: For the following:

1 Grout.

C. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

2. Provide templates for anchors and bolts specified for installation under other Sections.

3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

4. An ICBO report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor. The Contractor shall submit manufacturer's recommendations installation instructions and procedures for adhesive anchors. Upon review by Engineer, these instructions shall be followed specifically.

5. No substitutions for the indicated adhesive anchors will be considered unless accompanied with ICBO report verifying

strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75°F.

D. Samples for Verification: For each type and finish of extruded nosing and tread.

E. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

F. Welding certificates.

G. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Welding: Weld procedures and welder qualifications shall be available in the Contractor's field office for review. Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

2. AWS D1.2, "Structural Welding Code - Aluminum."

3. AWS D1.3, "Structural Welding Code - Sheet Steel."

4. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS - GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Corrosion Protection: Unless otherwise indicated, miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

2.3 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316L.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallically bonded to steel by a proprietary process.

1. Products:

a. IKG Industries, a Harsco company; Mebac.

b. W. S. Molnar Company; SlipNOT.

H. Steel Tubing: ASTM A 500, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

J. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel, Class 2 fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Corrosive Service: Bolts, nuts, and washers in the locations listed below shall be stainless steel as indicated.

1. Buried locations.

2. Submerged locations.

3. Locations subject to seasonal or occasional flooding.

4. Inside hydraulic structures below the top of the structure.

5. Inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump.

6. Chemical handling areas.

7. Inside trenches, containment walls, and curbed areas.

8. Locations indicated by the Contract Documents or designated by the Engineer to be provided with stainless steel bolts.

C. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.

1. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.

2. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

D. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

E. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group [1 (A1)].

F. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

G. Eyebolts: ASTM A 489.

H. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

I. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

J. Wood Screws: Flat head, ASME B18.6.1.

K. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

L. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

M. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

N. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material for Anchors in Exterior Locations: Alloy Group [1 (A1)] stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

O. Adhesive Anchors: Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.

1. Epoxy adhesive anchors are required for drilled anchors for outdoor installations, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails and reinforcing

bars. Epoxy shall comply with Section 03315 – GROUT. Threaded rod shall be galvanized for general purpose applications and stainless steel Type 316 for corrosive applications. Epoxy anchors shall not be permitted in areas where the concrete temperature is in excess of 100°F or higher than the limiting temperature recommended by the manufacturer, whichever is lower. Epoxy anchors shall not be used where anchors are subject to vibration or fire. Embedment depth shall be as the manufacturer recommends for the load to be supported.

2. Unless otherwise indicated, glass capsule, polyester resin adhesive anchors will be permitted in locations not included above and shall be Hilti HVA or Cobra Anchors. Threaded rod shall be galvanized steel.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content which complies with regulations of the State of Massachusetts. .

2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of which complies with regulations of the State of Massachusetts.

2. Products:

a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.

b. Carboline Company; Carbozinc 621.

c. ICI Devoe Coatings; Catha-Coat 313.

d. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.

e. Tnemec Company, Inc.; Tneme-Zinc 90-97.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete Materials and Properties: Comply with requirements in Section 03300 – CONCRETE for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts if units are installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as

indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.

1. Provide bearing plates welded to beams where indicated.

2. Drill girders and plates for field-bolted connections where indicated.

3. Where wood nailers are attached to girders with bolts or lag screws, drill holes at 24 inches o.c.

E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness, unless otherwise indicated.

1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.

2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

F. Galvanize miscellaneous framing and supports where indicated.

G. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.

2.13 PIPE GUARDS

A. Fabricate pipe guards from 3/8-inch thick by 12-inch wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe

with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4-inch anchor bolts.

B. Galvanize pipe guards after fabrication.

2.14 HATCHES

A. Where access hatches are mounted on a floor slab (including top slabs that are not covered with a roofing membrane) or on a concrete curb, the hatch shall be a flush type as indicated.

B. Hatches shall be fabricated from aluminum 5086 H34, 6063-T5 or 6061-T6, unless otherwise indicated. Hatch hardware shall be Type 316 stainless steel. Hatches shall be gutter-type; Bilco Type J or JD, Babcock-Davis Type B-FGA or equal.

C. The design live load shall be 300 psf, unless indicated otherwise.

D. Hatch opening sizes, number and swing direction of door leaves, and locations, shall be as indicated. Sizes are for the clear opening. Where the number of leaves is not given, openings larger than 42-inches in either direction shall have double-leaf doors. Unless indicated otherwise, hinges shall be located on the longer dimension side. Unless indicated otherwise, ladder hatches shall be a minimum of 30-inches wide by 36-inches long, with the ladder centered on the shorter dimension, and the door hinge opposite the ladder.

F. Door leaves shall be a minimum of 1/4-inch thick checkered pattern plate. Channel frames shall be a minimum of 1/4-inch material with an anchor flange around the perimeter. Hatches shall be provided with an automatic hold-open arm with release handle. Hatches shall be designed for easy opening from both inside and outside.

G. Hatches shall be designed to be water-tight and shall be equipped with a joint gutter and moat-type edge drain. A minimum 1-1/2 inch diameter drain connection shall be provided, located by the manufacturer.

2.15 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 and grates shall fit together evenly, so that the cover fits flush with the surrounding finished surface and so that the cover does not rock or

rattle when loading is applied. Round covers and frames shall have machined bearing surfaces.

C. Covers and grates with matching frames shall be designed to support the following loadings:

D. Where located within a structure, the design loading shall match that required for the adjacent floor area, or, if no floor loading is given, a minimum of 300 pounds per square foot.

E. Exterior covers and grates shall be designed for AASHTO HS-20 loading unless indicated otherwise.

2.16 FINISHES - GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

A Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.

2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.18 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.19 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 – EXECUTION

3.1 INSTALLATION - GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. 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. Qualifications of welders shall be in accordance with the AWS Standards governing same.

D. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

PART 4 – COMPENSATION

Not Used

END OF SECTION 05500

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work covered under this Section of the specifications includes furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with the furnishing and application of bituminous dampproofing and, at all manholes, box culverts, and structures including surface preparation and appurtenant work, complete in place, in accordance with the Drawings and Specifications.

1.2 RELATED WORK

A. Section 02252 - MANHOLES

B. Section 03300 – CONCRETE

1.3 SUBMITTALS

A. The Contractor shall submit manufacturer's technical product data on the bituminous dampproofing and installation instructions for all materials required under this Section.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

A. Bituminous dampproofing materials shall conform to Federal Specification SS-A-701 or ASTM D 449, Type A and shall be Dehydratine 4 as manufactured by W.R. Grace & Company; Trémco; Hydrocide 648 as manufactured by Sonneborn; or approved equivalent.

PART 3 - EXECUTION

3.1 APPLICATION

A. Bituminous dampproofing shall be applied in strict accordance with the printed instructions of the approved manufacturer. The surface must be clean and free of all foreign matter. Do not apply over a frost-covered surface. All cracks, voids, honeycombs, etc., shall be filled and repaired with mortar to provide a sound structural surface. No heating or thinning is required. If thinning is absolutely necessary, use a small amount of mineral spirits. Apply by brush or spray in a continuous unbroken film free from pinholes or other surface breaks. All surfaces to be dampproofed shall receive two coats. Each coat shall dry a minimum of 20 to 24 hours before application of the next coating. The second coat shall be applied perpendicular to the first. Allow a minimum of 48 hours for drying before backfilling. Each coat shall be applied at a rate of 65 square feet per gallon. Bituminous dampproofing can be factory applied providing application meets coating manufacturer's requirements. Additional field coatings must be applied, as required by the Engineer, to repair any coating imperfections and chipped or damaged areas.

PART 4 – COMPENSATION (NOT USED)

END OF SECTION 07610

APPENDIX A
OIL AND HAZARDOUS MATERERIALS
FINDINGS AND SOIL MANAGEMENT RECOMMENDATIONS

S E A

S E A CONSULTANTS INC.
Scientists/Engineers/Architects

MEMORANDUM

DATE: September 26, 2008

TO: Tim Stinson, P.E., S E A

FROM: Kevin Duffy, E.I.T., S E A,
Richard K. Quateman, LSP, CHMM, S E A

CC: Amy Coppers, P.E., S E A
Jay R. Perkins, P.E., Brierley Associates LLC
File

SUBJECT: Oil and Hazardous Materials Findings and Soil Management Recommendations
Upper Oxford Sewer Separation, Cambridge, Massachusetts

S E A No.: 2007108.10-A

INTRODUCTION

This memorandum presents the results of S E A's preliminary assessment of environmental conditions in the Upper Oxford Sewer Separation project area in Cambridge, MA. The project area includes the streets within the limits of Massachusetts Avenue, Roseland Street, Beacon Street, and Prentiss Street.

This preliminary assessment included a site reconnaissance and a subsurface soil sampling and analysis program. This memorandum also provides guidance on state and federal requirements for soil management, based on the results of the laboratory chemical analyses.

The Upper Oxford project area is typified by commercial properties on Massachusetts Avenue and residential properties on the remaining streets. The results of a state database search and an area reconnaissance identified two locations within the project area and one location immediately adjacent to the project area (See State Database Review) posing a potential risk of a release of oil or hazardous material (OHM) to environment or which could impact construction operations in the area.

FINDINGS

State Database Review

A state and federal database search was conducted, utilizing the Massachusetts Department of Environmental Protection (MassDEP) Site database. A review of the MassDEP Site database indicated the following properties:

- Release Tracking Number (RTN) 3-12159: A residential property located at 16-19a Forest Street is identified as the location of a release of #2 oil to soil and groundwater. The source of the contamination is an under ground storage tank. The release was initially reported in 1995 and was remediated at that time. The site is currently listed as closed by the MassDEP; and

- RTN 3-26997: A Utility-Related Abatement Measure (URAM) for utility installations on Oxford Street by Harvard University was submitted to MassDEP in June 2007. The URAM was submitted in response to detection of OHM associated with historic fill soils. Construction related to the URAM was completed in October 2007.
- RTN 3-10374: Immediately outside (south) of the study area on Massachusetts Avenue is the location of a gasoline station at 1725 Massachusetts Ave. A Class B-1 Response Action Outcome (RAO) Statement was submitted for this release, although remedial responses were conducted; the Class B-1 RAO indicates that no responses were implemented.

For the purpose of this investigation, all releases are considered to be posing a potential risk of a release of oil or hazardous material (OHM) to the environment or which could impact construction operations in the area.

Site Reconnaissance

S E A completed a reconnaissance of the project area using aerial photographs during DigSafe notification. The project area consists of residential properties and some areas of commercial properties. S E A did not observe indications of contamination, improperly stored hazardous materials, or evidence of on-going releases.

SUBSURFACE INVESTIGATION

A total of thirteen borings, designated, B-101 through B-114 (excluding B-103) were drilled by Carr-Dee Corporation of Medford, Massachusetts on September 2 through September 8, 2008. The borings were drilled at critical structure locations (as determined by S E A and its geotechnical subcontractor, Brierley Associates), or at a location determined to potentially pose an environmental impact to construction, to depths of between 15 feet and 22 feet below the ground surface (bgs). All borings were advanced within the right-of-way of the public roadways. Groundwater monitoring wells were installed in borings B-101, B-104, B-109, and B-113 upon completion. The test borings were advanced using 2-1/4 inch hollow-stem augers to the indicated depths. A standard split-spoon sampler, 24 inches long, was used to obtain soil samples beginning below the existing asphalt roadway continuous through the bottom of the boring for visual classification.

Borings were monitored by S E A. Locations of the test borings are shown on the attached Subsurface Exploration Location Plan. Boring logs were prepared by S E A.

SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

Soil

Immediately below the roadway asphalt surface, two to five feet of dark brown well graded sand with some fine gravel was observed. Below the initial fill layer, the soil was typically classified as fine to medium sand with less than ten percent non-plastic fines. At an average depth of ten feet bgs, fine silty sand was observed. SPT N-values classify the material as medium dense to dense.

Bedrock

Bedrock was not encountered during the boring investigation.

Groundwater

Groundwater was encountered in all boring locations at depths between 8.5' and 14' bgs.

LABORATORY ANALYTICAL PROGRAM

Representative samples of the underlying soils were collected from select borings and submitted to Alpha Woods Hole Labs (Alpha) of Westborough, Massachusetts for laboratory chemical analysis. Each sample was analyzed for Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver); polychlorinated biphenyls (PCBs); volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); petroleum hydrocarbons by GC/FID; and, corrosivity, ignitability, and reactivity. Samples were collected from boring B-101, B-105, B-108, and B-114.

The results of each analysis were compared with Massachusetts Contingency Plan (MCP) notification requirements and contaminant concentration limits, which are predominantly based upon the proximity of residences and residential/public use of properties. RCS-1 Reportable Concentration (RC) limits apply to locations at or within 500 feet of a residential dwelling, a residentially-zoned property, school, playground, recreational area or park; or within the geographic boundaries of a groundwater resource area categorized as RCGW-1 in 310 CMR 40.0362(1)(a). RCS-2 limits apply to all soil samples that are not obtained from category RCS-1 areas. Based on observed property uses and a review of Town zoning, RCS-1 Reportable Concentrations are believed to apply to the project area. A summary of the chemical analyses is attached as Table 1- Summary of Soil Analyses.

Metals

Arsenic, barium, chromium, and lead were detected above laboratory reporting limits in samples B-101, B-105, B-108, and B-114 with concentrations ranging from 4 – 6.5 μg/g , 8.6 – 46 μg/g, 12 – 22 μg/g, and 22 – 91 μg/g, respectively. These concentrations are below the RCS-1 limits of 20 μg/g , 1,000 μg/g , 30 μg/g , and 300 μg/g , respectively. Mercury was detected above laboratory reporting limits in samples B-101, B-105, and B-108 between 0.11 and 0.31 μg/g , but below the RCS-1 limit of 20 μg/g . No other metal parameter concentrations were detected above laboratory reporting limits or at concentrations exceeding RCS-1 limits.

VOCs

Naphthalene was detected above laboratory reporting limits in samples B-101, with a concentration of 1.2 μg/g . This concentration is below the RCS-1 limit of 4 μg/g . No other VOC parameter concentrations were detected above laboratory reporting limits or at concentrations exceeding RCS-1 limits.

SVOCs

Fluoranthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, acenaphthylene, anthracene, benzo(ghi)perylene, phenanthrene, dibenzo(a,h) anthracene, indeno(1,2,3-cd)pyrene, and pyrene were detected above laboratory reporting limits in sample B-105 With the exceptions of benzo(a)pyrene, SVOC concentrations were below respective RCS-1 limits. Benzo(a)pyrene was detected at 3.5 μg/g as compared with the RCS-1 limit for benzo(a)pyrene of 2 μg/g.

Fluoranthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, anthracene, benzo(ghi)perylene, phenanthrene, indeno(1,2,3-cd)pyrene, and pyrene were detected above laboratory reporting limits in sample B-108; all contaminant concentrations were reported as below the RCS-1 limits for these parameters.

Fluoranthene, phenanthrene, and pyrene were detected above laboratory reporting limits in sample B-101 with concentrations of 52 μg/g, 58 μg/g, and 52 μg/g, respectively. Of these, only the RCS-1 limit for phenanthrene (10 μg/g) was exceeded.

All reported analyte concentrations are below the RCS-1 limits with the exception of the benzo(a)pyrene concentration in sample B-105 and the phenanthrene concentration in sample B-101 as noted above. No other analytes were detected above laboratory reporting limits or at concentrations exceeding RCS-1 limits.

Total SVOC concentrations in soil collected from boring B-101 exceed the unlined landfill acceptance criteria of 100 μg/g at 162 μg/g.

Total Petroleum Hydrocarbons

Petroleum hydrocarbons were detected above laboratory reporting limits in samples B-101, B-105, and B-108 at 2,440 μg/g, 291 μg/g, and 488 μg/g, respectively as compared to the petroleum hydrocarbon RCS-1 limit of 1000 μg/g.

Other Analytes

No other analytes were detected above laboratory reporting limits or at concentrations exceeding RCS-1 limits.

Groundwater

No odor was detected in groundwater that was observed during drilling. Contamination is not expected to be encountered during excavation in this area. No groundwater samples have been collected to-date.

Physical Observations

No petroleum odor or staining was observed in soil recovered from soil borings.

CONCLUSIONS AND RECOMMENDATIONS

- Based on the findings presented in this memorandum, soils in the study area have been impacted by OHM. While the source(s) of these impacts are not known, they are likely associated with historical fill placement, typical discharges from automobile operations and parking and/or from atmospheric deposition.
- Exceedances of RCS-1 limits were identified in boring B-101 for petroleum hydrocarbons and phenanthrene. Additionally, the soil analyses reported exceedances of RCS-1 limits in boring B-105 for benzo(a)pyrene. Encountering soils in the general proximities of these borings at concentrations exceeding RCS-1 limits should be anticipated. Accordingly, prior to start of construction in proximity to borings B-101 and B-105 submittal of a Utility-Related Abatement Measure (URAM) Plan to MassDEP will be required.
- Based on available data, construction in other areas of the project is not anticipated to require use of a URAM Plan. If visual, olfactory or laboratory data evidence of oil or hazardous material (OHM) or historic fill typically associated with OHM is encountered in the course of utility construction, S E A recommends that an S E A Licensed Site Professional (LSP) or his/her designee assess soil conditions to determine appropriate soil management and regulatory requirements and responses.
- Based on the results of the analyses conducted on samples collected, surplus soils outside the URAM area are likely to be appropriate for either on-site reuse (subject to geotechnical requirements) or for re-use at an unlined landfill as daily cover or at a facility approved by MassDEP to accept less than RCS-1 soils.
- Soils excavated from the URAM areas should be segregated from non-impacted soils. If re-used, these soils must be re-used in the area of excavation. Impacted soils may not be re-used in less impacted areas.
- Soils excavated from the general proximity of boring B-101 may require treatment at an asphalt batch recycling or thermal treatment facility due to total SVOC concentrations.
- S E A recommends that all surplus soils be analyzed prior to off-site management to ensure compliance with applicable state and Federal regulations, including the MCP and the MassDEP anti-degradation policies.
- If construction dewatering is anticipated, S E A recommends that on-site re-infiltration be utilized to the extent feasible. If discharge to the storm and/or municipal sewer system is anticipated, S E A recommends that representative groundwater samples be collected from

study area monitoring wells to determine which permit(s) would be required for such discharge.

LIMITATIONS

The purpose of the work conducted by S E A was to assess the physical characteristics of the subject area with respect to the presence of OHM, as defined in Massachusetts General Laws Chapter 21E. In conducting this assessment, SEA gathered information from observations made during site reconnaissance and a preliminary environmental assessment of the site conditions which included observing soil borings and reviewing the results of laboratory analysis of soil samples collected by others. Due to the potential for errors, omissions, or inaccuracies, there is some risk associated with reliance on such information. Although there may be some corroboration provided by multiple sources, SEA cannot be responsible for the accuracy or completeness of the information reviewed or received during the course of this assessment.

The conclusions drawn by SEA are based solely on information gathered to date. Information that may be gathered in the future may modify the conclusions and opinions reported herein. If variations or other latent conditions become evident, it will be necessary to re-evaluate the conclusions stated in this report. This report has been prepared in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made.

ATTACHMENTS

Subsurface Exploration Location Plan
Table 1 – Soil Sample Summary
Laboratory Analytical Results
Boring Logs

APPENDIX B
SOIL BORING LOGS AND SOIL SAMPLY SUMMARY
MONITORING WELL COMPLETION LOGS

FIELD TEST BORING LOG

SHEET 1 of 1

S E A CONSULTANTS, INC. Science / Engineering / Architecture 215 First Street Cambridge, MA 02142	**PROJECT:** Frost Street - Cambridge, MA **LOCATION:** 51 Prentiss Street **CLIENT:** City of Cambridge, MA **WEATHER:** 70's, Sunny	**BORING NO:** B-110 **PROJECT NO:** 2007108.10-A

Ground Elevation: Survey Expected
Date Started: 9/4/2008
Date Finished: 9/4/2008
Driller: Carr-Dee - Joe C.
Soil Engineer/Geologist: TP

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING AT	STABILIZATION TIME
9/4/08	10.0'	-	upon completion
-	-	-	-
-	-	-	-

Depth ft.	PID (ppm)	Sample No.	Pen/Rec (in/in)	Depth ft.	Blows/6 inches	Strata	Visual Identification of Soil and/or Rock Sample
0						CONC. 0.25'	3" Bituminous Concrete Overlay
0.5	0.0	S1	24/16	0.5' - 2.0'	32-23-11	FILL 3.0'	**S1: FILL-** Fine to coarse sand, little fine gravel. Trace non plastic fines, brown, medium dense, damp. **(SW)**
2.0	0.0	S2	24/8	2.0' - 3.0'	7-11		**S2: FILL-** Fine to coarse sand, little fine gravel. Trace non plastic fines, brown, medium dense, damp. **(SW)**
3.0	0.0	S2A	24/10	3.0' - 4.0'	17-16	SAND 14.0'	**S2A: SAND-** Medium to coarse sand, trace fine gravel, brown, m. dense, damp. **(SP)**
10	0.0	S3	24/20	10.0' - 12.0'	20-16-18-24		**S3: SAND-** Medium to coarse sand, trace fine gravel. Trace non plastic fines, brown, dense, wet. **(SP)**
15	0.0	S4	24/21	15' - 17'	4-13-16-16	SILTY SAND 19.0'	**S4: SILTY SAND-** Fine silty sand, some silt, trace coarse sand, brown, medium dense, saturated. **(SM)**
20	0.0	S5	24/14	20' - 22'	10-9-9-8	SILTY CLAY	**S5: SILTY CLAY-** Clay, and silt, moderately plastic, gray, very stiff, wet.**(CL-ML)**

Bottom of Boring at 22.0' BGS.

Notes: Groundwater encountered at 10.0' BGS.

D=Dry C=Cored W=Washed
HSA=Hollow Stem Auger
SS=Split Spoon V=Vane
BGS=Below Ground Surface
FJ=Flush Joint V=Vane
WOR=Weight of Rod
RQD=Rock Quality Designation

Trace	0 to 10 %
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

BLOWS/FT	DENSITY
0-4	V. LOOSE
4-10	LOOSE
10-30	M. DENSE
30-50	DENSE
>50	V. DENSE

BLOWS/FT	CONSISTENCY
<2	V. SOFT
2-4	SOFT
4-8	M. STIFF
8-15	STIFF
15-30	V. STIFF
>30	HARD

TYPE	HSA	SS	-
ID SIZE (IN)	2.25"	1.375"	-
HAMMER WT (LB)	-	140	-
HAMMER FALL (IN)	-	30"	-

FIELD TEST BORING LOG

SHEET 1 of 1

S E A CONSULTANTS, INC. Science / Engineering / Architecture 215 First Street Cambridge, MA 02142	**PROJECT:** Frost Street - Cambridge, MA **LOCATION:** 41 Prentiss Street **CLIENT:** City of Cambridge, MA **WEATHER:** 70's, Sunny	**BORING NO:** B-111 **PROJECT NO:** 2007108.10

Ground Elevation: Survey Expected
Date Started: 9/2/2008
Date Finished: 9/2/2008
Driller: Carr-Dee - Joe C.
Soil Engineer/Geologist: ML

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING AT	STABILIZATION TIME
9/2/08	10.0'	-	upon completion
-	-	-	-
-	-	-	-

Depth ft.	PID (ppm)	Sample No.	Pen/Rec (in/in)	Sample Depth ft.	Blows/6 inches	Strata	Visual Identification of Soil and/or Rock Sample
0						CONC. 0.25'	4" Bituminous Concrete Overlay
						GRAVEL 0.5'	2" stone gravel borrow (up to 3")
0.5	0.0	S1	18/12	0.5' - 2.0'	15-19-11	FILL	**S1: FILL-** Fine to medium sand and gravel, little fine gravel, little coarse sand, trace non plastic fines, medium brown, medium dense, damp. **(SP-GP)**
2	0.0	S2	6/6	2' - 2.5'	8	2.5'	**S2: FILL-** Same as S1, medium grey with pockets of black loamy soil. **(SP-GP)**
	0.0	S2A	18/8	2.5' - 4'	14-19-25	SAND	**S2A: SAND-** Fine to medium sand, trace fine gravel, little coarse sand, tan, dense, moist. **(SP)**
5	0.0	S3	24/13	5' - 7'	15-25-26-26	8.0'	**S3: SAND-** Fine to medium sand, little fine gravel, little coarse sand, trace non plastic fines, orange, damp, dense. Stratified colors of tan, orange, brown. **(SP)**
10	0.0	S4	24/24	10' - 12'	7-8-10-12	SILTY CLAY	**S4: SILTY CLAY-** Clay and silt, medium grey, very stiff, wet. **(CL-ML)**
15	0.0	S5	24/24	15' - 17'	6-8-10-8		**S4: SILTY CLAY-** Clay and silt, medium grey, very stiff, wet. **(CL-ML)**
20	0.0	S6	24/24	20' - 22'	8-6-6-8		**S4: SILTY CLAY-** Clay and silt, medium grey, stiff, wet. **(CL-ML)**

Bottom of boring at 22.0' BGS.

Notes: Groundwater encountered at 10.0' BGS.
In silty clay layer, stratas of blue grey silty fine sand were encountered.

ABBREVIATIONS USED	PROPORTIONS	GRANULAR SOILS		COHESIVE SOILS		EQUIPMENT USED	CASING	SAMPLER	CORE
D=Dry C=Cored W=Washed		BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY				
HSA=Hollow Stem Auger	Trace 0 to 10 %	0-4	V. LOOSE	<2	V. SOFT				
SS=Split Spoon V=Vane	Little 10 to 20%	4-10	LOOSE	2-4	SOFT	TYPE	HSA	SS	-
BGS=Below Ground Surface	Some 20 to 35%	10-30	M. DENSE	4-8	M. STIFF	ID SIZE (IN)	2.25"	1.375"	-
FJ=Flush Joint V=Vane	And 35 to 50%	30-50	DENSE	8-15	STIFF	HAMMER WT (LB)	-	140	-
WOR=Weight of Rod		>50	V. DENSE	15-30	V. STIFF	HAMMER FALL (IN)	-	30"	-
RQD=Rock Quality Designation				>30	HARD				

FIELD TEST BORING LOG

SHEET 1 of 1

S E A CONSULTANTS, INC. Science / Engineering / Architecture 215 First Street Cambridge, MA 02142	**PROJECT:** Frost Street - Cambridge, MA **LOCATION:** 24 Prentiss Street **CLIENT:** City of Cambridge, MA **WEATHER:** 70's, Sunny	**BORING NO:** B-112 (MW) **PROJECT NO:** 2007108.10

Ground Elevation: Survey Expected
Date Started: 9/2/2008
Date Finished: 9/2/2008
Driller: Carr-Dee - Joe C.
Soil Engineer/Geologist: ML

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING AT	STABILIZATION TIME
9/2/08	10.0'	15.0'	upon completion
9/30/08	6.90'	15.0'	28 DAYS
-	-	-	-

Depth ft.	PID (ppm)	Sample No.	Pen/Rec (in/in)	Sample Depth ft.	Blows/6 inches	Strata	Visual Identification of Soil and/or Rock Sample
0						CONC. 0.25'	3" Bituminous Concrete Overlay
0.5	0.0	S1	6/6	0.5' - 1.0'	8	FILL 1.0'	**S1: FILL-** fine to medium sand, trace fine gravel, little coarse sand, trace non plastic fines, medium brown, medium dense, damp. **(SP)**
	0.0	S1A	12/6	1' - 2'	10-18	SAND	**S1A: SAND-** Fine to medium sand, trace coarse sand, trace non plastic fines, tan orange, moist, medium dense. **(SP)**
5	0.0	S2	24/13	5' - 7'	9-16-18-21	10.0'	**S2: SAND-** Fine to medium sand, trace fine gravel, little coarse sand, trace non plastic fines, tan orange, moist, medium dense. **(SP)**
10	0.0	S3	24/24	10' - 12'	4-7-7-6	SILTY CLAY	**S3: SILTY CLAY-** Clay, some silt, moderately plastic, medium grey, stiff, wet. **(CL-ML)**
15	0.0	S4	24/24	15' - 17'	5-14-7-7	20.0'	**S4: SILTY CLAY-** Clay, some silt, moderately plastic, medium grey, very stiff, wet. **(CL-ML)**
20	0.0	S5	24/24	20' - 22'	8-11-11-12	CLAYEY SILT	**S5: CLAYEY SILT-** Silt, some clay, moderately plastic. **(ML-CL)**

Bottom of boring at 22.0' BGS.

Notes: Groundwater encountered at 10.0' BGS.
Monitoring Well set at 15' (10' screen; 5' riser).

ABBREVIATIONS USED	PROPORTIONS	GRANULAR SOILS		COHESIVE SOILS		EQUIPMENT USED	CASING	SAMPLER	CORE
D=Dry C=Cored W=Washed		BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY				
HSA=Hollow Stem Auger	Trace 0 to 10 %	0-4	V. LOOSE	<2	V. SOFT				
SS=Split Spoon V=Vane	Little 10 to 20%	4-10	LOOSE	2-4	SOFT	TYPE	HSA	SS	-
BGS=Below Ground Surface	Some 20 to 35%	10-30	M. DENSE	4-8	M. STIFF	ID SIZE (IN)	2.25"	1.375"	-
FJ=Flush Joint V=Vane	And 35 to 50%	30-50	DENSE	8-15	STIFF	HAMMER WT (LB)	-	140	-
WOR=Weight of Rod		>50	V. DENSE	15-30	V. STIFF	HAMMER FALL (IN)	-	30"	-
RQD=Rock Quality Designation				>30	HARD				

FIELD TEST BORING LOG

SHEET 1 of 1

S E A CONSULTANTS, INC. Science / Engineering / Architecture 215 First Street Cambridge, MA 02142	**PROJECT:** Frost Street - Cambridge, MA **LOCATION:** 12 Prentiss Street **CLIENT:** City of Cambridge, MA **WEATHER:** 70's, Sunny	**BORING NO:** B-113 **PROJECT NO:** 2007108.10

Ground Elevation: Survey Expected
Date Started: 9/3/2008
Date Finished: 9/3/2008
Driller: Carr-Dee - Joe C.
Soil Engineer/Geologist: ML

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING AT	STABILIZATION TIME
9/3/08	10.0'	-	upon completion
-	-	-	-
-	-	-	-

Depth ft.	PID (ppm)	Sample No.	Pen/Rec (in/in)	Sample Depth ft.	Blows/6 inches	Strata	Visual Identification of Soil and/or Rock Sample
						CONC. 0.25'	3" Bituminous Concrete Overlay
0.5	0.0	S1	18/12	0.5' - 2'	13-10-10	FILL 2.0'	**S1: FILL-** Misc. Fill, fine to medium sand, little fine gravel, little coarse sand, little slightly plastic fines, loamy, moist, medium dense. **(SP)**
5	0.0	S2	24/15	2' - 4'	13-9-13-13	SAND	**S2: SAND-** Fine to medium sand, some coarse sand, trace fine gravel, trace non plastic fines, tan, medium dense, moist. **(SP)**
10	0.0	S3	24/18	10' - 12'	13-18-20-20	14.0'	**S3: SAND-** Fine to medium sand, some coarse sand, trace fine gravel, trace non plastic fines, tan, medium dense, wet. **(SP)**
15	0.0	S4	24/20	15' - 17'	4-5-7-10	SILTY CLAY	**S4: SILTY CLAY-** Clay, and silt, moderately plastic, medium grey, stiff, wet. **(CL-ML)**
20	0.0	S5	24/24	20' - 22'	10-12-12-17		**S4: SILTY CLAY-** Clay, and silt, moderately plastic, medium grey, very stiff, wet. **(CL-ML)**

Bottom of boring at 22.0' BGS.

Notes: Groundwater encountered at 10.0' BGS.

ABBREVIATIONS USED	PROPORTIONS	GRANULAR SOILS		COHESIVE SOILS		EQUIPMENT USED	CASING	SAMPLER	CORE
D=Dry C=Cored W=Washed		BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY				
HSA=Hollow Stem Auger	Trace 0 to 10 %	0-4	V. LOOSE	<2	V. SOFT				
SS=Split Spoon V=Vane	Little 10 to 20%	4-10	LOOSE	2-4	SOFT	TYPE	HSA	SS	-
BGS=Below Ground Surface	Some 20 to 35%	10-30	M. DENSE	4-8	M. STIFF	ID SIZE (IN)	2.25"	1.375"	-
FJ=Flush Joint V=Vane	And 35 to 50%	30-50	DENSE	8-15	STIFF	HAMMER WT (LB)	-	140	-
WOR=Weight of Rod		>50	V. DENSE	15-30	V. STIFF	HAMMER FALL (IN)	-	30"	-
RQD=Rock Quality Designation				>30	HARD				

FIELD TEST BORING LOG

SHEET 1 of 1

S E A CONSULTANTS, INC. Science / Engineering / Architecture 215 First Street Cambridge, MA 02142	**PROJECT:** Frost Street - Cambridge, MA **LOCATION:** 1739 Massachusetts Ave. (on Prentiss Street) **CLIENT:** City of Cambridge, MA **WEATHER:** 70's, Sunny	**BORING NO:** B-114 (ENV) **PROJECT NO:** 2007108.10

Ground Elevation: Survey Expected
Date Started: 9/2/2008
Date Finished: 9/2/2008
Driller: Carr-Dee - Joe C.
Soil Engineer/Geologist: ML

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING AT	STABILIZATION TIME
9/2/08	10.5'	-	upon completion
-	-	-	-
-	-	-	-

Depth ft.	PID (ppm)	Sample No.	Pen/Rec (in/in)	Depth ft.	Blows/6 inches	Strata	Visual Identification of Soil and/or Rock Sample
0						CONC. 0.25'	3" Bituminous Concrete Overlay
0.5	0.0	S1	18/12	0.5' - 2'	33-15-11	FILL	**S1: FILL-** loamy fine to medium sand, little fine to coarse gravel, little slightly plastic fines, medium dense, dark brown to brown, moist. **(SP-GW)**
2	0.0	S2	24/15	2' - 4'	8-4-6-5	4.0'	**S1: FILL-** loamy fine to medium sand, little fine to coarse gravel, little slightly plastic fines, loose, brown to tan, moist. **(SP-GW)**
4	0.0	S3	24/15	4' - 6'	5-12-13-27	SAND	**S3: SAND-** Fine to medium sand, some coarse sand, trace fine gravel, trace non plastic fines, light brown tan, medium dense, moist. **(SP)**
10	0.0	S4	24/18	10' - 12'	10-17-27-28	14.5'	**S3: SAND-** Fine to medium sand, some coarse sand, trace fine gravel, trace non plastic fines, light brown tan, medium dense, wet. **(SP)**
15	0.0	S5	24/24	15' - 17'	8-8-12-9	CLAYEY SILT	**S5: CLAYEY SILT-** Silt, some clay, moderately plastic, medium grey, very stiff, wet. Strafications of 35 to 50% clay.**(ML-CL)**
20	0.0	S6	24/24	20' - 22'	9-16-20-21		**S5: CLAYEY SILT-** Silt, some clay, moderately plastic, medium grey, hard, wet. Strafications of 35 to 50% clay.**(ML-CL)**

Bottom of boring at 20.0' BGS.

Notes: Environmental samples taken from 0.5' to 4.0' BGS.
Groundwater encountered at 10.5' BGS.

ABBREVIATIONS USED	PROPORTIONS	GRANULAR SOILS		COHESIVE SOILS		EQUIPMENT USED	CASING	SAMPLER	CORE
D=Dry C=Cored W=Washed		BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY				
HSA=Hollow Stem Auger	Trace 0 to 10 %	0-4	V. LOOSE	<2	V. SOFT				
SS=Split Spoon V=Vane	Little 10 to 20%	4-10	LOOSE	2-4	SOFT	TYPE	HSA	SS	-
BGS=Below Ground Surface	Some 20 to 35%	10-30	M. DENSE	4-8	M. STIFF	ID SIZE (IN)	2.25"	1.375"	-
FJ=Flush Joint V=Vane	And 35 to 50%	30-50	DENSE	8-15	STIFF	HAMMER WT (LB)	-	140	-
WOR=Weight of Rod		>50	V. DENSE	15-30	V. STIFF	HAMMER FALL (IN)	-	30"	-
RQD=Rock Quality Designation				>30	HARD				

Table 1
Summary of Soil Analyses
Upper Oxford Sewer Separation
Cambridge, MA

LOCATION				B-101		B-114		B-105 (NEWPORT RD)		B-108 (FROST ST)	
SAMPLING DATE				9/3/2008		9/2/2008		9/8/2008		9/5/2008	
LAB SAMPLE ID				L0813119-01		L0813119-02		L0813327-01		L0813327-02	
	MA-Unlined Landfill Limits	RCS-1-08	Units		Qual		Qual		Qual		Qual
Ignitability				NI	NI	NI	NI	NI	NI	NI	NI
Specific Conductance	4000		umhos/cm	22		110		78		10	U
Solids, Total			%	88		88		83		94	
pH			SU	7.9		8.4		7.2		8.4	
Cyanide, Reactive			mg/kg	10	U	10	U	10	U	10	U
Sulfide, Reactive			mg/kg	10	U	10	U	10	U	10	U
Petroleum Hydrocarbon Quantitation by GC-FID											
TPH	2500	1000	mg/kg	2440		189	U	291		488	
Polychlorinated Biphenyls by MCP 8082											
All analyzed Aroclors		2	mg/kg	0.114	U	0.0379	U	0.0402	U	0.0355	U
Semivolatile Organics by MCP 8270C											
Fluoranthene		1000	mg/kg	52		1.9	U	7.2		2.4	
Benzo(a)anthracene		7	mg/kg	38	U	1.9	U	3.4		1.3	
Benzo(a)pyrene		2	mg/kg	38	U	1.9	U	3.5		1	
Benzo(b)fluoranthene		7	mg/kg	38	U	1.9	U	2.9		0.74	
Benzo(k)fluoranthene		70	mg/kg	38	U	1.9	U	3.1		0.88	
Chrysene		70	mg/kg	38	U	1.9	U	3.4		1.3	
Acenaphthylene		1	mg/kg	38	U	1.9	U	0.59		0.35	U
Anthracene		1000	mg/kg	38	U	1.9	U	1.2		0.48	
Benzo(ghi)perylene		1000	mg/kg	38	U	1.9	U	2.2		0.54	
Phenanthrene		10	mg/kg	58		1.9	U	3.3		1.2	
Dibenzo(a,h)anthracene		0.7	mg/kg	38	U	1.9	U	0.55		0.35	U
Indeno(1,2,3-cd)Pyrene		7	mg/kg	38	U	1.9	U	2		0.52	
Pyrene		1000	mg/kg	52		1.9	U	6.6		2.5	
Total SVOCs				162		ND		39.94		12.86	
Total Metals by MCP 6000/7000 series											
Arsenic, Total	40	20	mg/kg	5.7		6.5		4		6	
Barium, Total		1000	mg/kg	21		41		46		8.6	
Cadmium, Total	30	2	mg/kg	0.52	U	0.54	U	0.55	U	0.49	U
Chromium, Total	1000	30	mg/kg	14		12		18		22	
Lead, Total	1000	300	mg/kg	88		91		86		22	
Mercury, Total	10	20	mg/kg	0.3		0.11		0.31		0.08	U
Selenium, Total		400	mg/kg	2.6	U	2.7	U	2.8	U	2.4	U
Silver, Total		100	mg/kg	0.52	U	0.54	U	0.55	U	0.49	U
Volatile Organics by MCP 8260B/5035-Soil Analysis											
Naphthalene		4	mg/kg	1.2		0.44	U	0.58	U	0.56	U
Total VOCs	5			1.2		ND		ND		ND	

APPENDIX C
TREE ASSESSMENT REPORT

SUMMARY OF TREE ASSESSMENT
Frost Street Area Sewer Separation and Surface Improvements Project
2007108.10-A
March 25, 2009

		Existing Conditions			Design Requirements for Construction	
Location	Station	Tree Dia (IN)*	Species	Access (FT)**	Method	Comments
19 Prentiss St	1003+31 L16'	10.2	Honey Locus	2.50	Resize Tree Pit	
65 Frost St. (on Prentiss)	1003+82 L15'	14.6	Sugar Maple	3.00	Resize Tree Pit	
65 Frost St. (on Prentiss)	1004+17 L15'	16.6	Sugar Maple	2.50	Remove	Install Proposed Tree and Tree Pit
65 Frost St.	4001+13 R15'	13.1	Sugar Maple	3.50	Remove	Install Proposed Tree and Tree Pit
24 Prentiss St. (on Frost)	4001+51 L15'	17.2	Sugar Maple	3.50	Remove	Install Proposed Tree and Tree Pit
73 Frost St.	4001+81 R15'	10.2	Norway Maple	3.00	Resize Tree Pit	
80 Frost St.	4002+14 L15'	14.3	Norway Maple	3.50	Resize Tree Pit	
24 Prentiss St.	2000+47 R15	6.0	Serviceberry	4.50	Resize Tree Pit	
64 Frost St. (on Prentiss)	2000+59 L15	1.9		4.75	Resize Tree Pit	
Between 28 & 34 Prentiss St.	2001+21 R15'	14.0	Linden	3.50	Resize Tree Pit	
35 Prentiss St.	2001+30 L15'	17.5		2.50	Resize Tree Pit	
34 Prentiss St.	2001+59 R15'	16.2		3.50	Resize Tree Pit	
Between 37 & 41 Prentiss St.	2002+06 L15'				Install New Tree	Ornamental Tree -- Resident Approved
40 Prentiss St.	2002+10 R15'	34.1		2.50	Other Option	Do Not Remove Curb under tree -- Use Hand Tools
41 Prentiss St.	2002+38 L15'				Install New Tree	Ornamental Tree -- Resident Approved
47 Prentiss St.	2002+97 L15'	13.1		4.50	Resize Tree Pit	Use Hand Tools
121 Oxford St. (on Prentiss)	2003+63 R15'				Install New Tree	Ornamental Tree -- Resident Approved
123 Oxford St. (on Prentiss)	2003+71 L15'				Install New Tree	Ornamental Tree -- Resident Approved
121 Oxford St. (on Prentiss)	2003+89 R15'	8.6		4.00	Remove	Remove Tree and Tree Pit -- Too close to Stop Sign
124 Oxford St. (on Prentiss)	3000+43 L16'	N/A	Empty Tree Pit	N/A	Remove	Remove Tree Pit -- Too close to Stop Sign
124 Oxford St. (on Prentiss)	3000+67 L16'				Install New Tree	Ornamental Tree -- Resident Approved
124 Oxford St. (on Prentiss)	3001+09 L15'	19.1		3.50	Resize Tree Pit	
63 Prentiss St.	3001+42 L15'				Install New Tree	Ornamental Tree -- Resident Approved
63 Prentiss St.	3001+57 L15'				Install New Tree	Ornamental Tree -- Resident Approved
65 Prentiss St.	3001+85 L15'	12.4		4.00	Resize Tree Pit	
Between 65 & 73 Prentiss St.	3001+95 L15' 3001+96 L15"	12.7 12.7	River Birch	2.50	Resize Tree Pit	Do not Grind Roots Both limbs part of the same tree
77 Prentiss St.	3002+15 L15'	9.5		4.50	Remove	Install Proposed Tree and Tree Pit
23 Traymore St. (on Prentiss)	3002+52 L15'	8.0		3.50	Resize Tree Pit	
81 Prentiss St.	3002+58 L15'				Install New Tree	Ornamental Tree -- Resident Approved
85 Prentiss St.	3003+14 L15'				Install New Tree	Ornamental Tree -- Resident Approved

*Tree Dia - Diameter of tree measured by hand with a cloth tape at breast height (4-1/2 feet above ground on the uphill side of the tree).
**Access - Distance between the Back of the Sidewalk (BOS) and the Base of the Tree, measured by hand with a tape measure.