



# City of Cambridge

## PURCHASING DEPARTMENT

795 Massachusetts Ave. • Cambridge, Massachusetts 02139-3219

Amy L. Witts  
Purchasing Agent

**TO:** All Bidders

**FROM:** City of Cambridge

**DATE:** March 23, 2016

**RE:** File No. 7157 –Chapter 90 Contract 19 Central Square and Pearl Street  
Reconstruction- Addendum No. 1

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This addendum is comprised of:

1. Questions and Answers
2. Sign-in sheet and Agenda from pre-bid meeting
3. Revised Bid Package (attached)
4. Added Lead Service Locations to section 900 Item 347 (attached)
5. Revised Tree Specification 0910 (attached)

The following questions were asked and answered:

**Question:** Should there be a 2-foot sump in a doghouse Manhole?

**Answer:** There should be no sump in a doghouse manhole, standard construction practices for the manhole type should be used.

**Question:** Should we assume all pipes from CB's are Ductile Iron?

**Answer:** Contractor should assume a mixture of DI and PVC based on depths.

Please note the time correction to the questions deadline in the pre-bid meeting agenda. Questions are due by 4:00PM on Thursday March 24, 2016.

All other details remain the same.

Amy L. Witts  
Purchasing Agent

Addendum No. 1

Chapter 90 Contract 19

	Name	Company	Phone	E-mail
1.	CARL HOWARD	NEWPORT	(603) 765-2882	C.howard@newport.com
2.	BOB KOUCAFAS	NEWPORT	603 718-4775	B.KOUCAFAS@NEWPORTCONSTRUCT.COM
3.	BILL HAIGHT	NEWPORT	701.953.6421	W.haight@newportconstruct.com
4.				
5.				
6.				

**Chapter 90 CT 19**  
**Pre-Bid Agenda**  
**March 22, 2016**

1. Project Overview
  - a. Pearl Street-Granite Street to Mass. Ave. Grind and Overlay, sidewalks, curbing, drainage, possible full depth or pulverization.
  - b. Central Square various locations. Sidewalks curbing, asphalt patching.
2. Materials testing requirements in initial part of section 0900.
  - a. Submittals- off site materials require both environmental analysis and physical properties testing (every 400 cu yards)
  - b. Fill/backfill placement and compaction testing
3. Tree Protection and Maintenance and Trimming, Items 102.50 and 102.51 (new specification)
  - a. Up to \$500.00 fine per incident
  - b. Erect and maintain temporary fencing at all tree locations
  - c. Root pruning should be done only after a certified arborist is contacted
4. Soil Management, Items 125.10 through 126.99
  - a. All soil removed from project is paid for under these items.
  - b. Construction debris – excavation and disposal of concrete, asphalt, etc within the limits of the sidewalks is incidental to sidewalk construction. Reinforced roadway slab concrete excavation and disposal is paid for under items 127.1 and 121.3. Construction debris is not paid for under the Soil Items.
5. Supplemental Conditions
  - a. #4- Work hours are 7 am to 4 pm. No work on weekends and holidays except for emergencies and as noted in contract. Cambridge has 13 Holidays
  - b. **#5- Traffic Control- Please review traffic, bicycle and pedestrian management**
    - i. **New bicycle management specification, contractor should review**
  - c. #7- Construction Schedule & Project Sequence. Intent is to finish all work in area completely (other than surficial items such as street scape furnishings and plantings) before opening to the public.
  - d. Review Lead service locations
6. Review of Technical Specifications ( a few high lights)
  - a. Item 141.1 – Test Pits- Note 5<sup>th</sup> and 6<sup>th</sup> paragraphs. No separate payment for test pit where structure or utility pipe can be installed immediately or within one to two days with plating. Also note 6<sup>th</sup> paragraph regarding sketches, photos, etc.

\*Questions are due by 4:00PM on Thursday March 24, 2016

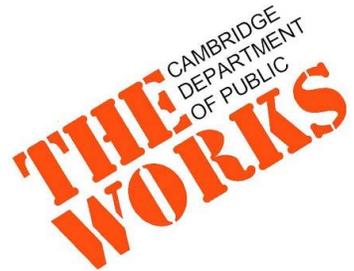
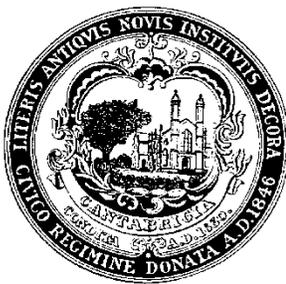
- b. Asphalt Items 420 to 472. All paving (except misc patching) requires 40 degrees + air temperatures and will be April 15<sup>th</sup> to - November 1<sup>st</sup> day time and May 1<sup>st</sup> to October 1<sup>st</sup> night time.
  - c. 701 Items- Concrete Sidewalks.
    - i. Sidewalk concrete may be placed April 1 through November 1 and with temperatures above 40 degrees.
    - ii. Proposed sidewalks that abut existing sidewalks shall extend 15' or to nearest ADA compliant panel.
    - iii. Double application of linseed oil, once after pour and 28 days later
7. Bid Opening at Purchasing Dept
- a. Thursday March 31, 2014 at 2:00 pm. ( Note: Bids must be received and placed in Purchasing Dept. lock box prior to 2:00 PM)
8. Bid Submittal Requirements
- a. See: "Required Bid Forms"
  - b. Contractors must fill in all blanks, including section 00312- Bidder's Qualifications. Attached sheets are not acceptable.
9. Questions
- a. Submit in writing by ~~5 pm~~ on Thursday, March 24, 2016
  - b. Address to: Amy Witts  
Purchasing Dept, Rm 303  
Cambridge City Hall  
795 Massachusetts Ave  
Cambridge, MA 02139  
Purchasing Dept Fax: 617-349-4008
10. Today's questions

\*Questions are due by 4:00PM on Thursday March 24, 2016

**File No 7157**

**Bid Set  
Addendum #1**

**CHAPTER 90 CONTRACT 19 CENTRAL SQUARE AND  
PEARL STREET RECONSTRUCTION**



**CITY OF CAMBRIDGE  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION  
MARCH 2016**

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**\*These forms must be submitted with the bid.**

File No. 7157

## INVITATION TO BID

The City of Cambridge, Massachusetts, the Awarding Authority, invites sealed bids for the project:

### **CHAPTER 90 CONTRACT 19 CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

#### **Add Alternate #1-PEARL STREET FULL DEPTH RECONSTRUCTION**

Nature and scope of work: **ROADWAY AND SIDEWALK RECONSTRUCTION, WATER AND DRAINAGE CONSTRUCTION, LANDSCAPE AND URBAN DESIGN IMPROVEMENTS. THIS CONTRACT WILL BE FOR 24 MONTHS..**

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

The estimated project value is: **\$4,000,000.00**

**Bidders must be pre-qualified by the Massachusetts Department of Transportation, Room 6260, 10 Park Plaza, Boston, MA. Only bids from bidders on the approved MASSDOT bidders list will be opened and considered for the contract.**

Specifications will be available from **8:30 a.m. to 8:00 p.m. on Monday, 8:30 a.m. to 5:00 p.m. Tuesday through Thursday, and 8:30 a.m. to Noon on Friday**, at the Purchasing Department, City Hall, 795 Massachusetts Avenue, Room 303, Cambridge, MA 02139 beginning **THURSDAY, March 10, 2016**, upon deposit of \$100.00 for each set in the form of a check made payable to the City of Cambridge. **The deposit will be refunded after the return of the documents in good condition with and no later than the time period set forth in the Instruction to Bidders, whether or not a bid was submitted.**

**All questions must be submitted no later than Thursday March 24, 2016 by 4:00 p.m. An Addendum will be issued to notify all bidders of the questions and answers.**

The contract documents may be examined at the Office of the Purchasing Agent, room 303, City Hall, 795 Massachusetts Avenue, Cambridge, MA 02139.

Sealed general bids will be received at the Purchasing Department, City Hall, 795 Massachusetts Avenue, Room 303, Cambridge, MA 02139 until **Thursday March 31, 2016 at 2:00 PM** at which time all general bids will be publicly opened and read aloud.

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 general bidder will be required to furnish a Performance Bond, a Labor and Material (Payment) bond each for 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 bids if it is in the public interest

to do so.

No less than the prevailing 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. Minority Business Enterprise Program;
2. Cambridge Employment Plan: minority/women/resident-hiring ordinance.
3. Cambridge Responsible Employer Plan
4. Living Wage Ordinance.
5. OSHA Certification
6. CORI City Policy

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

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

Date: **March 22, 2016**

Time: **10:00 AM**

Place: **Public Works Department Conference Room  
147 Hampshire Street  
Cambridge, MA 02139**

Amy L. Witts  
Purchasing Agent

**FILE NO. 7157**

**FORM FOR GENERAL BID**

**To the Awarding Authority:**

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

**CHAPTER 90 CONTRACT 19 CENTRAL SQUARE AND PEARL STREET  
RECONSTRUCTION**

**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. BID SUBMISSION REQUIREMENTS**

C. This bid includes addenda numbered \_\_\_\_\_

D. There is 1 Bid Alternate. The contract will be awarded to the responsible and eligible bidder submitting the lowest Base Bid or to the responsible and eligible bidder submitting the lowest Base Bid plus Bid Alternate#1. This decision will be made at the sole discretion of the City of Cambridge.

The proposed contract price for the **BASE BID**

is \_\_\_\_\_ DOLLARS  
(Amount in Words)

(\$ \_\_\_\_\_)  
(Amount in Figures)

The proposed contract price for the **BID ALTERNATE #1**

is \_\_\_\_\_ DOLLARS  
(Amount in Words)

(\$ \_\_\_\_\_)  
(Amount in Figures)

E. The subdivision of the proposed contract price is as follows: (All quantities are approximate)

**Items 125.10 through 126.99 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 inputted**

**value. Insertion of 0 is allowable. In that case, the final unit cost will be the minimum unit cost.**

- F. The undersigned agrees if selected as General Contractor, within seven 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 as **Additional Insured**, complying with the Insurance requirements set forth herein in the General Terms and Conditions of the contract, Article 8.

The City of Cambridge further requires that the General Contractor furnish the City with a copy of all insurance policies prior to or with the delivery of its signed Contract to the City.

- 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. Total bid 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 specific action contained in the Cambridge Employment Plan, the Supplemental Equal Employment Opportunity Program and the Americans with Disabilities Act. The contractor receiving the award of the contract shall be required to obtain from each of its subcontractors and submit to the contracting or administering agency prior to the performance of any work under said contract a certification by said subcontractor, regardless of tier, that it will comply with same.
- 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.
- 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.
- L. 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\_\_\_\_\_

\_\_\_\_\_  
(Name of General Bidder)

By\_\_\_\_\_  
(Name of Person Signing Bid and Title)

\_\_\_\_\_  
(Print Name of Person Signing Bid and Title)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_  
(City and State)

\_\_\_\_\_  
(Contact Phone Number)

\_\_\_\_\_  
(Contact Email)

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
102.5	127	Tree Protection and Maintenance, at _____ _____ Per Each				
102.51	127	Tree Trimming, at _____ _____ Per Each				
120.1	1850	Unclassified Excavation, at _____ _____ Per Cubic Yard				
125.1	1	Soil and Waste Management, at Five Thousand and 00/100+ _____ = _____ Dollars (\$5,000+ _____ ) = \$ _____ . Lump Sum				
125.2	20	Handling Asbestos Contaminated Soil / Fill, at Fifty and 00/100+ _____ = _____ Dollars (\$50+ _____ ) = \$ _____ . Per Cubic Yard				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
125.4	1700	Reuse Excavated Material On-site as Backfill, at  Five and 00/100+ _____ =  _____ Dollars  (\$5+ _____ ) = \$ _____ . Per Cubic Yard				
126.1	3000	Disposal of Soil - Background Soils (Class A-1), at  Five and 00/100+ _____ =  _____ Dollars  (\$5+ _____ ) = \$ _____ . Per Ton				
126.2	50	Disposal of Soil - Impacted <RCS-1 (Class A-2), at  Ten and 00/100+ _____ =  _____ Dollars  (\$10+ _____ ) = \$ _____ . Per Ton				
126.3	50	Disposal of Soil - Daily Cover Unlined Landfill (Class B-1), at  Ten and 00/100+ _____ =  _____ Dollars  (\$10+ _____ ) = \$ _____ . Per Ton				
126.4	50	Disposal of Soil - Daily Cover Lined Landfill (Class B-2), at  Twenty and 00/100+ _____ =  _____ Dollars  (\$20+ _____ ) = \$ _____ . Per Ton				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
126.5	50	Disposal of Soil - Non-Hazardous Solid Waste (Class B-3, B-4, B-5 and B-6), at  <u>Twenty and 00/100+ _____ =</u> _____ Dollars  <u>(\$20+ _____) = \$ _____.</u> Per Ton				
126.9	400	Disposal of Soil - RCRA Hazardous Waste (Class C-1 and C-2), at  <u>Eighty and 00/100+ _____ =</u> _____ Dollars  <u>(\$80+ _____) = \$ _____.</u> Per Ton				
126.99	50	Disposal of Asbestos Waste, at  <u>Thirty and 00/100+ _____ =</u> _____ Dollars  <u>(\$30+ _____) = \$ _____.</u> Per Ton				
129	16000	Pavement Milling, at  _____ _____ Per Square Yard				
129.5	5200	Pavement Reclamation/Pulverizing  _____ _____ Per Square Yard				
141.1	700	Test Pits for Exploration, at  _____ _____ Per Cubic Yard				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
142	365	Class B Trench Excavation, at _____ _____ Per Cubic Yard				
144	10	Class B Rock Excavation, at _____ _____ Per Cubic Yard				
145	5	Drainage Structure Abandoned _____ _____ Per Cubic Yard				
146	15	Drainage Structure Removed _____ _____ Per Cubic Yard				
151	4000	Gravel Borrow, at _____ _____ Per Cubic Yard				
152	1000	Processed Gravel, at _____ _____ Per Cubic Yard				
153	50	Controlled Density Fill- Excavatable, at _____ _____ Per Cubic Yard				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
156	2000	Crushed Stone, at _____ _____ Per Ton				
170	6100	Fine Grading and Compacting, at _____ _____ Per Square Yard				
201.51	1	Catch Basin Type 1 - 4 Foot Sump, at _____ _____ Per Each				
201.52	30	Catch Basin Type 1 - 6 Foot Sump, at _____ _____ Per Each				
201.53	3	Catch Basin Type 5 - Direct Inlet, at _____ _____ Per Each				
201.54	20	Leaching Catch Basin Type 1 - 6 Foot Sump, at _____ _____ Per Each				
202.01	5	Drain Manhole - Type 1, at _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
202.02	19	Drain Manhole Type 2 - 4-Foot Sump, at  _____ _____ Per Each				
220.1	104	Sanitary or Drainage Structure Adjusted, at  _____ _____ Per Each				
220.11	11	Sanitary or Drainage Structure Remodeled, at  _____ _____ Per Each				
220.3	2	Drainage Structure Change in Type, at  _____ _____ Per Each				
221	23	Frame and Cover, at  _____ _____ Per Each				
222.1	52	Frame and Grate, at  _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
225.52	52	Catch Basin Trap, at _____ _____ Per Each				
234.06	30	6 Inch Drainage Pipe - PVC, at _____ _____ Per Foot				
234.10	200	10 Inch Drainage Pipe - PVC, at _____ _____ Per Foot				
234.12	500	12 Inch Drainage Pipe - PVC, at _____ _____ Per Foot				
236.18	50	18 Re-enforced Conc. Pipe - RCP, at _____ _____ Per Foot				
236.24	50	24 Re-enforced Conc. Pipe - RCP, at _____ _____ Per Foot				
303.06	80	6 Inch Ductile Iron Water Pipe (Res. Jt.), at _____ _____ Per Foot				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
303.08	40	8 Inch Ductile Iron Water Pipe, at _____ _____ Per Foot				
303.10	200	10 Ductile Iron Pipe - DI, at _____ _____ Per Foot				
303.12	500	12 Ductile Iron Pipe - DI, at _____ _____ Per Foot				
347.1	150	1 Inch Copper Tubing Type K, at _____ _____ Per Foot				
347.12	150	1-1/4 Inch Copper Tubing Type K, at _____ _____ Per Foot				
347.15	150	1-1/2 Inch Copper Tubing Type K, at _____ _____ Per Foot				
357	46	Water Gate Box Replaced, at _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
358	208	Water Gate Box Adjusted, at  _____ _____ Per Each				
358.01	45	Water Gate Box Adjusted with Adapter, at  _____ _____ Per Each				
363.1	8	1 Inch Corporation Cock, at  _____ _____ Per Each				
363.12	8	1-1/4 Inch Corporation Cock, at  _____ _____ Per Each				
363.15	20	1-1/2 Inch Corporation Cock, at  _____ _____ Per Each				
370.6	3	6 x 6 Inch Tapping Sleeve, 6 inch Valve and Box, at  _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
370.8	3	8 x 6 Inch Tapping Sleeve, 6 inch Valve and Box, at  _____ _____ Per Each				
376	6	Hydrant, at  _____ _____ Per Each				
376.5	12	Hydrant Adjusted, at  _____ _____ Per Each				
420	500	Hot Mix Asphalt Base Course, at  _____ _____ Per Ton				
431	25	High Early Strength Cement Concrete Base Course, at  _____ _____ Per Square Yard				
460	2500	Hot Mix Asphalt, at  _____ _____ Per Ton				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
464.5	5100	Hot Poured Rubberized Asphalt Sealer, at  _____ _____ Per Foot				
472	1100	Hot Mix Asphalt for Miscellaneous Work, at  _____ _____ Per Ton				
472.5	600	Hot Mix Asphalt for Patching, at  _____ _____ Per Ton				
482.3	10750	Sawing Asphalt Pavement, at  _____ _____ Per Foot				
504	2310	Granite Curb Type VA4 - Straight, at  _____ _____ Per Foot				
504.1	250	Granite Curb Type VA4 - Curved, at  _____ _____ Per Foot				
509	170	Granite Transition Curb for Pedestrian Ramps - Straight, at  _____ _____ Per Foot				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
509.1	150	Granite Transition Curb for Pedestrian Ramps - Curved, at  _____ _____ Per Foot				
516	2	Granite Curb Corner - Type A, at  _____ _____ Per Each				
580	10100	Curb Removed and Reset, at  _____ _____ Per Foot				
594	950	Curb Removed and Discarded, at  _____ _____ Per Foot				
701	5300	4" Cement Concrete Sidewalk, at  _____ _____ Per Square Yard				
701.1	1025	6" Cement Concrete Sidewalk(Driveways and Intersections), at  _____ _____ Per Square Yard				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
701.2	1670	6" Cement Concrete Pedestrian Ramp, at  _____ _____ Per Square Yard				
701.28	180	Detectable Tile - Cast Iron, at  _____ _____ Per Square Yard				
702	40	Hot Mix Asphalt Walk Surface  _____ _____ Per Ton				
706.01	2350	Brick Walk on 4" HMA base, at  _____ _____ Per Square Yard				
706.05	200	Brick Walk on 6" HMA Base, at  _____ _____ Per Square Yard				
707.9	30	Bicycle Ring and Post, at  _____ _____ Per Each				
707.11	5	Trash/recycle Combination Compactor, at  _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
715.1	11	Mail Box Removed and Reset, at  _____ _____ Per Each				
748	1	Mobilization, at (not to exceed 10% of bid)  _____ _____ Lump Sum				
751	185	Loam Borrow, at  _____ _____ Per Cubic Yard				
765	1250	Seeding, at  _____ _____ Per Square Yard				
775	25	Street Tree (2½" - 3" Caliper), at  _____ _____ Per Each				
804.11	20	Electrical Conduit (double) Concrete Encased  _____ _____ Linear Foot				
811.11	1	Electric Handhole  _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
811.37	10	Electric Handhole, Adjusted _____ _____ Per Each				
813.1	25	Wire-No. 10 _____ _____ Linear Foot				
813.71	1	Ground Rod 8 FT Long _____ _____ Per Each				
823.7	12	Lighting Pole and Luminaire Removed and Reset _____ _____ Per Each				
832.1	26	Warning-Regulatory and Route Marker Alum. Panel Type _____ _____ Square Foot				
850	1	Traffic and Pedestrian Management (not to exceed 10% of bid) _____ _____ Per Each				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
864.04	50	Pavement Arrows and Legends - Refl. White (Thermoplastic), at  _____ _____ Per Square Foot				
865.1	6720	Cross Walks and Stop Lines Refl. White (Thermoplastic), at  _____ _____ Per Square Foot				
866.24	120	24 Inch Reflectorized White Line (Thermoplastic), at  _____ _____ Per Foot				
867.06	100	6 Inch Reflectorized Yellow Line (Thermoplastic), at  _____ _____ Per Foot				
877	250	Sign and Post, at  _____ _____ Per Each				
902.1	50	Structural Planting Meduim  _____ _____ Cubic Yards				
902.2	50	Planting Soil  _____ _____ Cubic Yard				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
902.3	50	Mulch _____ Cubic Yard				
995	1	Public Restroom _____ Lump Sum				
997	10	Bicycle Racks Removed and Replaced _____ Lump Sum				
998	1	Erosion and Sediment Control, at _____ Lump Sum				
999	1	Construction Staking, at (not to exceed 10% of bid) _____ Lump Sum				

Grand Total Amount of Bid:

\_\_\_\_\_ \$ \_\_\_\_\_  
 (Amount In Words) (Amount In Figures)

**ADD ALT #1 PEARL STREET FULL DEPTH RECONSTRUCTION**

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
125.1	1	Soil and Waste Management, at <u>Five Thousand and 00/100+ =</u> _____ Dollars <u>(\$5,000+ ) = \$ .</u> Lump Sum				
151	5300	Gravel Borrow, at _____ _____ Per Cubic Yard				
170	5200	Fine Grading and Compacting, at _____ _____ Per Square Yard				
420	5300	Hot Mix Asphalt Base Course, at _____ _____ Per Ton				
460	2100	Hot Mix Asphalt, at _____ _____ Per Ton				
464.5	5100	Hot Poured Rubberized Asphalt Sealer, at _____ _____ Per Foot				

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		AMOUNT	
			Dollars	Cents	Dollars	Cents
850	1	Traffic and Pedestrian Management (not to exceed 10% of bid)  _____ _____ Per Each				
998	1	Erosion and Sediment Control, at  _____ _____ Lump Sum				
999	1	Construction Staking, at (not to exceed 10% of bid)  _____ _____ Lump Sum				

Grand Total Amount of Add Alternate No 1 Bid:

\_\_\_\_\_ (Amount In Words)

\$ \_\_\_\_\_ (Amount In Figures)

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.

The condition of the above obligation is such that the Principal has submitted to the City of Cambridge, Massachusetts, a certain Bid attached hereto and hereby made a part hereof for the Project described as **CHAPTER 90 CONTRACT 19 CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

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 them.

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 set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and have caused this bond to be signed by their proper officers on this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

CONTRACTOR AS PRINCIPAL

SURETY

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
Name and Title:

\_\_\_\_\_  
Name and Title:

SEAL

SEAL

## 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 Supplier Diversity Office (SDO), Certified Minority/Women Business Directory. Only MBE firms approved by SDO 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 SDO 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 SDO-approved firms in the trades or materials categories you should include in your bid, you have not been able to secure 10% Minority business participation, then complete and submit with your bid MBE FORM#3 - CONTRACTOR REQUEST FOR EXTENSION and MBE FORM #4 - INFORMATION ON UNSUCCESSFUL MBE CONTRACT.
6. If you have any questions about the above steps, please call Duane Brown, Minority Business Compliance Officer, at 349-4331.

**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 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 previously given by SDO. 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 sub contract 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 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. Prime Contractor shall have the right to request suspension of any sanctions imposed by the City upon showing that it is once again in compliance with the MBE Requirements.

**CONTRACTOR CERTIFICATION OF COMPLIANCE**  
**Minority Business Enterprise Requirements**

**FORM**  
**1**  
**M.B.E.**

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Name & Address of Participating Minority Bus. Enterprises	Name of Participant	Dollar Value of Participation
--	---------------------	-------------------------------

1.

2.

3.

4.

5.

6.

7. GRAND TOTAL FOR MINORITY BUSINESS COMMITMENT \$ \_\_\_\_\_

8. PERCENTAGE MBE PARTICIPATION (Line 7 Divided by tot. 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  
LETTER OF INTENT TO PARTICIPATE  
Minority Business Enterprise Requirements**

2  
**M.B.E.**

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 Supplier Diversity Office (SDO), as a Minority Business Enterprise and is listed as such in the most recently issued SDO 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 SDO. I further certify that my company will give immediate notification in writing to both SDO 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*	QUANTIT Y	UNIT PRICE	AMOUNT

TOTAL AMOUNT\$ \_\_\_\_\_

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

\_\_\_\_\_  
Date

\_\_\_\_\_  
General Contractor

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_  
Business Address

**FORM  
CONTRACTOR REQUEST FOR EXTENSION  
Minority Business Enterprise Requirements**

3  
**M.B.E.**

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 **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 SDO MINORITY/WOMEN BUSINESS DIRECTORY supplied by the City of Cambridge Purchasing Department with the Bidding Documents; that said contracts 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. _____  | 11. _____ |
| 2. _____  | 12. _____ |
| 3. _____  | 13. _____ |
| 4. _____  | 14. _____ |
| 5. _____  | 15. _____ |
| 6. _____  | 16. _____ |
| 7. _____  | 17. _____ |
| 8. _____  | 18. _____ |
| 9. _____  | 19. _____ |
| 10. _____ | 20. _____ |

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 and opportunity to secure the required percentage of Minority Business participation.

\_\_\_\_\_  
Date

\_\_\_\_\_  
General Contractor

\_\_\_\_\_  
Authorized Signature

\_\_\_\_\_

\_\_\_\_\_  
Business Address

**INFORMATION ON UNSUCCESSFUL MBE CONTACT**  
**Minority Business Enterprise Requirements**

**FORM**

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

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

ITEM NO. 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 COMPANY 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

## NOTARIZED 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, and 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 **Sidewalk Repair and Pedestrian Ramp construction** business under your present firm or trade name?

\_\_\_\_\_

\_\_\_\_\_

5. How many years have you been engaged in the **Drainage Construction** business under your present firm or trade name?

\_\_\_\_\_

\_\_\_\_\_

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

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

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

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

9A Qualification Requirement for Reconstruction of Roadways and Sidewalks:

Within the last 10 years, the Bidder must have successfully completed at least 3 projects involving, as a minimum, the reconstruction of municipal roadways and Architectural Access Board compliant sidewalks, traffic signals, street lighting, line striping, surface improvements and landscaping. The dollar value of each project must have been at least 2 million dollars. Provide the following details:

Project #9A-1:

Project Name: \_\_\_\_\_

Start Date: \_\_\_\_\_ Completion date: \_\_\_\_\_

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

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Name of Owner's Representative (for Reference): \_\_\_\_\_

Owner's Representative's Current Telephone #: \_\_\_\_\_

Dollar Value of Contract: \_\_\_\_\_

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

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

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Project #9A-2:

Project Name: \_\_\_\_\_

Start Date: \_\_\_\_\_ Completion date: \_\_\_\_\_

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

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Name of Owner's Representative (for Reference): \_\_\_\_\_

Owner's Representative's Current Telephone #: \_\_\_\_\_

Dollar Value of Contract: \_\_\_\_\_

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

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

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Project #9A-3:

Project Name: \_\_\_\_\_

Start Date: \_\_\_\_\_ Completion date: \_\_\_\_\_

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

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Name of Owner's Representative (for Reference): \_\_\_\_\_

Owner's Representative's Current Telephone #: \_\_\_\_\_

Dollar Value of Contract: \_\_\_\_\_

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

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

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

Project #10-1:

Project Name: \_\_\_\_\_

Start Date: \_\_\_\_\_ Completion date: \_\_\_\_\_

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

---

Name of Owner's Representative (for Reference): \_\_\_\_\_

Owner's Representative's Current Telephone #: \_\_\_\_\_

Dollar Value of Contract: \_\_\_\_\_

Was work being performed as contractor or sub-contractor?: \_\_\_\_\_

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

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11. List all projects for which your organization has received a Notice of Intent to Award or a Notice to Proceed and that your organization expects to perform during Years 2016-2018. Rank the list according to decreasing dollar value of work to be done in Years 2016-2018. On the following "TABLE OF PROJECTED WORK LOAD", indicate the first 10 projects from that list and provide information on the name of the project, the type of project, owner of project, dollar value of work, and the estimated completion date. Under Project No. 11 in the following TABLE, indicate the number of projects and the sum of the dollar value of work that you expect to perform in Years 2016-2018 for all the remaining projects in the list.

BIDDER PROJECTED WORK LOAD

Project #	Name and Type of Project	Project Owner	Dollar Value of Work to be completed in 2014-2016	Estimated Project Completion Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11	Total Remaining Projects:		Total Value of Remaining Projects:	

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

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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.).

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13. 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

---

---

14. Federal Identification Number and Dun and Bradstreet Number

---

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

Name \_\_\_\_\_

Signature \_\_\_\_\_

Title \_\_\_\_\_

16. 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 \_\_\_\_\_)

County of \_\_\_\_\_)

as:

\_\_\_\_\_, 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\_\_\_\_

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**

\_\_\_\_\_ certifies that:  
(General Contractor)

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: \_\_\_\_\_



**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 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 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**

**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 and 11I for each apprenticeship 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

**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 apprenticeship 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 SUB-BIDS OVER \$25,000 INCLUDING ALL ALTERNATES, IF ANY.

RETURN THIS FORM WITH YOUR BID

## 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.**

**Americans With Disabilities Act (42 U.S.C. 12131)  
Section 504 of the Rehabilitation Act of 1973  
Tax Compliance/Anti-Collusion Statement  
Debarment Statement**

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 Contractor 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 Contractor's services, the individual with the disability must meet the essential eligibility requirements for receipt of the Contractor's services or participation in the Contractor's programs or activities with or without: 1) reasonable modifications to the Contractor's rules, policies and practices; 2) removal of architectural, communication, or transportation barriers; or, 3) provisions of auxiliary aids and services.

By submitting its contract, the Contractor 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 Contractor is receiving federal funds.

The undersigned certifies under penalties of perjury that this contract 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 Contractor has complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

The undersigned certifies that it is not currently subject to any State or Federal debarment order.

Date: \_\_\_\_\_

\_\_\_\_\_  
(Print Name of person signing bid)

\_\_\_\_\_  
(Signature & Title)

**This form must be submitted with your bid**

SECTION 00325

MASSACHUSETTS DIESEL RETROFIT PROGRAM STATEMENT OF INTENT TO COMPLY

The Department of Environmental Protection has developed the Massachusetts Diesel Retrofit Program (MDRP) in response to increasing health concerns with the emissions from diesels engines and vehicles. To control these emissions, the MADRP has identified oxidation catalyst retrofits as the control technology of choice. These retrofits consist of either an in-line replacement engine muffler system or an add-on control device. Compliance with the MDRP is technology based, such that installation of an EPA-certified (or equivalent) control device will constitute full compliance.

Statement of Intent to Comply

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

Local Governmental Unit : City of Cambridge Public Works

SRF Project No. :

Contract No. :

Contract Title : CHAPTER 90 CONTRACT 19 CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION

Bidder : \_\_\_\_\_

**The undersigned, on behalf of the above-named Bidder, agrees that, if awarded the contract, the Bidder will comply with the Massachusetts Diesel Retrofit Program (MDRP) by having all of the off-road (non-registered) diesel vehicles/equipment used on the Contract equipped with, or retrofitted with, after-engine emission controls that are EPA certified or equivalent.**

Signed under penalties of perjury.

\_\_\_\_\_  
Signature of authorized representative of contractor

\_\_\_\_\_  
Print name of authorized representative of contractor

\_\_\_\_\_  
Date

**TECHNICAL SPECIFICATIONS**  
**CHAPTER 90 ROADWAY AND SIDEWALK RECONSTRUCTION**  
**CONTRACT NO. 19**

**NOTE:** WHERE REFERENCE IS MADE BELOW TO THE “STANDARD SPECIFICATIONS”, THIS SHALL BE CONSTRUED TO MEAN THE LATEST EDITION, INCLUDING STANDARD SPECIAL PROVISIONS AND SUPPLEMENTAL SPECIFICATIONS, OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES (English Units Version).

CONSTRUCTION DETAILS REFERRED TO HEREIN SHALL BE CONSTRUED TO MEAN THE CAMBRIDGE DEPARTMENT OF PUBLIC WORKS STANDARD SPECIFICATIONS FOR STREET EXCAVATIONS AND CONSTRUCTION, PORTIONS OF WHICH HAVE BEEN INCLUDED HEREIN. THE REMAINDER IS AVAILABLE AT [www.cambridgema.gov/TheWorks](http://www.cambridgema.gov/TheWorks). IF CITY DETAIL IS NOT AVAILABLE, THE USE OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION DETAILS SHALL BE ACCEPTABLE WITH ENGINEER CONSENT.

ALL ITEMS SHALL CONFORM TO THE BUY AMERICAN GUIDANCE IN 2 CFR PART 176 SECTIONS 140 AND 160.

**PROJECT SPECIFIC EXCAVATION, SOIL BACKFILLS AND OFF SITE BORROW/FILL TESTING REQUIREMENTS**

**(GENERAL REQUIREMENTS – NO SEPARATE PAYMENT)**

Contractor shall make the following submittals and perform the following testing program on all onsite soils to be reused as backfill and on all off site borrow soils and material placed on the project. The cost of all submittals and testing stated below shall be incidental to the work and paid for by the Contractor.

A. Submittals:

1. Independent Laboratory and Testing Company. Submit 4 weeks prior to start of excavation, evidence that the Laboratory/testing company is:
  - a. accredited by the American Associates of the State Highway and Transportation Officials (AASHTO)
  - b. Has minimum 3 years experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.
  - c. Able to provide 3 references from previous work.
2. Submit to the City and the Engineer grain size analysis curve (ASTM D422) and compaction test results (ASTM D1557) for each proposed source of backfill including suitable on-site soil to be reused as backfill, for review two weeks prior to use of the material. Grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
3. Contractor shall submit to the City, a 10 lb representative sample of from each source of borrow material intended to be used, a minimum 7 days prior to delivery. Any material delivered to the site that is not consistent with the sample provided may be rejected, at no cost to the City.
4. Contaminant analysis for offsite borrow materials used. Each material imported shall be accompanied by a certification statement and analytical results. At a minimum, the certification

shall state that 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 samples shall be analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA method 418.1), and Total PCB's and pesticides (EPA Method 8081 and 8082). On site soils designated as suitable for reuse can be reused as backfill without providing certification required above.

5. Contractor shall, in coordination with Soil Management Plan, submit to the Engineer and the City an Excavation, Backfilling, and Filling Plan at least 2 weeks prior to earth moving activities. The review will be only for the information of the City for an overall understanding of the project sequence and site utilization. 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. Number and location of crews and equipment and manpower to be deployed
  - d. Traffic, bicycle and pedestrian management
  - e. Proposed location of stockpiles
  - f. Proposed locations and sequence of test pitting for soil testing and utility installations prior to the start of water pipe, drain, sewer and utility installations.
  - g. Maintenance and continued operation of existing infrastructure.

#### B. On-site Reuse/Borrow/Fill Testing Requirements

1. Contractor to perform at his cost, particle size and gradation analyses and compactibility testing in accordance with ASTM D422 and D1557, respectively, minimum one per source and one for **every additional 400 cubic yards of soil/borrow material to be reused/placed**. All results to be forwarded to the City and Engineer for review prior to commencing use.
2. Contractor to perform at his cost, in-place field testing for density and moisture content in accordance with ASTM D1156, D2167 or D2922 and ASTM D3017, D4944 or D4949, respectively. City or Engineer shall have access to results during measurements. All results to be submitted to the City and/or Engineer. Minimum test frequency shall be as follows, and no less than one test per lift or as requested by the Engineer and/or City:
  - a. Trenches under structures, utilities, roadways, driveways, sidewalks, and bike lanes: Every 100 lin. Ft per lift.
  - b. Trenches not under structures, roads, etc, such as landscape areas: Every 150 lin. Ft per lift.
  - c. Paved roadways or general areas backfilled: Every 1000 sq. ft. per lift
  - d. Under and around structures: Every 500 sq. ft. per lift.

#### C. Fill/Backfill Placement and Compaction

1. All materials shall be placed in layers not to exceed 8 inches, as placed, and compacted with suitable vibratory compaction equipment to at least 95 percent of the maximum dry density as determined by ASTM D1557. Lift thickness shall be reduced to 4 inches in confined areas only accessible by hand guided compaction equipment.

**ITEM 102.5****TREE PROTECTION AND MAINTENANCE****EACH****DESCRIPTION**

The work to be done under this Item consists of instituting and maintaining positive measures to protect and maintain public and private shade trees within and adjacent to the limits of work.

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.

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.***

**CONSTRUCTION METHODS**

Tree protection and maintenance measures shall include the following:

1. 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.
2. 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.
3. 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

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00900-03

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.

4. Traffic control plans shall be designed in such a way as to direct traffic away from tree trunks and branches.
5. 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.
6. Following construction, existing trees within the project area shall be mulched in accordance with the requirements for new trees, as specified in Section 910.
7. All tree protection and maintenance measures and operations shall be subject to review, approval or change by the City Tree Warden.

### COMPENSATION

Tree protection will be measured by the unit each, for each tree provided with protective measures as specified herein.

Payment for work under this items will be at the contract unit price per each and shall include full compensation for all labor, materials, disposal, equipment, tools, and any other incidentals necessary for the satisfactory completion of this work as specified, including furnishing, installing, maintaining, and removing drip line or tree pit fencing, tree wrap, and covering exposed roots with moist burlap, mulch, or soil.

### **ITEM 102.51 TREE TRIMMING**

#### **GENERAL:**

The work performed under this Item shall conform to the relevant provisions of Section 100 of the Standard Specifications and the following:

#### **Scope of Work**

The work shall consist of the provision of all labor, materials, equipment, and transportation required to complete the pruning of City street trees, in strict accordance with the conditions and specifications of these Contract Documents. The work shall include, but is not necessarily limited to the following:

- Initial site visit and assessment with City representatives
- Securing necessary permits and approvals before commencement of work
- Posting work areas for parking restrictions
- Securing police details, if necessary
- Marking work zones for traffic and pedestrian control
- Providing a schedule of work for City review and approval
- Meeting with City staff on a periodic basis
- Visual assessment of each tree to be pruned
- Determination of pruning objectives
- Pruning cuts
- Wound care

### **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

- Wood waste and debris consolidation & disposal
- Site cleanup

### **Equipment**

The following equipment and vehicles shall be considered a minimum requirement in order to be considered a responsible bidder under the terms and conditions of these Contract Documents. All gas- powered equipment and vehicles must be five years old or less.

- Two (2) aerial lift trucks with an articulating boom that have a working height of not less than sixty (60) feet. with Contractor’s name painted on each side
- Two (2) chipper dump trucks with a minimum capacity of nine (9) cubic yards, with Contractor’s name painted on each side
- Two (2) wood chippers with a capacity for 16” diameter limbs
- All relevant traffic control devices as prescribed by the Manual of Uniform Traffic Control Devices (MUTCD) of the U.S. Department of Transportation

### **Safety Standards**

- Tree pruning shall be performed only by certified arborists or arborist trainees who, through related training or on-the-job experience, or both, are familiar with the practices and hazards of arboriculture and the equipment used in such operations.
- One certified arborist (as defined in the section labeled “Quality Requirements,” and as identified in the “Statement of Bidder’s Qualifications” of these Contract Documents) must be present at all times as the on-site project manager while tree pruning is performed:
- Tree pruning operations shall comply with the American National Standard for Tree Care Operations— Safety Requirements (ANSI Z133.1), as approved by the American National Standards Institute, and published by the National Arborists Association. Operations shall also comply with applicable Occupational Health and Safety Administration (OSHA) standards.

### **Pruning Objectives**

The pruning operation shall focus on the following types of pruning:

- **Cleaning.** Cleaning shall consist of selective pruning to remove one or more of the following parts— dead, diseased, and/or broken branches. All deadwood that is two (2) inches or greater in diameter shall be removed. Branches with splits, large cavities or any defect that may result in failure shall be reduced, or removed to the trunk if reduction is not feasible.
- **Thinning.** Thinning shall consist of selective pruning to reduce density of live branches. Thinning shall result in an even distribution of branches on individual limbs and throughout the crown.
- **Raising.** Raising shall consist of selective pruning to provide vertical clearance. All branches extending lower than fifteen (15) feet above a public roadway and ten (10) feet above a public sidewalk shall be removed.
- **Reducing.** Reduction shall consist of selective pruning to decrease height and/or spread. Consideration shall be given to the ability of a tree species to tolerate this type of pruning. All branches obstructing park signs, street signs, traffic signs, traffic lights, and park or street lighting shall be removed. Branches shall

be pruned away from all houses and buildings a minimum of five (5) feet, or more if appropriate to the tree shape and structure.

- **Specialty (Young Trees).** For young yet established trees, branches that are rubbing or poorly attached shall be removed. A central leader or leaders as appropriate to the species should be developed. A strong, properly spaced scaffold branch structure should be selected. For newly planted trees, pruning shall be limited to cleaning.

### **Pruning Practices**

- A certified arborist (the on-site project manager) shall visually inspect each tree before commencing work.
- If a condition is observed requiring attention beyond the original scope of work, the condition should be reported to the City within 24 hours. Such conditions may include structural weakness, rot or decay that cannot be corrected by cleaning, and dead trees.
- Equipment and work practices that damage living tissue and bark beyond the scope of work shall be avoided. Climbing spurs shall not be used when climbing and pruning trees.
- Pruning tools (e.g. chain saws, pole saws, hand saws, pole pruners, etc.) shall be sharp and regularly sharpened and maintained throughout the Contract Term.
- Not more than 25% of the foliage of an individual tree should be removed within an annual growing season. The percentage and distribution of foliage to be removed shall vary according to the tree species, age, health and site, in accordance with the types of pruning identified above.
- Not more than 25% of the foliage of a branch or limb shall be removed when it is cut back to a lateral. The lateral shall be large enough to assume apical dominance.
- Heading shall be permitted only by the expressed permission of the City, when needed to reach a defined objective.
- Topping and lion tailing shall be considered unacceptable pruning practices.
- All pruning cuts shall be made in accordance with the American National Standard for Tree Care Operations—Standard Practices (ANSI A300 Part 1), as approved by the American National Standards Institute, and published by the National Arborists Association (revised 2001). All terminology included in these Technical Specifications shall be defined by ANSI A300 Part 1.
- When tracing wounds, only loose, damaged tissue should be removed. No other wound treatments shall be used.

### **Wood Waste & Debris Consolidation/Site Cleanup**

- Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree, or to surrounding people and property. Where necessary, ropes or other equipment shall be used to lower large branches to the ground.

### **Wood Waste & Debris Consolidation/Site Cleanup (cont.)**



The Contractor shall perform work in such a manner to minimize dust and utilize dust control techniques when necessary or as directed by the Engineer.

At the discretion of the Engineer, de-watering (pumping) may be required during trench excavation and the prosecution of the work. If such is the case, the Contractor shall obtain a dewatering permit from the City, United States EPA, or Massachusetts Water Resources Authority, as required, and water shall be discharged to a location accepted in advance by the Engineer.

All trench excavations shall strictly adhere to the latest OSHA requirements. Temporary trench support, in compliance with OSHA, required to excavate to a depth to prosecute the work shall along with the proper support of all existing utilities be the responsibility of the Contractor.

## COMPENSATION

Unclassified Excavation will be measured for payment as specified in Section 120 of the Standard Specifications and the following:

Payment for work under this item will be at the contract unit price per cubic yard and shall include full compensation for saw-cutting, labor, materials, equipment, tools, disposal of construction debris (concrete, brick, asphalt, etc.) dust control and any other incidentals necessary for the satisfactory completion of this work as specified.

Payment for removal and disposal of streetcar track shall be made as follows:

1. If rails and ties exist, payment for removal of rails and ties and disposal of rails shall be made at one and one-half (1-1/2) times the contract unit price bid per cubic yard for Item 120.1. Measurement for depth shall be from the top of rail to bottom of tie, and width shall be to the outside limits of the tie. Length shall be along the centerline of the track.
2. If only ties exist, payment for removal shall be made at one and one-quarter (1-1/4) times the contract unit price bid per cubic yard for Item 120.1. Measurement for depth shall be from top of tie to bottom of tie, and width shall be to the outside limits of the tie. Length shall be along the centerline of the track. Disposal of RR ties will be paid for separately.

NOTES ON EXCLUSIONS: Disposal of excavated soil is not included for payment under this item and shall be paid for separately. Excavation which is specified as incidental to other items, including sidewalks other than porous asphalt sidewalks, ramps, and utility systems, will not be paid for under Item 120.1. **Excavation of existing pavements of all types (brick, asphalt, concrete) will not be paid for separately. Disposal of Railroad ties will be paid for separately under 129.6.**

## NOTE FOR ITEMS 125.1 THROUGH 126.99

A minimum unit bid cost has been established for the unit price bid items 125.1 through 126.11. The Contractor is directed to review the minimum unit bid prices and increase them within the FORMS FOR GENERAL BID as the Contractor sees fit. The Contractor is not obligated to accept the minimum unit prices indicated but shall not reduce them. The minimum unit prices established may be below actual market costs and are provided to avoid unbalanced bidding. The Contractor is directed to review the minimum unit prices presented and develop competitive unit prices for inclusion in the FORMS FOR GENERAL BID. Any bids received which do not

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present unit prices entered by the Contractor within the FORMS OF GENERAL BID or present unit prices below the minimum unit prices established, shall be rejected as non- responsive.

<b>125.1</b>	<b>SOIL AND WASTE MANAGEMENT</b>	<b>LUMP SUM</b>
<b>125.2</b>	<b>HANDLING ASBESTOS CONTAMINATED SOIL/FILL</b>	<b>CUBIC YARD</b>
<b>125.4</b>	<b>REUSE EXCAVATED MATERIAL ON-SITE AS BACKFILL</b>	<b>CUBIC YARD</b>

DESCRIPTION

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 excavated materials, as approved by the Engineer, prior to using imported fill in order to reduce the volume of material to be disposed off-site provided the material is geotechnically suitable as backfill and does not result in spreading contamination to other areas or other soil/fill strata.

Excavated soil/fill, which is displaced by design features, (e.g. pipe and manholes), may be used as backfill elsewhere on the project provided the soil/fill is geotechnically suitable and does not result in spreading contamination or degrading the environmental quality at the location of reuse. Imported backfill shall be used only as accepted by the Engineer.

B. 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's selected disposal facility's acceptance criteria.

C. Unless specifically stated otherwise, terms used in this specification are as defined in the MCP, 310 CMR 40.0006.

D. Any soils which contain exhibit 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*. Soil/fill which is staged and characterized can be reused within the *area of excavation* or elsewhere on site provided the material has equal or less contamination than the point where it is to be reused.

E. 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.DS

F. Notification Procedures:

In the event of an emergency, the Contractor shall contact the following entities at the earliest possible opportunity:

- a. City's designated representatives.
- b. City of Cambridge DPW
- c. City of Cambridge Fire Department
- d. Engineer
- e. MassDEP

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 an emergency.

G. The Contractor shall provide the following at least two weeks prior to mobilizing onto the site:

1. Soil and Waste Management Plan (SWMP):  
The SWMP shall outline measures for sampling, analysis, disposal, and shall identify a waste staging area in the event that soil is stockpiled for subsequent reuse and/or disposal or unknown materials are encountered. The SWMP shall outline procedures for securing the staging area, controlling dust and soil / fill migration, appropriate covering of stockpiles to ensure adequate wind protection and keeping the soil dry.

The Contractor is advised that no City-owned or controlled areas are available to serve as waste staging areas for this Project. The Contractor's procedures shall be described in the Soil and Waste Management Plan.

2. Health and Safety Plan (HASP):  
The Health and Safety Plan shall outline measures for encountering oil and hazardous material (OHM), including exposure monitoring, prevention methods, and emergency response procedures.
3. 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 City or Engineer and/or their representative.
4. Spill and Discharge 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.
5. 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.

## COMPENSATION

### Item 125.1 - Soil and Waste Management

#### Method of Measurement

The costs associated with excavating, handling, testing and characterizing soil and waste other than allowed for in subsequent payment items shall be incorporated into the Contractor's lump sum bid price for Item 125.1.

## **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Payment for Soil and Waste Management will be based on the lump sum price bid for this item in the proposal. Measurement for payment will be based on the percentage of project completion based on elapsed time compared to the contractual construction time limit.

#### 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. Under the lump sum price for this item, the Contractor shall furnish all labor, materials, tools, equipment and incidentals required for Soil and Waste Management. This work includes, but is not limited to; soil / fill sampling, analytical services, transport to staging

area, testing, establishment and maintenance of appropriate staging area, development and implementation of all submittals and plans specified herein.

No payments shall be made during extended work shutdowns. An example of this would be winter shut down.

#### Exclusions

The following items are not included for payment under this item; transportation and disposal of soil and fill material; reuse of soil and fill material on site as backfill; handling asbestos contaminated material; sedimentation and erosion control for other uses besides soil management (at the staging area); all work associated with a staging area for other uses beyond soil and waste management.

### **Item 125.2 - 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. Under the cubic yard price for this item, 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 Cambridge City 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; handling asbestos contaminated pipe and structures; and all work associated with a staging area for other uses beyond asbestos contaminated material staging.

### **Item 125.4 - Reuse Excavated Material On-site as Backfill**

Method of Measurement

Measurement for payment for Reuse Excavated Material On-Site as Backfill shall be on the basis of actual cubic yards of soil/fill reused on-site as backfill, as measured and determined by the Engineer, to a maximum volume calculated based on the pay limits of the excavation as indicated elsewhere in the Construction Documents.

For record keeping purposes soil/fill that is reused on-site as backfill, shall be transported to and from the staging area under a Material Shipping Record.

Material reused as backfill outside of the pay limits indicated elsewhere in the Construction Documents shall be done at the Contractor’s expense, at no additional cost to the City.

It is the intent of this item to compensate the Contractor for material which is temporarily removed from the area of excavation and staged pending reuse. If the material is immediately reused at the area of excavation or elsewhere on site, no payment will be made. This cost shall be included in the Contractor’s Bid Prices for other relevant items of work.

Basis of Payment / Inclusions

Payment for Reuse Excavated Material On-site as Backfill shall be based on the cubic yard price complete for this item in the proposal. Under the cubic yard price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for Reusing Excavated Material On-site as Backfill. The work includes, but is not limited to: Handle, load, and transport to and from the soil/fill staging area excavated materials which are determined to be geotechnically suitable for reuse as backfill on site and consistent with surrounding conditions at the point of reuse.

Exclusions

The following items are not included for payment under this item: excavation; all work associated with a staging area; analytical testing of the material; placing the material as backfill; and compaction and compaction testing.

**ITEM 126.1      DISPOSAL OF SOIL – BACKGROUND SOILS (CLASS A-1)      TON**

DESCRIPTION

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

- a. ubiquitous and consistently present in the environment at and in the vicinity of the disposal site of concern; and attributable to geologic or ecologic conditions, or atmospheric deposition of industrial process or engine emissions;
- b. attributable to coal ash or wood ash associated with fill material;
- c. releases to groundwater from a public water supply system;
- d. 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.

For record keeping purposes soil/fill that meet the definition of background, shall be transported under a Material Shipping Record.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**







Probable Class B-3 through B-6 Material: Soil/Fill suspected of having high levels of contamination (i.e., equal to or greater than the applicable reportable concentration but suitable for disposal at a licensed non-hazardous solid waste facility). Soil with jar headspace results greater than 100 ppm or soil containing significant visual (i.e. >10% foreign material by volume) or strong olfactory evidence of contaminants. This material is to be sampled separately due to the potential of exceeding DEP's guidelines for reuse as daily cover at a landfill and requiring either recycling at an asphalt batch plant or as solid waste at an appropriately permitted disposal facility. The analytical results shall determine the final reuse/disposal option.

#### COMPENSATION

##### Method of Measurement

Measurement for Payment for Disposal of Soil – Non-Hazardous 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 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 and not specifically directed by the Engineer shall be done at the Contractor's expense, at no additional cost to the City.

##### Basis of Payment / Inclusions

The work includes, but is not limited to; handle, load, transport, and recycle or dispose soil/fill at an appropriately permitted, solid waste facility, all contaminated soil/fill, which is not hazardous waste but is unsuitable for other non-hazardous recycling and disposal options (Class B-1 or B-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 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.

<b>ITEM 126.9</b>	<b>DISPOSAL OF SOIL – RCRA HAZARDOUS WASTE (CLASS C-1 AND C-2)</b>	<b>TON</b>
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#### DESCRIPTION

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.

#### COMPENSATION

##### Method of Measurement

#### **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**



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.

<b>ITEM 129</b>	<b>PAVEMENT MILLING</b>	<b>SQUARE YARD</b>
<b>ITEM 129.5</b>	<b>PAVEMENT RECLAMATION OR PULVERIZING</b>	<b>SQAURE YARD</b>
<u>DESCRIPTION</u>		

Work to be done under this item shall conform to the relevant provisions of Section 120 of the Standard Specifications, and in particular Section 120.66, and the following:

This work consists of removing asphalt pavement to varied depths by milling machine in designated areas. Prior to milling, the Contractor shall discuss the proposed final grades and drainage concerns with the Engineer. It shall be the Contractor's responsibility to perform milling in such a manner as to restore the proper roadway grades and insure proper drainage.

CONSTRUCTION METHODS

Where grades provided on the drawings indicate that proposed grade is to be raised above existing, milling depth and overlay thickness shall be adjusted as directed by the Engineer. Where grades provided on the drawings indicate that proposed grade is to be lowered below existing grade, the Contractor shall excavate test pits or pavement cores to verify whether there is sufficient thickness of existing pavement to support a milling and overlay operation. This requirement for test pits/cores may be modified if other work of this Contract (such as water or drainage installation) is judged by the Engineer to provide similar information on pavement thickness.

The milling machine shall be equipped with an elevating device capable of loading milled material directly into dump trucks while operative. It shall have all necessary safety devices such as reflectors, headlights, taillights, flashing lights, and back up signals so as to operate safely in traffic both day and/or night.

The milling machine shall be designed and built for milling flexible pavements and possess the ability to mill cement concrete patches when encountered in asphalt pavement. It shall be self-propelled and have the means for milling without tearing or gouging the underlying surface. Variable lacing patterns shall be provided to permit a rough grooved or smooth surface as directed.

A three-inch cut to predetermined grade, or any specified lesser depth, shall be required to be made in a single pass. As directed by the Engineer, the Contractor shall mill areas which were insufficiently milled during the first pass at no additional cost to the City.

Cuts deeper than 3-inches shall be made in two passes. As directed by the Engineer, the Contractor shall mill areas which were insufficiently milled during the two passes at no additional cost to the City.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

The minimum width of pavement milled in each pass shall be six feet, except in areas to be trimmed and edged. The machine shall be adjustable as to crown and depth and meet the standards set by the Air Quality Act for noise and air pollution.

The milled surface shall conform generally to the grade and cross slope required. 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. The surface texture shall be as specified by the Engineer and excess material shall be removed so that the surface is acceptable to traffic if required.

The Contractor shall perform work in such a manner to minimize dust and utilize dust control techniques when necessary or as directed by the Engineer.

The City reserves the option to direct the Contractor to truck the milled material to another site in the City for use as base material.

The existing roadway shall be scarified and mixed with equal amount of gravel base existing in the roadway foundation. Pulverization will be means of travelling pulvi-miller or equivalent machine capable of ripping through existing asphalt at depths of 12-inches with one pass. The machine shall be self-propelled and be equipped with an adjustable grade blade, thus leaving its path generally smooth of traffic equipment. Road planers or cold milling machines, which are designed to mill or shred the existing hot mix asphalt pavement rather than crush or fracture it are no considered capable of achieving specification gradation. The required and necessary scraping action of milling will increase the percentage of fine aggregates. Existing hot mix asphalt 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.

**See Section “Supplemental Conditions” for requirements related to marking raised castings.**

### COMPENSATION

Pavement milling and pulverization will be measured for payment as specified in Section 120 of the Standard Specifications.

Payment for work under this item will be at the contract unit price per square yard or cubic yard and shall include full compensation for labor, equipment, tools, disposal of all materials, dust control, raising and lowering of structures and any other incidentals necessary for the satisfactory completion of this work as specified.

### **ITEM 141.1**

### **TEST PITS FOR EXPLORATION**

### **CUBIC YARD**

Work to be done under this item shall conform to the relevant provisions of Section 140 of the Standard Specifications and to the following:

The work of this item consists of the excavation and backfill of test pits to establish the location of existing underground utilities, or any other structures for which the exact location is required, as directed by the Engineer or as requested by the Contractor and approved by the Engineer.

### **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**



**ITEM 144**

**CLASS B ROCK EXCAVATION**

**CUBIC YARD**

Work to be done under these items shall conform to the relevant provisions of Section 140 of the Standard Specifications and to the following:

Class B Trench Excavation shall include removal of all materials, except Class B Rock Excavation, encountered in the construction of drainage pipe greater than 5-foot depth and encountered in the construction of water pipe greater than the 6-foot depth.

Technical requirements for excavation specified under Item 120.1 shall also apply as appropriate.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for trench excavation shall also be paid for under this item.

COMPENSATION

Class B Trench and Class B Rock Excavation will be measured for payment as specified in Section 140 of the Standard Specifications, and the following:

Class B Trench Excavation shall only apply to trench depths (measured from original ground to undisturbed subgrade) greater than 5 feet for drainage pipe, and greater than 6 feet for water pipe. Excavation to depths less than the above shall be included in the appropriate drainage pipe or water item.

Payment for Items 142 and 144 will be at the price bid per cubic yard complete, which price shall constitute full compensation for all labor, equipment, tools, supplies and other work necessary to complete the satisfactory excavation, backfill, removal of all materials encountered and disposal of construction debris (asphalt, concrete, bricks, etc.).

Notes on Exclusions: Disposal of excavated soil is not included for payment under this item and shall be paid for separately. **Excavation of existing pavements of all types (brick, asphalt, concrete)** will not be paid for separately.

**ITEM 145**

**DRAINAGE STRUCTURE ABANDONED**

**EACH**

**ITEM 146**

**DRAINAGE STRUCTURE REMOVED**

**EACH**

Work to be done under these items shall conform to the relevant provisions of Section 140 of the Standard Specifications and to the following:

The work of item 145 also includes the removal of the frame and grate or cover, the top 5feet of structure, the plugging of laterals and backfilling with CDF or stone.

The work of Item 146 also includes the removal of existing catch basins which have been indicated on the plans to be converted into sump manholes if the Engineer determines that an adequate sump does not exist, or if the structure is otherwise deficient. In such cases, the existing outlet pipe shall be reused or removed, and a sump manhole, to be paid for under the appropriate item, shall then be constructed.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

## COMPENSATION

Payment for Item 145 will be at the contract unit price for each and shall include full compensation for labor, excavation, steel plating, protection of existing utilities and repair of those damaged during construction, tree protection, materials, installation, lateral plugs; and any other incidentals necessary for the satisfactory completion of this work as specified.

Payment for Item 146 shall include plugging and protecting the existing outlet pipes during removal and replacement of the structures and pipes and disposal of construction debris (concrete, bricks, asphalt, structures, etc.).

Notes on Exclusions: Disposal of excavated soil is not included for payment under this item and shall be paid for separately. Payment for HMA and CDF shall be paid separately.

**ITEM 151**  
**ITEM 152**

**GRAVEL BORROW**  
**PROCESSED GRAVEL**

**CUBIC YARD**  
**CUBIC YARD**

Work to be done under this item shall conform to the relevant provisions of Section 401 of the Standard Specifications and to the following:

This work shall consist of furnishing, placing, fine grading, and compacting Gravel Borrow for utility trench backfill; roadway subbase; for sidewalk base and subbase; for subsoil in proposed planting areas where pavement or other unsuitable materials have been removed; and as shown on the Drawings and details and as directed by the Engineer.

## MATERIALS

The Gravel Borrow shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials, and shall conform to Standard Specifications M1.03.0., Type b.

Processed Gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials, and shall conform to Standard Specifications M1.03.1. No bricks allowed within the Processed Gravel.

## CONSTRUCTION METHODS

The gravel shall be compacted to 95% of the maximum dry density at optimum moisture content as determined by the AASHTO Standard Method of Test T99 Method C; except where used as subsoil for lawn areas, where compaction shall be to 88%-90% .

The Contractor shall perform work in such a manner to minimize dust and utilize dust control techniques when necessary or as directed by the Engineer.

## COMPENSATION

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

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Payment for work under this item will be at the contract unit price per cubic yard and shall include full compensation for material in-place and any incidentals necessary for the satisfactory completion of this work as specified.

**ITEM 170                                      FINE GRADING AND COMPACTING                                      SQUARE YARD**

Work to be done under this item shall conform to the relevant provisions of Section 170 of the Standard Specifications and to the following:

COMPENSATION

Grading and compaction of the subgrade will be measured for payment as specified in Section 170 of the Standard Specifications.

Payment for work under this item will be at the contract unit price per square yard and will be as specified in Section 170 of the Standard Specifications, and in accordance with the following:

This item will be measured for payment only when associated with full-depth roadway construction. Grading and compaction for sidewalk areas and all other purposes will be included in the payment for the relevant item.

<b>ITEM 201.51</b>	<b>CATCH BASIN TYPE 1 - 4-FOOT SUMP</b>	<b>EACH</b>
<b>ITEM 201.52</b>	<b>CATCH BASIN TYPE 1 - 6-FOOT SUMP</b>	<b>EACH</b>
<b>ITEM 201.53</b>	<b>CATCH BASIN TYPE 5 – DIRECT INLET</b>	<b>EACH</b>
<b>ITEM 201.54</b>	<b>LEACHING CATCHBASIN TYPE 1 – 6-FOOT SUMP</b>	<b>EACH</b>
<b>ITEM 202.01</b>	<b>DRAIN MANHOLE TYPE 1</b>	<b>EACH</b>
<b>ITEM 202.02</b>	<b>DRAIN MANHOLE TYPE 2 – 4-FOOT SUMP</b>	<b>EACH</b>

Work to be done under these items shall conform to the relevant provisions of Section 201 of the Standard Specifications and to the following:

MATERIALS

Catch Basins:

Precast concrete catch basins shall be designed for a minimum of H-20 loading, and shall conform to the dimensions shown on the Drawings and in the Construction Details. Catch basin sump depth shall be between 4 and 6 feet as directed by the Engineer, with an outlet opening of 12 inches. Catch basins shall conform to ASTM C478 and shall be constructed with bell and spigot or tongue and groove joints.

Gaskets for sealing joints shall be C-S 146 ready-to-apply butyl joint sealant in rope form or approved equivalent product. The sealant shall have an approximate cross section of 3/8 inch by 3-1/2 inch for single strip application or 3/8 inch by 3/8 inch square or 1/2-inch diameter cord for multiple cord usage application. Use six cords minimum for multiple cord applications.

No more than two lift holes will be cast or drilled in each section. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar.

All catch basins shall be provided with cast iron traps (paid for under Item 225.52.)

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

## Manholes:

Precast concrete manhole sections shall conform to ASTM C478, and shall be constructed with bell and spigot or tongue and groove joints. Where manholes are to be placed on existing pipelines, 4,000 PSI cast-in-place bases shall be constructed. Drain manholes shall have inverts and benches constructed of either concrete fill or brick as shown on the Drawings.

Gaskets for sealing joints shall be C-S 146 ready-to-apply butyl joint sealant in rope form or approved equivalent product. The sealant shall have an approximate cross section of 3/8 inch by 3-1/2 inch for single strip application or 3/8 inch by 3/8 inch square or 1/2-inch diameter cord for multiple cord usage application. Use six cords minimum for multiple cord applications.

No more than two lift holes will be cast or drilled in each section. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar.

Pipe connections into pre-cast sections shall be made with manhole seals that are cast-in at time of manufacture. Seals shall be Interpace "New-Lok Joint Flexible Sleeve"; L&L "A-Lok Manhole Sleeve"; Pre-Seal Basket Corp. "Press-Wedge II"; or approved equivalent product.

Connections to existing pipe in cast-in-place sections shall be sealed with "Kor N Seal" boot, or approved equivalent product.

Existing and proposed sump manholes which are connected to Type 5 (Direct Inlet) catch basins shall be equipped with cast iron traps (paid for under Item 225.52).

## CONSTRUCTION METHODS

### Catch Basins and Manholes

The Contractor shall excavate to the elevation of the bottom of the structure (see Items 120.1 and 142 for technical requirements). The subgrade material shall be compacted prior to installation of the structure. If the subgrade material is unsuitable, it shall be replaced, as directed by the Engineer, with 3/8" crushed stone (M2.01.6) and paid for under Item 156.

After installation of the structure, the Contractor shall backfill with suitable material up to an elevation which allows for placement of concrete collar and final pavement, as shown on the drawings.

A minimum of 3 courses of bricks (12" height maximum) shall be installed for purposes of future adjustment between the pre-cast top and the frame and grate and cover of all structures.

Hot mix asphalt patching shall be performed as specified under Item 472.

Castings shall be set, as directed by the Engineer, so that final grade of the manhole cover or catch basin grate is flush with the top course of asphalt pavement. Material around the structure shall be compacted and high early strength concrete collars shall be placed around the castings to an elevation which allows for placement of final asphalt pavement as shown on the drawings.

High early strength concrete shall be 3,500 PSI at 28 day test, ¾” aggregate, 5% air entrained, and have a maximum 4" slump. Concrete collars shall be of the dimensions shown on the Drawings.

Should the Engineer determine that the castings cannot be set to final grade upon installation, they shall then be set to the required temporary grade, without the concrete collar.

Final adjustment to grade, including installation of concrete collar, shall then be performed and paid for under Item 220 or Item 220.5.

Leakage Testing of Manholes

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, or 90 seconds for 4 or 5 foot manholes from 15 to 25 feet deep. A volume equivalent shall be calculated for larger diameter manholes to determine the testing length based on these parameters.

COMPENSATION

Drainage structures will be measured for payment as specified in Section 201 of the Standard Specifications, except “standard unit” depth of catch basins with 6-foot sump will be 10.5 feet; and “standard unit” depth of catch basins with 4-foot sump will be 8.5 feet; and “standard unit” depth of sump manholes shall be 11 feet.

Payment for these items will be at the contract unit price for each and shall include full compensation for excavation, steel plating, protection of existing utilities and repair of those damaged during construction, tree protection, materials, installation, concrete collar, break-in to existing pipe; and any other incidentals necessary for the satisfactory completion of this work as specified. Where structures are constructed over existing pipes, payment shall also include cast-in-place base, and by-pass pumping as needed. For drainage manholes, payment shall also include leakage testing.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for installation of drainage structures is included under this item.

The frame and grate and cover will be paid for under Item 221 or Item 222.1 as applicable. Catch basin trap will be paid for under Item 225.52. The 12" PVC connection from the catch basin to the storm drain will be paid for under Item 234.12. Hot mix asphalt for patching will be paid for under Item 472.

Notes on Exclusions: Disposal of excavated soil is not included for payment under this item and shall be paid for separately.

<b>ITEM 220.1</b>	<b>SANITARY OR DRAINAGE STRUCTURE ADJUSTED</b>	<b>EACH</b>
<b>ITEM 220.11</b>	<b>SANITARY OR DRAINAGE STRUCTURE REMODELED</b>	<b>EACH</b>

Work to be done under this item shall conform to the relevant provisions of Sections 201 and 220 of the Standard Specifications and to the following:

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

## CONSTRUCTION METHODS

Castings shall be set, as directed by the Engineer, so that final grade of the manhole cover or catch basin grate is flush with the final course of asphalt pavement. Material around the structure shall be compacted and high early strength concrete collars shall be placed around the castings to an elevation which allows for placement of final asphalt pavement as shown on the drawings. High early strength concrete shall be 3,500 PSI at 28 day test, 3/4 aggregate, 5% air entrained, and have a maximum 4" slump.

Existing frames and grates/covers that are deemed unfit by the Engineer for continued use shall be replaced by the Contractor and paid for under Item 221 or 222.1.

For catch basins and sump manholes, the Contractor shall verify whether the structure has a trap in good working order, and if not, shall furnish and install a new trap.

The Contractor shall be held responsible for the protection of the castings. Any frames, grates, or covers damaged or lost in any manner during the progress of the construction shall be replaced with new castings as specified in Items 221 and 222.1 at the Contractor's expense.

**See Section 825 "Supplemental Conditions" for requirements related to marking raised utility castings.**

## COMPENSATION

Adjustment and remodeling of sanitary or drainage structures will be measured for payment as specified in Section 220 of the Standard Specifications.

Payment for these items will be at the contract unit price for each and shall include full compensation for excavation, compaction, disposal of construction debris (concrete, asphalt, bricks, etc.), high early strength concrete, rodent control and any other incidentals necessary for the satisfactory completion of this work as specified.

New traps, if required, will be paid for under Item 225.52.

<b>ITEM 220.3</b>	<b>DRAINAGE STRUCTURE CHANGE IN TYPE</b>	<b>EACH</b>
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Work to be done under this item shall conform to the relevant provisions of Sections 201 and 220 of the Standard Specifications and to the following:

Where indicated on the Drawings and as directed by the Engineer, existing catch basins shall be converted to sump manholes.

## CONSTRUCTION METHODS

The Contractor shall completely remove the existing frame and grate in accordance with the requirements of the Standard Specifications.

## **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

The Contractor shall install a new frame and cover over the opening and adjust with mortar and bricks to the proper finished roadway or sidewalk grade. Contractor shall verify whether the structure has a trap in good working order, and if not, shall furnish and install a new trap.

COMPENSATION

Payment for this item shall be at the contract unit price each and shall include full compensation for all labor and materials, removal and disposal of existing frame and grate, repairs as deemed necessary by the Engineer, rodent control and any other incidentals necessary for the satisfactory completion of the work as specified.

New Frame and Cover will be paid for under Item 221.

New trap, if required, will be paid for under Item 225.52.

<b>ITEM 221</b>	<b>FRAME AND COVER</b>	<b>EACH</b>
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This item shall conform to the relevant provisions of Sections 201 and 220 of Standard Specifications and to the following:

Castings shall be Massachusetts Standard Heavy Duty Type A Sewer Frame and Cover as manufactured by LeBaron Foundry Inc., Neenah Foundry Co., Campbell Foundry Co., or approved equivalent product.

COMPENSATION

Frame and Cover will be measured for payment as specified in Section 220 of the Standard Specifications.

Payment for this item will be at the contract unit price per each and shall include full compensation for the frame and cover in-place and any other incidentals necessary for satisfactory compliance with this specification.

<b>ITEM 222.1</b>	<b>FRAME AND GRATE</b>	<b>EACH</b>
<b>ITEM 225.52</b>	<b>CATCH BASIN TRAP</b>	<b>EACH</b>

These items shall conform to the relevant provisions of Sections 201 and 220 of the Standard Specifications and to the following:

MATERIALS

Catch basin frames shall be as manufactured by E.L. LeBaron Foundry Co., model LK120D for three flange, Neenah Foundry Co., Campbell Foundry Co., or approved equivalent product.

Catch basin grates shall be cascade type, as manufactured by E.L. LeBaron Foundry Co., model L24SG18, Neenah Foundry Co., Campbell Foundry Co., or approved equivalent product.

Catch basin traps shall be installed in all catch basins in paved areas. Traps shall be cast iron and removable. Traps shall be Neenah Type R-3701, or the Eliminator Catch Basin oil & Debris Trap by Ground Water Rescue, Inc. or approved equivalent product.

COMPENSATION

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Frame and Grate or Trap will be measured for payment as specified in Section 220 of the Standard Specifications.

Payment for these items shall be at the contract unit price per each and shall include full compensation for the frame and grate, and trap, in-place and any other incidentals necessary for satisfactory compliance with this specification.

<b>ITEM 234.06</b>	<b>6 INCH DRAINAGE PIPE – PVC</b>	<b>FOOT</b>
<b>ITEM 234.08</b>	<b>8 INCH DRAINAGE PIPE – PVC</b>	<b>FOOT</b>
<b>ITEM 234.10</b>	<b>10 INCH DRAINAGE PIPE – PVC</b>	<b>FOOT</b>
<b>ITEM 234.12</b>	<b>12 INCH DRAINAGE PIPE – PVC</b>	<b>FOOT</b>

Work to be done under these items shall include the furnishing and installation of polyvinyl chloride (PVC) pipe for connections from catch basins to existing and proposed drainage structures and pipelines, all as shown on the Drawings and as directed by the Engineer.

#### MATERIALS

##### **PVC Pipe**

PVC pipe and fittings shall conform to ASTM D3034, latest revision, SDR 35 minimum wall thickness, with integral wall bell and spigot joints. The bell shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled. Wyes, tees, Inserta Tee, bends and adapters, and any other fittings required shall be provided. The pipe shall be colored green for in-ground identification as sewer/drain pipe.

#### CONSTRUCTION METHODS

##### **Excavation**

The Contractor shall perform all work necessary to excavate and support the trench to allow for installation of the pipe (see Items 120.1 and 142 for technical requirements).

Excavation of existing hot mix asphalt, brick and concrete pavements as required for installation of drainage pipe is included under this item.

##### **Pipe Installation**

Each pipe shall be handled into its position in the trench and installed in such a manner as not to damage the pipe and so as to protect at all times the jointing surfaces of the pipe. Operations shall at times be conducted so as to prevent damage to existing structures, utilities, and the work in place.

The Contractor shall furnish proper and adequate equipment such as slings, straps, hoists, and other equipment and devices necessary for the safe and suitable lifting, handling, laying, and support of all pipe and appurtenances when it is lifted and placed into position.

#### **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

All pipe, fittings, and appurtenances shall be carefully inspected by the Contractor for defects before installation and all defective, unsound or damaged pipe, fittings, or other materials, shall be rejected. The Engineer will make such additional inspections as he/she deems necessary, and the Contractor shall furnish all necessary assistance for such inspection. The interior of pipe shall be carefully and thoroughly cleaned of foreign matter before being lowered into the trench, and shall be kept clean during laying operations.

All pipe shall be bedded in 12" of 3/8-inch crushed stone (M2.01.6). Crushed stone shall be compacted in 6" lifts with a vibratory plate-type compactor to at least 90 percent of maximum density as determined by ASTM D1557. The crushed stone bedding material shall be placed in the bottom of the trench and shaped and compacted to give substantial uniform support to the lower half of the full length of pipe. Pipe laying shall proceed upgrade with the spigot ends of the pipe pointing in the direction of flow so that bells are installed upstream or uphill of spigot ends. The pipe shall be laid true to line and grade and in such manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.

Pipelines shall be constructed in dry trenches and shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of pipe shall be securely sealed so that no trench water, earth, or other substance will enter the pipe. Pipes shall not be used as conductors for trench drainage during construction.

Diversion and control of storm water flows and de-watering shall be the responsibility of the Contractor. The Contractor shall submit its planned methods for diversion and control to the Engineer for advance review and approval.

The Contractor will also be responsible for road surface drainage/flow at all times within the work zone. This includes taking preventative measures to keep water out of the trench and preventative measure to keep excavated materials out of nearby catch basins.

If during or after construction the City's catch basins within the work zone become partially or completely full of soil and/or debris, it will be the Contractor's responsibility to clean the catch basin and properly dispose of the material at no additional expense to the City.

### **Pipe Jointing**

Jointing of pipe shall be done by workmen thoroughly skilled in this type of work using the watertight gasket type joints and installed in strict accordance with the printed recommendations of the pipe manufacturer, and as approved. A gasket shall be placed in the groove of the spigot end of each pipe just prior to laying the pipe. After the pipe is aligned in the trench, ready to be joined, all joint surfaces shall be thoroughly cleaned.

Immediately before jointing the pipe together the bell shall be completely covered with a lubricant, as recommended by the pipe manufacturer, then be carefully pushed home into the joint of the previously laid pipe. The position of the gasket and joint shall be carefully inspected to insure that the joint has been properly made, and that the gasket is properly positioned to insure a watertight joint. 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 in adequate compression and proper position to insure watertight joints conforming to the latest testing requirements.

The installation of pipe, the details of gasket, attachment, and joint formation shall be in accordance with the pipe manufacturer's printed recommendations, and as approved by the Engineer.

### **Connecting Pipe to Pipe**

Connecting pipe to pipe shall be performed according to the manufacturer's instructions or as directed by the Engineer.

### **Connecting Pipe to Pipe of Dissimilar Shapes**

Connecting pipe to pipe of Dissimilar Shapes shall be performed using concrete collars per standard detail.

### **Connecting/Re-Connecting Laterals**

Connecting/Re-connecting laterals shall be performed in the following manner or as approved by the Engineer.

Lateral connections shall be made into the top one half of the City's main, between the 1:00 and 3:00 o'clock position or 9:00 and 11:00 o'clock position using an inserta tee or wye connection. The connection shall be made such that flow from the lateral is compatible with the direction of flow in the main.

Storm drain connections shall be installed at a minimum slope of 1 percent.

For main pipe sizes up to 24 inches in diameter, laterals shall be connected using either Inserta Tee or wye fittings. Combination saddle-wye fittings are prohibited. Connections directly into existing pipe without a Inserta Tee or full wye fitting are not allowed, unless approved by the Engineer.

For main pipe sizes greater than 24 inches in diameter, laterals shall be connected by Inserta Tee, resilient connectors with internal expansion rings, or methods approved by the Engineer. Resilient connectors shall conform to ASTM C923-89.

### **Connecting Pipe to New or Existing Structures**

Connecting pipe to new or existing structures shall be performed in one of the following manners or as approved by the Engineer:

**1. Flexible Pipe to Manhole Connectors-** Rubber flexible pipe to manhole connectors shall be manufactured in accordance with ASTM C923. Clamps and bands used to secure the Flexible Rubber Connectors shall be stainless steel Type 304 including screws, wedges and other appurtenances required to provide secure tight connections between the manholes and the pipe. The connectors shall be specifically designed for the pipe material and size to be connected to the structure.

**2. Brick & Mortar-** Mortar for patching holes in structure walls and at the connections of the pipe to the structure shall conform to Standard Specifications Material Specification M4.02.15. Brick shall conform to ASTM C32, Grade SS.

### **Backfill**

*Pipe joints and/or connections shall not be covered in any way until the Engineer has inspected them.* Once inspected, the pipe and/or connection shall be completely enveloped with 6 inches of pea stone or crushed stone (i.e. both sides and above the crown of the pipe) conforming to ASTM D 448 prior to trench backfill.

The excavation shall be backfilled with gravel borrow and the trench shall be temporarily or permanently patched as specified under Item 472.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

00900-031

COMPENSATION

Drain pipe will be measured for payment as specified in Section 230 of the Standard Specifications.

Payment for pipe items will be at the contract unit price per foot complete in place and shall include all sawcutting of existing pavement, trench excavation (including support) for excavation 5 feet or less in depth, disposal of construction debris (asphalt, concrete, brick, etc.) tree protection, steel plating, protection of existing utilities and repair of utilities damaged during construction, dust control, dewatering, crushed stone bedding and pipe envelope, pipe and fittings, connections to existing pipe and structures, disposal of construction debris and any other incidentals necessary for the satisfactory completion of this work as specified.

Gravel borrow will be paid for under Item 151. Trench excavation greater than a depth of 5 feet will be paid for under Item 142. Rock excavation will be paid for under Item 144.

Hot mix asphalt patching will be paid for under Item 472.

Notes on Exclusions: Disposal of excavated soil is not included for payment under this item and shall be paid for separately.

<b>ITEM 326.18</b>	<b>18” REINFORCED CONCRETE PIPE</b>	<b>LINEAR FOOT</b>
<b>ITEM 236.24</b>	<b>24” REINFORCED CONCRETE PIPE</b>	<b>LINEAR FOOT</b>

**SUBMITTALS:**

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

Submit product data of pipe and fittings.

Submit certified dimensional drawings of all pipes, fittings, and appurtenances.

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.

For informational purposes only, submit manufacturer’s printed installation instructions.

**DELIVERY AND STORAGE**

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 struted, 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**

**REINFORCED CONCRETE PIPE**

General: 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, all precast reinforced concrete pipe shall meet the requirements of ASTM C76, latest revision, for Wall "B", Class III and IV pipe, and for Wall "C", Class V pipe. All pipe shall be Class III unless indicated as Class IV or Class V on the plans. Regardless of the process used in the manufacture of the pipe, all pipe shall be manufactured of concrete having uniform high density and impermeability, and free from any objectionable voids, and shall have uniform positive and complete steel reinforcement bond and shall conform to the additional requirements specified herein. Workmanship and methods shall be in accordance with the best practices of modern shops for this type of work and shall be the product of a manufacturing firm having at least five years experience in the manufacture of this type of pipe. Pipe shall have a smooth and even interior surface free from roughness or irregularities. Prior to fabrication of pipe, submit shop drawings showing lengths of pipe, pipe joint details, construction details and tolerances as required by the Owner. Each pipe shall be marked with the date of manufacture, mark or trademark of the manufacturer, and the class, wall thickness of the pipe, and serial number. No slurry mix shall be used on interior of pipe.

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.

Dimensions, Reinforcement, and Strength Requirements: The dimensions, reinforcing steel, and strength requirements of the pipe shall meet the requirements of ASTM C76, latest revision, for Wall "B", Class III and IV pipe and for Wall "C", Class V pipe and the additional requirements specified herein. Reinforced concrete pipe shall be provided in full-length units, except where shorter lengths are indicated and/or required to meet field conditions; field cutting of pipe shall be avoided wherever possible. The cross-section of all ASTM C76 pipe shall be circular with circular reinforcing cages properly held in place with adequate longitudinal members to insure the accurate placement of all steel. The total cross-sectional area of steel in the pipe for the class and wall thickness specified herein shall be not less than that shown in ASTM C76, latest revision.

## PIPE JOINTS

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.

Gaskets for sealing joints shall be the "O-ring" type gaskets meeting requirements of ASTM C443, latest revision, in all respects, and shall be of neoprene of a special composition having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. Gaskets shall be of a composition and texture which shall be resistant to sewage, gasoline, industrial wastes, including oils and groundwater, and which will endure permanently under the conditions likely to be imposed by this use. Each gasket shall be a continuous ring of round solid section having smooth surfaces free from blisters, porosity and other imperfections. The gasket shall be the sole element of sealing and depended upon to make the joint watertight. When the pipe is laid, the gaskets shall be of adequate size to fill the groove on the spigot ring in which the gasket is placed. Cement mortar or other plastic materials, if required to finish the joints, shall not be employed as means for making joints watertight. Each compression ring shall be marked with type of rubber used.

## CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION

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.

Provide flat gaskets when size of pipe requires this type.

The gasket manufacturer shall supply test data and affidavits showing compliance with these Specifications.

Hydrophillic gasket waterstop shall be of type Volclay Waterstop-RX, as manufactured by Colloid Environmental Technologies Company, or equal.

## CONCRETE

Concrete used in the manufacture of all precast reinforced concrete pipe shall have an average strength of not less than 4,000, 5,000 and 6,000 pounds per square inch at 28 days as applicable for the size class and wall specified. Strength of concrete used in the manufacture of the pipe shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the pipe or by cores cut from pipe wall or by other approved method. Cement shall be moderate heat of hydration Portland cement conforming to ASTM C150, latest revision, Type II. Absorption determined by boiling test described in ASTM C76, latest revision, shall not exceed 5.3 percent of dry weight.

## INSPECTION AND REJECTION OF PIPE

Acceptance of pipe shall be made on the basis of certificates of compliance that the pipe meets all material specifications.

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.

## MARKING

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.

## PART 3 - INSTALLATION

### PIPE AND PIPE FITTINGS

### CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION

General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

Acceptance of Pipe: Refer to Section 02615 – Reinforced Concrete Pipe, or Section 02616 – Ductile Iron Pipe as required.

Pipe Storage: Refer to Section 02615 – Reinforced Concrete Pipe, or Section 02616 – Ductile Iron Pipe as required.

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.

Laying Pipe: Except where a concrete cradle or envelope is required, all pipe shall be laid in crushed stone in accordance with Section 02200 - Earthwork. 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.

Jointing Pipe: After the pipe are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned.

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.

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.

Cleaning: Care shall be taken to prevent earth, water and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water and debris from entering any existing Drain.

1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
2. Flush lines between manholes if required to remove collected debris.

Review of Completed Storm Drain System: If the visual observation of the completed drain or any part thereof shows any pipe, manhole, or joint to be of defective work or material the defect shall be replaced or repaired as directed. The visual observation shall be conducted by the Engineer and any defects shall be as identified by such. The Contractor shall coordinate and provide site access for the Engineer.

## TESTS

The completed pipe and joints shall be visually inspected by the Engineer and using closed circuit television inspections as directed by the Engineer, paid for by the Contractor at no additional cost to the Owner. If the 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 or any other unacceptable deflections or deformations, the defective work or material shall be replaced or repaired as directed.

<b>ITEM 357</b>	<b>WATER GATE BOX REPLACED</b>	<b>EACH</b>
<b>ITEM 358</b>	<b>WATER GATE BOX ADJUSTED</b>	<b>EACH</b>
<b>ITEM 358.01</b>	<b>WATER GATE BOX ADJUSTED WITH ADAPTER</b>	<b>EACH</b>

Work to be done under these items shall consist of adjusting and replacing gate boxes as necessitated by roadway work. All work under these Items shall conform to the applicable requirements of the Cambridge Water Department (CWD), portions of which are included herein.

The Contractor shall not operate any hydrants, valves, curb stops, or corporations, nor shall they draw any water from the system, without specific approval of CWD. Only CWD personnel will operate hydrants, valves, corporations and curb stops unless otherwise directed by the CWD.

The Contractor shall furnish all labor, materials, equipment and incidentals required to reset existing gate boxes to grade, and/or furnish and install new water gate boxes, as directed by the Engineer, prior to roadway or sidewalk paving.

Swing-ties are to be taken and promptly forwarded to the CWD Engineering Department to any temporarily covered gatebox. Prior to temporarily covering any gatebox, they are to be blown free of debris so that the gate operating nut can be readily accessed by the CWD. Notify the CWD at least 24 hours in advance of any gatebox work scheduled

**MATERIALS**

Gate Boxes: Shall be cast iron and of the telescopic design with two piece construction, a top with a cover and a bottom (5-inch inside diameter; 6-foot length). 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. Cast iron boxes shall be General Foundry "Buffalo" boxes or approved equivalent product.

Gate Box Adapters: Shall be Le Baron LSA 20 5 1/2" x 6 1/4" with cover. (Gate box adapters supplied by the City, if available, shall be installed as incidental to Items 460 and 472)

**CONSTRUCTION METHODS**

**General Requirements**

All construction shall conform to the relevant provisions of Section 300 of the Standard Specifications, the American Water Works Association standards, the detail drawings included in the Specifications, and the requirements of the CWD.

**Adjustment/Replacement of Gate Boxes**

The gate box shall be set, as directed by the Engineer, so that final grade of the cover is flush with the final course of asphalt pavement or sidewalk as applicable. Material around the structure shall be compacted and high early strength concrete collars shall be placed around the castings to an elevation which allows for the proper depth of final asphalt paving as shown on the drawings. High early strength concrete shall be 3,500 PSI at 28 day test, 3/4 aggregate, 5% air entrained, and have a maximum 4" slump.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Should the Engineer determine that the gate box cannot be set to final grade upon installation; it shall then be set to the required temporary grade, without the concrete collar. Final adjustment to grade, including installation of concrete collar, shall then be performed and paid for separately.

Where existing gate boxes are not suitable to be re-set or adjusted, the Contractor shall furnish and install a water gate box adapter prior to roadway paving.

The excavation shall be backfilled with gravel borrow up to a depth which allows for placement of final roadway or sidewalk paving.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for installation of gate boxes is included under this item.

**See Section 825 “Supplemental Conditions” for requirements related to marking raised utility castings.**

**COMPENSATION**

**Adjustment/Replacement of Gate Boxes**

Water gate boxes replaced in roadway or sidewalk; and adjustment of water gate boxes with or without adapters; will be measured by the unit each, complete in place.

Payment for work under Items 357.01 and 357.02 shall be at the contract unit price each and shall include full compensation for excavation, backfill, cleaning, furnishing all labor, tools, equipment, materials, water gate boxes, high early strength collars, disposal of construction debris and other incidentals necessary for the satisfactory completion of this work as specified.

Payment for work under Items 358 and 358.01 shall be at the contract unit price each and shall include full compensation for the gate box adapter and installation, resetting gate boxes to final grade and any other incidentals necessary for the satisfactory completion of this work as specified.

<b>ITEM 347.1</b>	<b>1 INCH COPPER TUBING TYPE K</b>	<b>FOOT</b>
<b>ITEM 347.12</b>	<b>1-1/4 INCH COPPER TUBING TYPE K</b>	<b>FOOT</b>
<b>ITEM 347.15</b>	<b>1-1/2 INCH COPPER TUBING TYPE K</b>	<b>FOOT</b>
<b>ITEM 363.1</b>	<b>1 INCH CORPORATION COCK</b>	<b>EACH</b>
<b>ITEM 363.12</b>	<b>1-1/4 INCH CORPORATION COCK</b>	<b>EACH</b>
<b>ITEM 363.15</b>	<b>1 -1/2 INCH CORPORATION COCK</b>	<b>EACH</b>

Work to be done under these items shall consist of replacing existing water services by providing new water services from the water main to the property line and connecting to existing services, including corporation stops, curb stops and boxes, as directed by the Engineer, in coordination with the Cambridge Water Department.

Water services shall be replaced at addresses to be provided by the engineer.

## Lead Services

30 Pearl Street	106 Pearl Street
34 Pearl Street	108 Pearl Street
44 Pearl Street	109 Pearl Street
46 Pearl Street	133 Pearl Street
63-65 Pearl Street	146 Pearl Street
94-96 Pearl Street	150-152 Pearl Street
100 Pearl Street	163 Pearl Street
102 Pearl Street	

## MATERIALS

Service pipe: shall be type “K” copper tubing, American manufactured, 1-inch minimum. All service fittings shall be extra heavy brass, manufactured by either Mueller Water Distribution Products or Ford Meter Box Company, Inc. **All services greater than 1-inch shall have the valve box installed at the corporation at the main.**

Brass goods: furnished under this specification shall be new and unused. All fittings and valves shall be manufactured in accordance with AWWA C-800.

Any part of the brass fitting or valve in contact with potable water shall be fabricated from Sebiloy or Federalloy or other City of Cambridge approved no lead/ultra low lead material. Residual lead levels shall not exceed a maximum of 0.25% by weight.

Components that do not contact potable water shall comply with the requirements of ASTM B 62 and ASTM B584 Copper Alloy Number C83600 or C84400 respectively.

Brass fittings and valves shall comply with the Safe Water Drinking Act, of the U.S. EPA. Service fittings and materials bid provided under these Items shall be certified as suitable for contact with drinking water by an accredited certification organization in accordance with ANSI/NSF Standard 61, Drinking Water Systems Components – Health Effects.

All brass fittings and valves shall have the manufacturers name or trademark integrally stamped or cast on it. Another marking identifying the “no lead ” brass alloy, e.g., “EB2”, NL or “FED” shall be cast or stamped on the fitting or valve.

If requested, an affidavit certifying compliance with these standards and specifications shall be signed and submitted by the manufacturing firm’s Quality Assurance or Engineering Manager.

## Corporations, Curb Stops And Saddles

- A. Corporations for 1-inch installations shall be heavy pattern, easy turning and of a type equal to the Ford FB 1000-4 (no lead brass) series. The inlet shall be an AWWA (CC) thread. The outlet shall be for a compression joint for Type-K copper. The 1-1/2 inch and 2-inch corporations shall be of a ball valve type which incorporates Teflon seats to assure self-centering of a Teflon coated bronze ball similar to a style typified by the Ford FAFB - 1000 (T-head) series or an approved equal by the CWD. The corporations shall be easy turning and non-binding. The inlet shall be an AWWA (CC) thread. The outlet shall be for a compression joint for Type-K copper. **ALL** corporations shall be subject to a sustained hydraulic pressure of 200 psi and tested in both the

open and closed positions for leakage and ease of turning. All taps greater than 1 inch will require the use of a tapping saddle.

- B. Curb stops for sizes 1-inch shall be a type equal to the Ford B44-444-Q (no lead brass) series or approved equal. The curb stop shall have a quarter turn stop with check, solid tee head and no waste. No curb stops with plugged solid waste shall be accepted.
- C. Service boxes shall be "Buffalo" 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 made of cast iron and be equal to a "Buffalo" style 94-E upper section. **Inside diameter to be a minimum of 2 1/4-inches.**
- D. Service saddles bodies shall be ductile iron, ASTM-A108 , with epoxy finish. Bales shall be carbon steel or stainless steel. Washers to be carbon steel, nuts to be semi finished galvanized hex steel. Gaskets to resist oil, acids, alkalies, and most (aliphatic) hydrocarbon fluids.

#### Fittings

- A. Unless otherwise approved, only compression type fittings manufactured by Mueller Inc., or equal, shall be used.
- B. Adapters required allowing connection to existing services shall be provided.

### CONSTRUCTION METHODS

#### Services Being Replaced

- A. After successful testing and chlorination, water services shall be installed as a "wet" tap as directed 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. 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.
- C. The Contractor shall remove and legally of existing service pipe and fittings as part of the work of these items. Existing service pipe material may be lead, galvanized iron, cast or ductile iron, plastic, or copper.

### COMPENSATION

#### Method Of Measurement:

The length of copper tubing to be paid for under these items shall be measured by the foot along the finished grade over the pipe from the corporation cock key to the point of interception of the existing service pipe. No

deduction will be made for curb stops and couplings. Separate measurements will be made for each individual service.

The number of corporation cocks to be paid for under these items shall be the actual number furnished and installed by the Contractor.

Basis of Payment:

Payment for copper tubing of various sizes will be based on the unit price bid for the appropriate item in the proposal. Under the per foot price for the each item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete the work, including excavation; backfill; furnish and install filter fabric as required; compaction; compaction testing; location of services; isolation of service line; coordination with the Cambridge Water Department and notification of affected customers; removal and disposal of existing water service pipe of any material; temporary excavation support furnished and installed complete, left in place, and cut off below grade; bedding; installation of new water service tubing; curb stops; adjustable curb boxes with covers; fittings; couplings; connections to the existing water service; disinfection; testing, flushing; and all incidental work required for the installation of copper service tubing not included for payment elsewhere.

Payment for corporation cocks of various sizes will be based on the unit price bid for the appropriate item in the proposal. Under the per each price for the each item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to complete the work, including excavation; backfill; tapping the main and installing saddles; corporation stops; and whatever couplings may be required to connect the new corporation stop to the existing or new copper service.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for installation of water services is included under this item.

Exclusions

The following are not included for payment herein but are included for payment elsewhere: saw cutting pavement; imported gravel sub-base; and restoration of pavement, curbing and sidewalks.

<b>ITEM 303.06</b>	<b>6 INCH DUCTILE IRON WATER PIPE (RES. JT)</b>	<b>FOOT</b>
<b>ITEM 303.08</b>	<b>8 INCH DUCTILE IRON WATER PIPE</b>	<b>FOOT</b>
<b>ITEM 303.10</b>	<b>10 INCH DUCTILE IRON WATER PIPE</b>	<b>FOOT</b>
<b>ITEM 303.12</b>	<b>12 INCH DUCTILE IRON WATER PIPE</b>	<b>FOOT</b>
<b>ITEM 370.6</b>	<b>6 X 6 INCH TAPPING SLEEVE, VALVE AND BOX</b>	<b>EACH</b>
<b>ITEM 370.8</b>	<b>8 X 8 INCH TAPPING SLEEVE, VALVE AND BOX</b>	<b>EACH</b>
<b>ITEM 376</b>	<b>HYDRANT</b>	<b>EACH</b>
<b>ITEM 376.5</b>	<b>HYDRANT – ADJUST</b>	<b>EACH</b>

GENERAL

Work to be done under these items shall consist of installing ductile iron water main, furnishing and installing new hydrants and valves; and adjusting existing hydrants to grade; as shown on the Drawings and as directed by the Engineer. All work under this Item shall conform to the applicable requirements of the Cambridge Water Department (CWD) portions of which are included herein. All removal and installation of hydrants must be approved by the Cambridge Fire Department prior to any work.

The Contractor shall not operate any hydrants, valves, curb stops, or corporations, nor shall they draw any water from the system, without specific approval of CWD. Only CWD personnel will operate hydrants, valves, corporations and curb stops unless otherwise directed by the CWD.

## DESCRIPTION

The Contractor shall furnish all labor, materials, equipment and incidentals required to install new water main, and set new hydrants and valves as shown on the Drawings and as directed by the Engineer.

## MATERIALS

Pipe: Pipe shall be Class 52 ductile iron cement lined and tar coated, lining shall be a minimum of one eighth in. (1/8") thickness. All pipe shall be manufactured to meet AWWA standards. Push on pipe joints unless specified. Standard gaskets shall be supplied.

Approved manufactures are U.S pipe and Foundry Company, and Griffin Pipe Company. All others must be approved by CWD.

Pipe Joints: Pipe shall be restrained joint type for the entire length of the main or branch lateral. Method of restraint shall be either an interlocking type or mechanical joint type. Mechanical joint restraint shall be incorporated into the design of the follower gland. The restraining mechanism shall consist of individually actuated wedges that increase their resistance to pull-out as pressure of external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be made of grade 60A2-10 ductile iron conforming to ASTM A536-84. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.1 and ANSI/AWWA C153/A21.3 of the latest revision. Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges. Joint shall have a rated work pressure of 350 psi. The joint restraint devices shall be listed by Underwriters Laboratories and be approved by Factory Mutual. The restraint shall be the Series 1100 MEGALUG restraint as produced by EBAA Iron, Inc., or approved equivalent product.

Pipe fittings: Shall be ductile iron, compact type for sizes 4"-12", cement lined, tar-coated, restrained mechanical joint, and rated for 350 psi working pressure. All nuts and bolts shall be of a type equal to ductile iron of KOR-10 steel T-bolts and nuts.

Couplings: Shall be Smith Blair, Style 441; Dresser, Style 153; Romac, Style 501; or approved equivalent product. Couplings shall be provided with plain, Grade 27, rubber gaskets and with black steel, track-head bolts and nuts.

Tapping Sleeves and Valves: Tapping sleeves shall be mechanical joint type and shall be Mueller H-615, American Darling 1004 or equal. Tapping valves shall meet the requirements of AWWA C500. The valves shall be flanged by mechanical joint outlets 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 bonnets and stuffing boxes 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 be Mueller H-667 or equal. Valves shall open right. (Clockwise). Multiple taps to be three (3) feet from flange to flange. Pre-inspection is required for all taps.

Valves: Valves 4 inch through 12 inch shall be resilient seated gate valves manufactured in accordance with AWWA C509 and as specified herein. Resilient seated gate valves shall be rated for a 200 psi working pressure or be of the same working pressure as the pipe they connect to, whichever is higher. All valves shall be fully manufactured in the United States. All gate valves shall be iron body, bronze mounted, resilient seated, non-rising stem type fitted with “O” ring seals. Valves shall be provided with a minimum of two O ring stem seals. Bonnet and gland bolts and nuts shall be Type 316 stainless steel. The hot dip process in accordance with ASTM A153 is not acceptable. Allen-wrench type bonnet and gland fastening shall not be acceptable and will be rejected. Wedges shall be totally encapsulated. Units shall be, in addition, UL and FM approved. Cast the word “OPEN” and an arrow indicating direction to open on each valve body or operator. Operating nut for all gate valves shall be 2 inches square. Extensions shall be provided for all gate valves where the depth exceeds 6 feet to the top of the operating nut. Extension stems shall be fabricated from solid steel. Stems shall not be smaller in diameter than the valve stem. Equip stem with wrench nut. Ensure all stem connections are pinned. Valves shall be non-rising stem. AWWA requirements for thrust collar and stem to be integrally cast (not pinned on), and copper alloy valve stems shall be strictly enforced. Valves shall have mechanical joint ends compliant with AWWA C111 unless otherwise noted. A 10 year warranty shall be provided for all resilient seated gate valves furnished on the project. All buried valves shall open right (clockwise) per CWD standards.

Valves larger than 12 inch shall be butterfly valves manufactured in strict accordance with AWWA C504 and as specified herein. Butterfly valves shall be bubble tight at rated pressures. Valve discs shall rotate 90 degrees from full closed to open. Operators shall be assembled to the valve by the valve manufacturer. The valve/operator shall be tested as a complete assembly by the valve manufacturer. The manufacturer shall have produced AWWA butterfly valves for a minimum of five years. Valve bodies shall be constructed of cast iron ASTM A126, Class B. Valves in vaults shall be flanged. Flange drilling shall be in accordance with ANSI B16.1, Class 150. Laying length shall be short body as listed in AWWA C504. Buried valves shall be mechanical joint end conforming to ANSI C111. Valve discs shall be constructed of cast iron ASTM A126 or A48, ductile iron ASTM A536. Material mating with the seat shall be either ni-chrome or Type 316 stainless steel. Rubber valve seats shall be Buna-N. The seat shall be located in the valve body. Seats shall be retained in the valve body by mechanical means without the use of metal retainers or other devices located in the flow stream. If seat retaining hardware in the valve body such as screws and segments are used, they shall be monel. If screws are used, monel plugs shall be affixed in the valve body and tapped to receive these screws. Valve seats located on the valve disc are not acceptable. Valve shafts shall be Type 304 stainless steel, ASTM A276 and shall be of a diameter not less than those listed in AWWA C504, Class 150B. Shaft seals shall be furnished where the shaft projects thru the valve body. Shaft seals shall be standard split-v type packing or of an O-ring design. Shaft seals shall be designed to allow replacement without removing the valve shaft. Valves shall be fitted with sleeve type bearings contained in the trunions of the valve body. Bearing material shall be nylon for valves thru 20 inch and fiberglass with teflon lining for valves 24 inches and larger. Valve manufacturer shall furnish and mount operator suitable for buried service. Operators shall be self-locking and suitable for submergence to 20 feet. A 2 inch square operating nut shall be furnished. Operator stops shall be capable of withstanding an input of 450 ft-lbs. Valve class shall be AWWA Class 150B with operators sized for bi-directional flow. All buried valves shall open right (clockwise) per CWD standards. Valves shall be manufactured by Henry Pratt (the “Groundhog” series); Mueller (Model 3211); Clow/Kennedy/M&H; DeZurik valve companies or approved equal.

All buried gate and butterfly valves shall be provided with extension shafts, operating nuts and valve boxes. Extension shafts shall be Type 304 stainless steel and the operating nut shall be 2 inch square. Shafts shall be

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designed to provide a factor of safety of not less than four. Operating nuts shall be pinned to the shafts. The top of the operating nut shall be located 2 inch below the rim of the valve box. Valve boxes shall be Buffalo boxes by General Foundry or equal and shall be a heavy pattern cast iron, three piece, telescoping type box with dome base suitable for installation on the buried valves. Inside diameter shall be at least 5 inches. Barrel length shall be at minimum 6 feet and adapted to the depth of cover, with a lap of at least 6 inches when in the most extended position. Covers shall be cast iron with integrally cast direction to open arrow, and the word "WATER" shall also be integrally cast. Aluminum or plastic are not acceptable. A means of lateral support for the valve extension shafts shall be provided in the top portion of the valve box. The cover of the valve boxes shall be close fitting and substantially dirt tight and flush with the top of the box rim. The upper section of each box shall have a top flange of sufficient bearing area to prevent settling and to increase the stability of the box to remain at its respective height. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval. 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. An approved operating key or wrench shall be furnished. All fasteners shall be Type 304 stainless steel.

Gate Boxes: See above under "Adjustment/Replacement of Gate Boxes".

Hydrants: Hydrants shall conform to the "Standard dry barrel hydrants" ANSI/AWWA C502-85. Hydrants shall be designed for 150 psi service and for installation in a 5 -ft. covered trench. They shall OPEN clockwise and must be marked with an arrow and the word OPEN to indicate the direction of turn of the stem to open the hydrant.

They shall have one steamer connection, 4- 1/2-inch and two 2-1/2 -inch hose nozzles all with National Standard threads (NST). Hydrant inlet opening on shoe shall have mechanical joints for accepting 6-inch ductile iron or cast iron pipe.

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).

Hydrants shall be capable of delivering a minimum of 600 GPM with a maximum of Two (2) psi pressure drop through the hydrant with both 2-1/2 inch hose nozzles open.

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 inch. Flat to point, pentagonal. Hydrants shall be hydrostatically tested as specified in AWWA C502.

The main valve assembly shall consist of a rubber composition valve with a bronze sub-seat and seat ring. The seal between the set ring and the seat shall consist of two (2) "o-rings" located in the machined groves above and below the drainage channel. There shall be at least two (2) exterior drain ports located one- hundred and eighty (180) degrees apart.

Hydrants shall be delivered without chains and be painted with two coats of weather resistant paint "silver" upper barrel". All iron work to be set below grade shall be painted with two coats of asphalt varnish specified in AWWA C502

Hydrant operating mechanism shall be housed in a compact seal plate assembly with an integral lubrication chamber. An “O-ring” seal shall be used on the hold down nut to prevent direct condensation or atmospheric contamination from entering the lubrication chamber. The hydrant operating mechanism shall be readily available for inspection without removing the seal plate from the barrel.

The design and construction of the hydrant operating mechanism located at the top of the hydrant shall be such that no part of the operating threads will be in contact with the water in the standpipe when the hydrant is in service. “O-ring” seals shall be used to prevent water under pressure from entering the lubricating chamber

Hydrant steamer nozzle center line shall be a minimum of 16 inches from the bury line of the hydrant. The bottom of the operating nut shall be a minimum of 9 inches from the steamer nozzle center line. The overall height (bottom of the operating nut to the bury line) shall be a minimum of 29 inches.

Anchoring Tees: New hydrant tees shall be anchor type. The branch shall have a plain end with integral gland and rotating mechanical joint restraints (see above).

## CONSTRUCTION METHODS

### General Requirements

Contractor shall furnish all labor, materials, equipment and incidentals required and provide all buried valves, hydrants and appurtenances complete with actuators and all accessories as shown on the Drawings and as specified herein. Valves, hydrants and appurtenances shall be delivered to the job site, handled and protected in accordance with AWWA standards and in accordance with manufacturer’s instructions. Threads and seats shall be protected from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use. Any damaged valves, hydrants and appurtenances shall be removed and replaced by the Contractor at his/her expense.

During installation of all valves and appurtenances, Contractor shall verify that all items are clean, free of defects in material and workmanship and function properly. Valves and appurtenances shall be disinfected prior to installation as outlined in the items for ductile iron water pipe. All valves shall be closed and kept closed until the joints on each side are completely made or as otherwise directed by the CWD. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve. Buried valves and boxes shall be installed in full conformance with AWWA C504 and C509, as applicable, and as specified herein.

Butterfly valves shall be set on their side as shown on the Drawings with the shaft set along the spring line of the pipe with the actuator perpendicular to the shaft. Operating nut shall be set on the valve actuator and vertically aligned in the center of the valve box. Prior to installation, all butterfly valves shall be tested as specified herein. All butterfly valves shall be delivered with blind flanges bolted in place until valve is pressure-tested on site, before installation and burial. The blind flange shall include a 1 inch corporation placed in both the extreme lower and upper portion of the flange for on-site pressure testing prior to installation. All butterfly valves shall be hydrostatically and leak tested as follows:

1. All butterfly valves shall be hydrostatically and leak tested prior to installation. Engineer or CWD shall witness testing of all valves. Contractor shall submit a certification report that each valve has been tested and passed the hydrostatic and leakage tests.
2. To one side of each valve, bolt a blind flange of the same nominal diameter as the butterfly valve being tested. The flange shall include two, 1 inch corporation stops. Each tap shall be placed in the extreme lower and upper portion of the flange.
3. Set the flange tightly to the valve. Water shall be introduced into the lower corporation and shall fill the cavity between the disk and the flange. Water will continue to be supplied until all air has been purged from the cavity.
4. After all air has been purged, install a pressure gauge on the upper corporation.
5. Continue filling the cavity until the pressure is 150 psig or 1.5 times the normal working pressure of the valve, whichever is greater. Maintain this pressure for a minimum of 2 hours. Monitor valve and disk for the presence of any leaks during this time. CWD shall witness testing and verify that each valve is of a satisfactory condition to be installed.
6. It is the responsibility of the installing Contractor that he/she ensures the safety of any persons performing the testing of the valves. No valve shall be tested within City streets. Testing shall be performed at a location approved by the CWD and DPW.

Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint. Valves shall be backfilled as shown on the Drawings and as directed by the CWD.

Fire hydrants shall be set at the locations as shown on the Drawings and bedded on a firm foundation. Hydrants shall be installed on City of Cambridge property. The CWD and CFD shall review and approve the location of all fire hydrants, should they need to be moved from where shown on the Drawings. Hydrants shall be installed on the property side of the sidewalk and not the curb side of the sidewalk and in locations to minimize damage from traffic and snow plowing operations. Hydrants shall be set in such a way to allow complete turning of a standard hydrant wrench to spin freely while opening or closing the valve. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing pipe. Contractor must confirm bury depth of the water main prior to ordering and installing new hydrants. A drainage pit as detailed on the Drawings shall be filled with screened gravel and compacted. The hydrants shall be set upon a slab of concrete not less than 4 inches thick and 15 inches square. During backfilling, additional screened gravel shall be brought up around and 6 inches over the drain port. Each hydrant shall be set in true vertical alignment and properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area for thrust blocks shall be as shown on the Drawings. Felt roofing paper shall be placed around hydrant elbow before placing concrete. Care shall be taken to ensure that concrete does not plug the drain ports. The cement concrete for thrust blocks shall be as specified herein. Hydrants shall be tied to the pipe with suitable rods or clamps, galvanized, painted, or otherwise rustproof treated. Hydrant paint shall be touched up as required after installation. Fire hydrants shall be painted in accordance with CWD's current, standard practice.

Manual air release valves shall be installed at the locations as shown on the Drawings. Corporation stops, service tubing, curb stops and valve boxes and covers shall be installed in accordance with these respective items as specified in this section.

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All hardware and appurtenances shall be installed as required and in accordance with manufacturer's recommendations, as acceptable to the CWD.

Contractor shall conduct a functional field test of each valve, including actuators and valve control equipment, and hydrant in presence of the CWD to demonstrate that each part and all components together function correctly. All testing equipment required shall be furnished by the Contractor. Valves, hydrants and other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities, and any deficiencies shall be corrected or the device shall be replaced or otherwise made acceptable to the CWD. Contractor shall take care not to over pressurize valves or appurtenances during pipe or valve testing. If any connection proves to be defective, it shall be replaced or repaired to the satisfaction of the CWD. All valves, hydrants, appurtenances and other items (including valve interiors) shall be cleaned and disinfected prior to installation, testing and final acceptance. The various pipelines in which valves, hydrants and appurtenances are to be installed are specified to be tested, cleaned and disinfected as described in the items for ductile iron water pipe. All valves, hydrants and appurtenances shall be tested, cleaned and disinfected as part of this work.

See Items 120.1 and 142 for technical requirements related to excavation.

Minimum depth of bury shall be 5 feet for all water lines, unless approved by CWD.

#### Setting New Hydrants

Work shall be closely coordinated with the Cambridge Water Department (CWD).

Hydrants and new laterals shall have at least 5' of cover and shall be bedded on a firm foundation. A drainage pipe 2-feet 6-inches in diameter shall be installed at the new hydrant location, filled with screened gravel and satisfactorily compacted. During backfilling, additional screened gravel shall be brought up around and 6-inches over the drain port prior to placement of backfill.

Each hydrant shall be set in true vertical alignment and shall be properly braced. The hydrant shall be tied to the pipe with suitable rods or clamps, galvanized, painted or otherwise rustproof treated. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Felt roofing paper shall be placed around the hydrant elbow before placing concrete. Care shall be taken to insure that concrete does not block the drain ports.

After installation of the hydrant, the Contractor shall backfill with gravel borrow up to an elevation equal to the subgrade of the proposed sidewalk or landscape area. Bituminous patching for temporary sidewalk, if required, shall be performed as specified under Item 472.

#### Pressure and Leakage Testing

Shall be performed on all new lines in accordance with AWWA C600 and CWD requirements. The pressure and leakage tests shall be as specified in ss 301.60.L of the Standard Specifications for Highways and Bridges, AWWA Standard C600-93, ss 4.11 and NFPA standard for underground sprinkler piping. In general, the water pipe shall be given a pressure and leakage test in sections of approved length. For these tests, the Contractor shall provide a method of determining the exact amount of water being pumped into the test section and a pressure gauge. The Contractor shall also furnish and install suitable temporary testing plugs or caps for the pipeline; all necessary pressure pumping, pipe connections and other similar equipment; and all labor required;

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all without additional compensation. Prices for the appropriate pipe items shall include compensation for testing. The test equipment shall be installed by the Contractor in such a manner that all water entering the section under test will be measured and the pressure in the section indicated and they shall be kept in use during all tests. The scheduling of pressure and leakage tests shall be approved by the CWD and shall be attended by a CWD representative. Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe.

If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, even to the extent of uncovering the entire section and repair or replace the defective pipe, fitting or joint all at his own expense.

A report containing calculations and documentation pertaining to the pressure and leakage testing shall be submitted to the CWD.

### Disinfection and Flushing

Shall be performed by the Contractor on all new lines in accordance with AWWA C651 after pressure and leakage testing and necessary repairs are complete.

After a section of the main has been pressure tested and found acceptable, it shall be flushed thoroughly by the Contractor. Flushing the completed main is to be followed by sterilization in accordance with the AWWA Standards for Disinfecting Water Mains (ANSI/AWWA C651-92). Test results for chlorine residuals for times as specified in the method of disinfecting must be submitted to the CWD. If the initial treatment fails to produce the desired result, the chlorinating procedure must be repeated. Discharge of chlorinated water shall comply with all Federal, State and Local Standards. DPW must be contacted prior to flushing. De-chlorinating facilities shall be used as required.

## COMPENSATION

### General

Excavation and backfill to a depth up to 6-feet; pipe couplings, plugs; pressure and leakage testing, and disinfection will not be measured for payment, but shall be considered incidental to the appropriate pipe items.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for the work of this section is included under these items.

Pavement or sidewalk restoration, if required, shall be as specified under Item 472 or the appropriate sidewalk item.

Trench excavation greater than a depth of 6 feet will be paid for under Item 142. Rock excavation will be paid for under Item 144. Hot mix asphalt pavement patching will be paid for under Item 472.

Payment for Item 303.06 will be at the contract unit price bid per foot and shall include full compensation for labor and materials to excavate to a maximum depth of 6 feet, install pipe as specified and indicated on the details, and backfill, and any other incidentals necessary for the satisfactory completion of the work as specified. Item shall include cutting of pipe, making and restraining joints, and any fittings.

## **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Payment for Item 350.06 will be at the contract unit price bid per each and shall include full compensation for labor and materials to excavate to a maximum depth of 6 feet, install gate and gate box, as specified and indicated on the details, and backfill, and any other incidentals necessary for the satisfactory completion of the work as specified.

Payment for Item 376 will be at the contract unit price bid per each and shall include full compensation for labor and materials to excavate to a maximum depth of 6 feet, furnish and install new hydrant, install screened gravel and concrete thrust blocks, and any other incidentals necessary for the satisfactory completion of the work as specified.

Payment for Item 376.5 will be at the contract unit price bid per each and shall include full compensation for labor and materials to adjust existing hydrants to new sidewalk grade as required.

Additional Fittings

All fittings required to complete this work will be in incidental to the item.

<b>ITEM 420</b>	<b>HOT MIX ASPHALT BASE COURSE</b>	<b>TON</b>
<b>ITEM 443</b>	<b>ROADWAY DUST CONTROL</b>	<b>(INCIDENTAL)</b>
<b>ITEM 431</b>	<b>HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE</b>	<b>SY</b>
<b>ITEM 460</b>	<b>HOT MIX ASPHALT</b>	<b>TON</b>
<b>ITEM 464.5</b>	<b>HOT POURED RUBBERIZED ASPHALT SEALER</b>	<b>FOOT</b>
<b>ITEM 472</b>	<b>HOT MIX ASPHALT FOR MISCELLANEOUS WORK</b>	<b>TON</b>

Work to be done under these items shall conform to the relevant provisions of Sections 420, 430, 440 and 460 of the Standard Specifications and to the following:

MATERIALS

The Hot Mix Asphalt Base Course, Intermediate -Binder Course, and Modified Top Course Pavement mixes shall be per Table “A” of the Standard Specifications as currently amended and supplemented by MassDOT.

CONSTRUCTION METHODS

All paving (except possible cases of miscellaneous patching) shall be when the air temperature is 40 degrees Fahrenheit or above. Day time paving shall be between April 15<sup>th</sup> and November 1<sup>st</sup> and night time paving shall be between May 1<sup>st</sup> and October 1<sup>st</sup>.

The pavement thickness shall be as shown on the drawings and details and as directed by the Engineer in overlay areas. In overlay areas designated “2-inch” it is anticipated that a 2-inch thick top course will be placed, following milling of a nominal 2 inches of pavement and crack sealing as directed by the Engineer.

Where grades provided on the drawings indicate that proposed grade is to be raised above existing, milling depth and overlay thickness shall be adjusted as directed by the Engineer. Where grades provided on the drawings indicate that proposed grade is to be lowered below existing grade, the Contractor shall excavate test pits or pavement cores to verify whether there is sufficient thickness of existing pavement to support a mill and overlay operation. This requirement for test pits/cores may be modified if other work of this Contract (such as water or drainage installation) is judged by the Engineer to provide similar information on pavement thickness. See drawings for additional information.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

At proposed raised intersections, the Contractor shall place the hot mix asphalt base for the concrete paver field using hand spreading and finishing methods (Item 472).

The work of this Section also includes (as part of Item 472) temporary patching of utility excavations and repaving of abutting driveways. Only driveway work which is indicated on the plans or directed by the Engineer shall be included under this Item.

**At work locations where proposed finished grades are not indicated on the Drawings, the proposed grades shall be discussed with the Engineer prior to work, in order to address existing and proposed drainage concerns. The Contractor shall be responsible for ensuring that all paved areas are graded to drain, either to existing structures, or new structures.**

Crack sealing shall be performed where directed by the Engineer with modified asphalts (e.g. rubber asphalt sealer). Prior to sealing a crack, it is absolutely essential that all compressible material be removed by high-pressure air or routing. If grass or vegetation is present in the crack, it may be necessary to 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.

Liquid Asphalt Emulsion shall be applied prior to installation of asphalt as incidental to this item. Emulsion shall be AC-20 conforming to AASHTO M226 and shall be applied at a temperature over 100 degrees F by an emulsion truck.

The emulsion truck shall have pneumatic tires of such width and number that the load produced on the surface shall not exceed 650 pounds per inch 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 readily controlled rates from 0.05 to .20 gallons per square yard as directed by the Engineer.

The emulsion shall be applied within a pressure range of 25 to 75 pounds per square inch. 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.

At all locations where new asphalt pavement will abut existing pavement, the Contractor shall saw-cut the existing pavement neat and straight as shown on the detail drawings. All joints shall be tacked with Emulsified Asphalt, Type RS-1 before paving. The joint shall be tacked again after paving and sanded.

No diesel shall be used on castings or for cleaning of equipment. Only soap and water shall be allowed.

The Contractor shall take all reasonable measures to assure proper drainage on the final surface of the roadway. Pavement which does not drain properly due to poor workmanship shall not be accepted by the City.

At locations which are not complete at the end of the day, the Contractor shall use paper joints. In no case shall a longitudinal joint be left open to traffic at day's end.

The Contractor shall be required to provide a minimum of two vibratory mechanical rollers. One shall be a steel drum with front and rear rollers and a minimum weight of 10 tons. The other roller shall be a combination roller with four rubber front tires and a rear steel drum. The roller shall be a minimum weight of eight tons. An all rubber tire roller with a minimum weight of eight tons can be substituted for the combination roller.

The Contractor shall supply an approved Dial Type Asphalt Thermometer (Range 50 degrees F to 500 degrees F) for each paving machine in operation on the project. The thermometer shall remain the property of the Contractor upon completion of the project.

Water gate box adapters provided by the City and installed by the Contractor shall be considered incidental to this item. Water gate box adapters provided and installed by the Contractor will be paid for under Item 358.01. The Contractor shall be responsible for coordinating structure adjustment by other utilities prior to paving.

Dust Control: The Contractor shall perform dust control as directed by the Engineer and in accordance with Section 440 of the Standard Specifications. The Contractor shall prevent operations 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 of the Project. The Contractor shall be responsible for any damage resulting from dust originating from its operations. Dust abatement measures shall be continued until the Contractor has completed its work. Dust abatement measures shall include but not be limited to spraying water, applying calcium chloride, and placing temporary pavement on and around trenches and on work sites.

#### COMPENSATION

Hot Mix Asphalt pavement will be measured for payment as specified in Sections 420 and 460 of the Standard Specifications.

Dust control will not be measured for payment, and will be considered incidental to the hot mix asphalt items, and sidewalk items, as appropriate.

Payment for work under Items 420, 460 and 472 shall be at the contract unit price per ton and shall include full compensation for labor, materials including emulsified asphalt, equipment, and any other incidentals necessary for the satisfactory completion of this work as specified.

Payment for work under Item 431 shall be at the contract unit price per square yard, regardless of actual thickness placed.

Sealing of cracks as directed by the Engineer will be measured by the foot and will be paid for at the Contract Unit Price bid under Item 464.5.

No work on abutter driveways will be paid for under Item 472 which is not shown on the plans, nor specifically directed by the Engineer.

**Please note that emulsion truck and rubber tire roller are a requirement for paving. Failure to comply with this requirement will result in the City prohibiting the Contractor from paving. There shall be no additional cost to the City in this event.**

**ITEM 472.5****HOT MIX ASPHALT FOR PATCHING****TON**

The work of this item shall conform to Section 400 Hot Mix Asphalt of the Standard Specifications for Highways and Bridges and the following.

Pavement repairs shall be smooth tight patches prepared for the resurfacing overlay operations.

Each existing pavement course determined to be unsound shall be removed to the full depth of the pavement course within a rectangular area. For each patch location equal to or greater than 50 square feet in area (and having a minimum dimension of 4 feet) where the existing pavement courses are removed down to subbase, the subbase shall be compacted by mechanical means to not less than 95% of the maximum dry density of the subbase material as determined by AASHTO T 99 method C at optimum moisture content. Each edge of the patch area shall be sawcut or otherwise neatly cut by mechanical means to provide a clean and sound vertical face. The vertical face of each edge shall be thoroughly coated with a hot poured rubberized asphalt sealant immediately prior to placing the HMA patching mixture.

Delaminated areas of existing pavement courses resulting from pavement milling shall be cut back neatly by mechanical means to the limits of any unsound material. After removing all unsound material, the underlying pavement surface within the patch limits shall receive a thorough tack coat at a rate of application of 0.05 gallons per square yard immediately prior to placing the HMA patching mixture.

HMA patching mixture shall be the same mixture type as the existing pavement course being patched or as specified on the plans or as directed by the Engineer. The lift thickness of the patching mixture shall not exceed four times the nominal maximum aggregate size of the mixture. The patching mixture will be placed by hand or by mechanical means and shall match the thickness, grade, and cross-slope of the surrounding pavement. The HMA patching mixture shall be compacted using a steel wheel roller. For patch areas not large enough to permit use of a roller, compaction shall be accomplished using a mechanical tamper capable of achieving the required in-place density. The in-place density of the HMA patching mixture shall be not less than 90% of the maximum theoretical density of the mixture as determined by AASHTO T 209.

**COMPENSATION**

Hot mix asphalt for patching will be measured for payment by the ton, complete in place.

Hot mix asphalt for patching will be paid for at the respective Contract unit price per ton, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

**ITEM 482.3****SAWING ASPHALT PAVEMENT****FOOT**

The work under this item shall consist of establishing a neat joint in the asphalt pavement where proposed hot mix asphalt pavement interfaces with existing pavement at the limit of work.

**CONSTRUCTION METHODS**

The asphalt pavement shall be cut straight using an approved power driven saw with an abrasive blade and shall be sawed dry. The saw cut shall be a minimum of 3/8" wide and extend to the depth indicated on the Drawings and details.

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Saw cut edges which become broken, ragged or undermined as a result of the Contractor's operations shall be re-saw cut prior to the placement of abutting pavement for which no additional compensation will be allowed. The edges of saw cut pavements shall be sprayed or painted with a uniform thin coat of SS-S1401-C joint adhesive immediately before placement of hot mix asphalt material against the edges. Costs associated with the furnishing and applying joint adhesive shall be considered as incidental to this Item.

**COMPENSATION**

Measurement for sawing asphalt pavement will be by the foot along the pavement surface.

Sawing asphalt pavement will be paid at the contract unit price per foot as described above. Said price shall include full compensation for all labor, tools, material and equipment necessary for the satisfactory completion of this work as specified.

Sawcutting associated with pavement repair at utility trenches and with curb work will not be measured separately for payment, but will be considered incidental to Item 472 and the appropriate curb items.

<b>ITEM 504</b>	<b>GRANITE CURB TYPE VA4 – STRAIGHT</b>	<b>FOOT</b>
<b>ITEM 504.1</b>	<b>GRANITE CURB TYPE VA4 – CURVED</b>	<b>FOOT</b>
<b>ITEM 509</b>	<b>GRANITE TRANSITION CURB FOR PEDESTRIAN RAMPS – STRAIGHT</b>	<b>FOOT</b>
<b>ITEM 509.1</b>	<b>GRANITE TRANSITION CURB FOR PEDESTRIAN RAMPS – CURVED</b>	<b>FOOT</b>
<b>ITEM 516</b>	<b>GRANITE CURB CORNER – TYPE A</b>	<b>EACH</b>
<b>ITEM 580</b>	<b>CURB REMOVED AND RESET</b>	<b>FOOT</b>

Work to be done under these items shall conform to the relevant provisions of Sections 501 and 580 of the Standard Specifications and to the following:

**CONSTRUCTION METHODS**

**Granite Curbing**

The Contractor shall neatly sawcut existing adjacent pavement and excavate a trench for the curb or edging that is eighteen (18) inches wide and as deep as required to allow the sub-grade to be twenty four (24) inches below the top of the finished curb/edging. The curb/edging reveal shall be as indicated on the Drawings or as directed by the Engineer. At raised intersections, curb shall be installed transverse to, and flush with, the roadway as shown on the Drawings and as specified under Item 706.7.

Cement concrete shall be installed on the subgrade for curb/edging foundation and shall be six (6) inches thick and eighteen (18) inches wide. Cement concrete shall be 4000 PSI at 28 day Test, 3/4" aggregate, 5% air entrainment, and maximum 4" slump.

After the curb stone is in place, cement concrete shall be placed on both sides of the curb stone. On the sidewalk/landscape side of the curb, the cement concrete shall be brought up to the elevation of the sub-base of the sidewalk or other proposed surface material as shown on the Drawings. On the street side of the curb, the cement concrete shall be brought up to the same elevation as the bottom of the adjacent hot mix asphalt binder course (in full depth construction areas), or as directed by the Engineer (in overlay areas).

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At flush transverse curbs adjacent to raised intersections or flush unit pavers, cement concrete shall be placed both sides of the curb as shown on the Drawings and Details.

The joints shall be pointed with mortar conforming to Section M4.02.15 of the Standard Specifications. Joints greater than 3/4" shall have a non-shrink caulking applied as directed by the Engineer.

Any work requiring chamfering, cutting or caulking of curb shall be incidental to these items. This shall include cutting the bottom of curb stone in order to clear shallow utility structures.

It is the intent of this project that maximum re-use be made of existing curbing. Where "Proposed Granite Curbing" is indicated on the Drawings, the Contractor shall construe this to mean either new material, or existing curbing within the project area which meets the requirements (including proper radius) of Section 580 of the Standard Specifications.

All curbing unsuitable for continued use shall be disposed of by the Contractor as directed by the Engineer.

### COMPENSATION

Curb items will be measured for payment as specified in Section 501 of the Standard Specifications.

Payment for work under these items shall be at the contract unit price per foot or each (as appropriate) and shall include full compensation for sawcutting, excavation, disposal, furnishing tools, equipment, labor, cement concrete foundation and backfill, hot mix asphalt, and any other incidentals necessary for the satisfactory completion of this work as specified.

Excavation of existing hot mix asphalt, brick and concrete pavements as required for the work of this section is included under these items.

### **ITEM 594                      CURB REMOVED AND DISCARDED                      FOOT**

Work to be done under this item shall conform to the relevant provisions of Sections 500 and 580 of the Standard Specifications and to the following:

### CONSTRUCTION METHODS

It is the intent of this project that maximum re-use be made of existing curbing. Curb removed and discarded will only be paid for in cases where the Engineer has determined that the existing curb is unsuitable for use due to condition, or because existing radius curb does not match the proposed curb geometry.

### COMPENSATION

Curb Removed and discarded shall be the length actually removed and discarded, measured in accordance with Section 501 of the Standard Specifications.

Payment for work under this item shall be at the contract unit price per foot and shall include full compensation for all labor, equipment, tools, sawcutting, excavation, removal, transporting and disposal, and any other incidentals necessary for the satisfactory completion of this work as specified.

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<b>ITEM 701</b>	<b>4 INCH CEMENT CONCRETE SIDEWALK</b>	<b>SQUARE YARD</b>
<b>ITEM 701.1</b>	<b>6 INCH CEMENT CONCRETE SIDEWALKS (DRIVEWAYS AND INTERSECTIONS)</b>	<b>SQUARE YARD</b>
<b>ITEM 701.2</b>	<b>CEMENT CONCRETE PEDESTRIAN RAMP</b>	<b>SQUARE YARD</b>
<b>ITEM 701.28</b>	<b>DETECTABLE TILE –CAST IRON</b>	<b>SQUARE YARD</b>
<b>ITEM 702</b>	<b>HOT MIX ASPHALT WALK SURFACE</b>	<b>TON</b>

Work to be done under these items shall conform to the relevant provisions of Section 701 of the Standard Specifications and to the following:

**MATERIALS**

Concrete: Concrete for sidewalks shall conform to the Standard Specifications, M4.02.00 through M4.02.12 and be 4000 PSI at 28 day test, 3/4 inch coarse aggregate, 610 pounds cement per cubic yard, 7% 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.

The concrete shall contain 1 pound of 100% polypropylene microfiber per cubic yard. Fiber shall be added during batching at the plant to insure uniform distribution. The micro-fiber shall be W.R. Grace micro-fiber or equal and shall be used in accordance with the supplier's specifications.

Hot Mix Asphalt: Conform to Section 701 of the Standard Specifications. Sidewalk section shall be 2 1/2” of hot mix asphalt (after compaction); over 8 inches of gravel base.

Cast Iron Detectable Tile:

The detectable warning strip at concrete pedestrian ramps, raised side street treatments abutting concrete sidewalks, and raised crosswalks abutting concrete sidewalks shall be the Cast Iron Detectable Warning Plates by East Jordan Iron Works (800-626-4653) or approved equivalent product. The Cast Iron Detectable Plate shall meet all ADA Accessibility Guidelines for Detectable Warnings. Plates should have truncated domes and a slip resistant texture with a coefficient of friction rating greater than 0.80. Warning panels shall be at least 24” deep and 60” wide at the point of crossing.

Size: 24 in. (+/- 1”) deep, cut as wide as the pedestrian ramp opening, and as wide of the crosswalk at raised side street treatments and raised crosswalks.

**CONSTRUCTION METHODS**

These items shall include excavation and disposal of the existing material and the fine grading and compaction of the sub-base prior to placement of concrete or asphalt. A jack hammer or saw cut shall be used at the beginning of each excavation and at all “back-of-sidewalk” limits in order to avoid damage to abutting properties and features which are to remain.

If the existing material is unsuitable or more material is needed for sub-base, additional material shall be installed and paid for under Item 151 Gravel Borrow as directed by the Engineer. If the existing material is brick, the City reserves the right to direct the Contractor to deliver the bricks to a specified site within the City at no additional cost.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

In areas where sidewalks are to be constructed in present roadway areas, the full depth of existing asphalt pavement shall be completely removed. Excavation of existing hot mix asphalt, brick and concrete pavements as required for the work of this section is included under these items.

Where new sidewalk abuts existing-to-remain sidewalk, the limit of work shall be established at the existing nearest existing contraction or expansion joint, where a neat sawcut shall be provided.

The Contractor shall exercise special care when excavating near trees. When major roots are in the way, the Contractor shall go under or between them. In no case shall the Contractor disturb the root structure of the trees without direction from the City Arborist. Exposed roots shall be covered promptly. Excavation of all tree wells shall be done entirely by hand.

All existing traffic signs within the limit of work shall be removed and delivered to the Cambridge Traffic Department, and all existing sign posts shall be removed and properly disposed of by the Contractor. This work shall be incidental to the various sidewalk items.

New traffic and street name sign posts, including new bases, shall be installed and paid for under Items 847.1 and 874. The work shall be sequenced such that regulatory sign messages shall be continuously maintained throughout construction.

The sub-base shall be prepared at the appropriate elevation for the depth of concrete or asphalt to be installed. The sub-base shall be graded to follow the proposed sidewalk elevations shown on the Drawings. At locations where no proposed grades are indicated, the sub-base shall be graded to allow for sidewalks to be sloped from the City right of way towards the street at 1/8 inch to the foot, or as directed by the Engineer.

The Contractor shall raise all water curb stop boxes to final grade and coordinate raising of other public and private utility boxes prior to pouring of concrete or placing of asphalt. The Contractor shall remove material from curb stop boxes with compressed air, after raising is complete and prior to pouring of concrete or placement of asphalt. Prior to pouring the concrete or placing the asphalt, the Contractor shall go over locations where curb boxes have been raised with the Engineer.

Proper compaction shall be obtained by means of plate-type mechanical compactors. The material shall be compacted 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 C.

Installation of Concrete: Concrete shall be installed to a depth of 6" at pedestrian ramps, across driveways, at street intersection corners (5' beyond the point of tangency on either side of the corner curve), and at other locations as directed by the Engineer. At all other locations, concrete shall be installed to a depth of 4".

Concrete sidewalks shall be placed between April 1<sup>st</sup> (pending no upcoming snow storms) and November 1<sup>st</sup> only. Ambient temperature shall be 40 degree or more.

Finishing shall be as specified in Subsection 701.61B of the Standard Specifications.

Curing shall be as specified in Section 476.71 of the Standard Specifications. Contractor shall propose curing method for review prior to starting. Any curing compound shall not discolor the concrete, shall be compatible with linseed oil application after 28 days, 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. The Contractor shall provide the Engineer with the curing compound specification prior to its use.

Expansion joints and saw cuts for Item 701.10, at the Demonstration Block, shall be located as indicated on the plans and as detailed. Saw-cutting shall be performed in a timely manner as to avoid fractures and splinters. Note sample section of Demonstration Block Sidewalk is required for review and approval.

Expansion joints shall be placed every 30 feet. Expansion joints shall also be placed around all appurtenances such as utility poles, hydrants, manholes, and other obstructions extending into and through the sidewalk. Expansion joints installed around utilities shall be 3/8" foam expansion joint polyethylene at a depth to match the adjacent sidewalk (4" or 6"). It is also required that an expansion joint of 1/4" thick foam at 4" or 6" deep is placed longitudinally along the granite curb between curb and the concrete; and also between buildings or retaining walls and the concrete sidewalk as directed by the Engineer. Six-inch expansion joints shall be placed at all locations where six-inch concrete corner slabs or 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.

Between the expansion joints at 30 foot spacing, the sidewalk shall be divided at 5 foot intervals with score joints, made with creasing tools having a penetration depth of minimum 1/2" and at 10 foot intervals with construction joints. Joints shall be placed 90 degrees transverse with the direction of traffic and shall be straight within a tolerance of 1/4" of a straight edge laid along the joint. Longitudinal joints shall be installed, at the direction of the Engineer, when the sidewalk is greater than 6' wide.

After 28 days, using pressure-spray equipment, the Contractor shall apply a mixture of boiled linseed oil to the new concrete pavement as an anti-spalling seal. The mixture shall consist of 50% double boiled linseed oil and 50% petroleum spirits, AASHTO M-233-79. Upon approval by the Engineer, the Contractor may use other products available on the market in accordance with manufacturer's recommendations (2 applications at right angles to each other are required for complete coverage). The sidewalk shall be swept and cleaned of any debris, gum, etc, and pressure washed, just prior to application of curing linseed oil compound.

“Don’t Dump” Placards: The work of this Section shall also include the installation of Cast Iron or Steel “Don’t Dump” placards, where new sidewalks abut existing or proposed catch basins and inlets. The placards will be furnished by the City at no cost to the Contractor, for installation by the Contractor.

**Finish Grades: At locations where the Drawings do not indicate proposed sidewalk grades, the grades shall be discussed with the Engineer prior to work, in order to address existing and proposed drainage concerns. The Contractor shall be responsible for ensuring that all new sidewalks areas are graded to drain, either to existing structures, or new structures.**

Pedestrian ramps and sidewalks shall be installed in strict conformance with the layout and grades shown on the Drawings, current Americans with Disabilities Act (ADA) and Massachusetts Architectural Access Board (AAB) regulations; and the applicable details of the Massachusetts Highway Department (MHD) Wheelchair Ramp Standards (latest edition).

The Contractor shall establish grade elevations at all pedestrian ramp and sidewalk locations, and shall set transition lengths according to the tables which are included on the Drawings. The Contractor shall use a digital

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

"Smart Level" to check all sub-base grades for compliance prior to installation of concrete. The Contractor shall not proceed with concrete installation on a sidewalk or ramp that is out of compliance without first contacting the Engineer.

At all pedestrian ramps and driveways, 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. At driveways, a joint shall be located between the sloping portion of the driveway (15% maximum slope), and the level area where pedestrians will cross the driveway (1.5% maximum cross slope).

The broomed finish on pedestrian ramps shall be perpendicular to the direction of the slope.

Detectable Tile

Cast iron detectable tiles shall be installed at time of sidewalk construction per manufacturers directions and as shown on the plans and specified herein. Retrofit, bolted, or surface applied installations shall not be accepted.

COMPENSATION

Sidewalk, driveways, and pedestrian ramps will be measured for payment as specified in Section 701 of the Standard Specifications, and the following:

Payment for work under these items shall be at the applicable contract unit prices and shall include full compensation for sawcutting, excavation (including removal of existing pavement in present roadway areas), disposal of construction debris (existing sidewalk, concrete, brick, asphalt, etc.), removal and disposal of traffic signs, preparation of sub-base, raising of water curb stop boxes, installation of "Don't Dump" placards, furnishing and placing cement concrete and hot mix asphalt as indicated, furnishing and installing detectable warning tiles, expansion joints, concrete sealant, and any other incidentals necessary for the satisfactory completion of this work as specified.

The Engineer reserves the right to extend any sidewalk limit of work shown on the plans up to an additional fifteen (15) feet, in order to connect to an existing ADA-compliant sidewalk. The Contractor will be compensated at the appropriate contract unit price for such increased quantities.

Notes on Exclusions: Disposal of any excavated soil is not included for payment under this item and shall be paid for separately. Changes necessitated to private property due to changes in grade of the sidewalk are not included for payment under this item and shall be paid for separately under the appropriate items; for example: asphalt driveways, granite curb, fencing.

<b>ITEM 706.01</b>	<b>BRICK WALK ON 4" HMA BASE</b>	<b>SQUARE YARD</b>
<b>ITEM 706.05</b>	<b>BRICK WALK ON 6" HMA BASE</b>	<b>SQUARE YARD</b>

DESCRIPTION:

Work to be done under these items shall conform to the relevant provisions of Sections 440, 460 and 700 of the MassDOT Standard Specifications and the following:

The work of these items includes installation of clay brick sidewalks on a treated sand-asphalt setting bed over an HMA base. The work also includes the installation of metal edging where the brick abuts a mulch tree pit, landscaped area or other non-rigid edge.

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Submittals for the work of these items shall include product data and test results certifying compliance with specified standards and actual samples of the bricks of the shape, pattern, and color specified.

## MATERIALS:

### Brick

All brick shall be wire-cut. Wire cut 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 equal approved by the Engineer. Size shall be 4"W by 8"L by 2 1/4 "D.

The brick shall be clay brick, uniform in size and evenly burned, and when broken shall show a dense structure free from lime, air pockets, cracks and lamination. Laminated bricks will not be accepted.

The bricks shall be for exterior paving and shall meet the requirements of ASTM C-902-Class SX 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 or more. Brick shall pass a minimum of 100 freeze thaw cycles.

### Sand-Asphalt Setting Bed

Asphalt cement shall conform to ASTM D 946, penetration grade 85-100. Sand shall be clean, hard sand with durable particles uniformly graded from coarse to fine and all passing the No. 4 sieve and conforming to ASTM C 144. The asphalt cement and sand shall be mixed at an asphalt plant in the proportion of seven percent (7%) asphalt and 93% sand. The mix shall be heated to 300 degrees F.

### Mastic Adhesive

Adhesive shall consist of two percent (2%) neoprene (grade WM1) oxidized asphalt with 155 degrees F softening point (80 penetration) and ten percent (10%) asbestos-free fibers and 88% asphalt.

### Sand-Cement Joint Filler

Joint fillet for butt-jointed brick shall be composed of a dry sand-cement mix at a ratio of 4:1. Mix shall be kept dry until application is completed and surface excess is swept clean.

Sand shall be a clean, washed uniformly well-graded masonry sand conforming to the requirements of ASTM C-144-70 with the further requirements that the fineness modulus shall be maintained at 2.25 plus/minus 0.10. Sand shall be from a single source meeting these requirements and as approved by the Engineer after laboratory test. Source of supply shall not be changed during the course of the job without written consent of the Engineer.

Portland Cement shall conform to the requirements of AASHTO M85.

### Metal Paving Iron edge

Metal Paving Edge: Provide at tree pits, landscape areas, and continuously at locations where paving does not abut a hard edge and as directed by the Engineer and as shown on the drawings. Metal edging to continue at 90 degree angle for minimum distance of 18" on one side around the corner at concrete pavement condition to insure adequate tie-in condition to prevent edge from moving upward and creating a trip hazard or maintenance hazard.

Specifications shall be as follow: Height: 4", Flange: 1.75", Lengths: 6'0" or 8' 0", Thickness: 3/16" Material: Galvanized steel.

Spikes: 15" Spiral galvanized steel placement every 12".

Metal Edge Specification: Galvanized steel paver restraint. Sections are to be L-shaped galvanized. Sections are to be notched to provide for smooth curves and crisp angles. Spikes are to be galvanized spiral not less than 15" in length

Metal 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.

Preformed Expansion Joint Filler:

The preformed expansion material shall conform to ASTM D-1752. The preformed expansion joint filler material data and installation directions shall be submitted to the Engineer for review and approval.

Sealant:

The sealant shall be a polyurethane-based, one component, elastomeric sealant complying with Federal Spec. TT-S-00230C, Class A Type 1 for horizontal use and Type 2 for vertical use.. Sealants shall be self-leveling pour grade type for horizontal use and non-sag grade type for vertical use. Color shall match the color of the adjacent materials as approved by the Engineer. Sealant material data and installation directions shall be submitted to the Engineer for review and approval. Application of sealant for site improvements shall be in accordance with approved manufacturers' recommendations.

CONSTRUCTION METHODS:

Excavation and Subgrade Preparation

These items shall include excavation and disposal of the existing material and the fine grading and compaction of the sub-base prior to placement of HMA base. A jack hammer or saw cut shall be used at the beginning of each excavation and at all "back-of-sidewalk" limits in order to avoid damage to abutting properties and features which are to remain.

If the existing material is unsuitable or more material is needed for sub-base, additional material shall be installed and paid for under Item 151 Gravel Borrow as directed by the Engineer. If the existing material is brick, the City reserves the right to direct the Contractor to deliver the bricks to a specified site within the City at no additional cost. No existing brick shall be reused in the performance of these items.

In areas where sidewalks are to be constructed in present roadway areas, the full depth of existing pavement shall be completely removed. Excavation of existing hot mix asphalt, brick and concrete pavements as required for the work of this section is included under these items.

Where new sidewalk abuts existing-to-remain sidewalk, the limit of work shall be established at the existing nearest existing contraction or expansion joint, where a neat sawcut shall be provided.

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

The Contractor shall exercise special care when excavating near trees. When major roots are in the way, the Contractor shall go under or between them. In no case shall the Contractor disturb the root structure of the trees without direction from the City Arborist. Exposed roots shall be covered promptly. Excavation of all tree wells shall be done entirely by hand.

All existing traffic signs, trash and recycling receptacles within the limit of work and deemed salvageable by the Engineer shall be removed and delivered to the Cambridge Traffic Department or Cambridge Department of Public Works as directed by the Engineer. All existing sign posts shall be removed and properly disposed of by the Contractor. All trash and recycling receptacles deemed unsalvageable by the Engineer shall be removed and properly disposed of by the Contractor. This work shall be incidental to the various sidewalk items.

New traffic and street name sign posts, including new bases, shall be installed and paid for under Items 847.1 and 874. The work shall be sequenced such that regulatory sign messages shall be continuously maintained throughout construction.

The sub-base shall be prepared at the appropriate elevation for the depth of sidewalk to be installed. The sub-base shall be graded to follow the proposed sidewalk elevations shown on the Drawings. At locations where no proposed grades are indicated, the sub-base shall be graded to allow for sidewalks to be sloped from the City right of way towards the street at 1/8 inch to the foot, or as directed by the Engineer.

The Contractor shall raise all water curb stop boxes to final grade and coordinate raising of other public and private utility boxes prior to placing HMA base. The Contractor shall remove material from curb stop boxes with compressed air, after raising is complete and prior to pouring of concrete. Prior to placing HMA base, the Contractor shall go over locations where curb boxes have been raised with the Engineer.

Proper subgrade compaction shall be obtained by means of plate-type mechanical compactors. The material shall be compacted 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 C.

#### HMA Base and Setting Bed Placement

The HMA base shall be placed in accordance with the applicable requirements of Section 400 of the MassDOT Standard Specifications.

Asphalt prime coat and sand-asphalt setting bed shall be applied only when the base material is thoroughly dry and weather conditions will allow application of these materials and brick paving before adverse temperature drops to 35 degrees F or precipitation of any type may occur. Contractor shall schedule application of these materials when temperature drops or precipitation are not expected for 48 hours. Forecasts shall be based upon National Weather Service (NOAA website: [www.noaa.gov](http://www.noaa.gov)). Contractor shall provide a printout of forecasted weather to the Engineer for approval prior to application of these materials.

Apply prime coat of emulsified asphalt to HMA base.

In the placement of the sand-asphalt setting bed over the surface of the HMA base, ¾ inch deep solid steel depth control bars shall be placed directly over the base. If grades must be adjusted, set wood chocks under depth control bars to proper grade. Depth control bars greater than ¾ inch deep may be used in these areas. Set bars parallel to each other to serve as guides for the striking board. The depth control bars shall not be set carefully to bring the bricks, when laid, to proper grade.

Place sand-asphalt bed between the parallel depth control bars. Pull this bed with the striking board over these bars several times. After each passage, low porous spots shall be showered with fresh sand-asphalt material to produce a smooth, firm, and even setting bed. As soon as this initial panel is completed, advance the first bar to the next position in readiness for striking the next panel. Carefully fill depressions that remain after removing the depth control bars and wood checks.

The setting bed shall be rolled with a power roller to a nominal depth of  $\frac{3}{4}$  inch while still hot. This thickness shall be adjusted so that when the bricks are placed and compacted, the top surface of the bricks will be at the required finished grade.

#### Brick Installation

A coating of mastic adhesive shall be applied by mopping, squeezing, or trowelling over the top surface of the setting bed so as to provide a bond under the bricks. If it is trowelled, the trowel shall be serrated with serration not to exceed 1/16 inch.

After the indicated setting materials or mastic is applied, install all indicated bricks to the patterns and grades indicated on the Contract Drawings with hand-tight joints and a uniform top surface. There shall be no deviation from indicated true grade greater than 1/4 inch in 10 feet. All finished paved areas shall slope to drain at a minimum of  $\frac{1}{8}$  inch per foot. Wet saw is required for cutting of bricks and filling in pieces where needed. Cutting bricks in place with wet saw is not allowed. No other method will be acceptable. All adjacent surfaces such as curb tops, manhole/handhole covers and rims, tree grates, etc. shall be absolutely flush with brick paving surfaces after compaction. 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. Brick pavers shall be tamped with manual equipment in tight areas to assure tight bonding with setting material.

Work shall proceed within an area only when that area can be completed within the work period. Secure all loose materials and provide temporary accessible edges of partially completed areas of brick that will be accessible to the public.

Newly laid bricks shall be protected at all times by panels of plywood. These may be advanced as work progresses; however, the plywood protection shall be left in areas that will be subjected to continued movement of materials and equipment. All necessary precautions shall be taken in order to avoid depressions and protect brick alignment.

After the brick pavers are in place, when the brick is thoroughly dry, apply dry sand/cement and sweep into the joint voids around the bricks. Re-apply a minimum of three times until all the voids are filled and sweep away all extraneous material.

Prior to acceptance, the brick paved area shall be flooded with water to assure that there are no depressions. Remove and reset bricks as required until surface is true to line and grade. Refill stone dust joints as necessary until all joints are filled to finish grade.

Sidewalks shall be installed in strict conformance with the layout and grades shown on the Drawings, current Americans with Disabilities Act (ADA) and Massachusetts Architectural Access Board (AAB) regulations; and the applicable details of the Massachusetts Highway Department (MHD) Wheelchair Ramp Standards (latest edition).

The Contractor shall establish grade elevations at all sidewalk locations. The Contractor shall use a digital "Smart Level" to check all sub-base grades for compliance prior to installation of bricks. The Contractor shall not proceed with brick installation on a sidewalk that is out of compliance without first contacting the Engineer.

At all driveways, joints and transition sections which define grade changes shall be formed, staked and checked prior to placing bricks. All grade changes are to be made at joints. At driveways, a joint shall be located between the sloping portion of the driveway (15% maximum slope), and the level area where pedestrians will cross the driveway (1.5% maximum cross slope).

“Don’t Dump” Placards:

The work of this Section shall also include the installation of Cast Iron or Steel “Don’t Dump” placards, where new sidewalks abut existing or proposed catch basins and inlets. The placards will be furnished by the City at no cost to the Contractor, for installation by the Contractor.

COMPENSATION:

Brick walk will be measured by the square yard, complete in place.

Payment for work under these items shall be at the contract unit price per square yard and shall include full compensation for sawcutting, excavation, (including removal of existing pavement in present roadway areas), disposal of construction debris (existing sidewalk, concrete, brick, asphalt, etc.), preparation of subbase, raising of water corporation stop boxes, hot mix asphalt base, new bricks, sand-asphalt setting bed, iron edge, expansion joints and sealant, installation of “Don’t Dump” placards, labor, tools, equipment, and any other incidentals necessary for the satisfactory completion of this work as specified.

All existing traffic signs, within the limit of work and deemed salvageable by the Engineer shall be removed and delivered to the Cambridge Traffic Department. All existing sign posts shall be removed and properly disposed of by the Contractor. This work shall be incidental to the various brick sidewalk items.

The Engineer reserves the right to extend any sidewalk limit of work shown on the plans up to an additional fifteen (15) feet, in order to connect to an existing ADA-compliant sidewalk. The Contractor will be compensated at the appropriate contract unit price for such increased quantities.

Notes on Exclusions: Disposal of any excavated soil is not included for payment under this item and shall be paid for separately. Changes necessitated to private property due to changes in grade of the sidewalk are not included for payment under this item and shall be paid for separately under the appropriate items; for example: asphalt driveways, granite curb, fencing.

<b>ITEM 707.9</b>	<b>BICYCLE RING AND POST</b>	<b>EACH</b>
<b>ITEM 707.11</b>	<b>TRASH/RECYCLE COMBINATION COMPACTOR</b>	<b>EACH</b>

DESCRIPTION

This section specifies requirements for miscellaneous site furniture as shown on the Contract Drawings and as listed below.

Submittals

The Contractor shall provide the following submittals:

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Manufacturer's product literature: Submit manufacturer's material and installation instructions. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details and maintenance data. Supply Certificate of Compliance for all materials required for fabrication and installation.

## MATERIALS

### Concrete Bases, Slabs and Foundations

Concrete for foundations shall be 4000 psi 28 day compressive strength with 3/4" aggregate in compliance with requirements of Section 900 of the Standard Specifications. The Contractor shall submit shop drawings detailing the concrete foundation as per this specification.

Reinforcing steel 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 A185, fabricated from as-drawn steel wire into flat sheets.
5. Reinforcing shall be uncoated unless indicated otherwise on the Contract Drawings.

### Gravel Sub-Base

Gravel subbase for site furnishings shall comply with the requirements of M1.03.0 Type B gravel borrow of the Standard Specifications.

### Bicycle Ring and Post

Bicycle Ring and Post shall be "Bike Hitch" model as manufactured by DERO Bike Racks, Cycle-Safe, Inc. or DuMor or approved equal. Centerbeam shall be 2" schedule 40 pipe (2.375" OD) and the ring shall be 1.5" OD, 11 gauge tube with an outside diameter of 16.5". Finish shall be hot dipped galvanized. The finish color shall be black. All attached hardware shall be galvanized.

### Trash/Recycling Combination Compactor

Shall be Big Belly Single Stream Recycling Compactor as manufactured by Big Belly Solar, 50 Brook Road, Needham, MA, (888) 820-0300, or approved equivalent. Color shall be black, as approved by the City. Volume of each unit shall be 32 gallons, City of Cambridge Standard.

### Non-Shrink Grout

Non-shrink epoxy grout shall be Five Star Epoxy Grout as manufactured by Five Star Products, Fairfield, CT; Sika Corp. Lyndhurst, NJ or Fosroc-Preco Industries Ltd, Plainview, NJ.

### Sealants

Sealant shall be a polyurethane-based, one component, elastomeric sealant complying with Federal Spec. TT-S-00230C, Class A Type 1 for horizontal use and Type 2 for vertical use. Color shall match the color of the adjacent materials as approved by the Engineer. Sealants shall be self leveling pour grade type for horizontal use and non-sag grade type for vertical use. Application of sealant for site improvements shall be in accordance with approved manufacturer's recommendations.

## **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

For horizontal use:

1. Vulkem 45, as manufactured by Mameko International, Cleveland, Ohio.
2. Urexpan NR-201, as manufactured by Pecora Corporation and supplied by Waldo Bros., Boston, MA
3. PRC-6006, as manufactured by Products Research and Chemical Corporation Gloucester City, NJ.

For vertical use:

1. Vulkem 45, as manufactured by Mameko International, Cleveland, Ohio.
2. Sikaflex 1-A, as manufactured by Sika Corp., East Hartford, CT.
3. Dynatrol 1, as manufactured by Pecora Corporation, Philadelphia, PA.

### CONSTRUCTION METHODS

All site furniture shall be fastened in accordance with the Drawings and per the manufacturer's recommendations. All Site Furniture shall be installed in a level, plumb condition, true to the lines and grades show on plans. The bike ring and post shall be vertical with a tolerance of +/-1 degree.

Two magnetic levels affixed to the rack post shall be used in the field to ensure this tolerance is met.

The Contractor shall be responsible for timing the delivery of all items so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism.

Cast-in-place concrete base and footings shall be installed in conformance with the requirements of Section 900 of the Standard Specifications.

Bicycle Ring and Post shall be embedded in a concrete foundation 20" in diameter and 12" deep. Embedment into concrete shall be a minimum 6". Set the bottom of the post such that the top of the post sits 35" above finished grade. Note that the concrete foundation shall be used in lieu of hot mix asphalt in brick sidewalk locations and that the top of the foundation is to be set at the bottom of the standard 3/4" sand/asphalt setting bed.

Non-shrink grout for anchor bolts shall be installed as shown on Drawings and in conformance with manufacturer's instructions.

Sealant for anchor bolts shall be installed as shown on the Drawings and in conformance with manufacturer's instructions.

All bike rings and posts shall be fabricated and fastened in accordance with these specifications and per the manufacturer's recommendations. All bike rings and shall be installed in a level, plumb condition, true to the lines and grades shown on the detail drawings. Welding shall conform to the current standards of the AWS. Metal shall not be primed, painted, or galvanized before welding.

### Special Requirements

The following special construction method requirements are in addition to the general requirements listed above.

The Engineer shall provide the Contractor with the proposed locations of bike rings and posts. The Contractor shall then stake locations of proposed bike ring posts for approval by the Engineer. Following acceptance of staked locations, the Contractor shall install posts and bike rings per manufacturer's recommendations, and apply sealant around posts to seal the opening in the surrounding pavement.

**MEASUREMENT AND PAYMENT**

Items 707.9, 707.10, 707.101 and 707.11 ITEM 707.9 will be measured PER EACH installed complete-in-place including excavation, surface mounting appurtenances, pipe, hardware, concrete, reinforcement, concrete slab and footings, blocking, solid surfacing and all which price and payment shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work, and construction methods.

**ITEM 715.1 MAIL BOX REMOVED AND RESET EACH**

**DESCRIPTION**

The work under this Item shall conform to the relevant provisions of Section 715 of the Standard Specifications and the following.

Contractor shall coordinate with the United States Postal Service (USPS) Post Master General for the removal, relocation and resetting of USPS mailboxes. The Contractor shall remove and reset the USPS mailboxes if the USPS is unable to do so, under the direction and agreement with the United States Postal Service.

The Contractor shall carefully remove all existing mailboxes as shown on the Drawings and as directed by the Engineer.

Mailboxes shall be satisfactorily stored and protected until reset in the proposed work.

Mailboxes and concrete support foundation lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new material at no additional cost. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

**COMPENSATION**

Mail box removed and reset will be measured for payment per each, complete in place.

Mail box removed and reset will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

**ITEM 748.00 MOBILIZATION LUMP SUM**

**DESCRIPTION**

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:

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

Installing temporary construction power, wiring, and lighting facilities.  
Developing construction water supply.  
Providing on-site sanitary facilities and potable water facilities.  
Arranging for and erection of Contractor's work and storage yard(s).  
Having all OSHA required notices and establishment of safety programs.  
Having the Contractor's superintendent at the job site full time.  
Submitting initial submittals.

### COMPENSATION

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 2 percent of the Total Amount of Bid.

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, furnishing office trailers fully equipped and supplied; 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 City 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 751**

### **LOAM BORROW**

### **CUBIC YARD**

Work to be done under this item shall conform to the relevant provisions of Section 751 of the Standard Specifications and to the following:

### DESCRIPTION

The work of this Section consists of all loaming work and related items as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:

1. Fine grading and loaming for lawn areas

### Definitions

The following related items are included herein and shall mean:

1. AOAC: Association of Official Agricultural Chemists

### Samples and Submittals

## **CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

At least thirty (30) days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with requirements of these specifications. Do not order materials until Engineer's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples.

1. Loam Borrow: The Contractor shall provide a one (1) cubic foot representative sample from each proposed source for testing, analysis, and approval. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Engineer and pay all costs. Testing reports shall include the following tests and recommendations.
  - a) Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. A hydrometer shall be used to determine percent of clay and silt.
  - b) Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
  - c) Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).
  - d) Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a public extension service or a private testing laboratory approved by the Engineer.
  - e) Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for fertilizing and liming applications to support successful turf growth.
  - f) All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists.
2. Peat: Submit a one (1) cubic foot sample and supplier's certification of contents.
3. All additives needed to amend a specific soil in order to meet these specifications.

#### Examination of Conditions

- A. All areas to be loamed and fine graded shall be inspected by the Contractor before starting work. Any defects shall be reported to the Engineer prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be loamed and fine graded, and he shall assume full responsibility for the work of this Section.

#### MATERIALS

##### Loam

- A. Loam shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one inch (1"), lumps, plants and their roots, debris and other extraneous matter as determined by the Engineer.

B. Loam shall have the following mechanical properties:

<u>Textural Class</u>	<u>% of Total Weight</u>	<u>Average %</u>
Sand (0.05 - 2.0 mm dia. range)	45 - 75	60
Silt (0.002-0.05 mm dia. range)	15 - 35	25
Clay (less than 0.002 mm dia. range)	5 - 20	15

C. Loam shall have an acidity range of pH 6.0 to pH 6.5 and shall contain not less than 4% nor more than 8% organic matter, as certified by required tests.

D. All loam proposed for use shall be tested for conformance to the specifications.

Soil Additives

A. Commercial fertilizer, peat, humus or other additives shall be used to counteract soil deficiencies as recommended by the soil test analysis, and as specified seeding supplements.

B. Commercial fertilizer shall be a product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers which shall bear the manufacturer's certificate of compliance covering analysis which shall be furnished to the Engineer. At least 50% by weight of the nitrogen content shall be derived from organic materials. Fertilizer shall contain not less than the percentages of weight of ingredients as follows or as recommended by the soil analysis:

<u>Nitrogen</u>	<u>Phosphorus</u>	<u>Potash</u>
10%	6%	4%

C. Humus shall be manufactured leaf compost. It shall be free from hard lumps and in a shredded or granular form. The acidity range shall be approximately 5.5 pH to 7.6 pH and the organic matter shall be not less than 65%. The minimum water absorbing ability shall be 200% by weight on an oven-dry basis.

D. Peat moss shall be composed of the partly decomposed stems and leaves of any of several species of sphagnum moss. It shall be free from wood, decomposed colloidal residue and other foreign matter. It shall have an acidity range of 3.5 pH to 5.5 pH as determined in accordance with the methods of testing of A.O.A.C., latest edition. Its water absorbing ability shall be a minimum of 1,100% by weight on an oven-dry basis.

E. Sand shall consist of hard, durable grains of quartz or other rock, clean and free from foreign matter or chemical contamination.

F. Ground limestone for adjustment of loam pH shall contain not less than eighty five percent (85%) of total carbonates and shall be ground to such fineness that forty percent (40%) will pass through 100 mesh sieve and ninety five (95%) will pass through a 20 mesh sieve. Contractor shall be aware of loam pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations. Ground limestone shall not be applied at a rate greater than two hundred pounds (200 lbs.)/one thousand (1,000) square feet incorporated into the soil, or fifty pounds (50 lbs.) of limestone/one thousand (1,000) square feet, surface application, per season.

- G. Sulphur shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis and net weight appearing on each container.
- H. Superphosphate: Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

## CONSTRUCTION METHODS

### Establishment of Subgrade/Subsoil

- A. In areas which are to receive loam borrow, all existing pavement, unsuitable materials, boulders, trash,, debris, etc. shall be removed to a minimum depth of 18-inches below final surface grade. Resultant voids shall then be backfilled with loosely compacted gravel borrow to an elevation equal to the proposed bottom of loam.

### Fine Grading and Loaming

- A. Contractor shall obtain Engineer's written approval of previously completed rough grading work prior to commencing loam placement work. Prior to spreading of loam, subgrades which are too compact to drain water or are too compact based upon compaction tests shall be ripped with a claw twelve inches (12") deep, pulled by a bulldozer 2'-0" on center, both directions. Contractor shall then regrade surface.
- B. Immediately prior to dumping and spreading the loam, the subgrade shall be cleaned of all stones greater than two inches (2") and all debris or rubbish. Such material shall be removed from the site.
- C. Loam or topsoil shall be placed and spread over approved areas to a depth sufficiently greater than four inches (4") so that after natural settlement and light rolling, a minimum four inch (4") compacted loam depth will have been provided and the completed work will conform to the lines, grades and elevations indicated. Supply additional loam, after testing and approval, as may be needed to give the specified depths and finished grades under the contract without additional cost to the City.
- D. Disturbed areas outside the limit of seeding shall be spread with a minimum of four inches (4") of loam to the finished grade.
- E. No subsoil or loam shall be handled in any way if it is in a wet or frozen condition.
- F. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Grades shall be established which are accurate to one-tenth of a foot (1/10') either way. Connect contours and spot elevations with an even slope.
- G. After loam has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove all stones over one inch (1") in diameter from the top three inches (3") of the loam bed. Loam shall also be free of smaller stones in excessive quantities as determined by the Engineer.
- H. The whole surface shall then be compacted with a roller or other suitable means to achieve a maximum dry density of 88 to 90 percent for the placed loam in accordance with compaction standards of ASTM D1557 Method D. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional loam and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.





COMPENSATION

Measurement and payment for the work under Item 775. shall be as specified in Section 910 of the project specifications (Technical Specifications for Tree Planting). Slow release watering bags (1 per tree) will be considered incidental to this item.

Measurement and payment for the work under Items 776 through 779. shall be by the unit Each. The unit bid price per each item shall constitute full compensation for providing materials, equipment, labor and incidentals required to perform the work of these Items, including but not limited to coordinating the work with other relevant items; locating sources of plants; excavation; furnishing and installing plant materials and mulch; providing potable water; performing initial pruning; providing inspection and maintenance on plant materials and replacing dead plants during guarantee period; resetting plants which have settled during guarantee period.

**ITEM 804.11                      ELECTRICAL CONDUIT (DOUBLE)                      FOOT**  
**CONCRETE ENCASED (LIGHTING)**

DESCRIPTION:

Work to be done under these items shall consist of performing trench excavation and backfill operations, as well as furnishing and installing PVC (polyvinyl chloride) conduit and fittings. All installations shall be encased in a minimum of 3” of concrete as shown on the drawings. This work shall be performed in accordance with the National Electrical Code, the details shown in the Contract Specifications and as may be directed by the Engineer.

Note: As indicated on the drawings, it is the intent of this project to use the existing lighting handhole and conduit system to the maximum extent possible. It is anticipated that the majority of new conduit to be furnished and installed under this Contract will be new 2-inch diameter laterals between existing handholes and new light bases.

Conduits between lighting control enclosures or utility manhole to electric hand holes or lighting control enclosures shall be 4 inches.

Conduits between hand holes and light bases or receptacles shall be 2 inches.

MATERIALS:

Rigid non-metallic conduit and fittings shall be high-quality polyvinyl chloride conduit (PVC). PVC conduit shall be heavy-wall Type 40, shall conform to industry standards and Commercial Standard CS207-60, shall be listed by Underwriters' Laboratories for direct burial underground use, and shall conform to or exceed all property requirements of UL651 and NEMA TC-2, 1970. All conduit shall be furnished with plain ends.

CONSTRUCTION METHODS:

The perimeter of the paved area to be removed for conduit installation shall be sawcut.

The depth of excavation shall be sufficient to allow passing the conduit beneath curb as necessary and encasing the conduits as specified herein and as shown on the plans. Conduits shall have a minimum of thirty inches (30") of cover in the public way. Any deviation from this requirement must be approved by the City of Cambridge Electrical Department and Engineer prior to installation.

Porous base material shall be wet as directed before placing the concrete. Unless otherwise directed, the concrete shall be compacted to the level as shown on the plans.

A 6-inch wide magnetic marker tape shall be placed approximately 2-feet above underground conduit. This tape shall be colored and serve as a warning device to personnel who may be involved in future excavations that 600 volt cable is located below and should be avoided if possible. It will serve as a general warning that hand digging is required beyond this point in order that the rigid non-metallic conduit below the tape is not damaged or otherwise penetrated.

PVC conduit shall be jointed by means of solvent cement joints. Conduit shall be cut square and deburred. All surfaces shall be wiped clean and dry. Using a natural bristle brush of width about equal to conduit size, the Contractor shall apply a coat of cement to the outside of the conduit end. (Note: Cement should be flowed on and not brushed out). Conduit and coupling shall then be firmly pressed together and the fitting turned a quarter turn to distribute the cement evenly. The time elapsed between applying the cement and completing the joint should not exceed 60 seconds. All conduit and fittings shall be watertight.

All conduits shall be free of foreign materials prior to the installation of conductors

A polypropylene or nylon pull rope shall be installed in all empty conduits.

Conduits shall be sealed after installation, prior to installing conductors.

#### COMPENSATION:

The items of this subsection will be measured by the foot installed complete, which price and payment shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work, excavation, concrete, backfill, compaction, surface restoration and construction methods.

Payment for work under these items shall include full compensation for sawcutting; excavation of existing pavement in roadway areas and asphalt, brick and concrete sidewalk pavements; and disposal of construction debris (existing sidewalk, concrete, brick, asphalt, etc.). Encased conduit runs will be paid for under the appropriate bid item based only on the number of conduits in the run, regardless of individual conduit size or sizes in the run.

No separate payment shall be made for marking tape, pull rope, concrete, or any incidental materials, but all costs in connection therewith shall be included in the Contract unit price per foot for these Items.

#### NOTES ON EXCLUSIONS:

Disposal of any excavated soil not suitable for re-use is not included for payment under this item and shall be paid for separately.

<b>ITEM 811.11</b>	<b>ELECTRIC HANDHOLE (LIGHTING)</b>	<b>EACH</b>
<b>ITEM 811.37</b>	<b>ELECTRIC HANDHOLE (ADJUSTED)</b>	<b>EACH</b>

Note: As indicated on the drawings, it is the intent of this project to use the existing lighting handhole and conduit system to the maximum extent possible. New handholes shall be furnished and installed under this Item only where indicated on the Drawings, or as directed by the Engineer.

MATERIALS:

Handholes for lighting shall be precast reinforced concrete in accordance with Section 801 of the MassDOT Standard Specifications, and shall conform to the details shown on the Drawings and the following:

Precast handhole units for lighting shall be 12”W x 24”L x 20”-33” D and shall otherwise meet the requirements of MassDOT Standard Specifications Section M4.02.14. Covers shall be clearly marked “LIGHTING”. Frames shall include threaded opening for a grounding lug, and a 3/8”-16 x 1 1/8” UL listed grounding lug.

CONSTRUCTION METHODS:

In general, the locations of lighting handholes are shown diagrammatically on the drawings. In general, it is the intent that a lighting handhole with ground rod be located between two adjacent light fixtures.

A handhole must be installed prior to the streetlight control cabinet for the service connection. No conductors other than the service entrance conductors shall be permitted in this handhole.

Each lighting installation shall be fused in the handhole associated with the fixtures. Fusing shall be provided by means of an in-line fuse holder, Tron HEB Series Single Pole Breakaway or approved equal, 10 ampere fuse. No fusing shall be allowed in the base of light poles.

COMPENSATION

Item 811.27 will be measured by the unit Each installed complete, which price and payment shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work, excavation, backfill, compaction, surface restoration and construction methods.

Payment for work under these items shall constitute full compensation for sawcutting; excavation of existing pavement in roadway areas and asphalt, brick and concrete sidewalk pavements; and disposal of construction debris (existing sidewalk, concrete, brick, asphalt, etc.).

NOTES ON EXCLUSIONS:

Disposal of any excavated soil not suitable for re-use is not included for payment under this item and shall be paid for separately.

<b>ITEM 813.10</b>	<b>WIRE - NO. 10</b>	<b>FOOT</b>
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**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

## DESCRIPTION

Provisions shall be made for wiring of the service entrance from the service panel board to the handholes and to each light fixture or receptacle, and for wiring of a continuous ground from the lighting circuit breakers to all handholes.

## MATERIALS

The minimum size wire from the circuit breaker to all hand holes shall be Two (2) No.1A.W.G. type THHN copper. 1 Black, 1 White and 1 No.8 A.W.G. THHN copper. Green for grounding conductor

The minimum size wire from the handholes to each light fixture luminaire, shall be two No. 10 A.W.G. type THHN copper for each service and one No. 10 A.W.G. type THHN copper for grounding. 1 Black, 1 White and 1 Green for grounding conductor

The minimum size wire from the handholes to each receptacle mounted at top of light pole, shall be two No. 10 A.W.G. type THHN copper for each service and one No. 10 A.W.G. type THHN copper for grounding. 1 Black, 1 White and 1 Green for grounding conductor

The minimum size grounding conductor from handhole or light fixture to ground rod shall be No. 4 AWG THHN copper with an approved type connection at each ground rod and light fixture.

Wires shall be continuous where practicable and where splices are made pressure connectors suitable for the purpose shall be used.

## CONSTRUCTION METHODS

Runs of wire and cable from the handholes to each light fixture shall be continuous with no splices except as required for branch connections. Splices, where required, shall be made in the handholes with compression type fittings suitable for the application. Shop drawings of the compression splice fittings shall be submitted for approval, by the Engineer, prior to any order being placed.

Runs of wire and cable from the lighting load center to the handholes shall be continuous with no splices except as required for branch connections. Splices, where required, shall be made in the handholes with compression type fittings suitable for the application. Shop drawings of the compression splice fittings shall be submitted for approval, by the Engineer, prior to any order being placed.

## COMPENSATION

Item 813.10 will be measured by the Each installed complete, which price and payment shall constitute full compensation for complete compliance with requirements of this item, including all labor, equipment, materials, tools, incidental work, and construction methods.

**ITEM 813.71**

**GROUND ROD 8 FT. LONG**

**EACH**

## DESCRIPTION:

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

00900-075



**ITEM 832.10                      WARNING-REGULATORY AND ROUTE                      SQUARE FOOT  
MARKER – ALUMINUM PANEL (TYPE A)**

Work to be done under this item shall conform to the relevant provisions of Section 828 of Standard Specifications and to the following:

The location, number and legend of new signs which are required shall be as shown on the Drawings or as directed by the Engineer. Signs will be mounted on posts which are furnished and paid for under Item 877.

The work under this Item includes all hardware, brackets, bolts, labor, etc. necessary to attach new sign panels to posts furnished under Item 877.

Signs

The legend, border, and background of sign panels (except as modified below) shall be Type “C”, permanently applied legend, or Type "D", silk screen processed, according to the requirements of Section M9.30.0 of the Standard Specifications, Type III or Type IV.

Compensation

Signs will be measured for payment as specified in Section 828 of the Standard Specifications. Object Markers will also be measured and paid for under this Item.

Payment for work under this item shall be at the contract unit price per square foot, and shall include full compensation for all labor, materials, equipment, and other incidentals necessary for the satisfactory completion of the work as specified.

**ITEM 850                      TRAFFIC AND PEDESTRIAN MANAGEMENT                      LUMP SUM**

DESCRIPTION

Work to be done under this item shall conform to the relevant provisions of Section 850 of the MassDOT Standard Specifications and to the following:

Work under this Item consists of developing and submitting traffic management plans; and furnishing, installing, relocating, maintaining in proper operating condition, and removing various traffic control devices for the protection of the traveling public and working personnel during construction and maintenance operations.

The design, application, and installation of all devices shall conform to:

- The detailed conditions specified in Paragraph 5 Traffic Control of Section 825 Supplemental Conditions of the Contract Documents;
- City of Cambridge standards, MassDOT’s “Standard Details and Drawings for the Development of Temporary Traffic Control Plans” and the “Manual on Uniform Traffic Control Devices” latest edition, Part VI, hereinafter referred to as MUTCD, and/or as directed.

The Contractor shall be responsible for the installation of adequate safety precautions for the protection of the traveling public and all project personnel. All construction vehicles not protected by any form of traffic control

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**

device on portions of the project which are open to traffic shall have an amber flashing light mounted on the cab roof or on the highest practical point of the machinery. The light shall be in operation whenever the equipment is working on the highway or travelway. Amber flashers must be a minimum of 40 candelas and have a flashing frequency of 50 to 60 times per minute. Either rotating beacons or strobe lights meeting these requirements are acceptable.

All materials provided by the Contractor under the items of this section shall remain the property of the Contractor upon completion of the project, unless otherwise specified below.

All work under this Section shall conform to the approved Temporary Traffic Control Plans, which shall be updated as needed by the Contractor throughout the life of the Project.

Work under this Item also includes providing 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 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.

#### COMPENSATION

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.

No payments shall be made during extended work shutdowns. An example of this would be winter shut down.

#### BASIS OF PAYMENT / INCLUSIONS

Payment for Traffic and Pedestrian Management shall be based on the lump sum price bid for this item in the proposal. Under the lump sum price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required to provide, maintain, relocate, and remove Traffic and Pedestrian Management in areas directly or indirectly influenced by construction within the limits of work or outside the limits of work; along truck routes inside or outside the limits of work; as delineated in the approved Traffic and Pedestrian Management Plan, by the MUTCD, ADA, MA AAB, and MassDOT standards; and as further required by the City and Engineer.

The work includes but is not limited to: fabrication of signage; furnishing and installing signage; mounting and securing signage; maintaining signage; protecting and storing signage not in use; relocating signage; removal of signage.

The work further includes, but is not limited to: obtaining permits; coordination with the City Department of Public Works and Traffic and Parking Department; coordination with private property owners within the limits of work; preparing, submitting, reviewing, implementing, and revising traffic management and control plans; work zone layouts, installing, and maintaining traffic management devices based on approved traffic management

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and control plans including precast concrete and/or triplex barriers with fencing and plywood panels, reflectorized drums, lane delineators, portable barricades, temporary crosswalks, and cones; temporary pavement markings; removal of temporary and existing pavement markings; furnishing, installing, shimming, pinning, maintaining, and removing steel road plates; furnishing, installing, and removing cold patch pavement as necessary or as directed by the Engineer; ordering and coordinating police details; furnishing and installing temporary construction fencing; maintaining roadways and sidewalks inside or outside the limits of work including sweeping and snow plowing locations where the work prevents municipal sweeping and plowing; 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; portable changeable message boards; temporary signal reconfiguration, and Police Details. Police Details will be paid directly by the City.

Signage damaged as a result of misuse or improper handling shall be replaced by the Contractor at no additional cost to the City.

<b>ITEM 864.04</b>	<b>PAVEMENT ARROWS AND LEGENDS - REFL. WHITE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>
<b>ITEM 865.1</b>	<b>CROSS WALKS AND STOP LINES REFL. WHITE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>
<b>ITEM 866.04</b>	<b>6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>
<b>ITEM 866.12</b>	<b>12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>
<b>ITEM 866.24</b>	<b>24 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>
<b>ITEM 867.06</b>	<b>6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC)</b>	<b>SQUARE FOOT</b>

Work to be done under this item shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

**CONSTRUCTION METHODS**

Broken lines through intersections are indicated only graphically on the Drawings. Actual pattern shall be 4-foot line and 4-foot space.

Pavement markings shall not be installed until a minimum of 15 days after final paving is completed. The Contractor shall notify the City of Cambridge Traffic Engineer at least 72 hours in advance of scheduled pavement marking installation. The exact location of pavement markings will be determined by the City’s Traffic Engineer at the time of installation. The City’s Traffic Engineer or representative must be present to supervise the pavement marking operations.

See Section 00850 of the Specifications for additional schedule requirements and restrictions.

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## COMPENSATION

Reflectorized pavement markings will be measured and paid for as specified in Section 860 of the Standard Specifications, except the quantity of broken lines shall be 1/3 of the end-to-end length of the line.

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**SIGN AND POST**

**EACH**

### DESCRIPTION:

Work to be done under this item shall conform to the relevant provisions of Section 840 of the Standard Specifications and to the following:

Work to be done under this item shall consist of furnishing and installing new traffic and street sign posts as shown on the Drawings, as directed by the Engineer and in conformance with City of Cambridge Department of Traffic, Parking and Transportation specifications.

### MATERIALS:

#### Posts:

New traffic sign posts shall be galvanized steel "U-channel" posts conforming to Section M8.18.6 of the Standard Specifications, in particular the Standard Special Provisions dated December 16, 2011, except minimum post weight shall be 3 lbs/foot.

### CONSTRUCTION METHODS:

It is critical that traffic sign posts not impede accessible pedestrian access. The Contractor shall install signposts in locations shown on the Drawings, and at additional locations as directed by the Engineer, prior to installation of sidewalk. In general, sign posts located in sidewalk areas shall be located 24" from the front of curb face. All sign post locations shall be verified in the field with the Engineer prior to placement.

Care shall be taken to install sign post bases in the appropriate direction for sign attachments and proper viewing. All signs shall be installed as high as possible on post with no sign being lower than 7 feet from final sidewalk grade. Sign bases shall be protected with safety barriers prior to installation of signposts. The Contractor shall install signposts and attach signs within 24 hours after sidewalk installation.

#### Traffic Signs Removed and Reset:

Where signs are to be removed and reset, as indicated on the Drawings or as directed by the Engineer, the work shall be considered incidental to the related sidewalk item. The Contractor shall be responsible for temporary storage of non-regulatory signs until they are ready to be reset. Regulatory signs shall remain in place at all times, either at their existing or new location as appropriate for the stage of construction. Temporary regulatory signs shall be utilized during any time that permanent regulatory signs need to be removed for construction and cannot be permanently reset at new location.

The Engineer will determine if the existing signs and post are in adequate condition for reinstallation. If signs or post or both are in poor condition, the Engineer will notify the Contractor to stack the signs on-site for future

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Cambridge Traffic Department disposal, and posts shall be disposed of by the Contractor. The Contractor will furnish and install new signs and posts, which will be paid for under the appropriate items of the Contract.

Signs Removed and Stacked:

Where signs are indicated to be removed and stacked, as indicated on the Drawings or as directed by the Engineer, the Contractor shall carefully remove the existing sign from the post, dispose of the existing sign post, and deliver the sign to the Department of Traffic, Parking and Transportation yard at 59 First Street, Cambridge. This work shall be considered incidental to the related sidewalk item.

COMPENSATION:

Traffic sign supports shall be measured by the unit each, complete in place.

Payment for work under this item shall be at the contract unit price per each and shall include full compensation for all labor, materials, equipment, and other incidentals necessary for the satisfactory completion of the work as specified.

**ITEM 995**

**PUBLIC RESTROOM**

**Lump Sum**

DESCRIPTION

The work under this item shall conform to the relevant provisions of Section 995 and any other relevant sections of the Commonwealth of Massachusetts "Standard Specifications", Massachusetts State Plumbing Code, Massachusetts State Electric Code and the City of Cambridge Standard Details.

The work shall consist of the installation of a pre-fabricated stainless steel stand alone restroom such as the Portland Loo (<http://www.portlandoregon.gov/bes/59293>, 503-823-7104) or approved equal. This work shall also include all excavation, backfill, grading, stone, footers, concrete pad, and utility connections from the restroom to the foundation.

MATERIALS AND CONSTRUCTION METHODS

CONCRETE FOUNDATION

Concrete for this structure shall meet the requirements of Section 701 Cement Concrete Masonry. Structure shall be suitable for H20 loading and be stamped by a professional engineer. The concrete pad is required to be at a minimum 1'-6" thick with #6 rebar at 12" on-center. The rebar shall be placed at a minimum 3" from the face of the concrete. The pad width is 6'-8" and 11'-3" long. All proposed utilities, 2" PVC electrical conduit, 1-1/4" copper domestic water pipe, and 4" PVC waste line, shall be sleeved through the concrete foundation with 2' of pipe exposed above the concrete pad as shown per plan. Refer to Section 347.15 for 1-1/2 domestic copper water main, section 237.04 for 4" PVC pipe, and section 804.11 for 4" PVC electrical conduit. A 10" x 10" area around the 4" waste line shall be tapered down 2" to the waste line to allow for proper connection.

PUBLIC RESTROOM

The restroom should be constructed of heavy gauge stainless steel with powder coating and graffiti resistant finish. The wall panels should be 1/4" thick, 316L –grade stainless steel for added saline and weather resistance. The metal support tubes shall be constructed of 304-1 stainless steel. The overall all dimension of the restroom shall not exceed 10'-7" length x 6' wide x 8'-6" tall. The restroom will have a curved entry with a radius of 2'-8.5" to the center of the post. Louvered panels shall be at the top and the bottom of the restroom. The lower louvered

**CENTRAL SQUARE AND PEARL STREET RECONSTRUCTION**



occurs at every location throughout the entire length of the contract to ensure that no sediment enters the city’s storm water or sewer system.

The Contractor shall install a “Silt-Sack®” or equal in every Catch Basin within and downstream of the projects limits. The Contractor shall submit manufacturer’s literature describing products, installation procedures and routine maintenance of the sediment filter device. Samples for Verification Purposes: Submit one (1) sample of a sediment filter device as produced by the manufacturer for the City’s Approval

These devices will be manufactured to fit the opening of the catch basin or drop inlet. The devices will have the following features: two dump straps attached at the bottom to facilitate the emptying of the device and shall have lifting loops as an integral part of the system to be used to lift the device from the basin and shall have a restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this yellow cord is also a visual means of indicating when the sack should be emptied. Once the strap is covered with sediment, it should be emptied, cleaned and placed back into the basin.

The contractor shall install the sediment filter before any work begins and shall place the device so that it is flush with the material around the frame of the grate of the Catch Basin structure. The contractor shall be responsible for the maintenance and placement of the strap lift holes to ensure that they do not become a hazard for pedestrians.

The contractor must maintain the device and remove the collected debris as directed by the Engineer. If any material is lost in the removal of the sediment filter then the contractor shall be responsible for the cleaning of the Catch Basin. The contractor must inspect the position of the device to ensure that the sediment filter device will work properly during any heavy rain or any storm greater than a 10 year flood

**MATERIALS**

Minimum Requirements for catch basin inlet protection:

<b>Regular Flow Inlet Protection</b>	
<b>Physical property</b>	<b>Requirements</b>
Filtering efficiency	75%-85% (minimum): highly dependent on local conditions
Grab Tensile	390 LBS
Grab Elongation	30% (minimum)
Puncture	120 LBS
Mullen Burst	600 PSI
Trapezoid Tear	120 LBS
UV Resistance	90%
Apparent Opening	40 US Sieve
Flow Rate	40 Gal/Min/ft^2
Permittivity	0.55 Sec^-1

<b>High Flow Inlet Protection</b>	
<b>Physical property</b>	<b>Requirements</b>



directed by the Engineer. The Contractor shall check plan dimensions, alignment, and elevations for accuracy with existing field conditions. Any errors and apparent discrepancies shall be called to the Engineer's attention immediately by the Contractor for correction or interpretation prior to proceeding with the work.

The Contractor shall maintain neat, orderly and complete survey notes and computations used in establishing the lines and grades. The survey notes and computations shall be made available to the Engineer within 24 hours upon request as the work progresses. The Engineer may check the layout as established by the Contractor at any time as the work progresses. The Contractor will be informed of the results of these checks, but the Engineer by doing so in no way relieves the Contractor of its responsibility for the accuracy of the layout work. The Contractor shall correct or replace any deficient layout and construction work which may be the result of inaccuracies in the Contractor's layout at no additional cost to the City.

Staking work shall be completed sufficiently in advance of construction to allow the Engineer to review elevations and make adjustments to proposed grades if required.

Curb, Curb Ramps, Sidewalks and Driveways: Construction stakes for curbing and sidewalks shall be placed at a maximum 25 ft interval. Additional stakes shall be set and maintained as necessary to achieve the required accuracy and to satisfy the Contractors' method of operations. Also, additional construction stakes shall be set as necessary to establish the location and grade of curb, curb ramps, sidewalks and driveways including points of change in alignment and grade.

Additional stakes shall also be set along the back of sidewalk at each side of building entries and steps.

All construction stakes shall be located to within 0.02 ft. of the true horizontal position and shall establish the grade elevation to within 0.01 ft of the true vertical position.

#### COMPENSATION

Payment for Item 999 will be at the contract lump sum price bid, which shall constitute full compensation for the work as specified herein, including but not limited to furnishing all labor, tools, stakes, flags, pins, equipment and incidentals necessary to complete the work.

No payments shall be made during extended work shutdowns. An example of this would be winter shut down.

All survey notes and computations used in establishing the required lines and grades shall be given to the Engineer within 21 days of completing work under the above item and must be received before final payment for the work will be made.

## SECTION 00910

### TREE PLANTING PREPARATION

#### PART 1 – GENERAL

##### 1.01 SCOPE OF WORK

###### A. General:

- 1. Work shall consist of furnishing all labor, materials, equipment and transportation required to complete all the planting preparation work in strict accordance with these specifications and applicable drawings. Work shall include, but not be limited to:**
  - a. Submitting samples of materials and analyses for approval.**
  - b. Securing necessary permits and approvals.**
  - c. Installing structural planting medium**
  - d. Back filling with planting soil within tree planting area.**
  - e. Installing Mulch in tree planting area**
- 2. The City of Cambridge reserves the right to work with its own work force or other Contractor(s) to install the tree plantings.**
- 3. The tree planting preparation will be performed by the requirements of the Contract Documents.**

##### 1.02 - 1.03 (NOT USED)

##### 1.04 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.
11. Occupational Safety & Health Administration- (OSHA) is the Federal agency responsible for insuring worker safety.

#### 1.05 SAMPLES AND SUBMITTALS

- A. **Upon award of the contract and at least thirty (30) days prior to intended use, the Contractor shall provide the following samples and submittals for approval. Do not order materials until Contract Supervisor's approval of submittal has been obtained. Delivered materials shall closely match the approved samples. Should the source of supply be changed within the course of the contract, the Contractor shall submit new samples or submittals for approval per the original submission.**
- B. Soils and Soil Management: Contractor shall make the following submittals and perform the following testing program on all on-site soils to be reused as backfill and on all off site borrow soils and material placed on the project. The cost of all submittals and testing stated below shall be incidental to the work and paid for by the Contractor.
  6. Independent Laboratory and Testing Company. Submit 4 weeks prior to start of excavation, evidence that the Laboratory/testing company is:
    - a. accredited by the American Associates of the State Highway and Transportation Officials (AASHTO)
    - b. Has minimum 3 years' experience in sampling, testing and analysis of soil and aggregates, and monitoring field compaction operations.
    - c. Able to provide 3 references from previous work.
  7. Submit to the City and the Engineer grain size analysis curve (ASTM D422) and compaction test results (ASTM D1557) for each proposed source of backfill including suitable on-site soil to be reused as backfill, for review two weeks prior to use of the material. Grain size analysis shall indicate that the backfill material conforms to the gradation requirements specified.
  8. Contaminant analysis for off-site borrow materials used. Each material imported shall be accompanied by a certification statement and analytical results. At a minimum, the certification shall state that 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 samples shall be

analyzed by a certified laboratory for total metals (EPA priority pollutant metals), volatile organic compounds (EPA Method 8270), petroleum hydrocarbons (EPA method 418.1), and Total PCB's and pesticides (EPA Method 8081 and 8082). On site soils designated as suitable for reuse can be reused as backfill without providing certification required above.

**C. Planting soil: At least 30 days prior to ordering materials, the Contractor shall submit to the Owner's Representative representative samples, certifications, manufacturer's literature and certified test results for proposed planting soil.**

**D. Structural Planting Medium: At least 30 days prior to ordering materials, the Contractor shall submit to the Owner's Representative representative samples, certifications, manufacturer's literature and certified test results for proposed structural planting medium.**

1.06 (NOT USED)

PART 2 – PRODUCTS

2.01 PLANTING SOILS

**A. Contractor shall provide all planting soil required to complete the planting operation. Planting soil shall be a natural, fertile, friable loam typical of cultivated planting soil of the locality, containing at least 10% and not more than 20% decayed organic matter (humus). Planting soil shall be free of sub-soil, stones greater than one and one-quarter inches, earth clods, sticks, stumps, clay lumps, roots, or other objectionable, extraneous matter or debris. Planting soil shall not be by test either excessively acid or alkaline nor contain toxic substances. Planting soil shall not be delivered or used for planting while in a frozen or muddy condition.**

B. Soil for planting trees shall be one of the following sandy loams; “course sandy loam”, “sandy loam”, and “fine sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil. Planting soil for trees shall have the following grain size distribution for material passing the #10 sieve:

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
2	-----	100
1	100	80
0.5	87	67
0.25	78	48
0.10	68	30
0.05	55	22
0.002	7	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.

2. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6.0 or less. ( $D_{80}/D_{30} < 6.0$ )

C. Name of planting soil supplier and sample to be approved by the City Arborist.

## 2.02 STRUCTURAL PLANTING MEDIUM (“SPM”)

- A. In specific areas designated in the Contract Documents the soil underlying the pavement cross section and the granular base material will be replaced with a material designed to structurally support the pavement slab and promote the root growth of street trees. This soil will be called Structural Planting Medium in this Section and shall be a mixture of Sand, Base Loam and Compost. Structural Planting Medium shall be the manufactured product of a commercial processing facility specializing in the production of manufactured soils and loam borrow. Structural Planting Medium shall be manufactured from sands, loams and compost, in accordance with the requirements of this Section. Structural Planting Medium shall be manufactured outside the Project limits and transported onto the Project for placement.
- B. The Structural Planting Medium shall consist of a blend of four parts by volume of Sand, one part by volume of Planting Soil and one part by volume of Compost. Blending of the components shall be carried out with earth moving equipment prior to placement. The components shall be blended to create a uniform mixture as determined by the Owner's Representative.
- C. Structural Planting Medium gradation shall be determined by the Soil and Plant Tissue Laboratory, University of Massachusetts, Amherst, using H<sub>2</sub>O<sub>2</sub> to destroy organic matter. Structural Planting Medium shall conform to the following grain size distribution for material passing the #4 sieve:

<u>U.S. Sieve No.</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
#4	---	100
#10	81	100
#20	57	88
#40	27	57
#100	11	24
#200	08	12
.002mm	01	02

- D. Structural Planting Medium shall not contain less than 1.5 percent nor more than 3.0 percent organic matter as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours).
- E. The acidity range of the Structural Planting Medium shall be pH 5.5 to 6.5. Structural Planting Medium shall have a starting pH of no lower than 5.0 at the manufacturing site.
- F. Structural planting medium shall be pH adjusted as required for planting of trees and shall be adjusted prior to delivery to the Project sites in accordance with recommendations by UMASS Soil & Plant Tissue Laboratory.

1. When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.
  2. When pH of loam borrow is less than 7 use either sulphur or ferrous sulfate to adjust pH downward to required levels.
  3. When pH of loam borrow must be raised to the required levels use limestone.
  4. Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by planting time.
- G. Structural Planting Medium shall be free of debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve Number 10 material). Soil shall not have levels of Aluminum greater than 200 parts per million.
- H. No Structural Planting Medium shall be delivered to the site until the review and approval of soil test results and recommendations by the Owner's Representative, but such approval shall not constitute final acceptance. The Owner's Representative will reject any material delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

2.03– 2.04 (NOT USED)

#### 2.05 MULCH

- A. Mulch shall be high quality, shredded or double-ground, premium bark mulch consisting of clean, organic plant material.
- B. Shall be uniform in color, a good brown color. The composition of the shredded pine bark material shall not exhibit a noticeable degree of any color change characteristics when wet.**
- C. The mulch must be free of dirt, insects, disease and extraneous debris that would be harmful to all trees being installed.**
- D. The shredded pine bark mulch material shall not have an unpleasant odor.**
- E. Bark Mulch shall be a well-graded material conforming to the following:
1. pH between 4.0 – 8.0
  2. Particle size 100% passing a 50mm (2 inch) screen
  3. Soluble salt content < 4.0 mmhos/cm
- F. Prior to the Contractor ordering shredded pine bark mulch material, the Contractor shall submit to the City Arborist, at the Contractor's expense, one cubic foot sample of the shredded pine bark mulch material. The Contractor shall not order any delivery of the shredded pine bark mulch material until the Contractor's sample has been inspected and approved by the City Arborist.**
- G. If the City Arborist disapproves of the sample submitted by the Contractor, then the Contractor shall continue at no expense to the City, to obtain other sources of pine**

**bark mulch material as specified until the Contractor's sample of such material, meets with the City Arborist's approval.**

## PART 3- EXECUTION

### **3.01 – 3.02 (NOT USED)**

#### 3.03 STRUCTURAL PLANTING MEDIUM: EXCAVATION, FILLING AND COMPACTION

- A. Perform percolation tests on existing subsoils or placed fill prior to placing and spreading Structural Planting Medium:
  - 1. Perform percolation testing of subsoil or placed fills to determine whether or not the subgrade will drain properly. Perform percolation tests in accordance with the requirements for percolation testing for each lift of SPM described in Section 3.04.
  - 2. In the event that percolation testing indicates that the subsoil, placed fills or ordinary borrow has been over compacted and will not drain, the Contractor shall loosen up the top 36 inches of the subsoil, ordinary borrow, special borrow or gravel borrow by ripping or other mechanical means. Re-compact the borrow by driving a small, tracked bulldozer over the area at low speeds so that the tracks of the bulldozer pass over the affected area and the soil is compacted to a density that will percolate in accordance with this Section.
  - 3. Perform sufficient percolation tests in areas of poorly draining or compacted subsoil or compacted placed fills as directed by the Owner's Representative to ensure that these underlying soils do not drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.
- B. Excavate or fill subsoil or ordinary borrow as required by the Owner's Representative to achieve the elevations of the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures.
- C. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents. Provide a written report to the Owner's Representative and the Owner's Representative that the subgrade has been placed to the required elevations and that the subgrade drains water in accordance with the required percolation tests. Perform no work of placing and spreading Structural Planting Medium until elevations have been confirmed and written report has been accepted by the Owner's Representative.
- D. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site

and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

- E. Do not proceed with the installation of Structural Planting Medium until all utility work in the area has been installed.
- F. Protect adjacent walls, walks and utilities from damage or staining by the Structural Planting Medium. Use one-half inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface no later than the end of each working day.

### 3.04 STRUCTURAL PLANTING MEDIUM: PLACEMENT

- A. Immediately prior to placing and spreading the Structural Planting Medium, the subgrade shall be cleaned of all stones greater than 2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Notify the Owner's Representative that the subsoil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading Structural Planting Medium.
- B. Structural Planting Medium delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that remain on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Owner's Representative and surrounded by silt fence installed in accordance with the Division 1 Section 01560, TEMPORARY ENVIRONMENTAL CONTROLS, of this Specification.
- C. Structural Planting Medium shall be sampled and tested in accordance with the requirements of this Section to verify application and incorporation of limestone, fertilizer and other soil amendments.
- D. Soil additives shall be spread and thoroughly incorporated into the layer of Structural Planting Medium by harrowing or other methods reviewed by the Owner's Representative.
- E. No Structural Planting Medium shall be handled or installed in any way if it is in a wet or frozen condition. A moist Structural Planting Medium is desirable.
- F. Sufficient grade stakes shall be set for checking the finished grades. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- G. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional Structural Planting Medium and the surface shall be re-graded and rolled until presenting a smooth and even finish corresponding to the required grades.
- H. Structural Planting Medium shall be spread in lifts not greater than 6 inches and compacted with a minimum of 2 passes of vibratory compaction equipment to a density between 92 and

94 percent Modified Proctor Maximum Dry Density in accordance with compaction standards of ASTM D1557 Method D. During the compaction process, all depressions caused by settlement or compaction shall be filled with additional Structural Planting Medium and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

- I. Phase the installation of the Structural Planting Medium such that wheeled equipment does not have to travel over already installed soil. If it is determined by the Owner's Representative that equipment must travel over already installed Structural Planting Medium, provide one inch thick steel plate ballast over the length and width of travel to cover Structural Planting Medium and protect it from compaction.
- J. Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The Structural Planting Medium in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of the Structural Planting Medium installation, it should offer a firm, even resistance when a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:
  - 1. Dig a hole in the installed soil that is a minimum of 4 inches in diameter, 4 inches deep. Do not penetrate through the lift being tested.
  - 2. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.
  - 3. In the event that the water drains at a rate less than one inch per hour, till the Structural Planting Medium to a depth required to break the over compaction.
  - 4. Perform a minimum of one percolation test per location as directed by the Owner's Representative.

3.05 – 3.11 (NOT USED)

### **3.12 PLANTING HOLE PREPARATION**

- A. Planting holes shall be filled with approved planting soil to required grades. Planting of trees will be by others under a separate City Planting Contract.**
- B. Surplus excavation and unsuitable material from the planting holes shall be removed from the site and either reused (if approved) or disposed of per the requirements of the Contract Documents.**
- C. Planting pits will require a minimum of 4' of walking space for sidewalk pedestrian traffic.**
- D. Tree wells shall be at least 16 square feet, 8'x2' or as directed by the City Arborist.**

3.13 to 3.18 (NOT USED)

3.19 MULCHING



**0902.3**

**MULCH**

**CUBIC YARD**

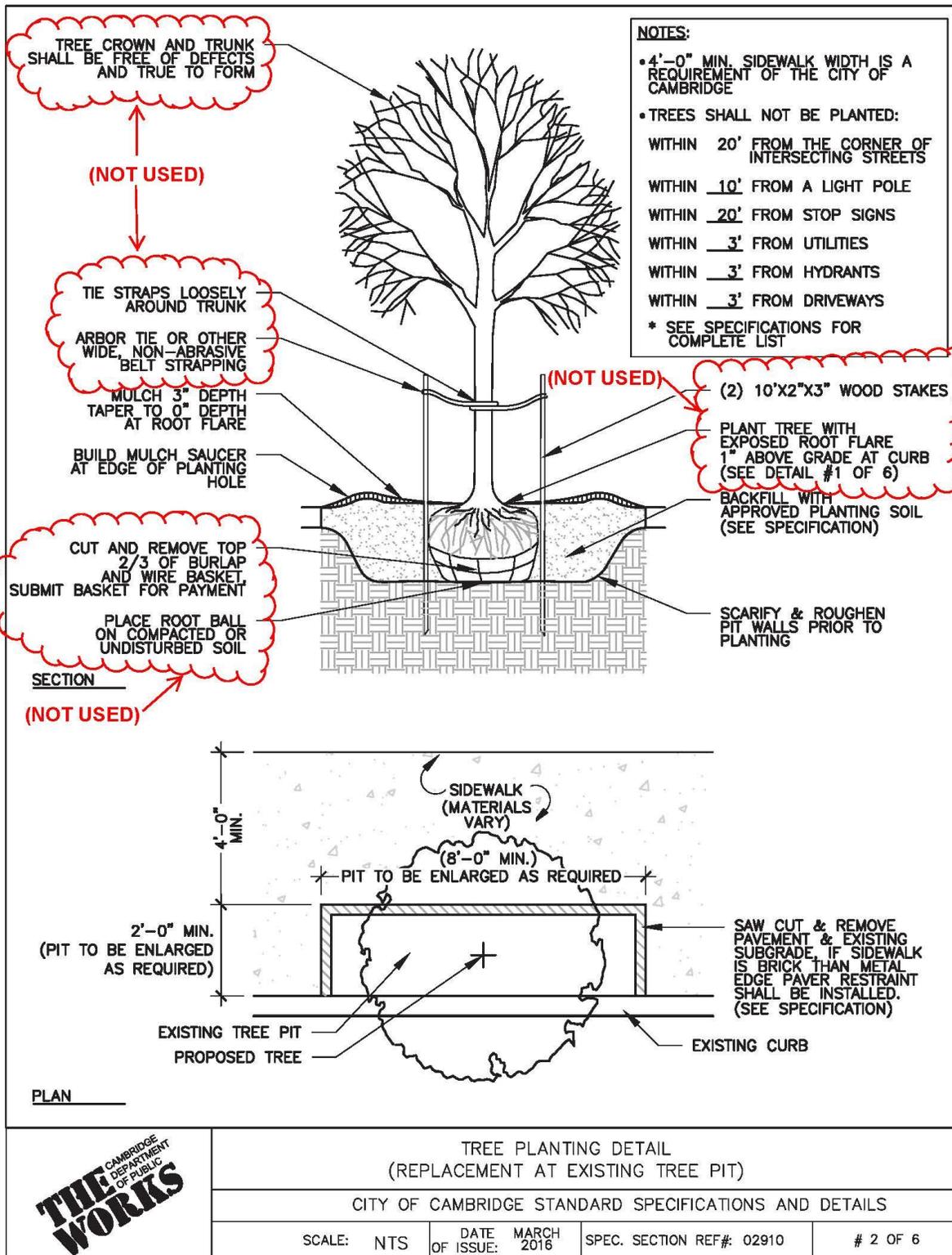
**METHOD OF MEASUREMENT:**

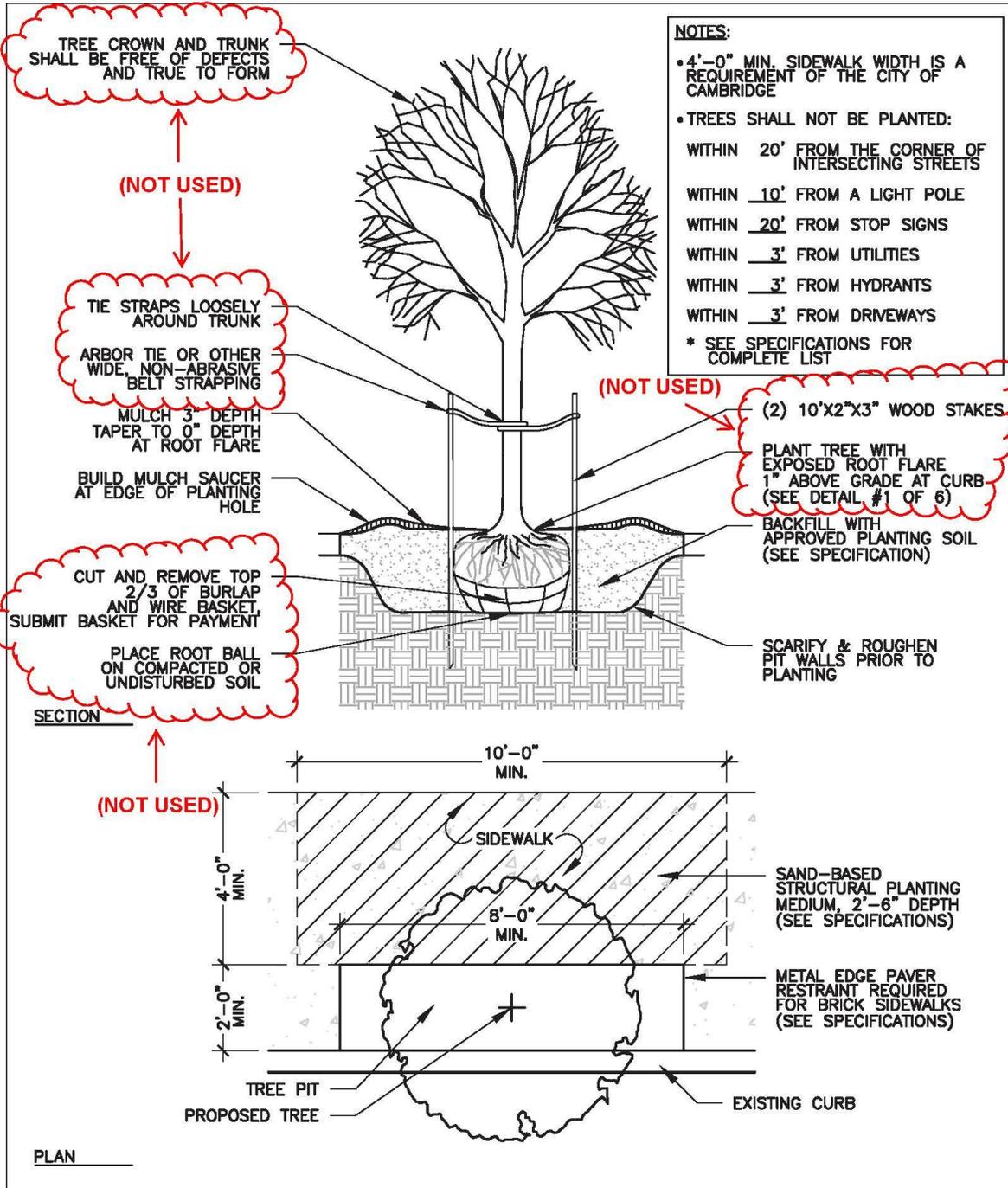
Measurement for Payment shall be based on the cubic yardage of Mulch installed by the Contractor as shown on the Contract Drawings and as directed by the Engineer, complete and in place.

**BASIS OF PAYMENT:**

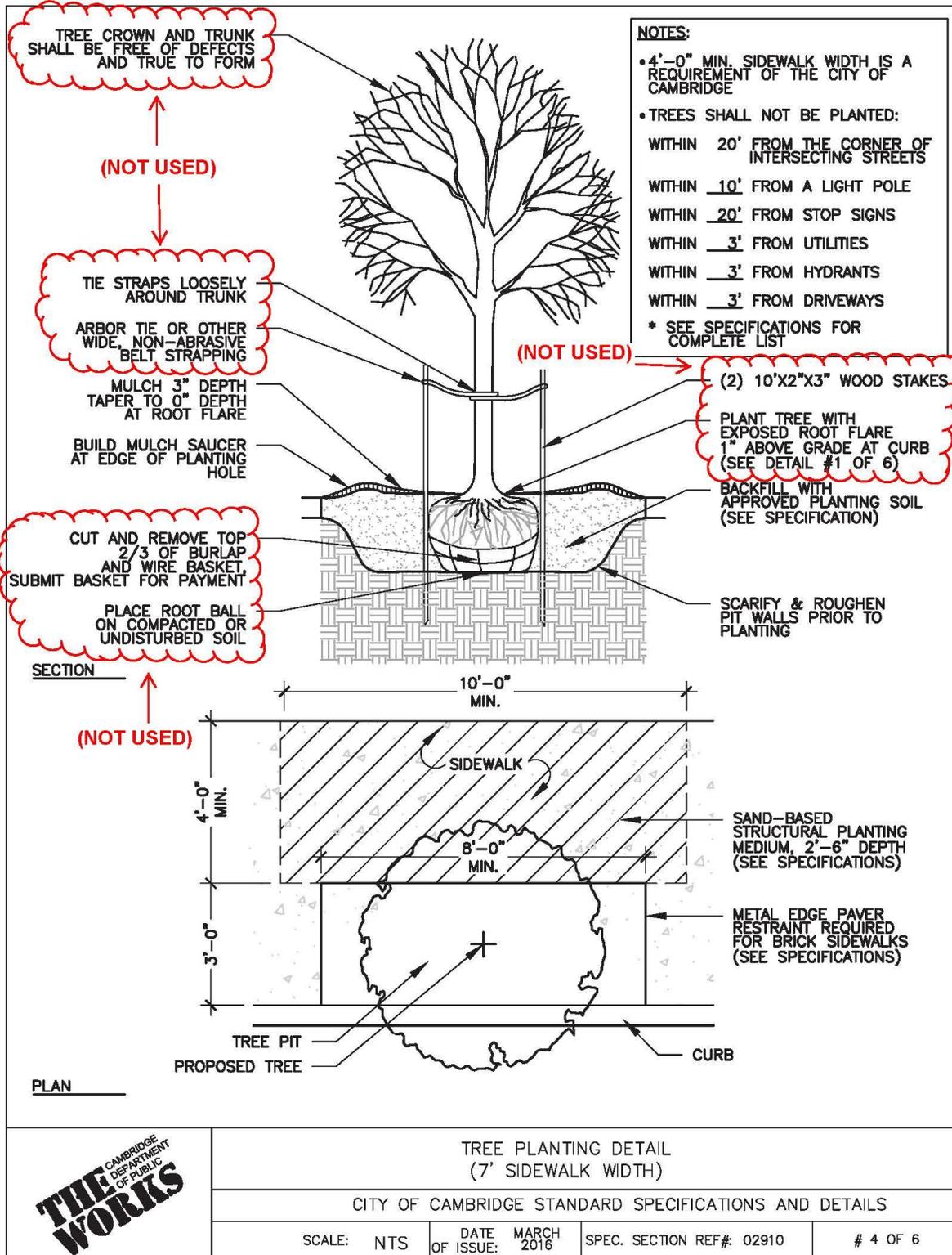
Payment for Mulch shall be based on the unit price bid for this item in the proposal. Under the unit price for this item, the Contractor shall furnish all labor, materials, tools, equipment, and incidentals required for the complete installation of Mulch as shown on the Contract Drawings or at the direction of the Engineer. The work includes, but is not limited to the following; testing, furnishing and installing Mulch; and all incidental work not included for payment elsewhere required to furnish and install Mulch whether included here or not.

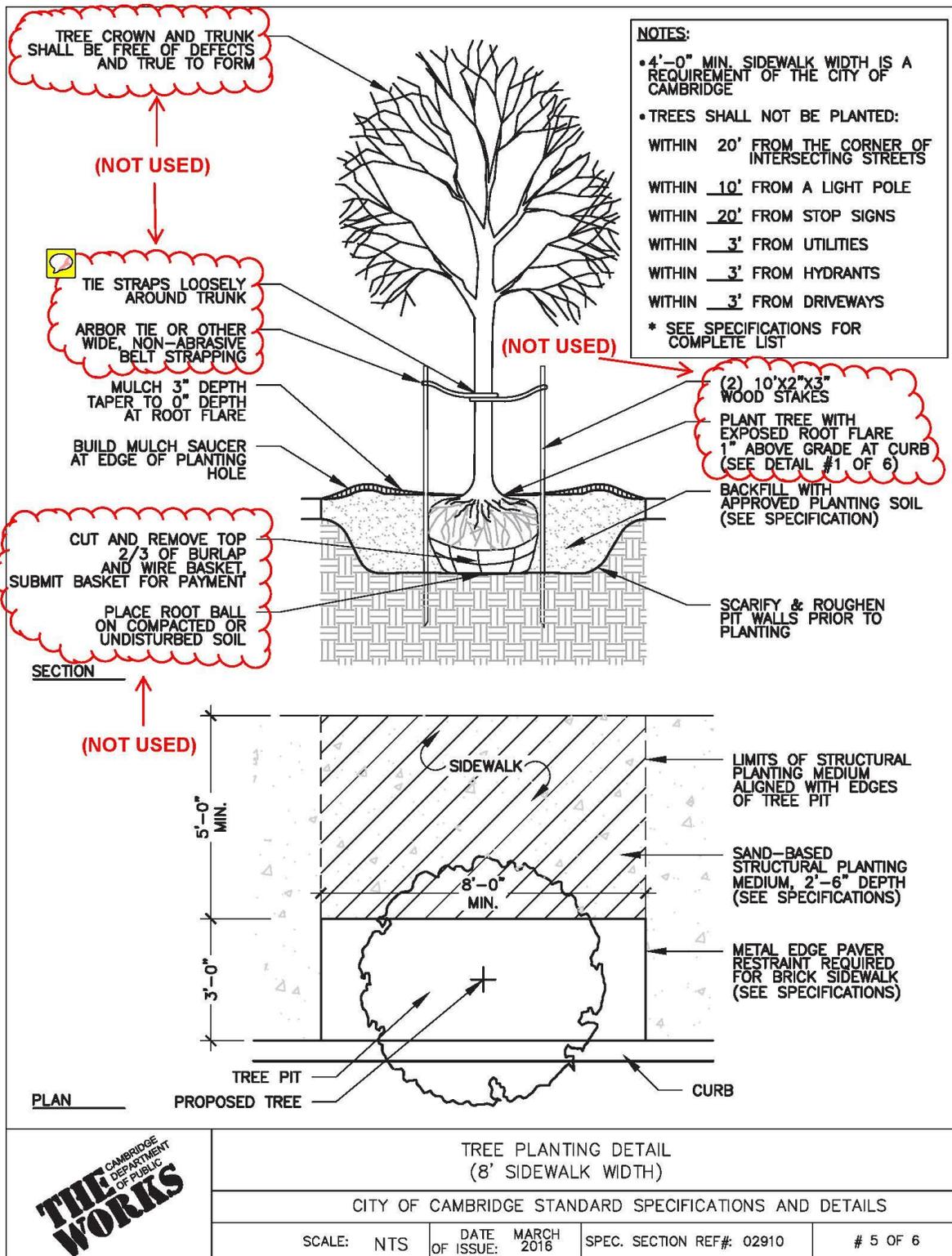
END OF SECTION 00910

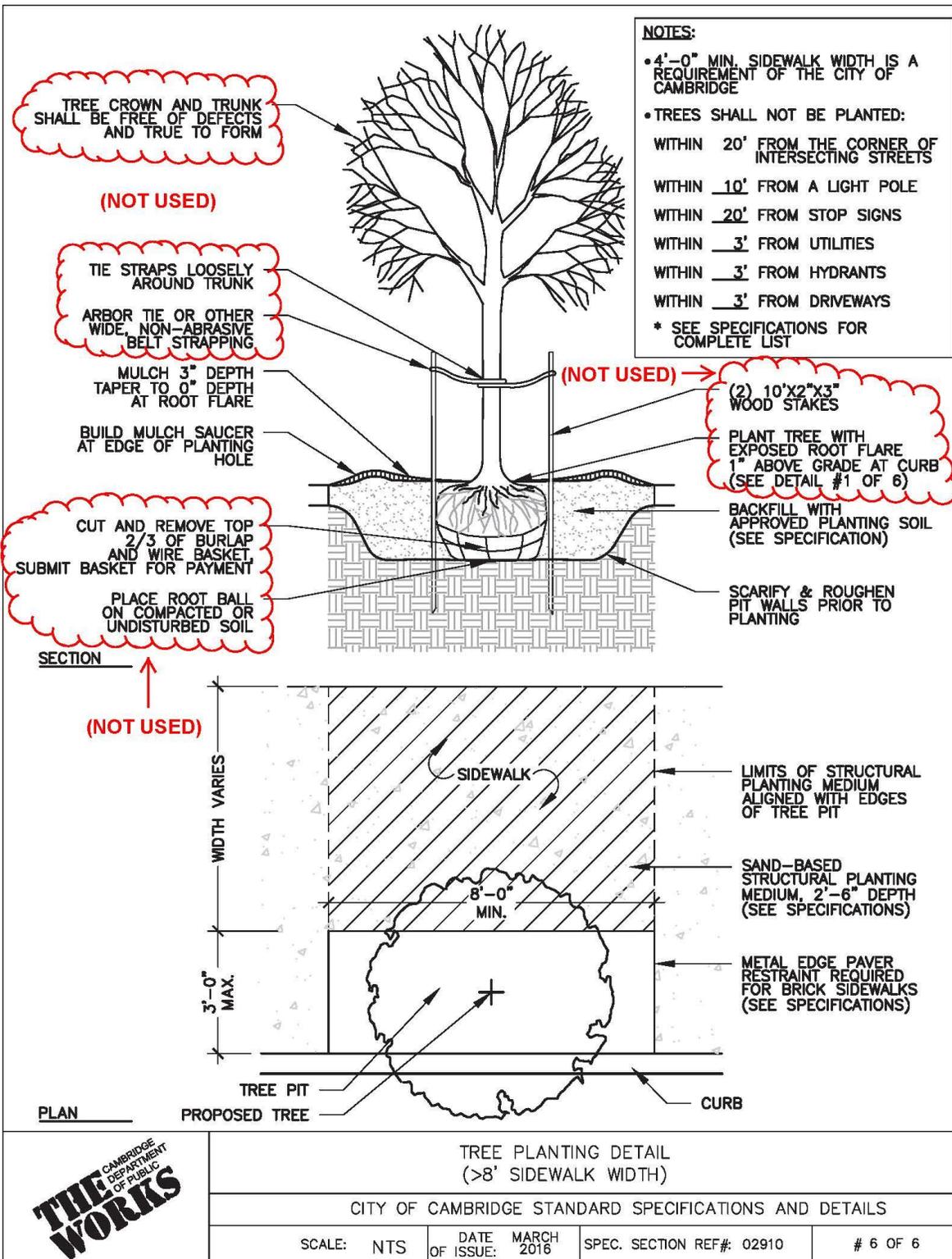




	<b>TREE PLANTING DETAIL</b> (6' SIDEWALK WIDTH)			
	CITY OF CAMBRIDGE STANDARD SPECIFICATIONS AND DETAILS			
	SCALE: NTS	DATE OF ISSUE: MARCH 2016	SPEC. SECTION REF#: 02910	# 3 OF 6







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, (\$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.

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 a 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 with 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 in complete.
2. The proper pruning (raise pruning) of low 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.
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 had tools and in such a fashion s 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.