SPECIAL PROVISIONS

BELMONT AND WATERTOWN
Roadway Reconstruction and Related Work (Including Traffic Signals)
on a Section of Trapelo Road/Belmont Street

Labor participation goals for this project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both contractor's and subcontractor's on-site construction workforce. Refer to document 00820 for details.

SCOPE OF WORK

All work done under this contract shall be in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 1988, the *English Supplemental Specifications* dated February 25, 2010, and the *Standard Special Provisions* contained in this book; the *2010 Construction Standard Details*, the *1996 Construction and Traffic Standard Details* (as relates to traffic standard details only); the *2003 Manual on Uniform Traffic Control Devices* with *Massachusetts Amendments*; the *1990 Standard Drawings for Signs and Supports*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Plans and these Special Provisions.
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The work to be done under this Contract consists of roadway widening and full depth reconstruction, pavement overlay, roadway drainage, sidewalk construction, relocation/installation of utility poles including MBTA poles, construction of traffic signals and the installation of signs, pavement markings and incidental work at Trapelo Road/Belmont Street in the Town of Belmont. The Contractor would be required to coordinate work with the MBTA which operates an electric trolley bus service along the Trapelo Road/Belmont Street corridor.

MBTA COORDINATION

It is brought to the Contractor's attention that the MBTA runs three transit systems within the project area:

- The commuter rail system that crosses under Lexington Street and Trapelo Road in Waverley Square and has a station in Waverley Square

- The diesel bus line #554 that runs between Waverley Square and Waltham traveling along Lexington Street and using Trapelo Road and Church Street with a stop on Trapelo Road

- The electric trolley line #73 that runs from Harvard Square and Waverley Square using Belmont Street and Trapelo Road. This is the line that will be most affected by the construction work and inversely will have the most affect on the construction work.

During the rush hours the electric trolleys that run along Trapelo Road and Belmont Street operate at five-minute intervals and have 14 stops in the eastbound direction and 15 stops in the westbound direction. The MBTA runs its transit systems on quarterly schedules the Contractor is required to obtain these schedules and be familiar with the MBTA operations.

The Power System - The electric trolleys are powered by unsheathed high voltage direct current wires that are suspended about eighteen feet above the roadway surface. These wires are supported over the roadway by a "catenary" system consisting of pairs of steel poles spaced at intervals of about 100 feet. This system extends from the Cambridge City line to Waverley Square. The unsheathed electric cables are supported over the roadway by a steel cable suspended between the pair of steel "catenary" poles on

either side of the roadway. They are fed by electric cables that are usually carried on top of the steel poles on one side of the roadway. In the commercial areas these feeder cables are usually in an underground system. No Construction equipment or personnel can come within ten feet of the power cables, sheathed or unsheathed, or five feet or the support wires, while the system is energized. The Contractor shall note that the MBTA power system is de-energized every Sunday when the MBTA operates diesel busses along this route. IF the power system needs to be de-energized for any time other than Sundays the MBTA will de-energize it on three-month intervals coinciding with their quarterly schedules. For this project the MBTA plans to de-energize the power on the overhead catenary line on Trapelo Road between Benton Square (the intersection of Trapelo Road and Belmont Street) and Waverley Square (Trapelo Road between Lexington Street and White Street) during the entire period of active construction using heavy equipment. Furthermore, the MBTA will also de-energize the power on the overhead catenary line on Belmont Street between the Cambridge City line and Benton Square during the period that the MBTA's summer schedule is in effect. This is a major inconvenience to the daily users of this line and the number of system closing must be kept to a minimum. The contractor must schedule his work to minimize the number of system closings and coordinate very closely with the MBTA's Power Division and inform them of the need to de-energize the system at least six weeks in advance of the beginning of the quarterly schedule that the contractor needs it closed for. The Contractor will also need to justify the closing. Prior to submitting his request to the MBTA he must have it reviewed and approved by the Engineer. The contact at the MBTA for the de-energizing of the power system shall be Katherine Berlin, 617-222-6133

Bus Stops – No two adjacent bus stops in a particular direction can be closed at the same time. The bus stops at Waverley Square and Benton Square (except Summer schedule) cannot be closed and will need to be relocated as approved by the Engineer and the MBTA. The MBTA shall be notified one week in advance of any planned closing of a bus stop. The contractor shall install signs at the bus stops that will be closed at least two days in advance of the proposed closing or relocation. The signs design of the signs shall be approved by the MBTA. The contact at the MBTA for the closing of bus stops shall be >>>>>

SUBSECTION 7.17 – TRAFFIC ACCOMMODATIONS

The Contractor shall do no work that will restrict traffic or close existing travel lanes during peak hourly volumes which occur between the hours of 7:00 AM to 8:30AM and 3:30 PM to 6:00 PM.

Upon commencement of construction, the Contractor shall submit the required work schedule to the Resident Engineer for distribution to the Town of Belmont.

TRAFFIC MANAGEMENT

The following conditions shall be followed unless otherwise required by the Engineer.

- At all times the Contractor shall maintain a minimum of one lane two-way travel on all streets, except where otherwise instructed or approved by the Engineer.

- At all times the Contractor shall keep one sidewalk open to pedestrians on either side of the street within the limits of the project.

- Reconstruction of intersections shall be carried out in a way such that all existing turning movements are maintained for local traffic.

- Pedestrian and vehicle access shall be maintained to all abutting properties except for very short periods of time that are not to exceed one hour. When it is necessary to deny access to a property, the owner shall be informed at least 48 hours in advance.

- Work involving fire hydrants shall be done in accordance with instructions from the Town of Belmont Public Works Department.

- Alternating fire hydrants shall be kept operative at all stages of the construction, unless otherwise required in writing by the Engineer. No fire hydrant shall be out of order for more than 12 hours.

UTILITY WORK

The Contractor shall not violate the 10-foot clearance perimeter around the overhead wire of the catenary system when energized. Furthermore, a 5-foot clearance perimeter is required to be adhered to around all elements of the catenary support system when energized.

Immediately following execution of this contract, the Contractor must arrange for completion of all utility works likely to interfere with the construction process, prior to commencement of the roadway work. Where utility works interfaces with the roadway work, the Contractor shall carry out his work concurrently and in conjunction with the utility companies involved with the project so as to provide for all possible co-operation towards the satisfactory completion of the work with minimum delay and inconvenience.

It should be noted that all underground utility work within a particular phase must be completed before excavation of the roadway in that phase can begin.

The Contractor is hereby made aware of the fact that there is a old, fragile 56" MWRA water supply conduit under the eastbound curb lane of Trapelo Road between Mill Street and Pleasant Street. This line is very shallow with little cover. The MWRA also has a smaller line in Common Street crossing Trapelo Road. The contractor must apply for an MWRA 8(m) permit prior to doing any work within 20 feet of these lines

Existing utility information shown on the drawings is believed to be correct but such information is not guaranteed and should be verified by the Contractor for exactness.

SUBSECTION 8.03 – PROSECUTION OF WORK

All underground utility work in the area must be all completed before roadway milling can begin.

Prior to milling and paving of the HMA Intermediate Course, all frames and grates or cover locations shall be located and referenced in order to install castings frames and grates or covers after the paving operations.

The pavement milling is to be performed over the full width without castings or obstructions.

The paving of the HMA Intermediate Course shall be over the entire milled surface without castings or gate boxes to provide for good compaction. The castings of the new proposed drainage structures and water gates shall not be installed until the surface course is ready to be placed unless so required by the Engineer or determined necessary to remove storm water runoff from the area to the degree it was before the new drainage system was installed. The removing and stacking of existing frames and grates and covers for most public utilities (Drainage, Sewer, MWRA, and MBTA) will be paid for under Item 223. Frame and Grate (or Cover) Removed and Stacked. The adjusting of all existing water gates to an elevation below that of the proposed milling will be paid for under Item 358 Gate Box Adjusted.

Once the HMA Intermediate Course is in place, only catch basins and those structures identified by the Engineer as required for the drainage of the roadway shall be installed to intermediate course grade. Setting the new and existing drainage structure castings to the intermediate course elevation will be paid for under Items 220. Drainage Structure Adjusted or 222.2 Frame and Grate (or Cover) Municipal Standard. Further adjustment of these structures to surface course grade will be paid for under Items 220.

Utility trenches over three feet in depth must have been in place for five months prior to milling. Utility trenches less than three feet in depth must have been in place three months before milling. Excavation must be squared-off at the end of each day.

The castings of all structures, which are required to be set or reset under this project, shall not be set complete in place to the final grade until after the intermediate course has been completed and surface course is scheduled to be completed within two weeks. Raised castings in the travel lanes of the intermediate course set to the surface course elevation shall be fitted with hard rubber ramps to protect raised castings.

Utility castings shall be exposed above intermediate course grade for not more than two (2) weeks before placement of surface course material is placed. This is a major inconvenience to the public; therefore, no work on this project shall be allowed to proceed until surface course placement has begun unless otherwise required by the Engineer.

The method of construction described above shall be maintained until the completion of the project. Intermediate course material shall be placed when there is sufficient distance to permit efficient placement operations. The surface course shall not be allowed to be placed until after the entire project has been completed to intermediate course level or as directed by the engineer.

CONSTRUCTION STAGING AND SCHEDULING

General Construction Stages

1. New Utility Installation

a. Within one month of the Contractor’s notice to proceed notify all private utilities of the preliminary schedule and what is expected of them and when relative to the adjusting and relocating of their facilities within the project area.

b. Excavate test pits at locations identified on the plans to determine if a conflict exists between the new utility installation and the existing utility. Report the results back to the Engineer. The Engineer will instruct the contractor as to the need to revise the plan for the proposed utility or have the existing utility relocated.

c. If the decision is to relocate the existing utility the contractor shall initiate this effort. The contractor will relocate any public utilities (drainage, water, sewer, MBTA) and give the private utilities (gas, telephone) and quasi public utilities (Belmont Municipal Electric Department) at least two months advance notice of the date they need to have their utility relocated by.

d. Utility trenches shall be repaired as shown on the plans and paid for under items xxx (asphalt, saw cut, tack coat).

e. No paving of the surface course shall occur until the trench has been allowed to settle as described hereinbefore.

2. Utility Work prior to Milling

a. Within one month of the Contractor's notice to proceed notify all private utilities of the preliminary schedule and what is expected of them and when relative to the adjusting and relocating of their facilities within the project area.

b. Locate all roadway utilities by survey

c. Notify all private utilities again within one month of the date their castings in the roadway will need to be adjusted or removed.

d. Remove all existing roadway drainage, sewer, and MBTA utilities castings and adjust the rim grade of existing gate boxes as specified under Item 415.

e. All roadway gate boxes shall be adjusted below the milled surface. It is not necessary to install a concrete collar during temporary adjustment in grade. A 1-inch thick compressible filler shall be placed on top of the cover to function as a bond breaker prior to the placement of temporary 6-inch depth of HMA. The bond breaker shall be incidental. HMA will be paid for under Item 472.

3. Roadway Milling

a. Mill roadway, half width at a time, the length of which shall be determined by the Contractor's ability to mill within a day's time. During the first half of the day operations, mill half of the roadway, and make the area suitable for traffic, while maintaining one lane of traffic in each direction.

b. During the second half of the day, switch traffic to the previously milled portion of roadway and repeat the sequence on the remaining section of roadway.

c. In residential areas parking will be restricted on both sides of the street during the milling operation. In the business areas parking will be eliminated only on one side of the roadway at a time except during the morning rush hour when traffic will be eliminated on both sides of the street. Milling operations in the business areas will start at 7:00 AM.

d. Only as much milling will be done in a week as can be overlaid with intermediate course material that same week.

4. Pavement Repair

a. Repair existing pavement base as required by the Engineer. This work will be paid for under items 151. and 451. as appropriate.

5. Intermediate Course

a. Place Superpave Intermediate Course as specified under Item 455.31.

6. Utility Work

a. After the Intermediate Course has been compacted, install the new and reset drainage frames and grates to the intermediated course grade. Only enough frames and grates shall be installed to provide at least the same level surface storm water runoff removal as was provided prior to construction.

7. Sidewalks and Islands

a. Reset and relocate existing curbing and install new curbing.

b. Construct sidewalks and raised islands

8. Utility Work

a. Advise the private utilities at least one month in advance of their need to have their castings adjusted to finish grade within a specified two week period.

b. Install all remaining public castings and adjust those already in the roadway to finish grade.

c. The above work shall be done in the two weeks immediately preceding the placement of the surface course

9. Surface Course

Place Superpave Surface Course as specified under Item 453.23.

NOTICE TO OWNERS OF UTILITIES

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations, and the Contractor shall at that time file a copy of such notice with the Engineer.

NAME	CONTACT PERSON	TELEPHONE
MassHighway District 4	Patricia A. Leavenworth	(781) 641-8300
519 Appleton Street	District Highway Director	
Arlington, MA 02476		
Town of Belmont	Glenn R. Clancy, PE	(617) 993-2650
Department of Public Works, Eng'g	Town Engineer	
19 Moore Street		
Belmont, MA 02478		
Belmont Fire Department	David L. Frizzell	(617) 993-2200
299 Trapelo Road	Fire Chief	
Belmont, MA 02478		
Belmont Police Department	Sgt Kevin Shea	(617) 993-2549
460 Concord Avenue	Traffic Safety Officer	
Belmont, MA 02478		
Town of Belmont	Jerry Schultz	(617) 993-2700
Water Department	Michael R. Bishop (Acting)	
35 Woodland Street		
Belmont, MA 02478		
Belmont Highway Department	Peter Castanino	(617) 993-2680
19 Moore Street		
Belmont, MA 02478		
Belmont Municipal Light Dept	Tim Richardson	(617) 993-2804
40 Prince Street		
Belmont, MA 02478		
MWRA - (Water Division)	Ralph Francesconi	(617) 305-5827
2 Griffin Way		
Chelsea, MA 02150		
MWRA (Sewer Division)	Kevin McKenna	(617) 305-5956
2 Griffin Way		
Chelsea, MA 02150		
Dept of Conservation & Recreation	Donald Guidoboni	(617) 626-1491
251 Causeway Street	Dir. Of Permitting	
Boston, MA 02114	Attn: Paul Trzcinski	

Verizon	Susete Seely	(781) 849-6311
125 Lundquist Drive		
Braintree, MA		
National Grid Gas	Dennis Peri	(781) 907-2836
40 Sylvan Road, 3rd Floor, E.3.661		
Waltham, MA 02451		
NSTAR Electric	Brian K. McDevitt	(781) 441-3541
One NStar Way – SE 370		
Westwood, MA 02090		
Comcast	Jean MacLaren	(603) 695-1461
676 Island Pond Road		
Manchester, NH 03109		
MBTA	Paul Jordan	(617) 222-5439
32 Cobble Hill Road		
Somerville, MA 02145		
MBTA (Power Division)	Jack Martin	(617) 222-3199
500 The Arborway		
Jamaica Plain, MA 02130		
MBTA (Transportation Division)	Kevin Kwok	(617) 222-6133
21 Arlington Avenue		
Charlestown, MA 02129		
MBTA (Safety Division)		
21 Arlington Avenue		
Charlestown, MA 02129		
MBTA (Engineering)		
Mass Bay Commuter Railroad Co.	James Merrill	(617) 222-3614
32 Cobble Hill Road		
Somerville, MA 02143-4431		

The Contractor's shall make his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etc., will occur. The Contractor shall notify "MASS DIG SAFE" and procure a DIG SAFE number for each location prior to disturbing existing ground in any way. The "Dig Safe" call center number is 1-888-344-7233.

DESIGNER / PROJECT MANAGER

DESIGNER PROJECT MANAGER

BSC Group, Inc.
Mr. Peter J. Briere, PE
(617) 896-4331

MassDOT
Albert Miller
(617) 973-7862

PRE-BID SITE VISIT AND COORDINATION WITH MBTA

MBTA operates an electric trolley bus system on Trapelo Road from Waverley Square to the Cambridge city line. There are live electric overhead wires along greater section of the corridor that should be taken into consideration during construction. The Contractor is required to visit the site to become familiarized with the site conditions and account for the presence of the overhead wires in the construction methods. The Contractor would be required to coordinate with the MBTA if any work is within 10 feet of MBTA overhead wires. Where the nature of work requires power shut downs, the Contractor shall liaise with the MBTA and the Engineer to schedule such work.

NOTICE TO TOWN TREE WARDEN

All existing trees within the right of way fall under the jurisdiction of the Town of Belmont's Tree Warden, Tom Walsh, (617)-993-2690. The Contractor shall provide to the Tree Warden the name and certification number of the arborist who will be in charge of roadside tree protection for review and approval at least thirty (30) days prior to the start of work. See roadside tree protection section for additional requirements. Contractor's arborist shall conduct a site walk with the Tree Warden, prior to starting work; to review protection procedures and other tree related issues.

PRESERVATION OF ROADSIDE GROWTH
(Supplementing Subsection 8.08)

The Contractor shall consult with the Town Tree Warden, prior to removing any tree not designated on the plans to be removed or to disturb the grade underneath the canopy of trees along the project.

It shall be the Contractor’s responsibility to provide adequate protection of trees within the work site through the full duration of the construction period. Maintenance and protection responsibilities shall include all portions of the tree and shrub, both above and below ground.

The Contractor shall take all measures to avoid grading within the drip line of existing trees to remain. Because some work will require disturbance within the drip line of many trees, the Contractor shall provide the services of a Massachusetts Certified Arborist, approved by the Engineer, during excavation work to provide root pruning and other services required to ensure the continued health of the trees. The cost of the Certified Arborist shall be incidental to the Tree Protection and Pruning Items of these Special Provisions.

If damage occurs to an existing tree designated for protection during execution of the work, the Contractor's arborist shall review the damage and recommend repair procedures to the Engineer. The Contractor’s Arborist shall be responsible for a detailed diary of all concerns or issues pertaining to tree injury, root injury, root excavation, limb removal, or the like.

Tree paint shall not be used.

For trees designated for protection, which as a result of damage, are determined by the Engineer to be unsafe and/or non-recoverable, the Contractor shall be required to replace the damaged tree(s), at no additional cost. Unless stipulated by the Engineer, the replacement trees shall measure, at a minimum, 2-

inch to 2.5- inch caliper size, and shall replicate in the aggregate the equivalent caliper inches of the damaged tree(s) removed. Tree replacement, as required, shall include the furnishing of all labor, materials, equipment, tools, and transportation required to perform all operations required to complete tree replacement. The work shall include, but is not limited to: removal and disposal of all damaged tree material including stumps as applicable, installation of replacement trees, one year bonded guarantee, and maintenance.

Refer to Item 102.5 Roadside Tree Protection for additional requirements.

PROVISIONS FOR TRAVEL

Before starting any work under this Contract, the Contractor shall develop a Schedule of Operations as provided in Subsection 8.02. The work schedule shall include a plan of construction procedures and the safety measures that shall be used during the prosecution of the work as set forth in Section 850 of the Standard Specifications for Highways and Bridges.

As required by the Engineer, uniformed traffic police shall be employed for the protection and maintenance of traffic. Reasonable facilities shall be provided by the Contractor for the convenient and safe passage of pedestrians and vehicles through the project, and also to and from properties abutting the site of improvement. Particular care shall be exercised at all times to establish and maintain such methods of procedure as will not create hazards of an unusual nature. The prosecution of work on any roadway which would interfere with the existing flow of traffic shall be limited to approximately one-half the roadway width at any one time. At least one lane in each direction shall be kept open at all times. One lane, two-way traffic shall require prior written approval by the Engineer. In such instances, two police officers will be required to control traffic. No detouring of traffic shall be allowed without the Engineer's permission.

DISPOSAL OF EXCESS MATERIAL

Surplus materials obtained from any type of excavation, and all existing and other materials not required to be removed and stacked or needed for use on the project, as determined by the Engineer, shall become the property of the Contractor and disposed of subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

MATERIAL TO BE STACKED

The Contractor shall carefully remove, transport and stack such materials at the following location:
Traffic Signal Equipment – Belmont Municipal Light Depart at 40 Prince St, Belmont;
Signs and other materials – Belmont Department of Public Works Highway Yard at C Street.
Catenary Poles – MBTA; 500 The Arborway, Jamaica Plain, MA 02130
Curbing, Edging, Fencing, and Street Furniture - Belmont Department of Public Works Highway Yard at C Street

TRAFFIC SHOP DRAWINGS

It is intended that shop drawings not be required for traffic control signal materials and equipment that are on the Department's current "Approved List", except as indicated below. The Contractor, however, shall submit a list of the manufacturer's designations (catalog number, model number or revision number) for all equipment to be used in the installation of the traffic control signal system for which shop drawings

are not required. This form, to be submitted by the Contractor, is to be titled "Traffic Signal Equipment Submittal List."

The following traffic signal items require shop drawing approval:

a. Mast Arms

Within fifteen (15) days after receipt of an approved shop drawing for any item, the Contractor shall provide the Engineer with written proof that he/she has ordered such approved materials required on the subject contract and a written confirmation that such order has been approved or released from fabrication, along with the expected delivery schedule from the manufacturers of the item. This delivery schedule shall be appropriate for timely completion of this project.

FINE TUNING, ADJUSTMENT AND TESTING PERIOD
(Supplementing Subsection 5.11)

Prior to the start of fine tuning period, the Contractor shall notify the Engineer in writing of the starting date.

SERVICE CONNECTIONS

The Contractor shall be responsible for the payment of all fees for services rendered in conjunction with service connections by utility companies under this project. The cost thereof shall be included in the lump sum price scheduled in the Proposal.

BOUNDS

The Contractor shall exercise due care when working around all existing bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, it shall be replaced and/or realigned by the Contractor as required by the Engineer. No compensation shall be due the Contractor for materials and labor required to re-establish the bound in its proper location.

CONSTRUCTION SAFETY

The Contractor shall supply safety vests to his personnel and require that they be worn while working in or near the roadways of this Project. The cost of furnishing such vests shall be included in the lump sum price, and all such vests shall remain the property of the Contractor.

SHEETING AND BRACING

The Contractor shall furnish, place, and remove all sheeting and bracing required to support the sides of all trenches or other excavations for this Project.

The Contractor shall be solely responsible for the safety of the work people and the adjacent facilities from danger of caving and sliding, and all work to be done shall be in strict accordance with the Department of Labor, Occupational Safety and Health Administration regulations and suggested practices for construction excavation and/or other applicable codes and regulations. Special precautions shall be taken to guard against any damage to or settlement of pavements, buildings, walls, pipes, ducts or other

structures and facilities which are adjacent to the work.

The cost of providing and removing sheeting, shoring and bracing shall be considered included in the lump sum price for the contract, and no additional compensation shall be allowed therefore.

GUARANTEE AFTER FINAL ACCEPTANCE

The Contractor shall diagnose (trouble-shoot) the traffic control signal system and pay the cost of replacing any part of the traffic signal control equipment found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

Upon the completion of the Project, and acceptance of the Project by the Massachusetts Highway Department (MHD), the Contractor shall turn over all guarantees and warranties to the MHD/Town.

MAINTENANCE OF TRAFFIC SIGNALS

It shall be the responsibility of the Contractor to provide all labor, equipment, and material required for the total maintenance of all existing and proposed traffic signal control equipment, excluding damage by accidents, unless otherwise specified under Subsection 7.17 "Traffic Accommodations," in which case Subsection 7.17 will govern.

These provisions shall apply to all signalized locations included as a part of this Contract from the date of written notice given to the Engineer that the Contractor shall work on or adjacent to an existing signal until the date when the Engineer shall recommend acceptance of the completed Project. This written notice must be given before the Contractor may proceed with any work on a specific traffic signal location. For the purpose of these Special Provisions, the phrase "traffic signal control equipment" is intended to include, but is not limited to, controllers, signal housings, supporting structures, cabinets, wires, conduit, detectors, interconnect cable and all other ancillary equipment used for traffic control.

The cost of maintenance of signals shall be deemed to be included in the lump sum price of the Contract, and no additional payments shall be made therefore.

PROTECTION OF UNDERGROUND FACILITIES

The Contractor shall make his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etc., will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 1-888-344-7233.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 1:00 P.M. on the Thursday before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdot-specifications@mhd.state.ma.us. Please put the MassDOT project file number and municipality in the subject line.

BID BONDS

All bid bonds submitted to the Cashier's Office should read (in part) "… are held and firmly bound unto The Massachusetts Department of Transportation."

MASSHIGHWAY TO MASSDOT NAME CHANGE

The following definitions in Section 100 of the Standard Specifications for Highways and Bridges are revised as follows:

(Amend definition of Department)

1.17 –Department .....Effective November 1, 2009, St. 2009, c. 25 abolishes the Massachusetts Department of Highways and all assets, liabilities, and obligations become those of the Massachusetts Department of Transportation ("MassDOT). Anywhere in this contract the terms Commission, Commonwealth, Department of Public Works, Department, Massachusetts Highway Department, MassHighway, Party of the First Part, or any other term intending to mean the former Massachusetts Department of Highways is used, it shall be interpreted to mean MassDOT or applicable employee of MassDOT unless the context clearly requires otherwise. Furthermore, MassDOT by operation of law inherited all rights and obligations pursuant to any contract, and therefore parties to this contract hereby acknowledge and agree that its terms shall be liberally construed and interpreted to maintain the rights and obligations of MassDOT. Furthermore, the parties hereby acknowledge and agree that the transfer of all rights and obligations from the Massachusetts Department of Highways to MassDOT shall not have the effect of altering or eliminating any provision of this contract in a manner that inures to the detriment of MassDOT.

(Add a definition for MassDOT)

1.46 – MassDOT The Massachusetts Department of Transportation, a body politic and corporate, under St. 2009, c. 25 "An Act Modernizing the Transportation Systems of the Commonwealth", as amended.

ENGINEERING DIRECTIVES

Contractors can access MassDOT, Highway Division Engineering Directives at:
http://www.massdot.state.ma.us/highway/publications.aspx

PERSONAL PROTECTIVE SAFETY EQUIPMENT FOR CONTRACTOR PERSONNEL

The Contractor is responsible to ensure that all personnel, including all subcontractors, working on the project are issued and are wearing all necessary personal protective safety equipment while working within the project limits. This equipment shall include, as a minimum, a hardhat and a safety vest, regardless of the type of work being performed. Other safety equipment shall be added as required to perform the work in which they are engaged and in accordance with all local, state and federal requirements in effect. Safety equipment shall be provided at no additional cost to the Department.

APPROVED EQUIVALENT (Supplementing Subsection 5.03 and Section 6.00)

For any materials named or described in these specifications, an approved equivalent to that named or described in the said specifications may be furnished.

CONTRACTOR/SUBCONTRACTOR CERTIFICATION – CONTRACT COMPLIANCE (Revision 03-23-10)

Pursuant to 23 C.F.R. § 633.101 *et seq.*, the Federal Highway Administration requires each contractor to "insert in each subcontract, except as excluded by law or regulation, the required contract provisions contained in Form FHWA–1273 and further requires their inclusion in any lower tier subcontract that may in turn be made. The required contract provisions of Form FHWA–1273 shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the requirements contained in the provisions of Form FHWA–1273." The prime contractor shall therefore comply with the reporting and certification requirements provided in MassDOT's CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form (DOT-DIST-192) certifying compliance with 23 C.F.R. § 633.101 for each subcontract agreement entered into by the contractor. The contractor shall provide a fully executed original copy of said CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form to MassDOT upon execution of any subcontract agreement. Failure to comply with the reporting and certification requirement of the CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form may result in action against the prequalification status of the prime contractor with MassDOT.

SUBSECTION 4.04 CHANGED CONDITIONS.

This Subsection is revised by deleting the two sequential paragraphs near the end that begin "The Contractor shall be estopped…" and "Any unit item price determined …" (1/6/2006).

SUBSECTION 4.06 INCREASED OR DECREASED CONTRACT QUANTITIES
Replace this Subsection with the following: (Revised – 3/05/ 2010)

The quantities contained in the Contract are set forth as a basis for the comparison of bids only and may not necessarily reflect the actual quantity of work to be performed. The Department reserves the right to increase, decrease or eliminate the quantity of any particular item of work.

Where the actual quantity of a pay item varies more than 25 percent above or below the estimated quantity stated in the Contract, an equitable adjustment in the Contract Price for that pay item shall be negotiated upon demand of either party regardless of the cause of the variation in quantity. No allowances will be made for loss of anticipated overhead costs or profits suffered or claimed by the Contractor resulting directly or indirectly from such increased, decreased or eliminated quantities or from unbalanced allocation among the contract items from any other cause. It is the intention of this provision to preserve the bid basis while limiting the Contractor's risk exposure to 25% of each bid quantity.

In the case of an overrun, the contractor will be compensated at the Contract Unit Price for a quantity up to 125% of the Contract quantity. The adjusted unit price shall only be applied to that quantity above 125% of the contract quantity.

Neither party shall be required to demonstrate any change in the cost to perform the work based solely on the overrun. The original Contract unit bid price shall have no bearing on determining the adjusted unit price for an overrun. The adjusted unit price shall be based on the estimated cost of performing the added work over 125% of the bid quantity. In the event that an adjusted unit price cannot be agreed upon within 30 days after being requested by either party, a unit price will be established that is deemed to be fair and equitable by the Engineer, whether higher or lower than the unit price bid. Payment will be made at that rate until agreement is reached or until the Contractor chooses to exercise his rights under Section 7.16.

To assist the Engineer in the determination of an equitable adjustment for an overrun, the Contractor shall prepare a submission in the following manner and accept as full payment for work or materials an amount for an equitable adjustment in the Contract Price equal to the following:

(1) The actual cost or a reasonable cost estimate for direct labor, material (less value of salvage, if any) and use of equipment, plus 10 percent of this total for overhead;
(2) Plus actual cost or a reasonable cost estimate of Worker's Compensation and Liability Insurance, Health, Welfare and Pension Benefits, Social Security deductions and Employment Security Benefits;
(3) Plus 10 percent of the total of (1) and (2) for profit and other unallocated costs;
(4) Plus the estimated proportionate cost of surety bonds.

SUBSECTION 4.06 (Continued)

No allowance shall be made for general superintendence and the use of small tools and manual equipment.

For work performed by a Subcontractor, the Contractor shall accept as full payment therefore an amount equal to the actual cost or the reasonable cost estimate to the Contractor of such work as determined by the Engineer, plus 10 percent of such cost. The Subcontractor is bound by the same criteria for the determination of an equitable adjustment as the Contractor.

In the case of an underrun, the unit price for the actual quantity installed, if less than 75% of the bid quantity, shall only be adjusted to account for increased unit costs that result solely from the decreased quantity. The adjusted unit price shall be the bid price plus the change in the actual unit cost of performing the work due solely to the decreased quantity.

The Contractor shall prepare a submission demonstrating actual increased unit costs for review and evaluation by the Engineer. No allowance will be made for loss of anticipated overhead costs or profits suffered or claimed by the Contractor resulting directly or indirectly from such decreased or eliminated quantities.

The Contractor is required to furnish itemized statements of cost and give the Department access to supporting records.

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etcetera, will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 1-888-344-7233.

BIDDERS LIST

Pursuant to the provisions of 49 CFR 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

BUY AMERICA PROVISIONS (23 CFR 635.410)

(Supplementing Subsection 6.01 Source of Supply and Quality)
Federal law 23 CFR 635.410 requires that all manufacturing processes, including application of the coating, for steel and iron materials to be permanently incorporated in Federal-aid highway construction projects must occur in the United States. Coating includes all processes which protect or enhance the value of a material to which the coating is applied.

Foreign steel and iron may be used if the cost of the materials as they are delivered to the jobsite does not exceed 0.1% of the total contract cost or $2,500 whichever is greater.

PROMPT PAYMENT AND RELEASE OF RETAINAGE TO SUBCONTRACTORS

The Contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of subcontract work not later than 10 business days from the receipt of each payment the prime contractor receives from the Department. Failure to comply with this requirement may result in the withholding of payment to the prime contractor until such time as all payment due under this provision has been received by the subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the contractor's prequalification status.

The Contractor further agrees to make payment in full, including retainage, to each subcontractor not later than 10 business days after the subcontractor has completed all of the work required under its subcontract.

ROADWAY FLAGGER (Supplementing Subsection 4.06)

MassDOT reserves the right to provide certified Roadway Flaggers who are MassDOT employees, at the discretion of the Engineer. The Contractor shall not be charged nor compensated for the use of MassDOT employee flaggers. Should the substitution of MassDOT employee flaggers result in the elimination or reduction of payable hours for Item 850.41 Roadway Flagger, the provisions of Section 4.06 Increased or Decreased Contract Quantities shall not apply. This item shall not be subject to renegotiation for any reason under Section 4.06 regardless of whether or not this item overruns or underruns.

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB).

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp 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.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN

This project is subject to Massachusetts General Laws, Chapter 131, Section 40 as amended. Signs shall be in accordance with the latest MassDOT Construction Standards. All costs for the manufacture, erection, maintenance, moving, and removal of the signs shall be absorbed by the contractor with no additional compensation other than the contract unit prices.

For this project the Massachusetts Department of Environmental Protection File Number is XXXXXX

SUBSECTION 8.10 DETERMINATION AND EXTENSION OF CONTRACT TIME FOR COMPLETION (TIME EXTENSIONS)

Replace this Subsection with the following:

A. General

It is an essential part of all contracts that contractors shall perform the Work fully, entirely and in an acceptable manner within the contract duration.

The contract duration is based upon the requirements of public convenience and the assumption that the Contractor will prosecute the Work efficiently and with the least possible delay, in accordance with the maximum allowable working time, as specified in the Contract.

The contract duration has been carefully considered and has been established for reasons of importance to the Department. The contract duration will be enforced and it is understood that the Contractor accepted this concept at the time of the submission of the bid. The timing of the Notice to Proceed (NTP) has been taken into account in the determination of the contract duration and the timing of the issuance of the NTP shall not, by itself, be a reason for a time extension.

An extension of contract time will be granted only if entitlement to a time extension has been clearly demonstrated to the satisfaction of the Engineer by a documented time entitlement analysis, performed in accordance with the requirements of Subsection 8.02.E.8 - Time Entitlement Analysis.

B. Requests for Additional Contract Time (Time Extensions)

In response to a request for a time extension, an extension of contract time may be granted for demonstrated delays resulting from only one, or, in the case of concurrent delays, a combination of the following causes:

1. Extra Work

Each extra work order (EWO) proposal shall include an evaluation of the impact of the EWO on contract time, expressed in calendar days. If there is no impact to the contract time as a result of the EWO, the EWO shall indicate this by stating that zero (0) calendar days of additional time is being requested. The need for a time extension as a result of the EWO must be clearly demonstrated by a documented time entitlement analysis (TEA) performed by the Contractor in accordance with the requirements of Subsection 8.02.D.8. A documented preliminary TEA supporting the EWO proposal shall be submitted to the Engineer as part of the EWO proposal. Also see Subsection 4.03 – Extra Work and Subsection 4.05 – Validity of Extra Work.

2. Department-Caused Delays

If any part of the Work is delayed or suspended by the Department, the Contractor will be granted a time extension to complete the Work or any portion of the Work only if entitlement to this time extension has been clearly demonstrated by a documented time entitlement analysis. Department-caused delays shall not include delays to or suspensions of the Work that result from the fault or negligence of the Contractor. Also see Subsection 8.05 – Claim for Delay or Suspension of the Work.

3. Increased Quantities

Increased quantities of work may be considered as the basis for a time extension only if the requirements of Subsection 4.06 - Increased or Decreased Contract Quantities are met. The time allowed for performance of the Work will be increased based on increased quantities only if entitlement to this time extension has been clearly demonstrated by a documented time entitlement analysis. A decrease in quantities shall also require a time entitlement analysis to determine if a deduction of contract time is warranted.

4. Delays Not Caused by Contractor Fault or Negligence

When delays occur due to reasonable causes beyond the control and without the fault or negligence of the Contractor, including, but not restricted to: "Acts of God"; war, whether or not declared, civil war, insurrection, rebellion or revolution, or to any act or condition incident to any of the foregoing; acts of the Government; acts of the State or any political subdivision thereof; acts of other contracting parties over whose acts the Contractor has no control; fires; floods; epidemics; abnormal tides (not including Spring tides); severe coastal storms accompanied by high winds or abnormal tides; freezing of streams and harbors; abnormal time of Winter freezing or Spring thawing; interference from recreational boat traffic; use of beaches and recreational facilities for recreational purposes during the Summer season; abnormal ship docking and berthing; unanticipated use of wharves and storage sheds; strikes, except those caused by improper acts or omissions of the Contractor; extraordinary delays in delivery of materials caused by strikes, lockouts, wrecks, and/or freight embargoes; a time extension will be granted only if entitlement to a time extension has been clearly demonstrated by a documented time entitlement analysis.

An "Act of God" as used in this subsection is construed to mean an earthquake, flood, cyclone, hurricane, tornado, or other cataclysmic phenomenon of nature beyond the power of the Contractor to foresee and/or make preparations against. Additional consideration may be given to severe, abnormal flooding in local rivers and streams that has been reported as such by the National Weather Service. Rain, wind, snow, and/or other natural phenomena of normal intensity, based on National Weather Service reports, for the particular locality and for the particular season of the year in which the Work is being prosecuted, shall not be construed as an "Act of God" and no time extension will be granted for the delays resulting there from.

Within the scope of acts of the Government, consideration will be given to properly documented evidence that the Contractor has been delayed in obtaining any material or class of labor because of any assignment of preference ratings by the Federal Government or its agencies to defense contracts of any type.

5. Delays Caused by Public Service Corporations, Municipal Departments or Other Third Parties
If any part of the Work is delayed by public service corporations, municipal departments or other third parties, a time extension will be granted only if entitlement to a time extension has been clearly demonstrated by a documented time entitlement analysis. Also see Subsections 5.05 - Cooperation by Contractor, 5.06 - Adjacent Contracts and 8.04 - Removal or Demolition of Buildings and Land Takings.

C. Time Extension Determination

1. When the Contractor submits a request for a time extension, placing the Department on notice of a delay due to any of the causes listed in Subsection 8.10.B, it shall be submitted in writing to the Engineer within fifteen (15) calendar days after the start of the delay. No time extension will be granted if a request for a time extension is not filed within fifteen (15) calendar days after the start of the delay.

A documented preliminary time entitlement analysis (TEA) supporting the request for a time extension and meeting the requirements of Subsection 8.02.E.8 shall be submitted to the Engineer no later than fifteen (15) calendar days after the request for a time extension is submitted to the Engineer or thirty (30) calendar days after the start of the delay. A documented final TEA shall be submitted to the Engineer no later than fifteen (15) calendar days after the end of the delay. During the time between the preliminary and final TEAs, the delay shall be documented in statused contract progress schedules submitted in accordance with the requirements of Subsection 8.02.E.5.

2. No time extension will be granted for any delay or any suspension of the Work due to the fault of the Contractor.

3. No time extension will be granted if the request for a time extension is based on any claim that the originally established contract duration was inadequate.

4. Time extensions will only be granted for delays, including concurrent delays, to activities affecting contract milestones, the contract completion date and/or other critical path activities as demonstrated to the satisfaction of the Engineer by a detailed time entitlement analysis that clearly states the number of calendar days of extra time being requested.

5. The probable slowdown or curtailment of work during inclement weather and winter months has been taken into consideration in determining the contract duration and therefore no time extension will be granted, except as defined in Subsection 8.10.B.4.

6. Any work restriction related to weather, permit conditions, community accommodation, traffic or any other restriction specified in the Contract or reasonably expected for the particular locality and for the particular season of the year in which the Work is being prosecuted must be considered in the analysis of each individual time extension and shall not be considered, in itself, justification for an extension of time.

7. Any time entitlement analysis prepared for the purpose of requesting a time extension shall clearly indicate any proposed overtime hours or additional shifts that are incorporated in the schedule. The Engineer shall have final approval over the use of overtime hours and additional

shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of time extensions if it is determined to be in best interest of the Department to do so.

D. Disputes

Any dispute regarding whether or not a time entitlement analysis demonstrates entitlement to a time extension, the number of days granted in a time extension or any other question of fact arising under this subsection shall be determined by the Engineer.

The Contractor may dispute a determination by the Engineer by filing a claim notice within fourteen (14) calendar days after the Contractor's request for additional time has been denied or if the Contractor does not accept the number of days granted in a time extension. The Contractor's claim notice shall include a time entitlement analysis that sufficiently explains the basis of the time-related claim. Failure to submit the required time entitlement analysis with the claim notice shall result in denial of the Contractor's claim.

SUBSECTION 4.03 EXTRA WORK

Replace this Subsection with the following:

The Contractor shall do any work not herein otherwise provided for when and as ordered in writing by the Engineer, such written order to contain particular reference to this Subsection and to designate the work to be done as Extra Work.

Unless specifically noted in the Extra Work Order, Extra Work will not extend the time of completion of the Contract as stipulated in Subsection 8.10.

The determination of the Engineer shall be final upon all questions concerning the amount and value of Extra Work (except as provided in Subsection 7.16).

Payment for Extra Work will be provided in Subsection 9.03.

ITEM 100.01 **SCHEDULE OF OPERATIONS – FIXED PRICE $10,000.00** **LUMP SUM**

TO BE INSERTED BY MassDOT

ITEM 102.3 **SHRUB TRIMMING** **FOOT**

GENERAL
The work to be done under this Item shall be done in conformance with the relevant provisions of Section 120 of the Standard Specifications, as directed by the Engineer, and the following:

The work to be done under this Item shall consist of the trimming of shrubs, as noted on the Plans, and as directed by the Engineer.

METHOD OF MEASUREMENT
Item 102.3 Shrub Trimming shall be measured by the foot, along the edge of the roadway ,sidewalk, or limit of work, or as called out on the Plans.

BASIS OF PAYMENT
Item 102.3 Shrub Trimming will be paid for at the contract unit price, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

ITEM 102.4 **HAND EXCAVATION ROOT ZONE** SQUARE YARD

GENERAL
The purpose of this item is to prevent damage to underlying utilities during installation of trees and related improvements.

The work under this item shall include hand excavation and construction of protective measures for utilities, and shall conform to the relevant provisions of Sections 101, 102, and 771 of the Standard Specifications and the following:

EXAMINATION OF CONDITIONS
It shall be the responsibility of the Contractor to carefully identify, the depth of existing utilities. Excavate to the proposed grades with as little impact to existing utilities as is possible. Where conflicts between the proposed improvements and existing utilities occur the contractor shall stop work immediately and contact the Engineer for a determination as to how to proceed.

METHOD OF MEASUREMENT
Item 102.4 Hand Excavation Root Zone will be measured for payment per yard as called out on the plans, complete in place.

BASIS OF PAYMENT
Item 102.4 Hand Excavation Root Zone will be paid for at the contract unit price per yard, which price shall include all labor, material, excavation, equipment and incidental costs required to

complete the work.

No separate payment shall be made for certified arborist, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 102.5 ROADSIDE TREE PROTECTION EACH

GENERAL
The purpose of these items is to prevent damage to branches, stems and root systems of existing trees to remain and ensure their survival. Provisions under this item include steps to minimize disturbance and to construct protection measures for trees close to construction areas.

It shall be the responsibility of the Contractor and the Contractor's arborist to ensure adequate protection of all trees within the work site through the full duration of the construction period. Maintenance and protection responsibilities shall include all portions of the tree above and below the ground. See Preservation of Roadside Growth (supplemental Subsection 8.08) for additional information.

The work under this item shall conform to the relevant provisions of Sections 101 and 771 of the Standard Specifications and the following:

EXAMINATION OF CONDITIONS
The Contractor shall be solely responsible for judging the full extent of the work requirements, including, but not necessarily limited to any equipment and materials required for providing tree protection.

Prior to execution of work the Contractor shall walk the entire length of the project with the Engineer, the Town Tree Warden, and Massachusetts Certified Arborist retained by the Contractor.

SUBMITTALS
Incidental to this item, the Contractor shall provide to the Engineer one (1) copy each of “Standards for Pruning Shade Trees” of the National Arborist Association, 174 Route 101, Bedford, New Hampshire, 03102, and American National Standards Institute (ANSI) Standard Z-133.1, and A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1: Pruning. These references shall be kept by the Engineer at his office for the length of the Contract.

Prior to start of work, the Contractor shall submit to the Engineer the name and certification number of the Massachusetts Certified Arborist referenced herein. Cost for Certified Arborist for all activities pertaining to this Item shall be incidental to this item.

TREE FENCING AND ARMORING
All existing trees within the limits of the work, which are marked on the Plans to be protected, shall be protected by snow fence, chain link fence or other acceptable device in order to avoid tree damage. The Contractor's arborist shall stake out the drip zones for review by the Engineer and the Town's Tree Warden. The tree protection barrier utilized by the Contractor shall be subject to the approval of the Engineer. The minimum height of the protective barrier for trees shall be 4 feet. Additionally, wooden slats shall be placed around the trunk as shown on the details. All trees that sustain bark, root, or trunk damage caused by the Contractor’s work force during the course of the work shall be repaired immediately by an experienced Massachusetts Certified Arborist, with proper

tools, and according to proper horticultural practices.

bark, root, or trunk damage caused by the Contractor's work force during the course of the work shall be repaired immediately by an experienced Massachusetts Certified Arborist, with proper tools, and according to proper horticultural practices.

PROTECTION FROM STAGING

To avoid compaction of existing roots, the stockpiling of heavy equipment, debris or construction material within the protected tree root zone area and/or drip line of designated protected trees is strictly prohibited. No plants shall be used for crane stays, guys or their fastenings. Upon notification by the Engineer, any material placed in this unauthorized zone shall be removed immediately. If access is required in drip zones, a 4-inch depth of wood chips, seasoned at least one year, shall be installed to reduce compaction. If determined by the Engineer in consultation with the Tree Warden, that damage has occurred, the Contractor shall be required to undertake corrective measures including but not limited to aeration, fertilization, and watering.

The securing of signs, barricades, temporary wire, cable and other materials to trees is prohibited.

PRUNING

Branches broken or torn during construction shall be examined by the arborist and where required removed back to the nearest lateral branch. The cut shall be made at the branch collar. The indiscriminate lopping off of a damaged branch shall not be accepted. All pruning tools shall be cleaned between trees to reduce the spread of disease and insects.

PROTECTION FROM EXCAVATION

The Contractor shall take due care to protect aerial branches from damage while performing work within the site. All low branching trees shall be protected from equipment damage and disturbance. Alternative operations shall be utilized to preserve smaller trees where required.

During Examination Arborist shall determine the best method for excavation around existing tree roots based upon Massachusetts Arborist Association and the National Arborist Association standards of care.

Excavation in drip zone areas (beyond Hand Excavation Root Zone.) where major roots (3" or greater) are present shall minimize the tearing or ripping of tree roots. Roots shall first be cleanly severed as far from the trunk of the tree as possible prior to continuing with the excavation, or otherwise avoided to prevent damage to the root. Tree roots shall not remain exposed. Root ends shall be covered within two hours of exposure with soil or burlap and kept moist until the final backfill or grade is established. See also Item 102.40 Hand Excavation Root Zone.

The removal of existing sidewalk within the drip zone shall be conducted carefully. The existing subgrade material under the sidewalk shall be reused, if it is deemed appropriate by the Engineer, in order to avoid damage to the tree roots.

Root pruning shall be performed using tools and machines designed specifically for this purpose. The size and type of tools and machine used shall be governed by the referenced standards and as acceptable to the Engineer. Root pruning shall be completed prior to base or subgrade preparation.

Watering shall be provided for trees that in the opinion of the arborist have been compromised by root damage or if natural precipitation is not acceptable (less than 1 inch per week averaged over 1

month). Trees shall receive min. 50 gal. per week. Watering shall be by a slow flow method that will allow the water to percolate thoroughly into the soil. Methods shall be as approved by the Engineer.

Where required to repair damage to trees by the contractors work, such care shall include but shall not necessarily be limited to trimming, irrigation and fertilizing. Contractor's Arborist, in conjunction with the Tree Warden, will inspect any trees suffering apparent significant damage for stability and vitality. For trees determined to be viable and stable, preservation care shall be provided as required herein.

METHOD OF MEASUREMENT
Item 102.5 Roadside Tree Protection will be measured for payment per each as called out on the plans, complete in place.

BASIS OF PAYMENT
Item 102.5 Roadside Tree Protection will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work. Excavation will be paid for separately under Items 102.4 Hand Excavation Root Zone, and Item 120 Earth Excavation.

No separate payment shall be made for certified arborist, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 127. CONCRETE EXCAVATION CUBIC YARD

GENERAL
The work under this Item shall be done in conformance with the relevant provisions of Section 120, as required by the Engineer, and the following:

When encountered within the limits of roadway and trench excavation or as required by the Plans, reinforced or unreinforced cement concrete shall be removed and legally disposed off-site
METHOD OF MEASUREMENT
Concrete excavation will be measured by the cubic yard in its original encountered position by measuring the surface area of concrete to be removed and measuring the depth to be removed.

BASIS OF PAYMENT
Payment shall include all labor, tools, and equipment required to excavate, remove, and dispose off-site of the cement concrete.

ITEM 129.3 OLD PAVEMENT EXCAVATION CUBIC YARD

GENERAL
The work under this Item shall consist of the excavation of old pavement materials at the locations shown on the plans, as required by the Engineer, and the following:

The work to be performed under this Item shall conform to the relevant provisions of Section 120 of the Standard Specifications.

METHOD OF MEASUREMENT

Old pavement excavation will be measured in their original position by the cross section method, except where such measurement is impracticable, the volume shall be such other methods as the Engineer may determine.

BASIS OF PAYMENT
Old pavement excavation will be paid for at the Contract unit price per cubic yard of the type of excavation as defined hereinbefore.

ITEM 129.52 TRACK EXCAVATION – TWO RAILS CUBIC YARD
ITEM 129.54 TRACK EXCAVATION – FOUR RAILS CUBIC YARD

GENERAL
The work under this Item shall be done in conformance with the relevant provisions of Section 120, as required by the Engineer, and the following:

The work under this Item shall consist of the excavation, removal, and disposal of the existing steel tracks and concrete foundation with either two or four rails, including the removal and discarding off-site of the rails and the concrete, brick or stone foundation materials.

METHOD OF MEASUREMENT
Item 129.52 Track Excavation – Two Rails and Item 129.54 Track Excavation – Four Rails will be measured by the cubic yard in place by measuring the surface area and depth to be removed.

BASIS OF PAYMENT
Item 129.52 Track Excavation – Two Rails and Item 129.54 Track Excavation – Four Rails will be paid for at the Contract unit price, per cubic yard , which price shall include the removal and discarding of steel rails, concrete, reinforced concrete, concrete ties, and all labor, tools, and equipment required to excavate, remove, and dispose off-site of the tracks and foundation.

ITEM 153. CONTROLLED DENSITY FILL – EXCAVATABLE CUBIC YARD

GENERAL
Work under this item shall conform to the relevant provisions of Section 150 of the Standard Specifications and the following.

The work shall consist of furnishing and placing controlled density fill in areas where the required compaction is not practicable, and in trenches in cold plane and overlay areas, and/or as required by the Engineer.

Controlled density fill shall meet the requirements of Sections M4.08.0 of the Standard Specifications for controlled density fill - Type 2E.

METHOD OF MEASUREMENT
Item 153. Controlled Density Fill-Excavatable will be measured per cubic yard complete in place.

BASIS OF PAYMENT
Payment for this item shall be at the Contract unit price per cubic yard, which price shall include

material, labor, complete in place as directed by the Engineer.

ITEM 180.1 HEALTH AND SAFETY PLAN LUMP SUM

GENERAL
It is the Contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his representatives, and the public from any on-site chemical contamination.

A check of electronic records maintained by the Massachusetts Department of Environmental Protection (DEP) revealed the presence of five oil and hazardous material (OHM) release sites proximal to the project route that have the potential causing contamination soil and groundwater within the project area.

- **Property, 1010 Pleasant Street, Belmont (RTN 3-2296 and 3-14403):** A release of diesel fuel to soil and groundwater was discovered during removal of an underground storage tank. Subsurface investigations revealed that soil contamination is localized to the rear of the property and that groundwater, which was encountered at depths between 9 and 18 feet below grade, flow to the south away from Pleasant Street. Contamination at this site is not expected to impact the reference project.

- **Mobil Service Station, 337 Pleasant Street, Belmont (RTN-3-0093 and 3-21120):** Leaking underground storage tank(s) released of petroleum products to soil and groundwater. Free-phase petroleum product was also encountered floating on groundwater. A groundwater recover and soil vapor extraction system are operated at the site. A well located in Brighton Street close to Pleasant Street is used for groundwater monitoring. Roadway work in the vicinity of this site must not interfere with or cause damage to the remedial system for the Mobil station site. The well in Brighton Street should be preserved and protected from damage.

- **Frm. Gasoline Station, 768 Pleasant Street, Belmont (RTN-3-3494):** A release of waste oil.

- **Lenny's Service Station, 768 Pleasant Street, Belmont (RTN-3-4762):** A release of petroleum product to soil and groundwater occurred. Subsurface investigations indicate that soil contamination is localized at the rear of the property. Groundwater is assumed to flow to the south-southeast towards Pearson Brook and away from Pleasant Street. The contamination at this site is not expected to impact the project.

- **Getty Service Station, 350 Pleasant Street (RTN 3-18200):** Release of gasoline to the paved road surface.

- Detailed information on OHM releases at 359-363 Pleasant Street and 350 Pleasant Street was not obtained. However, available information suggests that the likelihood of impacts to OHM release sites located between 350 and 1010 Pleasant is low.

In areas where excavation work will be conducted to install new or replacement drainage structures and lines, the Contractor should be aware of possible OHM impacts due to contaminated soil and groundwater.

The Health and Safety Plan (HASP) shall be prepared by a Certified Industrial Hygienist or other experienced individual with the appropriate OSHA required training to prepare such a plan. It shall

include the components required by OSHA 29 CFR 1910.120(b). The preparer's name and work experience shall be included as part of the Health and Safety Plan submittal. The plan shall be designed to identify, evaluate, and control health and safety hazards and provide for emergency response if needed. The Health and Safety Plan shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations, which may affect site workers and the public. Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions (e.g., OSHA, RCRA, CERCLA). In addition, guidelines of NIOSH, OSHA, USCG, EPA, etc., shall be followed. Equipment used for the purpose of health and safety shall be approved and meet pertinent standards and specifications of the appropriate regulatory agencies.

The Health and Safety Plan shall be submitted to the Engineer for approval at least four weeks prior to commencement of work. The review and acceptance of the plan by the Department does not relieve the Contractor of the responsibility for attaining the required degree of protection and training, or to comply with all laws, rules, regulations, standards or guidelines in effect during the execution of the contract.

A copy of the Health and Safety Plan shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the Department, Contractor and Subcontractors. The employee's signature on the Health and Safety Plan shall be deemed prima facie evidence that the employee has read and understands the plan. A copy of the plan with signatures shall be submitted to the Engineer at the conclusion of the Contract, or at the Engineer's request. Signature sheets shall be submitted monthly, or at the request of the Engineer.

BASIS OF PAYMENT

The work to be done under this Item will be paid at the Contract Lump Sum Price under Item 180.1 for the development and preparation of the HASP by a qualified individual.

ITEM 180.2 **IMPLEMENTATION OF HEALTH AND SAFETY PLAN** **HOUR**

GENERAL

For all construction activities, which require handling or exposure to potentially hazardous materials, the Health and Safety Plan shall specify an on-site Safety Officer. The Site Health and Safety Officer duties shall include, but are not limited to: implementation of the Site Health and Safety Plan, training, evaluating risks, safety oversight, determining levels of personnel protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site Safety Officer and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personnel protection being employed, monitoring data and any other information relevant to on-site safety conditions. The Site Health and Safety officer shall sign and date the Daily Log.

In the event that subsurface contamination is discovered during construction, the Site Safety Officer shall be present to oversee all handling, storage, sampling, and transport of such contaminated materials.

The level of protection, relative to respiratory and dermal hazards, required to ensure the health and

safety of on-site personnel shall be stipulated in the Health and Safety Plan and will be subject to modification by the on-site Safety Officer based on changing site and weather conditions and the following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, required personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personnel protective equipment for anyone who is working in an area either containing or suspected of containing a hazardous environment. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan and the Contractor shall have the required materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection will be paid for under Item 180.3.

METHOD OF MEASUREMENT

Item 180.2 Implementation of the Health and Safety Plan will be measured for payment by the hour, per person, of implementing the plan.

BASIS OF PAYMENT

Item 180.2 Implementation of the Health and Safety Plan will be paid for at the contract unit price per hour, per person, of implementing the plan and shall include the cost of enforcement by an on-site Safety Officer. Personnel protective clothing and equipment below Level "C" shall be considered incidental to the project and shall be a cost borne by the Contractor.

ITEM 180.3 PERSONNEL PROTECTION LEVEL 'C' UPGRADE HOUR

GENERAL

The Contractor shall provide to all workers disposable, protective clothing appropriate to the hazard level of the work. The protective equipment and its use shall be in strict compliance with the Health and Safety Plan (Item 180.1), and all appropriate regulations that address employee working conditions.

METHOD OF MEASUREMENT

Item 180.3 Personnel Protection Level 'C' Upgrade will be measured for payment by the hour, per person.

BASIS OF PAYMENT

Item 180.3 will be paid for at the contract unit price, per hour, per man, required in level 'C' personnel protection.

ITEM 180.4 MONITORING/HANDLING AND STOCKPILING OF CONTAMINATED SOILS CUBIC YARD

GENERAL

The On-Site Safety Officer or Environmental Consultant shall be responsible for evaluating soil with non-natural discoloration, petroleum or chemical odor, the presence of petroleum liquid or sheening on the groundwater surface or any abnormal gas or materials in the ground which are known or

suspected to be contaminated with oil or hazardous materials. Soil suspected of gasoline contamination shall be field tested using the jar headspace procedures according to Department of Environmental Protection Bureau of Waste Site Cleanup Interim Policy #WSC-94-400 (Remedial Waste Management Policy for Petroleum Contaminated Soil) and the Bureau of Waste Prevention Policy #COMM-97-001 (Reuse and Disposal of Contaminated Soil and Massachusetts Landfills). The Engineer shall be contacted immediately when any results indicate contamination requiring soil removal or when contamination not detectable by on-site instrumentation is suspected.

The Contractor shall be required to supply all personnel and materials required to comply with this section and to support the anticipated levels of protection and monitoring described above.
Within limited areas of the project site, it is likely that excavated soils may be contaminated. Where possible, all soils originally in contact with groundwater will be replaced in the same trench up to the existing groundwater level. All soils determined to be contaminated by metals or petroleum products, through the monitoring/evaluation program will be stockpiled for disposal in accordance with all Massachusetts Department of Environmental Protection statutes, policies, and regulations.

The Environmental Consultant/Contractor shall be responsible for identifying a disposal/recycling facility and obtaining all permits, approvals, Bill of Lading, etc. prior to the removal of the contaminated soil from the site. Any soils contaminated with hazardous materials that are not of petroleum origin shall be handled on a case-by-case basis. The contractor shall obtain at least three bids for the handling and disposal of any contaminated material. All manifest, bills of lading, etc. shall be the responsibility of the Contractor with copies provided to the Department. The Contractor is also responsible for hiring a Licensed Site Professional (LSP), as needed, for oversight and Bills of Lading, etc.

METHOD OF MEASUREMENT
Item 180.4 Monitoring/Handling and Stockpiling of Contaminated Soils will be measured by the volume, in cubic yards of contaminated material monitored, handled and/or stockpiled as described under Item 180.4.

BASIS OF PAYMENT
Item 180.4 Monitoring/Handling and Stockpiling of Contaminated Soils will be paid at the Contractor bid price, per cubic yard, which payment shall be considered compensation for all labor, tools, equipment and materials needed to do the work as described above.

ITEM 181.1 DISPOSAL OF CONTAMINATED SOILS TON

GENERAL
The contractor shall be responsible for the proper disposal or recycling of contaminated soils. The proper methods of disposal and recycling of contaminated soils shall comply with the methods described under Item 180.4 and in accordance with all Massachusetts Department of Environmental Protection and Environmental Protection Agency statutes, policies, and regulations. The following are disposal options for contaminated soils. MassHighway prefers methods involving recycling options.

DIRECTLY LANDFILLED HAZARDOUS WASTE

TREATED AND LANDFILLED HAZARDOUS WASTE

INCINERATED HAZARDOUS WASTE

DISPOSAL OF SPECIAL WASTE SOIL

PETROLEUM CONTAMINATED SOIL RECYCLED AT ASPHALT BATCH FACILITY

METHOD OF MEASUREMENT
Item 181, Disposal of Contaminated Soils will be measured by the weight, in tons, of contaminated material removed from the site and delivered to an approved landfill, disposal facility, or recycling facility, and includes any costs for approvals, permits, testing, transportation and disposal.

BASIS OF PAYMENT
Item 181, Disposal of Contaminated Soils will be paid at the contractor's unit bid price, per ton, which payment shall be considered full compensation for all labor, tools, equipment, permits, shipping papers and materials required to do the work as described above.

ITEM 187.3	**REMOVAL AND DISPOSAL OF DRAINAGE STRUCTURE SEDIMENTS**	**CUBIC YARD**
ITEM 187.31	**REMOVAL AND DISPOSAL OF DRAINAGE PIPE SEDIMENTS**	**FOOT**

DESCRIPTION
The work to be done under item 187.3 shall include removing the accumulated dirt, refuse, and other debris, as directed by the Engineer, as necessary for the Contractor to perform relevant items of work under this Contract, from designated drainage structures, including the gutter mouth of curb inlets, and disposing of materials removed. The cast iron hood shall be removed from all catch basins so equipped, prior to cleaning.

The work to be done under item 187.31 shall consist of removing the accumulated dirt, refuse, and other debris from drainage pipes. Drainage pipes shall be cleaned as directed by the Resident Engineer. No casting shall be removed until immediately preceding the work and shall be replaced immediately after the cleaning of the drainage pipes is completed. The uncovered catch basin leading to the designated drainage pipes shall not be left unattended at any time. The provisions of this item are not to be construed that all work be accomplished with equipment. Special conditions such as location, extraordinary shape due to conduits or public utility pipes, or off pavement work, etc., may require hand work.

Hydraulic lift trucks should be used during drainage structure and pipe cleaning operations so that the material can be decanted at the site. After material from several drainage structures along the same system is loaded onto the truck, the truck should be elevated so any free flowing liquid may drain back into the drainage structure. Material must arrive at the disposal facility sufficiently dry to pass the Paint Filter Liquids Test (or no liquid drips from it when a handful is taken and squeezed).

All material removed from the drainage structures and pipes shall be properly handled and disposed of by the Contractor, and this must be done in accordance with all DEP regulations, policies, and guidance. The responsibility for the proper handling and disposal of this material shall be solely the Contractor's.

Material removed from drainage structures and pipes shall be transported immediately to the place of disposal in machines or trucks that will not spill the material along the roadway. Any material falling on the roadway shall be removed at the Contractor's own expense.

Drainage structure and pipe cleanings are classified as a solid waste by the Massachusetts Department of Environmental Protection (DEP) and may be disposed of at any landfill that is permitted by DEP to accept solid waste. Materials containing free-flowing liquids are prohibited from being accepted at landfills. The DEP encourages the beneficial reuse of this material whenever possible; however, use not in accordance with DEP determination, or disposal or use as fill in an unapproved location is not acceptable.

It is anticipated that most, if not all, of the material will be landfilled, therefore the Contractor should be aware that many landfills may require testing and analysis of the material prior to accepting it for disposal at the facility.

The Contractor should be aware that in the event that the test results indicate a hazardous waste that cannot be landfilled, the Contractor shall be responsible for all costs associated with adhering to special regulations regarding disposal of hazardous waste. The Contractor should take this into consideration in preparing the bid.

COMPENSATION

METHOD OF MEASUREMENT

Material removed and that is to be transported to an approved facility, will be measured in the hydraulic lift truck, after DECANTING.

BASIS OF PAYMENT

Excavated material will be paid for at the contract unit price per cubic yard for ITEM 187.3 and per foot for ITEM 187.31 which price shall include the cost of removal, delivery and disposal at an approved landfill, disposal facility or recycling facility, the costs for approvals, permits, testing, transportation, and other incidental expenses, by a qualified individual as described above.

ITEM 201.5	**CATCH BASIN – MUNICIPAL STANDARD**	**EACH**
ITEM 201.52	**CATCH BASIN – MUNICIPAL STANDARD TYPE 2**	**EACH**
ITEM 201.53	**CATCH BASIN – MUNICIPAL STANDARD TYPE 3**	**EACH**
ITEM 201.54	**CATCH BASIN – MUNICIPAL STANDARD TYPE 4**	**EACH**

GENERAL

The work under these items shall conform to the relevant provisions of Section 200 of the Standard Specifications and the following:

Catch basins and manholes constructed under these items shall conform to the applicable construction details included on the plans.

METHOD OF MEASUREMENT

Items 201.5 – 201.54Catch Basins, will be measured for payment per each, complete and in place, including excavation, bedding, backfill, trap, and all appurtenances as shown on the details, except for the castings.

BASIS OF PAYMENT
Items 201.5 – 201.54, will be paid for at the respective Contract unit price per each, complete and in place, including excavation, bedding, backfill, trap, and all appurtenances as shown on the details, except for the castings. New castings will be paid under Item 222.2 Frame and Grade (or Cover) Municipal Standard . Where required by the Engineer, the Contractor shall reuse existing castings obtained from structures removed or abandoned elsewhere on the project or from the Town yard at no additional compensation.

Catch Basin – Municipal Standard Type 2 requires a double frame and grate for each structure as shown on the plans. The double frame and grates will be measured as two units for each structure and will be paid for under Item 222.2, Frame and Grate (or Cover) Municipal Standard .

ITEM 220.6 SANITARY STRUCTURE REBUILT FOOT
ITEM 220.8 SANITARY STRUCTURE REMODELED EACH

GENERAL
The work performed under these items shall conform to the relevant provisions of Section 220 of the Standard Specifications and the following:

When the line or grade or both line and grade of the sanitary structure changes more than 6 inches the structure shall be remodeled. The sloped masonry and the vertical masonry shall be removed to such depths as required by the Engineer and the new masonry shall conform to the proposed design and in conformity with requirements of the applicable parts of Section 201

When in the judgment of the Engineer the masonry shows deterioration, the structure shall be rebuilt. The casting and deteriorated masonry shall be removed in a neat manner until a clear sound base is obtained upon which concrete blocks and clay bricks may be set to rebuild the structure. Gravel borrow shall be furnished for backfill where required when excavated material is unsuitable. The casting shall be set to line and grade with a concrete collar and surfaced with a minimum of 3 inches of Hot Mix Asphalt top course as required. The new masonry construction, replacing of castings, highly early strength concrete collars, backfilling around structures and other incidental work shall be as specified in Section 201.

METHOD OF MEASUREMENT
Item 220.6, Sanitary Structure Rebuilt, will be measured per foot complete in place.
Item 220.8, Sanitary Structure Remodeled, will be measured per each complete in place.

BASIS OF PAYMENT
Payment for Items 220.6,-220.8 shall be at the respective Contract unit price. These unit prices shall include all labor, materials, equipment and transportation required to rebuild or remodel the sanitary structure in place.

ITEM 222.3 FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD EACH

GENERAL
The work to be done under this Item shall conform to the relevant provisions of Section 220 of the Standard Specifications, and the following:

The work to be done under this Item shall consist of the furnishing and installing of Frame and Grates (or Covers) Municipal Standards at the locations on the Plans, and as required by the Engineer.

METHOD OF MEASUREMENT
Item 222.3 Frame and Grate (or Cover) Municipal Standard will be measured per each in accordance with the provisions of Subsection 220.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 222.3 Frame and Grate (or Cover) Municipal Standard will be paid at the contract unit price. per each complete in place and in accordance with the provisions of Subsection 220.81 of the Standard Specifications. This unit price shall include all labor materials, equipment and transportation required to be complete.

ITEM 223.1 FRAME AND GRATE (OR COVER) REMOVED AND STACKED EACH

GENERAL
Work to be done under this item shall conform to the relevant provisions of Section 220, and the following:

All frames and grates or covers designated to be stacked shall be carefully removed and transported to the Belmont Town yard on Prince Street.

METHOD OF MEASUREMENT
Item 223.1, Frame and Grate cover Removed and Stacked, will be measured per each.

BASIS OF PAYMENT
Item 223.1, Frame and Grate Cover Removed and Stacked, will be paid at the Contract unit price per each. These unit prices shall include all labor, materials, equipment and transportation required to complete the work.

No separate payment shall be made for transporting of casting, but all costs in connection therewith shall be included in the price bid of Item 223.1.

ITEM 223.2 FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED EACH

GENERAL
The work to be done under this Item shall conform to the relevant provisions of Section 220 of the Standard Specifications, and the following:

The work to be done under this Item shall consist of the removing and discarding of Frame and Grates (or Covers) Municipal Standards as shown on the Plans, and as required by the Engineer.

CONSTRUCTION METHODS

METHOD OF MEASUREMENT
Item 222.3 Removing and Discarding Frame and Grate (or Cover) Municipal Standard will be measured per each in accordance with the provisions of Subsection 220.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 222.3 Removing and Discarding Frame and Grate (or Cover) Municipal Standard will be paid at the contract unit price per each complete in place and in accordance with the provisions of Subsection 220.81 of the Standard Specifications. This unit price shall include all labor materials, equipment and transportation required to be complete.

ITEM 241.21	**21 INCH REINFORCED CONCRETE PIPE**	**FOOT**
ITEM 241.27	**27 INCH REINFORCED CONCRETE PIPE**	**FOOT**

GENERAL
The work to be done under these Items shall conform to the relevant provisions of Section 230, and the following:

The work under these Items shall consist of the furnishing and installing of 21- and 27-inch Reinforced Concrete Pipe

METHOD OF MEASUREMENT
Item 241.21 21 Inch Reinforced Concrete Pipe and Item 241.27 27 Inch Reinforced Concrete Pipe will be measured by the foot in accordance with the provisions of Subsection 230.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 241.21 21 Inch Reinforced Concrete Pipe and Item 241.27 27 Inch Reinforced Concrete Pipe will be paid for at the contract unit price per each complete in place and in accordance with the provisions of Subsection 230.81 of the Standard Specifications.

ITEM 250.08	**8 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE**	**FOOT**

GENERAL
Work under this item shall conform to the relevant provisions of Section 230 and the following:

Plastic storm drain pipe shall comply with ASTMD-D-1785(latest revision) for Polyvinyl chloride (PVC) pipe. All PVC pipes shall be Class 150, DR-18.

Joints for PVC pipe shall be ‘ring-tite’ joints, a flexible elastrometric ring in a groove, bell and spigot ends. The elastrometric ring shall meet the requirements of ASTM F-477 (latest revision).

METHOD OF MEASUREMENT
Item 250.08, 8 Inch Polyvinylchloride Sanitary Sewer Pipe will be measured per foot in accordance with the provisions of Subsection 230.80 of the Standard Specifications.

BASIS OF PAYMENT

Item 250.08, 8 Inch Polyvinyl Chloride Sanitary Sewer Pipe, will be paid for at the contract unit price per foot complete in place in accordance with the provisions of Subsection 230.81 of the Standard Specifications.

ITEM 369.06 6 X 6 INCH TAPPING SLEEVE, VALVE AND BOX EACH

GENERAL
The work to be done under this Item shall conform to the relevant provisions of Section 360 of the Standard Specifications, as shown on the Plans, as directed by the Engineer, and the following:

The work to be done under this Item shall consist of the furnishing and installing of 6 x 6 inch tapping sleeves. The tapping sleeves shall meet the requirements of the Town of Belmont.

METHOD OF MEASUREMENT
Item 369.0 6 x 6 Tapping Sleeves will be measured per each, in accordance with the provisions of Subsection 301.80 of the Standard Specifications

BASIS OF PAYMENT
Item 369.0 6 x 6 Tapping Sleeves will be paid for at the contract unit price per each complete in place, which price shall include all labor, materials, equipment and incidentals, all in accordance with the provisions of Subsection 301.81 of the Standard Specifications.

ITEM 376.5 HYDRANT ADJUSTED EACH

GENERAL
The work under this Item shall conform to relevant provisions of Section 300 of the Standard Specifications.

Existing hydrants designated to be adjusted shall be to the line or grade shown on the plans or as required by the Engineer.

METHOD OF MEASUREMENT
Item 376.5 Hydrants to be adjusted will be measured per each be in accordance with the provisions of Subsection 301.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 376.5 Hydrants to be adjusted, will be paid for at the contract unit price per each complete in place and in accordance with the provisions of Subsection 301.81 of the Standard Specifications.

ITEM 384.2 CURB STOP ADJUSTED EACH

GENERAL
The work under this Item shall conform to relevant provisions of Section 300 of the Standard Specifications.

Existing gates and service boxes designated to be adjusted shall be to the line or grade shown on the plans or as required by the Engineer.

METHOD OF MEASUREMENT
Item 384.2 Curb Stop Adjusted will be measured per each be in accordance with the provisions of Subsection 301.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 384.2, Curb Stop Adjusted, will be paid for at the contract unit price per each complete in place and in accordance with the provisions of Subsection 301.81 of the Standard Specifications.

ITEM 390.	**SPRINKLER HEAD REMOVED AND RESET**	**EACH**
ITEM 390.1	**SPRINKLER SYSTEM PIPE REMOVED AND RESET**	**FOOT**

GENERAL
Work under this Item shall conform to the relevant provisions of Section 301 of the Standard Provisions and the following:

The work under these Items shall consist of removing existing sprinkler heads and piping and reinstalling or replacing them in a similar location as required by the Engineer. The work also includes removal, replacement and furnishing of new heads or pipe that is damaged due to the required work. The work shall also include all labor, materials, fittings, equipment, transportation and other incidental costs required to replace the existing system with a complete functioning system. Any new pipe or sprinkler heads shall match the existing pipe and heads in similar functionality, brand, diameter, material, pressure requirements or other manufacturer's requirements. All replacement parts will be approved by the Engineer.

A sketch/drawing shall be submitted to the Engineer for each system to be reset/replaced. The sketch/drawing shall include approximate locations of all necessary appurtenances for a complete system. The Contractor shall submit manufacturer's information about the sprinkler system to the Engineer for approval. The installation of the heads and pipe shall be in strict accordance with the recommendations and instructions of the manufacturer or as approved by the Engineer. Each system reset or replaced will be inspected and tested by the Engineer prior to acceptance.

METHOD OF MEASUREMENT
Item 390., Sprinkler Head Removed and Reset will be measured per each.
Item 390.1, Sprinkler System Pipe Removed and Reset, will be measured per foot, along the top of the pipe in place. No deduction shall be made for fittings or sprinkler heads.

BASIS OF PAYMENT
Payment shall be made at the contract unit price complete and in place. Payment shall include all labor, materials, equipment and transportation required to replace the existing sprinkler system with a complete functioning system.

ITEM 415.	**MICRO MILLING**	**SQUARE YARD**

GENERAL
The work under this item shall consist of micro-milling the existing pavement to the depth and at the locations specified in the Contract Documents or as required by the Engineer. The micro-milling operation shall include a control strip to be approved by the Engineer for construction. Unless

otherwise specified, the milled material shall become the property of the Contractor.

MATERIALS

Hot Mix Asphalt (HMA)

Control Strip

The Contractor shall micro-mill a control strip 500 feet minimum in length and to the nominal depth shown on the plans. The surface shall be tested transversely and longitudinally with a 10 foot straightedge furnished by the Contractor. The depth of the micro-mill cut shall be confirmed with the pavement notes and minimally adjusted as required for a smooth milled surface.

The micro-milling shall have a transverse pattern of 0.2 – 0.3 inch center to center of each strike area. The difference between the bottom of the 10 foot straightedge and the milled surface shall not exceed 1/8" (3mm). The difference between the high and the low of the grooves for a micro-milled textured surface shall not exceed 1/16" (1.6mm).

CONSTRUCTION

The existing pavement shall be milled same as produced for the control strip to the nominal depth shown on the plans, and as required by the Engineer in a manner that will restore the pavement cross section and ride quality. The Engineer may adjust the average milling depth by ± 3/4" (± 20mm) during each milling pass at no additional payment to make slight adjustment for milling operations to minimize delamination of the underlying pavement course or to otherwise provide a more stable surface.

The micro-milled surface strip shall provide a smooth riding surface with a uniform textured appearance free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment or poor workmanship. Any unsatisfactory surfaces not consistent with the approved control strip shall be corrected by additional micro-milling at the Contractor's expense and to the satisfaction of the Engineer.

Any roadway patching shall be performed before micro-milling. Additional roadway patching may be required to correct pavement defects made visible by micro-milling. After the micro-milling has been completed, all depressions, potholes and other irregularities shall be patched with HMA. Any existing manholes or other structures shall be temporarily ramped as required by the Engineer.

The Contractor shall coordinate milling and paving operations to minimize the exposure of milled textured surfaces to traffic. Under no circumstances shall the milled surface be left exposed to traffic for a period exceeding three days. The Contractor shall ensure that milled surfaces are overlaid in a timely manner to avoid damage to the pavement structure.

The Contractor shall be responsible for providing all grades required to remove the material to the proper line and grade, superelevation, and transitions shown on the plans or as required by the Engineer.

If delamination or exposure of a concrete or penetrated stone base or other material occurs when milling an asphalt pavement course, the Contractor shall cease milling operations and consult the

Engineer to determine whether to reduce the milling depth or make other adjustments to the operation.

EQUIPMENT

The milling equipment shall be self-propelled with sufficient power, traction, and stability to remove the existing HMA pavement to the specified depth and cross-slope. The milling machine shall be capable of operating at a minimum speed of 10 feet (3 meters) per minute, designed so that the operator can at all times observe the milling operation without leaving the control area of the machine, and equipped with the following:

(a) A built in automatic grade control system that can control the longitudinal profile and the transverse cross-slope.

(b) Cutting drum able to provide a minimum nominal 6 foot (2.0 meter) cutting width in one pass. The cutting drum shall use tungsten carbide teeth.

(c) An integral pickup and conveying device to immediately remove milled material from the roadway and discharge the millings into a truck, all in one operation.

(e) All required safety devices such as reflectors, headlights, taillights, flashing lights and back up signals so as to operate safely in both day and night.

(f) A small amount of water to cool the cutting teeth and control the amount of dust created by the milling process.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a smaller or lesser-equipped milling equipment shall be permitted and approved by the Engineer.

Sweeper Equipment Requirements**.**

The Contractor shall provide a sufficient number of mechanical sweepers to ensure that the milled surface is free of millings and debris at the end of each day's milling operations. Each sweeper shall be equipped with a water tank, spray assembly to control dust, a pick-up broom, a dual gutter broom, and a dirt hopper. The sweepers shall be capable of removing millings and loose debris from the textured pavement.

METHOD OF MEASUREMENT

Item 415., Micro-milling, will be measured for payment by the square yard of pavement surface milled, as measured in place.

BASIS OF PAYMENT

Item 415., Micro-milling will be paid for at the unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work as required by the Engineer.

No separate payment shall be made for sweeping and removal of the cuttings, but all costs in connection therewith shall be included in the unit price bid.

Asphalt for patching will be paid for under other respective item of work.

SECTION 450
QUALITY ASSURANCE

Specifications To Be Inserted by MassDOT

SECTION 450.0	**QUALITY ASSURANCE**	
ITEM 451.	**HMA FOR PATCHING**	**TON**
ITEM 452.	**ASPHALT EMULSION FOR TACK COAT**	**GALLON**
ITEM 453.	**HMA JOINT SEALANT**	**FOOT**
ITEM 454.5.	**LATEX MODIFICATION OF HOT MIX ASPHALT**	**TON**

SECTION 455
SUPER PAVE PAVEMENT COURSES

Specifications To Be Inserted by MassDOT

ITEM 455.23	**SUPERPAVE SURFACE COURSE – 12.5 (SSC - 12.5)**	**TON**
ITEM 455.31	**SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC - 12.5)**	**TON**
ITEM 455.42	**SUPERPAVE BASE COURSE – 37.5 (SBC – 37.5)**	**TON**

ITEM 464.	**BITUMEN FOR TACK COAT**	**GALLON**

GENERAL
All work done under this item shall conform to the applicable provisions of the Standard Specifications for Highways and Bridges, Section 400, Hot Mix Asphalt and the following:

A tack coat of asphalt emulsion, grade RS-1 shall be uniformly applied to existing or new pavement surfaces prior to placing pavement courses as specified below. The existing surface shall be swept clean of all foreign matter and loose material using a mechanical sweeper and shall be dry before the tack coat is applied.

(1) Tack Distributor System.

A pressure distributor shall be used to apply the tack coat. The tack distributor system shall be equipped with the following to control and monitor the application:
(a) System for heating the asphalt emulsion uniformly to specified temperature.
(b) Thermometer for measuring the asphalt emulsion temperature.
(c) Adjustable full circulation spray bar.
(d) Positive controls including tachometer, pressure gauge, and volume measuring device.

(2) Tack Application Requirements.
The tack coat material shall be applied by a pressure distributor. All nozzles on the distributor shall be open and functioning. All nozzles shall be turned at the same angle to the spray bar. Proper nozzle angle shall be as determined by the manufacturer of the distributor spray bar. The spray bar shall be adjusted so that it is at the proper height above the pavement surface to provide a double overlap spray for a uniform coverage of the pavement surface. A double lap application requires that the nozzle spray patterns overlap one another such that every portion of the pavement receives spray from exactly two nozzles.

When an HMA pavement course is placed on an existing tight smooth pavement surface, a tack coat shall be applied at the rate of 1/20 gal/sy (0.20 liters/square meter). All existing surfaces subjected to milling shall receive a tack coat at the rate of 1/15 gal/sy (0.28 liters/square meter). Tack coat shall be applied to cover approximately 90% of the pavement surface.

Any new HMA pavement course that has been open to traffic, or that was placed 30 days prior to placement of the subsequent pavement course, shall receive a tack coat at an application rate of 1/20 gal/s.y. (0.20 liters/square meter).

When the surface of a new HMA pavement course is in a condition which in the Engineer's judgment is unsatisfactory for the direct placement of the subsequent pavement course, a tack coat shall be applied at the applicable rate specified above for the particular pavement surface condition.

In addition to the requirements above, all vertical surfaces of cuts for patches, curbs, edging, utilities, and drainage structures shall receive a thorough tack coat application immediately prior to placing each HMA pavement course.

(3) Tack Inspection.
The asphalt emulsion temperature and application rate shall be periodically measured. If the temperature or application rate is determined to not be in conformance with the specification requirements above, the Contractor shall make appropriate adjustments to the tack application operations.

METHOD OF MEASUREMENT
Item 464., Bitumen for Tack Coat, will be measured by the square yard and the quantity to be measured shall be the actual number of gallons of bitumen for tack coat applied to the as required by the Engineer.

BASIS OF PAYMENT
Item 464., Bitumen for Tack Coat, will be paid for at the Contract unit price per gallon which shall be include full payment for all labor, materials, equipment, fuel and incidentals to properly complete the work to the satisfaction of the Engineer.

ITEM 472.1 HOT MIX ASPHALT FOR PERMANENT PATCHES TON

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

Areas of existing asphalt pavement courses that are significantly distressed or unsound shall be removed and replaced with patches using new Hot Mix Asphalt. 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 saw cut 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 required 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 shall 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.

METHOD OF MEASUREMENT
Item 472.1 Hot Mix Asphalt for Permanent Patches **will be measured** for payment per ton, complete in place.

BASIS OF PAYMENT
Item 472.1 Hot Mix Asphalt for Permanent Patches **will be paid** for by the ton of HMA FOR Permanent Patching complete to the satisfaction of the Engineer. The unit bid price per ton shall include all labor, equipment, tools, saw cuts, old pavement excavation, sweeping, tack coat, joint sealant and all incidentals for a complete localized repair of the pavement.

ITEM 482.3	**SAWING ASPHALT PAVEMENT**	**FOOT**
ITEM 482.4	**SAWING CEMENT CONCRETE**	**FOOT**

GENERAL
The work under these items shall conform to the relevant provision of Section 120 of the Standard

Specifications and the following:

The work shall include the saw-cutting of existing pavements at limits of full-depth pavement and sidewalk construction, and as required by the Engineer. Saw-cut equipment shall be approved by the Engineer prior to commencing work.

All edges of excavations made for saw-cutting pavements shall be squared by saw-cutting with power-driven tools to provide a neat, clean edge for joining new pavement as shown on the Plans. Ragged, uneven edges shall not be accepted. Areas which have been broken or undermined shall be edged neatly with a minimum disturbance to remaining pavements.

Saw-cut surfaces shall be sprayed or painted with a uniform thin coat of RS-1 asphalt emulsion immediately before placement of bituminous concrete material against the surface.

Sawing Asphalt Pavement and Sawing Cement Concrete (including saw-cutting required for the installation of traffic signal conduits) includes all labor, tools, materials, equipment and incidental costs required to complete the work to the satisfaction of the Engineer.

METHOD OF MEASUREMENT
Item 482.3-482.4, Sawing Asphalt Pavement and Sawing Cement Concrete, will be measured for payment by the foot, complete in place.

BASIS OF PAYMENT
Item 482.3-482.4, Sawing Asphalt Pavement and Sawing Cement Concrete, will be paid for at the contract unit price per foot under Item 482.3, Sawing Asphalt Pavement, and 482.4, Sawing Cement Concrete respectively. Which price shall include all labor, tools, materials, equipment and incidental costs required to complete the work to the satisfaction of the Engineer.

ITEM 486.	**SCORED CEMENT CONCRETE PAVEMENT**	**CUBIC YARD**
ITEM 486.2	**COLORED SCORED CEMENT CONCRETE PAVEMENT**	**CUBIC YARD**

GENERAL
The work under this item shall consist of constructing scored cement concrete pavement in accordance with these Special Provisions, the Construction Standard Details Drawing Number M/E 105.2.0 and in conformity with the lines and grades shown on the Plans and/or as required by the Engineer.

The scored cement concrete shall be 5,000 psi, 8inches, 26 p/ft^3 and shall conform to the requirements specified in Subsection M4.02.00 of the Standard Specifications.

The base below the concrete pavement shall be gravel the depth of which shall be such that the bottom line meets the bottom of the contiguous pavement and shall be compacted as specified in Section 401.

Forms shall be placed to the full depth of the concrete. They shall be of wood, not less than nominal 2 inch thickness and dressed on all sides. Forms shall be securely staked and braced and shall be constructed and set so as to resist the pressure of the concrete without springing out of alignment. The forms shall be oiled before use.

Colored concrete shall be brick red in color. The coloring shall be a mineral oxide based water reducing admixture; providing permanent fade resistant, uniform, streak free, integral color. It shall reduce color bleeding, laitance, and efflorescence.

Provide manufacturer's product data, and sample field panel for review and approval by the Engineer.

Concrete shall be deposited with minimum re-handling in one layer. Hand spreading and spading shall be done adjacent to forms. The concrete shall be struck off and float finished. Protection and curing shall be as required in Section 901. The surface of the concrete pavement shall be scored and the contraction joints shall be sawed as shown in Drawing Number 105,2.0 of the Construction Standard Details.

METHOD OF MEASUREMENT
Item 486., Scored Cement Concrete Pavement, will be measured per cubic yard complete in place and accepted.

BASIS OF PAYMENT
Item 486., Scored Cement Concrete Pavement, will be paid for at the Contract unit price under Item 486., Scored Cement Concrete pavement. The Contract unit price per cubic yard shall include full compensation for furnishing all labor, materials, tools, transportation, equipment, and incidentals required to complete the work to the satisfaction of the Engineer.

ITEM 487. RESIN CROSSWALKS SQUARE YARD

GENERAL
Work under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

The work under this item shall include preparation of the pavement surface in conjunction with the installation of Resin Crosswalks where shown on the plans or as required by the Engineer.

SUBMITTALS
Submit manufacturers product data describing the material and process to be used.

The application contractor shall be required to furnish written verification that they are an accredited, licensed installer of the approved material/process.

A mockup encompassing a minimum surface area of 3' x 8', consisting of the color(s) and pattern(s) selected for this project, shall be installed within a section of a planned crosswalk in the designated work area(s), at least five working (5) days prior to the initiation of any phase of construction of the crosswalks. The mockup site will be determined by the engineer. With approval of the completed sample section, work shall begin within twenty-four hours (24) hours of authorized notice to proceed. The cost of the mockup shall be included in the unit price for this item.

Contactor shall be required to furnish to the engineer the locations of a minimum of five (5) similar crosswalk projects within the Commonwealth of Massachusetts, installed for a minimum period of five (5) years, as specified herein. The resin-based compound used on these projects must support a documented history of field performance and integrity of the work intended.

PREPARATION
This phase of the work consists of pre-cutting, removal and disposal of the pavement surface.

The section(s) of pavement to be replaced with the textured surface shall be precut in neat straight lines by saw cutting. The existing pavement surface shall be removed to an approximate uniform depth of between .50 and .75 inches. The area milled shall be protected throughout construction operations.

Residues resulting from this element of the work shall be immediately removed from the jobsites and disposed of in a legal manner.

All work sites must be properly prepared in accordance with the material manufacturer's requirements. Pavement sections where the surface has been removed must be left in a neat and clean condition, satisfactory to the engineer.

INSTALLATION
Contractor shall be responsible for the preparation, placement and patterning of the resin according to the manufacturer' guidelines and subject to the approval of the Engineer. This synthetic paving material shall be composed of a hot-applied, resin-based compound formulated with a color stable pigment throughout, that shall be surface textured to simulate brick. The contractor shall be required to overlay in previously prepared recessed pavement surfaces as described in the preceding PREPARATION section and/or other areas, as required by the engineer.

Using manufacturer prescribed methods and the specialized equipment described herein, the contractor shall adequately heat and uniformly mix the material(s) together with the desired colored pigment supplied by the manufacturer. Maximum heating temperature of the completed formulation is 440 degrees F. The contractor shall then apply the properly prepared, homogeneous material to the surface of a hardened, structurally sound bituminous concrete or cement concrete pavement, as required. The material shall be spread to the desired build thickness (not to exceed .75 inches) using specialized ironing tools, heated sufficiently to smooth the surface to a state of readiness for patterning. No material shall be applied when precipitation is present.

The color and surface pattern options shall be in accordance with the drawings and specifications. Final forming will begin immediately after leveling has occurred, while the material is still hot enough to allow the mold selected, to adequately penetrate the surface and create the desired pattern.

Once the finished surface has cooled sufficiently the application area may be opened to vehicular and/or pedestrian traffic. Any residue resulting from this work shall be removed and disposed of in a proper manner. The completed work area is to be left in a neat and clean condition, satisfactory to the engineer.

PROTECTION
The contractor shall take reasonable precautions and steps during crosswalk construction to prevent bodily harm or injury or damage to adjacent facilities such as new curb, sidewalks, drainage structures or water supply facilities. If during the execution of the work, the Contractors operations damage public or private property, the cost of repair or replacement shall be the responsibility of the contractor at no expense to the owner.

MATERIAL

The material(s) shall be a hot-applied resin based compound developed specifically for use on bituminous concrete, with proven adhesion, flexibility and abrasion resistance characteristics, as well as color stability, chemical resistance and scrub ability.

The resin material shall be flexible with form stability consistent with the existing bituminous concrete and be formulated for use with appropriate traffic conditions in conformance to the following minimum physical properties:

TEST PROCEDURE	GRADE 45 - GRADE 60
	(heavy traffic)
Average Temp. Range	25 – 140 degrees F
Wheel Tracking @ 113	less than 1 mm/hr
Wheel Tracking @ 140 F	less than 5 mm/hr
Density	2.12
Cone Flow Test	15% maximum (5 hrs. @ 194 F)
Plane Test	5% maximum (5 hrs. @ 194 F)
Indent @ 104 F	50 dmm maximum
Indent @ 122 F	5 dmm maximum
Ash Content	90% maximum
Skid Resistance Value	55 - 70

A manufacturer's certificate of compliance shall be required. If in the opinion of the engineer additional product information is needed to determine the applicability of the product submitted the engineer may request material testing. Material testing will be conducted by an independent certified laboratory acceptable to the engineer.

EQUIPMENT

Contractor must possess and be familiar with the specialized machinery required to perform the procedures as outlined and contained within these technical specifications, including, but not limited to, appropriate trucks, air compressors, miscellaneous asphalt equipment, dispensers, mixers, melters, applicators, heaters, cutters and/or specialized tools etc.

To ensure optimum work site efficiency and project safety considerations, two (2) self contained trucks consisting of dual, independent, thermostatically controlled 1.5 ton mixers with a minimum combined capacity of three (3) tons, and total capacity of six (6) tons, specifically designed for use in conjunction with the hot applied resin shall be required on location by this contract.

MOBILIZATION

Construction of the Resin Crosswalks shall commence within twenty-four (24) hours of written notification to proceed issued by the engineer. Work shall commence within this timeframe without regard to the number of mobilizations that may be required by the engineer to complete this work, with the exception of inclement weather.

Due to the logistical complications inherent to this type of specialized construction, given the general project size, scope, schedule and public safety concerns, the contractor may not assume that a single mobilization will be sufficient to complete this entire phase of the crosswalk work required in an orderly fashion. No separate payment shall be made for mobilization or demobilization.

METHOD OF MEASUREMENT

Item 487., Resin Crosswalks, will be measured for payment per yard, complete in place.

BASIS OF PAYMENT
Item 487., Resin Crosswalks, will be measured for payment per yard, complete in place will be paid at the respective Contract unit price bid per yard, which price shall include all labor, material, equipment mobilization, mockup and incidental costs required to complete the work.

There shall be no additional compensation for the disposal of excavated materials or excess Resin materials.

No deductions shall be made for structures within the work area such as manholes, catch basins or water covers.

ITEM 514.2 GRANITE CURB INLET – STRAIGHT - MUNICIPAL STANDARD EACH

GENERAL
Work under these items shall conform to relevant provisions of Section 500 of the Standard Specifications and the following:

The work shall consist of furnishing and installing granite curb inlets (double) conforming to lines, grades, dimensions and details shown on the Plans. Care must be taken when handling and placement of curb. Any damaged curb inlet shall be replaced by the Contractor at his/her own expense.

METHOD OF MEASUREMENT
Item 514.2, Granite Curb Inlet – Straight- Municipal Standard, will be measured per each complete in place.

BASIS OF PAYMENT
Item 514.2, Granite Curb Inlet – Straight- Municipal Standard will be paid for at the contract unit price each, which price shall include all labor, tools, equipment, materials, transportation, and incidental work required to install the curb inlet complete in place, to the satisfaction of the Engineer.

ITEM 531. TIMBER EDGING FOOT
ITEM 531.1 TIMBER EDGING – REMOVED AND RESET FOOT

GENERAL
The work under these Items shall conform to the relevant provisions of Section 501 of the Standard Specification and the following:

The work under these Items shall consist of the furnishing and installing of Timber Edging in the locations as shown on the plans and the removal and resetting of existing timber edging, in accordance with these specifications, and/or as required by the Engineer.

MATERIALS
Pressure treated timbers for use as Timber Edging shall conform to the relevant provisions of item

955 Treated Timber. They shall match the size of the timbers they replace or abut. Landscape Timber screws shall be self taping heat treated steel screws with release coating. Anchor spikes shall be 24 inch #7 rebar.

CONSTRUCTION
Timber Edging shall extend to the depth of the adjacent concrete walk and shall meet the proposed and or existing elevation behind the walk, with an overall height from finish grade not to exceed 18 inches.

MEASUREMENT
Items 531. And 531.1 will be measured for payment per foot, complete in place.
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BASIS OF PAYMENT
Item 531. And 531.1 will be paid per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the work.

ITEM 532. QUARTER ROUND CURB FOOT

GENERAL
Work under these items shall conform to the relevant provisions of Section 501. and shall include fabricating and installing Quarter Round Curb in the locations as shown on the plans, in accordance with these specifications, and/or as required by the Engineer.

SAMPLE
The contractor shall construct a 10' long sample section including at least one expansion joint to be approved by the Town prior to construction under these items. A second panel shall be provided if the first is not accepted by the Town and shall be constructed at the direction of the Engineer. Upon acceptance the sample section shall be included as part of the final curb.

MATERIALS
Quarter Round Curb shall conform to the relevant provisions of Section M4 of the Standard Specifications and the following:
The concrete used for curb mix shall be a blend of approximately 65% concrete sand, 20% 3/8 stone, and 15% cement, with one (1) lb. of concrete reinforcing fiber per cubic yard or as required by manufacturer. Quarter Round Curb shall be minimum 4,000 P.S.I after a curing period of 28 days and shall meet the requirements of ASTM C94
Two or more areas of laitance over 6" shall be reason for rejection and replacement at no additional cost to the Owner.

CONSTRUCTION
Quarter Round Curb shall either be fabricated in the field by means of extrusion form or shall be precast. Quarter Round Curb that is precast shall extend to the depth of the adjacent concrete walk. Extruded cement concrete curbs may be anchored to the surface of cement concrete walk by placing 6"x1/2" steel dowels at one foot on each side of every joint. The pavement shall be dry and cleansed of loose or deleterious Materials prior to curb placement.

Quarter Round Curb shall be formed to match the shape of existing Quarter Round Curb to which it replaces or abuts. Quarter Round Curb shall be scored to correspond to the scoring of the adjacent sidewalk.

Where sections of existing and or proposed curb abut they shall receive an expansion joint and a 6”x1/2” steel dowel to control differential settlement.

METHOD OF MEASUREMENT
Item 532., Quarter Round Curb, will be measured for payment per foot, complete in place.

BASIS OF PAYMENT
Item 532., Quarter Round Curb, will be paid per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the work.

ITEM 532.1 QUARTER ROUND CURB REMOVED AND RESET FOOT

GENERAL
Work under these items shall conform to the relevant provisions of Section 500. and shall include removing, stockpiling, reinstalling, and where required replacing and or extending portions of Quarter Round Curb in the locations as shown on the plans, in accordance with these specifications, and/or as required by the engineer.

Existing Quarter Round Curb shall be photographed prior to removal and provided to the engineer for recording. Quarter Round Curb shall be reset in its existing state and quantity as closely matching the original condition as is possible.

Quarter Round Curb to be reset shall be removed and stored on the property from which it originated.

If the Quarter Round Curb is deemed to be in too poor a condition and or of inadequate quantity to complete the work, the contractor shall contact the engineer for a determination and shall provide additional Quarter Round Curb conforming to the provisions of item 532 Quarter Round Curb.

Sections of Quarter Round Curb to be removed shall be removed in sections by saw cutting at the nearest control joint. Saw cutting shall conform to the provisions of item 482.4 Sawing Cement Concrete.

SUBMITTALS
Contractor shall submit existing condition photos including station and address to the resident engineer for use in recording and comparing the accuracy and quality of finished workmanship.

METHOD OF MEASUREMENT
Item 532.1 Quarter Round Curb Removed & Reset will be measured for payment per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the work.

Sections replaced or extended will be measured under item 532 Quarter Round Curb.
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BASIS OF PAYMENT
Item 532.1 Quarter Round Curb Removed & Reset will be paid per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the

work.
Sections replaced or extended will be paid for under item 532 Quarter Round Curb.

Cutting of Quarter Round Curb will be paid for separately under item 482.4 Sawing Cement Concrete

The contractor shall not be paid for quantities of Quarter Round Curb discarded due to its condition or for materials damaged due to the contractor's operations.

ITEM 533.1 PAVER EDGING REMOVED AND RESET FOOT

GENERAL
Work under these items shall conform to the relevant provisions of Section 700. and shall include removing, stockpiling, reinstalling, and where required replacing paver edging. Existing Paver Edging shall be photographed prior to removal and provided to the engineer for recording. Pavers shall be reset in their existing state and quantity as closely matching the original condition as is possible.

Pavers to be reset shall be removed and stored on the property from which they originated.

SUBMITTALS
Contractor shall submit existing condition photos including station and address to the resident engineer for use in recording and comparing the accuracy and quality of finished workmanship.

METHOD OF MEASUREMENT
Item 533.1 Paver Edge Removed and Reset will be measured for payment per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the work.
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BASIS OF PAYMENT
Item 533.1 Paver Edge Removed and Reset will be paid per foot, complete in place which shall include all labor, material, equipment, excavation and incidental costs required to complete the work.

The contractor shall not be paid for quantities of pavers discarded due to their condition or materials damaged due to the contractor's operations.

ITEM 580.1 CURB REMOVED, RELOCATED AND RESET EACH
ITEM 581.1 CURB INLET REMOVED, RELOCATED AND RESET EACH
ITEM 582.2 CURB CORNER REMOVED, RELOCATED AND RESET EACH

GENERAL
The work performed under these Items shall conform to the relevant provisions of Section 580 of the Standard Specifications and the following:

Work performed under these Items shall consist of the removing, stacking, relocating, and resetting of curbing, curb inlets, and curb corners in close conformity with the lines and grades shown on the Plans or established by the Engineer.

METHOD OF MEASUREMENT
Item 580.1, 581.1, and 582.2, curbing, curb inlets, and curb corners will be measured per each complete in place.

BASIS OF PAYMENT
Item 580.1, 581.1, and 582.2, curbing, curb inlets, and curb corners will be paid for at the Contract unit price per each complete in place. This unit price shall include all labor, tools, materials, equipment and transportation required to complete the work to the satisfaction of the Engineer.

ITEM 590.	**CURB REMOVED AND STACKED**	**FOOT**
ITEM 593.	**EDGING REMOVED AND STACKED**	**FOOT**
ITEM 594.	**CURB REMOVED AND DISCARDED**	**FOOT**

GENERAL
Work performed under these items shall conform to the relevant provisions of Section 580 of the Standard Specifications, and the following:

The work shall consist of removing existing curb deemed satisfactory by the Engineer but not required for resetting on this Project, and carefully stacking temporarily in a stockpile on the site for removal by the Town. The Contractor's responsibility for the protection of the curbing shall cease upon final acceptance of the work or 60 days from the time a certified notice, with copy to the Engineer, is sent by Contractor to the Town. Any curbing damaged through lack of protection or carelessness on the part of the Contractor shall be replaced by the Contractor at his/her own expense.

METHOD OF MEASUREMENT
Items 590. Curb Removed and Stacked will be measured per foot as specified in Subsection 580.80 of the Standard Specifications, which shall be the length of curb actually removed from the project site.

BASIS OF PAYMENT
Items 590. Curb Removed and Stacked will be paid for at the respective Contract unit price per foot. These unit prices shall include all labor, tools, materials, equipment and transportation required to complete the work to the satisfaction of the Engineer.

ITEM 645.130	**30 INCH CHAIN LINK FENCE (PTR) VINYL COATED (LINE POST OPTION**	**FOOT**
ITEM 645.142	**42 INCH CHAIN LINK FENCE (PTR) VINYL COATED (LINE POST OPTION**	**FOOT**

GENERAL
The work to be done under these Items shall conform to the relevant provisions of Section 644 of the Standard Specifications and the following:

The work to be done under these Items shall consist of the furnishing and installing of vinyl coated chain link fence

MATERIALS

METHOD OF MEASUREMENT
Item 645.130 30-Inch and Item 645.142 42-Inch Vinyl Coated Chain Link Fence will be measured, approximately parallel to the ground by the foot of completed fence, exclusive of openings from outside to outside of end posts.

BASIS OF PAYMENT
Item 645.130 30-Inch and Item 645.142 42-Inch Vinyl Coated Chain Link Fence will be paid at the contract unit price per foot, complete in place, which price shall include full compensation for all labor, materials, equipment, and incidentals required to complete the installation.

ITEM 650.030	**30 INCH CHAIN LINK GATE WITH GATE POSTS**	**EACH**
ITEM 650.042	**42 INCH CHAIN LINK GATE WITH GATE POSTS**	**EACH**
ITEM 653.030	**30 INCH CORNER OR INTERMEDIATE BRACE POST**	**EACH**
ITEM 653.042	**42 INCH CORNER OR INTERMEDIATE BRACE POST**	**EACH**
ITEM 654.030	**30 INCH CHAIN LINK FENCE**	**FOOT**
ITEM 654.042	**42 INCH CHAIN LINK FENCE FABRIC**	**FOOT**
ITEM 654.072	**72INCH CHAIN LINK FENCE FABRIC**	**FOOT**

GENERAL
This work under these Items shall consist of fabricating and installing Chain Link Fencing and Gates per the standards of Section 644. of the Standard Specifications, and the following:

For fence items requiring poured-in-place concrete footings, construct concrete footing in accordance with requirements of Section 901 of the Standard Specifications.

METHOD OF MEASUREMENT
Items 650.030 30 Inch Chain Link Gate With Gate Posts, Item 650.042 42 Inch Chain Link Gate With Gate Post, Item 653.030 30 Inch Fence Corner or Intermediate Brace Post and Item 653.42 42 Inch Fence Corner or Intermediate Brace Post will be measured for payment per each, complete in place.

Item 654.030 30 Inch Chain Link Fence Fabric and Item 654.03 30 Inch Chain Link Fence Fabric will be measured for payment per foot, complete in place.

BASIS OF PAYMENT
Item 650.030 30 Inch Chain Link Gate With Gate Posts, Item 650.042 42 Inch Chain Link Gate With Gate Post, Item 653.030 30 Inch Fence Corner or Intermediate Brace Post and Item 653.42 42 Inch Fence Corner or Intermediate Brace Post will be paid for at the respective Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Item 654.030 30 Inch Chain Link Fence Fabric and Item 654.042 42 Inch Chain Link Fence Fabric will be paid for at the respective Contract unit price per foot, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete footings will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Rock excavation, where performed as required by the Engineer, will be paid for separately under Item 144. Class B Rock Excavation.

ITEM 655.30	**30 INCH METAL FENCE**	**FOOT**
ITEM 655.31	**22 INCH METAL GATE WITH GATE POSTS**	**FOOT**
ITEM 655.32	**30 INCH METAL GATE WITH GATE POSTS**	**FOOT**

GENERAL
This work shall consist of fabricating and installing metal Fence and Gates. The work shall be performed in accordance with the details shown on the plans, as specified in these technical provisions and as required by the Engineer.

STANDARDS
Construction and material standards shall comply with the Commonwealth of Massachusetts, Department of Public Works, "Standard Specifications for the Highway and Bridges," 1988 current amendments, hereinafter referred to as the Standard Specifications.

SUBMITTALS
The Contractor shall submit the following Shop Drawings, samples, and manufacturers information for approval:

Submit detailed shop drawings and fabrication details for metal fence(s).

Submit manufacturer's information, brochures and/or specifications for hot dip galvanizing, paint, and or powder coating finish.

QUALITY ASSURANCE AND WARRANTY
Cutting, painting (other than touch-up), and welding in the field shall not be permitted.

Contractor shall provide to the Department the written maintenance and operational instructions, all warranties, and guarantees provided by the Manufacturers for the specific improvements and finishes, for a minimum of one year after Final Acceptance. If Manufacturer does not provide warrantee for materials installed, Contractor shall assume all cost for replacement of specified material, if product fails during warrantee period.

Contractor shall provide a guarantee of minimum of one year after acceptance of Workmanship and against defect as determined by the Department, and shall completely replace or repair site improvements at their own expense within two months after item is identified in the field.

MANUFACTURERS
Master Halco, Inc.
One City Blvd. West, Suite 900
Orange, CA 92868
Phone (800) 229-5615
Fax (714) 385-0107

Ameristar Fence Products, Inc.,
1555 N. Mingo Rd
Tulsa, OK 74116

Phone (888) 333-3422

Ornamental Fence Supply
Big Rock, Illinois
P (815) 508-2454
Or approved equivalent.

MATERIALS
All steel for the metal fence items shall be fashioned from hot rolled mild carbon steel unless specified otherwise. Tubular steel, shall conform to requirements for ASTM 500, Grade B structural steel tubing. Wall thickness for tubing shall be 8 gauge minimum. Steel bar channel rail and steel pickets shall be fabricated from M1020 bar stock steel. Unless noted otherwise, steel for hardware shall be fabricated per ASTM A325 requirements and galvanized per ASTM A153 requirements. All iron castings shall be Gray Iron conforming to ASTM A48, Class 30 or better.

The Contractor shall provide bolting hardware made of the same basic metal and alloy and which match the finished color and texture of the metal being fastened, unless otherwise indicated on the detail drawings.

Welding materials and practices shall conform to AWS code. Welding rods shall be the same composition as the base metal being welded.

FABRICATION
Construct metal fence items according to Specification requirements and in conformance to the approved shop drawings.

Fence fabrication shall be accomplished using the highest standards of workmanship. All steel tubing seams shall be located on the inside face(s) of each metal fence item. All connections shall be welded and ground flush and smooth. Provide drilled vent holes in tubular steel posts. All fabricated metal fence items shall be fine sanded throughout to produce a high standard of surface smoothness. All surfaces and connections shall be without visible grinding marks, surface differentiation or variation.

Iron casting shall be uniform in quality and appearance; true to pattern, with fine surface texture. It shall be free from blow holes, porous spots, hard spots, shrinkage faults, visible warpage, buckle cracks, spots, and all other defects, which would impair its usefulness and appearance. Maximum acceptable shift shall be 1/16 inch. All ornamentation and markings shall be sharp and clearly defined. The finished for all the casting shall be of the finest surface of high grade fabrication with a minimum of grinding, machining, dressing, etc. in accordance with highest industry standards. Each casting shall be thoroughly cleaned of all sand, scales, fins, core anchors, welds, machine markings, projections, imperfections, etc. Excess dressing shall be cause for rejection.

FINISH
Finish shall be semi-gloss.

Color shall be black.

The finish color shall be either an electrostaticly applied polyester powdercoat, hot dip galvanized and painted or approved equivalent.

If a galvanized and painted finish is selected all hot dip galvanizing material shall be thoroughly cleaned in accordance with the Steel Structures Painting Council Standard, SSPC SP-1. Following fabrication of metal fencing, metal shall be thoroughly cleaned of all dirt, oil, residue or foreign substance and then hot dip galvanized in complete compliance with ASTM A123, A153, and/or A386.

Following galvanizing, each metal item shall receive surface grinding to remove lumps, sags or spikes resultant from the galvanizing process. The finished surface following grinding shall be hand smooth and without irregularities. Take care not to damage the galvanizing surface coating.

Galvanizer shall handle, pack, and ship, in such a manner as to minimize damage to the finish. Upon arrival at job site, it is the Contractor's responsibility to take equal precautions. Since some surface damage is inevitable, suitable touch-up material shall be readily available from the galvanizer for the Contractor's use.

Upon acceptance of construction and installation of each unit of fencing, the galvanizer shall supply to the Owner's representative the equivalent of one-half pint of touch-up material for each unit installed.

The galvanizer shall supply a warranty for each item of galvanized and top coated metal fencing which states that the galvanizing and top coating will project the steel against 10% or more visible rust for a period of twenty (20) years.
Painting shall include an epoxy prime coat with a minimum of three topcoats of black enamel paint. Thickness of finish coat shall be 8-10 mils. Minimum.

INSTALLATION
Install completed metal fencing items in accordance with Specifications and drawing requirements.

For metal fencing items requiring poured-in-place concrete footings, construct concrete footing in accordance with requirements of Section 901 of the Standard Specifications.

For metal fencing items requiring installation into areas of unit pavement or other finish materials, core holes in pavers to required size and depth. Set steel sleeves prior to pouring of concrete plumb and flush with bottom of paver setting bed. Install post at level height and shim as required.

All posts and all steel pickets shall be plumb. All steel channel rails shall parallel to the centerline grades.

Any surface damage during installation shall be required immediately to the Engineer's satisfaction.

METHOD OF MEASUREMENT
Item 655.30 30 Inch Metal Fence, Item 655.31 30 Inch Metal Gate 22 Inch Wide and Item 655.32 30 Inch Metal Gate 30 Inch Wide will be measured for payment by the foot complete in place.

BASIS OF PAYMENT
Item 655.30 30 Inch Metal Fence, Item 655.31 30 Inch Metal Gate 22 Inch Wide and Item 655.32 30 Inch Metal Gate 30 Inch Wide will be paid for at the respective Contract unit price per foot which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete footings will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Rock excavation, where performed as required by the Engineer, will be paid for separately under Class B rock Excavation.

ITEM 670.1 METAL FENCE REMOVED AND RESET FOOT

GENERAL
This work shall consist removing, storing, and reinstalling Metal Fencing. The work shall be performed in accordance with the details shown on the plans, as specified in these technical provisions and as required by the Engineer.
Existing Metal Fence shall be photographed prior to removal. Metal Fence shall be reset in its existing state and quantity as closely matching the original condition as is possible.

STORAGE
Store units in covered, dry locations, protected from weather, stored off the ground, and secured. Avoid use of protective materials that trap heat and moisture.

Protect product's finish from damage during handling and installation.

Secure all items from damage for any reason, including vandalism, and theft.

INSTALLATION
Install fence items in accordance with Standard Specifications.

For metal fencing items requiring poured-in-place concrete footings, construct concrete footing in accordance with requirements of Section 901 of the Standard Specifications.

For metal fencing items requiring installation into areas of unit pavement, core holes in pavers to required size and depth. Set steel sleeves prior to pouring of concrete plumb and flush with bottom of paver setting bed. Install post at level height and shim as required.

All posts and all steel pickets shall be plumb. All steel channel rails shall parallel to the centerline grades.

Any surface damage during installation shall be repaired immediately to the Engineer's satisfaction.

METHOD OF MEASUREMENT

Item 670., Metal Fence Remove and Reset, will be measured for payment by the foot, complete in place.

BASIS OF PAYMENT
Item 670., Metal Fence Remove and Reset, will be paid for at the respective contract unit price per foot, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete footings will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete

Masonry per Cubic Yard.

Rock excavation, where performed as required by the Engineer, will be paid for separately under Class B rock Excavation.

ITEM 672.1 METAL GATE AND GATE POST REMOVED AND RESET EACH

GENERAL
This work shall consist removing, storing, and reinstalling Metal Gate and Gate Post. The work shall be performed in accordance with the Standard Specifications and as required by the Engineer. Existing Metal Gate and Gate Post shall be photographed prior to removal. Metal Gate and Gate Post shall be reset in its existing state and quantity as closely matching the original condition as is possible.

STORAGE
Store units in covered, dry locations, protected from weather, stored off the ground, and secured. Avoid use of protective materials that trap heat and moisture.

Protect product's finish from damage during handling and installation.

Secure all items from damage for any reason, including vandalism, and theft.

INSTALLATION
Install completed Metal Gate and Gate Post items in accordance with Specifications and drawing requirements.

For Metal Gate and Gate Post items requiring poured-in-place concrete footings, construct concrete footing in accordance with requirements of Section 901 of the Standard Specifications. And at a minimum shall meet the standards detailed for proposed metal fence.

For Metal Gate and Gate Post items requiring installation into areas of unit pavement or other finish material, core holes in pavers to required size and depth. Set steel sleeves prior to pouring of concrete plumb and flush with bottom of paver setting bed. Install post at level height and shim as required.

All posts and all steel pickets shall be plumb. All steel channel rails shall parallel to the centerline grades.

Any surface damage during installation shall be repaired immediately to the Engineer's satisfaction.

METHOD OF MEASUREMENT
Item 672.1, Metal Gate and Gate Post Remove and Reset, will be measured for payment per each, complete in place.

BASIS OF PAYMENT
Item 672.1, Metal Gate and Gate Post Remove and Reset, will be paid for at the respective Contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete footings will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Rock excavation, where performed as required by the Engineer, will be paid for separately under Class B rock Excavation.

ITEM 701.01	**SCORED CEMENT CONCRETE SIDEWALK**	**SQUARE YARD**
ITEM 701.02	**COLORED SCORED CEMENT CONCRETE SIDEWALK**	**SQUARE YARD**
ITEM 701.11	**SCORED CEMENT CONCRETE SIDEWALK AT DRIVEWAY**	**SQUARE YARD**
ITEM 701.2	**CEMENT CONCRETE WHEELCHAIR RAMP**	**SQUARE YARD**

GENERAL
Work under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

Scoring patterns for Scored Cement Concrete Sidewalk, Scored Cement Concrete Sidewalk at Driveway and Colored Scored Cement Concrete Sidewalk shall be as shown on the plans & details. Scoring shall not be saw cut, hand trowling is required.

Colored scored concrete sidewalk shall be brick red in color. It shall be a mineral oxide based water reducing admixture; providing permanent fade resistant, uniform, streak free, integral color. It shall reduce color bleeding, laitance, and efflorescence. Colored concrete banding shall be scored on a 12 inch grid as shown on plans and details.

SAMPLES
The contractor shall construct an 8’ by 20’ long sample Scored Concrete Sidewalk section including at least one expansion joint and Colored Scored Concrete Sidewalk banding. Sample shall be approved by the Engineer prior to sidewalk construction under these items. A second panel shall be provided if the first is not accepted by the Engineer and shall be constructed at the direction of the Engineer. Upon acceptance the sample panel shall be included as part of the final concrete sidewalk.

SUBMITTALS
Detectable warning panels for wheelchair ramps shall be red pre-cast concrete paving units as supplied by one of the following or approved equal. Provide manufacturers product data.

Hanover
Detectable Warning Pavers
“Red15” Tech Tile

Tile Tech
Detectable Warning Pavers
“Red”

Pave stone
Detectable Warning Pavers
“Colonial Red”

Submit color sample for colored concrete along with manufacturer's product data.

METHOD OF MEASUREMENT
Item 701.01 Scored Cement Concrete Sidewalk, item 701.02 Colored Scored Cement Concrete Sidewalk, item 701.11 Scored Cement Concrete Sidewalk at Driveway and item 701.2 Concrete Wheelchair Ramp will be measured for payment per square yard, complete in place.

BASIS OF PAYMENT
Item 701.01 Scored Cement Concrete Sidewalk, item 701.02 Colored Scored Cement Concrete Sidewalk, item 701.11 Scored Cement Concrete Sidewalk at Driveway and item 701.2 Concrete Wheelchair Ramp will be paid at the respective Contract unit price bid per square yard, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 705. FLAGSTONE WALK SQUARE YARD

GENERAL
The work performed under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

Work performed under this item shall consist of the furnishing and construction of flagstone walk in close conformity with the lines and grades shown on the Plans or established by the Engineer.

METHOD OF MEASUREMENT
Item 705., Flagstone Walk, will be measured per square yard complete in place.

BASIS OF PAYMENT
Item 705., Flagstone Walk, will be paid for at the Contract unit price per square yard complete in place. This unit price shall include all labor, tools, materials, equipment and transportation required to complete the work to the satisfaction of the Engineer.

ITEM 706. BRICK WALK SQUARE YARD

GENERAL
The work under this item shall conform to the relevant provisions of Section 701 and the following:

The work to be performed under this Item shall consist of the furnishing and installing of brick walk in close conformity to the lines and grades shown on the Plans or established by the Engineer.

METHOD OF MEASUREMENT
Item 706. Brick Walk will be measured per square yard in accordance with the provisions of Subsection701.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 706. Brick Walk, will be paid for at the contract unit price per square yard, complete in place in accordance with the provisions of Subsection 701.81 of the Standard Specifications, which price shall include all labor, tools, materials, equipment, and incidentals to complete the work to the satisfaction of the Engineer,

ITEM 706.1 BRICK WALK REMOVED AND RELAID SQUARE YARD

GENERAL
The work shall consist of the removing and relaying of brick walk and granite steps, similar to the existing conditions and in close conformity with the lines and grades shown on the Plans or as required by the Engineer.

METHOD OF MEASUREMENT
Item 706.1 Brick Walk Removed and Relaid will be measured per square yard complete in place.

BASIS OF PAYMENT
Item 706.1, Brick Walk Removed and Reset, will be paid for at the Contract unit price per square yard. This unit price shall include all labor, tools, materials, equipment and transportation required to complete the work to the satisfaction of the Engineer.

ITEM 707.1 PARK BENCH EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of supplying and installing materials for Park Benches. Park Bench locations shall be as shown on the plans, in accordance with these specifications, and/or as required by the Engineer. For each bench removed and stacked duplicate and replace memorial placards where applicable.

STANDARDS
Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

ASTM – American Society for Testing and Materials;
AWS – American Welding Society;
SSPC – Steel Structures Painting Council

SUBMITTALS
Contractor shall submit all shop drawings, manufacturers' product data, and samples in accordance with Division I. Shop drawings shall be returned to the Contractor for resubmission if required information is incomplete. Verify all dimensions in the field before shop drawings are submitted. The Contractor shall submit a sample of the product finish and color for approval by the Engineer.

Shop drawings shall include plans, sections and details as required to show all materials and reinforcing, layout, dimensions, jointing, method of connection and assembly, fabrication and tolerances for types of materials, types and details of connections and openings, cuts, holes, bolts, plates, concrete footings, reinforcing and finishing, anchors and fasteners, attachment details, and painting and finishing.

Certificate of Compliance: Submit manufacturer's certification that each unit piece of Site Furniture has been constructed/installed to conform to design, materials, and construction equivalent to requirements for labeled construction.

Refer to Section 901, CEMENT CONCRETE MASONRY for submittal requirements for all foundations, footings, and reinforced concrete structures.

Manufacturer's Literature: Submit product data including details of construction, materials, dimensions, analysis, hardware preparation, color charts and specific finishes, and label compliance.

Furnish to the Engineer notarized certificates of compliance with ASTM requirements specified in this Section for each item.
The contractor shall provide shop drawings for each memorial plaques to be replaced. Shop drawing shall include photo's of each existing memorial plaque with station location for reference.

QUALITY ASSURANCE AND WARRANTY
Cutting, painting (other than touch-up), and welding in the field will not be permitted.

Contractor shall provide to the Department the written maintenance and operational instructions, all warranties, and guarantees provided by the Manufacturers for the specific improvements and finishes, for a minimum of one year after Final Acceptance. If Manufacturer does not provide warrantee for materials installed, Contractor shall assume all cost for replacement of specified material, if product fails during warrantee period.

Contractor shall provide a guarantee of minimum of one year after acceptance of Workmanship and against defect as determined by the Department, and shall completely replace or repair site improvements at their own expense within two months after item is identified in the field.

DELIVERY, HANDLING AND STORAGE
Deliver units to the site in manufacturer's original, unopened containers and packaging. Upon delivery examine packages immediately to ensure all products are complete and undamaged. Remove and replace damaged items.

Store units in covered, dry locations, protected from weather, stored off the ground, and secured on-site.
Avoid use of protective materials that trap heat and moisture
Protect product's finish from damage during handling and installation.
Secure all items from damage for any reason, including vandalism, and theft.

PRODUCTS
Benches shall meet the visual illustration shown on the Drawings.

Plainwell bench 72", steel slats, black or approved equivalent.
Landscape Forms Inc.
431 Lawndale Ave.
Kalamazoo, MI 49048
PH: (800-430-6209)

FM-324 Framers Modern bench, 6', steel slats,
black
Victor Stanley, Inc.
P.O. Drawer 330
Dunkirk, Maryland 20754 USA
PH: (800-368-2573)

Bench model 160-60, steel slats, black
Dumor Site Furnishings Inc.
M. E. O'Brien & Sons, Inc.
93 West Street P.O. Box 650
Medfield, MA 02052-0650
PH: (508-359-4200)

MATERIALS
Bench shall be manufactured of milled steel bars, plates, and pipes to the dimensions and quantities shown on the Drawings. Side supports shall be of one-piece construction. Bars shall be 3/8 inch minimum thickness. Provide all materials from new stock, free from defects impairing strength, durability and appearance, and of best commercial quality for the purpose specified.

All hardware shall be fabricated from steel conforming to ASTM A36 and shall be galvanized by the hot-dip process in conformity with ASTM A153-73 for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, unless otherwise specified as stainless steel conforming to ASTM Type 316 and 317 stainless steel bolts, anchors, clips, and fasteners shown on the Drawings and indicated herein.

All welds shall be continuous and ground smooth and watertight, without compromising the structural integrity of the weld.

Supply all equipment hardware and required accessories required for complete, operating and installed site improvement item specified herein. Provide all exposed fasteners of the same material, color and painted finish as the fastened material unless otherwise indicated in the Drawings and specified herein. Provide all exposed fasteners vandal-proof (spanner-head type), unless otherwise noted in the Drawings or specified herein. Provide fasteners and sleeves that allow for removal without damaging the fasteners or the item.

Anchoring for bench shall be as shown on the Drawings with stainless steel anchor bolts to dimensions and requirements of the manufacturer. Zinc plated bolts shall not be accepted.
All bolts shall receive an ornamental cover color to match bench to hide bolt form view.

FINISH
Unit shall be either electrostatically applied polyester powdercoat or coated with hot dip galvanizing before painting with an epoxy prime coat with a minimum of three topcoats of black enamel paint. Thickness of finish coat shall be 8-10 mils. Minimum.

Finish shall be semi-gloss.

Color shall be black.

CONSTRUCTION METHODS
Review layout of units for approval in the field with Engineer before footings and improvements are installed.

PARK BENCH INSTALLATION
Install Park Bench in accordance with manufacturer's instructions. Refer to the specific site elements and the Drawings for horizontal and vertical alignment. Anchor Park Bench securely and according to manufacturer's instructions and the Drawings, to concrete pads with stainless steel anchor bolts and fasteners with lock-tight washers.

Park Bench shall be securely installed to a 1/8 inch tolerance overall and shall be installed per manufacturer's directions, plumb and level, unless otherwise shown in the Drawings. Items that fall outside of this tolerance shall be required to be reset to meet tolerance, as a condition of acceptance. Bolts and fasteners shall be trimmed to safe length, as applicable and with review by the Engineer.

PROTECTION
Protect all stored and installed Park Benches from damage, use, theft or vandalism until acceptance. Contractor shall adjust, repair, or replace damaged, missing, or unacceptable items at their own expense.

Site items shall be clean, and finishes as specified as condition of acceptance. Clean with non-abrasive means, careful not to damage finishes.

METHOD OF MEASUREMENT
Item 707.1 Park Bench will be measured for payment per each as called out on the plans or as required by the Engineer.

BASIS OF PAYMENT
Item 707.1 Park Bench will be paid for at the contract unit price Per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 707.11 PARK BENCH REMOVED AND STACKED EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of detaching existing Park Bench from its foundation if any, packaging as required to prevent damage to finishes, and delivered to The Town of Belmont, MA Department of Public Works 40 Prince Street Belmont, MA 02478 The contactor shall notify the Engineer and call The Town department at PH: (617) 489-7171 at least 1 week prior to scheduled delivery.

MEASUREMENT
Item 707.11 Park Bench Removed and Stacked will be measured for payment per each as called out on the plans or as required by the Engineer.

PAYMENT
Item 707.11 Park Bench Removed and Stacked will be paid for at the contract unit price Per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 707.2 TRASH RECEPTACLE EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of supplying and installing materials for trash receptacles. Trash receptacle locations shall be as shown on the plans, in accordance with these specifications, and/or as required by the Engineer.

STANDARDS
Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

ASTM – American Society for Testing and Materials;
AWS – American Welding Society;
SSPC – Steel Structures Painting Council

SUBMITTALS
Contractor shall submit all shop drawings, manufacturers' product data, and samples in accordance with Division I. Shop drawings shall be returned to the Contractor for resubmission if required information is incomplete. Verify all dimensions in the field before shop drawings are submitted. The Contractor shall submit a sample of the product finish and color for approval by the Engineer.

Shop drawings shall include plans, sections and details as required to show all materials and reinforcing, layout, dimensions, jointing, method of connection and assembly, fabrication and tolerances for types of materials, types and details of connections and openings, cuts, holes, bolts, plates, concrete footings, reinforcing and finishing, anchors and fasteners, attachment details, and painting and finishing.

Certificate of Compliance: Submit manufacturer's certification that each unit piece of Site Furniture has been constructed/installed to conform to design, materials, and construction equivalent to requirements for labeled construction.

Refer to Section 901, CEMENT CONCRETE MASONRY for submittal requirements for all foundations, footings, and reinforced concrete structures.

Manufacturer's Literature: Submit product data including details of construction, materials, dimensions, analysis, hardware preparation, color charts and specific finishes, and label compliance.

Furnish to the Engineer notarized certificates of compliance with ASTM requirements specified in this Section for each item.

QUALITY ASSURANCE AND WARRANTY
Cutting, painting (other than touch-up), and welding in the field will not be permitted.

Contractor shall provide to the Department the written maintenance and operational instructions, all warranties, and guarantees provided by the Manufacturers for the specific improvements and finishes, for a minimum of one year after Final Acceptance. If Manufacturer does not provide warrantee for materials installed, Contractor shall assume all cost for replacement of specified material, if product fails during warrantee period.

Contractor shall provide a guarantee of minimum of one year after acceptance of Workmanship and against defect as determined by the Department, and shall completely replace or repair site improvements at their own expense within two months after item is identified in the field.

DELIVERY, HANDLING AND STORAGE
Deliver units to the site in manufacturer's original, unopened containers and packaging. Upon delivery examine packages immediately to ensure all products are complete and undamaged. Remove and replace damaged items.

Store units in covered, dry locations, protected from weather, stored off the ground, and secured on-site. Avoid use of protective materials that trap heat and moisture

Protect product's finish from damage during handling and installation.

Secure all items from damage for any reason, including vandalism, and theft.

PRODUCTS
Receptacles shall meet the visual illustration shown on the Drawings.

Receptacles shall be:

S-42 Series Litter Receptacle, black
With steel closing dome top
Victor Stanley, Inc.
P.O. Drawer 330

Dunkirk, Maryland 20754 USA
PH: 800-368-2573

Receptacle 158-32, black
With steel closing dome top PT.
Dumor Site Furnishings Inc.
M. E. O'Brien & Sons, Inc.
93 West Street P.O. Box 650
Medfield, MA 02052-0650
PH: 508-359-4200

Or approved equivalent.

MATERIALS

Provide all materials from new stock, free from defects impairing strength, durability and appearance, and of best commercial quality for the purpose specified.

Supply all equipment hardware and required accessories required for complete, operating and installed site improvement item specified herein.

All hardware shall be fabricated from steel conforming to ASTM A36 and shall be galvanized by the hot-dip process in conformity with ASTM A153-73 for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, unless otherwise specified as stainless steel conforming to ASTM Type 316 and 317 stainless steel bolts, anchors, clips, and fasteners shown on the Drawings and indicated herein.

Provide all exposed fasteners of the same material, color and painted finish as the fastened material unless otherwise indicated in the Drawings and specified herein.

Provide all exposed fasteners vandal-proof (spanner-head type), unless otherwise noted in the Drawings or specified herein. Some items will require removal for regular maintenance or for other uses. Provide fasteners and sleeves that allow for removal without damaging the fasteners or the item.

Trash receptacle shall meet the visual illustration shown on the Drawings and shall be manufactured of solid milled steel bars, bands, plates, and pipes to the dimensions and quantities shown on the Drawings.

All welds shall be continuous and ground smooth and watertight, without compromising the structural integrity of the weld.

Unit shall be coated with hot dip galvanizing before powder coating. Finish shall be an electrostatically applied powder coat. Color shall be black.

Anchoring for unit shall be floor mounted with stainless steel anchor bolts to dimensions and requirements of the manufacturer.

Receptacle shall have a high density plastic liner provided by the manufacturer minimum capacity of 32 gal.

CONSTRUCTION METHODS

Review layout of units for approval in the field with Engineer before footings and improvements are installed.

UNIT INSTALLATION
Install Site Furniture in accordance with manufacturer's instructions. Refer to the specific site elements and the Drawings for horizontal and vertical alignment. Anchor site furnishings, securely and according to manufacturer's instructions and the Drawings, to concrete pads with stainless steel anchor bolts and fasteners with lock-tight washers.

Units shall be securely installed to a 1/8 inch tolerance overall and shall be installed per manufacturer's directions, plumb and level, unless otherwise shown in the Drawings. Items that fall outside of this tolerance shall be required to be reset to meet tolerance, as a condition of acceptance. Bolts and fasteners shall be trimmed to safe length, as applicable and with review by the Engineer.

PROTECTION
Protect all stored and installed units from damage, use, theft or vandalism until acceptance. Contractor shall adjust, repair, or replace damaged, missing, or unacceptable items at their own expense. Site items shall be clean, and finishes as specified as condition of acceptance. Clean with non-abrasive means, so as not to damage finishes.

METHOD OF MEASUREMENT
Item 707.2 Trash Receptacle will be measured for payment per each which price shall include all labor, material, equipment and incidental costs required to complete the work.

BASIS OF PAYMENT
Item 707.2 Trash Receptacle will be paid for at the contract unit price Per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 707.21 TRASH RECEPTACLE REMOVED AND STACKED EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of detaching existing Trash Receptacle from its foundation if any, packaging as required to prevent damage to finishes, and delivered to The Town of Belmont, MA Department of Public Works 40 Prince Street Belmont, MA 02478 The contactor shall notify the Engineer and call The Town department at PH: (617) 489-7171 at least 1 week prior to scheduled delivery.

METHOD OF MEASUREMENT
Item 707.21 Trash Receptacle Removed and Stacked will be measured for payment per each as called out on the plans or as required by the Engineer.

BASIS OF PAYMENT
Item 707.21 Park Trash Receptacle and Stacked will be paid for at the contract unit price Per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 707.71 3 INCH WAVERLY TRAIL MEDALLION (INSTALLATION ONLY) EACH

ITEM 707.72 12 INCH WAVERLY TRAIL MEDALLION (INSTALLATION ONLY) EACH

GENERAL

Work done under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

The work shall consist of installing 3 inch and 12 inch trail medallions along the Waverly Trail as shown on the Plans . The medallions will be provided by others and installed in conformance with the manufacturers recommendations and the details shown on the Plans. The medallions shall be placed in conjunction with the placement of the cement concrete sidewalks. The Contractor shall ensure that each medallion is flush with the sidewalk surface and does not cause a tripping hazard. The Contractor shall also ensure that the medallion shall be protected during the installation so that the image/text on the medallion is clean and free from concrete debris.

The Contractor shall provide the Engineer with a schedule for the placement of the concrete sidewalks along the path of the Waverly Trail, one month prior to the placement of the concrete sidewalks, to allow for delivery of the medallions to the Contractor. The Contractor, Engineer and a representative from the Town shall review the placement of the medallions prior to the placement of the concrete sidewalks.

METHOD OF MEASUREMENT
Items 707.71 and 707.12 will be measured for payment per each medallion installed.

METHOD OF PAYMENT
Items 707.71 and 707.12 will be paid for at the contract unit price per each, which shall include all labor, equipment and incidental costs required to complete the work.

ITEM 707.81 STEEL BOLLARD REMOVED AND RESET EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of Removing existing steel bollard including its foundation, transporting it to the location indicated as shown on the plans, in accordance with these specifications, and/or as required by the Engineer and resetting it to meet its original conditions of installation.

CONSTRUCTION METHODS
The contractor shall remove steel bollard from its original location by first cleanly cutting away surface pavement to prevent damage to the bollard during removal, excavating as required to remove the bollard, and carefully removing any excess material required to cleanly reinstall the bollard in its new location.

MEASUREMENT
Item 707.81 Steel Bollard Removed and Reset will be measured for payment per each as called out on the plans or as required by the Engineer.

PAYMENT
Item 707.81 Steel Bollard Removed and Reset will be paid for at the contract unit price Per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete footings will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Cutting of Cement Concrete Sidewalk will be paid for separately under Item 482.4 Sawing Cement Concrete.

Rock excavation, where performed as required by the Engineer, will be paid for separately under Class B rock Excavation.

ITEM 707.82 BOLLARD EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of supplying and installing materials for Bollard. The bollard shall be provided with an optical assembly mounted inside the shaft providing an I.E.S. Type V distribution. The bollard shall be one-piece construction. The optical assembly shall be secured inside the shaft. The bollard top shall be removable for optical assembly access. The lighted bollards shall be furnished with an H.I.D. ballast and socket assembly. Sockets shall be glazed porcelain, medium base, with a copper alloy nickel plated screw shell and center contact. The ballast shall be a core and coil, high power factor, regulating type. Bollard locations shall be as shown on the plans, in accordance with these specifications, and/or as required by the Engineer.

STANDARDS
Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

ASTM – American Society for Testing and Materials;
AWS – American Welding Society;
SSPC – Steel Structures Painting Council

SUBMITTALS
Contractor shall submit all shop drawings, manufacturers' product data, and samples in accordance with Division I. Shop drawings shall be returned to the Contractor for resubmission if required information is incomplete. Verify all dimensions in the field before shop drawings are submitted. The Contractor shall submit a sample of the product finish and color for approval by the Engineer.

Shop drawings shall include plans, sections and details as required to show all materials and reinforcing, layout, dimensions, jointing, method of connection and assembly, fabrication and tolerances for types of materials, types and details of connections and openings, cuts, holes, bolts, plates, concrete footings, reinforcing and finishing, anchors and fasteners, attachment details, and painting and finishing.

Certificate of Compliance: Submit manufacturer's certification that each unit piece of Site Furniture has been constructed/installed to conform to design, materials, and construction equivalent to requirements for labeled construction.

Refer to Section 901, CEMENT CONCRETE MASONRY for submittal requirements for all foundations, footings, and reinforced concrete structures.

Manufacturer's Literature: Submit product data including details of construction, materials, dimensions, analysis, hardware preparation, color charts and specific finishes, and label compliance.

Furnish to the Engineer notarized certificates of compliance with ASTM requirements specified in this Section for each item.

QUALITY ASSURANCE AND WARRANTY
Units shall be free of cracks, chips, scratches and any other defect at the time of delivery. All units shall

be placed in a storage area, protected from damage prior to and during transit to the Owner's or Contractor's site.

Contractor shall provide to the Department the written maintenance and operational instructions, all warranties, and guarantees provided by the Manufacturers for the specific improvements and finishes, for a minimum of one year after Final Acceptance. If Manufacturer does not provide warrantee for materials installed, Contractor shall assume all cost for replacement of specified material, if product fails during warrantee period.

Contractor shall provide a guarantee of minimum of one year after acceptance of Workmanship and against defect as determined by the Department, and shall completely replace or repair site improvements at their own expense within two months after item is identified in the field.

DELIVERY, HANDLING AND STORAGE

Deliver units to the site in manufacturer's original, unopened containers and packaging. Upon delivery examine packages immediately to ensure all products are complete and undamaged. Remove and replace damaged items.

Store units in covered, dry locations, protected from weather, stored off the ground, and secured on-site. Avoid use of protective materials that trap heat and moisture

Protect product's finish from damage during handling and installation.

Secure all items from damage for any reason, including vandalism, and theft.

MATERIALS

Provide all materials from new stock, free from defects impairing strength, durability and appearance, and of best commercial quality for the purpose specified.

Supply all equipment hardware and required accessories required for complete, operating and installed site improvement item specified herein.

Provide all exposed fasteners of the same material, color and painted finish as the fastened material unless otherwise indicated in the Drawings and specified herein. Anchor bolts to be completely hot dip galvanized steel.

Provide all exposed fasteners vandal-proof (spanner-head type), unless otherwise noted in the Drawings or specified herein. Some items require removal for regular maintenance or for other uses. Provide fasteners and sleeves that allow for removal without damaging the fasteners or the item.

Bollard shall meet the visual illustration shown on the Drawings and shall be manufactured of steel or aluminum, to the dimensions and quantities shown on the Drawings.

Where specified in the drawing the Ornamental metal bollard shall include a recessed integral GFI receptacle. Wiring of receptacle shall be accomplished by a licensed electrician.

Anchoring for unit shall be floor mounted with stainless steel anchor bolts to dimensions and requirements of the manufacturer.

FINISH

Unit shall be either an electrostatically applied polyester powder coat or hot dip galvanized before painting. If painted finish shall include an epoxy prime coat, with a minimum of three topcoats. Thickness

of finish coat shall be 8-10 mils. Semi-gloss finish. Color shall be black.

CONSTRUCTION METHODS
Review layout of units for approval in the field with Engineer before footings and improvements are installed.

UNIT INSTALLATION
Install Bollard in accordance with manufacturer's instructions. Refer to the specific site elements and the Drawings for horizontal and vertical alignment. Anchor Bollard, securely according to manufacturer's instructions and the Drawings, to concrete pads with stainless steel anchor bolts and fasteners with lock-tight washers.

Ornamental Metal Bollard shall be securely installed to a 1/8 inch tolerance overall and shall be installed per manufacturer's directions, plumb and level, unless otherwise shown in the Drawings. Items that fall outside of this tolerance shall be required to be reset to meet tolerance, as a condition of acceptance. Bolts and fasteners shall be trimmed to safe length, as applicable and with review by the Engineer.

PROTECTION
Protect all stored and installed units from damage, use, theft or vandalism until acceptance. Contractor shall adjust, repair, or replace damaged, missing, or unacceptable items at their own expense. Site items shall be clean, and finishes as specified as condition of acceptance. Clean with non-abrasive means, careful not to damage finishes.

METHOD OF MEASUREMENT
Item 707.82 Bollard will be measured for payment per each as called out on the plans, complete in place.

BASIS OF PAYMENT
Item 707.82 Bollard will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Add conduit and line standard items find power source

ITEM 707.9 BICYCLE RACK EACH

GENERAL
This item of work shall conform to the relevant provisions of Section 700 and shall consist of supplying and installing materials for bicycle racks. Bicycle rack locations shall be as shown on the drawings, in accordance with these specifications, and/or as required by the Engineer.
Retain below if alternates are specified in Division 1 Section for work in this Section.

STANDARDS
Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

ASTM – American Society for Testing and Materials;
AWS – American Welding Society;
SSPC – Steel Structures Painting Council

SUBMITTALS
Product Data: For each type of product indicated. Include construction details, material descriptions,

dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.

Shop Drawings: Show fabrication and installation details, and attachments to other work.

DELIVERY, HANDLING AND STORAGE
Deliver units to the site in manufacturer's original, unopened containers and packaging. Upon delivery examine packages immediately to ensure all products are complete and undamaged. Remove and replace damaged items.

Store units in covered, dry locations, protected from weather, stored off the ground, and secured on-site. Avoid use of protective materials that trap heat and moisture

Protect product's finish from damage during handling and installation.

Secure all items from damage for any reason, including vandalism, and theft.

QUALITY ASSURANCE AND WARRANTY
Cutting, painting (other than touch-up), and welding in the field will not be permitted.

Contractor shall provide to the Department the written maintenance and operational instructions, all warranties, and guarantees provided by the Manufacturers for the specific improvements and finishes, for a minimum of one year after Final Acceptance. If Manufacturer does not provide warrantee for materials installed, Contractor shall assume all cost for replacement of specified material, if product fails during warrantee period.

Contractor shall provide a guarantee of minimum of one year after acceptance of Workmanship and against defect as determined by the Department, and shall completely replace or repair site improvements at their own expense within two months after item is identified in the field.

PRODUCTS

Modle U2, black
Cycle-safe, Inc.
947 Forest Hills Avenue, Suite C
Grand Rapids, MI 49546
888-950-6531

Hoop Rack HD
Dero Bike Rack Co.
2657 32nd Ave S,
Minneapolis, MN 55406
PH: 800-891-9298

Bike Rack 83-00-S2, black
Dumor Site Furnishings Inc.
M. E. O'Brien & Sons, Inc.
93 West Street P.O. Box 650
Medfield, MA 02052-0650
PH: 508-359-4200

MATERIALS

Steel: Free from surface blemishes and complying with the following:
Plates, Shapes, and Bars: ASTM A 36/A 36M.
Steel Pipe: Standard-weight Schedule 40 steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.

Metal Components shall be formed to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

Welded Connections shall be continuous. Solid members shall be welded with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

Pipes and Tubes: Simple and compound curves shall be made by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of bike rack components.

Exposed Surfaces shall be polished, sanded, or otherwise finished; smooth all surfaces, free from burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

Assemble components in the factory to the greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

FINISHES
Finish shall be electrostatically applied polyester powder coat or approved equivalent.
Color shall be black.

INSTALLATION
Racks shall be surface mounted as indicated on drawings.

Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated.

Maintain adequate setback position (minimum 2 feet from parallel walls; 2'-6" from perpendicular walls) of the rack with respect to adjacent building walls or other obstructions.

Provide minimum 4 feet at parking areas where vehicles overhang area between curbs or wheel stops and bike racks. Install bicycle racks level, plumb, true, and positioned at locations indicated on Drawings.

METHOD OF MEASUREMENT
Item 707.9 Bicycle Rack will be measured for payment per each as called out on the plans, or as required by the Engineer.

BASIS OF PAYMENT
Item 707.9 Bicycle Rack will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 715.1 MAIL BOX REMOVED AND RESET EACH

GENERAL
This work shall consist removing and reinstalling Mail Box. The work shall be performed in accordance with the details shown on the plans, as specified in these technical provisions and as required by the Engineer.

Existing Mail boxes shall be photographed prior to removal and submitted to the Engineer for record. Mail Box shall be reset in its proposed location, matching the original condition as closely as possible.

Contractor shall notify the US Postal Service at least 1 week in advance of relocation operations to either coordinate the selection of a temporary location during construction or to verify the proposed final location. Where mail boxes are removed and reset in place the Contractor shall notify US Postal Service to coordinate a schedule of construction operations and conditions for access.

Mail Box shall not be relocated without the written consent of a qualified US Postal Service representative.

METHOD OF MEASUREMENT
Item 715.1 Mail Box Removed and Reset will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT
Item 715.1 Mail Box Removed and Reset will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 740. ENGINEERS FIELD OFFICE AND EQUIPMENT - TYPE A MONTH

GENERAL
Work under this item shall conform to the relevant provisions of Section 740 and the following:

A computer system and a digital camera meeting the requirements set forth below and including installation, maintenance, power, paper and other supplies shall be provided at the Resident Engineer's Office. The diskettes and camera cards shall become the property of MassDOT. The computer system shall consist of the following:

Computer:	DELL, Compaq, or IBM, Small form factor (Approx: 4” x 12” x 14”, H x W x D), with speakers
CPU:	2.8 GHz Pentium 4 CPU with 800 MHz front side bus or better
RAM:	1 Gb of 400 MHz PC-3200 DDR (Dual Channel) or better
Video:	Intel Extreme Graphics 2 w/ DVI capability for digital flat panels;
Hard disk:	100GB, 7200RPM, SATA-100 or better
Monitor:	19" LCD, TFT Height adjustable stand, 1280x1024 pixel pitch DVI, 24pin DVI Flat Panel
CD-RW:	CDRW, 40X speed and 10 CD-R diskettes
Modem:	56K/V.90 internal or external modem
Floppy:	Standard 3.5" 1.44MB floppy disk drive and 10 - 1.44Mb Diskettes
Mouse:	Optical mouse with scroll (USB or PS/2) or equivalent
Keyboard:	Standard 104-key
Printer:	HP 1200 laserjet printer
OS:	Windows XP Professional
Office:	MS Office Professional (latest edition)
Connectivity:	8 high-speed USB 2.0 ports

The digital camera shall be Olympus, Nikon, Canon or approved equal with at least 3.2 Megapixel and 3X Optical Zoom / 3.4X Digital Zoom. The memory/storage cards shall be a 16MB x D card and a 64MB x D card. Additional accessories include a USB Connect and 2 sets of batteries, a battery recharger, carrying case, computer software if required and an AC adapter.

All computers must have an Internet access account. DSL (digital subscriber line) is preferred where available. If DSL is not available, a cable internet service provider will be acceptable. Only high speed internet access will be provided. Dial-up Internet access is acceptable; if no other service is available. (America Online is not acceptable service.)

The Engineer's Field Office and the equipment included therein, including the computer system, and camera shall remain the property of the Contractor at the completion of the project.

METHOD OF MEASUREMENT
Item 740., Engineers Field Office And Equipment-Type A, will be measured for payment per month.

BASIS OF PAYMENT
Item 740., Engineers Field Office And Equipment-Type A, will be paid for at the contract unit price per month, which price shall include all labor, material, equipment and incidental costs required.

ITEM 745.1 PEDESTRIAN BUS SHELTER –REMOVED AND RESET EACH

GENERAL
The work under this Item shall conform to the relevant provisions of Section xxx of the Standard Specifications, and the following:

The work under this Item shall consist o

MATERIALS

CONSTRUCTION METHODS

METHOD OF MEASUREMENT
Item 745.1 Pedestrian Bus Shelter – Removed and Reset will be measured per square yard in accordance with the provisions of Subsection701.80 of the Standard Specifications.

BASIS OF PAYMENT
Item 745.1 Pedestrian Bus Shelter – Removed and Reset, will be paid for at the contract unit price per square yard, complete in place in accordance with the provisions of Subsection 701.81 of the Standard Specifications, which price shall include all labor, tools, materials, equipment, and incidentals to complete the work to the satisfaction of the Engineer,

ITEM 752.1 TREE PIT CUBIC YARD

GENERAL
Work under this item shall consist of installing concrete saddle and drainage mat at curb to the extents as shown on the Drawings and as required by the Engineer. The work shall include placement, re-handling and incidental work.

Excavation shall be conducted as per item 141 Class A trench excavation.

Where there is a Utility identified directly beneath a tree pit test pits shall be performed at 10 feet on center to determine the depth of the Utility. If the utility is determined to be less than 3 feet below finish grade stop work immediately and contact the Engineer for direction.

Where hand excavation is prescribed by the Engineer due to the proximity of utilities hand excavation shall be conducted as per item 102.4 Hand Excavation Root Zone.

MATERIALS
Loam shall meet the criteria of Item 751. Loam Borrow as described herein.

Drainage mat shall be a 1" thick nylon core of fused entangled filaments with geotextile fabric bonded to both sides. It shall extend along the curb for the entire length of the tree pit and shall extend from the surface to the limit of loam borrow.

Concrete for curb saddle shall conform to the conditions of Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry.

DELIVERY, STORAGE, AND HANDLING
Do not deliver or place materials in frozen or saturated condition.

UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS
Notify the Resident Engineer of any subsurface conditions, which will affect the Contractor's ability to complete the work.

Locate and confirm the location of all underground utilities prior to the start of any excavation.

Repair any underground utilities or foundations damaged by the Contractor during the progress of this work. The cost of all repairs shall be at the Contractor's expense.

SITE PREPARATION
Excavate to the proposed subgrade to the depths as shown on Plans.

Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the Plans.

Coordinate installation of tree pit with installation of adjacent curbs pavements and structures to prevent collapse, and avoid pedestrian and vehicular hazards.

Protect adjacent walls, walks, waterproofing, and utilities from damage. Use one-half (1/2) inch plywood and/or plastic sheeting as required, to cover existing masonry work during the installation of the loam. Clean up any loam or dirt spilled on any paved surface at the end of each working day. Any damage to the paving or architectural work caused by installation shall be repaired by the General Contractor at the Installation Contractor's expense.

PLACEMENT OF LOAM FOR TREE PIT
After subgrade levels have been reached, and immediately prior to placing loam the entire subgrade area is to be thoroughly loosened to a minimum depth of two inches by deep raking.

Spread loam in 6 inch lifts and compact by watering or rolling with a minimum of two passes of a manual

lawn roller.

Tree pit loam shall be installed to the depth and to the horizontal extents of the area(s) shown on plans.

CLEAN UP
Upon completion of the tree pit loam installation operations, clean areas within the contract limits. Remove all excess fills and loam, and legally dispose of all waste materials, trash, and debris. Remove all tools and equipment and provide a clean, clear site.

METHOD OF MEASUREMENT

Item 752.10 Tree Pit will be measured for payment per cubic yard as called out on the plans.

BASIS OF PAYMENT

Item 752.10 Tree Pit will be paid for at the contract unit price, which price shall include all labor, material, equipment, excavation and incidental costs required to complete the work.

Concrete saddle will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Loam borrow will be paid for separately under Item 751 Loam Borrow.

Hand Excavation, if requested by the engineer, will be paid for separately under Item 102.4 Hand Excavation Root Zone

ITEM 752.3 ROOT PATH FOOT

GENERAL
This item of work shall consist of excavating trenches, backfilling with loam, covering with nonwoven geotextile, and biaxial soil reinforcing grid and adding plastic root barrier. Loam for backfilling shall conform to the relevant provisions of Section 751. Root path locations shall be as shown on the drawings, in accordance with these specifications, and/or as required by the Engineer.

Where there is a Utility identified directly beneath a Root Path test pits shall be performed at 10 feet on center to determine the depth of the Utility. If the utility is determined to be less than 3 feet below finish grade stop work immediately and contact the Engineer for direction.

SUBMITTALS
Product Data: For plastic soil reinforcing grid. Include construction details, material descriptions, and dimensions.

DELIVERY, STORAGE, AND HANDLING
Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other causes.

PRODUCTS
Geotextile migration barrier shall be a nonwoven synthetic geotextile fabric.

Geogrid soil reinforcing, Bi axial plastic reinforcing grid shall be one of the following products or approve equivalent.

Base Grid22,
US Fabrics, Inc.
3904 Virginia Avenue
Cincinnati, OH 45227

BX1100 Geogrid,
Tensar International Corporation
5883 Glenridge Drive
Suite 200
Atlanta, GA

SYNTEENSF11,
GSI Geo-Synthetics, Inc.
W239 N428 Pewaukee Rd.
Waukesha, WI 53188
Toll Free: 1-800-444-5523

Root barrier shall be a either a rigid interlocking plastic barrier, or a min. 60 mil. HDPE flexible root barrier intended for use in deflecting tree roots. It shall be one of the following products or approve equivalent.

LB 12-2 Linear Guide
Deep Roots Partners, L.P.
530 Washington St.
San Francisco, CA 94111

Root Barrier
Americover Inc.
2067 Wineridge Place Suite.
F
Escondido, CA 92029

Root Guide RS – 12
Root Solutions
San Rafael, Ca 94901

INSTALLATION
Excavate trench to depths as shown on plans. The subgrade shall be loosened to a depth of at least 3in to permit bonding of the planting soil to the subsoil. Remove all stones greater than 1in in diameter and all debris or rubbish. Such material shall be removed from the site, at no additional cost to the Owner.

loam borrow shall be placed and spread over approved areas to a depth sufficiently greater than base depth so that after natural settlement by watering and light rolling, the completed work shall conform to the lines, grades, and elevations indicated. Supply additional loam, after testing and approval shall be needed, to give the specified depths and finished grades under the Contract without additional cost to the Owner. Cover with geotextile migration barrier prior to placement of geogrid.

Unroll geogrid over root paths and sub grade and apply tension by hand to eliminate wrinkles. 1 foot overlap is required at seams. Adjacent geogrid rolls should be overlapped in the direction of anticipated fill spreading.

METHOD OF MEASUREMENT

Item 752.3 Root Path will be measured for payment Per Foot as called out on the plans, or as required by the Engineer.

BASIS OF PAYMENT

Item 752.3 Root Path will be paid for at the contract unit price Per Foot, which price shall include all labor, material, excavation, equipment and incidental costs required to complete the work.

ITEM 752.4 BIO-SWALE SOIL CUBIC YARD

GENERAL

The purpose of this item is to install planting medium for Infiltration Swale, as shown on the drawings and as required by the Engineer.

The work shall include obtaining, mixing, stockpiling, re-handling and incidental work. The work includes, but is not limited to, the following items: preparation, placement, and compacting of planting medium on prepared subgrade.

Where there is a Utility identified directly beneath an Infiltration Swale test pits shall be performed at 10 feet on center to determine the depth of the Utility. If the utility is determined to be less than 3 feet below finish grade stop work immediately and contact the Engineer for direction.

STANDARDS
The following standards form a part of these Specifications:

ASTM D1556. Test for Density of Soil in Place by tile Sand-Cone Method.

ASTM D1557. Moisture-Density Relations of Soils and Soil-Aggregate Mixtures
Using 10-lb. (4.5kg) Rammer and 18-in. (457mm) Drop.

AASHTO T-59. The Moisture-Density Relations of Soils Using a 5.5-lb. (2.5kg)
Rammer and a 12-in. (305mm) Drop.

SUBMITTALS
Submit soil test report as per Item 751. Loam Borrow.
Submit sieve analysis of sand to be used per the requirements of section 154. Sand Borrow.
Submit product data for organic amendment (compost) including manufacturers contact information, material content, and source.

MATERIALS
Planting medium shall be a uniformly graded mix of sand, compost and loam.

Mix design shall be by volume as follows and shall be adjusted as required. It shall be uniformly blended. soil mixture shall be 50-60% sand; 20-30% leaf compost, manure or other approved organic amendment (non-sludge) and 20-30% topsoil/loam borrow. The soil shall be a uniform mix free of stones, stumps, roots or other similar objects larger than two inches.

Fertilizer shall not be added to planting medium.

Planting medium shall meet the following criteria:

PH Range:	5.5-6.5
Organic Matter	1.5-3.0%
Soluable Salt Content	500 p.p.m. max.
Sieve Analysis	
Magnesium	32 ppm min.
Phosphorous (Phosphate P205)	69 ppm max.
(Phosphate	P205)
Potassium (K20)	78 ppm min.

Mixing procedure shall be as follows:

Planting medium shall be premixed and a sample shall be reviewed by the Engineer for uniformity prior to placement. Planting medium may, by the direction of the engineer be mixed in place by methods of layering in sand, loam and compost and tilling to a uniform consistency.

Sand shall meet the criteria of Section 154. Sand Borrow of the Department standard specifications.

Loam shall meet the criteria of Item 751. Loam Borrow as described herein.

Organic amendment shall be a well rotted composted leaf mold or other acceptable organic matter as approved by the engineer. Compost shall pass a 1" sieve. It shall have a pH between 5.5 to 8.0. Soluble salt content shall not to exceed 2.0 mmhos/cm (dS.m). Compost shall be free of Bermuda Grass, Quarkgrass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearthub, Japanese Knotweed or other noxious weeds.

Geotextile migration barrier shall be a nonwoven synthetic geotextile fabric.

DELIVERY, STORAGE, AND HANDLING
Do not deliver or place materials in frozen or saturated condition.

Deliver material at or near optimum compaction moisture content as determined by AASHTO T 99 D 698. Do not deliver or place materials in an excessively moist condition (beyond two (2) percent above optimum moisture content as determined by AASHTO T 99 D 698).

Do not store unprotected from large rainfall events. Do not allow excess water to enter the site prior to compaction (washing of tools, trucks, etc.) If water is introduced into the material after grading, allow material to drain to near optimum compaction moisture content.

SITE PREPARATION
Excavate to the proposed subgrade to the depths as shown on Plans.

Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the Plans.

Coordinate the installation of the planting medium with installation of adjacent pavement, curbs, structures and utility work.

Protect adjacent walls, walks, waterproofing, and utilities from damage or staining by the soil. Use one-half (1/2) inch plywood and/or plastic sheeting as required, to cover existing masonry work and other times during the installation of the structural soil material. Clean up any soil or dirt spilled on any paved

surface at the end of each working day. Any damage to the paving or architectural work caused by the Soils Installation Contractor shall be repaired by the General Contractor at the Soils Installation Contractor's expense.

PLACEMENT OF PLANTING MEDIUM
After subgrade levels have been reached, and immediately prior to placing planting medium
the entire subgrade area to be thoroughly compacted, then loosened to a minimum depth of two inches utilizing the teeth on the bucket of a backhoe or by deep raking.

Spread planting medium in the lifts not greater than 6 inches and compacted by watering.
planting medium shall be installed to a depth of 2 feet below finish grade and to the horizontal extents of the area(s) shown on plans.

The Resident Engineer should check the relative compactness of the materials on site.

CLEAN UP
Upon completion of the planting medium material installation operations, clean areas within the contract limits.

Remove all excess fills soils and mix stockpiles, and legally dispose of all waste materials, trash, and debris. Remove all tools and equipment and provide a clean, clear site.

Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the mix. Avoid washing the area until all paving has been completed.

METHOD OF MEASUREMENT
Item 752.4 Bioswale Soil will be measured for payment per cubic yard as called out on the plans, complete in place.

BASIS OF PAYMENT
Item 752.4 Bioswale Soil will be paid for at the Contract unit price per cubic yard, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Concrete saddle will be paid for separately under Item 903, 3000 psi, 1½ in., 470 Cement Concrete Masonry per Cubic Yard.

Excavation will be paid for under Item 141 class A trench excavation and/or Item 102.4 Hand Excavation Root Zone.

ITEM 752.5 STRUCTURAL SOIL CUBIC YARD

GENERAL
Work under this item to consist of providing Structural Soil for plantings as shown on the Drawings and as required by the Engineer.

The work shall include obtaining, mixing, stockpiling, re-handling and incidental work. The work includes, but is not limited to, the following items: preparation, placement, and compacting of structural soil medium on prepared subgrade, for the purposes of supporting isolated tree plantings located within the sidewalks.

Structural soil shall be a uniformly graded mix of sand, compost and loam.

Mix design shall be by volume as follows and shall be adjusted as required it shall be uniformly blended and compacted to 90 percent proctor. It shall have a minimum saturated hydraulic conductivity of six inches per hour at that density.

Mixing ratio shall be 4 parts coarse sand, 1 part loam and 1 part compost.

Mixing procedure shall be as follows:

Structural soil should be premixed to a uniform consistency but may, per the direction of the engineer be mixed in place by methods of layering in sand, loam and compost in 6" lifts and tilling to a uniform consistency. Where mixing in place is not feasible due to existing obstructions materials shall be premixed and placed for compaction.

Where there is a Utility identified directly beneath Structural Soil test pits shall be performed at 10 feet on center to determine the depth of the Utility. If the utility is determined to be less than 3 feet below finish grade stop work immediately and contact the Engineer for direction.

STANDARDS
The following standards form a part of these Specifications:

1. ASTM D1556. Test for Density of Soil in Place by tile Sand-Cone Method.

2. ASTM D1557. Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.5kg) Rammer and 18-in. (457mm) Drop.

3. AASHTO T-59. The Moisture-Density Relations of Soils Using a 5.5-lb. (2.5kg) Rammer and a 12-in. (305mm) Drop.

SUBMITTALS
Submit soil test report as per Item 751. Loam Borrow.
Submit sieve analysis of sand to be used per the requirements of section 154.00 Sand Borrow of the Standard Specifications.
Submit product data for organic amendment (compost) including manufacturers contact information, material content, and source.

MATERIALS
Sand shall meet the criteria of Section 154.00 Sand Borrow of the DEPARTMENT standard specifications.

Loam shall meet the criteria of Item 751.00 Loam Borrow as described herein.

Organic amendment shall be a well rotted composted leaf mold or other acceptable organic matter as approved by the engineer. Compost shall pass a 1" sieve. It shall have a pH between 5.5 to 8.0. Soluble salt content shall not to exceed 2.0 mmhos/cm (dS.m).

Perforated plastic pipe shall be corrugated HDPE plastic pipe with filter fabric wrapping.

Pipe riser shall be Schedule 40 PVC pipe, with matching cap and fittings (Color Black).

Geotextile migration barrier shall be a nonwoven synthetic geotextile fabric.

Root barrier shall be a either a rigid interlocking plastic barrier, or a min. 60 mil. HDPE flexible root barrier intended for use in deflecting tree roots. It shall be one of the following products or approve equivalent.

LB 12-2 Linear Guide
Deep Roots Partners, L.P.
530 Washington St.
San Francisco, CA 94111

Root Barrier
Americover Inc.
2067 Wineridge Place Suite.
F
Escondido, CA 92029

Root Guide RS – 12
Root Solutions
San Rafael, Ca 94901

DELIVERY, STORAGE, AND HANDLING
Do not deliver or place materials in frozen condition.

Do not store unprotected from large rainfall events. Do not allow excess water to enter the site prior to compaction (washing of tools, trucks, etc.) If water is introduced into the material after grading, allow material to drain to near optimum compaction moisture content.

SITE PREPARATION
Excavate to the proposed subgrade to the depths as shown on Plans.

Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the Plans.

Coordinate installation of the structural soil material with that of walls, curb footings, and utility work in the area. Structural & paving elements that are dependent on the structural soil material for support may be postponed until the immediately after the installation of the mix.

Protect adjacent walls, walks, waterproofing, and utilities from damage or staining by the soil. Use one-half (1/2) inch plywood and/or plastic sheeting as required, to cover existing masonry work and other times during the installation of the structural soil material. Clean up any soil or dirt spilled on any paved surface at the end of each working day. Any damage to the paving or architectural work caused by the Soils Installation Contractor shall be repaired by the General Contractor at the Soils Installation Contractor's expense.

PLACEMENT OF STRUCTURAL SOIL PLANTING MEDIUM
After subgrade levels have been reached, and immediately prior to placing Structural Soil Planting Medium the entire subgrade area to be thoroughly compacted, then loosened to a minimum depth of two inches by deep raking.

Spread Structural Soil the lifts not greater than six inches and compacted with a minimum of two passes of vibratory compaction equipment.

Structural soil shall be installed to a depth and to the horizontal extents of the area(s) shown on plans.

The Resident Engineer should check the relative compactness of the materials on site.

CLEAN UP
Upon completion of the structural soil material installation operations, clean areas within the contract limits.

Remove all excess fills soils and mix stockpiles, and legally dispose of all waste materials, trash, and debris. Remove all tools and equipment and provide a clean, clear site.

METHOD OF MEASUREMENT
Item 752.50 Structural Soil will be measured for payment per cubic yard as called out on the plans.

BASIS OF PAYMENT
Item 752.50 Structural Soil will be paid for at the Contract unit price per cubic yard, which price shall include all labor, material, equipment, excavation, and incidental costs required to complete the work.

ITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN LUMP SUM

GENERAL
This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit.

Pursuant to the Federal Clean Water Act, effective March 10, 2003, construction activities which disturb one acre or more are required to apply to the U.S. Environmental Protection Agency (EPA) for coverage under the NPDES General Permit for Storm Water Discharges From Construction Activities. On July 1, 2003 (68 FR 39087), EPA published the final NPDES construction general permit for construction activity. On August 4, 2003 (68 FR 45817), EPA reissued the General Permit for the Commonwealth of Massachusetts and included state specific requirements.

The NPDES General Permit requires the submission of a Notice of Intent (NOI) to the U.S. EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a seven (7) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals shall not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification and, if required, the SWPPP filing to DEP will be paid by the Contractor.

The owner, MassHighway, and the operator, the Contractor, must submit separate NOIs. In cases where

the municipality or other party has control over the plans and specifications or day-to-day site operations, said party must also submit a NOI. The Contractor is responsible to ensure that all required parties have submitted an NOI and shall provide proof of same to the Engineer.

The General Permit also requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the afore-mentioned statutes and regulations. The Plan shall include the General Permit conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four weeks prior to any site activities. It is the responsibility of the Contractor to be familiar with the General Permit conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to this project and to include in the Stormwater Pollution Prevention Plan the methods and means required to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA Construction General Permit, provide all information required, and obtain any and all certifications as required by the Construction General Permit. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to **IMPLEMENTATION**

Included in the General Permit conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.5 inches in twenty-four hours. The Contractor shall choose a qualified individual who will be on-site during construction to perform these inspections. The Engineer must approve the contractor's inspector. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions required to comply with the provisions of the General Permit. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. Inspection of these controls is considered incidental to the applicable items. This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved. Approval of final stabilization by the Engineer and confirmation of submission of the NOT shall be required prior to submission of the Resident Engineer's Final Estimate.

BASIS OF PAYMENT

Item 756., NPDES Storm Water Pollution Prevention Plan, payment for all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports

and filing fees are included in the Lump Sum for this Item. Upon final acceptance of the SWPPP by the Department, a payment equal to 50% of the Contract Lump Sum price will be paid. The remaining 50% of the Lump Sum will be paid in 10% increments distributed equally throughout the remaining period of the Contract.

ITEM 767.9 MATTING FOR EROSION CONTROL SQUARE YARD

GENERAL

The work under this item shall conform to the applicable requirements of Section 767, MULCHING; SEED FOR EROSION CONTROL of the Standard Specification, except as amended and supplemented, as indicated on the drawings and as specified below.

Erosion control matting work shall include the installation of erosion control matting, as shown on the Drawings or indicated in the specifications. Erosion control matting shall be installed on all slopes of one vertical foot to three horizontal feet, or steeper, within the project limits.

All work shall be done by a firm having a minimum of 5 years experience with applying erosion control matting in a spray form. Prior to beginning work, the Contractor shall furnish proof of qualifications to the Engineer for approval.

SAMPLES AND SUBMITTALS

At least 30 days prior to ordering, the Contractor shall submit to the Engineer, representative samples, manufacturer's literature and supplier's certification to the Engineer, certifying that the erosion control matting being supplied conforms to these Specifications. No material shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match the approved samples.

Erosion Control Matting: Submit representative sample, with manufacturer's specification and certification

MATERIALS

Erosion control matting shall be a mechanically bonded fiber matrix. The mechanically bonded fiber matrix shall be a hydraulically applied product, which upon drying shall adhere to the soil in the form of a continuous 100% coverage biodegradable erosion control blanket. The mechanically bonded fiber matrix shall be comprised of wood fiber, crimped polyester fibers, polysaccharide cross linked hydro-colloid polymer tackifier, and dark green dye. The matrix’s bonding agent shall, upon drying, become insoluble and non-dispersible.

The mechanically bonded fiber matrix shall meet the following requirements. The binder shall not dissolve or disperse upon rewetting. The mechanically bonded fiber matrix shall have no holes greater than 0.04 inch in size and shall have no gaps between product and soil. The mechanically bonded fiber matrix shall have water holding capacity of 1,500% minimum, shall have no germination or growth inhibiting factor and shall not form a water insensitive crust. It shall be composed of materials that are 100 percent biodegradable and are beneficial to plant growth.

Seed, fertilizer, growth stimulant and other seeding incidentals shall be furnished and placed under requirements of section 765 SEEDING of the Standard Specifications and these Special Provisions.

CONSTRUCTION METHODS

Contact manufacturer's representative at least 30 days prior to the installation of the mechanically bonded

fiber matrix to arrange for representative to be present at initial installation. Representative shall review mixing and application and provide verification to the Engineer, in writing, that Contractor is installing product per manufacturer's recommendations.

All slopes of one vertical foot to three horizontal feet shall first be spread with loam borrow, seeded and fertilized, or otherwise planted as shown on the plans or specified elsewhere. Loam borrow shall be installed per section 751. LOAM BORROW, PLANTABLE SOIL BORROW, PROCESSED PLANTING MATERIAL OR TOPSOIL REHANDLED AND SPREAD. Seed including fertilizer, lime and other seeding incidentals shall be installed per section 765 SEEDING. The mechanically bonded fiber matrix shall be installed at a rate of 3,500 pounds per acre by certified applicators according to manufacturer's instructions utilizing standard hydraulic mulching equipment. Do not apply the product in advance of rainfall, such that the bonded fiber matrix has an opportunity to dry for up to 24 hours after installation.

GUARANTEE

The date of Conditional Acceptance shall be establish period, a preliminary inspection shall be held to determine whether any erosion control matting areas require additional applications, as determined by the Engineer. Areas found unacceptable shall be promptly corrected. A final inspection for acceptance will be made after corrections have been made. All corrected erosion control matting cost shall be borne by the Contractor.

METHOD OF MEASUREMENT

Item 767.9 Matting for Erosion Control (spray form) will be measured per square yard installed complete-in-place on exposed surface area, including all samples, submittals, transportation, storage, protection, anchoring, labor, maintenance, materials and equipment required or incidental and for the satisfactory completion of the work.

Measurement for seed and seeding incidentals, specified herein, shall be made under Item 765 Seeding of the Standard Provisions and these Special Provisions.

BASIS OF PAYMENT

Item 767.9 Matting for Erosion Control (spray form) will be paid at the contract unit price including all samples, submittals, transportation, storage, protection, anchoring, labor, materials and equipment required to install the erosion control matting (spray form) as specified.

ITEM 773.238	**PINE – RED 8-10 FEET**	**EACH**
ITEM 773.436	**PINE - WHITE 5-6 FEET**	**EACH**
ITEM 775.004	**ASH - GREEN 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.018	**BEECH - RIVERS PURPLE 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.028	**ELM-AMERICAN-'VALLEY FORGE' 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.054	**HORNBEAM FASTIGIATE 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.061	**PAGODA TREE 'REGENT' 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.148	**LINDEN – LITTLE LEAF – 'GREENSPIRE' 2-2.5 INCH CALIPER**	**EACH**
ITEM 775.437	**LOCUST – HONEY – 'SKYLINE' 2-2.5 INCH CALIPER**	**EACH**
ITEM 776.042	**MAPLE – HEDGE 1.5-2 INCH CALIPER**	**EACH**
ITEM 776.523	**MAPLE - RED 'ARMSTRONG' 2-2.5 INCH CALIPER**	**EACH**
ITEM 776.543	**MAPLE - RED 'OCTOBER GLORY' 2-2.5 INCH CALIPER**	**EACH**
ITEM 777.036	**OAK – NORTHERN RED 2-2.5 INCH CALIPER**	**EACH**

ITEM 777.142	**OAK - PIN GREEN PILLAR 2-2.5 INCH CALIPER**	**EACH**
ITEM 777.164	**OAK - PYRAMIDAL ENGLISH 2-2.5 INCH CALIPER**	**EACH**
ITEM 777.241	**OAK – SCARLET 2-2.5 INCH CALIPER**	**EACH**
ITEM 777.331	**OAK – WHITE 2-2.5 INCH CALIPER**	**EACH**
ITEM 777.542	**PLANETREE - LONDON 2-2.5 INCH CALIPER**	**EACH**
ITEM 778.412	**CRABAPPLE – 'ADIRONDACK' 1.5-2 INCH CALIPER**	**EACH**
ITEM 781.152	**GINKGO – BILOBA 2-2.5 INCH CALIPER**	**EACH**
ITEM 781.155	**GINKGO – BILOBA 'FASTIGIATA' 2-2.5 INCH CALIPER**	**EACH**
ITEM 781.578	**LILAC TREE - JAPANESE 1.5-2 INCH CALIPER**	**EACH**
ITEM 782.252	**MOUNTAIN ASH – KOREAN - PYRAMIDAL 1.5-2 INCH CALIPER**	**EACH**
ITEM 782.423	**PEAR – CALLERY – 'CHANTICLEER" 2-2.5 INCH CALIPER**	**EACH**
ITEM 785.643	**INKBERRY – DENSA 2-3 FEET**	**EACH**
ITEM 786.461	**JUNIPER – SARGENT'S 15-18 INCH**	**EACH**
ITEM 786.471	**JUNIPER – 'SEA GREEN' 18-24 INCH**	**EACH**
ITEM 787.245	**YEW – HICK'S 30-36 INCH**	**EACH**
ITEM 787.262	**YEW – SPREADING ENGLISH 15-18 INCH**	**EACH**
ITEM 791.251	**FORSYTHIA - 'ARNOLD DWARF' 15-24 INCH**	**EACH**
ITEM 793.331	**PRIVET – REGAL 18-24 INCH**	**EACH**
ITEM 796.011	**BEAR BERRY – 2 GALLON**	**EACH**
ITEM 796.423	**DWARF FOUNTAIN GRASS – 'HAMELN' 1 GALLON**	**EACH**

GENERAL

The work under this item shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications, except as amended and supplemented as indicated on the drawings and as specified below.

For the above items the Contractor shall provide and install plant material of genus, species, variety, size and quantities in locations as required by the Engineer. The work of this section includes, but is not limited to, the following:

A. Purchasing and transporting plant material to construction sites
B. Installation of plant material
C. Plant care during 60-day Maintenance Period and one-year Establishment Period
D. Replacement of defective or dead plants at End of Maintenance Period
E. Replacement of defective or dead plants at End of Establishment Period

Cooperation By Contractor (Supplementing Subsection 5.05)

The Landscape Contractor shall have five years continuous experience and expertise in management, handling and installation of ornamental plant material in large-scale landscape construction projects. Site foreman shall have at least five years experience and shall be on-site during all times of plant installation.

SAMPLES AND SUBMITTALS

Plant Material: At least 180 days prior to anticipated planting, the Contractor shall submit a confirmation of availability for all plants on the list, accompanied by nursery sources. No substitutions shall be made without

the written consent by the Engineer. See Plant Tagging and Approval for additional requirements.

For all other materials, at least 30 days prior to ordering, the Contractor shall submit to the Engineer material specifications and (where applicable) installation instructions attesting that the following materials meet the requirements specified. No materials shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match the samples.

All material samples shall include supplier's literature and certification stating that material meets specifications. Submittals, including samples, material specifications, and installation specifications are as follows

Soil wetting agent: Submit one kilogram sample with supplier specifications and certification.

Fungal mychorrhizae: Submit sample with supplier specifications and certification.

Fertilizer: supplier specifications and certification.

Biostimulant: supplier specifications and certification.

Loam: The Contractor shall submit two 4.5-kilogram samples of loam to be used as backfill per the requirements of Section 751 of the Standard Specifications, accompanied by laboratory certified test results per the requirements of Section 751.

Backfill Mix: The Contractor shall submit a 4.5 kilogram representative sample of existing soil, which shall then be mixed with loam and tested according to the requirements specified herein. Mixing shall be done in the presence of the Engineer.

Organic Matter: submit sample with supplier specifications and certification. Peatmoss is not acceptable. Compost shall be free of Bermuda Grass, Quarkgrass, Johnson Grass, Mugwort, Nutsedge, Poison Ivy, Canadian Thistle, Tearthub, Japanese Knotweed or other noxious weeds.

Water: Submit a watering schedule, including sources of water, methods of irrigation, and any incidental work required to provide water for the plants.

Testing Methods: The Contractor shall submit to the Engineer for the engineer's inspection and approval, equipment and methods for testing soil moisture and soil pH.

The Contractor shall provide to the Engineer two new functioning moisture gauges, including instructions for use and batteries if required, for the engineer's use during the duration of the Contract. The meters shall be hand held and shall be capable of measuring moisture at a depth of 3in. Meter scale shall be sufficient to determine moist, dry, or wet soil. The meters shall be regularly checked for calibration against watered loam, and shall be replaced if found faulty at no additional cost.

In addition, the Contractor shall provide to the Engineer one copy of the "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN) for the duration of this Contract.

REFERENCES AND STANDARDS

The following standards shall apply to the Work of this Section.

ASNS: "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN).

Hortus III, 1976, L.H. Bailey Hortorium.

Tree and Shrub Transplanting Manual, E.B. Himelick, 1991, International Society of Arboriculture.

Pruning Standards: The "Standards for Pruning Shade Trees" of the National Arborist Association, 174 Route 101, Bedford, NH 03102.

EXAMINATION OF CONDITIONS

The Contractor shall be responsible for judging the full extent of work requirements involved. This responsibility includes, but is not limited to, the following: transportation, purchase, temporary storage and maintenance of plants; plant rehandling prior to final installation; removal and off-site disposal of contaminated existing loam; purchase, transport, and supply of loam.

MATERIALS

Plant Materials

The Contractor shall furnish all plants as shown on the plans, unless otherwise required in writing by the Engineer. All plants shall be nursery grown.

All plants shall be legibly tagged with the botanical name. Only plant stock grown within hardiness Zones 1 through 5, as established by the USDA Plant Hardiness Zone Map, will be accepted. The Contractor's suppliers shall certify in writing that the stock has actually been grown under Zone 5 or hardier conditions. Plants not so certified shall not be accepted.

All plants shall be typical of their species or variety in growth habit. Plant sizes, habit, rootballs, and containers shall be in accordance with the American Standard for Nursery Stock (ASNS, latest edition), Standards of the American Association of Nurserymen (AAN) as a minimum requirement for acceptance.

All plants shall be moved with the root systems in soil. Balled and burlapped plants shall be wrapped with untreated 8 ounce burlap, firmly held in place by a stout cord or wire. Wire containers shall be of adequate size to allow root development for the plant size as per ASNS requirements. Plants prepared with plastic or other non biodegradable wrappings shall not be accepted. Rootballs shall remain intact during all operations. No plant will be accepted if the rootball has been badly cracked or broken prior to, or during, the process of planting. Rootballs shall be moist upon arrival and shall be kept moist until installation. All balled and burlapped plants that cannot be planted at once shall be heeled in by setting them in the ground, covering the rootballs with soil, and watering them adequately.

Container-grown stock shall have been grown in the container long enough for the root system to have developed sufficiently to hold its soil together firmly. No plants shall be loose in the container. Container-grown plants shall not be pot bound, with spiraling roots or roots growing densely against the sides of the container. Score or butterfly cut rootball of all container-grown plants prior to planting.

Each plant shall have plenty of fibrous roots, healthy buds, and shall be free of disease or insect pests, eggs or larvae. All plant parts shall show active green cambium when cut. They shall be densely foliated when in leaf.

The trunk of each tree shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire or other causes. Pruning wounds shall be no larger than ¾ in and shall show vigorous scar tissue. No trees with double leaders or twin heads will be acceptable without the written approval of the Engineer. No plant material from cold storage will be accepted. In regard to shrubs, no single stemmed or thin plants will be accepted. The side branches shall be generous and well twigged, and the plant as a whole shall be well branched to the ground. The plants shall be in a vigorous condition, free from dead wood, bruises or other root or branch injuries.

Trees noted to be branched up shall have a minimum clear height of 6 feet to the first branch and be pruned no higher than 50% of its total height in accordance with the latest edition of American Nursery Standards. Pruned trees shall exhibit a good balance between crown and trunk and be typical of its species.

Loam Borrow

Loam borrow, sometimes referred to as loam, for planting soil mix shall be in accordance with the requirements of Standard 751 of the Standard Specifications,

Soil Amendments

Soil amendments, including ground limestone, sulfur, gypsum, and organic materials, shall meet the requirement of Loam Borrow, as described herein. Organic matter shall be composted leaf mold or other acceptable organic matter.

Planting Soil Mix

Planting soil for backfill shall consist of approved loam and the specified amendments uniformly included per the soil test and manufacturers recommendations . Mixed material shall be pH tested by the Contractor in the presence of the Engineer, and adjusted according to particular planting applications, using lime or sulfur as required. For plants that require an acid soil, such as ericaceous plants and broad-leaved evergreens, planting soil shall have a true pH of 4.5 to 5.5. Planting soil for all other plants shall have a true pH value of 6.0 to 6.5. Proposed soil amendments shall be submitted to the Engineer for approval prior to application.

Bark Mulch

Bark mulch shall be shredded pine bark aged a minimum of six (6) months. The mulch shall be dark brown in color, free of chunks and pieces of wood thicker than 1inches and shall not contain, in the judgment of the Engineer, an excess of fine particles. Unless otherwise specified in these special provisions, bark mulch shall be incidental to the cost of the planting items. Do not use wood chips.

Water

The Contractor shall be responsible for furnishing the contractor's own supply of water to the site at no extra cost. All plants injured or damaged due to the lack of water, or due to the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

Tree Watering Bags

Automatic tree watering shall be provided by the use of 20 Gallon sized drip tree bag such as "Tree Gator", "Ooze Tube", "Tree Camel Bag" or approved equal. Provide one bag for each installed tree. Cost of drip tree bag shall be incidental to the planting price.

Soil Wetting Agent

Soil Wetting Agent shall be a synthetic, non-toxic acrylic polyacrylamide or natural soluble plant extract. Application rates shall be per manufacturer's recommendations.

Fungal Mycorrhizae

Each plant shall be planted with fungal mycorrhizae. Mycorrhizae shall include at least three species of vesicular arbuscular (endomycchorizal) fungi as well as ectomycorrhizal fungi. Mycorrhizae shall be shipped in individual dosage packets.

Biostimulant

Biostimulant shall be a dry, water soluable product that contains nitrogen fixing, phosphorous solubilizing, and growth promoting bacteria. In addition, humic acid, cold processed kelp, B-Complex and K vitamins, amino acids and natural sugars shall be incorporated.

Fertilizer

Fertilizer for trees shall be a 3-3-3 organic pellitized product.

Fertilizer for shrubs shall be in the form of tablets designed and certified by the manufacturer to provide controlled release of fertilizer for a minimum of five years. The tablets shall be provided for each plant, and shall contain soluble fertilizer with a minimum guaranteed analysis as follows:

Available nitrogen:	16 percent
Available phosphoric acid:	8 percent
Available potash:	16 percent

Tablets shall be placed at a depth of 2.5-3in, equally spaced around the plant as it is being backfilled.
The number of tablets required for each plant is as follows:

Shrubs: One tablet for each foot of height or width.

Bone meal shall not be included in the backfill mixtures for plants that require fertilizer tablets.

CONSTRUCTION METHODS

Furnishing and planting of plant material shall include, but is not limited to, the following: providing list of plant materials and locations of digging of the pits and plant beds; amendment of loam as required to produce planting soil mix; provision of soil additives for pH requirements of specific plants; provision of soil wetting agents; provision of mycorrhizal fungi; furnishing the plants as specified; plant installation; watering and maintenance.

Seasons for Planting

Spring:	Deciduous materials	March 21 through May 1
	Evergreen materials	April 15 through June 1
Fall:	Deciduous materials	Oct. 1 through Dec. 1
	Evergreen materials	Aug. 15 through October 15

Requests for exceptions to this schedule shall be submitted in writing to the Engineer for approval.

No planting shall be done with frozen backfill or when the soil is in an unsatisfactory condition for working, as determined by the Engineer. Rock or obstructions shall be removed to the depth required to permit planting.

Plant Tagging, Substitutions and Approval

The Contractor shall locate, secure, tag, and ship plant material in a sufficiently timely manner to ensure minimal substitution and storage of plants. See Samples and Submittals for additional requirements.

When the specified types and sizes of plants are not available, provide list of nursery sources contacted to document that a thorough search has been conducted and provide a list of possible substitutions, accompanied by proposed nursery sources. Substitutions proposed by the Contractor shall have equivalent overall form, height, and horticultural characteristics as the plant material originally specified. Substitutions, as permitted by the Engineer in consultation with the Town of Belmont's Tree Warden, shall be approved in writing by the Engineer prior to tagging. At least 30 days prior to planting, the Contractor shall submit a schedule for tagging material to the Engineer. Once tagged, the Contractor shall provide written documentation to the Engineer that trees have been paid for or a retainer has been placed on the plant material to ensure that the nursery will hold the plants until planting operations can begin. If, due to schedule delays, the planting will be delayed and the plant material needs to be released, the Contractor shall submit the request to release material in writing, for approval of the Engineer. No plant material shall be released without approval in writing from the Engineer.

All trees and at least one representative sample of each shrub species required shall be tagged at least one month prior to the expected planting date. Contractor shall tag or allow the nursery to tag material for approval of the Engineer's representative. The Contractor shall request that the Engineer provide a representative to approve tagged stock to be planted under this Section prior to digging, for conformity to specification requirements as to quality, size, and variety. In the event that satisfactory material cannot be located, the Contractor shall be responsible for any required travel and overnight accommodations for the Engineer's representative during the period of time required to locate, select, and approve plant material.

Approval of tagged material at the nursery shall not prevent the right of inspection and rejection upon delivery at the site or during the progress of the work. Cost of replacement of materials rejected by the Engineer at the site will be paid by the Contractor.

Tree trunks shall be protected during shipping by a heavy walled cardboard sleeve or other suitable material. Plants shall either be shipped in enclosed trucks or all surfaces, leaves and branches shall be wrapped to prevent damage and desiccation.

Plant Delivery and Installation

The Contractor shall mark out locations for all plants to be approved by the Engineer before any plant pits or plant beds are dug. Remove all wrappings so that the plant canopy and stems and trunks shall be reviewed for damage or disease.

The Contractor shall locate all underground utilities within 10 feet of the proposed planting pits and notify the Engineer of any conflicts prior to digging plant pits.

The Contractor shall notify the Engineer 3 working days prior to the proposed arrival of plant material on the site. All plants shall be planted within 5 days of arrival on site or shall be rejected by the Engineer. Plants stored on site shall be shaded from direct sunlight at all times and shall not be stored on paved surfaces. Plants stored on site shall be watered daily.

Planting

The Contractor shall take extreme care when excavating for plant material to prevent damage to any utility. Any damage to utilities, and cost to repair damage, shall be the responsibility of the Contractor.

Prior to the installation of any plant material, the Contractor shall dig test pits to determine percolation rates. Pits shall be filled with water twice in succession. Conditions permitting the retention of water for more than 24 hours shall be brought to the Engineer's attention. Contractor shall recommend corrective measures to the Engineer for review and approval.

Plant pits shall not be excavated until the true depth of each individual root ball, with trunk flare exposed, is known. Contractor shall move each plant to its planting location. Unwrap tree root ball and remove all wrapping, including wire basket, burlap and ropes entirely. Shrubs and smaller materials shall have the container removed entirely. A claw instrument and brush shall be used to carefully remove soil from top of root ball until the plant materials trunk/stem flare, including valleys, is exposed. If soil in root ball is significantly different in classification to the soil in the planting area, carefully remove as much of the root ball soil as possible and mix it with back fill soil.

Wash off top of root ball and remove all secondary roots and girdling roots. Cut all roots on the outside of the root ball with a sharp instrument. Measure the difference between the true top and base of root ball and subtract one inch for each caliper of trunk size to determine proper depth of planting pit. Planting pits shall then be dug for each plant based upon the true root ball depth. Pit shall be scarified to prevent glazed soils.

Trees and shrubs shall be placed plumb as shown on the plans, with the root flare and valleys exposed above finished grade. Handle plants carefully to prevent damaging roots or stems.

Fill pits half way full with backfill making sure to place soil under bottom portions of root ball that is not sitting firmly on compacted subgrade. Add soil wetting agent, mycorrhizal fungi, biostimulant and 3-3-3 fertilizer per manufacturer specifications. Add water until thoroughly saturated to settle soil. Add remainder of backfill. Using the end of a shovel handle, push handle into soil at a 45 degree angle down into backfill to provide water access to eliminate air pockets. Do not use foot to compact soil. Holes shall be provided around circumference of root ball. Add water until soil is thoroughly saturated.

After planting, the Contractor shall submit wetting agent and fungi dose packets to the Engineer to certify installation of material.

Shape edge of planting pit to form a saucer for holding water and test saucer for integrity before adding mulch.

Mulch shall not be applied until Engineer reviews plant installation. Mulch shall then be applied after soil surface is dry. Water once the mulch is placed. Do not cover the stems or flares and valleys of the plant materials with mulch.

Plants shall not be wrapped after installation. A shade barrier of plastic mesh, acceptable to the Engineer, shall be placed at the base of all trees whose flares were covered with soil to prevent sunscald on the newly exposed bark. Mesh shall be at least 12inches in height and shall not come into contact with the trunk.

Wounds shall not be painted.

Staking and guying shall be incidental to tree installation. Stakes shall be made of hardwood. A solid metal bar shall be used to make pilot holes for the stakes. Three stakes per tree shall be provided where space permits. Use cloth tape rather than wire and hose. Tape, shall be located at a height that provides stability while still allowing some movement in the canopy to encourage development of stronger roots.

Plant Care

Contractor shall provide plant care for the duration of the Maintenance and Establishment periods.

Adequate watering is essential to plant care. During the 60 day Maintenance Period, plants shall receive a minimum of 1-1.5in of water per week over the entire plant pit or bed area, during the months of April

through November. Contractor shall provide detailed schedule, name and phone number of person responsible for watering, to Engineer and Tree Warden.

Following planting, trees and shrubs shall be pruned, if required, only to remove dead or damaged branches, sucker growth, crossing and or rubbing branches or other conditions detrimental to proper growth and in accordance with the American Nurserymen's Association Standards for Class I, fine pruning. Do not cut leaders. The Engineer shall determine, in consultation with the Town's Tree Warden, if plants require pruning, or shall be rejected. All pruning work shall be done by a Massachusetts Certified Arborist.

Plant care shall consist of keeping the plants in a healthy growing condition. Plant care shall include watering, weeding, pruning, re-mulching, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.

Any decline in the condition of new plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturists to inspect plant materials and to identify problems and recommend corrective procedures. The Engineer shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Engineer.

Absolutely no debris shall be left on the site. The Contractor shall repair any damage to site as required by the Engineer, at no additional cost to Owner.

Maintenance Period: 60 Days

The Maintenance Period shall begin immediately after each plant is installed and shall continue for a minimum of 60 days following the completion of all planting installations, or until the Conditional Acceptance of all planting work, whichever is a longer period of time. Contractor's Massachusetts Certified Arborist landscape contractor representative, Resident Engineer and the Tree Warden shall walk the project area to determine deficiencies or concerns.

All tree plantings shall include watering bags. Watering bags shall be filled at least once per week for the period from May 1st through October 1st with the exception of weeks where 1.5 inches or more of rain has fallen.

At the end of the Maintenance Period, the Contractor shall request inspection by the Engineer at least 10 days before the anticipated date of inspection.

At the time of inspection, if the plant materials and workmanship are acceptable to the Engineer, the Engineer shall issue a written Certificate of Conditional Acceptance to the Contractor. The date of the inspection shall establish the end of the Maintenance Period and the commencement of the required one-year establishment period for planting work.

If in the Engineer's opinion, plant materials and/or workmanship is deficient, acceptance shall not be granted, and the Maintenance Period for all the plants shall be extended until plant replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacement plants shall conform in all respects to the Specifications for the original plants and shall be planted in the same manner.

Establishment Period: One Year

The purpose of the Establishment Period is to nurture plants through at least one full growing season and one full winter.

All plants shall be inspected by the Engineer one year after Conditional Acceptance and shall be alive and in satisfactory growth at the end of that time. The Contractor is responsible for arranging inspection early enough in the season to allow adequate time to procure and install replacement material.

At the end of the Establishment Period, each plant shall show healthy growth as determined by the Engineer. Determination of healthy growth shall include, but is not necessarily limited to, viable leaves (in season) and terminal buds, as well as live cambium. Plants found to be unacceptable shall be removed promptly from the site and replaced immediately or during the next normal planting season, as permitted by the specifications.

Planted areas shall be free of weeds and debris, and plantings shall be remulched as required.

The Engineer will inspect the replacement planting work upon the request of the Contractor. Request for inspection shall be received by the Engineer at least ten days before the anticipated date of inspection.

Contractor shall reinstall stakes and guying as required. The Town of Belmont will remove stakes and guying at the end of the second year of growth. Tree watering bags shall be removed if requested by the Town. The bags shall remain the property of the Town.

Upon acceptance of the work of replacement planting, the Engineer shall issue a written Certificate of Final Acceptance for all plants installed under this Section to the Contractor.

Protection of Existing Plant Material to Remain

The Contractor shall take care when excavation around existing trees to remain. It shall be the Contractor's responsibility to treat any damage to an existing tree, as specified within these special provisions and standard specifications.

METHOD OF MEASUREMENT

Items 773.238 through 796.422 will be measured for payment per each as called out on the plans, complete in place.

BASIS OF PAYMENT

Items 773.238 through 796.422 will be paid for at the respective Contract unit price per each, which price shall include all labor, excavation, material, equipment and incidental costs required to complete the work.

No separate payment shall be made for plant pit excavation, soil preparation, soil amendments, planting mix preparation, loam for planting mix, soil wetting agents, mycorrhizal fungi planting, plant protection, bark mulch (including placement), watering, Tree watering bags, and all other incidentals required for furnishing and installing the plantings, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 804.3	**3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL)**	**FOOT**
ITEM 804.32	**3 INCH ELECTRICAL CONDUIT TYPE NM (DOUBLE)- PLASTIC (UL)**	**FOOT**
ITEM 804.33	**3 INCH ELECTRICAL CONDUIT TYPE NM (TRIPLE)- PLASTIC (UL)**	**FOOT**

DESCRIPTION

The work under this item shall consist of the furnishing and the installation of 3" electrical conduits for a

traffic signal system as shown on the plans or as directed, complete in place.

The work to be performed under these items shall conform to the relevant portions of Section 801.

METHOD OF MEASUREMENT
Measurement of the above listed items shall be in accordance with provisions of Subsection 801.80 of the Standard Specifications.

BASIS OF PAYMENT
Payment will be made at the unit price per foot for Item 804.3, 3 Inch Electrical Conduit Type NM-Plastic – (UL), Item 804.32 3 Inch Electrical Conduit Type NM (Double) – Plastic (UL) and Item 804.33 3 Inch Electrical Conduit Type NM (Triple) – Plastic (UL) as installed, complete in place, which price shall constitute full compensation for all labor, tools, and equipment, for furnishing and installing conduit, fittings, bends, clamps, couplings, all trench excavation (except rock), backfilling, joint encasement, de-watering, pull ropes, and all work necessary for the proper completion of the work specified herewith, as shown on the plans, or as directed by the Engineer.

ITEM 811.32 PULL BOX 12 X 24 INCHES EACH

DESCRIPTION
The work under these items shall conform to relevant provisions of Section 801 of the Standard Specifications and the following

The work under this Item shall consist of furnishing and the installation of the 12 X 24 Inches pull boxes and frames and covers as shown on the plans or as directed complete in place.

METHOD OF MEASUREMENT
Measurement of the above listed items shall be in accordance with provisions of Subsection 801.80 of the Standard Specifications.

BASIS OF PAYMENT
Payment for Item 811.32, Pull Box 12 X 24 Inches shall be at the contract unit price per each in accordance with Subsection 801.81 of the Standard Specifications. The unit price per each shall include the furnishing of materials and fittings, excavation and backfilling, all equipment and related work required to install the above item, complete in place, to the satisfaction of the Engineer.

ITEM 813.79 INTERCONNECT CABLE SYSTEM LUMP SUM

GENERAL
Work under this Item consists of furnishing and installing all materials, equipment, appurtenances, and making electrical connections for interconnecting traffic signal controllers in accordance with the applicable provisions of Section 800.

The work shall involve interconnecting traffic signals at the following locations as shown on the plans:

Location No. 1: Trapelo Road at Mill Street
Location No. 2: Trapelo Road at pedestrian signal east of Agassiz Street

Location No. 3: Trapelo Road at Pleasant Street
Location No. 4: Trapelo Road at Lexington Road/ Shaw's Drive/ Moraine Street
Location No. 5: Lexington Street at Thayer Street/Church Street

The proposed interconnect cable as shown on the plans shall be a continuous run through all pull boxes. Each conductor shall be terminated on properly labeled terminals. .

CONDUCTOR	**FUNCTION**
1	Cycle 1 & 2
2	Cycle 3 & 4
3	Split 1 & 2
4	Split 3 & 4
5	Offset 1
6	Offset 2
7	Offset 3
8	Free Operator
9	Flashing Operator
10	Common
11	Spare
12	Spare

The interconnect cable shall run between the traffic controller cabinets as shown on the plans. The cable shall conform to the requirements of I.M.S.A. Specifications and shall be 12 pair, #19 AWG stranded.

The Contractor shall install the proposed interconnect cable through the conduits and pull boxes as shown on the Plans. He shall make all required electrical connections to the proposed controllers as shown on the Plans.

A section of the interconnect conduit system, as shown on the plans, includes use of spare ducts within existing Belmont Municipal Light Department electrical conduits between locations Nos. 4 and 6 to cross the railroad bridge

After completion of this item, when the master controller generates information, the interconnect system shall transmit such information functionally to all interconnected local controllers.

Splices shall not be permitted. Cables must be terminated in a control box with R66 terminal blocks, split type, six clip wide, isolated between two slot clips. Bridge clips shall be furnished and installed to connect the three sets of slips for all terminals including spares. Cables shall be attached to the R66 blocks so that removal of bridge clips will isolate cables from each other. Installation of the cable shall be such that straight through pulls in hand holes and pull boxes shall not be permitted. At least five feet of cable shall be coiled in each pull box or handhole to facilitate future maintenance. All interconnect cable

shall be appropriately terminated in each control cabinet including lightning and overvoltage protection for each used conductor in each cabinet.

BASIS OF PAYMENT

Item 813.79 will be paid for at the Contract unit price, which price shall include all labor, excavation, material, equipment and incidental costs required to complete the work.

ITEM 815.3	**TRAFFIC CONTROL SIGNAL LOCATION NO 3**	**LUMP SUM**
ITEM 816.01	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 1**	**LUMP SUM**
ITEM 816.02	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 2**	**LUMP SUM**
ITEM 816.04	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 4**	**LUMP SUM**
ITEM 816.05	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 5**	**LUMP SUM**
ITEM 816.06	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 6**	**LUMP SUM**
ITEM 816.07	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 7**	**LUMP SUM**
ITEM 816.08	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 8**	**LUMP SUM**
ITEM 816.09	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 9**	**LUMP SUM**
ITEM 816.10	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 10**	**LUMP SUM**
ITEM 816.11	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 11**	**LUMP SUM**
ITEM 816.12	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 12**	**LUMP SUM**
ITEM 816.13	**TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO 13**	**LUMP SUM**

Work under the above Items shall be performed according to the provisions of Section 800 of the Standard Specifications, supplemented by the following:

The work includes furnishing and installing of traffic signal control equipment, signal housings, signal modules, signal posts and bases, mast arms, service connections and providing all incidental materials necessary for operating and controlling the traffic control signals, as shown on the plans and sketches. Only signal equipment listed on MassDOT's latest approved equipment list shall be used on this project.

The existing signal installation to be reconstructed under this shall be maintained in operation throughout the construction period and until the reconstructed/new traffic signal equipment is ready for operation.

Any temporary installations shall be in conformance with the current edition of the MUTCD at all times. If an existing signal is to be turned off temporarily to allow controller switchovers or rewiring, police details shall be used to control traffic at the intersection.

A list of major items required for each of the intersections is included on the Traffic Signal Plan. The lump sum prices bid for Traffic Control Signals shall be full compensation for all labor, materials, and equipment necessary or incidental to the installation of a traffic control system.

Cement concrete for foundation shall be 4,000 psi, 3/4-inch 610 Lbs. Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications. Reinforcing steel shall be an ASTM A-615, Grade 60.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Contractor shall deliver to the Engineer a certificate of compliance by the manufacturer for all materials purchased from the manufacturer.

Flashing Operation

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Section 4D.28 to Section 4D.31 of the MUTCD.

Controllers

Each traffic signal controller cabinet assembly shall comply with NEMA TS2-2003 specifications in its totality except the following options. The applicable NEMA section is referenced in parenthesis:

- Size 6 Cabinet (7.8.3.2)
- Sheet Aluminum (7.2.2.1)
- Painted (7.7.2) with Exterior & Interior: Primed Aluminum
- Pre-wired with Type 1, Config.#3 Assembly (5.3.1)
- Detector Rack Config.#2 (5.3.4)
- Type 1 Actuated/NTCIP Controller (3.2 and 3.3)
- Detector input test buttons in cabinet door:
  - 4 Pre-empt
  - 8 Pedestrian Phase
  - 16 Vehicle Channel

- Surge Protection with pre-approved independent lab test verification for each device
  - AC Service (5.4.2.4) except surge capacity shall be 80 kA
  - The following lines shall have surge suppression installed according to the respective voltage:
    - 8 Pedestrian detector lines
  - Surge suppressors (except those for AC Service) shall meet the following specifications:
    - Circuit Type: 3 stage
    - Surge Capacity: 10 kA 8 x 20 µs impulse per line
    - Resettable Fuse: Positive Temperature Coefficient (PTC)
    - Testing Param: ANSI/IEE C62.45
    - Warranty: 10 years (in writing included with above lab report)
- Document Tray
  - One (1) slide-out document tray shall be mounted below the bottom shelf.
    - Sufficient size to contain cabinet wiring diagrams and two manuals
    - Slides out on nylon rollers or ball bearings

        - Hinged cover to protect documents
        - The closed cover shall be able to support a laptop computer.
    - All cables shall be tied away to allow the tray to be opened and closed smoothly without any obstructions
- Meter Socket
    - Standard residential meter socket with no knock-out on top
    - Rated for 125 Amps, 100 Amps continuous, 600 VAC, CU/AL rated
    - Attached and electrically grounded to the cabinet
    - Three power service unfused terminal connections (AC-,AC+ and ground) having the ability to connect No. 6 AWG conductor
    - Bypass switch to remove meter without disrupting service

The front portion of the detector rack shall be provided with a marker strip to allow identification of detector phase assignments. In addition to the required marker strip, the Contractor shall supply and install on the upper left hand corner of the back of the cabinet door a laminated, pictorial diagram depicting the traffic detector amplifier channel assignments. The assignment information contained shall include approach name, phase, detector number and terminal numbers.

All programmable data contained within the controller, malfunction management unit, amplifiers, and other devices shall be printed out, documented, and kept within the cabinet.

All detectors shall be clearly labeled with approach, phase, detector number (if applicable) and cabinet lead-in termination point. The tag shall be made of plastic or plastic laminate and shall be labeled with permanent ink.

There shall be two switches for the police door: 1) Main power switch and 2) A switch for switching the controller from automatic to flashing operation and vice versa, with the controller power :off" in flashing operation.

The cabinet shall be wired with a normally closed switch connected to a user defined input to the controller for later remote monitoring of the control cabinet's door open status.

A 1/2- inch bead of silicone sealant is required to form a waterproof seal between the controller cabinet and the top of the concrete foundation.

All equipment supplied within the control cabinet shall be on the MassDOT's Traffic Signal Approved Equipment List, latest revision.

Master Controller

The master controller shall be compatible with the proposed NEMA TS2-Type 1 local controllers. General requirements are as follows:

<u>Construction</u>

The unit shall consist of a mainframe suitable for shelf mounting, with appropriate interface harnesses.

Operator programmable data entry shall be accomplished through a menu driven keyboard and a display located on the front panel.

Connectors shall be provided for interconnecting all inputs and outputs with their external control circuits.

Timing shall be accomplished by digital methods and with power applied shall use the power line frequency as the time base.

All components shall be operated in accordance with good commercial practice to optimize life and performance.

The design goal shall be such that, under 24 hour a day operating conditions in their circuit applications, all components shall have a life of not less than 5 years.

The circuit reference designation for each component on the printed circuit board shall be clearly marked immediately adjacent to the component.

Electrical

The master controller shall be designed for use of nominal 120 volt, 60 Hz single phase alternating current. It shall operate correctly in the voltage range of 95 to 135 volts AC.

All DC inputs and outputs shall conform to NEMA TS2 - Type 1 standards for transition zone, response time, current capability, surge and noise immunity, as well as all other applicable electrical specifications.

Environmental

The master controller shall maintain all its programmed functions from -30 degrees F to +165 degrees F.

The unit shall perform to this specification when operated in relative humidity from 5% to 95%.

The unit shall conform to all applicable portions of the Environmental and Operating Standards as described in the NEMA Standards TS2-1992.

Functional

All master control equipment shall be placed in the cabinet at the Trapelo Road and Lexington Street (Location 4) intersection. The master control equipment shall be capable of maintaining coordination between all interconnected locations. All controllers shall have internal coordination operation.

The master control equipment shall also be capable of providing a yearly time program for selecting four cycle lengths, three splits, and three offsets plus flashing operation for control of local controllers. The schedule shall be as included and/or as shown on the plans.

The master controller shall be fully compatible with all existing and proposed local controllers and capable of communicating with a computer at a remote location - via a telephone linkage (dial up modem) to the nearest telephone pole or manhole. The modem shall have a data rate of 1,200 baud minimum and use a 10- or 11-bit asynchronous protocol. The power on which the modem runs shall be 12 VDC. The interface shall be through an RS232 port. The modem shall have a 5-year warranty. The modem shall meet the environmental aspects of the NEMA specifications for controllers and corollary equipment.

The Contractor shall provide graphics required for intersection and system monitoring. These graphics shall be customized to reflect the exact geometry, detection, and signalization of the intersections included in the subsystem listed herein. All street names shall be labeled.

The Contractor shall program each programmable local hardware component according to the "time of Day Schedule" as follows:

TIME OF DAY SCHEDULE (BACK UP)

	6 AM-9 AM	**9 AM-11 AM**	**11 AM-2 PM**	**2 PM-4 PM**	**4 PM-7 PM**	**7 PM-6AM**
Mon - Fri	1-1-1	Free	Free	Free	2-2-2	Free
Sat	Free	Free	Free	Free	Free	Free
Sun/Hol	Free	Free	Free	Free	Free	Free

NOTE: CYCLE-SPLIT-OFFSET

NOTE: Patterns shown on the plans are as follows:

AM	1-1-1
PM	2-2-2

Note: Following implementation of the system, thresholds shall be revised as fine tuning occurs.

Video Detection system

The Video Detection System (VDS) shall monitor and detect vehicles on a roadway using video images which can be processed to provide detector outputs to a traffic signal controller. Components of the system shall be included in the MassDOT approved equipment list.

The VDS shall consist of one or more video cameras, a video detection processor (VDP) which mounts in a standard detector rack; a detector rack mounted extension module, field video monitor and pointing device, software and all associated equipment required to set up and operate the system in the field. The equipment shall included camera mountings, extensions, connectors and standard detector rack with power supply.

The system software shall be capable of detecting vehicles in multiple lanes using only the video image. Detection zones shall be defined using only onboard video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available. A separate computer shall not be required to program the detection zones.

Vehicle Detection

The VDS shall provide real time vehicle detection comparable to properly operating inductive loops.

Detection shall be a least 98% accurate in good weather conditions and at least 96% accurate in adverse weather conditions (rain, snow, fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

A minimum of 24 detection zones shall be supported and each detection zone shall be user definable in size and shape to suit the site and the desired vehicle detection region.

Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from the video camera. No separate computer shall be required to program the detection zones.
Detection zones shall have the capability of implementing logical functions (including AND and OR), counting, delay and extension timing. A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

A minimum of 3 detection zone patterns shall be saved within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages. The VDP shall continue to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. The new zone configuration shall not go into effect until the configuration is saved by the operator.

The selection of the detection zone pattern for current use shall be done through a menu or remote computer via RS-232 port. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

It shall be possible to save detector configurations on disk, to download configurations to the VDP or to retrieve the configuration that is currently running.

When a vehicle occupies a detection zone, the corners of the detection zone will flash on the video overlay display screen to confirm the detection of the vehicle.

Detector placement shall not be more distant from the camera than a distance of ten times the mounting height of the camera.

The VDP unit shall compensate for minor camera movement (up to 2 percent of the field view at 400 ft.) without falsely detecting vehicles. The camera movement shall be measured on the unprocessed video input to the processor units.

The VDP shall provide up to 24 channels of vehicle presence detection per camera through a standard detector rack edge connector and one or more extension modules.

The VDP shall provide dynamic zone reconfiguration (DZR) to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

Detection zone setup shall not require site specific information such as latitude, longitude, date and time to be entered into the system.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a constant call during the background learning period.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones shall be capable to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

Video Detection Camera

The video cameras used for traffic detection shall be furnished by the VDP supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 0.1 lux to 10,000 lux.

The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 380 lines vertical and 380 lines horizontal.

The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with a factory adjusted manual iris. Auto-iris lenses are not allowed.

The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.

The horizontal field of view shall be adjustable from 8.1 to 45.9 degrees. A single camera configuration shall be used for all approaches in order to minimize the setup time and spares required by the user.

The camera electronics shall include AGC (antiglare coating) to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 15" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -30 °F to +140 °F and a humidity range from 0% RH to 100% RH.

The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 15 watts or less under all conditions.

Recommended camera placement height shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier. The final camera placement shall be dictated by the specific intersection geometry for accurate detection of vehicles in the detection zones.

The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the VDP supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be black and white in RS170 or CCIR format. The video signal shall be fully isolated from the camera enclosure and power cabling.

The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be Belden 8281 or an equivalent 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 ohms/M), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering. The signal attenuation shall not

exceed 0.78 dB per 100 feet at 10 MHz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm BNC plug connectors should be used at both the camera and cabinet ends. The coaxial cable, BNC connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.

POWER CABLING

The power cabling shall be 16 AWG three-conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if necessary.

Mast Arm Structures

All signal heads and signs on the mast arms shall be fixed mounted. Shoe type bases shall be used. A minimum vertical clearance of 17.5 feet shall be maintained by the 35-foot mast arms.

Mast Arm Foundations

Borings were obtained at each mast arm foundation location and boring logs included. The Contractor shall be responsible for constructing the foundations in accordance with the recommendations noted on the plans, the Standard Specifications, and details based on these boring logs.

The foundation design shall be in conformance with the Standard Specifications and Standard Details. All shop drawings and calculations shall be stamped by a Professional Engineer registered in Massachusetts and provided to the engineer.

For all mast arm pole foundations, the standard mast arm pole foundation shall be modified to a concrete cored foundation as shown on the Standard Drawings for Type 2 Mast Arm Cored Pier Foundations included in the plans. For Type B mast arms use the foundation for required for a 45’ mast arm.

The Contractor is wholly responsible for the design of all foundations regardless of soil conditions and/or ledge found at the proposed foundation locations. Soil boring logs with soil type recommendations are furnished in these specifications.

In the event that soil conditions or ledge prevent the use of the MassDOT standard foundation type, the Contractor is responsible to select and design alternative foundation types. Alternative foundation types could include spread footings, coring and socketing into rock or other foundations previously used to support similar loads, within reason.

The Contractor is responsible for the design of all mast arm foundations. Standard mast arm foundations shall be assumed for bidding purposes to be 4’-6” diameter, 15’-0” deep, cored foundations. Type B mast arm foundations shall be assumed for bidding purposes to be 5’-0”

diameter. 14’-0” deep, cored foundations. If the design calculations dictate a different depth, the variance from the 15’ depth will be addressed in accordance with subsection 801.62 Foundations via pay Item 815.98, Footing Cost Adjustment on a per foot basis. All reinforcing steel required for these foundations shall be paid for under the Traffic Signal pay items and no adjustment will be made for any variance.

Foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is not impaired.

Mast Arms

All mast arms shall be monolever Type II galvanized Steel, and shall be designed in accordance with the AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals,” 4th Editions (2001) with 2003 Interims. The following shall be the design parameters:
Life: 25 years
Wind Velocity: 130 MPH
Fatigue Category: Category 2 with natural wind gust loading (no truck induced loading, no galloping loading, no vortex shedding)

Type B mast arms shall be designed to allow no more than 12 inches of dynamic sway range for 130 mile per hour wind and ice.

All shop drawings and calculations shall be stamped by a Professional Engineer registered in Massachusetts and provided to the engineer. Acceptance of Type II mast arm poles will be contingent upon review and approval of shop drawings for all mast arms. Shop drawings shall include paint chip and paint application methods/materials.

Mast Arm Sign Hanger Brackets

Sign hanger brackets for mast arms shall be used in all locations where a sign is to be mounted to the mast arm. Mast arm sign hanger brackets shall consist of a mast arm clamp assembly cast from 356-T6 aluminum alloy or equivalent, vertical support tube extruded from 6063 aluminum or equivalent, stainless steel bands, clamp screw, hardware and all miscellaneous materials necessary to fix mount the sign to the mast arm.

The sign hanger bracket shall be universally adjustable capable of making horizontal, vertical and 360-degree rotational adjustments so that any sign mounted on a mast arm can be adjusted to provide proper alignment and sight perpendicular to the flow of traffic.

Vertical support tubes shall be of sufficient length to allow mounting of the sign to within 3 In. of the top and bottom of the sign.

Backplates

Backplates shall be constructed of anodized half hard aluminum with a louvered profile. Backplates shall provide a minimum of 5-inch border around the signal assembly and shall be of dull flat black color. Corners of the backplates shall be rounded with a 2½-inch radius.
Backplates shall be installed with all vehicle signal heads.

Labels

All time settings, switches, harnesses, relays, terminals and fuses shall be clearly and permanently labeled.

Posts and Bases

All 8-feet and 10-feet traffic signal posts shall be aluminum. The pole shall be made of 6063-T6 aluminum alloy and shall be a continuously tapered, seamless tube. Bases shall be pedestal type cast aluminum. Pole and base shall be a single unit.

Vehicle Signal Heads

All vehicle signal heads shall be aluminum.

When in the judgment of the Engineer the visibility of proposed signal faces will be obstructed by trees and other vegetation, the Contractor shall clear the obstructions for proper sight distance. Any clearing necessary shall be done within the State Highway layout, as directed by the Engineer.

When in the judgment of the Engineer the visibility of proposed signal faces will be obstructed by trees and other vegetation, the Contractor shall clear the obstructions for proper sight distance. Any clearing necessary shall be done within the State Highway layout, as directed by the Engineer.

Led Signal Module

All signal and pedestrian displays shall be equipped with LED signal modules. All red, amber, green, and pedestrian signal housings with the exception of optically programmed housings shall conform to the following where applicable:

- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Arrow Traffic Signal Supplement, Dated April 3, 2006.
- ITE's Vehicle Traffic Control Signal Heads- Light Emitting Diode (LED) Circular Signal Supplement, Dated June 27, 2005.
- ITE's Pedestrian Traffic Control Signal Indications Part 2: Light Emitting Diode (LED) Pedestrial Traffic Signal Modules, Adopted March 19, 2004.
- Energy Star/ EPACT Program Requirements for Traffic Signals
- On the MassDOT's Traffic Signal Approved Equipment List

An independent lab shall certify that the LED signal module complies with the applicable ITE specification. The independent report should be submitted to MassDOT for review unless the module is already on the approved list. See "Traffic Signal Controls" under "Qualified Construction Materials" on the Department website.

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced by the manufacturer if it exhibits one of the following:

- A failure due to workmanship or material defects within the first 60 months of field operation
- A greater than 40 percent light output degradation or a fall below minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation

Spare Equipment

The Contractor shall provide in the traffic signal controller cabinet the following spare signal equipment listed below:

- A full complement of load switches to accommodate each available position of the break panel.
- A full complement of flash transfer relays to accommodate each available position of the back panel.
- Two (2) Bus Interface Units
- A 25 foot RS-232 cable for communication function with a laptop computer.

OPTICAL EMERGENCY PREEMPTION SYSTEM

The work consists of furnishing and installing optical traffic signal preemption systems ready for operation, as described herein and shown on the plans. Included in the work is the furnishing and installing of traffic signal preemption unit and related equipment, optical detection equipment and all necessary connections to the traffic signal controller. The fire preemption system shall be approved by MassDOT and installed in the same cabinet as the controller.

The fire preemption system shall consist of a data-encoded phase selector to be installed within the existing control cabinet. This unit will serve to validate, identify, classify, and record the signal from the optical detectors located on support structures at the intersection. Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The phase selector shall be a rack-mounted plug-in four-channel, dual priority device. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software on a disk shall be supplied and licensed to the Town as part of this contract. A hard copy of final programming data shall be left in the control cabinet. The Contractor shall supply a complete set of interface cables for phase selector to laptop connection.

Emergency vehicles equipped with optical energy emitters transmit optical energy impulses to optical detectors mounted at the intersection. When optical energy impulses are received at the intersection, control of the signals shall transfer from the local controller to show a selected display shown on the plans to assist the vehicle through the intersection without conflict. After the vehicle has passed through the intersection, control of the signals shall then return to the local controller which shall restore the appropriate timings that were in effect prior to preemption.

Preemption Confirmation Light

A preemption confirmation light shall be provided and mounted as shown on the plans. It shall be located in a position where it may be visible from all preemption approaches to each intersection. The light shall be weather tight and consist of a double flash clear (white) strobe which shall be illuminated whenever the controller is in the emergency preemption phase. The indicator light shall meet ITE, NEMA, IMSA and MassDOT standards. The light shall have a minimum diameter of 140mm and height of 170mm. It shall be capable of flashing at a rate of 60 to 75 flashes per minute. Candela intensity shall be a minimum of 1,000 for clear lenses.

The Contractor shall be responsible for the proper programming of the phase selector, orientation of the optical receivers in the field, and all other work necessary to provide a complete and operating emergency preemption system.

COUNTDOWN PEDESTRIAN SIGNAL

Construction

The LED countdown pedestrian module shall be a single, self-contained device, not requiring on-site assembly.

The assembly of the LED countdown pedestrian module shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination, and also to match threshold ambient light conditions.

The countdown signal shall use a standard 3-wire configuration for Walk, Don’t Walk and Neutral.

The LED countdown pedestrian module shall be made of UL94VO flame retardant material or similar. The lens of the module is excluded from this requirement.

Combination hand/person pedestrian signal modules shall incorporate separate power supplies for the hand and the person icons.

Countdown Functionality

The countdown module shall be compatible with all types of controllers, and especially with the type of traffic signal controller that will be installed as part of this project.

The countdown timer shall continuously monitor the traffic controller for any changes in the pedestrian phase time and reprogram itself automatically, if needed. The countdown module shall be automatically set by the traffic controller based upon the pedestrian change interval only

Per MUTCD, countdown displays shall not be used during the Walk interval or during the yellow change interval of a concurrent vehicular phase.

A steady upraised hand shall be displayed during the yellow change interval and the red clearance interval.

The countdown module shall begin at the start of the flashing DON'T WALK (pedestrian change interval) and shall display the number of seconds remaining until the termination of the DON'T WALK interval, and blank out or remain dark during the steady DON'T WALK interval.

The countdown timer display shall remain synchronized with the signal indications and shall always reach zero at the same time as the flashing hand.

Chromaticity

The standard colors for the LED countdown pedestrian module shall be white for the Walking Person and Portland orange for the Upraised Hand Icon. The countdown numbers shall be Portland orange.

The colors for these Icons shall conform to the current version of the MUTCD Section 4E.04

The chromaticity measurements shall remain unchanged over the input line voltage range of 80VAC to 135VAC.

Display

The LED countdown pedestrian signal shall consist of a single module 16" wide with the Upraised Hand and the Walking Person graphics overlaid upon each other and two seven-segment digits for the countdown display.

The operation, shape and size of the graphic symbols shall meet the current version of the MUTCD, Section 4E.04 and Section 4E.07.

The graphic symbols shall follow PTSCI Part 2 Section 4 for luminance, uniformity, and distribution.

The countdown numbers shall be at least 7 inches in height. The graphic symbols and the countdown numbers shall be located on a black opaque background.

The Portland orange LED shall be of the latest ALLnGa P technology and the white LED shall be of the latest GaN technology.

The individual LED light source shall be interconnected so that a catastrophic failure of a single LED will result in a total loss of not more than 5% of the signal light output.

Warranty

The LED module will be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation.

The LED module will be replaced or repaired by the manufacturer if it falls below the minimum intensity levels as established by ITE within the first 60 months of field operation.

Wiring and Service Connections

Traffic signal cable shall be of Type 2, 12 gauge, 10 conductor. All systems shall have a minimum of one (1) ten (10) conductor cable for each vehicle phase, overlap phase and pedestrian phase for controller outputs to field wiring required by the timing and sequence plan. A minimum of five (5) spare conductors shall be provided in the base of each signal post, mast arm pole and strain pole. Openings, where cables enter the base of a cabinet, shall be sealed with an approved elastic sealing compound. The open ends of conduits entering or leaving mast arms, posts and pull boxes shall also be sealed with the approved elastic sealing compound.

The work for service connections shall consist of furnishing and installing all materials and equipment to deliver power to traffic signals and related electrical systems.

The work for service connections shall consist of furnishing and installing all materials and equipment to deliver power to traffic signals and related electrical systems.

Equipment Color and Finish

Signal Housings	green number 24062 Federal Color Standard 5954
Front of Signal Housings	flat black
Signal Visors and Backplates	flat black
Posts and Bases	green number 24062 Federal Color Standard 5954
Controllers Cabinets	green number 24062 Federal Color Standard 5954
Meter Socket	green number 24062 Federal Color Standard 5954
Mast Arm, Posts and Bases	green number 24062 Federal Color Standard 5954
Hangers, Clamps & Brackets	green number 24062 Federal Color Standard 5954

The final painting shall have a semi-gloss finish in appearance. The contractor shall submit to the Engineer and the Town of Belmont for approval, paint chips of the prescribed color prior to any work being done under this heading

As-built Traffic Layout Plans

It will be the responsibility of the Contractor to provide the Design Engineer with as-built traffic signal layout plans indicating all changes made during the construction. The plans shall indicate the location of all traffic signal equipment installed including detectors, signal posts, mast arms, strain poles, pedestrian and vehicular signal heads, controller cabinets, conduit, pull boxes, service connections and pre-emption equipment. The plans shall also indicate the final as-built timing and sequence, major item list, power-pole number and meter number.

Upon receipt of the above as-built information from the Contractor, the Design Engineer will field verify the as-built information and plans. Following field verification, the Design Engineer will prepare the as-built Traffic Signal Layouts and/or Permits for submission to the MassDOT District 5 and the Town of Fairhaven Department of Public Works prior to the final acceptance of the project.

Miscellaneous Requirements

The actuated controllers shall have capability to preempt to a preselected phase by external command.

The Contractor's attention is drawn to the requirements of Section 813.60C Splicing, relative to four optional methods of splicing in signal bases, Section 813.40C Ground Electrodes relative to requirement 1 - connection to a water piping system and Section 813.61 Equipment Grounding.

All anchor bolts and bolts for holding hand hole and access covers shall be greased at the time of installation.

The Contractor shall make all necessary arrangements with the electric company for the service connections or for any main power cut off when necessary, and bear all charges incurred thereby.

COMPENSATION

The work under Items 815.3 Traffic Control Signal Location 3, and 816.01 to 816.13 Traffic Signal Reconstruction, Location Nos. 1 & 2, 4 to 13 will be paid for at the Contract Lump Sum prices, which prices shall include all labor, materials, equipment and incidental costs to complete the work. The Lump Sum price bid for this Item shall include the installing and maintaining of an operable traffic signal system, and the removal and stacking of the existing traffic signal equipment at the project site for collection by the Town. Signal equipment not required by the Town shall be removed and discarded by the Contractor away from the site at no additional cost.

Conduit will be paid for separately under Item 804.3, 3 Inch Electrical Conduit, Type NM Plastic (UL).

Pull boxes will be paid for separately under Item 811.31, Pull Box 12 x 12 Inches - SD2.031, and Item 811.32 Pull Box 12x24 Inches.

ITEM 823.75 MBTA CATENARY POLE – REMOVED AND STACKED EACH

GENERAL
Work under this item shall conform to Section 820 of the Standard Specifications, and the following:
Existing catenary lines shall be relocated to proposed MBTA Catenary Pole by MBTA prior to removal of existing MBTA Catenary Pole. Existing pole shall be cut at 12 inches below grade. Removed and stockpiled for pickup by MBTA or delivered to The Town of Belmont, MA Department of Public Works 40 Prince Street, Belmont, MA 02478 The contractor shall notify the Engineer, the MBTA representative and call the Town department at PH: (617) 489-7171 at least 1 week prior to scheduled delivery.

METHOD OF MEASUREMENT
Item 823.76, MBTA Catenary Pole Removed and Stacked will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT
Item 823.76, MBTA Catenary Pole Removed and Stacked will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 823.76 MBTA CATENARY POLE EACH

GENERAL
Work under this item shall conform to Section 820 of the Standard Specifications, and the following:
Obtaining and installing MBTA Catenary Pole as described in the MBTA P22-H-Tubular Steel Poles specification included in the appendix.

Where applicable, reattachment of catenary lines, and power lines shall be performed by the MBTA.

Where applicable, reattachment of lights and banners shall be performed by Belmont Light and Power.

Contractor shall notify the MBTA and Belmont Light and Power at least 1 week in advance of construction operations to coordinate the reattachment of supported features described herein and any other peripheral equipment required to complete the work.

Catenary Poles shall not be relocated without the written consent of a qualified MBTA representative.

Where applicable coordinate with Belmont Light and Power for reconnection of electrical equipment upon installation of conduit and riser.

FINISH
In addition to the primer finish described in the MBTA specification, the Poles supplied shall receive a minimum of three topcoats of black enamel paint. Thickness of finish coat shall be 8-10 mils. Minimum.

Finish shall be semi-gloss.

Color shall be black.

SUBMITTALS
Submit Manufacturer's Literature: Submit product data including details of construction, materials, dimensions, analysis, hardware preparation, color charts and specific finishes, and label compliance.

METHOD OF MEASUREMENT
Item 823.76- MBTA Catenary Pole will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT
Item 823.76- MBTA Catenary Pole will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

Item 826.70 Electric Service Riser Relocation, will be paid for separately.

ITEM 823.77 MBTA CATENARY POLE – CLEANED AND PAINTED EACH

GENERAL
Work under this item shall conform to Section M7 of the Standard Specifications, and the following:

Cleaning and painting Catenary Pole tubular steel post.

Submittals
Submission Requirements: Surface Finish and Color samples – Within 21 days after award of thecontract. Each sample shall be accompanied with a letter listing; the coating system contractorand manufacturer's information for coating system.

MATERIALS
The coating system shall be a zinc rich epoxy primer coating approved by the Engineer.
A semi-gloss exterior black enamel paint top coating approved by the Engineer.
Any surface damage during installation shall be repaired immediately to the Engineer's satisfaction.

CONSTRUCTION METHODS
Material preparation and finishing shall occur under dry conditions and between 50 and 80degrees Fahrenheit.

All Poles shall be thoroughly washed two times with a 50/50 solution of vinegar/water to remove all dirt, adhesive, oxidation, etc. and allowed to dry thoroughly prior to application of primer.

Contractor shall notify the MBTA and Belmont Light and Power at least 1 week in advance of construction operations to verify safe access to poles. No construction operations shall proceed without the express written permission of both agencies.

All exposed exterior metals shall have two coats of zinc rich epoxy primer or approved equal and two top coats of semi-gloss exterior black enamel paint.

Poles with existing prime coat shall receive primer on areas of exposed metal where paint and oxidation

have been removed, followed by the second coat of primer.

Paint finish shall be salt resistant and at least 6 mils in thickness after drying.

METHOD OF MEASUREMENT
Item 823.77 - MBTA Catenary Pole Cleaned and Painted will be measured per each complete in place, which shall include full compensation for furnishing all labor, materials, tools, equipment required to clean and paint all poles and peripheral hardware and all else incidental.

BASIS OF PAYMENT
Item 823.77 - MBTA Catenary Pole Cleaned and Painted will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 823.78 MBTA POLE PROTECTION EACH

GENERAL
The purpose of this item is to prevent damage to pole, riser, and foundation of existing MBTA Poles to remain, to ensure public safety and to prevent disruption to MBTA systems. Provisions under this item include steps to minimize disturbance and to construct protection measures for poles within construction areas.

It shall be the responsibility of the Contractor to ensure adequate protection of all MBTA Poles within the work site through the full duration of the construction period. Maintenance and protection responsibilities shall include all portions of the Pole above and below the ground.

The work under this item shall conform to the relevant provisions of the Standard Specifications and the following:

Examination of Conditions
The Contractor shall be solely responsible for judging the full extent of the work requirements, including, but not necessarily limited to any equipment and materials required for providing MBTA Pole protection.

Pole Armoring
All existing mbta poles within the limits of the work, which are marked on the Plans to be protected, shall be protected by wood slats strapped to pole/ riser as shown on the details or other acceptable device in order to avoid damage. The Pole protection barrier utilized by the Contractor shall be subject to the approval of the Engineer. The minimum height of the protective barrier for Poles with riser shall be 3 inches above the height of riser or a maximum of 4 feet, additionally. All Poles or Risers that sustain damage caused by the Contractor's work force during the course of the work shall be repaired immediately as directed by the engineer.

Where damage deemed by the engineer to impair the structural stability of MBTA Pole Riser or Foundation occur, The MBTA representative shall be notified in writing as to the condition and repair or replacement shall be executed immediately and at no additional cost to the owner or municipality as directed by the owners representative.

Protection from Excavation
The Contractor shall take due care to protect All portions of the Pole Riser and Foundation from damage while performing work within its vicinity. All over hanging wires shall be identified and protected from

equipment damage and disturbance. Alternative operations shall be utilized where required.

During Examination the engineer shall determine the best method for excavation around existing poles.

Necessary excavation that could pose risk of topple or other structural failure of the pole shall be brought to the attention of the engineer and where deemed necessary temporary bracing or other stabilization measures shall be put in place. Any significant excavation directly adjacent to Poles where improvements cannot be completed immediately shall be braced or temporarily filled.

The removal of existing sidewalk shall be conducted carefully. The existing subgrade material under the sidewalk shall be reused, if it is deemed appropriate by the Engineer, in order to avoid excavation.

Where required to repair damage to MBTA Poles by the contractors work, such care shall include but shall not necessarily be limited to cleaning, priming, painting, and patching of concrete.

METHOD OF MEASUREMENT
Item 823.78 MBTA Pole Protection will be measured for payment per each as called out on the plans, complete in place.

BASIS OF PAYMENT
Item 823.78 MBTA Pole Protection will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the work. Excavation will be paid for separately under Item 120 General Earth Excavation.

ITEM 826.51 FIRE ALARM BOX REMOVED AND RESET EACH

GENERAL
This work shall consist removing, and reinstalling Fire Alarm Box. The work shall be performed in accordance with the details shown on the plans, as specified in these technical provisions and as required by the Engineer. Existing Fire Alarm Box shall be photographed prior to removal and submitted to the Engineer for record. Fire Alarm Box shall be reset in its original location closely matching the original condition of its installation as possible.

Contractor shall notify the Belmont Fire Department at least 1 week in advance of construction operations to test and verify the function of the reinstalled Fire Alarm Box.

Disconnecting and reconnecting of telecommunication and power supply for Fire Alarm Box shall be performed by a licensed electrician,

Fire Alarm Box shall not be relocated without the written consent of a qualified Fire Department representative.

METHOD OF MEASUREMENT
Item 826.51- Fire Alarm Box Removed and Reset will be measured for payment per each as called out on the plans.

PAYMENT
Item 826.51-Fire Alarm Box Removed and Reset will be paid for at the contract unit price per each, which price shall include all labor, material, equipment and incidental costs required to complete the

work.

ITEM 826.70 ELECTRIC SERVICE RISER RELOCATION EACH

DESCRIPTION
The work shall conform to the relevant provisions of Section 800 and the following:

The work under this item shall consist of the removal and relocation of electric service risers attached to utility poles supplying secondary electrical service through underground conduit.

The existing underground conduit shall be excavated and exposed for a necessary distance to allow for the re-alignment of the conduit to the relocated pole. The existing galvanized riser and sweep at the base of riser shall be removed and reset on the new pole, reconnecting the existing conduit with a split coupling. The existing wires shall be retained in the conduit during the relocation. If additional lengths of conduit are necessary for the reconnection of the riser to the new pole, split conduit shall be used. New galvanized steel straps shall be used to attach the riser pipe to the utility pole, spaced per utility company recommendations. A ground clamp at the top of riser pipe and weather and wire seals will be installed per Utility Company recommendations.

The work shall include all excavation and backfill, compaction, and materials or any other requirements in accordance with the latest edition of the National Electrical Code, the respective utility company, local codes and guidelines. The work associated with disconnecting power and reconnecting power to the utilities secondary power lines should be performed at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, Power Company and the property owner/tenant during construction. No additional compensation shall be given for this work outside of normal work hours if necessary.

COMPENSATION
Payment for service connections shall be at the contract unit price per EACH. This shall be full compensation for the furnishing of all labor, materials, tools and equipment associated with the work complete in place. The work associated with the relocation of the utility poles and the transfer of the Utilities overhead primary and secondary wiring shall be the responsibility of the respective utility companies and shall not be paid for under this item.

ITEM 850.41 ROADWAY FLAGGER HOUR

GENERAL
The Contractor shall provide the number of flaggers required in either the appropriate Traffic Control Plan (TCP) template (see MassHighway's website at http://www.mhd.state.ma.us/) or that the Engineer requires for the direction and control of traffic within the site. A flagger shall be used as required by the Engineer in accordance with 701 CMR 7.00, this section, and the TCP. Any flagger determined by the Engineer to be ineffective in controlling traffic may be removed at the discretion of the Engineer. If a flagger is required to be removed, the Contractor shall immediately comply with the directive from the Engineer and shall immediately comply with the directive from the Engineer and shall suspend operations as required until a qualified replacement can be provided. Such a suspension of operations shall not be considered as a basis for a claim or an extension of time.

QUALIFICATIONS
Flaggers used during the performance of the Work shall be at least eighteen (18) years of age.

Flaggers used during the performance of the Work shall possess a current certificate of satisfactory completion from a Department-approved flagger training program within the previous two (2) years. Prior to the start of work, the Contractor shall provide to the Engineer a written list of certified flaggers to be used, including the most recent date of certification or re-certification for each person listed. All flaggers shall carry their approved flagging training program certification card with them while performing flagging duties. Flagger certifications shall remain valid for the duration of the project or the flagger shall be removed from the project.

Flaggers used during the performance of the Work shall have completed a First Aid training course according to the standards and guidelines of the American Heart Association or the American Red Cross. Flaggers shall carry their First Aid certification cards with them while performing flagging duties. First Aid certifications need not be renewed once the initial certification has expired.

MATERIALS
Each flagger shall be equipped with the following high visibility clothing, signaling, and safety devices:

1. A white protective hard hat with a minimum level of reflectivity per the requirements of ANSI, Type I, Class E & G;
2. A clean, unfaded, untorn lime/yellow reflective safety vest and safety pants meeting the requirements of ANSI 107 Class 3 with the words "Traffic Control" on the front and rear panels in minimum two (2) inch (50 millimeter) high letters;
3. A twenty-four (24) inch "STOP/SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a weighted, reflectorized red flag, flagger station advance warning signage, and two-way radios capable of providing clear communication within the work zone between flaggers, the Contractor, and the Engineer. The traffic paddle should be mounted on a pole of sufficient length to be seven (7) feet above the ground as measured from the bottom of the paddle;
4. A working flashlight with a minimum of 15,000 candlepower and a six (6) inch red attachable wand, a whistle with an attached lanyard, and a First Aid kit that complies with the requirements of ANSI Z308.1;
5. An industrial/safety type portable air horn that complies with the requirements of the U.S. Coast Guard.

COMPENSATION
Compensation for flaggers will be paid on an hourly basis for only the actual time spent flagging and payment shall be made under Item 850.41, Roadway Flagger. No allowance or additional payment shall be made for required training, equipment, travel time, transportation, or any administrative charges associated with the costs of flaggers.

ITEM 874. STREET NAME SIGN EACH

GENERAL
Work under this item shall conform to the applicable provisions of Section 828 of the Standard Specifications, supplemented and amended as follows: legends, sheeting, color and type shall be as shown on the Plans or as required by the Engineer.

METHOD OF MEASUREMENT
Item 874. Street Name Sign, will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT
Item 874 Street Name Sign will be paid at the Contract unit price per each which price shall include all labor, equipment, materials and incidentals required to complete the work.

ITEM 874.2 TRAFFIC SIGN REMOVED AND RESET EACH

GENERAL
The work under this Item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following.

The Contractor shall carefully remove all existing signs, attachment hardware, and sign support posts to be reset as shown on the Drawings and as required by the Engineer.

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset in the proposed work.

Signs, attachment hardware and sign support posts 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 required to replace any missing or unusable existing hardware.

Each sign with post shall be completely removed and reset in the proposed work complete with required attachment hardware.

METHOD OF MEASUREMENT
Items 874.2 will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT
Items 874.2 will be paid at the Contract unit price per each which price shall include all labor, equipment, materials and incidentals required to complete the work.

Included for payment under this Item are warning, regulatory, route marker signs, parking signs and miscellaneous directional signs. Excluded under this item are guide signs, which are covered under other items as applicable.

ITEM 874.4 TRAFFIC SIGN REMOVED AND STACKED EACH

GENERAL
Work under this Section shall conform to the applicable provisions of Section 850 of the Standard Specifications and the following:

The work shall consist of removing and stacking existing regulatory, warning and directional signs and supports. Signs and attached hardware shall be carefully removed from their supports. The supports and

existing foundations shall be removed to a depth of at least 6 inches below the existing ground and the holes backfilled with gravel. The surface shall be patched with a material to match the existing ground or as required by the Engineer.

The signs and supports shall be removed and temporarily stacked in a stockpile on the site for removal by the Town/Owner. The Contractor shall be responsible for the signs, and shall replace or repair any damage due to his operations with no additional compensation. Signs not required by the Town shall be removed and discarded by the Contractor away from the site.

If signs are attached to existing light poles, utility poles or traffic poles, only the sign and attached hardware shall be removed and stacked.

METHOD OF MEASUREMENT
Item 847.4 Traffic Sign Removed and Stacked, for this item will be measured on a per each basis.

BASIS OF PAYMENT
Item 847.4 Traffic Sign Removed and Stacked, will be paid for at the Contract unit price, which price shall be full compensation for dismantling, loading, transporting and stacking of the signs and supports as designated above, the excavating and disposal of the existing foundation, and the supplying and placing of compacted gravel backfill where foundations and posts are removed, and the patching of the existing surface, including all labor, material and incidentals to complete the work as shown on the Plans and as required by the Engineer.

ITEM 874.7. MISCELLANEOUS SIGNS REMOVED AND STACKED EACH

GENERAL
Work under this Section shall conform to the applicable provisions of Section 850 of the Standard Specifications and the following:

The work shall consist of removing and stacking existing regulatory, warning and directional signs and supports. Signs and attached hardware shall be carefully removed from their supports. The supports and existing foundations shall be removed to a depth of at least 6 inches below the existing ground and the holes backfilled with gravel. The surface shall be patched with a material to match the existing ground or as required by the Engineer.

The signs and supports shall be removed and temporarily stacked in a stockpile on the site for removal by the Town/Owner. The Contractor shall be responsible for the signs, and shall replace or repair any damage due to his operations with no additional compensation. Signs not required by the Town shall be removed and discarded by the Contractor away from the site.

If signs are attached to existing light poles, utility poles or traffic poles, only the sign and attached hardware shall be removed and stacked.

METHOD OF MEASUREMENT
Item 874.4 Miscellaneous Signs Removed and Stacked, for this item will be measured on a per each basis.

BASIS OF PAYMENT
Item 874.4 Miscellaneous Signs Removed and Stacked, will be paid for at the Contract unit price,

which price shall be full compensation for dismantling, loading, transporting and stacking of the signs and supports as designated above, the excavating and disposal of the existing foundation, and the supplying and placing of compacted gravel backfill where foundations and posts are removed, and the patching of the existing surface, including all labor, material and incidentals to complete the work as shown on the Plans and as required by the Engineer.

ITEM 874.8 MISCELLANEOUS SIGNS REMOVED AND RESET EACH

GENERAL

The work under this Item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following.

The Contractor shall carefully remove all existing signs, attachment hardware, and sign support posts to be reset as shown on the Drawings and as required by the Engineer.

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset in the proposed work.

Signs, attachment hardware and sign support posts 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 required to replace any missing or unusable existing hardware.

Each sign with post shall be completely removed and reset in the proposed work complete with required attachment hardware.

METHOD OF MEASUREMENT

Items 874.8, Miscellaneous Signs – Removed and Reset will be measured for payment per each as called out on the plans.

BASIS OF PAYMENT

Items 874.8, Miscellaneous Signs – Removed and Reset will be paid at the Contract unit price per each which price shall include all labor, equipment, materials and incidentals required to complete the work.

Included for payment under this Item are guide signs.

END OF DOCUMENT