

DOCUMENT A00801*Put-In Revised 07/01/2012***SPECIAL PROVISIONS****WESTFORD, CARLISLE AND ACTON****Federal Aid Project Number:**

Construction of the Bruce Freeman Rail Trail (Phase 2A), Bridge No. 7 over Great Road (Route 2A), Replacement of Bridge No. 1 over Nashoba Brook, Replacement of Bridge No. 2 over Nashoba Brook, Replacement of Bridge No. 3 over Nashoba Brook, Replacement of Bridge No. 4 over Nashoba Brook, Replacement of Bridge No. 5 over Nashoba Brook, and Replacement of Bridge No. 6 over Butter Brook

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

The work under this Contract consists of the construction of a paved multi-use trail in the Towns of Westford, Carlisle and Acton along the former Lowell Secondary railroad line owned by the Commonwealth of Massachusetts. Phase 2A of the project begins at the termination of Phase I at the intersection of Route 225 and Route 27 in Westford and heads southerly approximately 700 feet where it intersects the Carlisle town line. The trail then continues southerly for approximately 850 feet through Carlisle to the Acton town line. From there, the proposed trail continues southerly through Acton for a distance of approximately 4.5 miles to a point 1,000 feet south of Wetherbee Street, behind Teamworks Acton (located at 30 Great Road in Acton).

The work includes clearing and grubbing, track removal, earth excavation, full depth hot mix asphalt pavement, drainage improvements, fence installation, retaining wall construction, six bridge decks, one new prefabricated bridge over Route 2A/119 in the Town of Acton, parking lots, landscaping and trail amenities, installation of rectangular rapid flash beacons, traffic signing and pavement markings, traffic control management, and other street improvements.

The work also consists of the installation of a traffic signal system at one (1) location, complete with vehicle detectors, signal posts, signal heads, cabinet, foundations, pull boxes, service connections, and all other equipment, materials and incidental costs necessary to furnish, install and program a complete and functioning traffic control signal system as specified and as shown in the contract documents.

All work under this contract shall be done in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 1988, the *Supplemental Specifications* dated June 15, 2012, and the *Standard Special Provisions* contained in this book; the *2012 Construction Standard Details*, the *1996 Construction and Traffic Standard Details* (as relates to traffic standard details only); the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with *Massachusetts Amendments* and the *Standard Municipal Traffic Code*; 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.

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@dot.state.ma.us. Please put the MassDOT project file number and municipality in the subject line.

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.mass.gov/massdot/highway>

Select Doing business with us

Select Design/Engineering

Select Engineering & Policy Directives

Select Engineering Directives

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.

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 4.03 EXTRA WORK (Also see Subsection 4.05)

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.

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 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.E.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.

SUBSECTION 8.10 (Continued)**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 therefrom.

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.

SUBSECTION 8.10 (Continued)

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.

SUBSECTION 8.10 (Continued)

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.

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.

DISPOSAL OF EXCESS MATERIAL

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.

The Contractor shall remove the upper soil layer containing vegetation such as grass, leaves and other organic material that is determined to be unsuitable for reuse in construction of the trail. Removal of the unsuitable material will be paid for under Item 120.1 Unclassified Excavation.

It is assumed that all soil excavated below this unsuitable layer will be reused within the project limits due to environmental concerns.

SHOP DRAWING SUBMITTALS (Replace Subsection 5.02, 8th paragraph)

The Contractor shall submit two sets of full-scale shop drawing prints to the Engineer for approval. If corrections are required, one set of the marked-up drawings will be returned to the Contractor for revision and subsequent re-submittal. The Engineer shall make all copies of the approved shop drawings as indicated in Table 1 of Subsection 5.02 and will distribute the drawings. No changes shall be made to the approved drawings without the written consent of the Engineer.

Required shop drawing submittals will include but are not limited to the following items:

- Item 655.01 Timber Rail Fence
- Item 656. Remove and Reset Electric Gate and Equipment
- Item 665.3 72 Inch Stockade Fence
- Item 673. Steel Pipe Access Gate
- Item 706.38 Granite Pier
- Item 707.1 Park Bench
- Item 707.81 Removable Bollard
- Item 707.9 Bike Rack
- Item 996.4 Prefabricated Concrete Modular Gravity Wall

DESIGNER/PROJECT MANAGER

DESIGNER
Greenman-Pedersen, Inc.
Rebecca Williamson, P.E.
978-570-2980

PROJECT MANAGER
MassDOT
David Shedd, Project Manager
857-368-9329

NOTICE TO OWNERS OF UTILITIES (Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or municipal and State 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. The Contractor shall, at the same time, file a copy of such notice with the Engineer. It is the Contractor's responsibility to provide adequate notice to all public and private utilities that may be affected by the construction of the project.

The following are the names of owners of the principal utilities affected as well as other major contacts, but completeness of this list is not guaranteed:

Electric Company

NStar Electric (Carlisle and Acton)
One NSTAR Way, SUM SE 310
Contact: Steven Owens

Westwood, MA 02090
(781) 441-8180

National Grid (Westford)
40 Sylvan Road, Floor E3.741
Contact: Michael Mokey

Waltham, MA 02451
(781) 907-3527

Gas Company

National Grid Gas
40 Sylvan Road, 3rd Floor W3.244
Contact: Melissa Owens

Waltham, MA 02451
(781) 907-2845

Tennessee Gas Pipeline Company
8 Anngina Drive
Contact: David Wood

Enfield, CT 06082
(860) 763-6005

Telephone Company

Verizon
1166 Shawmut Avenue
Contact: Karen Nunes

New Bedford, MA 02746
(508) 991-3522

Water

Westford Water Department (Westford)
60 Forge Village Road
Contact: Steven Cronin

Westford, MA 01886
(978) 692-5529

Acton Water District (Acton)
P.O. Box 953
Contact: Chris Allen

Acton, MA 01720
(978) 263-9107

Concord Water and Sewer Division (Acton)
135 Keyes Road
Contact: Alan Cathcart

Concord, MA 01742
(978) 318-3250

Sewer

Acton Health Department (Acton)
472 Main Street
Contact: Doug Halley

Acton, MA 01720
(978) 264-9634

Railroad

PanAm Railways (Westford)
Iron Horse Park
Contact: John Steiniger

North Billerica, MA 01862
(978) 663-6961

MBTA (Acton)
500 Arborway
Contact: Christine Bresnahan

Boston, MA 02130
(617) 222-3361

Cable Company

Comcast (Westford, Acton)
676 Island Pond Road
Contact: Jean MacLaren

Manchester, NH 03109
(603) 695-1461

MassDOT Fiber/Telcom (Westford)

10 Park Plaza – Rm 4470

Office of Real Estate and Asset Development Boston, MA 02116

Contact: Martin Polera (617) 248-2974

AT&T/TCG, c/o Siena Engineering (Westford, Acton)

50 Mall Road, Suite 203

Burlington, MA 01803

Contact: David Edgar (781) 221-8400, X 7005

NStar Communications (Carlisle, Acton)

One NStar Way, NE 220

Westwood, MA 02090

Contact: Andrew Balta (781) 441-3492

Fire Alarm

Carlisle Fire Department (Carlisle)

P.O. Box 575

Carlisle, MA 01741

Contact: David Flannery (978) 369-2242

Acton Fire Alarm (Acton)

371 Main Street

Acton, MA 01720

Contact: Ken Ineson (978) 264-9645

Department Of Public Works

Westford Town Engineer

28 North Street

Westford, MA 01886

Contact: Paul Starratt (978) 692-5520

Carlisle Department of Public Works

P.O. Box 149

Carlisle, MA 01741

Contact: Gary Davis (978) 369-6156

Acton Town Engineer

472 Main Street

Acton, MA 01720

Contact: Corey York (978) 264-9628

Other

MCI Metro Access (Westford, Acton)

P.O. Box 600

Charlton, MA 01507

Contact: Stephen Parretti (508) 248-1305

Lighttower (Westford)

80 Central Street

Boxborough, MA 01719

Contact: Evan Spitzer (978) 264-6022

PROJECT UTILITY COORDINATION FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (Document A00808) is the best available information at the time of the bid and has been considered in setting the contract duration. The information is provided for the contractor's use in developing their bids. If the contractor submits a schedule in accordance with Section 8.02 that varies from the one assumed in the Project Utility Coordination Form the contractor must coordinate the proposal with the Engineer and the Utility companies to develop a mutually agreed upon schedule prior to the start of construction.

A time extension will be granted for a utility delay only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form or agreed upon by all parties in the baseline schedule and the delay impacts the critical path.

Inclusion of the Project Utility Coordination information shall not be construed as changing or superseding any other provision of the contract. Utility delays, as provided by Section 5.05, are non-compensable delays. The sole remedy for utility delay is a time extension under Section 8.10.

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.

STRUCTURE DEMOLITION

The contractor will make his own investigation of the structure to be demolished including the materials that are part of, or may be stored in the structure. No increase will be made to the bid price due to the nature of the materials involved in the demolition. All costs for permits, dump fees, taxes, special handling of hazardous materials, etcetera, shall be included in the bid price of the demolition item.

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 the portion of this project in Westford, Massachusetts, the Massachusetts Department of Environmental Protection File Number is 334-1429. For the portion of this project in Acton, Massachusetts, the Massachusetts Department of Environmental Protection File Number is 85-1011.

SAWCUTS

Saw cutting required for the installation of traffic signal equipment and conduit, street lighting conduit, water pipes, drainage pipes and structures will be paid for separately under the respective items and shall not be included for payment under Item 482.3.

Sawcuts shall be made at limits of full depth pavement construction. Payment for this work shall be included under Item 482.3, Sawing Asphalt Pavement.

GENERAL REQUIREMENTS FOR WORK INVOLVING PAINTED STEEL (9/9/2011)

Demolition and work involving painted steel shall conform to the requirement of Section 961 of the Supplemental Specifications dated February 25, 2010.

Work Involving Painted Steel

Hazardous materials shall be removed in the immediate area of any intended welding, heating, saw cutting or burning of steel. Hazardous material removal is required to allow the demolition of structural steel, railings, drainage systems, utility supports, steel lamp posts, etc.

The contractor shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The contractor shall certify in writing to the Engineer the results of all testing, and shall also certify that any lead (Pb) coated steel removed from the project was not reused or buried, but was sent to a scrap metal recycling facility.

GENERAL REQUIREMENTS FOR WORK INVOLVING PAINTED STEEL (Continued)

Implement and maintain programs and procedures, which comply with the requirements of this specification and all applicable standards and regulations. Comply with all applicable regulations even if the regulation is not specifically referenced herein. If a state or local regulation is more restrictive than the regulation of this specification, follow the more restrictive requirements.

This requirement is intended only for the demolition and preparation prior to repair and does not include provisions for recoating of steel.

Environmental

All applicable portions of Sections 961.65 “Worker Protection” and 961.66 “Environmental Protection and Monitoring” shall be followed when performing this work.

During chemical stripping a hand washing facility maybe used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Section 961.68 “Handling of Hazardous Waste and Reporting Release Programs”.

The applicable submittals shall be according to Section 961.69 “Submittals”.

Cleaning/Removal**Cutting or Burning of Steel**

All surfaces to be welded, heated, saw cut or burned shall be cleaned so as to remove all contaminants and/or hazardous materials, which could be discharged to the environment as a function of the subsequent operations.

Lead paint shall be removed in its entirety in an area prescribed by a 6 inch (15 cm) minimum offset from the required work. The paint removal operation may be dry abrasive blasting, wet abrasive blasting or chemical stripping.

Proper level of containment shall be used when performing this work in accordance with Section 961.67 “Containment”. Full containment is not required during chemical stripping operation however; the Contractor shall install proper shielding and/or tarpaulins under the chemical stripping operations in order to catch all debris generated during this procedure. A cleaned area must be inspected and approved before the demolition operations are started.

During cleaning operations the Contractor shall be required to furnish and erect temporary floodlights illuminating the steel surface at a minimum of 30-foot candles. This lighting shall be used in areas where there is insufficient lighting for proper cleaning operations and inspection. The Contractor shall supply electrical power.

The Contractor shall provide support for interim and final inspection of the bridge during cleaning operations. This support shall include the necessary traffic controls and safe access to the work.

GENERAL REQUIREMENTS FOR WORK INVOLVING PAINTED STEEL (Continued)**Mechanical Disassembly of Steel**

All surfaces to be mechanically disassembled by shear cutting or removing bolts or rivets shall not require deleading. When shear cutting or removing bolts or rivets, the Contractor shall not use any method that will cause dust and/or particles to be emitted and/or dispersed into the environment to an extent that would expose the workers above the Action Levels of 30ug/cm³.

For purposes of limiting the lead (Pb) dust, the Contractor will be required to dampen the lead paint work areas.

The contractor shall install a proper shielding and/or tarpaulins under all lead-paint-coated surfaces to be shear cut or bolts or rivets ordered removed in order to catch any loose lead paint chips, dust or particles.

NEW INTRODUCTIONS OF INVASIVE PLANTS INTO OR AROUND THE SITE

(Supplementing Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property)

The Contractor shall ensure that no invasive plant species, as defined and listed as Invasive, Likely Invasive, or Potentially Invasive, by the Massachusetts Invasive Plant Advisory Group <http://www.massnrc.org/MIPAG>, are introduced or spread around the site by construction activities including but not limited to improperly cleaned construction equipment and importation of infected materials such as borrow, compost, nursery stock, seed, or hay bales. Corrective measures, if necessary, shall be made by the Contractor as directed by the Engineer.

The Contractor shall be solely responsible for all costs associated with ensuring that invasive species are not introduced or spread around the site by construction activities and for all corrective measures required for as long as necessary to eliminate the introduced invasive plant species and prevent re-establishment of same.

PROSECUTION OF WORK (Supplementing Subsection 8.03)

Before starting any work under this Contract, the Contractor shall prepare, and submit to the Engineer for approval, a plan (based on the Contract traffic management plans) that indicates the traffic and pedestrian routing proposed by the Contractor during the various stages and time periods of the work and the temporary barricades, signs, drums and other traffic control devices to be employed during each stage and time period of the work to maintain traffic and access to abutting properties.

Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day. Signs having messages that are irrelevant to the proposed traffic conditions during each phase of operations shall be removed or properly covered at the end of each work period. Signs shall be kept clean at all times and legends shall be distinctive and unmarred.

PRESERVATION OF ROADSIDE GROWTH (Supplementing Subsection 8.08)

The Contractor shall take all necessary care when excavating or working in the vicinity of existing trees so that the root systems, trunks, and branches are not damaged. All precautions shall be taken to insure that heavy equipment does not damage any roots, including those that lie below the limits of excavation.

Do not store equipment or stockpile materials within drip line of trees or in areas enclosed by tree protection fencing.

Avoid any direct soil contamination in root zone area by petroleum, petroleum products or solvents, salts or any other pollutant during construction.

All cutting or trimming of trees to be preserved shall be executed by a Massachusetts Certified Arborist. The Contractor shall provide the Engineer with a copy of the certification prior to any work on trees.

Existing plants adjacent to construction may be protected as a group using temporary fencing as specified under Item 102.52, or in the event of construction close to individual trees, using Individual Tree Protection as specified under Item 102.51.

Trees that, in the judgment of the Engineer, have been irreparably damaged by the Contractor shall be replaced in kind and in size, or, with a quantity of 2 inch caliper replacement trees (the quantity of which shall be determined by the Engineer) such that the cumulative caliper of the replacement trees will be up to the equivalent of diameter of the lost tree at breast height. Cost of replacement trees shall be paid by the Contractor.

Cost of removal of destroyed tree, including roots and stump, as well as the cost of replacement trees, shall be paid for by the Contractor.

DIVISION II – TECHNICAL SPECIFICATIONS**ITEM 100.01 SCHEDULE OF OPERATIONS – FIXED PRICE \$100,000 LUMP SUM****8.02 Schedule of Operations - Type 2 (\$10,000,001 - \$50,000,000)****A. General Requirements**

For Definition of Terms, see Subsection 8.02.B.

This Contract requires that a schedule control program be instituted by the Contractor to create a construction schedule that tracks and documents the progress of the Work from Notice to Proceed (NTP) through Final Acceptance.

This program requires the following schedule submittals to be made by the Contractor:

- Preliminary Schedule (first 120 Calendar Days after NTP)
- Contract Progress Schedules
- Short-Term Construction Schedules
- Summary Contract Progress Schedules
- Time Entitlement Analyses
- Recovery Schedules

The Contractor shall use computer software capable of preparing, statusing and revising Critical Path Method (CPM) schedules using precedence diagramming methods as approved by the Engineer.

The software shall be capable of printing activity reports and plotting CPM time-scaled logic diagrams, both of which shall be sortable by structures, facilities, subcontractors, submittals, deliveries, extra work orders and any other critical features of the Contract.

Within seven (7) Calendar Days after NTP, the Contractor shall submit to the Engineer sufficient information demonstrating that the CPM software it proposes to use on the Contract is fully capable of producing the specified schedules and tracking tools. The Engineer shall notify the Contractor in writing within seven (7) Calendar Days after receipt of the Contractor's notification on software (within fourteen (14) Calendar Days after NTP) if there are any objections to the CPM software selected.

The Basis of Payment for this work is shown in Subsection 8.02.F.

B. Definition of Terms

Activity - An element in the Contract Progress Schedule describing a discrete part of the Work and establishing the time required for completing that part of the Work.

Baseline Contract Progress Schedule - The initial version of the Contract Progress Schedule, accepted by the Department, with or without comments, and showing the Contractor's plan for completion of the Work within the Contract Time in effect at the start of the Contract.

Calendar Day - Any day of the year, regardless of whether or not work is performed by the Contractor, which day of the week on which it falls, or whether or not it is a holiday.

Critical Path - Any continuous sequence of activities in the Contract Progress Schedule that controls achievement of a Contract Milestone and/or the Contract Completion Date.

Construction Schedule - The Schedule which shows the Contractor's approach to planning, scheduling, and execution of the Work, referred to herein as the Contract Progress Schedule.

Contract Milestone - A Contract Milestone is a significant and key instant of time with a zero (0) duration that highlights progress made on the project. Contract Milestones are specified in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents.

Contract Progress Meeting - A weekly or every other week schedule meeting to review the progress on the Short-Term Construction Schedule, including, but not limited to, the actual completion percentage, a comparison of actual dates with early dates, and any additional information deemed pertinent for a full and complete discussion of the Short-Term Construction Schedule. See also Subsection 8.02.E.6.

Contract Progress Schedule - The Contract Progress Schedule shows how the Work is to be completed from Notice to Proceed through Final Acceptance. Contract Progress Schedules may be Baseline, Revised, or Stated versions. See also Subsections 8.02.E.3 through 8.02.E.5.

Contract Progress Schedule of Record - The Contract Progress Schedule of Record is the latest Contract Progress Schedule accepted by the Engineer and is the official schedule of the project.

CQE - Contract Quantity Estimate or pay estimate that occurs every two (2) weeks. Also known as the progress payment.

CPM - Critical Path Method is a computerized construction project planning and scheduling process where a construction project schedule's critical path is the longest chain or path of activities leading to project completion.

Delays - Any slippage of the Early Dates in the Contract Progress Schedule which forecast a slippage in the Contract Milestone and/or the Contract Completion Date.

Early Completion Schedule - A CPM schedule showing completion of the Work ahead of the Contract Completion Date specified in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents.

Early and Late Dates - Early start or completion times and late start or completion times for the performance of activities in the Contract Progress Schedule.

Extra Work Order. A Contract Modification adding money and associated necessary time to the Contract. See also Subsection 8.10.B.1.

Final Acceptance - Full and complete satisfaction of the Contract Requirements, consisting of completion and acceptance of all physical work and submission and acceptance of all contractually-required reports and other documentation. See also Subsection 5.11.

Float - Float shall be defined as the amount of time between when an activity can start or finish (Early Start or Early Finish Date) and when an activity must start or finish (Late Start or Finish Date.) Float is further defined as the amount of time any given activity or path of activities may be delayed before it will affect the Contract Time. Float belongs to the project and is a shared commodity between the Department and the Contractor and is not for the exclusive use or benefit of either party. Either party has full use of the float until it is depleted. The float may be claimed by whichever party first demonstrates a need for it, i.e., that any activities on the critical path, where float equals zero, any Contract Milestones and/or the Contract Completion Date have been delayed. The Contractor shall demonstrate this need in a Time Entitlement Analysis meeting the requirements of Subsection 8.02.E.8.

Fragnet - a mini-schedule or sub-network containing a logically-linked group of activities or durations that illustrate a distinct event or period of time in the Contract Progress Schedule. Fragnets are typically used as the schedule portion of a Time Entitlement Analysis (TEA) and are required to be submitted as part of a TEA. See also Subsection 8.02.E.8.

Logic Diagram - A logic diagram is a type of construction project schedule that shows the progression of the work as a network where activities are linked by arrows with the tail of the arrow connected to the predecessor activity and the head of the arrow connected to the successor activity. Logic diagrams may be either time-scaled or non-time-scaled.

NTP - Notice to Proceed. A letter sent to a contractor after Contract Award by the Director of Contracts and Records containing the contractual start and completion dates. The date of this letter is referred to as the NTP Date.

Pay Estimate - See CQE.

Preliminary Schedule - The Preliminary Schedule is a summary-level Contract Progress Schedule that shows how the Contractor plans to perform the Work for the first one hundred and twenty (120) Calendar Days of the Contract on a detailed basis and how it plans to perform the remaining portion of the Work from Notice to Proceed to Final Acceptance on a less-detailed basis. See also Subsection 8.02.D.

Recovery Schedule - A Recovery Schedule is a detailed Revised Contract Progress Schedule that changes the Contract Progress Schedule of Record to show how the Contractor plans to recover from or make up the contract time lost on the project's critical path due to a delay. See also Subsection 8.02.E.9.

Revised Contract Progress Schedule - A Revised Contract Progress Schedule incorporates activities, logic ties, and relationships added to or deleted from the Contract Progress Schedule of Record based on a Time Entitlement Analysis accepted by the Engineer. See also Subsections 8.02.E.4 and 8.02.E.8.

Short-Term Construction Schedule - A Short-Term Construction Schedule details the daily work activities for a thirty-five (35) Calendar Day period, the two (2) weeks prior to the Contract Progress Meeting and the three (3) weeks following the meeting in a bar chart format. The daily activities shall correspond to the Contract Progress Schedule activities, but shall be at a greater level of detail. See also Subsection 8.02.E.6.

Stated Contract Progress Schedule - A Stated Contract Progress Schedule is a monthly update of the Contract Progress Schedule of Record. See also Subsection 8.02.E.5.

Substantial Completion - Substantial Completion occurs when either the Work has been completed except for work having a Contract Price of less than one (1) percent of the adjusted Total Contract Price or substantially all of the Work has been completed and opened to public use, except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work. See also Subsection 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes.

Summary Contract Progress Schedule - A Summary Contract Progress Schedule is a separate and distinct schedule based upon the internal coding of the Contract Progress Schedule. This coding shall allow a summary-level Contract Progress Schedule to be produced that identifies major physical classes, structures, facilities, and/or other elements of the Work as discussed in Subsection 8.02.E.1. See also Subsection 8.02.E.7.

Time Entitlement Analysis (TEA) - A method of schedule delay analysis that shows the impacts of a particular delay by arranging the affected activities in a timeline of when the delay occurred. This allows the effect of a particular event or delay to be determined and illustrated. Fragnets are typically used as the schedule portion of a Time Entitlement Analysis (TEA) and are required to be submitted as part of a TEA. See also Subsection 8.02.E.8.

Work Day - Any day of the week on which work is performed by the Contractor, including Saturdays and Sundays, but excluding holidays observed by the Contractor.

C. Schedule Reviews

The Engineer will respond to each schedule submittal within fifteen (15) Calendar Days of receipt providing comments and disposition that either accepts the schedule or requires revision and resubmittal.

Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

The Engineer's comments will address whether items of the Work have been omitted, if activity durations are reasonable or that the means, methods, timing and/or sequencing of the Work are practicable. The planning, scheduling, and execution of the Work and the accuracy of their

representation in the Contract Progress Schedule shall remain the sole responsibility of the Contractor.

The Contractor shall not be relieved from its responsibility for satisfactorily completing the Work within the specified Contract Time due to its failure to submit an acceptable Contract Progress Schedule.

Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

D. Preliminary Schedule

The Preliminary Schedule shall be submitted to the Engineer within twenty-one (21) Calendar Days after Notice to Proceed.

The Preliminary Schedule shall be a summary-level Contract Progress Schedule that shows the Work being completed in accordance with the Contract Milestones contained in Subsection 8.03 – Prosecution of Work or elsewhere in the Contract Documents. It shall incorporate the Contractor’s detailed work activities for the first one hundred and twenty (120) Calendar Days of the Contract. The portion of the Preliminary Schedule addressing the remainder of the Work shall be in sufficient detail and content, including logic ties and durations, to show the Contractor’s general plan for completion of the Work in accordance with the Contract Milestones.

At a minimum, the Preliminary Schedule, as well as all subsequent schedules described in Subsection 8.02.E, shall clearly define the progression of the Work from Notice to Proceed to Final Acceptance by using separate activities for each of the following items:

- 1) Notice to Proceed
- 2) Each component of the Work
- 3) Procurement of permit modifications by the Contractor or the Engineer
- 4) The preparation and submission of shop drawings and other required submittals, the duration of which shall be determined by the Contractor
- 5) The review and return of shop drawings and other required submittals, the duration of which shall be a minimum of thirty (30) Calendar Days, unless otherwise approved by the Engineer
- 6) Items to be paid, such as, engineering work, permanent materials and equipment (material on hand), such as unfabricated structural steel (raw materials), equipment procurement, and equipment delivery to the site or storage location
- 7) Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting this Contract

- 8) Interim Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
- 9) The critical path, clearly defined and labeled
- 10) Float shall be clearly identified as defined in Subsection 8.02.B
- 11) Substantial Completion per the requirements of Subsection 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes
- 12) Punchlist Completion Period
- 13) Physical Completion per the requirements of Subsection 5.11 - Final Acceptance
- 14) Documentation Completion per the requirements of Subsection 5.11 - Final Acceptance
- 15) Final Acceptance per the requirements of Subsection 5.11 - Final Acceptance

The work activities identified for the first one hundred and twenty (120) Days shall be in sufficient detail to support the pay estimate for that period, including all activities which the Contractor is required to perform or plans to perform and for which the Contractor intends to receive payment as specified in Subsection 9.01 – Measurement of Quantities.

The Preliminary Schedule shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2.

The Preliminary Schedule shall be valid for one hundred and twenty (120) Calendar Days after Notice to Proceed. The Preliminary Schedule will be superseded and replaced by the Baseline Contract Progress Schedule following its acceptance by the Engineer. If the Baseline Contract Progress Schedule not be accepted by the Engineer within one hundred and twenty (120) Calendar Days after Notice to Proceed, the Contractor shall revise the Preliminary Schedule to include the additional work activities that have occurred during the time period that has elapsed after the previous time period of one hundred and twenty (120) Calendar Days after Notice to Proceed, status the schedule as required by Subsection 8.02.E.5 and resubmit it no less than every two (2) weeks until the Baseline Contract Progress Schedule is accepted by the Engineer. This revised, statused Preliminary Schedule shall be called the Statused Preliminary Schedule. For Baseline Contract Progress Schedule requirements, see Subsection 8.02.E.3.

No pay estimate shall be approved by the Engineer until the Preliminary Schedule has been submitted to the Engineer, unless otherwise agreed to by the Engineer.

E. Contract Progress Schedules

1. Requirements for all Contract Progress Schedules

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 through 8.02.E.9 shall fully conform to the following requirements:

- a. **LOGIC:** The Contract Progress Schedule shall divide the Work into activities with appropriate logic ties, to show; (i) the Contractor's overall approach to the planning, scheduling and execution of the Work, (ii) consistency with the requirements of this Subsection, (iii) the Contractor's approach to conformance with any sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.
- b. **ACTIVITIES:** The Contract Progress Schedule shall clearly and separately define the progression of Work from Notice to Proceed to Final Acceptance by using separate activities as described in Subsection 8.02.D.
- c. **EARLY AND LATE DATES:** Early Dates consist of Early Start and Early Finish dates. The Early Start date is the earliest date an activity can start or commence. The Early Finish date is the earliest date an activity can finish or be completed. Late Dates consist of Late Start and Late Finish dates. The Late Start date is the latest date an activity can start without delaying or lengthening the duration of the project. The Late Finish date is the latest date an activity can finish or be completed without delaying or lengthening the duration of the project.
- d. **DURATIONS:** Activity durations shall be in Work Days. Durations shall be regulated by a work breakdown structure (WBS) of physical elements of the Work determined by work discipline, station number, or structure, which reflect the time the Contractor and/or Subcontractors require to perform the related work.
- e. **ITEMS TO BE PAID:** The Contractor shall specifically identify in the Contract Progress Schedule all items of permanent materials and equipment (Materials On Hand) for which the Contractor intends to request payment, in accordance with Subsection 9.04 - Partial Payments, prior to the incorporation of such items into the Work.
- f. **ACTIVITY DESCRIPTIONS:** The Contractor shall use standard activity descriptions in all Contract Progress Schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.
- g. **ACTIVITY IDENTIFICATION NUMBERS:** The Contractor shall use the standard activity identification numbering system specified below for all activities in all Contract Progress Schedules:

```

C# # # # # - # # #
  |       |
  |       |
  |       + - - - - Sequential Numbering Code
  |
  |
+ - - - - Contract Number

```

- **Contract Number -** The first seven (7) characters of the activity identification number shall consist of a “C” for Contract followed by the five (5) digit Department contract number and ended with a dash.

BIDI – Bid Item Number Designation: A seven (7) digit code corresponding exactly, including periods and spaces, to the bid item number with which the activity is associated.

Example:

975.3	Metal Bridge Railing
PCM	Activity added by Proposal or Contract Modification

PROJ – Primary Project Type: A one (1) or two (2) letter code corresponding to the primary project type or type of structure as shown below. Additional codes may be added by the Contractor as approved by the Engineer.

BC	Bridge Modification or Rehabilitation
BN	Bridge New
BR	Bridge Replacement
BP	Bike Path
CB	Catch Basin
D	Demolition
H	Highway Reconstruction (local road or state highway)
HI	Highway Reconstruction (interstate highway)
P	Painting
R	Resurfacing
S	Surfacing
TS	Traffic Signals
TU	Tunnels
U	Utilities
V	Vertical Construction (Chapter 149)

RESP – Organization Responsibility Code: A one (1) to five (5) digit code corresponding to the initials of the organization responsible for performing the work contained in the activity. Examples of this coding are:

MIW	McGrath Iron Works
BCEC	Bay City Electric Company
MBTA	Massachusetts Bay Transportation Authority
CSX	CSX Railroad Corporation
MDOT	Massachusetts Department of Transportation Highway Division

OTHR – Other Field: A seven (7) digit code reserved for the exclusive use of the Engineer as required for coding miscellaneous items such as contract modifications, submittal activities, time and material work, force account work, or other category of work activity that may prove to need such coding during the progress of the Work.

XXX	A description of something other than the above.
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- i. **CALENDARS:** Different calendars may be created and assigned globally, i.e., applying to all activities, or individually to each activity. Calendars define the available hours of

work in each Calendar Day, Holidays and general or project-specific non-Work Days. Examples of non-Work Days include, but are not limited to:

- Winter Shutdown Period: December 1 thru March 15. This may be optional depending on any requirements that may be stated elsewhere in this Contract.
 - Peak traffic hours on heavily traveled roadways
 - Special requirements by sensitive abutters, railroads, utilities and/or other state agencies.
 - Cape Cod Summer Roadway Work Restrictions: While these restrictions may be project-specific based on such factors as the exact location of the project, whether or not the roadway involved has a high traffic volume and/or is a main route, its proximity to beaches and other popular tourist attractions, and its overall impacts on traffic and tourism, they are generally enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer.
 - Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod, project-specific restrictions may be enforced based on the same factors listed above for Cape Cod.
 - Turtle and Fish Migration Periods and/or other in-water work restrictions: Project-specific
 - Working over Waterways Restricted Periods: Project-specific
 - Night-time paving and striping operations temperature restrictions: Project-specific
- j. NOT TO BE USED: Unspecified milestones or constrained dates, scheduled work not required for the accomplishment of a Contract Milestone, use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer, delayed starts of follow-on trades, or use of float suppression techniques contrary to the provisions of Subsection 8.05 – Claim for Delay or Suspension of the Work shall not be used in the Contractor's Progress Schedule.
- k. FLOAT: See Subsection 8.02.B.
- 1. THIS SECTION NOT USED.**
- 2. Contract Progress Schedule Reporting and Submittal Requirements**

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 through 8.02.E.9 shall be prepared and submitted in accordance with the requirements listed below.

Each Contract Progress Schedule submittal shall be uniquely identified.

Contract Progress Schedules shall be prepared using the computerized construction scheduling software described in Subsection 8.02.A and approved by the Engineer.

All Contract Progress Schedule submittals shall include each of the following documents, prepared in two formats; copied to three (3) compact discs (CD) and three (3) copies plotted on paper, for distribution as follows: one (1) copy each for the Boston Construction, District Construction and Resident Engineer's Offices:

a. Narratives

A Narrative is a written description of the schedule that shall:

- (i) itemize and describe the flow of work for all activities on the Critical Path;
- (ii) compare Early and Late Dates for activities on the Critical Path;
- (iii) show progress highlights and quantify Work Days gained or lost versus the Contract Progress Schedule of Record;
- (iv) describe the Contractor's plan, approach, methodologies, and resources to be employed for completing the various operations and elements of the Work;
- (vi) itemize shifts, Holidays, and if multiple calendars are applied to the activities, uniquely identify each calendar.

b. Bar Charts

Time scaled bar charts shall be prepared using a scale that yields readable plots and that meet the requirements of Subsection 8.02.E.1. Activities shall be linked by logic ties and shown on the Early Dates. Critical paths shall be highlighted and Total Float shall be shown for all activities. The paper plots of schedule Bar Charts shall be as follows:

24" X 36"-sized paper shall be used for Baseline Schedules, Revised Contract Progress Schedules and Recovery Schedules;

11" X 17" - sized paper shall be used for all other schedule types and Time Entitlement Analyses. These may be submitted as a .pdf file, if approved by the Engineer.

c. Time scaled Logic Diagrams

Time scaled logic diagrams shall be prepared using a scale that yields readable plots and that meet the requirements of Subsection 8.02.E.1. Activities shall be linked by logic ties and be shown on the Early Dates. Critical paths shall be highlighted and Total Float shall be shown for all activities. Paper plots of time-scaled logic diagrams shall be submitted as stated in Subsection 8.02.E.2.b - Bar Charts

d. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The Detailed Activity Schedule Comparison consists of an updated bar chart that overlays the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. Simple instructions for creating Detailed Activity Schedule Comparisons appear on the MassDOT Highway Division website at: <http://www.massdot.state.ma.us/Highway/>

e. THIS SECTION NOT USED.

f. THIS SECTION NOT USED.

g. THIS SECTION NOT USED.

3. Baseline Contract Progress Schedule

The Baseline Contract Progress Schedule shall be due seventy-five (75) calendar days after Notice to Proceed. The Baseline Contract Progress Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving extra work orders or any other type of alleged delay.

The Baseline Contract Progress Schedule shall include all activities and content contained in the Preliminary Progress Schedule for the first one hundred and twenty (120) Calendar Days after NTP. Variations from the durations, logic, and work plan identified in the Preliminary Progress Schedule shall be limited to correction of errors in logic and/or addition of detail. All changes shall be clearly highlighted and identified and explained and justified in writing as part of the Contract Progress Schedule Narrative required in Subsection 8.02.E.2.a.

The Baseline Contract Progress Schedule shall be prepared and submitted in accordance with Subsections 8.02.E.1 and .2.

Once the Baseline Contract Progress Schedule has been accepted by the Engineer, with or without comments, it will represent the as-planned schedule for the Work. It shall then be known as the Baseline Schedule and shall be the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 8.02.E.4 and .5.

Failure to submit a Baseline Contract Progress Schedule within seventy-five (75) Calendar Days after Notice to Proceed could result in withholding of full or partial payments by the Engineer. Beyond one-hundred and fifteen (115) Calendar Days after Notice to Proceed, no pay estimate will be approved by the Engineer until the Baseline Contract Progress Schedule has been submitted, unless otherwise agreed to by the Engineer.

4. Revised Contract Progress Schedules

Upon review and acceptance by the Engineer of revised activities and/or logic ties contained in Time Entitlement Analyses prepared in accordance with Subsection 8.02.E.8 or Recovery Schedules prepared in accordance with Subsection 8.02.E.9, these changes shall be incorporated into the next Stated Contract Progress Schedule as a Revised Contract Progress Schedule. A Revised Contract Progress Schedule shall be due with the pay estimate immediately following the Engineer's acceptance of the schedule changes.

Revised Contract Progress Schedules shall include a comprehensive listing of all activities added to or deleted from the Contract Progress Schedule of Record as well as a complete listing of all logic and activity relationship changes which have been made. All changes shall be clearly highlighted and identified and explained and justified in writing as part of the Contract Progress Schedule Narrative required in Subsection 8.02.E.2.a.

Revised Contract Progress Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and .2.

Once a Revised Contract Progress Schedule has been returned by the Engineer to the Contractor as "Resubmittal Not Required", it shall become the Revised Contract Progress Schedule of Record, meaning it shall be used for subsequent Stated Contract Progress Schedules.

Except as otherwise designated by a Contract Modification, no Revised Contract Progress Schedule that extends performance beyond the Contract Time and/or any Contract Milestone shall qualify as a Revised Contract Progress Schedule of Record.

5. Stated Contract Progress Schedules

Stated (Updated) Contract Progress Schedules shall be submitted by the Contractor along with the first pay estimate of each month.

A Stated Contract Progress Schedule shall consist of the following:

1. A Schedule Narrative consistent with Subsection 8.02.E.2.a.
2. A Summary Contract Progress Schedule consistent with Subsection 8.02.E.7.

Each Stated Contract Progress Schedule shall reflect updated progress to the status date and shall forecast the finish dates for in progress activities and remaining activities, but shall not change any activity descriptions, durations, or sequences without the acceptance of the Engineer. Updated progress shall be limited to as built sequencing and as built dates for completed and in progress activities. As built data shall include actual start dates, remaining Work Days, and actual finish dates for each activity.

Stated Contract Progress Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and .2 along with the first pay estimate of the month, but no later than fourteen (14) Calendar Days after the pay estimate submittal.

Accepted Stated Contract Progress Schedules shall update and replace the Contract Progress Schedule of Record.

Stated Contract Progress Schedules submitted later than fourteen (14) Calendar Days after the pay estimate submittal will be deemed to be no longer useful and will not qualify for payment. However, failure to submit a Stated Contract Progress Schedule within any monthly period, whether on time or late, could result in the withholding by the Engineer of the remainder of the pay estimate payment due for that time period.

6. Short Term Construction Schedule

The Contractor shall provide a Short Term Construction Schedule that details the daily work activities, including multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall correspond to the Contract Progress Schedule activities, but shall be at a greater level of detail.

The Short- Term Construction Schedule shall be submitted at each Weekly or Bi-Weekly (every two (2) weeks) Contract Progress Meeting, but, regardless of the frequency of progress meetings, shall be submitted no less often than once every two (2) weeks. It shall display all work for a

thirty-five (35) Calendar Day period: completed work for the two (2) week period prior and all planned work for the three (3) week period following the Contract Progress Meeting or the end of the previous two (2) week period.

The Contractor shall be prepared to discuss the Short Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, schedule of work affecting abutters, and corresponding work with affected utilities.

Short Term Construction Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2.

Failure to submit Short Term Construction Schedules at each Contract Progress Meeting could result in withholding of full or partial pay estimate payments by the Engineer.

7. Summary Contract Progress Schedule

The Summary Contract Progress Schedule is not a separate, stand-alone schedule that must be formally submitted by the Contractor, unless requested by the Engineer, but is a schedule that is created using the internal coding of the detailed Contract Progress Schedule. The Contract Progress Schedule shall be coded such that a summary-level Contract schedule may be produced that identifies major physical classes, structures, facilities or other elements of the Work as discussed in Subsection 8.02.E.1. The durations of summary activities shall coincide with the Contract Time and Contract Milestones shown in Subsection 8.03 - Prosecution of Work. The activity descriptions for all summary-level activities shall be subject to the review and acceptance of the Engineer.

8. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) consists of a descriptive narrative, prepared in accordance with Subsection 8.02.E.2.a, and an as-built CPM schedule, in the form of a fragnet, see Subsection 8.02.B - Definition of Terms, that has been developed from the project's Contract Progress Schedule of Record, see Subsections 8.02.E.3-5, and illustrates the impact that additional time, added to the Contract Progress Schedule of Record by a delay or an extra work order, has on the Contract Progress Schedule of Record's critical path, Contract Milestones, and/or Contract Completion Date. TEAs shall be used to determine the schedule impact of extra work orders. A TEA may also be referred to as a Proposal Schedule, a Time Impact Analysis or a Time Impact Evaluation.

TEAs shall incorporate all proposed activities and logic ties required to implement the extra work order or other schedule impacts as well as detailing all impacts on existing activities, logic ties, the critical path, Contract Milestones, and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, and restraints, necessitated by the extra work order, for the completion of the remaining work.

Any TEA prepared for the purpose of requesting a time extension shall clearly indicate any proposed overtime hours or additional shifts that are proposed to be incorporated in the schedule. The Engineer shall have final discretion 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.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 8.02.E.1 and 2 and shall be based on the Contract Progress Schedule of Record for the time the delay starts.

TEAs shall be submitted as part of an extra work order submission, a request for a time extension or within fourteen (14) Calendar Days after a request for a TEA by the Engineer.

When accepted, the changes included in a TEA shall be incorporated into a Revised Contract Progress Schedule per the requirements of Subsection 8.02.E.4 and resubmitted to the Engineer.

Failure to submit a TEA within fourteen (14) Calendar Days of a request from the Engineer could result in withholding of full or partial pay estimate payments by the Engineer.

9. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work.

In addition, a Recovery Schedule shall be required whenever the Critical Path of the Contract Progress Schedule of Record exceeds the greater of:

- a.) A delay of twenty (20) Calendar Days, or
- b.) A delay equal to 5% of the Calendar Days remaining until the Contract Completion Date due to any of the three situations listed below:
 1. If the contractor is behind schedule due to the fault of the contractor.
 2. If the contractor anticipates becoming behind schedule due to the fault of the contractor.
 3. When the delay is not the fault of the Contractor and the Department chooses to recover the lost time and requests a proposal to achieve that.

Recovery Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and .2 within fourteen (14) Calendar Days of any of the cases listed above.

Failure to submit a Recovery Schedule when and as required could result in withholding of full or partial pay estimate payments by the Engineer.

10. Disputes

All schedules shall be submitted, reviewed, dispositioned, and accepted in the timely manner specified in Subsection 8.02.C so as to provide the greatest possible benefit to the execution of this Contract.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer.

Pending resolution of any dispute, the last schedule accepted by the Engineer will remain as the Contract Schedule of Record as described in Subsections 8.02.E.3-5.

F. Basis of Payment

1. All required schedule-related work, including, but not limited to, computer software, schedule preparation and schedule submittals will be paid under Pay Item 100.01 as defined below.
2. Failure to submit schedules within the time periods stated elsewhere in this subsection could result in the withholding of full or partial Contract pay estimate payments by the Engineer.
3. A fixed price of \$100,000 will be provided to the Contractor for the Project Schedule Submittal requirements contained herein. The Contractor is advised that this “fixed price” value is separated from what the Department considers to be the Contractor’s general condition costs for payment purposes only. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor’s general conditions. The fixed price payment item shall be earned as a fixed amount set by the Department at the time of the bid. Each bidder shall include this fixed price bid item value in the total bid value. Failure to do so will be grounds for the rejection of the bid.
4. Twenty percent (20%) of this pay item will be paid upon receipt by the Engineer of the Contractor’s Baseline Schedule, prepared and submitted in accordance with Subsection 8.02.E.3.
5. The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the time remaining until the time that the payment occurring immediately after Substantial Completion has been made. This calculation will be subject to revision should Substantial Completion be delayed beyond the original calculation date.

PAY ITEM

100.01 SCHEDULE OF OPERATIONS - FIXED PRICE \$100,000 LS

ITEM 102.51
ITEM 102.52**INDIVIDUAL TREE PROTECTION**
TEMPORARY TREE PROTECTION FENCE**EACH**
FOOT

The work under these items shall conform to the relevant provisions of Sections 101, 644 and 771 and the following:

The purpose of these items is to prevent damage to branches, stems and root systems of existing individual trees as well as shrubs and other quality vegetation to remain, and to ensure their survival. To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 feet of the canopy of trees or where directed, the Contractor shall take the appropriate protective measures specified herein.

Individual Tree Protection, Item 102.51, shall be used when construction activities are likely to occur within the canopy of individual trees or where there may be any risk of damage to trees.

Temporary Tree Protection Fence, Item 102.52, shall be used to protect areas of existing trees or other areas of quality vegetation that is to remain.

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 necessary for providing tree protection.

Incidental to the cost of these items, the Contractor shall retain the services of a certified arborist, who shall make recommendations as to the specific appropriate treatment of trees within or near the work zone.

Prior to any construction activities, the Contractor and Arborist shall walk the site with the Engineer and Town Tree Warden to identify which trees will require protection and to determine approved measures. The Arborist shall make recommendations as to appropriate methods to protect the trees. The Engineer will have final decision as to trees and methods.

The Contractor is responsible for the protection of all existing trees and plants within and immediately adjacent to the construction area that are not designated to be removed for the length of the construction period.

SUBMITTALS

Incidental to this item, the Contractor shall provide to the Engineer one (1) copy 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.

MATERIALS

Fence and temporary fence posts shall be subject to the approval of the Engineer.

Fencing for individual plants shall be polyethylene fencing or chain link fence (new or used).

Staking for individual tree protection fencing shall be steel posts or 2x4 lumber as directed and approved by the Engineer.

Wood chips shall conform to provisions of Wood Chip Mulch under Materials Section M6.04.3.

Trunk protection shall be 2x4 cladding, at least 8 feet in length, clad together with wire. Alternative materials shall be at the approval of the Engineer. Alternative materials shall provide adequate protection from anticipated construction activities and shall not injure or scar trunk. Trunk protection shall include burlap to separate trunk cladding from bark.

Temporary Tree Protection Fence shall be brightly colored polypropylene barricade or wooden snow fencing for tree protection or safety fencing as shown on the Contract drawings or as directed by the Engineer. Fencing shall be a minimum of 4 feet high and supported by steel or hardwood stakes spaced at a maximum of 8 feet on center or by other means acceptable to the Engineer. Fencing shall be materials and fastenings sufficient to provide sturdy and highly visible separation of the construction activities from the trees and existing plantings to be preserved

Incidental to these items, the Contractor shall provide water for maintaining plants in the construction area that will have exposed root systems for any period during construction.

CONSTRUCTION METHODS

To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 feet of the canopy of trees, the Contractor shall provide Individual Tree Protection as specified herein.

For individual tree protection, the Contractor shall set posts and fencing at the limits of the tree canopy. Where construction activities closer to the trees is unavoidable, the contractor shall tie branches out of the way and place wood chips to a depth of 6 inches on the ground to protect the root systems. The Contractor shall wrap the area of the trunk of the tree with burlap prior to armoring with 2x4 cladding. Cladding for tree trunks shall extend from the base of the tree to at least 8 feet from the base.

To the extent possible, temporary landscaped fencing shall be installed at the limit of tree canopy and shall be staked and maintained vertical for the length of the contract.

Where excavation within canopy is unavoidable, the Contractor shall use equipment and methods that shall minimize damage to the tree roots, per recommendations of the Certified Arborist. Such methods may require root pruning prior to, as well as during, any excavation activities.

All fencing, trunk protection, branch protection, and woodchips shall be maintained throughout the duration of the contract. Protective fencing shall be repaired and woodchip mulch replaced as necessary during the duration of the contract at no additional cost.

Cutting and Pruning

Some pruning of roots and branches may be a necessary part of construction. Pruning will be performed on the same side of the tree that roots have been severed.

The Contractor shall retain the services of a Massachusetts State Certified Arborist to oversee any cutting of limbs, stem or roots of existing trees. All cuts shall be clean and executed with an approved tool. Under no circumstances shall excavation in the tree protection area be made with mechanical equipment that might damage the existing root systems.

Any tree root area exposed by construction shall be covered and watered immediately. Exposed tree roots shall be protected by dampened burlap at all times until they can be covered with soil.

Watering

Water each tree within the construction area where work is in progress twice per week until the surrounding soil of each tree is saturated for the duration of construction activities.

Removal of Protection

After all other construction activities are complete, but prior to final seeding, wood chips, temporary fencing, branch protection, and trunk protection materials shall be removed and disposed off site by the Contractor at no additional cost.

Tree Damage

The Contractor shall be held responsible for the health and survival of the existing trees in the immediate vicinity of the of the construction area. Damage that, in the Engineer's opinion, can be remedied by corrective measures shall be repaired immediately. Broken limbs shall be pruned according to industry standards. Wounds shall not be painted. Trees or shrubs that are damaged irreparably shall, at the Engineer's discretion, be replaced per the requirements of Division I of these Special Provisions. Cost of replacement trees shall be borne by the Contractor.

COMPENSATION

Where the plans show specific, individual trees to remain and where grading or other disturbance is shown within the drip line of these trees or where the Engineer determines that an individual tree must be protected, these trees shall be protected and paid for under Item 102.51 Individual Tree Protection per each tree protected.

Temporary landscape fence will be measured for payment by the foot of fence installed, complete in place.

Payment under these items shall be scheduled throughout the length of contract: 30 percent of value shall be paid upon installation, 30 percent approximately halfway through the contract, and the remainder to be paid at the end of the contract after completion of construction operations that would disturb plants and after the protection materials have been removed and properly disposed of off-site by the Contractor.

Compensation for Individual Tree Protection will be paid for at the contract unit price per each under Item 102.51. This item shall include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

Where construction disturbance, such as grading activities, will occur within the limits of the canopy of groups of trees, these trees shall be protected and paid for under Item 102.52, Temporary Tree Protection Fence.

Temporary Tree Protection Fence will be paid for at the Contract unit price per foot. This item shall include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

Cost of wood chips, as required, shall be incidental to these items.

ITEM 129.5

TRACK EXCAVATION

FOOT

The work under this item shall conform to the relevant provisions of Sections 112 of the Standard Specifications and the following:

DESCRIPTION

The work shall consist of the removal and disposal of the existing railroad track rails, plates and connection hardware as shown on the plans.

The removal and disposal of creosote wood ties shall be in accordance with and paid for under Item 184.1 Disposal of Treated Wood Products.

With the exception of railroad equipment to be removed and reset as shown on the plans, the removal and disposal of all other materials related to the railroad facilities shall be in accordance with and paid for under Item 120.1 Unclassified Excavation.

Disposal of Materials

The steel track rails, plates and connection hardware shall become the property of the Contractor who shall properly dispose of all such materials at a facility licensed to process the material.

Submittals

The Contractor shall submit for review and approval the methods and equipment proposed for removal and disposal of the steel track rails.

COMPENSATION

Track excavation will be measured for payment by the foot along the centerline of the track bed and shall include both rails and all associated hardware.

Track excavation will be paid for at the at the Contract unit bid price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 180.1

HEALTH AND SAFETY PLAN

LUMP SUM

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 Health & Safety Plan (HASP) shall be prepared by a Certified Industrial Hygienist or other experienced individual with the appropriate training required by OSHA to prepare such a plan, and 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 HASP must be stamped by a Certified Industrial Hygienist certifying that it complies with all applicable laws, regulations, standards and guidelines, and that it provides a degree of protection and training appropriate for implementation on the project during the execution of this contract.

The HASP shall be designed to identify, evaluate, and control health and safety hazards associated with the work on this project and provide for emergency response if needed. The HASP 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.

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 shall 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

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 will 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, necessary 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 necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection shall be paid for under Item 180.3.

BASIS OF PAYMENT

Implementation of the Health and Safety Plan will be paid at the contract bid price per hour 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**

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.

BASIS OF PAYMENT

Payment for Item 180.3 will be 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**

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 necessary 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. will 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

Measurement shall be made by the volume, in cubic yards, of contaminated material monitored, handled and/or stockpiled as described under Item 180.4.

BASIS OF PAYMENT

Work under this Item shall 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 180.5**LICENSED SITE PROFESSIONAL****HOUR**

A Licensed Site Professional will be required to provide the services necessary to comply with the requirements of the Massachusetts Contingency Plan (MCP), 310 CMR 40.000, with respect to the scope of work for this Contract. These services will include, but are not limited to, sampling and analysis of potentially contaminated media, preparation of IRA, URAM and RAM Plans, status reports, transmittal forms, release notification forms, completion statements and related documents required pursuant to the MCP. The LSP will be responsible for obtaining all permits related to the characterization, treatment, and disposal of contaminated media. The LSP will provide oversight of handling, stockpiling, re-use, treatment and disposal of contaminated media, including preparation of Bills of Lading, Manifests, and related shipping documents. Environmental technicians, including but not limited to personnel conducting field monitoring and sampling, data interpretation and support services directly related to MCP compliance, are also included in this Item.

The name and qualifications of the Licensed Site Professional (LSP) will be submitted to the Engineer for review and approval at least two weeks prior to initial site activities. The LSP shall have significant experience in the oversight of MCP activities at active construction sites.

The LSP will coordinate all activities with MassDOT and the Massachusetts Department of Environmental Protection through the Engineer or his/her designee.

The LSP will be responsible for adequately characterizing contaminated media to insure that it meets the requirements of the MCP and, in the case of contaminated media to be disposed of off-site, to insure that it meets the acceptance criteria set forth by the disposal facility. The LSP will be responsible for adequately characterizing subsurface conditions prior to backfill in areas where contaminated soil/sediments are excavated. The cost of laboratory analyses conducted in accordance with the sampling and assessment requirements for compliance with the MCP will be paid for within the unit bid price for Item 180.4 – Monitoring/ Handling and Stockpiling of Contaminated Soils, Item 180.6 – Soil Tests, and Item 181.1 – Disposal of Contaminated Soil.

Work under this Item shall be paid at the Contractor bid price per hour of service provided to perform the work as described above. The bid price shall reflect the cost of the LSP and any environmental technicians providing the services described above.

ITEM 180.6

MISCELLANEOUS SOILS TESTING

EACH

The work under this item shall conform to all relevant provisions of the Standard Specifications, the Special Provisions and the following:

The Engineer may, from time to time, direct the Contractor to obtain soil samples from various locations within the project area and to perform laboratory analyses on those soil samples to assess reuse or disposal options.

SAMPLING AND ANALYSIS

The Contractor shall collect discrete soil sample(s) from locations within individual soil piles or specific land area identified by the Engineer. The soil samples shall be collected at a depth specified by the Engineer. The samples shall be delivered to a Massachusetts certified laboratory using proper chain-of-custody documentation for the analysis of Resource Conservation and Recovery Act (RCRA) 8 metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polyaromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (Method 1311) for metals.

DATA EVALUATION AND REPORT

The Contractor shall review and summarize the laboratory data from the soil sampling analyses. The data will be compared to Massachusetts Contingency Plan (MCP) soil standards and acceptance criteria for soil recycling and landfill disposal facilities. A letter report shall be delivered to the Engineer outlining the soil sampling methods, laboratory analyses results and proposed options for reuse or disposal of the soil.

METHOD OF MEASUREMENT

Miscellaneous Soil Testing shall be measured by each round of samples collected, tested and reported to the Engineer. A round of samples shall include a total of three samples.

<u>ITEM 181.11</u>	<u>DISPOSAL OF UNREGULATED SOIL</u>	<u>TON</u>
<u>ITEM 181.12</u>	<u>DISPOSAL OF REGULATED SOIL – IN-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.13</u>	<u>DISPOSAL OF REGULATED SOIL – OUT-OF-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.14</u>	<u>DISPOSAL OF HAZARDOUS WASTE</u>	<u>TON</u>

GENERAL:

THE MASSDOT ASSESSMENT & REMEDIATION PROJECTS UNIT OF THE ENVIRONMENTAL SERVICES SECTION IS WORKING WITH THEIR CONSULTANT TO DO SOME RESEARCH INTO THE BATTERY WELLS AT THIS TIME. ADDITIONAL INFORMATION WILL BE INCLUDED UPON COMPLETION OF THE RESEARCH.

The work under these Items shall include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as “disposal” for the remainder of this specification unless otherwise stated. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying a disposal facility(s) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

CLASSES OF CONTAMINATED SOILS:

The Contractor and its LSP shall determine, in accordance with Items 180.1 through 180.6, if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the Massachusetts Contingency Plan (MCP). Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

Unregulated Soil consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal area for unregulated soils for approval. If such a disposal area is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal area that s/he has been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. **A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.**

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the item of work to which it pertains.

Regulated Soil consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. **Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form.** This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

Hazardous Waste consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). **Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.**

MONITORING/SAMPLING/TESTING REQUIREMENTS:

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Items 180.1 through 180.6,. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

Copies of the fully executed Weight Slips/Bills of Lading/Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three (3) days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three (3) days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT:

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation item, Item 180.4 and this Item.

REGULATORY REQUIREMENTS:

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts Department of Environmental Protection, the U.S. Environmental Protection Agency, Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions are applicable. The Contractor shall reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS:

I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option. The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis programs required under Items 180.4, 180.6, and 181.11 – 181.14. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a baseplan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated,

regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal. At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

A. Excavation and Stockpiling Protocol:

Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material in accordance with Items 180.1 through 180.5.

B. Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.
2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

C. Transportation:

The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

1. Demolition Debris. Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.
2. Soil/Sediment. Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material offsite using the same categories identified for demolition debris above.

BASIS OF PAYMENT AND METHOD OF MEASUREMENT FOR ITEMS 181.11 THROUGH 181.14:

Disposal of contaminated soil shall be measured for payment by the Ton of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used.

- Item 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in Tons (TN), of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.
- Item 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight, in Tons (TN), of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.
- Item 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight, in Tons (TN), of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

Item 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight, in Tons (TN), of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 183.1 TREATMENT OF CONTAMINATED GROUNDWATER GALLON

The Contractor is advised that contaminated groundwater may be encountered during excavations. It is likely that treatment of the contaminated groundwater using liquid phase granular activated carbon will be required to complete the work under this Contract. The Methods described under Item 183.1 provide for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via Methods under Item 183.1.

It is not the intent herein for the Department to design for or specify to the Contractor which particular treatment is to be used, if necessary. Rather, it is the Department's intent to provide guidance to the Contractor for informational and bidding purposes only. It is, therefore, the Contractor's responsibility to use a treatment method which allows him/her to meet any and all laws, regulations, policies, guidelines and permit requirements.

The overall handling and management of contaminated groundwater is regulated by DEP under the provisions of 310 CMR 40.000. The unpermitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of several federal and state laws and regulations.

Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate regulatory jurisdiction prior to initiating any dewatering activity.

There are basically four options available:

1. Pump to a tight tank or "vacuum truck", with subsequent treatment/disposal at an off-site approved facility;
2. Discharge to a sanitary sewer with appropriate permit from local and regional sewerage authorities and DEP;
3. Discharge to a storm drain or surface water body with permit or approval from DEP and/or the US EPA; or
4. Discharge to the ground with the approval from DEP.

Generally, the utilization of options (2) through (4) involves treating the contaminated groundwater prior to discharge. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

For short-term operations, treatment and discharge to a surface water body/storm drain may be the most cost-effective and expedient alternative. In such cases, a short-term exemption from the permitting provisions of the National Pollutant Discharge Elimination System (NPDES) may be approved by the US EPA, via the Regional Office in Lexington, Massachusetts.

The US EPA will not specify a treatment system or method but normally requires that the treated discharge water meets Massachusetts Drinking Water Standards. The discharge standards are normally met by treating the dewatered groundwater through granular activated carbon canisters, or similar techniques.

The Contractor shall be responsible for determining compliance with the requirements of the obtained Permit and for any sampling, testing, and disposal required in connection with said Permit. The Contractor is also advised that additional requirements may be administered by the local sewer authority. The Massachusetts Highway Department and the City reserve the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements.

Longer term discharges to surface waters or storm drains, and any discharge to the ground, require approval and/or issuance of the provisions of 314 CMR 3.00 and 5.00, respectively. In such cases, contact: DEP, Division of Water Pollution Control, One Winter Street, Boston, MA 02108.

For the purpose of these specifications, and to establish a basis for the bid, it is anticipated that liquid-phase granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental and other related costs. Item 183.2 will be used for disposal of used granular-activated carbon canisters.

COMPENSATION

Treatment of contaminated groundwater will be measured for payment by the gallon of contaminated groundwater pumped through granular activated carbon (GAC) canisters or other treatment medium.

Treatment of contaminated groundwater will be paid for at the Contract unit price per gallon, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

Disposal of liquid-phase granular-activated carbon shall be paid for separately under Disposal of Granular Activated Carbon, Item 183.2.

ITEM 183.2 DISPOSAL OF GRANULAR ACTIVATED CARBON POUND

Work under Item 183.2 is based upon the disposal of granular activated carbon used as the treatment medium for contaminated groundwater found during excavations.

COMPENSATION

Disposal of granular activated carbon will be measured for payment by the pound of carbon used.

Disposal of granular activated carbon will be paid for at the Contract unit price per pound, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

All other costs associated with treatment of contaminated groundwater will be covered under Treatment of Contaminated Groundwater, Item 183.1,

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS TON**DESCRIPTION**

This section shall apply to the disposal of all treated wood. The timber rail ties are suspected to be treated with either creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood to a waste-to-energy facility that is licensed to burn treated wood. The Contractor is required to submit manifests and certificates of destruction to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

COMPENSATION

Disposal of treated wood products will be measured for payment by the ton of treated timber removed and subsequently accepted at the waste-to-energy facility.

Disposal of treated wood products will be paid for at the Contract unit price per ton, which price shall include all labor, materials, equipment, and incidental costs required to complete the work. No separate payment will be made for testing, loading, transportation, approvals, and permits, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 185.8 REMOVE POISON GAS COMPARTMENT TANK EACH

THE MASSDOT ASSESSMENT & REMEDIATION PROJECTS UNIT OF THE ENVIRONMENTAL SERVICES SECTION IS WORKING WITH THEIR CONSULTANT TO DO SOME RESEARCH INTO THE BATTERY WELLS AT THIS TIME. ADDITIONAL INFORMATION WILL BE INCLUDED UPON COMPLETION OF THE RESEARCH.

ITEM 252.08

**8 INCH CORRUGATED
PLASTIC (POLYETHYLENE) PIPE**

FOOT

The work under this item shall conform to the relevant provisions of Section 230 of the Standard Specifications.

ITEM 299.

**REMOVE AND RESET CONCORD
WATER DEPARTMENT PIPES**

LUMP SUM

The work under this item shall conform to the relevant provisions of Section 300 of the Standard Specifications and the following:

The work shall consist of relocating an unspecified length of 16” Cast Iron (Suction?) and 6” PVC Drain.

Once the District Utility Coordination Meeting occurs with the District and Concord Water Department, more information will be available to better develop this item prior to the 100% Design Submission.

COMPENSATION

Remove and reset Concord Water Department pipes will be paid for at the Contract lump sum price, which price shall include all labor, materials equipment, and incidental costs required to complete the work.

ITEM 431.1

**HIGH EARLY STRENGTH CEMENT
CONCRETE BASE COURSE**

CUBIC YARD

The work under this item shall conform to the relevant provisions of Section 430 of the Standard Specifications and the following:

The work shall include the furnishing and placing of high early strength cement concrete base course for narrow roadway widening as shown on the plans and as directed by the Engineer.

COMPENSATION

High early strength cement concrete will be measured for payment by the cubic yard, complete in place.

High early strength cement concrete will be paid for at the Contract unit price per cubic yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

<u>ITEM 450.90</u>	<u>CONTRACTOR QUALITY CONTROL</u>	<u>TON</u>
<u>ITEM 451.</u>	<u>HMA FOR PATCHING</u>	<u>TON</u>
<u>ITEM 452.</u>	<u>ASPHALT EMULSION FOR TACK COAT</u>	<u>GALLON</u>
<u>ITEM 453.</u>	<u>HMA JOINT SEALANT</u>	<u>FOOT</u>
<u>ITEM 455.23</u>	<u>SUPERPAVE SURFACE COURSE – 12.5 (SSC-12.5)</u>	<u>TON</u>
<u>ITEM 455.32</u>	<u>SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC-19.0)</u>	<u>TON</u>
<u>ITEM 455.42</u>	<u>SUPERPAVE BASE COURSE – 37.5 (SBC-37.5)</u>	<u>TON</u>

Work under these Items shall conform to the relevant provisions of Document 00717 SUPERPAVE REQUIREMENTS contained herein and the following:

The Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is XX.X Million 18-kip (80-kn) ESALs. The PGAB Grade selected for this Contract is PG XX-XX.

ITEM 470.2 **HOT MIX ASPHALT BERM, TYPE A - MODIFIED** **FOOT**

The work under this item shall conform to the relevant provisions of Section 470 of the Standard Specifications and the following:

CONSTRUCTION

Hot Mix Asphalt Berm, Type A – Modified, shall be constructed by means of an approved extrusion machine in conformance with the dimensions and at the locations shown on the Plans.

COMPENSATION

Hot mix asphalt berm, Type A – Modified will be measured for payment by the foot, complete in place.

Hot mix asphalt berm, Type A – Modified will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

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

The work under this item shall conform to the relevant provisions of Section 120 of the Standard Specifications and the following:

DESCRIPTION

The work shall include the sawcutting of existing asphalt pavement where shown on the plans, and as directed by the Engineer.

CONSTRUCTION

Sawcut equipment shall be approved by the Engineer prior to commencing work.

The existing pavement shall be sawcut through its full depth, or to the elevation of the abutting proposed pavement subgrade, whichever is less, at all joints between existing and proposed pavements, and at all utility trenches through existing pavement to remain, to provide a uniform, vertical surface for the proposed pavement joint with the existing pavement.

Sawcut edges that become broken, ragged or undermined as a result of the Contractor's operations shall be resawn prior to the placement of abutting proposed pavement at no additional cost.

Sawcut surfaces in asphalt pavement shall be sprayed or painted with a uniform thin coat of (RS-1) Asphalt Emulsion immediately before placement of hot mix asphalt material against the surface.

COMPENSATION

Sawing asphalt pavement will be measured for payment by the foot sawcut, complete in place.

Sawing asphalt pavement will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental required to complete the work.

No separate payment shall be made for saw cutting required for the installation of traffic signal equipment and conduit, street lighting equipment and conduit, drainage pipes and structures but all costs in connection therewith shall be included in the Contract unit price bid under Item 482.3.

ITEM 620.2

STEEL W BEAM HIGHWAY GUARD (SINGLE FACED) – RUB RAIL

FOOT

The work under this item shall conform to the relevant provisions of Section 601 of the Standard Specifications and the following:

This work shall install standard W beam highway guardrail and a premium pressure treated timber rail (rub rail) at the back side of the guard rail post, adjacent to the road or traveled way.

CONSTRUCTION

The timber rail shall be 2"x6" (nominal dimensions) premium (No. 1) pressure treated. Timber length shall be such that ends of rail are located on guard rail posts. Connecting hardware shall be galvanized and shall conform to ASTM A 123-78. Bolts shall be approximately ½"x4" with two (2) bolted connections per rail per every guard rail post. Lap posts shall have four (4) bolted connections. Bolt heads shall be countersunk or of a carriage bolt type. Bolt and nut shall be treated to prevent nuts from backing out.

COMPENSATION

Steel beam highway guard (single faced) – rub rail will be measured for payment by the foot, complete in place.

Steel beam highway guard (single faced) – rub rail will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 655.01**TIMBER RAIL FENCE****FOOT**

The work under this item shall include the fabrication and installation of timber rail fence as dimensioned and where shown on the plans, as directed by the Engineer and as follows:

MATERIALS

Materials shall meet the requirements specified in the following Subsection of Division III, Materials and the following:

Gravel Borrow	M1.03.0 – Type b
Wooden Rails and Posts	M9.05.3
Timber Preservatives	M9.05.5

Galvanized connections, bolts, washers and nuts shall conform to ASTM A 123-78.

CONSTRUCTION**Timber Rail Fence Fabrication and Erection**

All posts for timber rail fence shall be machine driven provided that posts are not damaged in the process. If a post cannot be machine driven, it shall be set plumb in mechanically excavated or cored holes and secured in gravel borrow footings according to the plans. Posts shall be spaced as shown on the plans. In setting the posts, precautions shall be taken to ensure proper offset, alignment and leveling to prevent bending or twisting of the rail.

Posts for timber rail fence mounted on wall shall be set plumb in steel sleeves integrally cast into concrete wall and sealed with grout. Posts shall extend securely from the bottom of the sleeve to the required height. Posts shall be spaced as shown on the plans. In setting the posts, precautions shall be taken to ensure proper offset, alignment and leveling to prevent bending or twisting of the rail.

Butt joints shall be used for all rail splices. Two (2) bolts shall be used per each rail/post connection.

All connections, screws, bolts, nuts, and washers shall be galvanized.

All posts and rails shall be ACQ treated. Posts shall have a preservative retention level of 0.60 and rails shall have a minimum preservative retention level of 0.40.

COMPENSATION

Timber rail fence will be measured for payment by the foot complete in place.

Timber rail fence will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for gravel borrow, wooden rail and posts, timber preservatives for post buried ends and all required hardware, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 665.3**REMOVE AND RESET ELECTRIC
GATE AND EQUIPMENT****LUMP SUM**

THIS ITEM IS USED TO REMOVE AND RESET THE ELECTRIC OPERATED GATE, OPERATING MECHANISM AND CONTROL SYSTEM LOCATED AT THE END OF REX LANE IN ACTON. ADDITIONAL INFORMATION WILL BE INCLUDED WITH THE 100% SUBMISSION.

ITEM 665.3**72 INCH STOCKADE FENCE****FOOT**

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following:

Work under this item shall consist of installing prefabricated wooden stockade fence at locations shown on the plans and/or as directed by the Engineer. Fence construction and installation shall conform to the installation procedure shown on the construction details. The work shall include all materials, labor and equipment necessary to complete the construction and erection of the Cedar Stockade Fence.

The Contractor shall be responsible for field measurements and location of wood fencing. Layout drawing(s) indicating post locations and section lengths shall be submitted to the Engineer for review and approval, prior to fabrication.

The Contractor shall submit shop drawings and/or catalog cuts including details illustrating fence height, sizes of posts, rails, sections and all appurtenances for approval, prior to fence fabrication.

MATERIAL

Wood fence posts shall be Number 2 Pine Pressure Treated Lumber, or other approved species. Wood Pickets and rails to be Number 1 Cedar. Wood shall be marked to indicate the wood grade and preservative standard. All hardware shall be stainless steel or galvanized. Posts shall be ACQ treated and have a preservative retention level of 0.40 or an MCA of 0.16 pcf.

Fencing shall be 6 feet in height, selected for strength and decay resistance in its intended use. All wood shall be debarked. Wood members shall be sized for the sufficient strength.

Nail screws shall be high quality grade, of the type commonly used for its intended purpose. Nail screws shall be sized for long-life holding power and to prevent splitting wood members.

Fencing shall be produced by a manufacturer normally producing wood fence products of this type.

CONSTRUCTION

Posts and fence elements shall be set plumb in excavated holes backfilled with gravel unless otherwise directed by the Engineer.

All wood members should be evenly sized within range of approximate limits, uniform and straight. Post tops shall be shaped into blunt curved end. A prefabricated picket/stockade fence system is required. Backing rails shall be shaped to provide flattened surface for picket attachment. Picket tops shall be curved points. Members shall be installed to form a sturdy, stockade-type visual screen.

The lines of the fence shall follow the fence lines as indicated on the drawings. Tops and bottoms shall be installed straight and level, stepped to any grade. All sections shall be plumb and straight.

Posts and pickets shall be installed plumb and parallel to each other. Rails shall be installed perpendicular to posts and evenly spaced.

Fence posts shall be evenly spaced approximately 8 feet on center and buried to a minimum depth of 3'-6", and as necessary to accommodate any changes in grade. Earth shall be properly compacted around posts for firm support. If unsuitable soil conditions occur such as rock, ledge and peat, notify the Engineer for acceptable alternate post setting customary in the trade.

COMPENSATION

72 inch stockade fence will be measured for payment by the foot along the top rail from center to center of end posts, complete in place.

72 inch stockade fence will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment, and incidental costs required to complete the work. No separate payment will be made for line posts, end posts, bracing, gravel borrow for post foundations, concrete footing if required and hardware, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 673.**STEEL PIPE ACCESS GATE****EACH****DESCRIPTION**

Work under this item shall consist of installing steel pipe access gates and locking posts as shown on the plans and where directed by the Engineer.

MATERIALS

Steel pipe for straight sections shall be Schedule 40 circular seamless steel pipe in accordance with ASTM 53 Type F. Steel pipe for all sections formed with bends or curves shall be schedule 40, circular seamless steel pipe in accordance with ASTM A53 Grade B Type E.

All hardware shall conform to ASTM A307 requirements and shall be galvanized per ASTM A153.

All steel to be painted shall be galvanized in accordance with relevant sections of ASTM A123 or ASTM A386 to assure proper bonding of paint to steel surfaces exposed to the weather.

The contractor shall submit shop drawings to the Engineer for approval. After approval by the Engineer, fabrication of the gates may proceed.

All castings shall be true to drawings. They shall have a dense smooth surface, uniform quality of appearance, free from blow holes or runoffs, porous spots, hard spots and shrinkage faults and cracks.

All castings shall be thoroughly and carefully cleared of all sand, scale and fins. They shall be free from marks of core anchors, projections and imperfections.

The Contractor shall furnish all supplemental parts necessary to complete each item whether or not such parts are shown or specified. Fastenings shall be of the same material, color and finish as the metal to which applied unless otherwise indicated.

Paint shall conform to current standards and be subject to the approval of the Engineer. Color is black.

CONSTRUCTION

1. Metal Workmanship: Work shall be executed only by mechanics experienced in the trade.

Welding shall be done by certified welders only. Welding shall be in conformance with AWS codes. The Contractor shall obtain the exact dimensions at the site and will be held responsible for the accurate erection of all parts of this work. The Contractor shall check measurements, compare dimensions and other data with various trades installing adjoining work to assure proper coordination.

Cut, fit and drill as necessary for proper assembly and installation of all work for attaching items of other trades prior to galvanizing. Contractor shall not alter the galvanized fabrication in the field without Engineer's approval.

All joints exposed to the weather shall be formed to exclude water. All connections shall be formed with "fish-mouthed" joints full seam welded, ground smooth and sanded and shall present an appearance of a complete homogeneous metal.

Shop connections shall be welded and field connections bolted unless otherwise indicated. Bolts shall be turned up tight and threads deformed to prevent loosening. Draw up all threaded connections tightly, after buttering the same with pipe joint compound, to exclude water.

2. Metal Fabrication: Shop fabrication shall be welded. Steel shall be well-formed to shape and sized for shape lines or angles. Shearing and punching shall leave clean, true lines and surfaces.

Arc welding procedures shall conform to the current standards of the AWS. All welds shall be ground smooth and flush to a neat finish. Ease all corners. Metal shall not be primed, galvanized, or painted before welding.

Castings shall be sound and free from warp, holes and other defects that impair their strength and appearance. Exposed surfaces shall have a smooth finish with sharp, well-defined lines and arises.

Machine joints, where required, shall be milled to a close fit. Thickness of metal and details of assembly shall give ample strength and stiffness.

3. Hot-Dip Galvanizing: All exterior ferrous metal mentioned under Metal Fabrication and Metal Workmanship above shall be hot-dip galvanized.

Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing and/or shop priming.

Galvanizing shall be in a dry kettle process in accordance with ASTM A 123, ASTM A 153 and ASTM A385, as applicable. Galvanizing shall be done with a nickel enrichment of the galvanizing tank. Galvanizer shall provide notarized certification that the galvanizing process used was done in accordance with these specifications and has the nickel enrichment. It shall state day each piece was galvanized.

Prior to galvanizing, all metal shall be cleaned (pickled) in accordance with SSPC-SP8. Cleaning shall remove all rust, scale, and coating surface must be clean, dry, undamaged and free of all loose rust, dirt, grease, or other contaminants including salt deposits.

Galvanize all ferrous fasteners, clips, sleeves, anchors and accessories in contact with galvanized items.

All galvanized materials shall be marked with a stamp indicating the name of the galvanizer, the ASTM Specification and the weight of the zinc coating in ounces per square foot.

Items to be galvanized shall be galvanized after fabrication. Where size of assembly is too large for complete unit galvanizing, these assemblies shall be galvanized prior to fabrication, in as large sections as practical and then only with the written approval of the Engineer.

Touch-Up and Repair: For damaged and field welded metal-coated surfaces, clean welds, bolted connections and abraded areas. At galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A780. Galvanizing repair paint shall have 65 percent zinc by weight. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A123 or A153 as applicable.

4. Surface Treatment: Metal finishes of the steel pipe gates shall be painted. Color is black.
5. Attachment: Steel pipe gates shall be anchored into the concrete base as shown in the details on the drawings.

Install steel pipe gates level and plumb at locations indicated on the plans in accordance with approved shop drawings. Coordinate sequence of operation in planning footings and installation of surrounding pavement.

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

Protect steel pipe gates from paint spatter, concrete splashes and other construction damage by wrapping in plastic sheeting or heavy kraft paper and taping in place. Do not remove until adjacent work is completed. Repair any damage to painted finish.

COMPENSATION

Steel pipe gate will be measured as one unit each, complete in place.

Steel pipe gate will be paid for at the Contract unit price bid each unit installed, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for hardware, concrete, close and open position gate posts and heavy duty locking chain, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 691.01**LANDSCAPE BOULDER****EACH****DESCRIPTION**

The work shall consist of furnishing and placement of individual boulders to provide physical barriers. Locate and install boulders as shown on the plans and as directed by the Engineer. Boulders shall be placed to prevent all terrain vehicles from gaining access to the trail. Boulders shall be placed with the “best side” up, 4 feet apart. A base 6 inches thick of crushed stone shall be placed under each stone.

MATERIALS

Landscape boulder shall be clean, solid, durable stone boulders that can easily be placed as directed. The boulder shall have an approximate minimum width, length and height of 3 feet and a maximum width, length and height of 5 feet. The ratio between the smallest and largest dimension shall not exceed 1.5. The boulder shall also be as near to round or cubical dimensions as practical and reasonable to be accepted as suitable. No flat or elongated boulders will be accepted. The top of the boulders shall be in reasonable horizontal and vertical alignment to provide a pleasing appearance when used with other boulders in the construction of a barrier. The Contractor shall submit details and photos of the proposed boulders for approval. Crushed stone shall conform to the relevant provisions of Section 402 of the Standard Specification.

CONSTRUCTION

Landscape boulders shall be placed at the location shown on the plans and as directed by the Engineer. Boulders shall be placed to create a smooth and uniform barrier in every direction.

The ground beneath the rock boulder shall be excavated to specified depth to accept crushed stone. Stone shall be graded or shaped to receive the boulder so as to prevent any rocking or movement of the boulder.

COMPENSATION

Landscape boulders will be measured for payment by each boulder placed, complete in place.

Landscape boulders will be paid for at the Contract price each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for transportation, excavation and crushed stone, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 691.1 **LANDSCAPE BOULDER REMOVED AND RESET** **EACH****DESCRIPTION**

The Contractor shall remove existing rock boulders from various locations along the proposed bike path and relocate them to the locations as shown on the plans.

CONSTRUCTION

Landscape boulders shall be placed at the location shown on the plans and as directed by the Engineer. Boulders shall be placed to create a smooth and uniform barrier in every direction.

The ground beneath the rock boulder shall be excavated to a depth of 6 inches except crushed stone. Stone shall be graded or shaped to receive the boulder so as to prevent any rocking or movement of the boulder. Crushed stone shall conform to the relevant provisions of Section 402 of the Standard Specification.

COMPENSATION

Boulders removed and reset will be measured for payment by the each complete and in place.

Boulder removed and reset will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for transportation, excavation and crushed stone, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 698.4 **GEOTEXTILE FABRIC FOR PERMANENT** **SQUARE YARD**
EROSION CONTROL

The work under this item shall conform to the relevant provisions of Section 600 of the Standard Specifications and the following:

The work under this item shall consist of furnishing and installing geotextile fabric below the stone dust shoulders as shown on the plans.

MATERIALS

The geotextile fabric shall conform to Department Material Specification M9.50.0 Type I Geotextile Fabric For Erosion Control.

CONSTRUCTION

Fabric shall be placed in intimate contact with the gravel borrow subbase. Seams shall be overlapped by at least two feet. If the Contractor elects to sew seams instead of overlap, colored thread must be used. The Contractor shall take care not to allow more than two weeks of exposure to direct sunlight. Fabric rolls shall not be dropped more than two feet.

COMPENSATION

Geotextile fabric for permanent erosion control will be measured for payment by the square yard, complete in place. No separate measurement shall be made for overlapping material.

Geotextile fabric for permanent erosion control will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

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

ITEM 699.

FILTER STRIP

SQUARE YARD

The work under this item shall conform to the relevant provisions of Section 765 of the Standard Specifications and the following:

DESCRIPTION

The work shall include the construction of the Filter Strips where shown on the plans or as directed by the Engineer.

MATERIALS

2 inches of stable and mature compost shall be provided for the entire Filter Strip Treatment Area to amend the topsoil unless the soil already has an organic content of 5% or greater. The compost must be tilled into the underlying native soil to a depth of 4 inches to prevent washing out the compost and avoid creating a defined layer of different soil types that could prevent downward percolation of water.

Compost shall be as specified in the Materials Section of the Standard Specification.

Compost shall not contain any sawdust, straw, green or under-composted organic matter, or toxic or otherwise harmful materials. Compost should not contain unsterilized manure.

Soil with a clay content which has more than 10% passing the no. 200 sieve shall be avoided.

The permanent erosion control grass seed mix shall be as follows unless a Horticultural or Erosion-Control Specialist recommends a different mix:

- 20% Big Bluestem
- 15% Creeping Fescue
- 10% Little Bluestem
- 10% Canada Wild Rye
- 10% Virginia Wild Rye
- 7% Switch Grass
- 7% Partridge Pea
- 7% Showy Tick Trefoil

7% Fringed Brome Grass
7% Deer Tongue

The seed mix shall be applied by hand broadcasting at a rate of 1 LB/1000 SF.

The seed shall be Pure Live Seed.

The season for seeding work shall be from April 1 to June 1 and from August 15 to October 15 with the following qualifications. The actual turf construction work shall be done only during periods within the season which are normal for such work as determined by weather conditions and by accepted practice in this locality and as accepted by the Engineer.

Level Spreader shall meet the requirements specified in the following Subsection of Division III, Materials:

Crushed Stone M2.01.1

CONSTRUCTION

All trees, stumps, brush, rocks and similar materials that could interfere with installation should be removed and disposed of in a manner that is consistent with standards for maintaining and improving the quality of the environment and with proper functioning of the filter strip.

The filter strip shall be shaped to the grade and dimensions shown in the plans or as directed by the Engineer. If necessary, topsoil shall be stockpiled and spread to the required grade and thickness.

Excess spoil shall be disposed of in areas where it does not interfere with the required flow characteristics of the filter strip.

All areas disturbed during construction shall be vegetated.

Broadcast Seeding: Seed may be broadcast by using a cyclone or whirlwind seeder, or by hand. If spread by hand, small or light-seeded species such as bluestem may be mixed with filler (e.g., sawdust, kitty litter, or clean washed sand) to achieve an even distribution. Seed shall be applied in two directions, each perpendicular to one another. One half the seeding rate shall be applied in each direction. Seed shall be incorporated 3mm to 6mm deep by raking or dragging, cultipacking, or tracking with heavy machinery. Raked areas shall be rolled with a weighted roller to provide good seed to soil contact. Do not roll or track the seed if the soil is wet.

Upon completion of broadcast seeding and packing, or within 24 hours, straw mulch shall be hand broadcast uniformly over the entire planting area. Straw mulch shall be free of weed seeds and shall be applied at a uniform rate of 1700 Kgs/Hectare. Straw mulch shall be incidental to seeding.

To aid in the establishment of vegetation, surface water runoff shall be prevented from entering the filter strip through the use of temporary diversions until after vegetation is established to a minimum height of 4 inches and 90 percent ground cover.

A satisfactory stand of turf, as determined by the Engineer, shall be required to be acceptable. Seeded areas shall have a close stand of grass with no bare spots greater than 3 inches in diameter. At least 90 percent of the grass established shall be permanent grass species. At the time of acceptance, the Contractor shall remove temporary barriers used to protect turf areas. Absolutely no debris may be left on the site.

COMPENSATION

Filter strip will be measured for payment by the square foot complete in place.

Filter strip will be paid for at the Contract unit price per square foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 701.2 CEMENT CONCRETE WHEELCHAIR RAMP SQUARE YARD

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

DESCRIPTION

The depth of the cement concrete wheelchair ramp shall be 4 inches in thickness.

Detectible warning panels shall be installed as shown on the Plans and as detailed in the Construction Standard Details E 107.2.0R through E 107.6.9R. The tile shall conform to the Americans with Disabilities Act (ADA) requirements. Detectable Warning Panels shall be incidental to the item. Surface mounted detectable warning panels such as thermoplastic and/or 'mats' shall not be accepted.

COMPENSATION

Cement concrete wheelchair ramp will be measured for payment by the square yard, complete in place.

Cement concrete wheelchair ramp will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 701.3 **STAMPED CEMENT CONCRETE ISLAND** **SQUARE YARD**

The work under this item shall conform to the relevant provisions of Section 476 of the Standard Specifications and the following:

DESCRIPTION

Stamped cement concrete median shall consist of red colored stamped cement concrete within the splitter islands as shown on the plans. The cement concrete shall be 4 inches in thickness. A stamped brick pattern shall be utilized.

The cement concrete shall be an integrally colored cast in place concrete of a color Chromix admixture formulated by L. M. Scofield (201-672-9050), Davis Colors (800-638-4444), Butterfield Color (1-800-282-3388) or approved equivalent. The color shall be a red brick color and shall be approved by the Engineer.

Submit for review the complete technical data sheets for the colored admixture and the curing compound, the design mixes, color sample and stamped brick pattern.

The installer shall have a minimum of 5 years of experience installing colorized cast in place concrete in similar applications.

Notify the manufactures authorized representative at least 1 week prior to start of work.

Integrally colored concrete mockups shall be installed in place. The mockup shall be a minimum of 5 square yards. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic yard increments. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, stamped brick pattern and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the remaining work. Accepted mockup provides visual standard for work. Mockup shall remain through completion of work for use as a quality standard for finished work.

Concrete materials and design shall be per manufactures recommendations. Admixture shall be added per manufactures recommendations.

Concrete mockup shall be allowed to cure for one month prior to review for color acceptance. Construct as many mockups as required by the Engineer until satisfactory colors and patterns are provided. The mockup will not be part of the finished work.

COMPENSATION

Stamped cement concrete median will be measured for payment by the square yard, complete in place and accepted.

Stamped cement concrete median will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

<u>ITEM 702.</u>	<u>HOT MIX ASPHALT WALK SURFACE</u>	<u>TON</u>
<u>ITEM 703.</u>	<u>HOT MIX ASPHALT DRIVEWAY</u>	<u>TON</u>

Work under these Items shall conform to the relevant provisions of Document 00717 SUPERPAVE REQUIREMENTS contained herein.

<u>ITEM 704.2</u>	<u>STONE DUST</u>	<u>TON</u>
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The work under this item shall conform to the relevant provisions of Section 150 and 701 of the Standard Specifications and the following.

The work shall include the furnishing and placing of stone dust for use on shoulders as shown on the Drawings and as directed by the Engineer. Weed barrier fabric shall be installed between the subbase and the stone dust.

SUBMITTALS

Prior to construction, the Contractor shall submit a sample of the stone dust and weed barrier fabric for approval by the Engineer.

During construction, the Contractor shall construct a test installation of a 50 foot length of the stone dust on both sides (100 feet total length) of a portion of the constructed trail to ensure the appropriateness of the stone dust material. The test installation shall be installed as per the plans and specifications. The test installation shall remain for approximately 30 days (a longer duration may be necessary so that a substantial rain event may be experienced) to ensure its ability to handle the potential for wash out. Once the test installation has been approved by the Engineer, the material shall be installed for the remainder of the project as called for in the contract documents. Should the test installation not provide suitable results, the gradation shall be refined as per the Engineer's direction. The test installation process shall be repeated until the proper gradation is achieved and approved by the Engineer.

MATERIALS

Stone dust shall consist of clean, inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials.

Stone dust must meet or exceed the following gradation:

100% passing 3/8"
90-100% passing #4
80-100% passing #8
50-80% passing #16
25-60% passing #30
10-30% passing #50
2-10% passing #100
0-3% passing #200
FM = 2.6-2.9

Color shall be dark gray.

Weed barrier fabric shall be a free draining geotextile commonly used to prevent vegetation growth that can be placed between layers of soil.

CONSTRUCTION

Place, grade and compact at the lines and grades as shown on the plans and as directed by the Engineer. The stone dust shall be spread and compacted to yield a compacted depth of 4 inches and shall be compacted to the satisfaction of the Engineer using either power rollers or tamping rollers or other devices approved for use by the Engineer.

COMPENSATION

Stone dust will be measured by the ton, complete in place.

Stone dust will be paid for at the Contract unit price per ton, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for weed barrier fabric, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 706.38

GRANITE PIER

EACH

THIS ITEM IS USED TO PROVIDE AND BUILD GRANITE PIERS AND GRANITE PAVERS AT THE LOCATIONS AS SHOWN ON THE PLANS. FURTHER COORDINATION IS REQUIRED WITH LOCAL OFFICIALS. ADDITIONAL INFORMATION WILL BE INCLUDED WITH THE 100% SUBMISSION.

ITEM 707.1

PARK BENCH

EACH

GENERAL

The work under this section will be to furnish and install benches as specified below and on the Plans.

Reference Standards

ASTM - American Society for Testing and Materials

Quality Assurance

1. Source: For each type of product required for the work of this Section, provide products of one manufacturer and source for consistency.
2. Codes and Standards: Perform site furnishings work in compliance with applicable requirements of governing authorities having jurisdiction. Workmanship and finish shall be equal to the best practice of modern shops for each item of work.
3. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

4. The work of this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades which adjoin materials of this Section before installing items specified.
5. Protect site furnishings from paint spatter, splashed concrete, and other construction damage by wrapping and taping in place plastic sheeting or heavy kraft paper until adjacent work is completed. Repair any damage to finish in a manner consistent with manufacturer's recommendations.

Submittals

1. Shop Drawings: Supply shop drawings at an approved scale for location, installation and erection of each site furnishing item under this Section.
2. Product Data: Provide manufacturer's product data showing installation and limitations in use of each site furnishing item. Supply Certificates of Compliance for all materials required for fabrication and installation.
3. Material Selection and Samples: Submit samples showing the complete range of colors, textures and finishes available for all components required for construction.

MATERIALS

Model number and manufacturer shall be Bench #ES400 with #ES401, manufactured by Wabash Valley Manufacturing, ph: 1-800-253-8619, slats style, black color, surface mounted with center arm rest, or approved equal manufactured by one of the following:

1. DuMor Inc. ph: 717-436-2106
2. Victor Stanley, Inc. 1-800-368-2573

CONSTRUCTION

General

1. Site furnishings shall be erected as indicated on the Drawings, plumb, level, snug, and free from rocking. Make necessary shimming and final adjustments.
 - A. Shims shall be stainless steel sized so that they do not protrude beyond the base of the item so as to be visible in completed installation
2. Exposed metal surfaces shall be finished in accordance with Section M7, Paints and Protective Coatings, except as noted otherwise.
3. Foundations shall be as shown on the drawings or as recommended by the manufacturer. Anchor bolts shall be cored into the foundations and an approved outdoor epoxy used to set anchor bolts into foundations.

Benches

- A. Benches shall be located as indicated on the Drawings.
- B. Bench shall be surface mounted to pavement in accordance with manufacturer's recommendations.

COMPENSATION

Park bench will be measured for payment by the each unit installed, complete in place.

Park bench will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for foundations, anchor bolts and epoxy, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 707.81**REMOVABLE BOLLARD****EACH****DESCRIPTION**

Work under this item shall consist of installing removable bollards as shown on the plans and where directed by the Engineer.

MATERIALS

Steel: bollards shall be schedule 80 steel pipe size as indicated on the drawings. Steel shall conform to ASTM A36 and shall be galvanized in accordance with relevant sections of ASTM A123 or ASTM A386 to assure proper bonding of paint to steel surfaces exposed to the weather.

Cast Iron Cap: shall conform to and meet all current requirements of the American Standards Association and the American Society for Testing Materials of 48-class 25 for gray cast iron. Cap shall be of one piece construction and shall be true to the drawings and sample furnished. The shaft of the cap shall be equipped with three (3) Hex Socket Set screws spaced 120 degrees apart securely fastening the cap to the post. The cap shall be tack welded after approval by the engineer for orientation and alignment to prevent removal.

The contractor shall submit one painted bollard complete with cast iron cap to the Engineer for approval. After approval by the Engineer, fabrication of the pavement bollards on the site may proceed but must match the sample in quality and materials.

All castings shall be true to drawings and the sample furnished. They shall have a dense smooth surface, uniform quality of appearance, free from blow holes or runoffs, porous spots, hard spots and shrinkage faults and cracks.

All castings shall be thoroughly and carefully cleared of all sand, scale and fins. They shall be free from marks of core anchors, projections and imperfections.

The contractor shall submit shop drawings to the Engineer for approval. After approval by the Engineer, fabrication of the bollards may proceed.

Paint shall conform to current standards and be subject to the approval of the Engineer. Color is black.

CONSTRUCTION

1. **Metal Workmanship:** Work shall be executed only by mechanics experienced in the trade. Welding shall be done by certified welders only. The Contractor shall obtain the exact dimensions and will be held responsible for the accurate erection of all parts of this work. Cut, fit and drill as necessary for proper assembly and installation of all work for attaching items of other trades.

All joints exposed to the weather shall be formed to exclude water. All welds wherever visible shall be ground smooth, filed and shall present an appearance of a complete homogeneous metal.

2. **Metal Fabrication:** Shop fabrication shall be welded. Steel shall be well-formed to shape and sized for shape lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Casting shall be sound and free from warp, holes and other defects that impair their strength and appearance. Exposed surfaces shall have a smooth finish with sharp, well-defined lines and arises. Machine joints, where required, shall be milled to a close fit. Thickness of metal and details of assembly shall give ample strength and stiffness.
3. **Hot-Dip Galvanizing:** All exterior ferrous metal mentioned under Metal Fabrication and Metal Workmanship above shall be hot-dip galvanized.
4. **Surface Treatment:** Metal finishes shall be painted. Color is black.
5. **Attachment:** Bollards shall be anchored into the concrete base as shown in the details on the drawings.

Install bollards, level and plumb at locations indicated on the plans in accordance with approved shop drawings. Coordinate sequence of operation in planning footings and installation of surrounding pavement.

Protect bollards from paint spatter, concrete splashes and other construction damage by wrapping in plastic sheeting or heavy kraft paper and taping in place. Do not remove until adjacent work is completed. Repair any damage to painted finish.

COMPENSATION

Removable bollard will be measured for payment by the each, complete in place.

Removable Bollard will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for hardware, cap, concrete and gravel base, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 707.9**BIKE RACK****EACH****DESCRIPTION**

Work under this item shall conform to the relevant provisions of Sections 700 and 901 of the Standard Special Specifications and the following.

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
AASHTO	American Association of State Highway and Transportation Officials
SPIB	Southern Pine Inspection Bureau
AWPA	American Wood Preservatives Associations
AWS	American Welding Society
SSPC	Steel Structures Painting Council
NBGQA	National Building Granite Quarries Association, Inc. "Specifications for Architectural Granite"

Submittals

Contractor shall submit all shop drawings, manufacturers' product data, and samples in accordance with Division I. Shop drawings will be returned to the Contractor for resubmission if required information is incomplete. Verify all dimensions in the field before shop drawings are submitted.

Shop Drawings and Manufacturer's Specifications: Contractor shall submit shop drawings of every item listed in this Section. 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 for all items required. Coordinate trades as required.

Certificate of Compliance: Submit manufacturer's certification that Bike Racks have been constructed 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.

Submit manufacturer's products and material descriptions and/or installation instructions for the following items:

1. Bike Rack

Galvanizing and Painting Certification

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

Submittals to Department at Acceptance

Deliver Bike Racks in packaging that provides protection during transit and job storage. Provide additional protection to prevent damage to the finish of the Bike Racks.

Upon delivery, inspect Bike Racks for damage. Minor damage may be repaired provided that refinished items are equal in all respects to new Work and acceptable to the Engineer; otherwise, remove and replace damaged items.

Store Bike Racks on site under cover. Place units on minimum 4-inch wood blocking. Avoid use of protective materials that trap heat and moisture. If protective covering on any Bike Rack becomes loose or wet, remove immediately, dry, replace, and resecure cover until installation. Secure all items from damage for any reason, including vandalism, and theft.

Quality Assurance, Warranties, Guarantees, and Replacement

Contractors shall provide materials from the same manufacturer for site items consistent throughout the project and shall install according to manufacturer's instructions for the specific condition as shown in the Drawings.

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.

MATERIALS

General

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

All items shall be packaged and wrapped appropriately for delivery and storage, completely covered and protected from damage.

Items shall be stored high and dry and covered and protected from the elements until ready for installation.

Deliver items with original manufacturer's name labels, instructions, and warranties.

Contractor shall be required to replace items that are damaged during delivery, storage and installation.

Supply all equipment hardware and necessary 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.

Concrete for footings for Bike Racks, as indicated on the Drawings, shall be steel reinforced Portland Cement Concrete – 3,500 PSI. Refer to the Drawings for concrete reinforcing and to that Section for submittal, testing, and design requirements.

For galvanized, painted, and/or coated steel finishes: Refer to the Item for requirements.

Bike Rack

Bike rack shall meet the visual illustrations shown on the drawings, and be manufactured as follows, or equal:

1. Model “CLR-9-SF (IG)” Classic Bike Rack, as manufactured by Madrax division of Trilary, Inc., 1080 Uniek Drive, Waunakee, WI 53597, Phone: 1-800-448-1080.
2. Model “AT-108” as manufactured by Keystone Ridge Designs, 670 Mercer Road, Butler, PA 16001, Phone: 1-800-284-8208.
3. Model “VSB-8” as manufactured by Huntco Supply, Portland, Oregon, Phone: 1-800-547-5909

Color shall be black.

CONSTRUCTION METHODS

General

All items located on the Drawings shall be fabricated and installed by the Contractor as detailed on the Drawings, as per manufacturers’ written installation procedures and as directed by the Engineer. All fabrication and installation Work shall be accomplished using the highest standards of Workmanship and shall include all excavation, concrete for footings, labor, transportation, storage, and incidentals to make the Work complete.

Project Conditions

Installation of items shall follow Manufacturer's guidelines for project conditions during installation.

Contractor shall schedule delivery of items and all necessary equipment and hardware so as to arrive at the site in a timely manner to comply with construction schedule and minimize on-site storage times. The Contractor shall be ready to discuss the purchasing of Bike Racks at the beginning of the Contract so suitable arrangements can be made to meet the date of completion. Items delivered to the site prior to scheduled installation time shall be stored in a secured staging area with all small components retained separately by the Contractor. Protect all items from weather, careless handling, and construction in the vicinity, vandals or pilferers.

Stake locations of all items in the field for approval by the Engineer before commencing any excavation or footing installations.

Contractor shall install all furnishings and Site Improvements level and with plumb vertical alignment, and as otherwise indicated on the Drawings. All fasteners shall be as specified by the manufacturer and/or as shown on the Drawings and specified herein. Fasteners shall be of correct and appropriate size, vandal resistant, tight, and secure, and shall be trimmed to appropriate lengths so as not to protrude beyond nut and be a safety hazard and shall match color of adjacent metal.

Any incidence of damage, vandalism, or theft of any item during installation shall be reported immediately to the Engineer, remedial action shall be decided, and repairs made to the satisfaction of the Engineer. The Contractor is required to secure all items of the Work from access by the Public until Final Acceptance.

Verify all field conditions before submitting shop drawings.

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

Excavation

After approval of all shop drawings, execute all excavations according to Section 120, EXCAVATION and Section 140, EXCAVATION FOR STRUCTURES before proceeding within work area so as to avoid disruption of existing materials to remain or newly installed items. Any items damaged by excavation which are to remain or are newly installed shall be replaced or repaired to existing conditions by the Contractor at no cost to the Department.

Concrete Footings and Structures

Placement of gravel borrow or backfill, when indicated on the Drawings, shall be as specified in Section 400 of the Standard Specifications and the Drawings.

Installation of all concrete footings and bases, form Work, reinforcing, curing, testing and protection shall be as specified in Section 901 CEMENT CONCRETE MASONRY and as shown on the Drawings. Dimensions, grades, and imbedded hardware shall be as indicated on the Drawings and specified herein. Secure and brace all imbedded hardware and objects in concrete in a true and vertical position until cured.

Contractor shall finish all concrete surfaces which will remain at finished grade by troweling all surfaces smoothly to drain away from installed item, tooling all edges neatly with rolled edges and corners and protecting surfaces from the sun, wind and vandalism until cured. Wrap and protect all imbedded anchor bolts.

Bike Rack Installation

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

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

Bike Racks shall be securely installed to a 1/32 inch tolerance overall and shall be installed 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.

Protect all stored and installed Site Improvements 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.

COMPENSATION

Bike rack will be measured for payment by each, installed, complete in place.

Bike rack will be paid for at the Contract unit price each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 714.2

MILE MARKER REMOVED AND RESET

EACH

The work shall include removing and resetting existing concrete and granite posts and slabs use as mile markers as shown on the plans.

Wood blocking shall be used for protection when moving the mile marker. The marker shall be fully supported. The direction of text and burial depth shall be noted. One side of the mile marker shall be excavated to the base of the marker to determine if it was set in a foundation. The marker shall be excavated, stored in a secure location and reset at the location shown on the plans. The marker shall be placed plumb and in the same orientation, to the depth noted during excavation.

COMPENSATION

Mile marker removed and reset will be measured for payment by the each, complete in place.

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

ITEM 714.3 **RAILROAD SIGNAL POLE REMOVED AND RESET** **EACH**

The work shall include removing and resetting existing signal poles located along the existing railroad right of way.

The poles shall be carefully removed. Any cross arm and bracing that exists on the poles shall be retained and removed with the pole. If necessary, new mounting hardware shall be provided to connect the cross arm to the pole. Any existing signal cabling shall be removed and disposed. The burial depth shall be noted. The pole shall be excavated, stored in a secure location and reset at the location shown on the plans. The pole shall be reset to the depth noted during removal. If the existing depth is too shallow to support the pole height, the pole shall be set to a depth consistent with current practice.

COMPENSATION

Train signal pole removed and reset will be measured for payment by the each, complete in place.

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

ITEM 719. **TRACK SWITCH REMOVED AND RESET** **EACH**

The work shall include removing and resetting existing manual track switches located along the existing railroad right of way.

The connecting rod shall be disassembled and the switch removed from the railroad ties. The existing connecting rod and other switch components connected to the rails, the ties and rails shall be removed and disposed of under other items in the Contract.

The track switch shall be stored in a secure location and reset at the location shown on the plans. New mounting hardware may be required. The switch shall be mounted to two railroad ties, approximately six feet in length. The switch shall be mounted two feet from one end. The ties shall be buried such that only two inches remain exposed at the switch. The tracks shall be completely embedded in the slope on the side of the paved bikeway.

COMPENSATION

Track switch removed and reset will be measured for payment by the each, complete in place.

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

ITEM 719.1 **SIGNAL CABINET REMOVED AND RESET** **EACH**

The work shall include removing and resetting existitng signal cabinets located along the existng railroad right of way.

There are several signal cabinets of different configuration, located adjacent to each other and individually. All equipment within the cabinet shall be removed and disposed of. All penetrations shall be sealed watertight. Cabinet orientation shall be noted prior to removal. The cabinet shall be removed, stored in a secure location and reset at the location shown on the plans.

COMPENSATION

Signal cabinet removed and reset will be measured for payment by the each, complete in place.

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

ITEM 740. **ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A)** **MONTH**

The work under this item shall conform to the relevant provisions of Section 740 of the Standard Specifications and the following:

Two computer systems and a digital camera meeting the requirements set forth below including installation, maintenance, power, paper, disks and other supplies shall be provided at the Resident Engineer's Office:

The Computer Systems shall meet the following minimum criteria or better:

- Case: Small form factor
- RAM: 4 GB
- Hard disk: 500GB, 7200RPM
- Monitor: 24" LCD with Built-in speakers
- DVD-RW/CD-RW: Combo drive including DVD ± RW
- Network Adapter: 10/100 Mbit/s
- USB Ports: 6 high-speed USB ports
- Mouse: Optical mouse with scroll, mouse pad included
- OS: Windows with all security updates
- Web Browser: Internet Explorer with all security updates
- Applications: Latest MS Office Professional with all security updates
Latest Adobe Acrobat Professional with all security updates

Antivirus software with all current security updates maintained through the life of the contract.

Internet access: High speed internet access.

Flash drives: 2 - 8 GB USB

Multifunction Printer: Color laser printer, fax, scanner, and copier – all with 600 x 600 dpi capability.

A Digital Camera shall meet the following minimum criteria or better:

Resolution: 10 Megapixel
 Optical Zoom: 10X
 Memory: 8 GB SD card
 USB Port: USB 2.0 with PC cable
 Screen: 2-inch LCD with scratch-resistance and anti-reflectance
 Battery Power: 2 sets of rechargeable batteries with battery charger
 Carrying Case: Rain-proof with shoulder strap
 Video Capability with sound

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

Disks, flash drives, and card readers with cards shall become the property of the Department.

Twelve three ring binders, one inch thick with clear covers and side pockets shall be provided for the Engineer as incidental to the project and will become the property of the Massachusetts Department of Transportation - Highway Division.

Compensation for this work will be made at the contract unit price per month which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer.

ITEM 755. WETLAND REPLICATION AREA SQUARE YARD

The work to be done under this item includes excavating, fine grading, and installing soil amendments and wetland plants where shown on plans and as directed by the Engineer. The vegetated replication shall be completed in accordance with the Massachusetts Department of Environmental Protection's March 2002 *Massachusetts Inland Wetland Replication Guidelines* and any other requirements of the Final Order of Conditions, other applicable state or federal permit and the Engineer.

Contractor shall be responsible to retain an Environmental Scientist (e.g., Botanist, Biologist, Wetland Scientist, or other individual with similar qualifications) and a minimum of two years experience in similar wetlands replacements. The Environmental Scientist shall perform survey of work areas and materials to be re-handled and spread.

The success of a replication area is dependent on the existence of an appropriate site as determined by the evaluation of site characteristics and other pertinent data.

The Contractor shall be responsible to completely restoring any vegetated wetlands temporarily impacted during construction. Any restored areas shall comply with this specification in its entirety including the Monitoring, Replacement and Maintenance Plan. Any clearing and grubbing within wetland limits shall be limited to the removal of debris only.

CONSTRUCTION

General

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill, or other foreign materials that are washed or otherwise carried into the wetland resource areas.

Erosion and Sedimentation Control

A single row of staked haybales or equivalent in accordance with that specified in the Final Order of Conditions shall be installed along the border of the existing wetland and the limit of wetland fill as shown on the plans. Haybales shall be tightly butted to the adjacent bales, and staked with two 1-inch x 1-inch x 3-foot stakes spaced evenly in the bale and driven solidly into the underlying material. This shall serve as the limit of work line. Following planting, a second line of staked hay bales shall be placed at the upper limit of the wetland replacement area, as shown on the plans. These will serve to protect the replacement area from sedimentation and from foreign materials that could potentially enter the area.

Replacement Area Preparation

This wetland replacement shall be performed under the direction and guidance of a qualified Environmental Scientist and as specified in these provisions. The preparation of the replacement area shall be accomplished in the following order. The Environmental Scientist and Contractor shall perform survey of site conditions. The hydrology of the replication site should be understood as it is critical to predicting the surface and groundwater elevations that will result following completion of the project. The replacement area shall be excavated beginning at the edge of wetlands to be extended in the location as shown on the plan. The excavation at this location shall be a minimum depth of 12-inches below the adjacent wetland grade to be adjoined. The bottom of the excavation shall be graded to be 12-inches below the adjacent wetlands minimum. Additional depth to remove material below this bottom grade may be required, with the additional excavated material to be replaced with hydric soil as described below, in paragraph Wetland Soils.

Any wetland resource area adjacent to the replacement area shall be separated from the replacement area by a barrier of haybales as shown on the drawings or specified equivalent. Excavated soil shall become the property of the Contractor to be legally disposed of off-site or recycled for use or as directed by the Engineer.

All trees, stumps, and brush and other vegetation shall be removed from the wetland area that is to be affected by the project and shall become the property of the Contractor to be legally disposed of off-site or recycled for use.

No excavated or waste material shall be stockpiled in the resource areas or buffer zone while awaiting disposal.

Wetland Soils

Soil translocation is the preferred methodology for obtaining replication soils. If possible, construction sequencing should provide for construction of the replication area first, using materials from the impacted wetland. If additional soils are needed then soil amendments from off-site may be used. A descriptive soil profile shall be gathered by the Wetland Scientist prior to its impact to replicate in the vegetated wetland replacement area. Information gathered should include at a minimum, horizons, characteristics, Munsell hue, value, and chroma and evidence of wetland hydrology. Soil amendments taken from areas where invasive species are present should be avoided. If soil amendments are used, the A-horizon should consist of a mixture of equal volumes of uncontaminated organic and mineral materials. The organic material used should be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards. Peat moss of any type shall not be used as a source of organic matter. Mineral material should be predominantly in the loam, loamy sand to silt loam texture range, with minimal quantities of gravel or rock. The Contractor is responsible for obtaining a suitable source of soil amendment material, both from on-site and off-site.

Soils to be used at the replacement site must be used immediately or stockpiled for as little time as possible. While stockpiled, the soils shall be kept wet and not allowed to dry out. The method for maintaining the appropriate moisture level should be documented by the Contractor and Wetland Scientist. Contamination of these soils should be prevented. They should be transported in vehicles that have been washed so that no exotic/invasive seeds from other sites get mixed in with them.

Usable hydric soil from the proposed wetland fill areas shall be excavated, re-handled and spread in the replacement area. There shall be a 12-inch minimum deep layer of hydric soils placed in the replacement area. If there is not sufficient usable hydric soil in the proposed wetland fill areas to provide 12-inches of backfill in the wetland replacement area, an alternative soil mixture may be used. The goal for soils at the replacement site should be to create soil profiles that approximate as closely as possible the soil profiles at the nearest undisturbed existing wetland. This means that a surface horizon is created that approximates the A or O horizon at the undisturbed wetland site and that a minimum, contains 6 – 12 inches of A or O material. Beneath the A or O there should be a B-horizon (subsoil) that approximates the depth and texture of the B-horizon at the undisturbed wetland and it should be loose and friable, and the texture should be loamy sand to silt loam.

All excavated soils must be stockpiled outside the resource area and at least 100 feet from the edge of the wetland. Precautions (e.g., temporary covering of stockpiles, haybale barriers around stockpiles) shall be taken as necessary to prevent erosion of the stockpiled material.

Finished grade shall be at an elevation that provides a hydrologic connection between the replacement area and the adjacent wetland. The Contractor shall verify that this elevation is not at a level that could dewater an adjacent wetland.

The wetland soils shall be deposited in the replacement area in a manner minimizing travel over and subsequent compaction of the underlying material and replacement wetland soils.

Upon completion of the replacement area, a hay bale barrier or approved equivalent shall be placed around the entire perimeter to protect it during the rest of the construction.

The final grading of the wetland soils shall result in no breaks in elevation upon removal of sedimentation barriers.

The sedimentation barriers shall be removed at the completion of all construction for the project. The ground under the sedimentation barriers shall be reseeded when the barriers are removed.

Wetland Replacement Planting

The intent of this Section is to insure that at least 75 percent replacement surface area is reestablished with indigenous wetland plant species within two growing seasons of their planting in accordance with the Massachusetts DEP Wetlands Protection Act Regulations. The following specifications provide for good establishment, low transplant shock, monitoring of the plantings, and replacement of plant material if necessary.

Planting Specifications

After the replacement area has been prepared as described above, it shall be planted. Wetland planting shall be performed between April 1 and June 15 or September 1 and October 30 or as recommended by the Environmental Scientist and as approved by the Engineer. Specific guidance for planting materials is as follows:

All plant material used shall be nursery grown and healthy, sound and free of disease, insect, pests, eggs or larvae, and shall have a well-developed root system. Container-grown plants shall have sufficient roots to hold planting mix intact after removal from containers, but should not be root-bound.

Plant material shall be planted as soon as possible (within one week) after it has been purchased. All plant materials temporarily stored at the site prior to planting shall be maintained by careful watering, and shall be protected from damage by construction activities and adverse weather conditions.

The plantings shall consist of the wetland dominant species in each layer documented in the impacted wetland area, if possible and appropriate and include ground stabilization through seeding with Pure Live Seed and shall be a wetland mix comprised of native New England species from one of the following suppliers or an approved equal: New England Wetland Plants, Amherst, MA (#413) 549-4000; Allen Seed, Exeter, RI (#800-527-3898); or Ernst Conservation Seeds, Meadville PA (#800- 873-3321). Such mix shall be specific to the hydrologic conditions of the site and approved by the Wetland Specialist or MassDOT Landscape Design Section. It may be necessary to substitute approved alternative plants if the specified plant material is not available. Any substitutions must be approved by the Wetland Scientist prior to planting.

Shrubs shall be planted 8-10 feet on center, trees shall be planted 10-15 feet on center unless the Wetland Scientist recommends otherwise. Shrub and tree densities should be used to determine the total number of specimens within a given area.

Planting Procedure

All wetland plantings shall be performed by hand, using hand implements, e.g., shovel or trowel. The following procedure shall be used for wetland plantings.

Plants shall be placed as specified in the project drawings and as directed by Wetland Scientist. To install each plant, a small hole shall be dug. A mixture of water and soil from the hole shall

be prepared. The plant shall be removed from its container or burlap covering and set in the hole in a manner so that the top of the root ball is level with the surface of the ground. Care should be taken to keep the root ball intact while handling.

For Balled & Burlap and container-grown material only, the following procedure for fertilizer application applies. Once each hole is dug for the replacement area vegetation, a small portion of slow release, root contact type fertilizer should be placed in the hole prior to the input of the plant material. Any fertilizer used for this work first must be approved by the Wetland Scientist at least by one week prior to use. For all shrub material, a small portion of bone meal shall also be placed into the hole prior to insertion of the shrub. All vegetation shall be fertilized with a fertilizer that is high in phosphorus composition to aid in plant root development. Care shall be taken to not over-fertilize the transplanted plant material. If, by the determination of the Wetland Scientist, some plants are burned due to over-application of the fertilizer, all affected plant material shall be replaced in-kind immediately by the horticultural contractor. For bare-root material, no fertilizer shall be placed in the hole at time of planting.

After fertilizer has been added and the plants placed, the soil mixture shall be backfilled into the hole and lightly compacted around the base of the plant.

After plantings are completed, the replacement area will be hand raked to eliminate all soil compaction. Hand raking shall be conducted until soil is loose. Raking will also be performed in order to maintain finish grades established prior to planting. It is essential that any planted material be watered after planting within the same day. If for any reason all plantings are not accomplished in one day, the finished plantings must be watered in the interim.

Wetland seed mix shall be applied after soil has been raked. Seed shall be sown by hand or by a small mechanical lawn seeder at the rates specified in the plant list. Water-soluble, quick-release fertilizer shall be broadcast at recommended rates along with the seed mix. The fertilizer nutrient analysis (ratio of sources of Nitrogen: Phosphorous: Potassium) should not be higher than 10-10-10. Watering of the seeded area must take place after seeding within that same day. Care should be taken during watering to direct a gentle spray of water that does not disturb seed on the soil surface.

Monitoring and Replacement

Monitoring will be performed in order to ensure satisfactory plant establishment and compliance with the performance standards for Bordering Vegetated Wetland from the Massachusetts Wetlands Protection Act Regulations at 310 CMR 10.55 (4)(b) or with any other relevant regulations of the Department of Environmental Protection.

First Inspection

An inspection shall be conducted at the end of the first full growing season, or 180 growing season days after planting, whichever comes first. Following this inspection, the Contractor is required to replace all plants that have not shown satisfactory evidence of establishment, and to reseed any areas that have not achieved at least 50 percent cover with wetland herbaceous species. It is the Contractor's responsibility to eradicate exotic / invasive plant species upon observation. Therefore, inspections of the replacement / restoration areas should be conducted frequently during the first two growing seasons to specifically monitor for exotic / invasive species. Cover shall be generally uniform over the entire planted area. In any area where this coverage by healthy vegetation has not been achieved, all dead or unsatisfactory plants shall be

removed and replaced in kind and size by the Contractor, at no additional cost to the owner, with plants as originally established under this specification and planting plan.

Second Inspection

A second inspection shall be made at the end of the second growing season. Following this inspection, the Contractor is required to replace all plants that are not healthy or are not flourishing. At the time of the second inspection, the Wetland Scientist shall determine whether the wetland replacement area has achieved the required 75 percent uniform coverage of revegetation with wetland plant species. 75 percent uniform cover by wetland species shall be assumed satisfactory evidence of growth after the second growing season. If this percentage is not achieved, additional plantings of the specified kind and rate, shall be made by the Contractor, at no additional cost to the owner.

COMPENSATION

Wetland replication area will be measured for payment by the square yard, complete in place.

Wetland replication area will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for retaining a Wetland Scientist, survey of areas regarding existing conditions, evaluation of presence of satisfactory existing wetland (hydric) soils for reuse in the replication area, excavation, provision and placement of suitable wetland soil materials, grading, protection of the work, wetland plantings, fertilizer and inspections, but all costs in connection therewith shall be included in the Contract unit price bid.

No separate payment will be made for the repair of existing wetlands impacted during construction, but all costs in connection therewith shall be included in the Contract price bid.

ITEM 756.

NPDES STORMWATER POLLUTION PREVENTION PLAN

LUMP SUM

(Rev. 09/2009)

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, 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 14, 2008 (73 FR 40338), EPA issued the final NPDES Construction General Permit (CGP) for construction activity.

The NPDES CGP 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 will 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 to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

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 will 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 necessary 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 onsite 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 necessary 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 will be required prior to submission of the Resident Engineer's Final Estimate.

COMPENSATION

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention plan. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submissions of a Notice of termination (NOT) when final stabilization has been achieved.

ITEM 765.15

SEEDING – STEEP SLOPE MIX

SQUARE YARD

The work under this item shall conform to the applicable requirements of Section 765 of the Standard Specifications, except as amended and supplemented as indicated on the drawings and as specified below.

DESCRIPTION

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

- A. Incorporation of Additives for Seeding
- B. Fine Grading
- C. Mechanical Seeding
- D. Hydroseeding
- E. Hydromulching
- F. Maintenance and protection

All seeding work shall be done by a firm experienced in seeding work having a minimum of five years experience with seeding installation. Prior to beginning work, the Contractor shall furnish proof of qualifications to the Engineer for approval.

Hydromulch installation work shall include the installation of wood fiber mulch, as shown on the Drawings or as indicated in the specifications, herein. Hydromulch shall be installed on areas within the project limits. Matting for Erosion Control shall be used on all areas seeded with the

same mixes on all slopes that are steeper than one vertical foot to three horizontal feet within the project limit as specified under Item 767.9, MATTING FOR EROSION CONTROL.

The work of this Section includes topdressing and overseeding the existing or grass cover or repairing grass damaged by construction and as shown in the Drawings and as directed. Steep Slope Mix (low growing turf type fescues) is for use on long, steep slopes under heavy plantings where mowing will be difficult and erosion can occur. Application of this mix shall be as shown on the Drawings and as directed.

Samples and Submittals

At least 60 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 material shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match approved materials.

- A. Seed
- B. Fertilizer
- C. Ground limestone
- D. Superphosphate
- E. Hydromulch

Seed: A manufacturer's Certificate of Compliance shall be submitted with each shipment of seed. These Certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. Only current year's crop seed shall be permitted. No seed may be sown until the Contractor has submitted the Certificates of Compliance.

Hydroseed and Hydromulch: Prior to the start of work, the Engineer shall be furnished with a certified statement for approval as to the number of pounds of seed, mulch and tackifier to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding or hydromulching that can be covered with the quantity of solution in the hydroseeder.

MATERIALS

Seed Section M6.03.0 shall be amended as follows.

The following seed mix, conforming in plant species to the percentages specified, shall be used in areas as indicted on the drawings.

Supply 3 Lbs/1000 SF of the following Seed for ITEM 765.15, SEEDING-STEEP SLOPE MIX (for planting in shrub beds on steep slopes).

Grass Mixture:

Name	Germination	Purity	Lbs/1000sf
Festuca longifolia “Reliant” Reliant Hard Fescue	96%	85%	1.05
Festuca longifolia “Crystal” Crystal Hard Fescue	96%	85%	1.05
Festuca var. Commutata “Jamestown” Jamestown Fescue	80%	85%	0.75
Trefolium repens White Clover	75%	85%	0.15
		Total:	3.0 Lbs.

Seed shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and the weed seed content shall not exceed 1% by weight. Where possible, seed stock shall come from a local source. The seed shall be furnished and delivered, in the proportion specified, in new, clean, sealed, and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed which has become wet, moldy or otherwise damaged shall not be acceptable. The Contractor shall take care to handle and store the wildflower seed according to grower's recommendations and shall not subject the seed to extremes of heat, cold or moist conditions.

Refer to the Drawings for limits and types of seeding required and as directed by the Engineer.

Fertilizer Section M6.02.0 shall be supplemented by the following:

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

Nitrogen	Phosphorus	Potash
10%	6%	4%

Limestone Section M6.01.0 shall be amended so that dolomitic limestone shall be the only acceptable form.

Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 18% available phosphoric acid.

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct.

Hydromulch to cover hydroseeded areas shall be fiber processed from whole wood chips manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper or cardboard.

Moisture content of hydromulch shall not exceed 10%, plus or minus 3% as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.

The hydromulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.

The hydromulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be noninjurious to plant growth.

CONSTRUCTION

Inspections

Soil amendments, such as fertilizer, lime, and organic material, shall be based on tests of representative samples of loam to be used on the slopes. Contractor shall be responsible for ensuring timely testing and recommendations. Soil tests shall be by a laboratory acceptable to the Engineer. Soil test results and recommendations shall be delivered to the Engineer.

Notify the Engineer and arrange for inspections of areas to be seeded when:

- A. When planting soil (loam borrow) has been spread and fine graded, amendments incorporated and before seeding.
- B. When seeding operations are beginning.
- C. When seeding operations are complete to establish a date when maintenance shall commence. When maintenance period is complete for Acceptance.

Notify the Engineer and arrange for inspections of areas to be top dressed and overseeded when:

- A. Existing grass areas have been mown to the required heights.
- B. When top dressing loam borrow has been spread prior to seeding.
- C. When overseeding is complete to establish a date when Maintenance shall commence.
- D. When maintenance period is complete for Acceptance.

General Construction Methods

Placement of Loam Borrow shall be installed and paid for under Item 751.

The season for seeding work shall typically be from April 1 to June 1 and from August 15 to October 15 with the following qualifications. The actual turf construction work shall be done only during periods within the season which are normal for such work as determined by weather conditions and by accepted practice in this locality and as accepted by the Engineer.

Seed only when the bed is in a friable condition, not muddy or hard. Areas where the soil condition is unacceptable may be required to be replaced and/or reworked and amended until acceptable to the Engineer at no additional cost to the Department.

Install erosion control matting in all drainage swales and on all slopes steeper than one vertical foot to three feet horizontal, per Item 767.9, MATTING FOR EROSION CONTROL.

Incorporation of Additives

Soil additives shall be spread and thoroughly incorporated into the top four (4) inches of the loam layer by harrowing or other methods approved by the Engineer.

Fine Grading of Seeded Areas and Preparation of the Seed Bed

The whole surface shall then be fine graded by hand raking. Remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove all stones over one (1) inch in diameter from the top three (3) inches of the loam. Loam shall also be free of smaller stones in excessive quantities as determined by the Engineer.

If seed bed is proposed to be seeded by hand broadcasting, smooth surface to meet finished grades with raking and broadcast seed according to requirements specified. Compact with rolling after seeding. If bed is proposed to be hydroseeded, roll and compact bed before seeding. The surface shall then be compacted with a roller or other suitable means to remove air pockets and achieve an even stable surface that is sufficiently porous to absorb water and allow root growth. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional borrow and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

Turf Construction

Contractor shall obtain Engineer's written approval of fine grading and bed preparation before doing any seeding or hydroseeding.

Seeding

Seeding shall be scheduled when rain is not expected for 48 hours and within seasonal dates specified. No seeding shall be done in windy or wet weather. Prepared loam bed shall be reviewed by the Engineer before seeding commences.

Hand Seeding

For hand seeding rake soil lightly and roll to ensure seed is in firm contact with soil. Following rolling, water the seeded area thoroughly and evenly with a fine spray to penetrate the soil to a depth of at least two (2) inches.

Seeding shall be done in two directions at right angles to each other. Sow the seed with seeding device at the specified seeding rate as accepted by the Engineer.

Hydroseeding

For hydroseeding, a mobile tank with a capacity of at least 500 gallons shall be filled with water and seed in quantities so they may be sprayed in the specified proportions per unit of area to be hydroseeded.

The slurry shall be thoroughly mixed by means of positive agitation in the tank. The slurry shall be applied by means of a centrifugal pump using the turret or hose application technique from the mobile tank. The hose or turret shall be equipped with a nozzle of a proper design to insure even distribution of the hydroseeding slurry over the area to be hydroseeded. The hose or turret shall be operated by a person thoroughly familiar with this type of seeding operation.

Seeding

Differing quantities of hydromulch, fertilizer, superphosphate, and limestone shall be included in slurry mix depending on seed type, application requirements, and recommendations for amendments based on results of loam soil analysis.

Seeding for Steep Slopes

For slopes steeper than 3:1, erosion control matting shall be installed and paid for as specified in Item 767.9., Matting for Erosion Control.

Preparing and Top Dressing of Areas to be Overseeded

All areas of existing or damaged grass areas shall be top dressed and overseeded as directed by the Engineer. Mow existing grass to a height of four (4) inches before topdressing and overseeding. Remove and discard all grass clippings and debris from the site.

Contractor shall spread approved, mechanically screened loam in areas of top dressing in accordance with Item 751., Loam Borrow.

Overseeding

Contractor shall obtain Engineer's written approval of top dressing of screened loam before doing any seeding.

Seed only when the top-dressed bed is in a friable condition, not muddy or hard.

Seed type and application rates for overseeding shall be the same as those listed in application rates for the particular seed mix specified for that area in locations as shown on the Drawings.

To maximize seed to soil contact, slice seeding is recommended for all areas to be overseeded. Mechanical seeding shall be undertaken in two separate passes at ninety degrees to each other. Rake soil lightly and roll to ensure seed is in firm contact with soil.

Following rolling, thoroughly and evenly water seeded areas with a fine spray to penetrate the top-dressed screened loam to a depth of at least four (4) inches.

Turf Maintenance

Maintenance shall begin immediately after any area is seeded and shall continue for a minimum 60-day active growing period following the completion of all turf construction work, and until final acceptance of the project. In the event that seeding operations are completed too late in the fall for adequate germination and growth of grass, then maintenance shall continue into the following spring and reseeded shall take place as necessary at that time. Adequate growth shall be as determined by the Engineer.

Maintenance shall include reseeding, erosion control, watering, weeding, fertilizing, and resetting and straightening of protective barriers. Herbaceous and woody weeds shall be removed from seeded areas.

Watering shall be provided as follows:

- A. The Contractor shall provide all labor and water required to establish all seed mixes, turf and wildflowers. Contractor shall water as required, during maintenance period to insure that one (1) inch of water is applied in the soil to the seeded areas and that water is maintained to a depth of two (2) inches or greater.
- B. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply one complete coverage to the grass areas in an 8 hour period.

After the grass in seeded areas has appeared, all areas and parts of areas which, in the opinion of the Engineer, fail to show a uniform stand of turf, for any reason whatsoever, shall be repaired, regarded as necessary until all areas are stable and covered with a satisfactory growth of turf. Repair and reseeding shall occur within specified seeding dates, and may require repeated applications of seed and fertilizer. All such repairs and reseeding shall be done by a method approved by the Engineer and shall be incidental to this item.

During the maintenance period, any decline in the condition of seeded areas shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall, at his own expense, engage professional horticulturists to inspect turf and to identify problems and recommend corrective procedures.

A satisfactory stand of turf, as determined by the Engineer, shall be required to be acceptable. Seeded areas shall have a close stand of grass with no weeds present and no bare spots greater than three (3) inches in diameter. All surfaces of the soil shall be stable and at least 90 percent of the grass established shall be permanent grass species. At the time of acceptance, the Contractor shall remove temporary barriers used to protect turf areas. Absolutely no debris may be left on the site.

COMPENSATION

Seeding Steep Slope Mix will be measured per for payment by the square yard, complete in place.

Seeding Steep Slope Mix will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for all fine grading, amendments, seeding, maintenance, mowing and watering, but all costs in connection therewith shall be included in the Contract unit price bid.

Placement and grading of loam borrow will be paid for separately under Loam Borrow, Item 751. Matting for erosion control will be paid for separately under Item 767.9.

ITEM 767.9**MATTING FOR EROSION CONTROL****SQUARE YARD**

Work under this item shall conform to the plans and the relevant provisions of Section 767 and the following:

DESCRIPTION

The work shall include the furnishing and placement of permanent erosion control matting for ditch and slope protection and stabilization as shown on the plans and as directed by the Engineer, after the placement of Loam Borrow and seed. Matting shall be placed on all slopes steeper than 1 vertical foot to 3 horizontal feet and all drainage swales.

MATERIALS

Furnish material that is clean, sound and free of rips or tears.

Staples shall be U-shaped with eight (8) inch legs and one (1) inch crowns from 6 gauge or larger wire.

Erosion control mats shall be undyed, untreated, biodegradable, jute, coconut coir, or other approved yarn woven into a plain weave mesh with approximately 0.65 to one (1) inch square openings.

Jute mesh shall be a uniform open plain weave fabricated from jute yarn that does not vary in thickness by more than ½ from its normal diameter. The mesh shall not exceed one (1) by one (1) inch in size and with an average weight of 0.5 kg/cm +/- 5% when tested in a standard atmospheric condition according to ASTM D 1776.

CONSTRUCTION METHODS

Install according to the manufacture's recommendations. Install mats to soil surfaces that are at final grade, stable, firm, and free of rocks or other obstructions.

Spread mats evenly and smoothly, without stretching, to ensure direct contact with the soil at all points. Unroll fabric parallel to the drainage flow direction. Drive all staples flush with soil surface.

Repair damage areas immediately. Restore the soil in damaged areas to finished grade, re-fertilize, and re-seed.

Place upslope mat end in a vertical, six (6) inch deep slot. Staple the mat end along the bottom of the slot at twelve (12) inch intervals. Backfill the slot and compact. Staple the outer edges at six (6) foot intervals. Overlap the abutting edges by four (4) inches. Staple the overlap at three (3) foot intervals.

Overlap the roll ends by eighteen (18) inches with the upslope end on top. Staple the overlap at twelve (12) inch intervals.

Turn the downslope mat end under six (6) inches of mat and staple along the fold at twelve (12) inch intervals. Staple throughout the mat at staggered two (2) foot intervals.

For swale installations, construct check slots every twenty-five (25) feet. Dig a six (6) inch slot perpendicular to the flow direction. Tuck 3 folds of mat into the slot. Staple the mat securely along the bottom of the slot and continue unrolling the fabric in the desired direction.

COMPENSATION

Matting for erosion control will be measured for payment by the square yard, complete in place. Overlapped matting will not be measured for payment.

Matting for erosion control will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

<u>ITEM 785.733</u>	<u>INKBERRY – COMPACT 24-30 INCH</u>	<u>EACH</u>
<u>ITEM 790.133</u>	<u>CORALBERRY SHRUB – CHENAULT 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 790.433</u>	<u>CRANBERRY BUSH – AMERICAN 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 791.313</u>	<u>FOTHERGILLA – DWARF 18-24 INCH SPREAD</u>	<u>EACH</u>
<u>ITEM 794.735</u>	<u>SUMMERSWEET SHRUB 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 795.153</u>	<u>WINTERBERRY – MALE 24-30 INCH</u>	<u>EACH</u>
<u>ITEM 795.157</u>	<u>WINTERBERRY – FEMALE 24-30 INCH</u>	<u>EACH</u>

The work under these items shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the Standard Special Provisions.

ITEM 816.01 TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 1 LUMP SUM

LOC. 1: Carlisle Road (Route 225) at Main Street (Route 27)

SCOPE OF TRAFFIC SIGNAL WORK

The work to be done under this item consists of furnishing and the installation of a new traffic control signal system at the above intersection, complete with loop detection, signal posts, controllers, cabinets, foundations, wire and cable, emergency vehicle preemption system, and all other equipment, materials and incidental costs necessary to furnish, install and program a complete and functioning traffic control system as specified and as shown in the contract documents.

All work under these items shall conform to the relevant provisions of Section 800 of the Standard Specification, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the following technical provisions:

GENERAL REQUIREMENTS

A list of the major traffic signal items required is included on the Plans. Each component supplied must be on the most recent MassDOT’s Approved Equipment List, unless authorization from MassDOT is provided for use of equipment on a “test” or “pilot” basis.

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and the manufacturer's data has been received in writing from the Engineer. Approval of these drawings shall be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

Any Electrical Contractor performing work must be on the MassDOT Approved Contractor List and also have International Municipal Signal Association (IMSA) Certification as a Traffic Signal Electrician Level II.

SERVICE CONNECTIONS

The Contractor shall coordinate with the servicing utility company for installation of a new service meter to each new controller cabinet.

Service connections shown on the plans are approximate only. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto.

A 100-ampere meter socket approved by the servicing utility company shall be furnished and installed on the side of the control cabinet by the serving utility company.

A 3" PVC Conduit shall be installed from the controller cabinet to the utility pole and/or electric manhole, which will supply electrical service to the controller cabinet. This conduit shall be encased in concrete where crossing roadways and/or driveways.

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.12 of the 2003 MUTCD.

TRAFFIC SIGNAL EQUIPMENT

The traffic signal controller unit (CU), malfunction management unit (MMU) and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-1998, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

TRAFFIC SIGNAL CONTROLLER

The controller unit shall be a keyboard-entry menu-driven unit conforming to the Standard Specifications, with internal time base coordination, emergency preemption, and programmatic capability.

Controllers shall conform to Section 3, Controller Units of NEMA No. TS 2, Traffic Controller Assemblies. The controller unit shall meet all applicable requirements of the NEMA Standard Publication No. TS 2 Type 1 and the Department's 1995 Standard Specifications. Controllers shall utilize an input/output interface conforming to Section 3.3.1 of the NEMA TS 2 Standard for all input/output functions with the back panel terminals and facilities, the malfunction management unit, detector rack assemblies and auxiliary devices.

The controller shall be complete with a module, including modem card and physical connector to support closed loop communication.

BUS INTERFACE UNITS

The Bus Interface Unit (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 1 cabinet assembly.

The BIU shall perform the interface function between Port 1 at the controller unit, the malfunction management unit, loop detector rack assembly, and the back panel terminal and facilities.

As a minimum, two (2) LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

MALFUNCTION MANAGEMENT UNITS

The malfunction management units (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 2 cabinet, a NEMA TS 2 Type 1 cabinet, or a NEMA TS 1 cabinet without loss of functionality. The MMU shall be connected directly to the controller unit to support enhanced MMU monitoring of controller operations.

LOAD SWITCHES

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 Standard. All load switches shall utilize optically isolated encapsulated modular solid-state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

Note: The controller cabinet assembly shall be initially supplied with a full compliment of load switches to accommodate each available position of the back panel.

FLASHER

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 Standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

FLASH TRANSFER RELAYS

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 Standard.

The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

Note: The controller cabinet assembly shall be initially supplied with a full compliment of flash transfer relays to accommodate each available position of the back panel.

EMERGENCY VEHICLE PREEMPTION

The emergency vehicle preemption system shall be installed in the same cabinet as the controller.

The emergency vehicle preemption control system shall consist of a data-encoded phase selector to be installed within the traffic 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 optical detectors shall be single input, single output units used to control one approach. All traffic signal installations shall be supplied with a minimum of two optical detectors unless otherwise noted in the major item list.

The phase selector shall be a rack-mounted plug-in two or four channel, dual priority device. The phase selector shall plug into a shelf-mounted single card slot chassis. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software, on 3.5" floppy disk shall be supplied and licensed to the Department. 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.

The CONTRACTOR shall install confirmation strobe at the traffic signal location as shown on the plans. The confirmation strobe shall serve to validate to the driver of the emergency vehicle that the traffic signal has recognized the preemption call and will initiate the proper preemption sequence. The confirmation strobe shall have a clear/white lens.

The CONTRACTOR shall be responsible for the proper programming of the phase selector, orientation of the optical detectors, and all other work necessary to provide a complete and operating emergency vehicle preemption system.

The CONTRACTOR may be required to field adjust the location of the optical detectors for optimum line of sight detection in the presence of the Engineer to properly detect preemption calls from approaching vehicles.

VEHICLE DETECTOR AMPLIFIERS

The loop detector amplifiers shall be supplied as two-channel rack mounted units with programmable delay and extension timing, however, all delay and extension programming shall be completed internally in the controller unit.

A chart shall be permanently affixed to the controller cabinet door, which labels each amplifier channel. The chart shall indicate the detector number, street name, approach direction, lane assignment, corresponding phase and terminal number for each amplifier channel.

The detector lead-in cables shall also be similarly labeled, both in the controller cabinet and in the pull box containing the detector lead-in splice. This labeling and attachment shall be of durable materials such as brass or plastic, attached by wire or plastic ties. Adhesive attachment of the label shall not be acceptable.

VEHICLE LOOP DETECTORS

Wire loop detectors shall be installed in the roadway for vehicle detection. In advance of the loop detector installation, the Contractor shall mark, on site, the loop detectors with any changes required by field conditions such as manholes. The loop detector layout shall be inspected and approved by the Engineer before the loop detectors are installed.

Loop wire shall be encased in a protected plastic tubing of PVC or polyethylene plastic, IMSA 51-5,0.25 inch outside diameter, and the wire may have cross-linked polyethylene insulation or it may have THHN/THWN insulation.

Splicing insulator shall be an approved re-enterable rigid body splices kit with a non-hardening sealing compound compatible with the wire insulation.

Splice and Connection: Splicing and connection shall be made in the pull box nearest the roadway loop sensor but not exceeding four loops per pull box. All loops included in a detector group as shown on the plans shall be spliced in a single pull box. Each lead and lead-in connector shall be stripped back and spliced using a pressure type wire connector applied with a crimping tool. Multiple loop sensors shall be identified as detailed on the plans.

Lead-in splicing shall be staggered to prevent contact with each other. Each crimped splice shall be soldered and insulated. The insulation material shall be heat-shrunked polyolefin. The shielded lead-in cable outer jacket and shield shall be stripped back sufficiently to ensure that the shield cannot come into contact with the spliced conductors. Follow the instructions of the kit manufacturer for this procedure when installing the re-enterable splice kit.

NOTE WELL: The above splice shall be done on the day of the loop wire installation to prevent the entrance of any moisture into the plastic tubing.

The lead-in conductors shall be connected to the appropriate terminals in the controller cabinet, by using crimped or soldered terminal ends. The heat source for soldering shall be electrical not exceeding 30W capacity.

Testing of Loops: The following test procedure shall be performed in the presence of the Engineer before and after the loop sensor is sealed in the pavement as detailed below. The cost of equipment, labor, and materials to perform such testing and similar re-testing following repairs, replacement, or adjustment of any detector within the project area shall be included in the contract unit price for this Item.

After installation of wire loop sensors in the roadway and installation of shielded lead-in connecting the loop sensors to the controller cabinet, each loop sensor and lead-in combination shall be tested (at the controller cabinet) for proper installation. The resistance from lead to lead of the same loop shall not exceed three (3) ohms per one thousand (1000) feet as measured by a high quality meter suitable for measurements of low resistance in the range of 1 to 6 ohms.

A megohm meter test at 500 volts DC shall be made between the two leads of a loop/lead-in combination temporarily spliced together, but otherwise disconnected from all terminals, and the shield drain wire and the earth ground connection. These resistances shall be at least one hundred (100) megohms.

A megohm meter test at 500 volts DC shall be made between lead-in shield and the earth ground rod. This resistance shall be at least one hundred (100) megohms.

The meter used for these tests shall be checked for calibration each day of use by using a resistor block of 5% resistors simulating loads of 1 megohm, 20 megohm and 100 megohms. The observed meter reading shall be 10% of the nominal resistor load.

If any loop sensor and lead-in combination fails to pass any one of the four (4) tests, it shall be repaired and then re-tested on two occasions at least two (2) weeks apart and then shall pass on each re-test occasion. If the loop sensor lead-in combination does not pass all these re-tests, a new loop sensor and/or lead-in shall be installed, and shall pass these tests, at no additional cost.

After the above tests have been satisfactorily completed, all loop sensor/shielded lead-in inductance shall be measured and a written report of the results shall be filed with the Engineer and a copy stored with the “box prints” at the intersection.

TRAFFIC CONTROLLER CABINET

The controller cabinets shall conform to the NEMA TS 2 Type 1 Standards, Section 7. Cabinet size shall be as shown below. It should be noted that approximate cabinet dimensions are in inches. The Cabinet shall be a ground-mounted type as shown on the plan.

Item Number	NEMA TS 2 Cabinet Type	Cabinet Size (Nominal) (HxWxD*)	Back Panel	Mounting	Malfunction Management Unit
816.01	NEMA Size 6	56”x 44”x 28”	12-Position	Ground	16 Channel

* Approximate cabinet dimensions are provided in inches.

The control cabinet shall be made of aluminum with an interior painted aluminum and an exterior painted black.

Note: The control cabinet shall be initially wired with a “D” harness. All wires for this harness shall be properly terminated on the backpanel.

The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinets' door open status.

Note: No Manual Police Button shall be provided.

Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired.

The following requirements are applicable to each signalized location and are designed for effective use of a laptop computer in conjunction with traffic signal controllers. These requirements are also designed to permit all engineers, electricians and technicians (including those who are disabled but ambulatory) to work in the cabinet in a safe, effective and comfortable manner. To this extent, the following meets applicable ADA requirements.

1. Adjust the control cabinet height by use of a cabinet extender, adjust the placement of cabinet shelves, adjust the height of the cabinet foundation or provide any combination of these three items so that the top of the LCD or other visual display window of both the local controller and the master controller is no more than 48" above finished grade in front of the cabinet. The top of the cabinet door opening shall be at least 5'8" above finished grade. Any technical provision, plan detail, standard specification or standard drawing to the contrary shall not apply to the extent that it may conflict with this viewing height requirement.
2. Furnish and install one slide-out/slide-in shelf or swing-out/swing-in shelf appropriate for the size and load of a laptop computer. This moveable shelf shall support the bottom of the laptop computer at a height between 3'-4" and 3'-8" above finished grade in front of the cabinet.
3. Furnish and install a paved pad in front of the control cabinet. This pad may be of bituminous concrete or cement concrete, built in accordance with the sidewalk specification applicable to this project, approximately level, approximately 1" above the surrounding unpaved surface, or at even grade with the adjacent surface if paved. This pad shall abut the front of the cabinet; project at least 1' to each side of the cabinet and at least 3' in front. No pad is required if the front of the cabinet immediately abuts an existing or proposed paved sidewalk or other paved surface.
4. Both the firmware and software version in each timer unit shall be the same throughout the project, and shall be the latest version available on the market. In addition, the contractor shall promptly furnish to the owner and install all upgraded versions of both firmware and software through the last day of the inspection period, guarantee period or warranty period, whichever date is later.
5. The contractor shall furnish one cable with each new timer unit to connect a controller timing mechanism to a laptop computer. This cable shall have a termination at one end to match the controller. It shall have a termination on the other end to match the type of serial port found on laptop computers, usually DB9. This cable shall be wired to provide serial RS232C communication between the controller and the computer.

6. Payment for the work described above shall be deemed to be incidental to and included in the prices bid for various items of traffic signal work, and no additional payment shall be made for the work described above.

TESTING OF GROUNDING SYSTEM

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications.

POSTS AND BASES

Signal base foundations shall not obstruct a sidewalk so that passage by physically challenged persons is impaired

SIGNAL HEADS

Signal heads shall be rigid mounted. All traffic signal lenses shall be 12" in diameter unless otherwise noted on the plans. All signal heads shall be equipped with light emitting diode (L.E.D.) 12" modules as noted on the plans.

Signal heads shall be made of aluminum. Signal heads shall be installed with cut tunnel visors unless otherwise noted on the major items list on the plans.

TRAFFIC SIGNAL LED MODULES

The LED module shall be an approved item from MassDOT's Traffic Control Devices Approved Equipment List. See "Traffic Controls" under "Qualified Construction Materials" on the Department website:

http://www.mhd.state.ma.us/downloads/trafficMaterials/trafficSignalControls_1209.pdf

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 or repaired by the manufacturer if it exhibits one of the following:

1. A failure due to workmanship or material defects within the first 60 months of field operation
2. 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.

PEDESTRIAN HEADS

Pedestrian head indications shall be illuminated L.E.D. type displaying the graphical symbols of a walking person and/or upraised hand and shall be painted black. The displays shall be "full" displays, outline symbols are not acceptable. All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs. Pedestrian heads shall be made of aluminum.

PEDESTRIAN PUSH BUTTONS

Pedestrian push button controls shall be raised from or flush with their housings and shall be a minimum of 2" in the smallest dimension. The force required to activate the controls shall be no greater than 5lbs.

Pedestrian push buttons shall be located as close as practicable to the path curb ramp serving the controlled crossing and shall permit operation from a clear ground space. If two crosswalks, oriented in different directions, end at or near the same location, the positioning of pedestrian push buttons and/or legends on the pedestrian push button signs should clearly indicate which crosswalk signal is actuated by each pedestrian push button.

Note: The contractor is responsible for determining the correct arrow orientation of the sign and or pedestrian push button.

A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

PAINTING

All new traffic signal equipment shall be painted in accordance to the relevant provision of Section 815 of the Standard Specifications and the following:

Controller cabinet	(Exterior)	-	Aluminum
	(Interior)	-	Aluminum
Posts and Bases		-	Aluminum
Signal housings	(Back)	-	Yellow
	(Front)	-	Black
Signal housing supports		-	Yellow
Visors of signal housing	(Outside)	-	Yellow
	(Inside)	-	Black
Meter socket		-	Aluminum

SOFTWARE

All local controller, malfunction management unit, loop detector amplifier and emergency vehicle preemption software shall be supplied with the latest available revision. Any software upgrades released by the manufacturer shall be supplied at no additional cost to the Town for a period of five years after acceptance of the traffic signal installation.

DOCUMENTATION

Each programmable local hardware component (i.e. controller, malfunction management unit, loop detector amplifier, emergency vehicle preemption phase selector) shall be initially programmed by the Contractor based on information contained on the plans.

Note: Three bound sets of hard copy programming per device shall be supplied to the Town by the CONTRACTOR.

Upon final acceptance of the signal by MassDOT, the CONTRACTOR shall supply 8½"x11" or 11"x17" laminated copy of the traffic signal design plan and sequence and timing chart to be left in the cabinet documentation envelope mounted on the inside of the cabinet door.

EXISTING INSTALLATION

The existing signal installations shall be maintained in operation throughout the construction period and until the new signal system is ready for operation. The contractor may install temporary supports for signal heads as necessary to allow for construction activities. Any temporary installation shall be in conformance with the MUTCD in every case. If an existing signal is to be turned off temporarily to allow controller switchover or requiring temporary turn-off, a police detail shall be used to control traffic at the intersection until stop-and-go operation is restored.

Old cable and unusable materials shall be disposed of by the Contractor.

AS-BUILT TRAFFIC LAYOUT PLANS AND SIGNAL PERMIT

It will be the responsibility of the contractor to provide As-Built traffic signal layout plans and/or Traffic Signal Permit, indicating all signal equipment, detectors, conduits, pullbox, complete with as-built timing and sequence, major item list, power-pole number and meter number. The Contractor shall provide the final As-Built/Permit Plan in hard copy and electronic AUTOCAD files to MassDOT District 3 Traffic Engineer prior to the Final Acceptance of the signal system. If desired, the Contractor may hire an ENGINEER or the DESIGN ENGINEER for a fee for preparing the Traffic Signal Permit and electronic version. These plans shall also be delivered to the Town of Northborough prior to the final acceptance of the project.

COMPENSATION

Work under Item and 816.01 will be paid for at the respective Contract unit prices per Lump Sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for the maintenance of existing signal installations during construction, but all costs in connection therewith shall be included in the Contract unit price bid.

Conduit will be paid for separately under 3 Inch Electrical Conduit, Item 804.3. Pull boxes shall be paid for separately under Pull Box 12 x 12 Inches, Item 811.31.

ITEM 816.80

TRAFFIC CONTROL **SIGNAL REMOVED AND STACKED**

LUMP SUM

The work under this item shall conform to the relevant provision of Section 815 of the Standard Specifications and the following:

The work shall include the removal, transporting and stacking, as directed by the Engineer, of existing traffic signal equipment at the intersection of Route 27 (Acton Road) and Route 225 (Westford Street) in the Town of Westford.

The individual items of work shall include but not necessarily be limited to: removing, transporting and stacking existing traffic signal equipment including the removal and disposal of their foundations and electrical system; removing and disposing or abandoning existing hand holes and signal conduit; disconnecting the power source; removing the riser on the utility pole.

The existing mast arms and ground-mount signal poles shall be retained and reused.

All signal heads, LED modules, backplates and visors; controller cabinet with internal components; and pullbox frames and grates shall be carefully removed, and with prior approval of the Engineer, transported and stacked at the Westford Highway Department, 28 North Street, Westford, MA, 01886. If the Westford Highway Department determines any equipment is not acceptable, it shall become the property of the Contractor for disposal off site at no additional cost.

Old cable and all unusable material, as determined by the Engineer, shall be disposed of by the Contractor.

The work shall also include the excavation and backfilling with compacted gravel of the holes resulting from the excavation of the foundations and the replacement, in kind, of any surface material disturbed.

COMPENSATION

Traffic control signal removed and stacked will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for dismantling, loading, transporting, and stacking of the traffic control signals as designated above, the excavation and disposal of the existing foundations, the supplying and replacing of compacted gravel backfill and restoration or replacement, in kind, of the area where foundations and posts are removed, but all costs in connection therewith shall be included in the Contract unit price bid.

<u>ITEM 824.01</u>	<u>RECTANGULAR RAPID-FLASH BEACONS,</u>	<u>LUMP SUM</u>
	<u>LOCATION NO. 1</u>	
<u>ITEM 824.02</u>	<u>RECTANGULAR RAPID-FLASH BEACONS,</u>	<u>LUMP SUM</u>
	<u>LOCATION NO. 2</u>	
<u>ITEM 824.03</u>	<u>RECTANGULAR RAPID-FLASH BEACONS,</u>	<u>LUMP SUM</u>
	<u>LOCATION NO. 3</u>	
<u>ITEM 824.04</u>	<u>RECTANGULAR RAPID-FLASH BEACONS,</u>	<u>LUMP SUM</u>
	<u>LOCATION NO. 4</u>	
<u>ITEM 824.05</u>	<u>RECTANGULAR RAPID-FLASH BEACONS,</u>	<u>LUMP SUM</u>
	<u>LOCATION NO. 5</u>	

- Location No. 1:** Bike Trail at Main St (Rte 27) Northern
- Location No. 2:** Bike Trail at Main St (Rte 27) Southern
- Location No. 3:** Bike Trail at Brook St
- Location No. 4:** Bike Trail at Concord Rd
- Location No. 5:** Bike Trail at Wetherbee St

DESCRIPTION

The work under these items shall conform to the relevant provisions of Section 824 of the Standard Specifications and the following. The work shall include furnishing and installing solar powered rectangular rapid-flash beacons (RRFB) at the locations indicated on the plans or where directed by the Engineer. All work shall be in accordance with MassDOT Standard Specifications and as shown on the plans and in the special note for these item numbers.

GENERAL REQUIREMENTS

Each RRFB shall consist of two rapidly and alternately flashing rectangular yellow indications having LED array based pulsing light sources, and shall be designed, located, and operated with the detailed requirements specified on the plans.

Each RRFB shall be a complete assembly, consisting of supporting structure (pole, breakaway transformer base, sign supports), indications and electrical components (wiring, solid-state circuit boards, etc).

The designated warning signs shall be paid under Item 832.

FUNCTIONAL REQUIREMENTS

Each RRFB shall require solar power.

Each RRFB shall be activated by push button.

Each RRFB shall be ADA compliant.

The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation after a predetermined time limit (based on MUTCD procedures). The time limits are listed on the plans for each RRFB system.

A small light directed at, and visible to, pedestrians in the crosswalk shall be installed integral to the RRFB to give confirmation that the RRFB is in operation.

When activated, the RRFB indications shall flash in a rapidly alternating “wigwag” flashing sequence (left light on, then right light on).

Each of the RRFB’s indications shall have 70 to 80 periods of flashing per minute.

MECHANICAL CONSTRUCTION REQUIREMENTS

Each RRFB indication shall be a minimum size of approximately 5” wide x 2” high.

The two RRFB indications shall be aligned horizontally, with the longer dimension of the indication horizontal, and a minimum space between the two indications of approximately 7” measured from inside edge of one indication to inside edge of second indication.

The outside edges of the two indications, including any housing, shall not protrude beyond the outside edges of the integral signage of the RRFB.

The light intensity of the RRFB's indications shall meet the minimum specifications of the Society of Automotive Engineers (SAE) standard 1595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.

The supporting structure of the RRFB (breakaway transformer base, post, sign holders, etc) shall be constructed of manufactured aluminum embodiments.

Each RRFB is to be supplied with all required hardware to install assembly.

Each RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow or "AHEAD" plaque.

Each RRFBs associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when activated, simultaneously commence operation of their alternating rapid flashing indication and shall cease operation sumultaneously.

ENVIRONMENTAL OPERATIONS

The pushbutton shall be capable of continuous operation over a temperature range of -30 degrees F to 165 degrees F (-34 degrees C to 74 degrees C).

COMPENSATION

The RRFB will be paid for at the Contract unit prices per Lump Sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 832.1

TRAIL RULES SIGN

EACH

Work to be done under this Item shall conform to the relevant provisions of Section 828, "Traffic Signs" of the Standard Specifications for Highways and Bridges and the following:

The sign in this category shall be fabricated with M9.30.0 - Type III High Intensity Encapsulated Lens or Type IV High Intensity Non-Metalized Prismatic Lens Reflective Sheeting. Legend type shall be either Type C or Type D.

The sign shall have a white background with black lettering, shall be 24in x 36in and shall include the following text:

BRUCE FREEMAN RAIL TRAIL

Guidelines for Sharing the Path

Hours of Operation:

One Half Hour Before Sunrise to One Half Hour After Sunset

General Guidelines

- EVERYONE: KEEP TO THE RIGHT except to pass.
- Pass on the left, only when safe.
- Give an audible warning before passing.
- Yield to emergency and maintenance vehicles.
- Maximum Speed: 15 MPH

Bicycling

- Helmets are recommended for all cyclists and required by state law for children under 13.
- Stop your bicycle, if necessary, to yield or to prevent an accident.
- Bicyclists must yield to pedestrians.
- Bicyclists may ride a maximum of two-abreast only when safe

Walking / Jogging

- Keep to the right when walking or running on the path.
- Look before entering the bikeway or changing direction.
- Don't walk or run more than two abreast.

In-Line Skating

- Helmets, kneepads, and wristguards are advised.
- Keep to the right so that other users may pass safely.
- Skate single-file when the bikeway is busy.

Common Courtesy

- Do not litter or trespass on private property.
- Keep your dog on a leash (Maximum 6 Feet). Pick up after your dog.
- Respect other bikeway users. Share the path.

COMPENSATION

Measurement for Item 832.11, Trail Rules Sign, will be per each, complete in place.

Payment for Item 832.11 will be at the Contract unit price per each sign panel in place and will include without additional compensation one P-5 post, all hardware, brackets, bolts, labor, materials, excavation, transportation, etc. necessary to complete the above work.

ITEM 850.41**ROADWAY FLAGGER****HOUR**

The Contractor shall provide the number of flaggers required in either the appropriate Traffic Management Plan (TMP) template (see MassDOT's website at <http://www.massdot.state.ma.us/>) or that the Engineer deems necessary for the direction and control of traffic within the site. A flagger shall be used as directed by the Engineer in accordance with 701CMR 7.00, this section, and the TMP. 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 directed to be removed, the Contractor shall immediately comply with the directive from the Engineer and shall suspend operations as necessary 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.

Flaggers utilized during the performance of the work must possess a certificate of satisfactory completion from a Department-approved flagger training program, such as, but not limited to, those offered by the Associated General Contractors (AGC), the American Traffic Safety Services Association (ATSSA), American Flagging and Traffic Control (AFTC), or the National Safety Council (NSC), within the previous three (3) 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. All flaggers shall have completed Cardiopulmonary Resuscitation (CPR) and First Aid training according to the standards and guidelines of the American Heart Association or the American Red Cross. All flaggers shall carry their CPR/First Aid certification cards with them while performing flagging duties. All certifications shall remain valid for the duration of the project or the flagger shall be removed from the project.

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 "STOP / SLOW" traffic paddle conforming to the requirements of Part 6E.03 of the Manual on Uniform Traffic Control Devices (MUTCD), a 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 shall 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.

Roadway traffic flaggers Compensation for flaggers will be measured for payment by the hour for only the actual time spent flagging.

Roadway traffic flaggers will be paid for at the Contract unit price per hour, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for required training, equipment, travel time, transportation, or any administrative charges associated with the costs of flaggers, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 874.45 **TRAFFIC SIGN REMOVED AND DISCARDED** **EACH**

Work under this Section shall conform to the applicable provisions of Section 828 of the Standard Specifications and the following:

GENERAL

The work shall consist of removing and discarding existing regulatory, warning and directional signs and supports not required for reuse on this project.

CONSTRUCTION

The supports and existing foundations shall be removed to a depth of at least 6” 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 directed by the Engineer. The signs and supports shall become the property of the Contractor and the Contractor shall legally dispose of the items at a location not on MassDOT Highway Division property.

If signs are attached to existing light poles, utility poles or traffic poles, only the sign and attached hardware shall be removed and discarded.

COMPENSATION

Traffic sign removed and discarded will be measured for payment by the each.

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

No separate payment will be made for dismantling, loading, transporting and discarding of the signs and supports as designated above, the excavation 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, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 874.55 **MISCELLANEOUS SIGN REMOVED AND RESET** **EACH**

The work shall include removing and resetting existing trackside signage and posts related to the operation of the railroad.

The sign, composed of a heavy duty steel rail, has an attached wood or steel horizontal member. All attempts shall be made to remove the sign and horizontal member intact. The burial depth of the post and direction and orientation of the horizontal member shall be noted. Existing foundations shall be removed to a depth of at least 6in 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 directed by the Engineer.

The sign shall be stored in a secure location and reset at the location shown in the plans. The sign shall be placed at the same orientation and to the depth noted during removal.

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 necessary to replace any missing or unusable existing hardware.

COMPENSATION

Miscellaneous sign removed and reset will be measured for payment by the each, complete in place.

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

ITEM 983.51 **MODIFIED ROCK FILL** **SQUARE YARD**

The work under this item shall conform to the relevant provisions of Section 983 of the Standard Specifications and the following:

DESCRIPTION

The work to be performed under this Item shall consist of the furnishing and installing of Modified Rock Fill at the locations shown on the plans and cross sections.

COMPENSATION

Modified rock fill will be measured for payment by the cubic yard, complete in place.

Modified rock fill will be paid for at the Contract unit price per cubic yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

Geotextile fabric shall be placed under the stone area and will be paid for separately under Geotextile Fabric for Permanent Erosion Control, Item 698.4.

<u>ITEM 995.01</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 1</u>	<u>LUMP SUM</u>
<u>ITEM 995.02</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 2</u>	<u>LUMP SUM</u>
<u>ITEM 995.03</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 3</u>	<u>LUMP SUM</u>
<u>ITEM 995.04</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 4</u>	<u>LUMP SUM</u>
<u>ITEM 995.05</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 5</u>	<u>LUMP SUM</u>
<u>ITEM 995.06</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 6</u>	<u>LUMP SUM</u>
<u>ITEM 995.07</u>	<u>BRIDGE STRUCTURE, BRIDGE NO. 7</u>	<u>LUMP SUM</u>

SPECIAL PROVISIONS TO BE ADDED FOR 100% DESIGN SUBMISSION.

ITEM 996.4 **PREFABRICATED CONCRETE MODULAR** **SQUARE FOOT**
GRAVITY WALL

DESCRIPTION

This work shall consist of the construction of multiple prefabricated modular reinforced concrete gravity walls at various locations throughout the project in accordance with these specifications and in reasonably close conformance with the lines and grades shown on the plans, or established by the Engineer. Included in the scope of the Prefabricated Concrete Modular Gravity Wall construction are all grading necessary for wall construction, excavation, support of excavation, backfill, construction of leveling pads, segmental unit erection, concrete inserts for utility brackets and miscellaneous items necessary for a complete installation.

The Prefabricated Concrete Modular Gravity Wall design shall follow the general dimensions of the wall envelopes shown in the contract plans. Depending on location, the wall may require an opening for drain pipes or cross culverts, which openings and connection design shall be considered incidental to this item. The top of the leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be at or below the elevation shown on the plans. The top of the face panels shall be at or above the top of the panel elevation shown on the plans.

The Contractor shall require the design-supplier to supply an on-site, qualified experienced technical representative to advise the Contractor concerning proper installation procedures. The technical representative shall be on-site during initial stages of installation and thereafter shall remain available for consultation as necessary for the Contractor or as required by the Engineer. The cost associated with the representative is incidental to this item.

Quality Assurance

Prefabricated Concrete Modular Gravity Walls shall be designed and constructed as specified herein. The design shall be subject to review and acceptance by the Engineer. The acceptability of a Prefabricated Concrete Modular Gravity Wall design shall be at the sole discretion of the Engineer. Any additional design, construction, or other costs arising as a result of rejection of a retaining wall design by the Engineer shall be borne by the Contractor.

Precast segmental unit blocks shall be manufactured in a concrete products plant with MassDOT approved facilities. All calculations and Shop Drawings shall be signed and stamped by a Professional Engineer specializing in geotechnical construction and is registered in the Commonwealth of Massachusetts.

Approved Prefabricated Concrete Modular Gravity Wall systems are:

T-wall Retaining Wall ® by Concrete Systems, Inc.
Redi Rock Retaining Wall ™ by Michie Corporation/Capital Concrete Products
Stone Strong Retaining Wall by MBO Precast

The contractor installing the Prefabricated Concrete Modular Gravity Walls shall have demonstrated experience constructing Prefabricated Concrete Modular Gravity Walls and shall use personnel having demonstrated experience in the installation procedures recommended by the manufacturers and as specified herein.

All Prefabricated Concrete Modular Gravity Walls shall be built in accordance with the Plans and accepted Shop Drawings for the proposed wall systems.

Design Requirements

Work includes furnishing and installing concrete retaining wall units to the lines and grades designated on the Contract Drawings and as specified herein. Base of footing elevation shall be as shown on the Plans. All wall elements shall be within the right-of-way limits shown on the Plans. The panels shall be placed so as not to interfere with drainage or other utilities, or other potential obstructions.

In general, the prefabricated concrete modular block wall system shall be designed in accordance with the manufacturer's requirements, as specified herein and shown on the Plans, and in accordance with AASHTO LRFD Standard Specification for Highway Bridges, Section 11.11. Where conflicting requirements occur, the more stringent shall govern.

The prefabricated modular reinforced concrete gravity walls shall be dimensioned so that the maximum factored bearing pressure does not exceed 6500 pounds per square foot.

Facing panels shall have tongue and groove, ship lap or similar approved connections along all joints, both vertical and horizontal.

Prefabricated Concrete Modular blocks shall be installed on cast-in-place concrete leveling pads.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, fences, concrete parapet wall or other appurtenances shown on the Plans shall be accounted for in the stability design of the wall. The concrete anchors required for the utility brackets are incidental to this item.

Walls or wall sections which intersect at an angle of one hundred thirty (130) degrees or less shall include a special corner element to cover the joint formed by the abutting walls or wall sections and to permit relative movement. Corner elements shall not consist of connected standard facing panels.

MATERIALS

The Contractor shall be responsible for the purchase or manufacture of the precast concrete modular blocks, geotextile filters, panel/reinforcement connections, bearing pads, joint filler, and all other necessary components. The Contractor shall furnish to the Engineer the appropriate Certificates of Compliance certifying that the applicable wall materials meet the requirements of the project specifications. All materials used in the construction of the Precast Concrete Modular Block walls shall meet the requirements specified in the following subsections of Division III, Materials Specifications of the MHD Standard Specifications and as specified herein.

Materials not conforming to this section of the specifications or from sources not listed in the contract documents shall not be used without written consent from the Engineer.

Prefabricated Concrete Modular Block Units

The panels shall be fabricated in accordance with Section M4 and Section 901, with the following exceptions and additions:

- A. Inspection and Rejection: The quality of materials, process of manufacture, and finished units shall be subject to inspection by the Engineer prior to shipment. Precast units may be subject to rejection on account of failure to conform to this specification. Individual units may be rejected because of any of the following:
1. Variations in the exposed face that substantially deviate from the approved architectural model as to color, texture, relief, and reveals in accordance with precast concrete industry standards.
 2. Dimensions not conforming to the following tolerances:
 - i. Position of panel connection devices within 1", except for coil and loop imbeds which shall be 3/16". All other dimensions within 3/16".
 - ii. Panel squareness as determined by the difference between the two diagonals shall not exceed 1/2".
 - iii. Surface defects on smooth-formed surfaces measured over a length of five feet shall not exceed 1/8". Surface defects on textured-finished surfaces measured over a length of 5' shall not exceed 5/16".
 3. Defects indicating honeycombed or open texture.
 4. Defects which would affect the structural integrity of the unit including cracked or severely chipped panels.
- B. Unless otherwise indicated on the plans, the concrete surfaces shall be finished in accordance with Section 901.68 and as modified herein. The panels shall be cast on a flat area. The coil embeds, tie strip guide, and other galvanized devices shall not contact or be attached to the face panel reinforcement steel.
- C. The date of manufacture, production lot number, and the piece mark shall be clearly scribed on an unexposed face of each panel.
- D. All units shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Panels in storage shall be supported in firm blocking to protect the panel connection devices and the exposed exterior finish.

- E. Reinforcing steel for precast panels shall be plain uncoated reinforcing bars in accordance with Section M8.
- F. Quality assurance and testing will be modified by the following:
1. Compressive Strength - Acceptance of concrete panels with respect to compressive strength will be determined on the basis of production lots. A production lot is defined as a group of panels that will be represented by a single compressive strength sample and will consist of either 40 panels or a single day's production, whichever is less.
 2. During the production of the concrete panels, the manufacturer will randomly sample the concrete in accordance with AASHTO T141 (ASTM C172). A single compressive strength sample, consisting of a minimum of four cylinders, will be randomly selected for every production lot.
 3. Compressive tests shall be made on a standard 6-inch by 12-inch test specimen prepared in accordance with AASHTO T23 (ASTM C31). Compressive strength testing shall be conducted in accordance with AASHTO T22 (ASTM C39).
 4. Air content test will be performed in accordance with AASHTO T152 (ASTM C231) or AASHTO T196 (ASTM C173). Air content samples will be taken at the beginning of each day's production and at the same time as compressive samples are taken to insure compliance.
 5. The slump test will be performed in accordance with AASHTO T119 (ASTM C143). The slump will be determined at the beginning of each day's production and at the same time as the compressive samples are taken.
 6. For every compressive strength sample, a minimum of two cylinders shall be cured in accordance with AASHTO T23 (ASTM C31) and tested at 28 days. The average compressive strength of these cylinders, when tested in accordance with AASHTO T22 (ASTM C39) will provide a compressive strength test result which will determine the compressive strength of the production lot.
 7. If the Contractor wishes to ship the panels prior to 28 days, a minimum of two additional cylinders will be cured in the same manner as the modular block units. The average compressive strength of these cylinders when tested in accordance with AASHTO T22 (ASTM C39) will determine whether panels can be shipped.
 8. Acceptance of a production lot will be made if the compressive strength test result is greater than or equal to 5,000 pounds per square inch. If the compressive strength test result is less than 5,000 pounds per square inch, then the acceptance of the production lot will be based on its meeting the following acceptance criteria in their entirety:
 - a. Ninety percent of the compressive strength test results for the overall production shall exceed 5,150 pounds per square inch.
 - b. The average of any six consecutive compressive strength test results shall exceed 5,250 pounds per square inch.
 - c. No individual compressive strength test result shall fall below 4,600 psi.

Joint Materials

Cover all joints between panels on the back side of the wall with a geotextile fabric. The geotextile fabric shall conform to the requirements of Section M9.50.0, Type II. Slit film and multifilament woven and resin bonded non-woven geotextile fabrics are not allowed for this application. The minimum width of the fabric shall be 12 inches. Lap fabric at least 4 inches where splices are required.

Backfill Material

All backfill materials used in the concrete modular block wall volume shall conform to Gravel Borrow M1.03.0, Type B, and the following additional requirements:

- A. Soundness - The material shall be substantially free of shale or other soft, poor durability particles. The materials shall have a magnesium sulfate soundness loss, as determined by AASHTO T104 (ASTM C88), of less than 30 percent after four cycles.

Leveling Pad

The leveling pad shall be constructed of 2500 psi, 1-1/2 inch, 425-pound cement concrete as specified in Section M4. Leveling pad shall have minimum dimensions of 8 inches thickness and 12 inches width and be placed at the design elevation shown on the plans within a 1/8 inch tolerance.

Acceptance of Material

The Contractor shall furnish to the Engineer a Certificate of Compliance certifying that the above materials comply with the applicable contract specifications. A copy of all test results performed by the

Contractor necessary to assure contract compliance shall also be furnished to the Engineer. Acceptance will be based on the Certificate of Compliance, accompanying test reports, and visual inspection by the Engineer.

SUBMITTALS

- A. Design computations demonstrating compliance with the criteria specified herein and shown on the Plans, prepared and signed and stamped by a registered professional engineer licensed in the Commonwealth of Massachusetts and specializing in geotechnical engineering. The design calculations shall include:
 - 1. Statement of all assumptions made and copies of all references used in the calculations.
 - 2. Analyses demonstrating compliance with all applicable earth, water, surcharges, seismic, or other loads, as specified herein and required by AASHTO.
 - 3. Analyses or studies demonstrating durability and corrosion resistance of retaining wall systems for the proposed location and environment. The designers shall provide all corrosion protection devices necessary for the retaining wall to have a minimum service life of 75 years in the proposed location and environment.
- B. A detailed resume of the wall designer listing similar projects and demonstrating necessary experience to perform the retaining wall design, including a brief description of each project that is similar in scope. A reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, address and current phone number.

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- C. A detailed listing of prefabricated modular block walls that the contractor has constructed, including a brief description of each project and a listing of personnel who will construct the walls, demonstrating their experience in construction of prefabricated modular block walls. A reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, address, and current phone number.
- D. Manufacturer's product data for the prefabricated modular block wall system, including material, manufacture, erection specifications, all specified erection equipment necessary, details of buried prefabricated modular block wall elements, structures design properties, type of backfill, and details for connections between facing panels.
- E. Shop Drawings showing the configuration and all details, dimensions, quantities, and cross-sections necessary to construct the prefabricated modular block wall, including but not limited to the following:
1. A plan view of the wall which shall include Contract limits, stations and offsets, and the face of wall line shown on the Plans.
 2. An elevation view of the wall which shall include the elevations at the top of the wall, at all horizontal and vertical break points, and all steps in the leveling pads. The elevation view shall also show designation as to the type of retaining wall system(s), and an indication of the final ground line and maximum calculated bearing pressures.
 3. A typical cross section or cross sections showing the elevation relationship between existing ground conditions and proposed grades, and the proposed wall configuration, including details for the proposed methods for connecting to proposed conditions. The sections shall also indicate the location of the face of wall shown on the Plans.
 4. General notes pertaining to design criteria and wall construction.
 5. A listing of the summary of material quantities for each wall.
 6. Details of sleeves and pipes and other embedded items to be installed through the walls.
 7. Clearly indicated details for construction of walls around foundations or any other potential obstructions.
 8. Details of the architectural treatment of facing panels.
 9. Drainage design detail and design scheme.
 10. Location of utilities.
 11. Sequence and schedule of construction, including overall construction schedule.
 12. Methods of excavation and requirements for proper backfill.
 13. Method of maintaining stability of excavated trenches.
 14. Method of monitoring plumbness and deviation of wall.
 15. Excavation support system, if any.
 16. Any acceptance testing and frequency.
 17. Details and location of all necessary construction and expansion joints.
 18. Connection details at the interface of the wall and any adjacent proposed abutment structure.
 19. Details of impermeable membrane connection to facing panels and to runoff collection system.
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CONSTRUCTION

Delivery, Storage, and Handling

The Contractor shall check the material upon delivery to assure that the proper material has been received. A product certification should be provided with each shipment.

All wall materials and modular block units shall be stored elevated from the ground and protected to prevent all mud, wet cement, epoxy, and like substances from affixing themselves to the panels or materials. The panels shall be supported during storage to prevent excessive bending stress. For storage exceeding 30 days in duration, all materials shall be stored in or beneath a trailer or covered with a colored tarpaulin to prevent long-term exposure.

Wall Excavation

Earth excavations shall be in accordance with the requirements of Section 120 and in close conformity to the limits and construction stages shown on the Plans. Sections 120.80, 120.81, and 120.82 do not apply to the work covered in this section. Payment for excavation and incidentals to complete the excavation are included in the Prefabricated Concrete Modular Block wall Item.

Foundation Preparation

The foundation for the structure shall be graded level for a width equal to the length of reinforcement elements plus 1 foot. Prior to wall construction the foundation shall be compacted with at least 10 passes of a smooth wheel vibratory roller weighing at least 10,000 lbs. Compact the foundation area to provide a hard and level surface to support the wall units. Any foundation soils found to be unsuitable shall be removed and replaced with Special Borrow Material as per Section 140 and Section 150. The foundation for the structure shall be inspected and approved by the Engineer before erection is started.

Wall Erection

Precast concrete modular block units shall be placed so that their final position is vertical as shown on the Plans. For erection, panels are handled by means of lifting devices connected to the upper edge of the panel. Panels should be placed in successive horizontal lifts in the sequence shown on the approved Shop Drawings as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in position by means of temporary wedges or bracing according to the wall supplier's recommendations. Concrete facing vertical tolerances and horizontal alignment tolerances shall not exceed 3/4 inch when measured with a ten-foot straight edge. During construction, the maximum allowable offset in any panel joint shall be 3/4 inch. The overall vertical tolerance of the wall (top to bottom) shall not exceed 1/2 inch per ten feet of wall height.

Backfill Placement

Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing panels. Any wall materials which become damaged during backfill placement shall be removed and replaced at the Contractor's expense. Any misalignment or distortion of the wall facing panels due to placement of backfill outside the limits of this specification shall be corrected at the Contractor's expense.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T-99, Method C or D (with oversize corrections as outlined in Note 7 of that test). For backfills containing more than 30 percent retained on the 3/4 inch sieve, a method of compaction consisting of at least 4 passes by a heavy roller shall be used.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

The maximum lift thickness after compaction shall not exceed 12 inches. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

Compaction within three feet of the back face of the wall shall be achieved by at least three passes of lightweight mechanical tamper, roller, or vibratory system.

At the end of each day's operation, the Contractor shall slope the last lift of the backfill away from the wall facing to rapidly direct runoff away from the wall face. In addition, the Contractor shall not allow surface runoff from other areas to enter the wall construction site.

Drainage

Weep holes shall be provided through the face panels along the wall system and can be shop fabricated or field cored.

COMPENSATION

Prefabricated concrete modular block walls will be measured for payment by the vertical square feet of retaining structure, according to the dimensions shown on the Plans, complete in place. The vertical area of retaining structure is defined as the area, measured at the wall face, bounded by the top of the leveling pad, ends of wall, and top of coping.

Prefabricated concrete modular block walls will be paid for at the Contract unit price per square foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for excavation and backfill, but all costs in connection therewith shall be included in the Contract unit price bid.

The unit price for Prefabricated Concrete Modular Block Wall shall include costs for:

- A. All design work, preparation of written submittals and plans, revision of submittals, sample submittals, and any other necessary preliminary work prior to and after acceptance of the retaining wall by the Engineer.
- B. All materials, including transportation for the prefabricated concrete modular block walls, attachment devices, fasteners, bearing blocks and shims, joint materials, copings, concrete masonry, reinforcing steel, and incidentals.

- C. All labor and equipment required to excavate and prepare the wall foundation, form and cast the leveling pad, erect the prefabricated concrete modular block wall to the lines and grades shown on the Plans, place and connect attachment devices, install the joint materials, install wall drainage, place and compact backfill, and construct any other items necessary to complete the prefabricated concrete modular block wall.
- D. All temporary shoring.

ITEM 997.4

REPAIR HEADWALL

EACH

THIS ITEM IS FOR THE REPAIR OF EXISTING HEADWALLS AT SIX LOCATIONS IN THE TOWN OF ACTON. ADDITIONAL INFORMATION WILL BE INCLUDED AT THE 100% SUBMISSION.