DOCUMENT A00801

DRAFT BTC SPECIAL PROVISIONS

MARION-WAREHAM
Federal Aid Project No. HIP(NGB)-003S(786)X
Bridge Replacement, M-05-001=W-06-013 & W-06-016, Marion Road/Wareham Road (Route 6) over Weweantic River
Design-Build

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

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2024 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control,* the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD) with Revisions 1, 2, and 3 and the November 2022 Massachusetts Amendments to the MUTCD*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

See RFP for full description of Project scope.

SUBITEM NUMBERING

The subitem numbering contained in the Draft BTC Special Provisions is presented for informational purposes only in coordination with MassDOT Standard Nomenclature.

No separate payments will be made for subitems.

PROPRIETARY PRODUCTS

MassDOT has approved the use of the following proprietary products on this Contract pursuant to M.G.L. c. 30, § 39M(b):
[INSERT ITEM NUMBER AND NAME OF PROPRIETARY PRODUCT/SPECIFICATION]

Approval letter has been filed with MassDOT.

LANDSCAPE AND WETLAND DESIGN SPECIAL PROVISIONS

The Design-Builder shall use the lastest Landscape and Wetland Design Special Provisions available from the following link:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

District 5 Utility/Constructability Engineer - Richard Bilski, (857) 368-5073,
Email: Richard.Bilski@dot.state.ma.us

If available, existing bridge plans indicate the location of the existing known utilities in the vicinity of the work. As the accuracy and completeness of the plans are not guaranteed in any manner, it is the Design-Builder's responsibility to make their own investigation to assure that no damage to existing structures, drainage lines, traffic signal conduits, etc., will occur.

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

A list of public and private utilities can be found on the MassDOT website at:
https://www.mass.gov/info-details/utility-contacts-by-district-and-municipality

Select District 5
Select the City/Town, and then locate the utility

The utility contact list is for guidance only and is not guaranteed to be complete or up to date.

Town officials are shown at website https://www.mass.gov/lists/massachusetts-cities-and-towns
and select the required City/Town website.

State Police are shown at website https://www.mass.gov/info-details/massachusetts-state-police-troop-boundaries . Select the area of jurisdiction to find the local station.

The Design-Builder shall inform the following officials in each area that he is assigned to work in: Superintendent, Department of Public Works, or City Engineer. Superintendent, Water Department, Superintendent, Sewer Departments. Police Department, Fire Department, Electric Company, Railroads.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Design-Builder and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Design-Builder shall coordinate with Utility companies that are impacted by the Design-Builder's operations. To support this effort, the Design-Builder shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Design-Builder shall provide copies to the Engineer of the Deign-Builder's communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Design-Builder.
- Providing meeting minutes for all utility-related meetings that the Design-Builder attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Design-Builder.
- Any communication, initiated by the Design-Builder, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

B. PROJECT UTILITY COORDINATION (PUC) FORM

The utility schedule and sequence information provided in the Project Utility Coordination Form (if applicable) is the best available information at the time of the bid and has been considered in setting the contract duration. The Design-Builder shall use all of this information in developing the bid price and the Baseline Schedule Submission, inclusive of the individual utility durations sequencing requirements, and any work that has been noted as potentially concurrent utility installations.

C. INITIATION OF UTILITY WORK

The Engineer will issue all initial notice-to-proceed dates to each Utility company based on either the:

1) Design-Builder's accepted Baseline Schedule
2) An approved Early Utility Request in the form of an Early Utility sub-net schedule (in accordance with the requirements of this Subsection)
3) An approved Proposal Schedule

C.1 - BASELINE SCHEDULE – UTILITY BASIS

The Design-Builder shall provide a Baseline Schedule submission in accordance with the requirements of Subsection 8.02 and inclusive of all of the information provided in the PUC Form that has been issued in the Contract documents. This is to include the utility durations, sequencing of work, allowable concurrent work, and all applicable considerations that have been depicted on the PUC Form.

SUBSECTION 8.14 (Continued)

C.2 – EARLY UTILITY REQUEST – (aka SUBNET SCHEDULE) PRIOR TO THE BASELINE
All early utility work is defined as any anticipated/required utility relocations that need to occur prior to the Baseline Schedule acceptance. In all cases of proposed early utility relocation, the Design-Builder shall present all known information at the pre-construction conference in the form of a 'sub-net' schedule showing when each early utility activity needs to be issued a notice-to-proceed. The Design-Builder shall provide advance notification of this intent to request early utility work in writing at or prior to the Pre-Construction meeting. Prior to officially requesting approval for early utility work, the Design-Builder shall also coordinate with MassDOT and all utility companies (private, state or municipal) which may be impacted by the Contract. If this request is acceptable to the Utilities and to MassDOT, the Engineer will issue a notice-to-proceed to the affected Utilities, based on these accepted dates.

C.3 – PROPOSAL SCHEDULE - CHANGES TO THE PUC FORM
If the Design-Builder intends to submit a schedule (in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02) that contains durations or sequencing that vary from those provided in the Project Utility Coordination (PUC) Form, the Contactor must submit this as an intended change, in the form of a Proposal Schedule and in accordance with MassDOT Standard Specifications, Division I, Subsection 8.02. These proposed changes are subject to the approval of the Engineer and the impacted utilities, in the form of this Proposal Schedule and a proposed revision to the PUC form. The Design-Builder shall not proceed with any changes of this type without written authorization from the Engineer, that references the approved Proposal Schedule and PUC form changes. The submission of the Baseline Schedule should not include any of these types of proposed utility changes and should not delay the submission of the Baseline Schedule. As a prerequisite to the Proposal Schedule submission, and in advance of the utility notification(s) period, the Design-Builder shall coordinate the proposed utility changes with the Engineer and the utility companies, to develop a mutually agreed upon schedule, prior to the start of construction.

D. UTILITY DELAYS
The Design-Builder shall notify the Engineer upon becoming aware that a Utility owner is not advancing the work in accordance with the approved utility schedule. Such notice shall be provided to the Engineer no later than seven (7) calendar days after the occurrence of the event that the Design-Builder believes to be a utility delay. After such notice, the Engineer and the Design-Builder shall continue to diligently seek the Utility Owner's cooperation in performing their scope of Work.

In order to demonstrate that a critical path delay has been caused by a third-party Utility, the Design-Builder must demonstrate, through the requirements of the monthly Progress Schedule submissions and the supporting contract records associated with Subsection 8.02, 8.10 and 8.14, that the delays were beyond the control of the Design-Builder.

SUBSECTION 8.14 (Continued)

All documentation provided in this section is subject to the review and verification of the Engineer and, if required, the Utility Owner. In accordance with MassDOT Specifications, Division I, Subsection 8.10, a Time Extension will be granted for a delay caused by a Utility, only if the actual duration of the utility work is in excess of that shown on the Project Utility Coordination Form, and only if;

1) proper Notification of Delay was provided to MassDOT in accordance with the time requirements that are specified in this Section
2) the utility delay is a critical path impact to the Baseline Schedule (or most recently approved Progress Schedule)

E. LOCATION OF UTILITIES

The locations of existing utilities are shown on the Contract drawings as an approximation only. The Design-Builder shall perform a pre-construction utility survey, including any required test pits, to determine the location of all known utilities no later than thirty (30) calendar days before commencing physical site work in the affected area.

F. POST UTILITY SURVEY – NOTIFICATION

Following completion of a utility survey of existing locations, the Design-Builder will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Design-Builder will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Design-Builder shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Design-Builder should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Design-Builder shall copy the Engineer on any correspondence between the Utility Owner and the Design-Builder.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Design-Builder as the work progresses.

I. ACCESS AND INSPECTION

The Design-Builder shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Design-Builder shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

NATIONAL GRID EMERGENCY TELEPHONE NUMBERS

GAS:
Emergency: 1-800-233-5325
New Service: 1- 877-696-4743
Customer Support: 1-800-732-3400

ELECTRIC:
Outage/ Emergency: 1-800-465-1212
New Service: 1-800-375-7405
Customer Support: 1-800-322-3223

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

GAS:
Outage/ Emergency: 800-592-2000
New Service: 866-678-2744
Customer Support: 800-592-2000

ELECTRIC:
Outage/ Emergency: 800-592-2000 or 844-726-7562
New Service: 1-888-633-3797 (1-888-need pwr)
Customer Support: 1-800-340-9822

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT
(Supplementing Subsection 7.01)

On all projects, the "Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment" Regulation (2 CFR 200.216) prohibits the Design-Builder from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Design-Builder certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Design-Builder shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Design-Builder.

BUILD AMERICA BUY AMERICA PREFERENCE

On Federally-aid projects the Buy America (23.CFR § 635.410) and Build America, Buy America Act (Pub. L. No. 117-58, §§ 70901-52). requires the following,

(1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, must occur in the United States. Foreign steel and iron can be used if the cost of the materials does not exceed 0.1% of the total Contract cost or $2,500, whichever is greater. The action of applying a coating to a covered material (i.e., steel and iron) is deemed a manufacturing process subject to Buy America. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to requirements of Build America, Buy America. Steel used for temporary support of excavation, including H piles, soldier piles, and sheeting when the steel is required to be left in place is subject to requirements of Build America, Buy America. Temporary steel shall remain in place when it falls within the influence zone of the soil supporting any structure or railroad tracks.

(2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and

(3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States. “Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:

- non-ferrous metals,
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables),
- glass (including optic glass),
- lumber; or
- drywall.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

NOTE: The requirements for manufactured products indicated in paragraph (2) above are not in effect for this contract.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL
(02/06/2020)

Demolition and work involving painted steel shall conform to the requirements of Subsection 961 of the Standard Specifications.

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 Design-Builder shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The Design-Builder 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.

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 Subsections 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 may be used in lieu of a decontamination/changing facility.

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

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

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL (Continued)

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 Subsection 961.67 "Containment". Full containment is not required during chemical stripping operation however; the Design-Builder 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 Design-Builder 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 Design-Builder shall supply electrical power.

The Design-Builder 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.

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 Design-Builder 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 30µg/m3.

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

The Design-Builder 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.

PIGEON WASTE

The Design-Builder shall remove and dispose of the pigeon waste and any other debris accumulated on the steel members and bridge seats in areas where work is being performed. Pigeon waste and debris material contaminants will require special handling and disposal in accordance with all Federal, state, and local requirements. No separate payment will be made for removal and disposal of pigeon waste. Cost shall be incidental to the contract pay items.

EMERALD ASH BORER ADVISORY

To the extent possible, all trees and brush shall be disposed of on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, Design-Builder shall identify proposed location for disposal, and provide written notification to the Engineer for approval. Disposal shall be in city or town of project, or at minimum, within county, of construction operations.

SUBITEM 102.3	**HERBICIDE TREATMENT OF INVASIVE PLANTS**
SUBITEM 102.33	**INVASIVE PLANT MANAGEMENT STRATEGY**
SUBITEM 102.511	**TREE PROTECTION - ARMORING AND PRUNING**
SUBITEM 102.513	**AIR EXCAVATION AND ROOT PRUNING**
SUBITEM 102.521	**TREE AND PLANT PROTECTION FENCE**
SUBITEM 102.531	**TREE CARE - PRUNING**
SUBITEM 102.533	**TREE CARE - WATERING**

The Design-Builder is directed to:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions for Landscaping Item Special Provisions.

MassDOT Landscape Design Section Contact, Robbin Bergfors: robbin.bergfors@dot.state.ma.us

As part of the Invasive Plant Management Strategy, the Design-Builder shall submit mapping showing the field delineations, restrictions and setbacks from natural resources and water supplies as required and as described in 333 CMR 11.00 for herbicide applications. The mapping, field delineations and setbacks shall be approved prior to plan approval.

The Design-Builder is directed to:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions
for Landscaping Item Special Provisions.

BASIS OF PAYMENT

No separate payment will be made for Subitems 102.3, 102.33, 102.511, 102.513, 102.521, 102.531, and 102.533, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3

ITEM 115.1	**DEMOLITION OF BRIDGE NO. M-05-001=W-06-013**	**LUMP SUM**
ITEM 115.2	**DEMOLITION OF BRIDGE NO. W-06-016**	**LUMP SUM**

DESCRIPTION

The work under these items shall conform to the relevant provisions of Subsection 112 of the Standard Specifications, the Plans, and the following:

The Design-Builder shall refer to demolition requirements provided in the RFP Volume II – Technical Provisions. In the event of conflict between these special provisions and the RFP, the RFP requirements shall govern.

The work to be done under these items shall consist of furnishing all labor, materials, and equipment necessary for the full and partial removal (superstructure and substructure) and satisfactory disposal of the existing bridges M-05-001=W-06-013 (CBJ), and W-06-016 (CBH).

Removal of barrier and railings that extent onto wingwalls or any other items associated with the bridge structures is considered incidental.

Limits of demolition are a minimum of two feet below grade or as indicated on the BTC Plans. All materials removed in this demolition shall become the property of the Design-Builder and shall be recycled, reused, or disposed of in accordance with all applicable Local, State, and Federal requirements.

It is anticipated that shielding, tarps etc. will be required during certain construction and demolition activities. All such materials required shall be considered incidental to this item and no separate payment is included for this protection.

The Design-Builder must ensure that all concrete, reinforcing steel, structural steel, lead paint chips, dust or particles and any other demolition materials will be prevented from falling into Weweantic River, roadway, or other areas below. Any material that falls below during the demolition process shall be removed immediately and at the Contractor's expense.

Temporary Protective shielding may be used in conjunction with this demolition and if used considered incidental to this item and no additional compensation shall be given for temporary protective shielding. Debris from construction must be carefully contained within the work zones. The Design-Builder shall be required to remove any debris generated from construction from the site immediately and to restore portions of the site affected by the operation to their original undisturbed condition or better. Removal of debris generated by demolition and construction will be performed at the Contractor's own expense.

The Contractor shall be responsible for dust control as a result of the demolition operations. Dust shall be collected and removed from the site. Under no circumstances shall dust be allowed to settle on the river. If dust or other material is found to be entering the river as a result of the Contractor's operation, all operations shall cease until the Design-Builder has remedied the shielding. No work shall begin again without the approval of the Engineer.

ITEMS 115.1 AND 115.2 (Continued)

The Contractor shall be solely responsible for maintaining the stability of the existing structure at all times during the demolition and construction operations.

Prior to the commencement of work for this item, the Design-Builder shall submit approved demolition plans for MassDOT acceptance to ensure that demolition material is contained and that any areas below are not damaged. Plans for any lane closure shall be submitted for approval should the Contractor elect this procedure. Proposed hours, duration, and procedures for contacting MassDOT, town/city, and emergency facilities shall be identified.

The Design-Builder is responsible to validate the proposed limits of demolition and support required to maintain the integrity of the bridge structure to remain. Particular attention is required to the limits of staged demolition. The temporary slab support system shall be paid for under the Lump Sum 995.01. Items and any temporary deck repairs shall be paid for under Items 127.4, 127.41, and 909.5.

If the Contractor intends to place cranes directly adjacent to the existing structure, stability calculations shall be performed checking the structure is stable during all stages of the structure removal for which the crane is utilized. If the Contractor intends to place cranes or equipment directly supported by the existing structure, strength and stability calculations shall be performed checking the structure is stable and has adequate strength during all stages of the structure removal for which the crane or equipment is utilized. Calculations shall use all intended construction.

The use of explosives or blasting to accomplish any aspect of the demolition work is expressly prohibited.

The Contractor's demolition method shall take into consideration any utilities and drainage structures near the bridge. The Design-Builder shall be responsible for protecting any existing utilities that pass over, under and/or are attached to the bridge from any damage.

The Contractor shall take care not to damage any adjacent structures that have been designated to remain permanently or during staged construction or newly constructed bridge elements. Any damage shall be repaired by the Contractor to the satisfaction of the Engineer at the Contractor's expense.

The work under this item shall also include removal and disposal of any existing protective shielding or temporary shoring that may be suspended from and supporting the existing bridge to prevent material and debris from falling on the road below.

The Contractor is advised to conduct a field investigation prior to submission of Proposal. The Design-Builder shall verify all conditions, dimensions, and materials in the field and shall base their proposal on their own findings without any additional compensation for variances from the BTC Plans, RFP, or these Special Provisions regarding actual conditions for the materials to be removed. MassDOT does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on the Plans. No additional compensation, other than the Lump Sum Bid Price for this Item, shall be made if the materials or work proves to be different from that inferred or described herein, or shown on any Plans. Plans of the existing structure are provided in Volume II, Appendix C.

ITEMS 115.1 AND 115.2 (Continued)

Any demolition work in the river shall be in accordance with the environmental permit documents that requires turbidity screens, material handling, material storage, and other related items which are considered incidental to this Item.

Pier demolition in the river shall be performed within cofferdam structures to contain the work and to prevent debris fallout into the river.

The Contractor's methodology shall make every effort to capture debris from falling into the river. Any debris that does fall into the open water shall be immediately removed.

Disposal Of Treated Timber Products

The timber components (such as existing shielding and timber piles) of the existing bridges are suspected to be treated with creosote pentachlorophenol and/or CCA. The costs for all sampling, laboratory testing, loading, transportation, and disposal of the treated wood shall be included under Item 184.1. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of Disposal of Treated Wood Products are to be completed in accordance with state and federal regulations.

REINFORCED CONCRETE EXCAVATION

The work to be done shall conform to the relevant provisions of Subsections 112, 120, and 140 of the Standard Specifications and the following:

Reinforced Concrete Excavation shall include sawcutting, excavation, and partial or full removal of the existing reinforced concrete abutments, piers, and wingwalls. The limits of concrete removal shall be as indicated on the plans or as directed by the Engineer. In addition, the Contractor is required to remove all dust, loose concrete and debris encountered as part of the excavation prior to installation of the new concrete.

Portions of substructures to be removed may be abandoned in place in accordance with Subsection 112 of the Standard Specifications if they do not interfere with proposed construction.

All concrete materials removed by shall become the property of the Contractor and shall be properly disposed away from the work site. Excavation shall include the removal of unsound concrete, loose concrete, dust, and other foreign matter, prior to applying bonding compound.

ITEMS 115.1 AND 115.2 (Continued)

The edges of final surfaces where concrete is to be partially removed under this Item (Bridge No. M-05-001=W-06-013 (CBJ) and W-06-016 (CBH)) shall be sawcut to a depth of 1 inch with an approved power saw capable of making straight cuts. Re-entrant corners shall not be allowed. All costs in connection with saw cutting shall be considered incidental to this Item.

The Contractor's operations shall not result in any damage to adjacent structures or foundations. Any damage to adjacent structures that are to remain that are damaged as a result of the Contractor's operations, shall be repaired by the Contractor as required by the Engineer and at no additional expense.

The Contractor shall take all measures necessary to ensure that concrete, reinforcing steel, other demolition materials, tools and equipment will be prevented from falling or entering any roadway, waterway, or other area below and shall submit a plan, schedule and procedure for approval prior to performing the work. All materials, equipment, labor, etc. to accomplish this task shall be considered incidental to this Item.

Temporary Protective Shielding

The Contractor shall take care to ensure that any equipment, tools, or materials do not fall into the river or adjacent travel ways. This shall be accomplished by the utilization of adequate shielding placed beneath the existing superstructure prior to demolition.

All shielding shall meet the following requirements:

1. The Contractor is responsible for designing, furnishing, installing, and maintaining the shielding. When directed by the Engineer, the Contractor shall remove and dispose of the shielding to the satisfaction of the Engineer.

2. The Contractor shall submit drawings and calculations, stamped by a Professional Engineer Registered in the Commonwealth of Massachusetts, for the proposed shielding to MassDOT for approval prior to installation. The drawings shall include details of all connections, brackets, and fasteners.

3. No portion of the existing structure shall be removed until required Protective Shielding is completely in place and the Contractor has approval from MassDOT to proceed.

4. The shielding shall extend the full length of the bridge span and a sufficient distance above and beyond as required to protect the areas below. All spaces along the perimeter of the shielding and at the seams shall be sealed to prevent dust and debris from escaping and falling below.

ITEMS 115.1 AND 115.2 (Continued)

Shielding shall be designed to safely withstand all loads that it will be subjected to. The allowable design stresses shall be in accordance with the AASHTO LRFD Bridge Design Specifications, current edition. The design shall include a complete description of equipment and construction methods proposed for the concrete removal and the maximum size of concrete piece that will be excavated (i.e. 12-inch x 12-inch jack hammered sections or 6-foot x 2-foot wet saw cut sections). Shielding shall also be designed to withstand the impact imparted by the maximum sized piece of excavated concrete should it fall during excavation or removal. The shielding shall remain the property of the Contractor and shall be removed from the site when no longer needed. If the Contractor's operations damage any existing portions of previously installed shielding, such damage(s) shall be repaired at the Contractor's expense.

SUBMITTALS

Submission requirements are provided in the RFP Volume II – Technical Provisions.

Any change to the demolition procedure will require prior review by MassDOT.

The Design-Builder shall not proceed with demolition until MassDOT has given written acceptance Issue for Construction of the demolition plan. Note: Any acceptance or approvals for Issue for Construction of the above submissions by MassDOT shall not relieve the Contractor from responsibility for all demolition procedures and operations.

Any change to this demolition procedure will require prior review by MassDOT.

The Contractor shall not proceed with demolition until MassDOT has given written acceptance Issue for Construction of the demolition plan.

JOBSITE CONDITIONS

Prior to the start of demolition of the structures the Contractor shall have a written verification from Utility Companies and Municipal Departments and Agencies that all utilities have been removed or abandoned in place or that the contacted organization has no active utilities on the structures or on or within the bay in the vicinity of the bridge. Furnish MassDOT with a copy of the verification.

All existing utilities located on the bridges shall be detached from the existing structures and permanently relocated or temporarily supported and protected during demolition, then reattached to the new structures. The facilities which adjoin the structures to be demolished shall be protected and the Contractor shall leave the same in a safe and satisfactory condition.

BASIS OF PAYMENT

Item 115.1 and 115.2 will be paid at the respective contract Lump Sum bid price, which price shall include all labor, materials, equipment, and incidental costs required to complete the demolition of each bridge.

SUBITEM 119.5 CONSTRUCTION NOISE CONTROL

Work under this subitem shall conform to the relevant provisions of Subsection 850 of the Standard Specifications, and the following:

1.1. GENERAL

A. The intent of this subitem is to minimize construction noise within construction areas, lay- down areas, and communities adjacent to the construction site. To this end, the Design-Builder and all subcontractors, suppliers, and vendors, are required to comply with all applicable local noise regulations, specification requirements, and the noise level limits specified herein.

B. This subitem specifies requirements for response to community complaints. All requirements of this subitem, if needed during performance of the Work, will be overseen by an approved Acoustical Engineer employed by the Design-Builder.

C. The Design-Builder will use equipment with efficient noise-suppression devices and employ other noise abatement measures such as enclosures and barriers necessary for the protection of the public. In addition, the Design-Builder will schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the Work and to occupants of buildings in the vicinity of the Work.

D. In no case will the restrictions identified in this Section limit the Design-Builder's responsibility for compliance with all Federal, state, and local safety ordinances and regulations.

1.2. TERMS USED

A. Noise is any audible sound which has the potential to annoy or disturb humans, or to cause an adverse psychological or physiological effect on humans.

B. Daytime refers to the period from 7 AM to 6 PM local time daily, except Sundays and Federal holidays.

C. Evening refers to the period from 6 PM to 10 PM local time daily, except Sundays and Federal holidays.

D. Nighttime refers to the period from 10 PM to 7 AM local time daily, as well as all day Sunday and Federal holidays.

E. Noise-Sensitive Locations shall mean locations where particular sensitivities to noise exist, such as residential areas, institutions, hospitals, and parks.

F. Nuisance Noise refers to sound levels that annoy or disturb a reasonable person of normal sensitivities, but do not exceed the noise limits specified herein.

SUBITEM 119.5 (Continued)

G. Lot-line refers to the line separating a parcel of land from another parcel or from the street.

H. Background Noise will be defined as the measured ambient noise level associated with all existing environmental, transportation, and community noise sources in the absence of any audible construction activity.

I. dBa will be defined as the sound level (in decibels referenced to 20 micro-pascals) as measured using the A-weighting network on a sound level meter, in accordance with ANSI S1.4 Standards.

J. Lmax will be defined as the maximum measured sound level at any instant in time.

K. Leq will be defined as the equivalent sound level, or the continuous sound level that represents the same sound energy as the varying sound levels, over a specified monitoring period.

L. L10 will be defined as the sound level exceeded 10 percent of the time for a specified monitoring period.

M. Slow specifies a time constant or 1 second for the root-mean-square (RMS) detector used by a sound level meter, in accordance with ANSI S1.4 Standards.

N. Impact noise is noise produced from impact or devices with discernible separation in sound pressure maxima. Examples for impact equipment include but are not limited to blasting, clam shovel or chisel drops, pavement breakers, jackhammers, hoe rams, mounted impact hammers, and impact pile drivers (but not vibratory pile drivers). Table 2 specifies types of equipment which are considered to emit impact or continuous noise.

1.3. SUBMITTALS

A. Submit (as needed) the name, address, and qualifications of the Acoustical Engineer, as specified in Article 1.5 of this Section for review and acceptance.

B. Develop and submit for approval, a Noise Control Plan (NCP) that outlines in detail, the measures to be implemented by the Design-Builder to comply with this Section. Any modifications to the approved NCP must be submitted for review and approval prior to implementation.

C. Submit (as needed) shop and working drawings, computations, material data, and other descriptions for abatement measures used as Temporary Noise Barriers, Acoustical Barrier Enclosures, or Noise Control Curtains as specified in Articles 2.3, 2.4, 2.5 of this Section. Drawings and computations will be stamped by a Registered Professional Engineer in the Commonwealth of Massachusetts.

SUBITEM 119.5 (Continued)

1.4. CONSTRUCTION LIMITATIONS

A. Noise Levels

1. Daytime, evening, and nighttime construction noise levels at noise-sensitive locations and other noise monitoring locations will not exceed the limits specified in Table 1 or 5 dBA over surrounding background noise levels, unless the noise exceedances occur when mitigation consistent with this specification is utilized, as determined by MassDOT. The lot-line criteria will apply to all points on a given lot-line of an affected receptor.

2. In addition, equipment operating under full load shall not exceed the Lmax noise limits specified in Table 2, unless noise exceedances occur when mitigation consistent with this specification is utilized, as determined by MassDOT. The 50-feet noise emission limits specified in Table 2 will apply to the entire operation in which the equipment is engaged. Table 2 also provides distinction as to which equipment is considered to emit impact or continuous noise.

3. Work shall be performed in a manner to prevent nuisance conditions such as noise which exhibits a specific audible frequency or tone (e.g., backup alarms, unmaintained equipment, brake squeal) or impact noise (e.g., jackhammers, hoe rams). MassDOT shall make any final interpretation concerning whether or not nuisance noise conditions exist. MassDOT has the authority to stop the Work until nuisance noise conditions are resolved, without additional time or compensation for the Design-Builder.

B. Equipment Operations

1. If night work is allowed by MassDOT, vibratory pile driving shall be prohibited during the nighttime period (i.e. 10 PM to 7 AM as defined in Article 1.2).

2. If night work is allowed by MassDOT, the use of all impact devices, including hoe rams, jackhammers, chiseling devices, and pavement breakers, shall be prohibited during the nighttime hours (i.e. 10 PM to 7 AM). Any necessary use of impact devices between 10 PM and 7 AM must be reviewed by the Engineer in advance and allowed as an exception only upon sufficient justification.

3. The Design-Builder shall use approved haul routes to minimize noise at residential and other sensitive noise receptor sites.

SUBITEM 119.5 (Continued)

4. If night work is allowed by MassDOT, all equipment with backup alarms operated during the hours of 10 PM to 7 AM by the Design-Builder, vendors, suppliers, and Subcontractors on the construction site shall be equipped with either audible self- adjusting ambient-sensitive backup alarms or manually-adjustable alarms. The ambient-sensitive alarms shall automatically adjust to a maximum of 5 dBA over the surrounding background noise levels. The manually-adjustable alarms shall be set at the lowest setting required to be audible above the surrounding noise. Installation and use of the alarms shall be consistent with the performance requirements of the current revisions of Society of Automotive Engineering (SAE) J994, J1446, and OSHA regulations.

    a. Or, if work is allowed by MassDOT between the hours of 1O PM to 7 AM, the Design-Builder will use in lieu of audible backup alarms an appropriate alternative safety method in accordance with OSHA regulations (29 CFR Part l926, Subpart "O", l926.6Ol.b.4 and l926.6O2.a.9.) and accepted Health and Safety Plan that is to be submitted by the Design-Builder. This applies to all vehicles and equipment operated by the Design-Builder, vendors, suppliers, and Subcontractors on the construction site.

5. Per State regulations, engine idling for trucks is limited to 5 minutes maximum.

1.5. ACOUSTICAL ENGINEER

A. The Acoustical Engineer identified in this Article shall oversee all requirements of this Section.

B. The Acoustical Engineer shall have the following minimal qualifications:

1. Bachelor of Science or higher degree from a qualified program in engineering, physics, or architecture offered by an accredited university or college, and five years' experience in noise control engineering and construction noise analysis; or current enrollment as a full Member or Board-certified Member in the Institute of Noise Control Engineering (INCE).

2. Demonstrated substantial and responsible experience in preparing and implementing construction noise controls and monitoring plans on construction projects conducted in an urban setting, calculating construction noise levels, and designing and overseeing the implementation of construction noise abatement measures.

C. If at any point, in the judgment of the Engineer, the quality of the Acoustical Engineer's submittals proves to be repeatedly unacceptable, then the Engineer can require the submittal and selection of an alternative Acoustical Engineer meeting the requirements in this Article.

SUBITEM 119.5 (Continued)

MATERIALS

2.1 GENERAL

A. All equipment and materials specified in this part will remain the property of the Design-Builder or Design-Builder's subcontractors, vendors, and suppliers, as applicable.

2.2 NOISE REDUCTION MATERIALS AND EQUIPMENT

A. Noise reduction materials may be new or used. Used materials shall be of a quality and condition to perform their designed function.

B. Noise reduction equipment and materials may include, but not be limited to:

1. Shields, shrouds, or intake and exhaust mufflers.

2. Noise-deadening material to line hoppers, conveyor transfer points, storage bins, or chutes.

3. Noise barriers using materials consistent with the Temporary Noise Barrier materials specified in Article 2.3 of this Section.

4. Noise curtains using materials consistent with the Noise Control Curtains materials specified in Article 2.5 of this Section.

C. If work between the hours of 10 PM and 7 AM is allowed by the Engineer, all equipment with backup alarms operated during the hours of 10 PM to 7 AM by the Design-Builder, vendors, suppliers, and subcontractors on the construction site will be equipped with either audible self-adjusting ambient-sensitive backup alarms or manually-adjustable alarms. The ambient-sensitive alarms shall automatically adjust to a maximum of 5 dBA over the surrounding background noise levels. The manually-adjustable alarms shall be set at the lowest setting required to be audible above the surrounding noise. Installation and use of the alarms shall be consistent with the performance requirements of the current revisions of Society of Automotive Engineering (SAE) J994, J1446, and OSHA regulations.

D. All equipment used on the construction site, including jackhammers and pavement breakers, shall have exhaust systems and mufflers that have been recommended by the manufacturer as having the lowest associated noise.

E. The local power grid shall be used wherever feasible to limit generator noise. Where a generator is necessary, it will have the maximum noise muffling capability recommended by the manufacturer to meet the noise emission limits specified in Table 2.

SUBITEM 119.5 (Continued)

2.3 TEMPORARY NOISE BARRIERS

A. Materials

1. Temporary barriers shall be constructed of 3/4-inch Medium Density Overlay (MDO) plywood sheeting, or other material of equivalent utility and appearance having a surface weight of two pounds per square foot (2 lbs/sq.ft.) or greater. The temporary noise barriers shall have a Sound Transmission Class of STC-30, or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90.

2. The temporary barriers shall be lined on one side with glass fiber, mineral wool, or other similar noise curtain type noise-absorbing material at least 2-inches thick and have a Noise Reduction Coefficient rating of NRC-0.85, or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

3. The materials used for temporary barriers shall be sufficient to last through the duration of construction for this Contract and will be maintained in good repair.

B. Construction Details

1. Barrier panels shall be attached to support frames constructed in sections to provide a moveable barrier utilizing the standard "Temporary Precast Concrete Median Barrier" for the Project, or other supports designed to withstand 80 mph wind loads plus a 30 percent gust factor.

2. When barrier units are joined together, the mating surfaces of the barrier sides shall be flush with each other. Gaps between barrier units, and between the bottom edge of the barrier panels and the ground, shall be closed with material that will completely fill the gaps, and be dense enough to attenuate noise.

3. The barrier height will be designed to break the line-of-sight and provide at least a 5 dBA insertion loss between the noise producing equipment and the upper-most story of the receptor(s) requiring noise mitigation. If for practicality or feasibility reasons, which are subject to the review and approval of MassDOT, a barrier cannot be built to provide noise relief to all stories, then it must be built to the tallest achievable height.

C. Prefabricated acoustic barriers are available from various vendors. An equivalent barrier design can be submitted as specified in Paragraph 1.3 in lieu of the plywood barrier described above.

SUBITEM 119.5 (Continued)

2.4 ACOUSTICAL BARRIER ENCLOSURES

A. Materials

1. The acoustical barrier enclosure shall consist of durable, flexible composite material featuring a noise barrier layer bonded to sound-absorptive material on one side.

2. The noise barrier layer shall consist of rugged, impervious material with a surface weight of at least one pound per square foot (1 lbs/sq.ft.). The sound absorptive material shall include a protective face and be securely attached to one side of the flexible barrier over the entire face.

3. The acoustical material used shall be weather and abuse resistant, and exhibit superior hanging and tear strength during construction. The material shall have a minimum breaking strength of 120 lb/in. per FTMS 191 A-M5102 and minimum tear strength of 30 lb/in. per ASTM D117. Based on the same test procedures, the absorptive material facing shall have a minimum breaking strength of 100 lb/in. and a minimum tear strength of 7 lb/in.

4. The acoustical material shall be corrosion resistant to most acids, mild alkalis, road salts, oils, and grease.

5. The acoustical material shall be fire retardant and be approved by the local fire department with jurisdiction over the proposed location for installation (City of Lowell Fire Department) prior to procurement. It shall also be mildew resistant, vermin proof, and non-hygroscopic.

6. The acoustical material shall have a Sound Transmission Class of STC-25 or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90. It shall also have a Noise Reduction Coefficient rating of NRC-0.70 or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

7. The Design-Builder shall submit the name of the manufacturer, properties of the material to be furnished, and two one-foot square samples to MassDOT for review prior to submittal of design and detailed engineering as specified in Paragraph 1.3.

SUBITEM 119.5 (Continued)

B. Construction Details

1. The acoustical barrier enclosure shall be designed to effectively cover a noise producing source to reduce noise affecting nearby noise-sensitive receptors.

2. The acoustical material shall be installed in vertical and horizontal segments with the vertical segments extending the full enclosure height. All seams and joints shall have a minimum overlap of 2 inches and be sealed using double grommets. Construction details shall be performed according to the manufacturer's recommendations.

3. The Design-Builder shall be responsible for the design, detailing, and adequacy of the framework and supports, ties, attachment methods, and other appurtenances required for the proper construction of the acoustical barrier enclosure.

4. The design and details for the acoustical noise barrier enclosure framework and supports shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Design-Builder shall submit the design and detailed engineering drawings to MassDOT as specified in Paragraph 1.3.

2.5 NOISE CONTROL CURTAINS

A. Materials

1. The noise control curtain shall consist of durable, flexible composite material featuring a noise barrier layer bonded to sound-absorptive material on one side. The noise barrier layer shall consist of a rugged, impervious material with a surface weight of at least one pound per square foot (1 lbs/sq.ft). The sound absorptive material shall include a protective face and be securely attached to one side of the flexible barrier over the entire face.

2. The noise curtain material used shall be weather and abuse resistant, and exhibit superior hanging and tear strength during construction. The curtain’s noise barrier layer material shall have a minimum breaking strength of 120 lb/in. per FTMS 191 A-M5102 and minimum tear strength of 30 lb/in. per ASTM D117. Based on the same test procedures, the noise curtain absorptive material facing shall have a minimum breaking strength of 100 lb/in. and a minimum tear strength of 7 lb/in.

3. The noise curtain material shall be corrosion resistant to most acids, mild alkalies, road salts, oils, and grease. It also will be mildew resistant, vermin proof, and non-hygroscopic.

4. The noise curtain material shall be fire retardant and be approved by the local fire department with jurisdiction over the proposed location for installation (City of Lowell Fire Departments) prior to procurement.

SUBITEM 119.5 (Continued)

5. Noise control curtain shall have a Sound Transmission Class of STC-30 or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90. It shall also have a Noise Reduction Coefficient rating of NRC-0.85 or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

6. The Design-Builder shall submit the name of the manufacturer, properties of the material to be furnished, and two one-foot square samples to MassDOT for review prior to submittal of the design and detailed engineering drawings as specified in Paragraph 1.3.

B. Construction Details

1. The noise control curtains shall be designed to effectively reduce noise affecting nearby noise-sensitive receptors. The curtains shall be secured above, at the ground, and at intermediate points by framework and supports designed to withstand 80 mph wind loads plus a 30 percent gust factor.

2. The curtains shall be installed in vertical and horizontal segments with the vertical segments extending the full curtain height to the ground. All seams and joints shall have a minimum overlap of 2 inches and be sealed using Velcro or double grommets spaced 12 inches on center. Curtains shall be fastened to framework and guardrails with wire cable 12 inches on center. Construction details shall be performed according to the manufacturer's recommendations.

3. The curtain height shall be designed to break the line-of-sight and provide at least a 5 dBA insertion loss between the noise producing equipment and the upper-most story of the receptor(s) requiring noise mitigation. If for practicality or feasibility reasons, which are subject to the review and approval of the Engineer, a curtain system cannot be built to provide noise relief to all stories, then it must be built to the tallest achievable height.

4. The Design-Builder shall be responsible for the design, detailing, and adequacy of the framework and supports, ties, attachment methods, and other appurtenances required for the proper installation of the noise control curtains.

5. The design and details for the noise control curtains framework and supports shall be prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts. The Design-Builder shall submit the design and detailed engineering drawings to the Engineer as specified in Paragraph 1.3.

SUBITEM 119.5 (Continued)

CONSTRUCTION METHODS

3.1 NOISE REDUCTION METHODS

A. The Design-Builder shall use all reasonable efforts to implement the noise reduction methods listed below to minimize construction noise emission levels. Noise reduction methods shall include, but not be limited to:

1. Use of: 1) concrete crushers or pavement saws for concrete deck removal, demolitions, or similar construction activity; 2) pre-augering equipment to reduce the duration of impact or vibratory pile driving; 3) local power grid to reduce the use of generators.

2. Attaching: 1) intake and exhaust mufflers, shields, or shrouds; 2) noise-deadening material to inside of hoppers, conveyor transfer points, or chutes.

3. Maintaining: 1) equipment mufflers and lubrication; 2) precast decking or plates; 3) on-site roadways to minimize surface irregularities to prevent unnecessary noise.

4. Limiting: 1) the number and duration of equipment idling on the site; 2) the use of annunciators or public address systems; 3) the use of air- or gasoline-driven hand tools.

5. Configuring, to the extent feasible: 1) the construction site in a manner that keeps loud equipment and activities as far as possible from noise-sensitive locations; 2) barrels or signage to detour traffic away from plated trenches.

6. Scheduling of construction events and limiting usage times to minimize noise, especially during nighttime hours and near sensitive abutters.

7. Constructing noise barriers and/or noise curtain systems.

8. Minimizing noise from the use of backup alarms using measures that meet OSHA regulations. This includes use of self-adjusting ambient-sensitive backup alarms, manually-adjustable alarms on low setting, use of observers, and scheduling of activities so that alarm noise is minimized.

9. Where practical and feasible, configuring construction sites to minimize backup alarm noise. For example, construction site access should be designed such that delivery and dump trucks move through the site in a forward manner without the need to back up.

10. Preventing nuisance noise conditions such as from squealing equipment, backup alarms, radios and public address systems, etc.

11. Using variable message and sign boards that are solar powered or connected to the local power grid.

SUBITEM 119.5 (Continued)

3.2 COMPLAINT PROCEDURE

A. To facilitate the handling of potential noise complaints, the Community Liaisons designated by each of the local communities shall serve as the project liaisons during construction. The Community Liaisons shall forward any complaints to the Design-Builder team and the Engineer.

B. The objective of the complaint procedure is to ensure that public and agency complaints are addressed and resolved consistently and expeditiously.

C. If the Design-Builder receives a complaint regarding construction noise, the Design-Builder shall immediately notify the Acoustical Engineer and contact the Engineer.

D. In the event that noise levels measured by the Design-Builder's Acoustical Engineer exceed allowable limits as specified in Article 1.4 of this Section, or work being performed under this contract is resulting in nuisance conditions as determined by the Engineer, the Design-Builder shall immediately use noise reduction materials and methods as described in Article 3.1 to reduce noise levels or to alleviate the nuisance conditions.

3.3 TEMPORARY NOISE BARRIERS

A. General

1. The Design-Builder shall erect temporary noise barriers to mitigate construction noise at locations per the NCP and/or as directed by the Engineer.

2. The temporary noise barriers shall be readily moveable so that they may be re-positioned, as necessary, to provide noise abatement for non-stationary, as well as stationary, processes.

B. Installation, Maintenance, and Removal

1. The barriers shall be installed such that the noise-absorptive surfaces face the construction noise source.

2. The Design-Builder shall maintain the temporary noise barriers and repair all damage that occurs, including, but not limited to, keeping barriers clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the barriers, and openings between or under the units, shall be repaired promptly or replaced by the Design-Builder with new material.

3. The Design-Builder shall remove and dispose of the temporary noise barriers at the end of the Contract or sooner at the direction of the Engineer.

SUBITEM 119.5 (Continued)

3.4 ACOUSTICAL BARRIER ENCLOSURES

A. General

1. The Design-Builder shall erect acoustical barrier enclosures to mitigate construction noise at locations per the NCP, as required in construction drawings, and/or as directed by the Engineer.

2. The acoustical barrier enclosures shall be readily moveable so that they may be repositioned, as necessary, to provide noise abatement for non-stationary equipment (e.g., jackhammers, chain saws, compressors).

B. Installation, Maintenance, and Removal

1. The acoustical enclosure shall be installed such that the noise-absorptive surfaces face the construction noise source.

2. The Design-Builder shall maintain the acoustical barrier enclosures and repair all damage that occurs, including, but not limited to, keeping barriers clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the acoustical enclosure, and openings between or under the panels, shall be repaired promptly or replaced by the Design-Builder with new material. Construction work shall not proceed until repairs are made.

3. The Design-Builder shall remove and dispose of the acoustical enclosure at the end of the Contract, or sooner at the direction of the Engineer.

3.5 NOISE CONTROL CURTAINS

A. General

1. The Design-Builder shall erect noise control curtains to mitigate construction noise at locations specified in construction drawings, per the NCP, and/or as directed by the Engineer.

2. Noise control curtains shall particularly be used for short-term operations (e.g., less than 3 months), or where vehicular or pedestrian access is required during the day, or as directed by the Engineer.

B. Installation, Maintenance, and Removal

1. The noise control curtains shall be installed without any gaps such that the sound- absorptive side faces the construction activity to be shielded. The curtains shall be supported by the existing elevated roadway, bridge spans, or other methods identified by the Design-Builder.

SUBITEM 119.5 (Continued)

2. The Design-Builder shall maintain the noise control curtains and repair all damage that occurs including, but not limited to, keeping noise control curtains clean and free from graffiti and maintaining structural integrity. Gaps, holes, and weaknesses in the noise control curtains, and openings between or under the panels, shall be repaired promptly or replaced by the Design-Builder with new material. Construction work that shall produce noise exceeding the established thresholds without the noise control curtains in place shall not proceed until such repairs are made.

3. The Design-Builder shall remove and dispose of the noise control curtains at the end of the Contract, or sooner at the direction of the Engineer.

TABLE 1. CONSTRUCTION NOISE LOT- LINE LIMITS IN dBA

Period of the Day	Hours	Land-use	Non-Impact Equipment		Impact Equipment	
			Leq	Lmax	Leq[a]	Lmax
Daytime	7:00 am to 6:00 pm	Noise-sensitive	70	85	n/a	90
		Commercial	77	--	n/a	--
		Industrial	82	--	n/a	--
Evening	6:00 pm to 10:00 pm	Noise-sensitive	62	80	n/a	80
Nighttime	10:00 pm to 7:00 am	Noise-sensitive (BL^e < 70 dBA)	60	75	n/a	80

NOTES:

(a) Noise from impact equipment is exempt from the Leq requirement, however is still subject to a lot-line Lmax limit.

(b) All measurements shall be taken at the affected lot-line. In situations where the work site is within 50 feet of a lot-line, the measurement shall be taken from a point along the lot- line such that a distance of 50 feet is maintained between the sound level meter and the construction activity being monitored.

(c) Lot-line noise limits shall apply to all points along the receptor's lot-line.

(d) Leq noise readings are averaged over 20 minute intervals. Lmax noise readings occur instantaneously.

(e) BL is the average baseline or background measured in Leq.

SUBITEM 119.5 (Continued)

TABLE 2. CONSTRUCTION EQUIPMENT 50-FEET NOISE EMISSION LIMITS (a), (b)

Equipment Category	Lmax Noise Limit at 50 ft, dBA, slow	Is Equipment an Impact Device? (c)	Acoustic Usage Factor (d)
All other equipment > 5 HP	85	No	50 %
Auger Drill Rig	84	No	20 %
Backhoe	78	No	40 %
Bar Bender	80	No	20 %
Blasting	94	Yes	1 %
Boring Jack Power Unit	80	No	50 %
Chain Saw	84	No	20 %
Clam Shovel	87	Yes	20 %
Compactor (ground)	80	No	20 %
Compressor (air)	78	No	40 %
Concrete Batch Plant	83	No	15 %
Concrete Mixer Truck	79	No	40 %
Concrete Pump Truck	81	No	20 %
Concrete Saw	90	No	20 %
Crane (mobile or stationary)	81	No	20 %
Dozer	82	No	40 %
Drill Rig Truck	79	No	20 %
Drum Mixer	80	No	50 %
Dump Truck	76	No	40 %
Excavator	81	No	40 %
Flat Bed Truck	74	No	40 %
Front End Loader	79	No	40 %

SUBITEM 119.5 (Continued)

TABLE 2. (Continued)

Equipment Category	Lmax Noise Limit at 50 ft, dBA, slow	Is Equipment an Impact Device? (c)	Acoustic Usage Factor (d)
Generator (25 KVA or less)	73	No	50 %
Generator (more than 25 KVA)	81	No	50 %
Gradall	83	No	40 %
Grader	85	No	40 %
Grapple (on backhoe)	85	No	40 %
Horizontal Boring Hydraulic Jack	80	No	25 %
Hydra Break Ram	90	Yes	20 %
Impact Pile Driver (diesel or drop)	95	Yes	20 %
Insitu Soil Sampling Rig	84	No	20 %
Jackhammer	85	Yes	20 %
Man Lift	75	No	20 %
Mounted Impact Hammer (hoe ram)	90	Yes	20 %
Paver	77	No	50 %
Pavement Scarifier	85	No	20 %
Pickup Truck	75	No	40 %
Pneumatic Tools	85	No	50 %
Pumps	77	No	50 %
Refrigerator Unit	73	No	100 %
Rivet Buster / Chipping Gun	79	Yes	20 %
Rock Drill	81	No	20 %
Roller	80	No	20 %
Sand Blasting	90	No	20 %

SUBITEM 119.5 (Continued)

TABLE 2. (Continued)

Equipment Category	Lmax Noise Limit at 50 ft, dBA, slow	Is Equipment an Impact Device? (c)	Acoustic Usage Factor (d)
Scraper	84	No	40 %
Shears (on backhoe)	90	No	40 %
Slurry Plant	78	No	100 %
Slurry Trenching Machine	80	No	50 %
Soil Mix Drill Rig	80	No	50 %
Tractor	84	No	40 %
Vacuum Excavator (vac-truck)	85	No	40 %
Vacuum Street Sweeper	80	No	10 %
Ventilation Fan	79	No	100 %
Vibrating Hopper	85	No	50 %
Vibratory Concrete Mixer	80	No	20 %
Vibratory Pile Driver	95	No	20 %
Warning Horn	83	No	5 %
Welder / Torch	73	No	40 %

NOTES:

(a) Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
(b) Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
(c) "Impact" equipment is assumed to produce separate discernable sound pressure maxima.
(d) "Acoustic Usage Factor" represents the percent of time that equipment is assumed to be running at full power while working on site.

BASIS OF PAYMENT

No separate payment will be made for Subitem 119.5, but all costs in connection therewith shall be included in the Contract lump sum bid price for bid Item 100.3.

ITEM 127.4 **REINFORCED CONCRETE DECK EXCAVATION (FULL DEPTH)** **SQUARE YARD**

ITEM 127.41 **REINFORCED CONCRETE DECK EXCAVATION (PARTIAL DEPTH)** **CUBIC YARD**

Work under these Items shall conform to the relevant Provisions of Subsection 120 of the Standard Specifications, RFP Volume II, Section 4.10.7 and shall consist of full depth and/or partial depth removal and satisfactory disposal of all disintegrated or otherwise unsatisfactory reinforced concrete from the bridge deck as required by MassDOT.

Prior to excavation, the Contractor shall cover all drainage structures that may be affected by the work. The structures shall remain covered until the new concrete has set and the area has been cleaned.

The edges of all areas where concrete is removed under Items 127.4 and 127.41 shall be cut to neat lines by sawcutting or by methods approved by MassDOT, to a minimum depth of 1 inch, and all costs in connection with such work shall be incidental to the pertinent item. Patch areas shall be made rectangular in shape with horizontal and vertical edges and square corners.

Minimum depth of all cement concrete areas to be excavated shall be one (1) inch below the bottom of the top layer of longitudinal reinforcing steel throughout the entire excavated area. No concrete shall be placed until approval of MassDOT is given.

The cost for the removal of hot mix asphalt and any membrane waterproofing above the area of reinforced concrete excavation shall be incidental to relevant Items 127.4 and 127.41.

Surface preparation and concrete removal equipment shall be of the following types:

Pneumatic and Power-Driven Chipping Hammers: In no event shall any pneumatic or power hammer weighing more than thirty-five (35) pounds be used for the removal of concrete. Pneumatic power hammers heavier than the nominal fifteen (15) pound class shall not be used for removing concrete from below any reinforcing bar.

Abrasive Blasting Equipment: Abrasive blasting equipment shall be capable of removing rust and old concrete from exposed reinforcing steel when deemed necessary by MassDOT.

During the prosecution of this work, MassDOT may reject the use of any method or equipment which causes undue vibration or possible damage to the structure or any part thereof.

Bobcats/Skid Steers will be allowed only to collect debris from the deck surface and will not be allowed to remove concrete from the patch area. All concrete debris shall be removed by hand or by using hand tools. The smaller pieces may be blown out using an oil free air compressor after first being wetted with water to control airborne particulates.

Also included under these Items are all costs in connection with the cleaning, cutting, and bending of the existing reinforcing steel designated to be retained in the proposed construction. Any existing reinforcing steel damaged or otherwise made unsatisfactory for continued use because of the Contractor's operations shall be replaced at the Contractor's expense. Any reinforcing steel that is unsuitable for further use through no fault of the Contractor shall be replaced and cost shall be under Item 910.1. All reinforcing steel that is loose shall be tied tightly together using wire ties. Ties are required at every other intersection of transverse and longitudinal reinforcing.

ITEM 127.4 AND 127.41 (Continued)

Temporary Protective Shielding must be used on bridges over the river during full depth excavation and when, in the opinion of MassDOT, there is the possibility of dislodging concrete from the bottom of the deck. Any stay in place forms damage or otherwise made unusable shall be repaired or replaced, at the discretion of the Engineer, at the contractor's expense.

Immediately before placement of new concrete, the exposed area to be patched shall be free of foreign materials. These materials shall be removed by abrasive blasting and by use of oil free compressed air. No grease, dust, rust, or laitance will be allowed to remain on reinforcing steel and exposed concrete surfaces.

All excavated materials shall become the property of the Contractor and shall be removed from the job site.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 127.4 will be measured for payment by the SQUARE YARD and will be paid at the at the respective contract unit price per SQUARE YARD.

Item 127.41 will be measured for payment by the CUBIC YARD and will be paid at the at the respective contract unit price per CUBIC YARD.

The quantity paid for these Items shall be the actual area or volume excavated to be removed and properly disposed according to all city, town, State and Federal rules, regulations, and requirements and as required by MassDOT.

The Contractor will be compensated under either Item 127.4 or 127.41 for excavated concrete. In no case will the Contractor be compensated under more than one Item for the same excavated material.

The Contract unit price shall include all labor, tools and equipment including the incidental removal of any bituminous concrete and waterproof membrane, necessary to complete the work as required by MassDOT.

SUBITEM 150.01 FOAMED GLASS AGGREGATE LIGHTWEIGHT FILL GROUND IMPROVEMENT

The work under this Subitem shall conform to the relevant provisions of Subsection 150 of the Standard Specifications and to the following:

The use of lightweight fill is included in the BTC as ground improvement to increase the global stability factor of safety and to reduce settlement in areas where the approaches and causeway is to be widened and the grade raised, as shown on the BTC Drawings.

Although there are many potential alternative lightweight fill products that could be considered, the BTC design includes Foamed Glass Aggregate (FGA). FGA shall be fully encapsulated within a separation geotextile and shall also be placed with sufficient soil cover as to not be buoyant during extreme flooding events. The lightweight fill used must be suitable for use in a marine environment over the design life of the project.

The work shall consist of furnishing all labor, equipment, and materials, including supplying the Foamed Glass Aggregate (FGA), and performing all operations required to install FGA fill to the limits shown on the BTC Drawings and consistent with the final embankment design.

The Design-Builder shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the Work specified in this Section, including:

1. Preparation of subgrade.
2. Storage and handling of FGA.
3. Protection of all existing utilities and structures.
4. Protection of geotechnical instrumentation.
5. Placement and compaction of FGA fill to the limits shown on the Plans.
6. Placement of geotextile as specified herein and to the limits shown on the Plans.

The Design-Builder shall supply and install FGA fills that conforms to the following requirements:

1. FGA shall be made from of a minimum of 95% recycled glass.
2. FGA shall meet the gradation specifications presented below upon delivery per ASTM C136/136M-19.

Gradation tests shall conform to the requirements of AASHTO Method T27.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
4-in.	100
2 ½-in.	85-100
3/8-in.	0-15

1. The as-manufactured FGA shall have a maximum dry bulk density of 15 pounds per cubic foot (pcf) per ASTM C29/29M-17a. The as-delivered ULFGA shall have a maximum compacted moist bulk density of 18 pcf per ASTM C29/29M-17a.

2. The manufacturing process shall produce a closed cell FGA material, which is non-leaching.

SUBITEM 150.01 (Continued)

3. The FGA shall have a minimum peak friction angle for normal stresses between 500 and 1,000 psf of 45 degrees per ASTM D3080/D3080M-11.
4. The FGA manufacturer must demonstrate experience of manufacturing a minimum of 100,000 cubic yards of FGA meeting the requirements of this Section.
5. Geotextile fabric shall be placed to separate the FGA fill from adjacent materials:
6. The geotextile fabric shall be a non-woven, staple fiber, needle-punched, polypropylene geotextile.
   a. The geotextile shall either have a minimum mass per unit area of 76 oz./yd2 per ASTM D5261 or meet the requirements of a Class 2 separation geotextile per AASHTO M288.
   b. The geotextile shall have a minimum grab tensile strength (MARV) of 160 lbs per ASTM D4632 and shall meet the requirements for Separation Geotextile.

The Design-Builder shall submit an Installation Plan to MassDOT for acceptance a minimum of 30 calendar days prior to the first scheduled delivery of FGA material to the site. The Installation Plan shall include but may not be limited to the following:

1. The name and address of the FGA supplier(s).
2. Manufacturer's specifications, catalog cut sheets, laboratory testing results, and other product data needed to demonstrate compliance with the requirements specified herein.
3. Written certification from manufacturer's quality control testing laboratory indicating that the product meets or exceeds the gradation, strength, compacted unit weight, and internal friction angle requirements specified herein. The laboratory test results shall be completed within 60 calendar days of submitting the Installation Plan. The Design-Builder shall submit additional laboratory testing results to MassDOT for each 500 cy delivered to the site, prior to delivery of the FGA material to the site.
4. Two (2) bulk samples of FGA.
5. Proposed means of delivery to the site and stockpiling (if proposed).
6. Proposed equipment specifications and procedures for placing separation geotextile and placing and compacting FGA.

FGA Product Delivery, Storage and Handling

1. Deliver, store, and handle materials in accordance with manufacturer's recommendations.
2. During all stages of manufacture, shipment, storage, and construction, the Design-Builder shall minimize the amount that the FGA material moves on site to prevent physical damage. Construction equipment other than for placement and compaction of FGA shall not operate on the exposed FGA surface until a minimum 12-in. thickness of aggregate subbase material (i.e., cover material) is placed over the FGA. The cover material shall be placed and compacted within 48 hours of placing and compacting the final lift(s) of FGA in an area. Until that time, operation of construction equipment directly on the FGA shall be limited to light-duty equipment with rubber tires.
3. During delivery, storage and handling, the Design-Builder shall not contaminate the FGA with earth material or any other debris or aggregate materials.
4. The Design-Builder shall protect the FGA before, during, and after construction as recommended by the material manufacturer.

SUBITEM 150.01 (Continued)

ULFGA Installation

1. The Design-Builder shall provide a minimum of five (5) working days' notice to MassDOT prior to the placement of any FGA fill.
2. The Design-Builder shall place the FGA fill to the plan and vertical limits shown on the Plans. Preparation of the subgrade shall include excavation with a smooth-edged bucket to minimize disturbance of the subgrade materials. The Design-Builder shall proof compact soil subgrades prior to placement of FGA fill.
3. Compaction shall be performed in the presence of the Design-Builder's Geotechnical Engineer of Record who will observe performance of the selected equipment and compactive effort, and will modify requirements for the number of passes and lift thickness stated herein if needed for specific compaction equipment.
4. The areas to be filled using FGA shall not have standing water, ice, organic or otherwise unsuitable materials present prior to placement. If encountered, the Design-Builder shall excavate these materials and replace them with compacted fill meeting the requirements of Common Borrow.
5. A non-woven geotextile fabric shall be used to separate the FGA fill from adjacent soils. The geotextile will act as a separator between the FGA and adjacent materials. Adjacent panels of geotextile shall be either sewn together or overlapped a minimum of 12 inches. The Design-Builder shall not place geotextile fabric until the subgrades have been inspected and approved by the Design-Builder's Geotechnical Engineer of Record.
6. To limit possible degradation, the geotextile shall not be exposed to the elements for more than 14 days after placement.
7. FGA may be dumped and spread in place. Construction equipment other than for placement and compaction shall not operate on the exposed FGA.
8. In open areas, FGA fill shall be placed using tracked equipment (excavator and dozer) in uncompacted lifts not exceeding 18 inches in loose thickness.
9. Compaction in open areas shall be performed with a pneumatic rubber tired static roller with maximum ground pressures of 1,500 psf. Sufficient compaction has been achieved when, in the judgement of the Design-Builder's Geotechnical Engineer of Record, the material ceases to densify further with additional passes of the roller. Excessive compaction shall be avoided to minimize crushing of the FGA particles.
10. In areas not accessible by larger equipment (e.g., adjacent to bridge abutments and wingwalls, near utilities, etc.), FGA fill shall be placed using smaller tracked equipment in uncompacted lifts not exceeding 12 inches in loose thickness. Compaction in limited access areas can also be performed in 6-inch lifts using a small vibrating plate compactor with a maximum operating weight of 250 lbs. Sufficient compaction has been achieved when the material ceases to densify further with additional passes of the plate compactor. Excessive compaction shall be avoided to minimize crushing of the FGA particles.

FGA Testing

1. The Design-Builder shall measure the compacted bulk density at the site per the requirements of ASTM C29/29M-17a and shall submit documentation of the results to the Resident. A minimum of one (1) test shall be performed for every 500 cubic yards of FGA delivered to the site. All bulk density testing shall be performed in the presence of the Design-Builder's Geotechnical Engineer of Record and MassDOT's Representative.

SUBITEM 150.01 (Continued)

2. The Design-Builder's Geotechnical Engineer of Record shall visually observe compaction of each lift of FGA for sufficient compaction. The Design-Builder shall not place additional lifts of FGA until the previous lift has been inspected and approved by the Design-Builder's Geotechnical Engineer of Record.
3. Compaction shall be performed in the presence of the Design-Builder's Geotechnical Engineer of Record who will observe performance of the selected equipment and the compactive effort, and establish requirements for the number of passes, and lift thickness for each piece of specific compaction equipment that the Design-Builder intends to use.

COMPENSATION

No separate payment will be made for Subitem 150.01, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 153. CONTROLLED DENSITY FILL – EXCAVATABLE

The work under this subitem shall conform to the relevant provisions of Subsections 150 and 901 of the Standard Specifications and the following:

DESCRIPTION

This item shall be used for backfilling around utility crossings, at tie-ins and as directed by the Engineer.

MATERIALS

Controlled Density Fill Type 2E shall meet Materials Specification M4.08.0.

COMPENSATION

No separate payment will be made for Subitem 153., but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 173. DECOMPACTION FOR SEEDING

DESCRIPTION

This work will include soil ripping for decompaction of previously paved areas, construction staging areas, and/or temporary construction access roads to allow for root growth and infiltration of water.

SUBMITTALS

The Contractor shall submit for approval equipment and methods for testing soil moisture and compaction.

The Contractor shall submit a report (after decompaction) of the standard proctors or penetration resistance ratings to the Engineer with an electronic copy forwarded to the MassDOT Landscape Design Section.

CONSTRUCTION METHODS

All soil decompaction activities must occur at a soil moisture content between 5 - 20% measured at the depth of the work. Soil moisture shall be tested by the Contractor using a moisture gauge according to Subsection 771.41.

Compacted Subsoil: Soil Ripping

After rough grading and removing debris from the surface, loosen the soil by dragging a ripping shank or chisel through the soil to depths of four inches minimum and twelve inches maximum. Shank/chisel spacing shall be maximum of 9 inches on center.

At least three (3) separate series or patterns of movement are required:

- The first series or pattern of passes is applied lengthwise, parallel with the longest spread of the site; gradually progressing across the site's width, with each successive pass.
- The second series runs obliquely, crossing the first series at an angle of about 45 degrees.
- The third series runs at right angle or 90 degrees to the first series.

Provide a minimum of (3) compaction tests per 10,000 SF area of decompacted soil using approved equipment and methods.

Comparison of Compaction Limits			
Rating	Bulk density (g/cm^3)	Standard proctor (%)	Penetration Resistance (psi)
Excellent	≤1.10	75-85%	75-125
Good	1.60 to 1.38		126-175
Fair	1.39 to 1.69	>85%	176-225
Poor	≥147		>225

SUBITEM 173. (Continued)

Note: Below 75 psi with the penetration resistance method is unacceptable, as soil becomes increasingly unstable and will settle excessively.

Ripped subgrade shall be approved by the Engineer in coordination with the MassDOT Landscape Design Section prior to placement of loam borrow or compost blanket.

Protection of Decompacted Soils

After decompaction activities have taken place, do not pass motorized equipment or stockpile construction materials or equipment on previously decompacted soil.

The Contractor shall protect decompacted soil from damage including contamination and re- compaction due to other soil installation, planting operations, and operations by other Contractors.

Maintain protection of decompacted areas until project acceptance.

Repair of Re-compacted Soils

After decompaction has taken place, any soil that becomes re-compacted to a density greater than 169 psi shall be decompacted again.

Loosen compacted soil and replace unsuitable material or soil that has become contaminated by debris as determined by the Engineer. Re-compacted and/or unsuitable soil shall be loosened or replaced at the Contractor's expense.

Where existing soil has become contaminated by debris and needs to be replaced, provide ordinary borrow that is of similar depth and density as the soil that was removed.

COMPENSATION

No separate payment will be made for Subitem 173., but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work will consist of ensuring the health and safety of the Design-Builder's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Design-Builder will prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP will include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP will 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. The EHASP will be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Design-Builder will comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety will be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP will be maintained on-site at all times by the Design-Builder. The on-site copy will contain the signature of the Engineer and each on-site employee of the MassDOT, Design-Builder, and Subcontractors involved with on-site activities. The employee's signature on the EHASP will be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets will be submitted to the Engineer.

The EHASP will specify a Design-Builder Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection, required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer will implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

ITEM 180.01 (Continued)

During implementation of the EHASP, a daily log will be kept by the Site Safety and Health Officer and a copy will be provided weekly to the Engineer. This log will be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer will sign and date the daily log.

BASIS OF PAYMENT

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the Lump Sum Bid Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work. The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02 PERSONAL PROTECTION LEVEL C UPGRADE HOUR

The work will consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Design-Builder will have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use will be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the Contract unit price, per hour, per worker, required in Level C personal protection.

No payment will be made to the Design-Builder to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, media (i.e. soils, sediments, surface water and/or groundwater) requiring evaluation and/or management under the Massachusetts Contingency Plan (MCP) may be encountered. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include a site walk, field screening, sampling, analysis and characterization of potentially contaminated media, preparation and implementation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the MCP. LSP services shall also be necessary to temporarily move material generated on the project to an off-site storage location.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the Massachusetts Department of Environmental Protection (DEP) shall be submitted for all work assignments listed for the LSP and environmental technicians. Upon approval of the LSP Qualifications, the LSP will be designated as the LSP of Record unless MassDOT designates in writing otherwise. The LSP of Record will serve as the primary point of contact for all hazardous material matters on the project.

The LSP shall evaluate soil and/or sediment with discoloration, odor, elevated field screening results, presence of petroleum liquid or sheen on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect media. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall evaluate the need for confirmatory sampling prior to backfill in areas where contaminated material has been excavated and disposed off-site for compliance with applicable regulatory requirements. The Engineer shall approve the locations of the testing sites prior to the sampling.

Contaminated media shall be handled in accordance with all applicable state and federal statutes, regulations, and policies. The LSP shall adequately evaluate contaminated media for compliance with the requirements of the MCP and Department Policies.

ITEM 180.03 (Continued)

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and both shall be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise tabular format which tracks the excavation, stockpiling, analysis and reuse/disposal of all known/suspect contaminated media. These records shall be up-to-date and submitted to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media in a tabular format and compare the results to applicable reporting thresholds. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results, evaluation of applicable regulatory exemptions, reporting obligations, and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties, and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Engineer before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

ITEM 180.03 (Continued)

LABORATORY TESTING IN SUPPORT OF LSP SERVICES

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included and are incidental to Items 181.11 through181.14.

In order to maintain compliance with the MCP and Department Policies or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. No sampling shall be conducted without prior approval from the Engineer. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this item will be measured per person, per hour of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

This item is for LSP work for compliance with the MCP and Department Policies. LSP hours and any laboratory testing related to off-site disposal of excess soil and sediment is incidental to Items 181.11-181.14 (including, but not limited to, disposal characterization, disposal package preparation, landfill acceptance, shipment paperwork preparation, field screening, and tracking). LSP hours for groundwater management (including characterization, obtaining off-site discharge permits, compliance testing, etc.) is incidental to Item 183.1.

ITEM 181.11	**DISPOSAL OF UNREGULATED SOIL**	**TON**
ITEM 181.12	**DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY**	**TON**
ITEM 181.13	**DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY**	**TON**
ITEM 181.14	**DISPOSAL OF HAZARDOUS WASTE**	**TON**

The work under these Items will include the transportation and disposal of contaminated material excavated, or excavated and stockpiled. It will 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 Design-Builder will 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 purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these items for reuse within the project limits. The Design-Builder 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 Design-Builder will be responsible for identifying disposal facility (ies) 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 Design-Builder will be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Design-Builder 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 Design-Builder and LSP will 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 Design-Builder and its LSP will determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials will be given a designation for purposes of reuse or disposal based on the criteria of the 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:

ITEMS 181.11 through 181.14 (Continued)

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 will 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 Design-Builder will submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Design-Builder will 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 Design-Builder will provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed of 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, will be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, will 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.

ITEMS 181.11 through 181.14 (Continued)

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 will 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 will be disposed of at an out-of-state permitted facility. This facility will be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility will 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 will be permitted to accept all contamination which may be present in the soil excavate. The Design-Builder will 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 Design-Builder will 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 Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis will be included in the bid cost for the applicable disposal items. The Design-Builder will obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

ITEMS 181.11 through 181.14 (Continued)

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 Design-Builder will 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 Design-Builder, and the intended disposition of the material. The Design-Builder will 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.

WASTE TRACKING

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Design-Builder from each disposal facility and for each load disposed of at that facility will be submitted to Engineer and the Design-Builder's LSP within three days of receipt by the Design-Builder. The Design-Builder is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Design-Builder will 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 Design-Builder will 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 will be loaded by the Design-Builder 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 will be lined and loads covered with a liner, which will 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 will be decontaminated in accordance with applicable local, state and federal regulations. This requirement will 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.

ITEMS 181.11 through 181.14 (Continued)

REGULATORY REQUIREMENTS

The Design-Builder will be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT will not be responsible at any time for the Design-Builder's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Design-Builder will comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), 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 will be provided by the Design-Builder without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions will apply. The Design-Builder will reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Design-Builder'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 Design-Builder will 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 program. 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.

ITEMS 181.11 through 181.14 (Continued)

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 Design-Builder will submit, in writing, the following for review and will not begin excavation activity until the entire submittal is acceptable to MassDOT.

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.

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or 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 Design-Builder. The compliance history will 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.

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 will be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Design-Builder will 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.

ITEMS 181.11 through 181.14 (Continued)

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.

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.

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 off-site using the same categories identified for demolition debris above.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

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. The work of the LSP for disposal under all of these items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, 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 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.

ITEMS 181.11 through 181.14 (Continued)

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 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 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 182.1 INSPECTION AND TESTING FOR ASBESTOS LUMP SUM

The work shall include the inspecting and testing of all materials suspected of containing asbestos. When any demolition is required to enable the inspection and testing of the suspected material it will be considered incidental to this Item and the Contractor must perform all asbestos handling and testing in accordance with the regulations stated below.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during any disturbance of asbestos suspected material. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not "ITEM 182.2 REMOVAL OF ASBESTOS" is required. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

REGULATIONS

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

ITEM 182.1 (Continued)

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards Regulations, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

BASIS OF PAYMENT

Payment will be at the contract unit price per Lump Sum for ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS as specified above including all materials, tools, equipment and labor to complete the inspecting and testing of the asbestos suspected material.

All costs in the connection with the protection of general public, private property, and all costs associated with the proper inspecting and testing of the material shall be included in the price and no additional compensation will be allowed.

ITEM 182.2 REMOVAL OF ASBESTOS FOOT

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
29 CFR 1910 Section 134 Respiration Protection
29 CFR 1926 Construction Industry
29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
29 CFR 1910 Section 1200 Hazard Communication
29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
40 CFR 61 Subpart A Regulation for Asbestos
40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor Standards, (DLS) including but not limited to:

454 CMR 28.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing Subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

ITEM 182.2 (Continued)

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a contractor or subcontractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor Standards. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Supervisor and Asbestos Project Designer as required by 454 CMR 28.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health and Safety Plan (HASP) may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS
The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

STANDARD OPERATING PROCEDURES
The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.

2. Proper protective clothing and respiratory protection prior to entering the work spaces.

3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other engineering controls.

4. Proper exit practices from the work space though the showering and decontamination facilities.

5. Removing asbestos containing material in ways that minimize release of fibers.

ITEM 182.2 (Continued)

6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.

7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.

8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.

9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLS certification of proposed Supervisors and Foreman responsible for asbestos work.

2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLS, EPA and OSHA standards.

3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.

4. Written plan of action and standard operating procedures (HASP) to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.

5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.

6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.

7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and licenses number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

ITEM 182.2 (Continued)

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

Method Of Measurement:

ITEM 182.2 will be measured by the FOOT for the complete removal and disposal of the asbestos containing material.

Basis Of Payment:

Payment will be at the contract unit price per FOOT for ITEM 182.2 REMOVAL OF ASBESTOS, as specified above including all materials, tools, equipment and labor necessary to complete the work specified above.

All costs in connection with the protection of the general public, private property and all costs associated with the proper disposal of the material removed shall be included in the price and no additional compensation will be allowed.

ITEM 184.1 DISPOSAL OF TREATED WOOD PRODUCTS TON

Work under this item shall include the transportation and disposal of all treated existing wood product as directed by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood. The Contractor is required to submit disposal manifests 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

Measurement and payment will be by the weight, in tons, of treated timber transported and accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

SUBITEM 190.01 BORINGS

The work under this subitem shall conform to the relevant provisions of Subsection 190 of the Standard Specifications and the following:

The Design-Builder will be required to supplement the existing subsurface information to meet the minimum exploration spacing requirements of MassDOT's Bridge Manual. In addition, MassDOT may require additional borings, test pits, probes, geophysical surveys, or cone penetration tests in connection with any of MassDOT's reviews.

The BTC documents include explorations that were performed for the proposed structures and bridge span arrangements.

Due to difficult drill rig access, test boring explorations were not done along the exact alignment of the proposed causeway retaining walls during the BTC Design Phase of the project. The locations of eight (8) Construction Phase Test Borings to be completed by the Design- Builder as early action items are listed below. These 8 test borings will require site preparation work by the Design-Builder to allow them to be completed within a maximum 5 ft perpendicular distance from the proposed retaining wall alignment and each boring shall be drilled and 10 ft of bedrock cored. It will be necessary to remove a section of the guardrail and construct a level platform suitable for a drill rig to safely work on the existing rip-rap slope to access the wall alignment at each of these locations. The station locations of these construction phase test borings on the southeast and northwest sides of the causeway are as follows:

- STA. 97+00 – Southeast
- STA. 98+50 – Southeast
- STA. 98+50 – Northwest
- STA. 101+50 – Southeast
- STA. 101+50 – Northwest
- STA. 103+75 – Southeast
- STA. 103+75 – Northwest
- STA. 107+25 – Southeast

These explorations in addition to the existing explorations will count towards meeting the Bridge Manual boring spacing requirements for retaining walls.

Any changes to the BTC structure locations may require additional borings to meet MassDOT's Bridge Manual criteria. Subsurface explorations shall be conducted for any new and modified structures so that the requirements of AASHTO LRFD Bridge Design Specifications Article 10.4 and Table 10.4.2-1, and MassDOT's Bridge Manual are met.

The Design-Builder shall perform borings for any proposed overhead traffic sign support structures.

The Design-Builder shall perform and analyze additional borings, test pits, and other subsurface investigations, along with laboratory soil and rock testing, necessary to complete the design and construction of the Project, including the design and installation of temporary bridges, trestle structures, causeways, and temporary roadway embankments.

The Design-Builder shall deliver to MassDOT digital copies of logs, in a GINT format, an AutoCAD compatible format, and PDF format, for all additional investigations conducted. The Design-Builder shall also provide a database (or excel file) of all subsurface investigations including exploration ID, town, northing, easting, ground elevation, boring elevation, total boring depth, ground water elevation, structure ID, bedrock core, digital pictures of all rock cores, laboratory test results, and any other relevant information.

SUBITEM 190.01 (Continued)

The Design-Builder shall obtain all Governmental Approvals necessary for geotechnical investigations, including Dig Safe, and all approvals required for access road grading, drilling permits, and groundwater protection from inter-aquifer contamination. Boxes of soil and rock samples, with an as-drilled exploration plan, are to be delivered to the MassDOT Storage Facility in Lawrence, MA. Any soil or rock samples which are taken for laboratory testing must be returned to their respective boxes after testing is complete.

COMPENSATION

No separate payment will be made for Subitem 190.01 but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 996.12.

SUBITEM 202.65 OUTLET CONTROL STRUCTURE

The work under this subitem shall consist of the construction of an Outlet Control Structure and shall conform to the relevant provisions of Subsections 201 and 901, and Materials Sections M4 and M8 of the Standard Specifications and/or amended as follows:

The Outlet Control Structure shall be precast concrete. The precast manholes shall conform to the latest ASTM Specifications for precast reinforced concrete sections (ASTM C478). Concrete shall have a minimum compressive strength of 4000 psi. Reinforcing steel shall conform to the latest ASTM A185 Specifications. The manhole shall have a capability of supporting HS 20-44 live load.

Joints of precast manhole sections shall be sealed with either a round rubber "O"-ring gasket or a flexible joint sealant. The "O"-ring shall conform to ASTM C443.

Manhole rungs shall be steel reinforced copolymer polypropylene plastic conforming to ASTM C478. Rungs shall be 14 inches wide. Copolymer polypropylene shall meet ASTM Specification D4101. Steel reinforcing shall be 3/8-inch diameter, Grade 60 conforming to ASTM Specification A615 and shall be continuous throughout the rung. The portion of the legs to be embedded in the precast section shall have fins and be tapered to insure a secure bond.

Orifice size and overflow grate shall be as shown on the plans.

The orifice shall have a trash rack over the opening.

The overflow grate will be a convex “domed” shape, extending not less than seven (7) inches above the upper rim of the frame.

The frame may be cast into the top section of the outlet control structure or bolted to the top. A submittal of the mounting procedure will be required, and materials shall not be ordered until an approved mounting method has been determined.

The frame shall be set to an elevation such that the top of the frame matches the “Rim” grade in the design plans.

The structure shall be placed on a 6” thick bedding of crushed stone. Orifice and overflow grate shall be incidental to this Item.

Adjustment to grade for frame and cover shall be made using courses of brick conforming to ASTM C32, Grade 55, or by use of precast concrete rings conforming to ASTM C478. Concrete collar to be 4,000 psi cement concrete, per MassDOT Construction Standard Detail E 202.9.0.

COMPENSATION

No separate payment will be made for Subitem 202.65, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 200.1.

SUBITEM 221.1 FRAME AND COVER - SECURED

The work under this Subitem shall conform to the relevant provisions of Subsections 201, 220 and the following:

The work to be done under this Subitem consists of the furnishing and delivering Frame and Cover – Secured to the site as shown on the Plans, and as directed by the Engineer.

Frame and Cover - Secured assemblies shall consist of covers and frames that conform to the nominal size, weight, material and load-carrying requirements in MassDOT Construction Standard Details E 202.6.0, E 202.7.0 and E 202.8.0, and are on the relevant MassDOT Qualified Construction Materials list. Some dimensions of secured manhole covers and frames may vary slightly from those shown on the standard details to account for necessary fastening components. The Contractor shall submit shop drawings of all drainage castings for approval prior to ordering.

Covers and frames shall be held securely together by bolting to threaded holes in the frame or to nuts or tumbler devices secured by the frame, by use of hooks attached to the cover or by any other means approved by MassDOT, to prevent being dislodged under traffic loading. Gaskets and other sealing devices will not be allowed.

COMPENSATION

No separate payment will be made for Subitem 221.1, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 200.1.

SUBITEM 440.5 CONSTRUCTION DUST CONTROL AND MONITORING

GENERAL

A. Work under this subitem shall conform to the relevant provisions of Subsection 440 of the Standard Specifications, and the following:
B. The Design-Builder is responsible for controlling construction related dust emissions at all times during the work of this Contract, 24 hours per day, 7 days per week, including nonworking hours, weekends, and holidays. Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride must be implemented to control dusting during trenching, excavation, embankment, and demolition operations. Work shall be conducted in a manner that will not result in nuisance dust conditions (i.e., visible airborne dust cloud).
C. The Design-Builder is responsible for controlling dust during concrete demolition to reduce the amount of silica dust created in accordance with OSHA 29 CFR 1926 Subpart Z.
D. Intrusive activities may be reduced or curtailed under high wind or heavy rain conditions if the Engineer deems continued operations to be a safety hazard to the workers.
E. The Design-Builder is responsible for monitoring dust in accordance with the USEPA and National Air Quality Ambient Standards, Department of Environmental Protection (DEP) regulations and the HASP during all construction operations.

SUBMITTALS

A. Prior to starting any work, the Design-Builder shall develop and submit for approval a dust control plan that outlines in detail the measures to be implemented. The plan shall include details as to how dust emissions will be controlled and/or minimized for demolition activities, earthwork activities, including excavation, stockpiling of material, and transportation on public roadways.
B. The Design-Builder shall submit shop and working drawings, computations, material data, and other descriptions for wind screens, barriers and supports. Wind screens, barriers and supports shall be designed to withstand 80 MPH wind loads plus a 30% gust factor. Drawings and computations shall be stamped by a Registered Professional Engineer of the Commonwealth of Massachusetts.
C. The Design-Builder's submittal shall include details describing providing, installing and removing tarps or other vertical barriers as may be required during concrete repairs to the tunnel arch, tunnel walls, boat section walls and the roadway slab in the tunnel and boat section to isolate dust and debris in the vicinity of occupied work areas.
D. Prior to starting any work, the Design-Builder shall develop and submit for approval a dust monitoring plan that outlines in detail the measures to be implemented. The plan shall include details as to how dust will be monitored during the construction period.

SUBITEM 440.5 (Continued)

MATERIALS

A. The material for this work shall be of the kind described below, shown on the plans and shall meet the requirements of the following subsections of Division III, Materials:
   a. Water M4.02.04
   b. Calcium chloride M9.01.0
B. As needed, soil stabilizer shall be non-toxic, non-corrosive, and environmentally safe.
C. Wind screens shall be a durable fabric mesh of 50 percent porosity, attached to a fence.
D. Wind barriers shall be solid wood panels, solid durable fabric attached to a fence, or other solid barriers intended to block the passage of the wind.
E. As needed, covers for stockpiles shall be UV resistant plastic tarps with a minimum 4 mil thickness.
F. Seeding for Erosion control shall conform to M6.03.01.

CONSTRUCTION SITE DUST CONTROL

A. Water or calcium chloride shall be used to provide dust control.
B. The Design-Builder shall apply water as necessary, or as required by the Engineer to control dust. Several applications per day may be necessary to control dust depending on weather conditions and the work activity being performed.
C. Soil stabilizers such as polymer emulsion-based products shall be applied per the manufacturer directions for the area where dust control is needed.
D. Both water and soil stabilizer application equipment shall consist of sprinkler pipelines, tanks, tank trucks, or other devices that are capable of providing regulated flow, uniform spray, and positive shut-off.
E. Calcium Chloride shall be applied at a rate of 1.5 pounds per square yard, or as required by the Engineer to control dust.
F. Water shall not be applied to any roadway surface when freezing conditions occur.
G. The Design-Builder shall ensure that vegetation and the soil to be used for vegetation are not treated. The use of petroleum products for dust suppression is prohibited.
H. Wind screens and/or wind barriers shall be provided in locations where they would be effective in minimizing the spread of dust. The location of wind screen and/or wind barrier placement shall be submitted as part of the Design-Builder's dust control plan. Both wind screens and wind barriers can be moved as necessary as the active work area shifts within the work zone. The Design-Builder shall keep wind screens and wind barriers in good condition at all times.
I. Compressed air for cleaning debris from any surface or structure will be permitted only when in compliance with the approved dust control plan.
J. Only wet cutting of concrete block, concrete, and/or asphalt surfaces is allowed.

SUBITEM 440.5 (Continued)

PUBLIC ROADWAY DUST CONTROL

A. Vehicles leaving the construction site shall have no mud or dirt on the vehicle body or wheels.
B. Haul truck cargo areas shall be securely covered during material transport on public roadways.
C. Material with high water content shall be not be allowed to leak from truck cargo areas during transport over public roadways.
D. Vehicle mud and dirt carryout, material spills and soil wash-out onto public roadways and other paved areas shall be immediately cleaned up by the Design-Builder.
E. At work zone egress points, the Design-Builder shall use power sweeping which consists of vacuuming, wet power sweeping, regenerative air sweeping, or wet power broom sweeping on paved roadways. Dry sweeping is prohibited.
F. On haul roadways, the Design-Builder shall use vacuum power sweeping to keep roadways clear from dust and dirt.

EARTHWORK DUST CONTROL

A. During batch drop operations (i.e., earthwork with front-end loader, clamshell bucket, or backhoe) the free drop height of excavated or aggregate material shall be minimized to prevent the generation of dust.
B. To prevent spills during transport, freeboard space shall be maintained between the material load and the top of the truck cargo bed rail.

STOCKPILE DUST CONTROL

A. The Design-Builder shall employ one or more of the following methods to prevent the release of dust from stockpiles. The method to be used shall be submitted for review and approval as part of the dust control plan specified under Submittals.
B. Water shall be used during active stockpile load-in, load-out, and maintenance activities.
C. UV resistant plastic tarps on stockpiles, secured with sandbags or an equivalent method to prevent the tarps from being dislodged by the wind. The Design-Builder shall repair or replace covers whenever damaged or dislodged, without additional compensation.
D. Soil stabilizers applied to the surface of inactive stockpiles.
E. Hydroseeding of inactive stockpiles. Seeding shall conform to M6.03.1.

DEMOLITION DUST CONTROL

A. Water shall be used during demolition.
B. During transportation of demolition debris, truck cargo areas shall securely covered.

SUBITEM 440.5 (Continued)

DUST MONITORING MEASURES

A. The quantity and location of dust monitoring equipment will be determined by the LSP. At least one (1) dust monitor will be placed down-wind and one (1) one dust monitor will be placed up-wind of the current construction activities as directed by the LSP. Dust particulate matter will be measured in the ambient air as PM-10, a real-time weighted average from the start of the shift. Results will be monitored on a continual basis to ensure dust particulate matter does not exceed the 150-ug/m3 (0.150-mg/3) action level per USEPA National Ambient Air Quality Standards (NAAQS) and described in the Project-approved SS-HASP. The LSP or a qualified representative will be present during all operations causing dust for monitoring. If any dust particulate matter exceeds the action level, the qualified representative will cease all dust causing activities and notify a superintendent. At that point, either additional dust suppression methods will be put in place, changes will be made to demolition equipment/methodology, or demolition operations will remain on hold until weather conditions change. Dust monitoring measures and protection shall be installed at outdoor dining facilities in the vicinity of the portals.

COMPENSATION

No separate payment will be made for Subitem 440.5, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 504.2 GRANITE CURB TYPE VA4 – SPLAYED END

Work under this subitem shall conform to the relevant provisions of Subsection 501 of the Standard Specifications and the following:

The work shall include furnishing and installing curb transition sections at the locations shown on the plans to match into the proposed or existing edge. The curbing shall be type VA-4 and shall have a minimum length of six feet (6'-0"). The curb shall be sawcut to match into the proposed adjacent granite curb or curb inlets at one end and the opposite end shall match into the existing hot mix asphalt curb or sloped granite edging as shown on the plans.

COMPENSATION

No separate payment will be made for Subitem 504.2, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 655.21 PEDESTRIAN HANDRAIL
SUBITEM 655.22 BRIDGE PEDESTRIAN HANDRAIL

The work under these Subitems shall conform to the relevant provisions of Subsection 644. of the Standard Specifications and the following:

The work under these Subitems shall consist of furnishing and installing metal railing as shown on the drawings and as directed by the Engineer.

The Contractor shall submit for the Engineer's approval, shop drawings of rail materials, finishes, and installation methods.

The Bridge Pedestrian Handrail shall match the physical appearance of the Pedestrian Handrail, Subitem 655.21, but must meet horizontal and vertical design loads per AASHTO Sections 13.8 and/or 13.9 for a Pedestrian Railing and/or Bike Railing.

The Pedestrian Handrail and Bridge Pedestrian Handrail shall be 42 inches in height above the finish ground, steel framework shall contain 2-inch diameter extra strong pipe rails with 1-inch square steel fence pickets, set with5-inch maximum spacing between picketsand posts. Posts shall be 2.5-inch diameter schedule 40 pipe at a maximum of 6.5 feet on center. Flat bars and angle steel members shall be supplied to seal all picket- to-rail intersections. All posts shall have cast iron rail caps and base supports. If profile grade exceeds 1.5%, all post flanges shall be cut parallel to roadway profile grade.

All steel (except fasteners) shall be galvanized and painted. Color TBD.

Pedestrian Handrail shall be installed such that the bottom rails are set a maximum of 5 inches above the finish ground. Pedestrian Handrail shall be set plumb and level.

Pedestrian Handrail and Bridge Pedestrian Handrail shall be free of any damage, including but not limited to scratches, scuffs, dents, paint chipping, after final installation, subject to inspection by the Engineer.

COMPENSATION

No separate payment will be made for Subitems 655.21 and 655.22, but all costs in connection therewith shall be included in the respective Contract lump sum bid price for Items 995.01 and 995.02.

SUBITEM 697.1 SILT SACK

Work under this subitem shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this subitem includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Design-Builder and shall be removed from the site.

The Design-Builder shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the Design-Builder shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Design-Builder's expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Subsection 227 of the Standard Specifications

COMPENSATION

No separate payment will be made for Subitem 697.1, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 200.1.

SUBITEM 697.2 FLOATING SILT FENCE

DESCRIPTION

The work includes furnishing, installing, maintaining, and removing floating silt fence, where required during in-water work that may produce turbidity or sedimentation, to prevent construction materials, debris, and sedimentation from entering the waterway and surrounding areas.

MATERIALS

Floating silt fence shall be a Type I floating silt fence. Their deployment shall be tailored to the site-specific conditions and their final design shall take into consideration the contaminated sediments, permeability of the fence, appropriate mooring methods, and other pertinent conditions.

The floating silt fence shall be heavy duty, long- life type, capable of withstanding minor wind, wave, and current action.

SUBMITTALS

Submit catalogue cuts and shop drawings showing the materials to be used as floating silt fence and the means and methods for their installation and removal.

CONSTRUCTION METHODS

The floating silt fence shall be deployed such that the navigational traffic in the Weweantic River will not be disrupted.

The Contractor shall clean and maintain the floating silt fence in good operating condition, acceptable to the Engineer, and repair or replace the screens, buoyancy equipment, tensile cable and ballast chain as needed to maintain the integrity of the enclosures.

Floating silt fence shall remain in place at individual work locations for a minimum of 24 hours after completion of the work.

COMPENSATION

No separate payment will be made for Subitem 697.2, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 698.3 GEOTEXTILE FABRIC FOR SEPARATION

The work under Geotextile Fabric for Separation shall include furnishing and placement of geotextile fabric for separation in the construction of the modified rock fill slopes, riprap at drainage outlets and swales at the locations shown on the BTC plans or as directed by the Engineer.

Geotextile Fabric for Temporary Soil protection shall conform to the requirements of AASHTO M 288, Class 1 woven and shall be listed on the Qualified Construction Material's List and be approved for Separation.

Six inches of crushed stone shall be placed over the fabric prior to placement of fill. Stone shall meet M2.01.1.

Following completion of construction work, fill, stone, and fabric shall be removed and properly disposed off-site or as required by the Engineer.

CONSTRUCTION METHODS

Construction and installation shall be in accordance with AASHTO M 288, including Appendix A.

COMPENSATION

No separate payment will be made for Subitem 698.3 but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 701.4 CEMENT CONCRETE SIDEWALK TYPE TURTLE WALL

The work under this Subitem shall conform to the relevant provisions of Subsection 701 of the Standard Specifications, and the following:

The work shall include constructing reinforced cement concrete sidewalks type turtle protection walls to the limits as shown on the BTC drawings and as directed by the Engineer.

MATERIALS

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

- Cement Concrete (4,000 psi, ¾-inch, 610) M4.02.00
- Reinforcing Bars M8.01.0
- Preformed Expansion Joint Filler M9.14.0

COMPENSATION

No separate payment will be made for Subitem 701.4, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 706.7 CONCRETE PAVER FOR SEDIMENT FOREBAY

DESCRIPTION

This Subitem is intended to provide a level protective surface over a compacted gravel borrow foundation to facilitate maintenance of the storm water pretreatment sedimentation forebay.

The work shall include the construction to the line and grade of a level sedimentation forebay protective bottom surface

While this subitem calls for concrete pavers, other surface types are acceptable, such as granite cobbles or granite pavers, if the surface is relatively flat and joints between pavers are uniform and flush vertically.

Each piece of granite curb or edging shall have a minimum length of eighteen (18) inches, minimum width of four (4) inches and minimum depth of four (4) inches. Granite curb or edging shall be placed in an offset tile pattern with two (2) inch spacing on all sides; spacings to be filled with sand borrow. Curb material may be either new or existing curb or edging designated to be discarded as shown on the plans within the Project limits of work.

Reused curbing shall include removal, temporary storage and protection, cutting, removal and disposal of all foreign matter prior to installation.

Curb layout pattern shall be pre-approved by the Engineer.

COMPENSATION

No separate payment will be made for Subitem 706.7, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

ITEM 740.3 ENGINEER'S FIELD OFFICE AND EQUIPMENT MONTH

Work under this item shall conform to the relevant provisions of Subsection 740, RFP Volume II, Sections 1.1.11 and 10.1, and the following:

In addition to the requirements specified under RFP Volume II, Section 9.1.3.2, four (4) desktop, and two (2) laptop network computer systems and printer system meeting the requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

In addition to the general requirements specified herein, the office shall be furnished with six (6) new tablet computers as specified in RFP Volume II, Section 1.1.11; one (1) copy of the approved scheduling software licenses preload and maintained on a separate dedicated scheduling computer system as specified in RFP Volume II, Section 9.1.3.

All equipment shall be UL approved and Energy Star compliant.

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

Processor:	Intel, 3.5 GHz
System Memory (RAM):	12 GB
Hard Drive:	500 GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	8 GB
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
Video/Audio	the computer system shall be capable of allow video calling and recording:
Video camera	shall be High Definition 1080p widescreen capable video calling and recording with built in microphone. The microphone system shall capture natural audio while filtering out background noise.
Audio	shall be stereo multimedia speaker system delivering premium sound.
OS:	Latest Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitors:	For each computer system - Two 27" LED with Full HD resolution. Max. resolution 1920 x 1080
Flash drives:	2 (two) - 128GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740.3 (Continued)

Laptop Computer System shall meet the following minimum criteria or better:

Laptop computer, meeting the minimum requirements set forth below and including all of the necessary installation, maintenance, power, and other supplies shall be provided.

The laptop computer shall consist of the following or better:
CPU:..... Core i5
RAM:..... 8 GB
Hard disk:..... 7200 RPM Free Fall Sensor Hard Drive up to 500 GB store space
Monitor:..... 17" widescreen
DVD-RW/CD-RW:..... Recordable DVD/CD drive (DVD±R DL; DVD±RW; CD±RW)
Network Adapter:..... Built-in 10/100/1000 Ethernet LAN (RJ-45 connector)
Wireless Networking..... Wireless-B+G+N
USB Ports:..... 4 high-speed USB ports
Mouse:..... Wireless optical mouse with scroll
OS:..... Windows Professional with all current security updates
Web Browser:..... Internet Explorer with all current security updates
Applications:..... Latest MS Office Professional with all security updates
Latest Adobe Acrobat Professional with all security updates
Latest Autodesk AutoCAD LT
Antivirus software with all current security updates maintained through the life of the contract.

Power:..... Car 12 Volt adapter and standard 110V AC adapter
Carrying Case:..... Rain-proof with shoulder strap
Internet access:..... High speed internet access for the duration of the contract
Monitors:..... For each Laptop Computer System - One 27" LED with Full HD resolution. Max. resolution 1920 x 1080
(provide docking station for each laptop)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:
- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF)
- Reduction/enlargement capability
- Ability to copy and print 11” x 17” paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access protection

ITEM 740.3 (Continued)

In addition to the new computers specified above, one new 36" Plotter (up to 2400 X 1200 optimized from 1200X1200 input DPI) with maximum detail selected (color and black revolution) shall be also provided at the engineer's field office.

The Design-Builder shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

The Engineer's Field Office shall be minimum of 2,000 square feet in size , with one conference room table along with (12) office chairs and (12) additional chairs, The conference room shall have acoustics and features to support conference calls and web conferencing via Cisco Webex, or Citrix Goto Meeting or Adobe Connect or equal for video/audio conferencing, screen sharing for multiple parties including new speaker telephone with multiple microphones and wireless speakers for conferences/meetings; one new 75" LED Smart TV panel wall mounted with Wi-Fi and software to support web conferencing; latest smart features/computer capability, and connected to standalone new computer system shall be provided.

The Contractor shall supply a power inverter and tablet computer tablet charging stations for the tablets, multi shelf or otherwise.

Office Equipment:
1 legal size fireproof metal file cabinets, four drawers with locks
2. legal size metal file cabinets, four drawers with locks

The Engineer's Field Office and the equipment included herein including the computer systems, notebooks computers, printer, Smart TV panel, and tablet computers shall remain the property of the Design-Builder at the completion of the Project. Disks, flash drives, and card readers with cards shall become the property of the Department.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

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.

SUBITEM 751.7 COMPOST BLANKET

The Design-Builder is directed to:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions
for Landscaping Item Special Provisions.

COMPENSATION

No separate payment will be made for Subitems 751.7, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

SUBITEM 754.23 DIAMONDBACK TERRAPIN PROTECTION PLAN

General

This Subitem outlines the requirements of the Division of Fisheries and Wildlife's Natural Heritage and Endangered Species Program (MassWildlife) for projects that occur in the vicinity of high-priority Diamondback Terrapin populations. The Project work to be completed consist of the development and implementation of a Diamondback Terrapin Protection Plan, in accordance with the letter by the Massachusetts Division of Fisheries & Wildlife Natural Heritage & Endangered Species Program (MassWildlife) regarding the Marion Wareham Bridge Replacement Project (dated January 8, 2024). Compliance with MassWildlife's letter is the responsibility of the Contractor.

Diamond-back terrapin protection plan

As stated within the MassWildlife letter, a Northern Diamond-backed Terrapin Turtle Protection Plan is to be submitted to the Division for review and written approval. Said Plan shall detail procedures for protecting state-listed turtles during construction, and be prepared and implemented by a qualified, Division-approved (Tim McGuire, Endangered Species Review Biologist, MassWildlife Natural Heritage & Endangered Species Program, 1 Rabbit Hill Road, Westborough, MA 01581; timothy.mcguire2@mass.gov; (508) 389-6366) wildlife biologist. The Division is available for consultation on Plan development and can provide contact information for qualified biologists. The Division-approved Plan shall be implemented as written; any proposed changes to the Plan must be submitted to the Division for review and written approval prior to implementation of said changes. By December 31st of any year in which work occurs, the qualified biologist shall submit: a) a summary report to the Division detailing project status and compliance with the Plan; and b) any observations of state-listed turtles at https://www.mass.gov/how-to/report-rare-species-vernal-pool-observations.

At a minimum, the Diamondback Terrapin Plan shall include:

1. Scientific Collection Permit application. The Scientific Collection Permit must be obtained from MassWildlife to handle state-listed species.
2. Biologist name, contact information, and qualifications.
3. Anticipated schedule of operations within Diamondback Terrapin Habitat.
4. Description of any proposed methods to establish a limit of work barrier to isolate Diamondback Terrapin from the work zone, and to keep construction personnel outside of unpermitted sensitive areas. May include use of silt fence and/or other types of barriers, and signage.
5. Description of turtle monitoring protocols to ensure Diamondback Terrapin individuals are not harmed by work activities.
6. Construction personnel training/education on the Diamondback Terrapin Plan.

MassWildlife staff is available for further guidance and consultation on the development of the Diamondback Terrapin Protection Plan (Tim McGuire, Endangered Species Review Biologist, timothy.mcguire2@mass.gov; (508) 389-6366).

SUBITEM 754.23 (Continued)

COMPENSATION

No separate payment will be made for Subitem 754.23 but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 754.3 COMBINATION PROTECTION FENCE

The work under this Subitem shall conform to the relevant provisions of Subsection 670 of the Standard Specifications and the following which shall include the furnishing and placement of a Combination Protection Fence which will consist of a combination Turtle Protection Fence and a Sediment Control Barrier as shown on the plans. The purpose of the Combination Protection fence (CPF) is to control sediments and exclude turtles from the work area during construction. This fence will be removed when construction is complete.

The CPF will consist of two parts: turtle exclusion/protection fence and sediment control barriers: The purpose of the Turtle Protection Fence is to protect wildlife from entering the work area.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from stormwater flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. The contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff. Where a sediment control barrier is called for, it shall be installed prior to disturbing upslope soil.

MATERIALS AND CONSTRUCTION

Prior to initial placement of fence and barriers, the Wetland Specialist, Contractor, and the Resident Engineer shall review locations specified on the plans to ensure that the placement will provide maximum effectiveness. Installation of the fencing will generally be according to the plans and will be verified in the field by the Wetland Specialist on hand. The bottom of barriers and fence shall be trenched as shown on the plans.

Turtle Protection / Exclusion Fence

The design of the turtle protection fence shall be reviewed by Wildlife Biologist with a minimum of 5 years' experience implementing turtle protection plans and has relevant experience to the species in question in this type of wildlife control barrier design. The Contractor shall engage a qualified Wildlife Biologist to review the design and certify that the turtle protection fence is adequate, prior to submission to, and approval by the Engineer. The design shall be in accordance with all applicable permits, plans, and details.

The protection fence shall consist of vinyl coated galvanized wire mesh or rigid plastic mesh and shall be black in color. Materials shall be UV resistant.

Support posts and all connecting hardware shall be galvanized and shall be designed to withstand environmental loads (wind, ice, etc) in accordance with the latest edition of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

Sediment Barrier

Materials and Installation shall be per Subsection 670.40 of the Standard Specifications. Plastic netting and plastic mesh materials present an entrapment hazard for wildlife and sediment and erosion control materials that contain them may not be used. See USFWS site for more information: https://www.fws.gov/initiative/protecting-wildlife/make-change-wildlife-friendly-erosion-control-products. As shown on plans and details, sediment controls are to be placed landward of the turtle exclusionary fencing.

SUBITEM 754.3 (Continued)

MAINTENANCE

Maintenance of Sediment Control Barriers shall be per Subsection 670.40 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP).

The contractor shall inspect the sediment barrier after each significant rain or significant high tide event, and as specified in relevant permits and protection plans to ensure that they are working effectively and as intended. The contractor shall be responsible for ensuring that an effective barrier is in place for all phases of the contract.

Sediment Barriers that decompose naturally due to weatherization over time such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact and continues to provide water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

The Combination Protection fence shall be dismantled and/or removed when construction work is complete and when site conditions are sufficiently stable to prevent surface erosion and after receiving permission to do so from the Resident Engineer.

For all instances, any nonbiodegradable material, including photo-biodegradable fabric, plastic netting, nylon twine, and silt fence, shall be removed and disposed off-site by the Contractor regardless of site context.

COMPENSATION

No separate payment will be made for Subitem 754.3 but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

ITEM 755.2 TIDAL WETLAND MITIGATION AND SALT MARSH REPLICATION AREA LUMP SUM

Work under this item shall conform to the relevant provisions of Subsections 120, 770, 771 and the following:

The work under this Item includes the furnishing of all labor, transportation, equipment, materials and plants required for construction, protection, and maintenance of Tidal Wetland Mitigation and Salt Marsh Replication Areas as compensation for proposed impacts to existing tidal wetlands. Tasks include erosion controls, excavation, fine grading, goose fence installation, planting, maintenance, and removals as shown on the Plans and as required by the Engineer.

DESCRIPTION OF WORK
To ensure that no loss of wetland function results from the proposed project, Tidal Wetland Mitigation Areas characterized by Salt Marsh shall be replicated through constructed wetlands and/or restored by planting in existing substrates in areas shown on the Plans. Tidal Wetland Mitigation and Salt Marsh Replication Areas shall hereafter be referred to as Mitigation Areas. The following minimum area requirements shall be met for the Wetland Mitigation Area location shown on the Plans.

Salt Marsh Mitigation Area
Project Area = 5,930 sf.

Upland buffer restoration Area
Project Area = 6045 sf.

Mitigation Areas shall be constructed to meet the requirements of the permits and consistent with the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 of the Clean Water Act pertaining to Water Quality Certification (314 CMR 9.06(2)), and the U.S. Army Corps of Engineers - New England District Compensatory Mitigation Guidance.

The Contractor shall be responsible for protection and preservation of natural areas adjacent to the wetland mitigation area both within and outside of the project limits for the duration of the contract period. Access to Mitigation Areas shall be clearly defined in order to minimize damage to existing vegetation and soils. The Contractor shall use duck boards or mats, as necessary, to minimize impacts from foot paths or construction equipment. All labor and materials required for protection and preservation site shall be incidental to this item. Damage to soils or vegetation due to trampling, vehicles, storing of materials, debris, or negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

To protect new herbaceous plantings from grazing by geese, Goose Fence shall be installed according to Wetland Specialist in order to enclose tidal wetland planting areas and prevent geese from flying, swimming or walking into the area. All costs associated with installation, maintenance and removal of Goose Fence are incidental to this item.

SUBMITTALS
The Contractor shall submit the following for approval by the Engineer in consult with the MassDOT Landscape Architect at least sixty (60) days prior to installation. The Contractor shall make all submittals to the Engineer in a timely and complete manner.

Sand: Contractor shall submit for approval all sources of clean sand prior to ordering. Soil tests shall be provided to the Engineer for approval at least thirty (30) days prior to delivery. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of sand to the site to verify that sand brought in from off-site is free of invasive plant species including all viable plant parts.

ITEM 755.2 (Continued)

Plants: Source of purchased plant material, confirmation of availability, and certification of provenance from the nursery supplier must be approved / confirmed in advance of project construction start, as applicable. Species substitutions must be approved in writing by the MassDOT Landscape Design Section prior to ordering and at least sixty (60) days prior to installation.

Photographic Documentation: Prior to any disturbance, clear and legible digital photographs with date and time stamps shall be taken of the existing site conditions including existing wetlands to be impacted, all proposed wetland mitigation sites and reference/model wetland areas, typically an adjacent undisturbed wetland. These shall be submitted to the Engineer on CD
/ DVD / USB format.

MATERIALS
All materials are incidental to this item unless specified otherwise.

Plants: Ideally, a significant number of the sourced plants should come from adjacent impacted salt marsh to extent practicable.

Subsoil: Organically amended subsoil should be purchased from an approved vendor. It will pre- mixed and applied prior to placement of course sand surface cover materials M104.1.

Erosion Controls:
Combination Protection Fence (CPF):
See Construction Plans / Specs for Combination Protection Fence (CPF) Details. Combination Protection Fence shall conform to all requirements thereof. Dimensions of fencing / materials provided shall be sufficient to meet the installation requirements within entire project and within the intertidal zone.

Soils:
Imported soils for planting shall be coarse sand conforming to the requirements of M1.04.0 Type 'a' Sand Borrow per Division III of the Standard Specifications. Compost or organic soil amendments shall not be used in tidal wetland areas. No soil or soil amendment shall be brought on site without prior approval of the material source and test results approved by the Engineer.

Existing clean sandy soil or existing peat mat in situ that is free of unacceptable materials and meets the target elevations shall be considered suitable for planting in salt marsh areas.

Soil within the top 1-foot depth of the proposed Mitigation Area surfaces shall be spot checked for unacceptable material. Unacceptable materials include rubble, debris, large rocks, invasive plant material or other foreign matter. Unacceptable materials shall be removed from the site prior to final grading and/or planting.

ITEM 755.2 (Continued)

Usable sand without organic matter may be stripped and stockpiled for re-used in salt marsh replication areas. Sand excavated from the intertidal zone may be saline. Saline soils shall not be used in landscape areas outside tidal wetlands of similar salinity. Excavated soils shall be stockpiled outside resource areas and stored at least 100-feet from the edge of the wetland. Precautions shall be taken as necessary to prevent erosion of the stockpiled material. In the event there is excess borrow, it shall be disposed of without additional compensation.

Existing hydric soils that have been excavated and stockpiled may be chemically altered after drying and are not an acceptable planting substrate in salt marsh areas. Existing soils containing or potentially containing viable parts of invasive plant material shall not be relocated on-site and must be disposed of off-site at an approved disposal facility.

Plant Material:
The Contractor shall source plants to the species and sizes shown on the Mitigation Plans. Contractor to order plants several months in advance to ensure that roots are fully developed, as required. Coordination with MassDOT and supplier to confirm that the species and sizes shown on the Plans are available will be of paramount importance to the success of the site.

All plant material shall conform to the current issue of American Standard for Nursery Stock (ASNS), ANSI Z-60.1, latest edition published by American Association of Nurserymen (AAN), with: American Standard for Nursery Stock (ASNS), ANSI Z60.1-2004, or latest edition, published by American Nursery and Landscape Association (ANLA), (formerly American Association of Nurserymen). Other subsequent references to AAN should likewise be revised to ANLA.

All plant material shall be species native to the region. As per current recommendations by the NOAA Restoration Center and the EPA Ecoregion Assessment, in order to maintain genetic diversity, only native species of seed and plants collected from the EPA Level III Ecoregion of the project area shall be used for ecosystem restoration. The EPA Level III Ecoregions of Massachusetts are Ecoregion 84 Atlantic Coastal Pine Barrens which encompasses Barnstable, Dukes, Nantucket and Plymouth Counties. Ecoregion 59 Northeastern Coastal Zone encompasses the remainder of Massachusetts. The current EPA map, Ecoregions of the Continental United States, is available through the following link: ftp://ftp.epa.gov/wed/ecoregions/us/Eco_Level_III_US.pdf
The nursery source shall certify that the provenance, or origin, of the seed from which the plants were produced is from the applicable EPA Level III Ecoregion.

Transplants and plant material collected from the wild outside of the construction impact area is prohibited. Collection within the construction impact area should be performed as approved in writing by the Wetland Specialist. All other Plant materials shall be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to the Engineer upon request.

ITEM 755.2 (Continued)

All plant material used shall be nursery grown and healthy, sound and free of disease, insect pests, eggs or larvae, discolorations, leaf wilting or curling and weeds. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil after removal from the container. Roots shall visibly extend to the inside face of the growing container but shall not be root-bound or girdling. Plants grown in peat pots shall be well-rooted through the pot with 4-6 stems per pot and stems at least 6-inches in height.

Plant material intended for tidal wetlands shall be acclimated to the salinity of the adjacent water body. Salinity acclimation shall be done incrementally at the nursery to bring the plants up to a tolerance of the site salinity. Plants shall be thriving in the nursery at the target salinity level for a minimum of two weeks prior to delivery.

All plants shall be delivered to the site as live, actively growing or just breaking dormancy, and arrive to the project site ready for planting. The Resident Engineer and/or Wetland Specialist may reject plants damaged in handling or transport. Plant material shall be installed as soon as possible after it has been delivered to the site.

Soil and root mass shall be watered and moist upon delivery to the job site. Plants with dry soil and roots shall not be acceptable. All plant materials temporarily stored at the site prior to planting shall be stored out of direct exposure to sun and wind, shall be maintained by careful watering and shall be protected from damage due to construction activities and adverse weather. Plants stored improperly may be rejected and shall be replaced by the Contractor at no additional cost to MassDOT.

No plants shall be installed until the Wetland Specialist approves the condition of the plant material and the process of installation.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect at least ninety (90) days prior to planting. The Contractor shall submit a list of nurseries that were contacted and unable to supply the species as shown on the Plans. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Goose Fence:

Netting:	UV-stabilized polypropylene netting, such as typical of deer netting, to be approved by MassDOT Landscape Architect
Structure:	square or quadrangular
Mesh size:	1-inch (max.) in either longitudinal or transversal direction
Color:	black
Tensile strength:	308 lbs. (min.)
Elongation:	20 % (max.)
Fasteners:	minimum 10-inch long UV-stabilized nylon cable ties
Posts:	2-inch x 2-inch untreated hardwood stakes. Metal stakes are not an acceptable substitute.
Overhead lines:	#18 white, braided nylon twine; 20# white polished hemp twine; or approved equal.
Bird repellent ribbon:	2 inch-wide holographic iridescent diffraction foil ribbon.

Available from the following manufacturers or approved equal.
¾ inch wide: Holographic Bird Scare Tape from Dalen 2 inch wide: Tanglefoot Repeller Ribbon from Contech 2 inch wide: Irri-tape from Bird-X

ITEM 755.2 (Continued)

Water:
Plant material shall be saturated with fresh water before delivery, upon delivery to the site and twice daily up to time of installation. The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. According to DEP requirements, water from the river shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water or use of contaminated water.

METHODS
Site Preparation:
Prior to an initial site meeting, the Contractor shall stake out Mitigation Area boundaries and set grade stakes in the field. Prior to the start of work, the Contractor shall walk the site with the Engineer, Wetland Specialist, and MassDOT Landscape Architect for an initial site meeting. The purpose of the meeting is to verify limits of work, locations and installation of Phase 1 erosion controls, proposed construction methods, and grade stake elevations.

Erosion and Sediment Control:
The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Mitigation Areas and nearby wetland resource areas. Erosion controls shall be in place prior to any construction activities.

The Engineer and Wetland Specialist shall inspect and approve erosion and sediment control measures prior to excavation work. The Contractor shall remove sediment deposits as necessary to maintain the filters in working condition. The Contractor shall maintain erosion controls in a functional condition at all times, including inspections after each rainfall and at least daily during prolonged rainfall and shall immediately correct all deficiencies.

Phase 1 Erosion Controls for Tidal Wetlands:
CPF shall serve as temporary erosion control during site preparation, excavation, grading and planting operations. Floating turbidity curtains shall not be acceptable for use above the mean low water line. CPF shall also act as a limit of work barrier for all heavy equipment. It is the Contractor’s responsibility to ensure that adequate erosion control measures are in place and maintained to prevent suspended sediment and siltation from entering adjacent waters and wetlands.

CPF shall be installed along the border between existing salt marsh and the channelward limit of salt marsh replication areas. The CPF shall begin and end in the surrounding upland and shall be placed so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Silt fencing shall be trenched into soil and secured to prevent sediment transport out of the work area. The top of siltation barrier shall extend above the highest tide elevations predicted for the period of work in order to contain suspended sediment within the work area during high tides and storm events. If necessary, CPF shall be reinforced with wire or plastic mesh to withstand the forces of flooding and ebbing tides.

Immediately following acceptance of wetland planting, the channelward CPF shall be removed to allow unimpeded tidal flow across the site. Trenches and disturbed soil shall be restored to a smooth and level surface relative to surrounding areas. Exiting vegetation disturbed by erosion control installation and removals shall be replanted as directed by the Engineer and Wetland Specialist.

ITEM 755.2 (Continued)

Phase 2 Erosion Controls for Tidal Wetlands:
Following acceptance of final grades and prior to planting in salt marsh replication areas, compost filter tubes shall be installed as a second line of erosion control above the Mean High High Water (spring high tide) line along upper limits of the Mitigation Areas.

Upon final acceptance of adjacent seeding, the compost filter tubes shall be cut open, compost spread evenly over the soil surface a maximum depth of 2-inches and the composted area shall be seeded with same seed mix used for upland stabilization. Stakes, ropes and other non- biodegradable materials shall be removed and disposed of offsite by the Contractor.

Excavation and Grading:
Final grades in the salt marsh replication areas shall conform to target elevations as shown on the Plans and as approved by the Wetland Specialist. These areas shall be staked and grades set for approval prior to clearing and excavation. To the extent possible, limits shall be a minimum of 6 feet from trunk of trees that are to remain. Actual limits of mitigation areas may be adjusted in the field to protect root systems of existing trees. However, the total area of Wetland Mitigation required by all permits shall not be reduced. Wetland Specialist will remain on-site to determine final excavation depth versus ability to maintain existing cedars on-site.

Sequence and execution of work shall ensure minimal compaction and no heavy equipment moving over replacement soils. If heavy equipment is required to travel over existing wetland soils, wood mats shall be placed to minimize impacts. Upon acceptance of final grades, no heavy equipment or equipment shall travel across mitigation areas or adjacent wetland resource areas.

Salt marsh restoration areas shall conform to existing and/or adjacent grades.

The Contractor shall provide a minimum depth of one (1) foot of suitable planting substrate for salt marsh replication areas as defined in the materials section. If unacceptable material is found, it shall be removed from the soil. Soil that is beyond usable quality as determined by the Engineer and Wetland Specialist shall be disposed of off-site.

If suitable soils are not present at the required depth within the target elevations, the mitigation area shall be excavated to a depth of one (1) foot below proposed target elevations and backfilled with clean, coarse sand. Special hydric soils or organic amendments are not required for tidal wetland areas.

ITEM 755.2 (Continued)

The Contractor shall identify existing areas of established invasive plants within the Mitigation Area and notify the Engineer and MassDOT Landscape Architect of the condition. Soil containing invasive plant material shall be excavated and disposed of off-site at an approved facility.

All cut trees, stumps, brush, wrack or vegetation not specified to remain shall be removed from Mitigation Areas unless directed otherwise by the Engineer and Wetland Specialist. Materials shall not to be stockpiled in the resource areas or buffer zone while awaiting disposal.

The finished grade shall be at an elevation that will provide a hydrologic connection between the replacement area and adjacent wetlands or water source. The Contractor shall verify that this elevation is not at a level that could dewater or flood an adjacent non-tidal wetland. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland.

After grading, Contractor shall allow a Settling Period of one full tide cycle, approximately two weeks, for substrates to settle before acceptance of final grades. Prior to planting, the Engineer and Wetland Specialist shall confirm that the target elevations have been achieved and provide approval of final grades to the Contractor. If settling or shifting occurs during the settling period, correct final grades before planting and removal of CPF from salt marsh replication areas.

Mitigation Area Planting:
Planting shall be overseen by the Wetland Specialist. Plants shall be installed while planting surface is in the dry and according to the Plans. If planting includes more than one intertidal zone planting area, the Wetland Specialist shall flag out limits of intertidal zones prior to planting.

Plants shall be installed within the range of target elevations within the intertidal zone and at the spacing shown on the Plans. In salt marsh restoration areas, plugs shall be installed to fill in gaps among existing vegetation at the spacing shown on the Plans. Resilient adaptability of salt marsh grasses requires interplanting of high and low marsh species. Plan areas indicating species are diagrammatic for the purpose of quantifying materials but will be interplanted at their transitional edge per field direction. Discrepancies shall be resolved by the Wetland Specialist in consultation with the Wetland Specialist and MassDOT Landscape Design Section.

Plant material shall be installed as soon as possible after delivery. Plants stored onsite prior to planting shall be maintained in acceptable condition as described in materials section. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist with replacement at the Contractor’s expense.

Plants shall be installed at a depth to prevent dislodging through the tide cycles and as shown on the Plans. Firmly backfill hole by hand with the planting substrate to prevent dislodging from tidal action. There is potential for air pockets especially when planting in an existing peat substrate; care shall be taken not to leave air pockets in the planting hole. Stepping on the planting hole to backfill may cause stems to break and is not an acceptable practice.

Mulch shall not be used for plantings within the intertidal zone below the High Tide Line (spring high tide) line.

ITEM 755.2 (Continued)

Plants installed within the intertidal zone, or range of normal tidal flooding, shall not require additional watering after installation.

Herbaceous Plants:
Installation of herbaceous plants shall occur within the planting window of May 1 to June 30. Planting outside of these dates shall require written approval from the Engineer in coordination with the Wetland Specialist and MassDOT Landscape Design Section. Planting holes shall be 6- 8 inches deep and of sufficient width to accept plugs or peat pots.

Woody Plants:
Plants shall be removed from the container or burlap covering and set in the hole 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. Circling or girdling roots shall be untangled to promote spreading growth.

Goose Fence:
Goose fence shall be installed as perimeter protection for salt marsh mitigation areas prior to planting and according to the Plans. The Contractor shall ensure that the goose fence is maintained and wetland plantings are not grazed or disturbed by geese throughout the duration of the Establishment and Planting Guarantee Period. Any plants damaged or lost due to inadequate protection shall be replaced at the Contractor's expense.

Goose Fence shall consist of UV-stabilized polypropylene netting secured to stakes in order to enclose the tidal wetland planting area and prevent geese from flying, swimming or walking into the area. Wetland planting areas shall be divided by Goose Fence into sections no greater than 48 feet by 48 feet. The top of netting shall be at or above Mean High High Water (spring high tide) elevation to prevent geese from swimming into planting areas. A network of overhead lines shall be installed to prevent geese from flying into planting areas. Bird repellent ribbon shall be attached to the overhead lines and top edge of netting to warn birds of the obstructions.

The Contractor shall remove and properly dispose of all Goose Fence materials at the end of the second growing season after plants enter dormancy or as directed by the Resident Engineer.

Mitigation Performance Standards:
The Contractor shall fulfill the following minimum Mitigation Performance Standards for the Mitigation Areas within a Planting Guarantee Period of two (2) full growing seasons after Final Acceptance of plantings. Monitoring shall be performed by the Wetland Specialist as described below.

1. MassDOT is responsible for reestablishing success of ~ 2,677 sf the replacement area to a 1:1 ratio within of the site within two growing seasons.
2. The target elevations for Mitigation Areas and planting types have been met and maintained. A minimum of 90% of each wetland mitigation area must meet desired hydrology. Areas that are too high or too low should be identified along with suggested corrective measures.
3. Establish at least 75% uniform cover of the intended herbaceous wetland plant community.
4. Establish at least 95% of woody plants installed.

ITEM 755.2 (Continued)

Plant species listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the USACE – New England District shall be identified as such in the monitoring reports and corrective measures taken to control them within the limits of the Mitigation Areas for the duration of the Planting Guarantee Period.

If at the end of the Planting Guarantee Period, the Mitigation Performance Standards have not been met according to the monitoring report, the Contractor shall provide corrective measures and install replacement plant material to achieve the required establishment. All costs associated with achieving the Mitigation Performance Standards through the Planting Guarantee Period shall be incidental to this subitem.

As-Built Drawings:
Following acceptance of the planting by MassDOT, as-built drawings of the Wetland Mitigation Areas shall be surveyed and prepared as per the USACE - New England District's Compensatory Mitigation Guidance. As-built drawings shall be prepared at a clearly legible scale including 1-ft. contours and polygons outlining each wetland mitigation area. The as-built drawings shall serve to confirm that area requirements have been met and as the base map for mitigation monitoring. The as-built drawings shall be provided in printed paper format (full size 30" x 42" sheets) as well as Portable Document Format (e.g., Adobe PDF) and AutoCAD files on compact disk. As-built drawings shall be completed within 30 days of acceptance of initial wetland mitigation planting.

Final Acceptance:
Final acceptance of work under this Subitem shall be contingent upon the following.

a. Completion of wetland work and Final Site Inspection by Engineer and Wetland Specialist.
b. Completion and acceptance of As-Built Drawings by the Engineer and Wetland Specialist.

Monitoring and Maintenance:
Monitoring shall be performed by the Wetland Specialist in order to ensure compliance with the Mitigation Performance Standards. Monitoring methods and report content shall conform to the Wetland Mitigation Report as approved by the regulatory agencies. The monitoring schedule shall be as per scope of work for Wetland Specialist. Work performed by the Wetland Specialist shall be according to and paid for separately and is not included in this item.

Based on monitoring results and as directed by the Engineer in consultation with the MassDOT Environmental and Landscape Design Sections, the Contractor shall make corrective measures to achieve compliance with the Mitigation Performance Standards. All plants not showing satisfactory evidence of establishment during the Planting Guarantee Period shall be replaced within the appropriate planting window. Unsatisfactory plants shall be removed and replaced along with dead and missing plants.

Maintenance of Mitigation Areas shall include replacement of dead or missing plant material, maintaining goose fence in effective and satisfactory condition, removal of debris within and around perimeter of Mitigation Area, correcting unintended ponding, erosion and gullies. Goose Fence shall be maintained in tidal Mitigation Areas for at least two full growing seasons. If tidal wetland plants are replaced, goose fence shall be maintained or be re-installed to protect seedlings from foraging for two full growing seasons. All maintenance shall be incidental to this item.

SUBITEM 755.2 (Continued)

BASIS OF PAYMENT

Within 10 days of Notice to Proceed, the Contractor shall submit, in duplicate, for approval by the Engineer, a schedule of unit prices and amounts for the major components of the Mitigation Areas as listed on the following table. The cost of labor and materials for any item not listed but required to complete the work under this item shall be considered incidental to the item and no further compensation will be allowed.

Item Component	Quantity	Unit	Unit Price	Amount
Combination Protection Fence	XX	FT	$	$
Goose Fence	XX	FT	$	$
Coarse Sand	XX	CY	$	$
Prunus maritima – 18-24 IN	XX	EA	$	$
Baccharis halimifolia – 18-24 IN	XX	EA	$	$
Salt marsh grass 2-inch plugs	XX	EA	$	$
Saltmeadow cordgrass 2-inch plugs	XX	EA	$	$
American beachgrass 2-inch plugs	XX	EA	$	$
Bitter Panicgrass Seed / Oat Cover	XX	EA	$	$

*Note: Quantities for salt marsh restoration area have been roughly estimated. Actual quantities shall be determined in the field by the Wetland Specialist after impacts to existing vegetation from the temporary bridge have been assessed.

Item 755.2 will be paid at the contract Lump Sum bid price, which price shall include all labor, materials, equipment, and incidental costs required to complete the Tidal Wetland Mitigation and Salt Marsh Replication Areas.

PAYMENT SCHEDULE
75 percent paid upon Final Acceptance.
25 percent paid at end of Planting guarantee period.

SUBITEM 755.45 WETLAND RESTORATION

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

DESIGNER INSTRUCTIONS:

NOTE:

- ***If there will be no or minimal soil compaction, tilling is not be necessary.***
- ***Incorporate invasive plant management items if required by permits.***

DESCRIPTION

The work under this subitem shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this subitem shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

SUBITEM 755.45 (Continued)

Compost Blanket shall be as specified under that item.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

[Insert Mix and Rate of Application.
Wetland seed mixes available at https://www.mass.gov/lists/landscape-design-and-roadside-maintenance.]

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

[Select as appropriate]
Plant species and sizes to be included in the Restoration Area shall be as specified on the plans. //OR// as follows: Insert Plant List with Botanical Name/Common Name/Size/Quantity.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

SUBITEM 755.45 (Continued)

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, temporary separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Erosion and Sediment Control Barriers

Barriers are to be maintained from construction to the extent practicable, and as required by MassDOT and. if required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

SUBITEM 755.45 (Continued)

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

[Select scarification or tilling. Amend as needed. Delete what does not apply.]

Soil Scarification
(Recommended where impacts or area is minimal).
Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall ***be seeded with mulch //OR// seeded with Compost Blanket*** as specified below. Seeding shall immediately follow soil preparation.

Soil Tilling with Compost
(Recommended where compact is severe or organic matter need to facilitate faster restoration).
Two inches of compost shall be applied over the impacted area and soil shall be tilled to a depth of 4 inches below the existing grade. Following tilling, soil shall be raked relatively smooth, or as directed. Upon approval of prepared soil, area shall be seeded and hydromulched.

[Select appropriate seeding method. Delete what does not apply.]

Seeding with Mulch
(Recommended where impacts are minimal and/or importing compost is not cost effective due to size or location of area).
Upon approval of prepared soil, area shall be seeded. Seeding shall be hand broadcast with straw mulch applied per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Seeding with Compost Blanket
(Recommended where practical or already used on project as will facilitate faster restoration).
Application of compost blanket and seed shall be done as one application and shall not begin until the Engineer has approved the site and soil conditions. The Contractor shall notify the Engineer when raked areas are ready for inspection and application of compost blanket and seed.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost blankets and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

Planting

Planting shall conform to SUBSECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

SUBITEM 755.45 (Continued)

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

SUBITEM 755.45 (Continued)

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

SUBITEM 755.45 (Continued)

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Subitem 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Planted species are establishing well and cover 75^ percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into salt marsh.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

COMPENSATION

No separate payment will be made for Subitem 755.45 but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

SUBITEM 755.75 WETLAND SPECIALIST

The Design-Builder is directed to:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions
for Landscaping Item Special Provisions.

WETLAND SPECIALIST QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation, as well as experience with wetland and stream restoration projects. The Wetland Specialist shall be employed to oversee all vegetated wetland and streambed work, salt marsh work and mitigation, and all restoration activities, including but not limited to grading, placement of substrate, seeding, vegetation plantings, and placement of wildlife habitat features. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District. The Wetland Specialist may also serve as an Environmental Monitor if the qualifications are met.

WETLAND SPECIALIST SUBMITTALS – QUALIFICATION
Add the following:

- As identified within the conditions of permitting approvals; the name, contact information, and qualifications shall be provided to MassDEP for approval prior to the Pre-Construction Meeting.
- The name and contact information of the approved WS shall be provided to the Marion and Wareham Conservation Commissions prior to the start of work.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight
Add the following:

- ***Monitoring Reports:*** Annual monitoring reports are to be submitted by the Wetland Specialist no later than January 15th each year. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Section 401 Water Quality Certifications, Section 404 USACE authorization, and other regulatory permits, as required.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Salt Marsh Mitigation items:

- Request for Conditional Acceptance.
- Request for Final Acceptance.

SUBITEM 755.75 (Continued)

SCOPE OF WORK

Inspections & Construction Oversight
Replace with the following:

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
  - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
  - Select and mark snags, logs, and woody material to be retained for placement in the Salt Marsh Mitigation, as appropriate.
  - Note invasive plants in and adjacent to Salt Marsh Mitigation.
  - Provide summary report if and as specified under Salt Marsh Mitigation items.
- Erosion and Sediment Control, Excavation, and Grading for Replication Areas
  - Wetland Specialist and Engineer will approve Contractor erosion and sedimentation control installation.
  - Approve excavated depth and grading for appropriate wetland hydrology according to mitigation plan and spec (755.2).
  - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
  - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
  - Review and approve methods of soil protection and restoration if required.
  - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.
- Re-vegetation of Mitigation Area
  - Placement of any woody material to be re-used.
  - Verify all plants used complies with specifications and site conditions, and as noted in Tidal Wetland Mitigation Area Spec (755.2). Determine limits for plantings based on elevations, approve seeding and planting methods, and collect relevant plant information and seed tags (sourcing, tags, etc) to submit with Request for Conditional Acceptance.
  - Review planting methods noted in mitigation plan prior to installation and oversee layout of wetland plants.
  - At least 75% of the surface area of the salt marsh and wetland replication and/or restoration areas shall be vegetated with indigenous wetland plant species within two growing seasons. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time. Annual monitoring reports are to be submitted by the Wetland Specialist no later than January 15th each year. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed.

SUBITEM 755.75 (Continued)

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Salt Marsh Mitigation items. Submittal shall include a report and photo documention of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Salt Marsh Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Salt Marsh Mitigation and surrounding area to ensure that it meets the conditions specified under the Salt Marsh Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Salt Marsh Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Salt Marsh Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Salt Marsh Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Salt Marsh Mitigation items.

If the Salt Marsh Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Per Agency approval, at least 75% of the surface area of the salt marsh and wetland replication and/or restoration areas shall be vegetated with indigenous wetland plant species within two growing seasons. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time.

COMPENSATION

No separate payment will be made for Subitems 755.75,but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

SUBITEM 755.76 WETLAND MONITORING REPORTS

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this subitem shall be for the submittal of Wetland Monitoring Reports following the completion of salt marsh construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

"Wetland Mitigation" shall be used herein for applicable wetland work, whether salt marsh replication (creation of a new salt marsh) and/or wetland restoration (restoration after temporary impacts).

The Design-Builder shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the "Wetland Specialist," to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Subitem 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Subitem 755.75 Wetland Specialist.

SCOPE OF WORK

Post-Construction Wetland Monitoring Reports

Final Acceptance of the wetland construction work as specified under Item 755.2 and/or Subitem 755.45 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the salt marsh mitigation area relative to the performance standards identified in the permitting applications, the design plans, and performance criteria established by MassDEP approval, and the reference salt marsh.
- Recommendation for a corrective plan of action if needed.

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the salt marsh/es and wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

SUBITEM 755.76 (Continued)

Monitoring Reports shall be as follows for ***2*** years:

- *MassDEP: Annual Reports - (no later than January 15 of every year).*
- *ACOE: Annual Reports - (no later than January 15 of every year).*

At least 75% of the surface area of the salt marsh and wetland replication and/or restoration areas shall be vegetated with indigenous wetland plant species within two growing seasons. Additionally, evidence of hydrology, including hydric soil formation shall be submitted at the same time. Monitoring reports shall include an assessment based on the approved success criteria, representative photos, and recommended corrective actions as needed.

COMPENSATION

No separate payment will be made for Subitems 755.76,but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

Subitem 755.76 Wetland Monitoring Reports and associated inspections will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = ***1 Report***
- Year 2 = ***1 Report***

SUBITEM 756. NPDES STORM WATER POLLUTION PREVENTION PLAN

This Subitem 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 (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. The Design-Builder shall be fully responsible for compliance with the most recently issued CGP and any subsequent revisions. Should a fine or penalty be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Design-Builder shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. 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 (SWPPP) 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 Design-Builder.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The Design-Builder shall prepare the SWPPP and update it as necessary. The Design-Builder shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Design-Builder to comply with the CGP 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 the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.

SUBITEM 756. (Continued)

It is the responsibility of the Design-Builder to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, regulations, construction methodologies, and the like are the responsibility of the Design-Builder. Amendments will require the approval of the Engineer prior to implementation.

In addition to the CGP requirements for inspections, MassDOT requires inspection of all erosion controls and site conditions on a weekly basis. Inspections are also required at portions of sites that discharge to sediment or nutrient impaired or high quality waters per the CGP when each incidence of rainfall exceeding 0.25 inches in twenty-four hours, significant high tides, or after snowmelt discharge from a storm event that produces 3.25 inches or more of snow within twenty-four hours occurs. The CGP requires that inspections be performed by a qualified individual as outlined in the CGP. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The inspector's qualifications shall be submitted to the Engineer for approval prior to beginning any work. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Design-Builder 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 Design-Builder 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 CGP. The Standard Specifications require adequate erosion control for the duration of the Contract. All control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Design-Builder to replace or modify the control for site conditions at no additional cost to the Department. The Design-Builder must maintain all control measures and other protective measures in effective operating conditions and shall consider replacement of erosion controls for each construction season.

This Subitem 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 which are selected by the Design-Builder to facilitate and/or address the Design-Builder's schedule, methods and prosecution of the work shall be considered incidental to this item.

SUBITEM 756. (Continued)

The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. 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. The permittee shall use EPA's website to prepare and submit the NOT.

BASIS OF PAYMENT

No separate payment will be made for Subitem 765., but all costs in connection therewith including all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports, filing fees, and satisfactory submission of a Notice of Termination (NOT) when final stabilization has been achieved shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 767.121 SEDIMENT CONTROL BARRIER

The Design-Builder is directed to:
https://www.mass.gov/info-details/landscape-and-wetland-design-special-provisions
for Landscaping Item Special Provisions.

BASIS OF PAYMENT

No separate payment will be made for Subitem 767.121, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 804.3	**3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC – (UL)**
SUBITEM 804.32	**3 INCH ELECTRICAL CONDUIT TYPE NM (DOUBLE) PLASTIC (UL)**
SUBITEM 804.41	**4 INCH FRE CONDUIT**
SUBITEM 804.42	**4 INCH ELECTRICAL CONDUIT TYPE NM (DOUBLE)-PLASTIC (UL)**
SUBITEM 804.44	**4 INCH ELECTRICAL CONDUIT TYPE NM (4 BANK)-PLASTIC (UL)**
SUBITEM 804.412	**4 INCH ELECTRICAL CONDUIT TYPE NM (12 BANK)-PLASTIC (UL)**
SUBITEM 804. 4	**4INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC – (UL)**
SUBITEM 804.61	**6 INCH FRE CONDUIT**
SUBITEM 804.62	**6 INCH ELECTRICAL CONDUIT TYPE NM (DOUBLE) PLASTIC (UL)**
SUBITEM 804.64	**6 INCH ELECTRICAL CONDUIT TYPE NM (4 BANK)-PLASTIC (UL)**
SUBITEM 806.4	**4 INCH ELECTRICAL CONDUIT TYPE RM – GALVANIZED STEEL**

The work under these subitems shall conform to the relevant provisions of Subsections 801 and 813 of the Standard Specifications and the following:

DESCRIPTION

The work shall include the installation of conduits and handholes/manholes for the relocation of MassDOT and other Fiber Optic Cable (FOC) operators with directional drilling of casing pipe (with innerducts) under the MBTA railroad tracks as well as the installation of temporary facilities such as conduit and handhole/manhole. The work shall also include the relocation of MassDOT owned FOC.

The work includes installing plastic conduit underground, with transitions from plastic to Fiberglass Reinforced Epoxy (FRE) at bridge crossings and galvanized steel rigid metal conduit (RMC) at utility pole risers. Handholds/manholes shall be installed at connection points between new and old underground conduit. Any exposed conduit, such as at bridge abutments and adjacent to bridges shall be fiberglass. Junction boxes to be attached to bridge abutments, as shown on the plans, shall be a part of this work. Expansion couplings shall be furnished, installed, and tested as required and as described below.

The work includes the transitioning to 1-4-inch or 1-6-inch Fiberglass Reinforced Epoxy (FRE) conduit from PVC conduit, over the bridges. Expansion couplings shall be furnished, installed, and tested as required and as described below.

When crossing under pavement and under the Shared Use Path or sidewalk, the conduit shall be encased in concrete. The ductbank shall be constructed as shown in standard details. Replace 3” conduit in details with 4-inch or 6-inch conduit as needed.

The Contractor shall install all FOC Connections to the Comcast, Verizon and Open Cape systems (if required) shall be done by Comcast, Verizon or Open Cape personnel. The Contractor shall coordinate with Comcast, Verizon, and Open Cape for these final connections.

SUBITEMS 804.3 THROUGH 806.4 (Continued)

All new conduits in trenches shall be installed with detectable warning tape placed 1 foot above the conduits. All new conduits shall have pull tapes in each innerduct so cables can be pulled later by the FOC operators.

The Contractor shall coordinate schedules with FOC operators and MassDOT for relocation of facilities as well as FOC. The Contractor shall protect and maintain the conduits throughout construction of the Project.

If the FOC operators cannot pull the cables through the conduits because of obstructions, kinks, or other issues of any kind, the Contractor shall remedy the situation at no additional cost.

Special care is required to protect the existing cables during the installation of the new structures and conduits in the area of the existing FOC utilities. Hand digging and /or vacuum extraction will be required for the installation of new structures and conduits at any location that is within 5 feet of a live FOC utility. Any hand and/or vacuum extraction digging is considered incidental to the protection of this utility and will be performed at no additional compensation.

The Contractor is responsible for protecting existing and newly installed conduits within the Project limits.

The Contractor shall contact the FOC operator 72 hours prior to working within 10 feet of the existing or newly installed system. Any damage to the existing FOC system will be repaired by the Contractor at the Contractor's expense.

SUBMITTALS

The Contractor shall submit the following for each item required for construction of the conduit:

1) Pipe manufacturer's technical specification and product data for innerducts and outer ducts.
2) Manufacturer's technical data containing information on new pipe and fittings.
3) Verifications from the pipe manufacturer of training in the proper method for handling and installing the new pipe.
4) Sketches and material type for bridge attachment of conduit to utility support bracket.
5) Construction sequencing, design, or procedures different than what is shown on the plans for review and approval prior to proceeding.

QUALITY ASSURANCE

Provide manufacturer's certification in writing, that materials meet or exceed minimum requirements as specified and are compatible with the backbone of the existing system as per the FOC operators.

DELIVERY, STORAGE AND HANDLING

Products shall be shipped, stored, and handled in a manner consistent with the written recommendations of the manufacturer to not to degrade quality, serviceability or appearance.

SUBITEMS 804.3 THROUGH 806.4 (Continued)

All products delivered to the project site shall be accompanied by test reports certifying that the pipe conforms to the applicable ASTM specifications. Any product found to be defective by the FOC operators either before or after installation shall be removed from the project site and replaced with a sound product.

If stored for more than two (2) weeks, the materials shall receive all maintenance considerations required by the manufacturer for proper storage of the materials.

FIBERGLASS REINFORCED EPOXY PIPE (FRE)

Fiberglass Reinforced Epoxy pipe (FRE) shall be installed over the bridge between the expansion joints of each abutment along the outside exterior stringer. At the expansion joint of each abutment, FRE shall transition to PVC conduits using expansion couplings. Flexible FRE expansion couplings shall be installed at this transition from PVC to FRE conduit and one additional coupling installed near the middle of the bridge as required by FOC operators. Bridge attachment support brackets shall be used to attach the FRE to the new bridge superstructure as shown on the BTC plans.

Bridge attachments, testing and installation of pull tapes shall be considered incidental to the installation of the conduit and included in the unit price per foot of the item.

FRE shall be ballistics tested filament wound fiberglass reinforced heavy wall conduit. The conduit shall be free from defects and nominally uniform in color, density and physical properties. Inner diameter shall be 4 or 6 inches. The conduit shall be supplied with integrally wound tapered bell and ground spigot to be used with an adhesive according to manufacturer's recommendations and warranty. All joints shall withstand a joint pullout force of 1,000 pound. Any fittings, adaptors or sweeps shall be of the same material and manufacturer unless otherwise specified. Conduits shall be supplied in approximately 20-foot lengths and all conduit and fittings shall contain an ultraviolet inhibitor.

GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

Galvanized Steel Rigid Metal Conduit (RMC) shall be suitable for bridge attachment and underground installation and shall be at a minimum Schedule 80 galvanized steel conduit. Steel pipe shall meet ASTM A-53, TYPE S GRADE B.

INSTALLATION

Conduits shall be installed where shown on the Plans with a minimum slope change along the length of the pipelines. All conduits shall be installed in trenches with a minimum 1.5 feet width and backfilled with suitable material. Detectable warning tape shall be installed 1-foot above the conduits.

LAYING PIPE

Excavations shall be made to accommodate the bedding material. Bedding material shall be clean of foreign material and meet the requirements for ordinary borrow. Boulders may not be backfilled against the conduits. Objects greater than 12-inch diameter shall be removed and not used as suitable backfill material. All excavations shall be kept dry while pipe is being laid and until each joint and pipe has been inspected by the FOC operator(s) and approval given to commence backfilling operations.

SUBITEMS 804.3 THROUGH 806.4 (Continued)

Any pipe, which is not laid to grade and alignment, shall be re-laid to the satisfaction of the FOC operator(s). No blocking shall be used. Pipe shall be installed in accordance with published recommendations of the pipe manufacturer.

PIPE DEFLECTION FOR CONDUIT

Pipe installed under this Specification shall have a maximum deflection of 5% at the time of testing. Such deflection is defined as the amount of vertical deformation (nominal inside diameter less the minimum vertical diameter when measured) multiplied by 100 and divided by the nominal diameter of the pipe.

All lines with a deflection angle greater than 5% shall be repaired by re-bedding or replacement of the pipe at the Contractor's expense.

INSPECTION

At the conclusion of the Work, all pipelines shall be visually inspected by the Engineer and the FOC operators to insure a straight and plumb alignment.

All pipelines which are not straight, and plumb shall be removed and replaced at the Contractor's expense.

CLEANING AND TESTING

The Contractor shall thoroughly clean the conduit by flushing with water or other means to remove dirt, stones, and other material. Prior to acceptance, all pipelines shall be inspected for cleanliness and to ensure no obstructions exist.

COMPENSATION

No separate payment will be made for Subitems 804.3 through 806.4, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

Any repair to the existing or newly installed conduit, protection devices required to protect the FOC throughout the project and equipment required to attach the conduit to the bridge will be considered incidental to the Work performed under these Subitems.

SUBITEM 821.12 HIGHWAY LIGHTING POLE (ANCHOR BASE) 8 FOOT BRACKET

The work under this Subitem shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

The work of this Subitem shall consist of furnishing and installing poles, davit bracket arms for luminaires to be mounted at 30 feet high as located and detailed on the Contract Plans.

This Subitem includes poles to be used with the roadway luminaires specified herein. All poles shall be of the same design shape; dimensionally, aesthetically, and supplied by the same manufacturer.

All poles shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

The pole shall consist of a single piece, round tapered steel shaft with a galvanized finish, which is applied after all fabrication has been completed. The length of each pole assembly shall position the proposed luminaires at the mounting height above the finished roadway as shown on the drawings.

Each pole shall include base plate, handhole, anchor bolts as required, and base plate covers.

All materials required to mount the poles regardless of the mounting shall be replaced and provided by the Contractor.

1. Breakaway couplings will be provided and shall conform to all MassDOT standards and be supplied by the pole Manufacturer. When a breakaway base is used as shown on the drawings, a customized full-length galvanized base plate cover shall be provided. Breakaway couplings shall be cast iron (Triplex) not aluminum.
2. A 4 inch X 6 inch reinforced galvanized handhole shall be included and oriented 90 degrees from the luminaire. The handhole and reinforcements shall be welded to the pole shaft at 1 foot 6 inches above the top of the base plate. Internally positioned and welded securely on the opposite pole wall from the handhole, a grounding lug, complete with grounding screw shall be provided. A galvanized cover shall be provided by the Manufacturer.
3. For base mounted poles, the anchor bolts, if required, shall be manufactured using a carbon steel bar and have a 90 degree bend on one end and shall be galvanized over the entire length of the bolt. Four (4) anchor bolts with galvanized nuts and washers shall be provided for each new pole foundation required for this project (see detail drawing for pole foundation requirements.). The length of the anchor bolt shall be in accordance with the recommendation of the pole Manufacturer.
4. All materials are to be galvanized after fabrication (no exceptions will be taken). Any modifications made to the pole in the field shall be approved by the Engineer.
5. All poles shall be provided with an internal vibration-dampening device secured by means of stainless-steel hardware. Actual mounting height of device shall be per the recommendations of the pole manufacturer.

The Contractor is required to provide all miscellaneous hardware required to install the above items, which are not noted on drawings or specification. All hardware, unless noted above, shall be stainless steel grade 316 or better.

SUBITEM 821.12 (Continued)

The Contractor shall provide the following information complete in form, prior to acceptance and manufacture of any products for this project. Any exclusion of the following items will invalidate the submittal (no partial submittals):

A. Contractor shall supply a certification of compliance with the specifications, warranty, design calculations, and weld details.
B. Submit shop drawings, exploded view assembly drawings, catalog cuts, descriptive information for poles, arms, and mounting hardware for each product type specified in accordance with Subsection 5.02 of the Standard Specifications. (Note; seven (7) copies of each shall be supplied.) A Professional Engineer (Structural) registered in the Commonwealth of Massachusetts (Structural) shall stamp all drawings.
C. Submit structural design calculations, stamped by a Professional Engineer (Structural) registered in the Commonwealth of Massachusetts for all components of pole and anchor base. Design shall be in accordance MassDOT standard and supplemental specification Subsection 820.41.
D. Submit installation instructions provided by the Manufacturers detailing the installation procedures and recommended maintenance procedures for all poles.

The Manufacturer shall comply with the following warranty:

A. The Manufacturer warrants that the design, material, and workmanship incorporated in each pole shall be of the highest grade and consistent with established, and generally accepted, standards for lighting applications.
B. The Manufacturer agrees that this warranty (non-prorated warranty) shall commence with the acceptance of the poles, whether a defect is patent or latent, and shall continue for a period of five (5) years (non-prorated warranty) after acceptance by MassDOT.
C. This warranty by the Manufacturer shall be valid for all installations of procured products, regardless of the Installing Contractor. The Manufacturer will be allowed to inspect, at no cost to the Department with the Engineer present, the installation of the product in order for the final issuance of the warranty specified above. Should any modifications be required regarding the installation of the product(s), it will be at the expense of the Contractor. Once the Manufacturer accepts all modifications, the product warranty will become effective and supported by the Manufacturer.

Any claims against the warranty will be valid regardless of who performs the installation. The Manufacturer will be allowed to inspect after the time the repair has been made, at no cost to the Department with the Engineer present, the installation of the product in order for the final issuance of the warranty specified.

COMPENSATION

No separate payment will be made for Subitem 821.12, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 823.09 HIGHWAY LIGHTING LUMINAIRE LED

The work under this Subitem shall conform to the relevant provisions of Subsection 820 of the Standard Specifications and the following:

The work under this Subitem shall consist of furnishing and installing LED luminaires to be mounted at 30 feet high as located and detailed on the Contract Plans.

The work under this Subitem shall also include wiring and all incidentals necessary to provide a fully functional lighting system.

This Subitem includes luminaires mounted on poles specified on the plans. All luminaires shall be of the same design shape; dimensionally, aesthetically, and supplied by the same manufacturer. All luminaires specified in this section shall be delivered and clearly marked with the manufacturer's name and catalog number, voltage, lamp type, maximum wattage, and driver type.

All luminaires shall be in accordance with MassDOT manufacturing and submittal standards and include the following:

COBRA HEAD HIGHWAY LIGHTING LUMINAIRE LED

The Housing shall be made of a low copper die cast Aluminum alloy (A360), 0.100" (2.5mm) minimum thickness, and shall fit on a 1.66" (42mm) O.D. (1.25" NPS), 1.9" (48mm) O.D. (1.5" NPS) or 2 3/8" (60mm) O.D. (2" NPS) by 5 1/2" (140mm) minimum long tenon. The Housing shall come with a zinc plated clamp fixed by 2 zinc plated hexagonal bolts 3/8 16 UNC for ease of installation and shall provide an easy step adjustment of +/- 5° tilt in 2.5º increments. The Housing shall include an integral bubble level standard (always included), and shall be quick release, toolless entry, single latch, hinged, removable door which opens downward to provide access to electronic components and to a terminal block. Door shall be secured to prevent accidental dropping or disengagement. A clearance of 13" (330mm) at the rear is required to remove the door. The Housing shall be complete with a bird guard protecting against birds and similar intruders and an ANSI label as per C136.15-2015 to identify wattage and source (both to be included in box).

The Light Engine shall be composed of 4 main components: Heat Sink / LED Module / Optical System / Driver Electrical components are RoHS compliant, IP66 sealed light engine. LEDs tested by ISO 17025-2005 accredited lab in accordance with IESNA LM-80 guidelines, extrapolations in accordance with IESNA TM-21 shall have a metal core board to ensure greater heat transfer and longer lifespan.

Heat Sink shall be built in the housing, designed to ensure high efficacy and superior cooling by natural vertical convection air flow pattern always close to LEDs and driver optimizing their efficiency and life. Product shall not use any cooling device with moving parts (only passive cooling). Shall have wide openings to enable natural cleaning and removal of dirt and debris. Entire luminaire is rated for operation in ambient temperature of -40°C / -40°F up to +40°C / +104°F.

SUBITEM 823.09 (Continued)

TYPE IV

LED Module shall be Composed of 48 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Neutral White, 4000 Kelvin nominal (3985K +/- 275K or 3710K to 4260K), CRI 70 Min. 75 Typical.

Optical System to be IES type IV (asymmetrical). Composed of high-performance UV stabilized optical grade polymer refractor lenses to achieve desired distribution optimized to get maximum spacing, target lumens and a superior lighting uniformity. System shall be rated IP66. Performance shall be tested per LM-63, LM-79 and TM-15 (IESNA) certifying its photometric performance. 0% up-light and U0 per IESNA TM-15.

The Driver is to be High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class 1, THD of 20% max.

The current supplying the LEDs will be reduced by the driver if the driver experiences internal overheating as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload. Automatic recovery after correction. Standard built-in driver surge protection of 2.5kV (min).

Driver to have Integrated Dimming compatible 0-10 volts.

Surge Protector: Integrated Feature, Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

Luminaire shall have a standard NEMA Receptacle for photoelectric cell or a shorting cap. Shorting cap to be provided with each luminaire.

Luminaire Life shall meet IES files for energy consumption and delivered lumens for each option. Based on ISTMT in-situ thermal testing in accordance with UL1598 and UL8750, System Reliability Tool. Advance data and LED manufacturer LM-80/TM-21 data, expected to reach 100,000 + hours with >L70 lumen maintenance @ 25°C. Luminaire Useful Life accounts for LED lumen maintenance AND all of these additional factors including: LED life, driver life, PCB substrate, solder joints, on/off cycles, burning hours and corrosion.

The wiring connection of the luminaire shall be done using a terminal block connector 600V, 85A for use with #2-14 AWG. wires from the primary circuit, located inside the housing. Due to the inrush current that occurs with electronic drivers, recommend using a 10Amp time delay fuse to avoid unwanted fuse blowing (false tripping) that can occur with normal or fast acting fuses.

SUBITEM 823.09 (Continued)

Hardware- All exposed screws shall be complete with Ceramic primer-seal basecoat to reduce seizing of the parts and offers a high resistance to corrosion. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

Finish- Color to be textured medium grey and applied in accordance with the AAMA 2603 standard. Application of polyester powder coat paint (4 mils/100 microns) with ± 1 mils/24 microns of tolerance. The Thermosetting resins provides a discoloration resistant finish in accordance with the ASTM D2244 standard, as well as luster retention in keeping with the ASTM D523 standard and humidity proof in accordance with the ASTM D2247 standard.

The surface treatment achieves a minimum of 5000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 standard.

LED products manufacturing standard: The electronic components sensitive to electrostatic discharge (ESD) such as light emitting diodes (LEDs) are assembled in compliance with IEC61340-5-1 and ANSI/ESD S20.20 standards so as to eliminate ESD events that could decrease the useful life of the product.

The luminaire shall have a Vibration Resistance that meets the ANSI C136.31, 2010, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications (Tested 3G over 100 000 cycles).

The luminaire shall meet the California Test 611, Testing durability of mast arm mounted luminaires, specifications (a 2 000 000 cycles test).

Service Tag: Each individual luminaire shall be identifiable via a Service tag application via a simple scan. The label with the code shall placed on the inside of the mast door which allows you to gain instant access to the luminaire configuration.

Warranty: Luminaire shall come with a warranty of 10 years on product and finish.

The luminaires shall be listed and certified by the following: cULus Listed for Canada and USA. Luminaire meets DOE and MSSLC Model Specification for LED Roadway Luminaires. The LED Cobra head luminaires shall be Design Lights Consortium qualified, consult DLC QPL to confirm your specific fixture selection is approved. Luminaire complies with or exceeds the following ANSI C136 standards: .2, .3, .10, .14, .15, .22, .25, .31, .37, .41.

SUBITEM 823.09 (Continued)

Comparable fixtures include:

*Signify Lumec Road Focus Medium RFM-ORL-160W48LED-4K-G2-4-UNV-DMG-KAH3- 2C-API-PH9-SP2

LEOTEK Greencore Midssize GCM3-60J-MV-40K-4-GY-190-WL-4B-DSC-SP2

American Electric Autobahn ATB2-40BLEDE13-MVOLT-R4-20-NL-SH

* Indicates the design fixture. If one of the other two fixtures are selected, then the Contractor shall submit photometric plan and statistics showing equal or improved uniformity and average maintained illuminance.

COMPENSATION

No separate payment will be made for Subitem 823.09, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

SUBITEM 824.41 PEDESTRIAN HYBRID BEACON ROUTE 6 SHARED-USE PATH CROSSING (HAWK) - LOCATION #1

SUBITEM 824.42 PEDESTRIAN HYBRID BEACON ROUTE 6 SHARED-USE PATH CROSSING (HAWK) - LOCATION #2

All work under these Subitems shall be in accordance with Section 800 of the Standard Specifications, the BTC Plans, and the following:

The work consists of the construction of the traffic control signal at the following location: Location 1. - Route 6 Shared-Use Path Crossing (Station 93+50 & Station 93+63)

Location 2. - Route 6 Shared-Use Path Crossing (Station 107+35 & Station 107+52)

The work to be done under these Subitems consists of furnishing and installing Pedestrian Hybrid Beacons across Route 6 at Location 1 traveling northbound (Station 93+50) and southbound (Station 93+63) and across Route 6 at Location 2 traveling northbound (Station 107+35) and southbound (Station 107+52)

MATERIALS

The work shall include the furnishing and installation of all or part of the following items:

- The traffic signal controller cabinet, and foundation with concrete pad;
- Traffic signal controller, back panel, Malfunction Management Unit, Bus Interface Unit, load packs, relay flashers, grounding rod, police panel, and all wiring and appurtenances to complete the installation;
- Traffic signal post foundations and mast arm foundations with anchor bolts;
- Signal post and pedestals, mast arm posts and arms;
- Signal heads, backplates, and tunnel visors;
- Countdown pedestrian signals, audible pedestrian push buttons, signs and saddles;
- All pull boxes (for signal cable);
- All cable and wiring (signal cable);
- Ground rods, equipment grounding and bonding;
- Service connection (overhead); and,
- All other equipment, materials and incidental costs necessary to provide a complete, fully operational traffic signal system as specific herein and as shown on the plans.

A list of required major traffic signal system items is included on the plans. All equipment installed shall be listed on the MassDOT "Approved Equipment List".

All existing traffic signal equipment removed is the property of MassDOT and has been specified by MassDOT to be disposed.

The Contractor shall provide all labor, equipment and material required for the total maintenance of all existing and proposed temporary and permanent traffic signal control equipment within the project limits, including damage by automobile accidents, unless otherwise specified.

SUBITEMS 824.41 and 824.42 (Continued)

The Contractor should be aware that there are electric lines and that their attention should be directed to the AASHTO Guide on Occupational Safety on Highway Construction Projects, Subpart N. 1926.550 relating to construction equipment clearances at overhead electric lines, which states that the minimum clearance between the lines and any part of the crane or load must be at least 10 feet from lines rated 50 KV or below, and greater distance for higher voltage.

TRAFFIC SIGNAL SERVICE CONNECTION

This work shall consist of EverSource furnishing and connecting power at the locations provided in the plans. EverSource will connect and disconnect power as required. No work shall be done in manholes or on power poles without a representative of the EverSource being present. The Contractor will be responsible for coordinating the EverSource work.

The project requires electric connection services from existing and proposed overhead power lines on Route 6, as shown on the plans. The Contractor shall coordinate and cooperate with EverSource to complete the installation of this service. All notification permits, and installing fees required by EverSource in connection with the installation of the electric service shall be the responsibility of the Contractor.

For overhead connections, EverSource will make the connection from the top of the riser on the utility pole to the power source. The Contractor shall supply all labor, materials and equipment to install the service connection, complete in place and in accordance with EverSource procedures, from the controller to and including the riser with enough wire coiled above the riser to permit EverSource servicing the area to make the final connection. If handholes are required by EverSource, they must be EverSource approved handholes (Polymer Concrete) and shall have a 6” layer of ¾” crushed stone (M2.01.4) under the handhole for drainage.

It shall also be the Contractor's responsibility to pay all charges to EverSource for performing this work. No direct reimbursement will be made under this contract to the Contractor for payments made to EverSource, it being understood that full compensation for any payment made by the Contractor to the utility company will be included in the Contract bid prices, This shall include conduit for the power supply, utility pole risers, weatherheads and temporary power supply until each crossing has been accepted by MassDOT.

SHOP DRAWINGS

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 800.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer.

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

SUBITEMS 824.41 and 824.42 (Continued)

TRAFFIC SIGNAL EQUIPMENT

The traffic signal controller units (CU), malfunction management units (MMU), bus interface units (BIU), detector amplifiers, cabinet power supply 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 2-2021, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

Traffic Signal Controller Cabinet

The Controller Cabinet shall conform to the NEMA TS 2 Standards, Section 7 “cabinets”. The cabinets 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. The cabinets shall be installed with the door opening positioned in order to allow general observation of the flow of traffic and the inside of the cabinets at the same time.

The controller and cabinet assembly shall be supplied in a TS 2 Type 1 configuration. Each cabinet shall be supplied with a full complement of spare load switches, and flash transfer cubes to fill each open position in the backpanel.

The cabinet shall be made of aluminum and the exterior shall not be painted. The cabinet size shall be a "CA/CB" cabinet. The cabinet shall include a fan, thermostat and police panel with manual button assembly.

Controller cabinet foundation shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired; maintain ADA clearances.

Traffic Signal Controller

The Controller shall be included on MassDOT’s approved equipment list for traffic signal equipment. The traffic controller supplied shall conform to Section 3 "Controller Units" of the NEMA TS 2 Standard. The traffic controller shall be supplied in a TS 2 Type 1 Configuration. Specifically, the controller units (CU) shall be supplied as actuated controllers with NTCIP capabilities; defined as Type A1N in Subsection 3.2 of the NEMA TS 2 Standard.

The controller unit shall utilize an interface conforming to Subsection 3.3 of the NEMA TS 2 Standard. The controller units shall utilize an input/output interface conforming to the requirements of Paragraph 3.3.1 for all input/output functions with the Terminals and Facilities (TF), Malfunction Management Unit (MMU), detector rack assemblies and auxiliary devices.

The controller unit shall also meet the requirements of Paragraph 3.3.6 "NTCIP Requirements" of the NEMA TS 2 Standard.

SUBITEMS 824.41 and 824.42 (Continued)

The controller units shall be supplied with Port 1, Port 2, and Port 3 as defined by the requirements of Subsections 3.3.1, 3.3.2, and 3.3.3, respectively.

Furnishing and installing signal controllers shall include setting the system parameters, timings, offsets and all other programming work necessary. The contractor will also be responsible for fine-tuning the control unit upon completion of the unit set-up.

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

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 1 cabinet, a NEMA TS 2 Type 2 cabinet, or a NEMA TS 1 cabinet without loss of functionality.

Cabinet Power Supply
A separate power supply shall be supplied for the TS 2 cabinet. As a minimum, the power supply shall meet all requirements of Paragraph 5.3.5 of the NEMA TS 2 Standard. The unit shall be AC line powered and provide regulated DC power, unregulated AC power, a line frequency reference for the rack mounted loop amplifiers, bus interface units, load switches and other auxiliary cabinet equipment as required. The power supply shall be either shelf mounted or installed as part of the loop detector rack assembly.

1. + 12 VDC +/- 1 VDC @ 2.0 amps,
2. + 24 VDC +/- 2 VDC @ 2.0 amps,
1. 12 VAC @ 250 milliamps, and
2. 60 Hz line frequency reference.

A test point terminal shall also be located on the units front panel for + 24VDC and logic ground testing.

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.

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.

SUBITEMS 824.41 and 824.42 (Continued)

Flash Transfer Relay
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.

Spare Equipment
The Contractor shall provide the following spare signal equipment in each of the traffic signal controller cabinets:

1. A full complement of load switches to accommodate each available position of the back panel.
2. A full complement of flash transfer relays to accommodate each available position of the back panel.
3. A 25 foot RS-232 cable for communication function with a laptop computer.
4. One (1) BIU.

Surge Suppression
The Contractor shall supply and install surge suppression on all outputs and inputs in each of the traffic signal controller cabinets in accordance with MassDOT Standards. Contractor shall contact MassDOT Electrical Systems Unit directly for requirements and/or questions.

Bus Interface Units
The Bus Interface Units (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.

At a minimum the BIU shall perform the interface function between port 1 at the controller unit, the malfunction management unit (MMU), the loop detector rack assembly, and the terminal facilities. The cabinets shall be supplied with the appropriate number of BIUs required to provide an operating traffic control signal according to the plans and these specifications.

As a minimum, two 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.

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

SUBITEMS 824.41 and 824.42 (Continued)

TRAFFIC SIGNAL POSTS & BASES

Square transformer bases to be used shall be an iron mold casting. Hardware shall include templates, ¾ inch anchor bolts, nuts, washers and shims. The height of base shall be approximately 15 inches, and the height of the base is included in the height of the shaft. The bottom of the base shall be designed for anchorage on a 12 inch wide square. The posts shall be steel. Bases shall be provided with a door opening and an iron door, complete with a cap screw fastening device and a tapped hole for a grounding lug.

MAST-ARM ASSEMBLIES

All mast arm assemblies shall be Type II, conforming to the "Overhead Signal Structure and Foundation Standard Drawings", December 2015. The length of mast arm shaft shall be according to the plans.

The Contractor shall furnish to the Engineer design calculations and weld details for the pole selected. Design calculations shall be submitted with the Shop Drawings. All drawings and calculations must be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Only poles of prequalified manufacturers shall be used. A list of prequalified manufacturers can be obtained from the Bridge Engineer of the Massachusetts Department of Transportation (MassDOT).

Per MassDOT standards, signs are not permitted to hang from the mast arms. All signs mounted on the mast arms shall be bolted through the sign face. Signs mounted on the mast arm shaft shall have proper mounting brackets that meet MassDOT guidelines.

Mast Arm Foundations

The Contractor shall be responsible for constructing the foundations in accordance with the recommendations noted on the plans, the MassDOT Standard Specifications.

The foundation design shall be in conformance with the Standard Specifications and MassDOT Standard Details as shown on the plans. All shop drawings and calculations shall be stamped by a Professional Engineer registered in Massachusetts and provided to the Engineer and designer for approval prior to constructing.

The Design-Builder is wholly responsible for the design of all foundations regardless of soil conditions and/or ledge found at the proposed foundation locations. For bidding purposes, the Design-Builder shall assume foundations to be 42 inches by 10 feet.

In the event that soil conditions or ledge prevent the use of the MassDOT standard foundation type, the Design-Builder is responsible to select and design alternative foundation types. Alternative foundation types could include spread footings, coring and socketing into rock or other foundations previously used to support similar loads, within reason.

SUBITEMS 824.41 and 824.42 (Continued)

The Contractor shall request written approval from the Resident Engineer before the placement of any concrete for foundations of strain poles, mast arms, signal posts, and cabinets. Anchor bolts shall be set accurately and tops shall be formed neatly. The top forming shall extend downward for a minimum of 12 inch on the side of any foundation. The lower portions of all foundations may be poured directly against undisturbed earth or may be formed at the option of the Engineer.

When located within a sidewalk, foundations shall be located approximately 3 inches below finished grade as to not obstruct an accessible path so that passage by physically-challenged persons is not impaired.

Traffic Signal Cable

All signal cable connections in the bases of signal poles, posts, and cabinet shall be made by means of appropriate terminal blocks. These blocks shall be completely furnished and installed on terminal block mounting strips in bases. All cable shall comply with Subsection 813.

MATERIALS

All mast arm poles and arms, traffic signal posts and pedestals shall be galvanized steel, and shall be designed in accordance with the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals," 2013 Edition with 2015 Interim Revisions. All mast arm poles and arms, traffic signal posts and pedestals, and controller cabinets shall NOT be painted.

WARRANTY- LED Signals

The LED signal module will be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits either a greater than 40 percent light output degradation or a fall below the minimum intensity levels within the first 36 months of field operation.

VEHICULAR SIGNAL HEADS

Vehicle signal housings shall be 3-section, 12-inches (Hybrid Beacon Configuration) and shall conform to Section 800 and MassDOT Specifications for 8 and 12 inch Traffic Signals, dated November 8, 1993. Tunnel visors shall be in accordance with Institute of Transportation Engineers (ITE) "Vehicle Traffic Control Signal Heads (2005), or most recent version." All signal housings shall contain light emitting diode (LED) signal indications, which shall conform to MassDOT Specifications for Light Emitting Diode (LED) 12" Vehicle Traffic Signals, dated September 30, 2005. 5-inch black non louvered backplates with 2-inch retroreflictive strips shall be provided on all signal heads as noted on the plans. All signal heads visors and backplates shall be gloss black.

SUBITEMS 824.41 and 824.42 (Continued)

MOUNTING SIGNALS

Signals shall be rigidly mounted by means of galvanized cable clamps, or approved equivalent. All signal heads mounted overhead on mast arms shall be installed, with the bottom of the signals at the same height. The Contractor shall modify any signal head location that is visibly obstructed to a motorist or pedestrian by overhead street light posts or other obstructions as determined by the Engineer.

PEDESTRIAN SIGNAL HEADS/PUSH-BUTTONS

The housings shall be LED Type. All pedestrian signal heads shall have full overlay symbol Hand/Man graphics as shown on the plans. The pedestrian signal head shall be a 16"x 18" inch single bimodal section LED type with Count Down Timer. Signal heads shall not be painted.

A maximum mounting height of 42 inch above the finish sidewalk grade shall be used for pedestrian push buttons and shall meet ADA/AAB requirements. Pedestrian push-buttons shall be accessible, meet current ADA/PROWAG requirement and provide the following features.

The Accessible Pedestrian Signal (APS) system shall include a power supply and control unit which installs in the traffic controller. The pushbutton activation shall trigger a latching LED, sound and vibro-tactile bounce. A locator tone with a nominal duration of 0.15 seconds repeated at 1 second intervals shall be provided which automatically adjusts to ambient background noise. The button shall vibrate and a percussive tone be provided during the walk. All sounds shall automatically adjust to ambient background noise. Sounds shall have independent settings for minimum and maximum volume. Legend on the pedestrian sign shall be “Push Button Wait For Walk Signal” in text and in Braille or in raised letters. An arrow(s) shall be provided to be faced in the direction of the pedestrian crossing. The unit shall be designed to operate at temperatures from minus 40 degrees F to 150 degrees F.

DIAGRAMS AND MANUALS

Wiring and schematic diagrams, descriptive parts, lists, and instructions and maintenance manuals shall be provided for all items furnished under these specifications. Tables, charts or data for use in designing loops of various sizes and configurations, other than specified below, shall be provided. Ten (10) complete sets of diagrams, manuals and pertinent information shall be furnished with each contract.

CONSTRUCTION METHODS

Once the Contractor begins construction in the area, it shall then be his responsibility to operate and maintain the traffic/pedestrian signal system at each location. The Contractor shall provide temporary pedestrian and vehicle signals with all required equipment to power and operate if a mid-block crossing is to be introduced. The Contractor is responsible for the cost of electricity for each traffic signal for the duration of the work until the acceptance of the work by MassDOT.

SUBITEMS 824.41 and 824.42 (Continued)

The Contractor shall be required to keep records of dates when traffic signal posts are installed and when traffic signals are put on flashing and stop and go. These records are to be submitted to the Engineer by the first of each month.

If required, the Contractor shall make all electrical arrangements with EverSource for providing service to the controller. The Contractor shall supply and install 3" PVC conduit and wires to the EverSource system under the supervision of EverSource. The Contractor will be required to pay directly to the company, all charges resulting from, at no additional cost to MassDOT above the lump sum bid for this contract. The Contractor, or his agent, will not cause any of his personnel to work in an electric manhole or on a pole without permission of EverSource.

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.

SUBMITTALS

A. Catalog cuts for all traffic signal control equipment used on the project shall be provided to both the Engineer for review and approval prior to ordering any equipment.

B. The Contractor's attention is directed to specific requirements record keeping included in the MassDOT Standard Specifications.

COMPENSATION

No separate payment will be made for Subitems 824.41 and 824.42, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

ITEM 851.11 TRAFFIC MANAGEMENT AND MOBILIZATION DAY

Work under this Item shall conform to the relevant provisions of Subsection 850 of the Standard Specifications, RFP Volume II, Section 4.10.7, and the following:

During prosecution of the work, MassDOT may identify locations where repairs, emergency or otherwise, are required. This item is intended to be used as a means of providing payment to the Design-Builder for the purposes of mobilizing those forces and equipment necessary, including providing timely traffic management, in response for temporary patching and repairs to existing pavement and emergency bridge deck repair Notifications, to begin work as required.

This item is only applicable if the work requires a traffic setup outside of an already established work zone.

This item shall consist of preparatory work and operations for response for repairs after notification from the Engineer. If repairs are identified as an emergency, requests for emergency repair by MassDOT must be responded to by the Design-Builder within two (2) hours of notification.

This item shall include preparations necessary for:

- Movement of personnel, equipment, supplies, and incidentals to the project site,
- Establishment of facilities necessary for the work assignments,
- Operations which must be performed and/or for costs not specified in the Contract and not included under any other Contract Item.
- Traffic management and control at the work zone.

Payment for early response shall be in addition to that for any other items that may apply toward the completion of each emergency Work Order.

METHOD OF MEASUREMENT

Item 851.11 will be measured for payment by the Day notified repair Work Order, for traffic management and mobilization and preparatory work and operations for temporary patching and repairs to existing pavement and emergency response for bridge deck repairs within two (2) hours of notification as described above.

In the event that another emergency occurs during the period that the Design-Builder's forces have been notified and are mobilizing or working, all additional responses performed by a different emergency response crew at a different work site during that period will be considered an additional emergency response in accordance to the requirements specified herein.

BASIS OF PAYMENT

Item 851.11 will be paid for at the Contract unit price per Day which price shall include all labor, materials, equipment, and incidental costs required to complete the work..

The Contract unit price is in addition to any other items that may apply toward the completion of the emergency assignment.

Work for HMA for Patching, Reinforced Concrete Excavation, Rapid Setting Concrete for Repairs, and Steel Reinforcement for Structures will be paid for under their respective Items.

SUBITEM 852.11 TEMPORARY PEDESTRIAN BARRICADE
SUBITEM 852.12 TEMPORARY PEDESTRIAN CURB RAMP

DESCRIPTION

Work under these Subitems consists of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

MATERIALS

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a 48-inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

CONSTRUCTION METHODS

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60-inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

SUBITEMS 852.11 AND 852.12 (Continued)

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

COMPENSATION

No separate payment will be made for Subitems 852.11 and 852.12, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 853.23 TEMPORARY BARRIER (TL-3)

Work under this subitem shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of TL-3 temporary barrier systems for channelization of traffic and/or work zone protection.

Materials

The Contractor shall use a temporary barrier system that is listed on the Qualified Traffic Control Equipment List.

The Contractor may submit alternate materials to the Engineer for approval if the temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Contractor shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all temporary barrier systems in conformance with the relevant provisions of Section 850.69 and shall be incidental to the temporary barrier systems.

Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer.

CONSTRUCTION METHODS

Temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Contractor shall not place any breaks in the temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining barrier system.

Within the LON section, temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

SUBITEM 853.23 (Continued)

Damage to the pavement surface caused by the temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Contractor's expense.

Temporary barrier systems that require anchorage systems shall conform with the relevant provisions of Subsection 850.70.

COMPENSATION

No separate payment will be made for Subitem 853.23, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 853.33 TEMPORARY BARRIER – LIMITED DEFLECTION (TL-3)

Work under this subitem shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of limited deflection TL-3 temporary barrier systems for channelization of traffic and/or work zone protection. Limited deflection temporary barrier systems shall have a maximum dynamic deflection of 18 inches and in all cases the clear area available behind the barrier shall be greater than the dynamic deflection of the barrier system.

MATERIALS

The Design-Builder shall use a temporary barrier system that is listed on the Qualified Traffic Control Equipment List.

The Design-Builder may submit alternate materials to the Engineer for approval if the limited deflection temporary barrier system meets the following criteria:

1. The system has been tested by an independent laboratory that is accredited by FHWA to crash test roadside hardware;
2. The system meets the minimum requirements of the AASHTO *Manual on Assessing Safety Hardware* (MASH) at Test Level (TL) 3 or higher; and
3. The system has a federal-aid eligibility letter from FHWA.

Copies of the testing results and the federal-aid eligibility letter shall be submitted and approved by the Engineer prior to procurement of an alternate temporary barrier system.

The Design-Builder shall supply shop drawings to confirm the available clear area behind the barrier equals or exceeds the maximum dynamic deflection of MASH Test 3-11 during testing procedures taken at an independent laboratory that is accredited by FHWA to crash test roadside hardware.

Delineators shall be installed on all restrained temporary barrier systems in conformance with the relevant provisions of Section 850.69 and shall be incidental to the temporary barrier systems.
Temporary impact attenuators that are listed on the Qualified Traffic Control Equipment List shall be used whenever a blunt end of the restrained temporary barrier system is facing traffic within the clear zone unless it is protected by a second barrier system or secured to a separate barrier system or bridge railing by a method approved by the manufacturer.

CONSTRUCTION METHODS

Limited deflection temporary barrier systems shall be placed in line with the drawings. Installation shall be per the manufacturer's specifications, details, and the approved shop drawings.

The Design-Builder shall not place any breaks in the limited deflection temporary barrier system that will result in sections that are shorter than the stated minimum length-of-need (LON) under MASH Test 3-11. Exceptions shall be allowed for gate systems or changeable length segments placed over expansion joints if those barrier segment types have been tested and meet the minimum requirements of MASH Test 3-11 with the adjoining limited deflection barrier system.

SUBITEM 853.33 (Continued)

Within the LON section, limited deflection temporary barrier systems shall only be placed on paved surfaces unless otherwise tested and certified under MASH TL-3 for those conditions.

Damage to the pavement surface caused by the limited deflection temporary barrier during installation, while in service, and/or during removal shall be repaired as directed by the Engineer at the Design-Builder's expense

Limited deflection temporary barrier systems that require anchorage systems shall conform to the relevant provisions of Subsection 850.70.

For limited deflection temporary barrier systems that require anchorage systems, the cost of furnishing and installing the anchorage and hardware and the restoration of pavement surfaces or adjacent permanent barrier systems to facilitate anchorage shall be considered incidental to the Work.

COMPENSATION

No separate payment will be made for Subitem 853.33, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 853.501 TEMPORARY IMPACT ATTENUATOR REMOVED AND RESET
SUBITEM 853.63 TEMPORARY IMPACT ATTENUATOR, UNI-DIRECTIONAL, REDIRECTIVE (TL-3)

Work under Subitem 853.501 shall conform to the relevant provisions of Subsection 850 and shall consist of maintaining, removing and reinstalling temporary impact attenuators where indicated on the plans or as directed by the Engineer.

Work under Subitem 853.63, shall conform to the relevant provisions of Subsection 850 and shall consist of furnishing, installing, maintaining and final removal of temporary impact attenuator systems for protection of the ends of temporary barrier and other roadside hazards in work zones. All work shall be in conformance with the specifications of the manufacturer and in close conformance with the locations, lines, and grades shown on the plans.

Materials

The Contractor shall supply a temporary impact attenuator that meets the same or higher crash Test Level (TL) as the adjacent temporary barrier, unless otherwise shown on the plans. The temporary attenuator shall be listed on the Department's Qualified Traffic Control Equipment List.

The temporary impact attenuator shall be designed to fit within reasonably close tolerance of the dimensions given on the plans.

The Contractor shall supply shop drawings for the temporary attenuator and for any anchorage system and for any transitions or connections between the temporary attenuator and the adjacent barrier or other roadside hazard.

The side of the temporary attenuator that faces traffic shall include a Type 3 Object Marker that conforms to the language found in Sections 2C.64 and 2C.65 of the *Manual on Uniform Traffic Control Devices.*

Unless a separate barrier system protects it from opposing traffic, only temporary impact attenuators that are certified for bi-directional use shall be used in medians.

Construction Methods

Installation means and methods shall be per the manufacturer's specifications and/or drawings.

Temporary Impact Attenuators Removed and Reset consists of removing temporary impact attenuators, relocating and reinstalling at a new location per the specifications and recommendations of the manufacturer and as shown on the plans or as directed by the Engineer.

Excavation for temporary attenuator foundations and anchorage shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be replaced with compacted gravel borrow.

The Contractor shall supply the Engineer instructions for installation and the manufacturer's recommended routine inspection and maintenance program. The cost of inspection and maintenance of temporary attenuators shall be considered incidental in nature.

SUBITEMS 853.501 AND 853.63 (Continued)

Damaged temporary impact attenuators shall be replaced by the Contractor within 24 hours or as directed by the Engineer, at the Contractor's expense. A truck mounted attenuator that meets the same or higher TL, or other means of protecting the damaged temporary impact attenuator, shall be deployed until the repairs or replacement has been completed, at the Contractor's expense.

COMPENSATION

No separate payment will be made for Subitems 853.501 and 853.63, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 853.8 TEMPORARY ILLUMINATION FOR WORK ZONE

The work under this subitem shall conform to the relevant provisions of Subsections 801, 813, 820 and 850 of the Standard Specifications and the following:

DESCRIPTION

The intent of this Item is to maintain existing light levels on all travel lanes throughout the project. As the existing lighting system is removed and/or travel lanes shifted away from existing lighting during various stages of the work, additional lighting shall be added to maintain travel lane illumination levels.

The work shall also include illuminating the entire work area on a temporary basis.

Additionally, the work shall include illuminating the lane closure/shift and crossover roadway areas for the purpose of conducting nighttime work and other areas as designated by the Resident Engineer. The work shall include illumination of the median crossover when use of the crossover is required during nighttime operations.

Nighttime work will occur at all locations where operations during daytime hours will unduly hamper and delay the motoring public, as listed elsewhere in this Contract.

Illumination Standards

The use of temporary portable light towers shall be limited to balloon diffuser system or anti-glare light heads. These portable light towers shall be used throughout the project area for temporary work zone lighting. The use of unshielded high wattage flood lights shall not be permitted. The Contractor may utilize the existing roadway lighting system to illuminate travel lanes or work zones as necessary, if all illumination requirements are maintained.

Travel lanes outside of work areas shall be illuminated to a level that meets current lighting levels with all luminaires fully functional.

The traveled way within the lane closure/shift areas, the median crossovers, and the travel lanes consisting of two bidirectional travel lanes (one in each direction separated by temporary barrier) and all cones, drums, or other physical barriers placed on the roadway for the purpose of channelizing or restricting vehicular traffic shall be illuminated to a minimum average of 2 foot candles measured on both the horizontal and vertical planes 6 inches above the surface in question.

The work zone area to be illuminated shall be defined as beginning at the first reflectorized drum or other channelizing device effecting a change in travel lane width or position, median crossover, and both ends of the transition crossover until traffic is returned to its existing travel lanes. A uniformity ratio (average to minimum) of 4 to 1 or better shall be maintained at all times within the illuminated transition area.

CONSTRUCTION METHODS

The Contractor shall conduct field measurements to determine ambient light levels along the work zone travel lanes. These findings shall be used to determine the number, type and location of fixtures needed to provide the illumination required.

SUBITEM 820.121 (Continued)

The Contractor will be responsible for determining the required number and type of fixtures and the appropriate mounting heights needed for the lane closure/shift areas, the crossover areas, and the work zone travel lanes. A detailed lighting plan with photometrics detailing the lighting levels to be provided and types, locations and mounting heights and directionality of all lighting provided and utilized (if existing is used) shall be designed by a registered professional engineer registered in Massachusetts and submitted to the Engineer for approval prior to implementing any lane closure/shift and crossover traffic control operations.

COMPENSATION

No separate payment will be made for Subitem 820.121, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 856.3 REAL TIME TRAFFIC MANAGEMENT SYSTEM FOR WORK ZONES

GENERAL

The Real Time Traffic Management system (RTTM) design shall consider all proposed lane closures, detours, and traffic shifts throughout the project consistent with the Temporary Traffic Control Plans (TTCP) and construction phasing in the Base Technical Concept (BTC).

The Design-Builder shall be responsible for procurement, deployment, maintenance, and satisfactory performance of the RTTM for the duration of the project. The RTTM shall be comprised of Portable Traffic Sensors (PTS), Portable Changeable Message Signs (PCMS), public facing internet site, Closed Circuit Television (CCTV) cameras and any other equipment necessary to provide a fully functioning RTTM.

The focus of RTTM will be on the approach to and within the project limits but are not limited and may include adjacent local roadways impacted by the project. Additionally, the RTTM will need to deploy equipment to convey information at regional highway interchanges and key-locations.

SYSTEM REQUIREMENTS

Monitor and collect traffic data along various highway segments, and local roadways impacted by the project and disseminate real-time travel time information based on the data to the Massachusetts Department of Transportation (MassDOT) on a Design-Builder supplied and maintained website via the internet and the traveling public via field installed PCMS. The RTTM software may be accessed via a web portal or utilizing client-side system software. Should software installation be required for access, the Design-Builder shall install, configure, and troubleshoot the software required on any MassDOT computer as necessary to access the full functionality of the system software.

The RTTM software shall provide a U.S. Department of Transportation Work Zone Data Exchange (WZDx) DeviceFeed data feed. The feed shall be accessible by the MassDOT Work Zone Manager (WZM) via HTTP across the internet. The WZDx DeviceFeed shall be compatible with the latest version of WZDx at the time of project notice to proceed. See the documentation for Creating a WZDx Feed for more information.

The RTTM system software shall be configured so that appropriate personnel at MassDOT are notified by email and in text format each time a malfunction has occurred, when the malfunction has been corrected in the system, and when a malfunction record is made in the database. The notification shall also display an error message for the device or devices affected. The RTTM system provider is responsible for this notification procedure. The RTTM system shall provide device outage alerts via email to MassDOT for outages greater than 15 minutes. The email addresses for recipients of these outage alerts will be provided by MassDOT. All equipment outages must be logged and easily accessible at any time by any RTTM user level from the system database. This information shall also be easily graphed and exported in a comma delineated spreadsheet format. Any pay reductions as per the pro-rated schedule (see Section “Operational Performance”) will be calculated from these outage summaries.

The RTTM system shall provide current operational and location status (i.e., current traffic data and messages, communications system, signs, and sensors, as well as lat/long of all deployed devices) updated everyone (1) minute maximum via the Internet on a dedicated Design-Builder developed and maintained website. The status of all devices shall be able to be seen all at once in a List View or similar format without selecting individual devices to obtain this information.

SUBITEM 856.3 (Continued)

The RTTM system shall be configured to assess, log, and provide notification of any type of malfunction that has occurred. This assessment includes but is not limited to communications disruption between any device in the system configuration, changeable message board malfunctioning (in accordance with the latest National Transportation Communications for Intelligent Transportation Systems Protocol (NTCIP)), CCTV Camera malfunction, speed sensor malfunction, loss of power, low battery, etc. This malfunction information shall be sent via email in text format to MassDOT for each occurrence. Access to all such log information shall be available from the website by approved users at any time. All logs shall be updated to the nearest minute.

To support incident management, the RTTM system shall be configured to allow approved users (Operators) to manually override motorist information messages on a single or multiple PCMS for a user-specified start time duration, after which automatic operation will resume with display of messages appropriate to the prevailing traffic conditions. The system shall also allow these same types of users to end one or more overrides at any time. All devices that are in an override mode shall provide an obvious icon to indicate this state for each PCMS. The RTTM system shall log all message overrides with time and date (to document the starts and stops), message content, and name of the user that performed the action. This log information shall be accessible to all system users directly from the RTTM web interface at any time upon initiation. All logs shall be updated to the nearest minute.

The RTTM system shall be capable of calculating and having “real time” travel time information displayed on the PCMS. This “real time” information shall be calculated and displayed on the PCMS to the nearest minute along with the current time of day.

The RTTM system shall be capable of detecting the presence of slowed and queued traffic on project roadways, specifically along the detour routes as shown on the TTCP and report these events via the RTTM. This “real time” information shall be calculated and displayed on the applicable PCMS’ to the nearest minute.

This Project will also require the RTTM system to have the capability to notify MassDOT personnel (by email and text) once the speed through the work zone decreases below 15 miles per hour (mph). The system shall also notify the same users once speeds return to free flow conditions (above 55 mph or another approved adjustable threshold). These speed thresholds shall be able to be changed throughout the project and shall be configurable for different speeds for each sensor to accommodate changing speed limits and work zone speed limits. The RTTM system will be capable of transferring (each minute) a snapshot of the real time data to the RTTM. The RTTM system shall allow for all system users identified by MassDOT to be notified via e-mail of these speed changes. Access to all sensor data shall be available from the software by all users at any time. All data shall be provided up to the nearest minute. The data shall be easily graphed and exported at any time by any users, with user defined parameters (time period, data intervals, data parameters (speed, occupancy, etc.), etc.).

To allow for motorist information messages and data collection of high specificity, the RTTM system shall acquire traffic data of accurate speed measurement that includes the capability of detecting stopped traffic and counting traffic volume and lane.

SUBITEM 856.3 (Continued)

The RTTM system shall provide 24/7 access to all system users for all message history, with the associated date/time (stated in the local time zone), message posted by specific user or by automation, all sensor data, and travel time route data (in the system increments of every minute and other selectable intervals, such as 5, 15, 60 minutes intervals etc.). Traffic data and graphing shall be provided for the user defined parameters and be exportable to a comma delineated spreadsheet format for further analysis and use directly from the software by the user. All information shall be updated to the nearest minute.

The system shall incorporate a means of secured communications between the central hosted server and all field devices. The method of securing the communications shall be a Virtual Private Network (VPN) that restricts any unauthorized parties from remotely accessing the field devices. The Design-Build Entity is responsible for furnishing and maintaining all VPN components that interact between the system server and the field devices. If CCTV cameras are a component of this Project, then an exclusion may be made so that the video stream and/or images are also accessible to other state-approved parties (such as 511 or project websites). All RTTM equipment shall be made secure from access (both physical and electronically) at both the local and remote levels. All RTTM system operator control functions shall be password protected. The Design-Build Entity shall also ensure the physical security of those devices and:

- Shall configure equipment with strong passwords.
- Disable any used programs, protocols/ports on the modems/signs.
- Shall filter-out other Internet addresses from reaching the modems/signs (except the vendor's network that the modems/signs are being managed from).

Full system functionality shall be provided using the latest version of Microsoft Edge or Google Chrome.

The RTTM system shall operate continuously (24 hours, 7 days a week) when deployed on the Project and shall always be collecting and storing data. The RTTM system shall acquire the aforementioned data, develop travel times, identify slowed and queued traffic, and select motorist information messages automatically based on this information without operator intervention after system initialization.

The RTTM system shall automatically select default and advisory messages based on traffic conditions at a single traffic sensor point or at multiple traffic sensor points in combination.

MassDOT users shall have the capacity to create, name, and save a library of up to 20 different default or automatic advisory messages for each PCMS. The library shall have the ability to be sorted by name for ease of use. The Design-Build Entity shall preprogram a set of override messages based on guidance contained herein, and in the Contract Plans for each PCMS as a starting point for further refinement in coordination with MassDOT.

The default and advisory message content shall be programmable from the RTTM website accessed by MassDOT.

The system devices and software shall autonomously restart and notify all required users in case of power failure for any field hardware or the RTTM software.

The Design-Build Entity shall provide an API from the Design-Build Entity RTTM software to the MassDOT Smart Work Zone Manager (SWZM) software. The API shall be provided from the RTTM system and all RTTM equipment unless otherwise directed by MassDOT. The Design-Build Entity shall coordinate with MassDOT on the readiness of the API prior to the start of equipment deployment. The API shall be tested with the SWZM software no later than 14 days prior to the start of the Operational Field Test.

SUBITEM 856.3 (Continued)

The Design-Build Entity shall accommodate periodic audits of the API data after system activation to confirm correctness of the data. The Design-Build Entity shall be responsible to make any corrections to the API so that accurate data is provided to MassDOT. The Design-Build Entity shall be responsible to confirm the accuracy of data to MassDOT's satisfaction.

The Design-Build Entity shall provide a video wall accessible thru a public facing website that displays still images of every RTTM CCTV simultaneously on a single page for use by MassDOT. The images are to be updated no less than every minute. The website should also provide for camera control access, to select individuals identified by MassDOT, through this same website. Camera access control shall be limited to preset views established by RTTM system administrators. This feed shall also be capable to be temporarily terminated immediately upon notice from MassDOT to a system administrator. The webpage shall be capable of being viewed by an unlimited number of viewers at the same time without degradation or interruption.

OPERATIONAL REQUIREMENTS

The Design-Build Entity performs the required configuration of the RTTM's communications system during system initialization.

Included in the operational responsibilities is the assumption of all communication and power costs such as Federal Communications Commission (FCC) licensing, cellular telephone, wireless data networks, satellite, and Internet subscription charges, solar system support, battery maintenance, and transport and labor. In addition to these requirements, the Design-Build Entity shall assume all responsibility for any damaged RTTM equipment due to crashes, vandalism, adverse weather, etc. that may occur during the systems deployment.

Communications between the RTTM software and any individual PCMS, CCTV, and PTS are independent through the full range of deployed locations and do not rely upon communications with any other PCMS, CCTV, or PTS except when co-located on the same piece of equipment.

The RTTM's communications system incorporates an error detection, correction, and notification mechanism to ensure the integrity of all traffic condition data and motorist information messages.

RTTM SUBMITTALS AND SCHEDULE

A maximum of 7 Days after Notice to Proceed (NTP), the Design-Build Entity shall submit the following information to MassDOT for review and approval:

- Design-Build Entity shall provide a qualifications package that details the following:
    - Design-Build Entity shall provide documentation demonstrating experience in deployment, maintenance, and management of multiple RTTM projects similar in size, concept, and scope to the system proposed herein completed in the last five (5) years. Experience should show work done by individuals who will be assigned to this project as well as that of the company. Projects referred to should be identified and provide the name of the customer shown, including the name, email addresses, and telephone number of the responsible official of the agency who may be contacted for verification.

SUBITEM 856.3 (Continued)

- Design-Build Entity shall provide the number, and names where practicable, of executive and professional personnel, programmers, consultants, etc., who will be engaged in the work on behalf of the Design-Build Entity. Show where these personnel will be physically located during the time they are engaged in the work. Include a resume or similar document indicating the education and experience in work zone ITS solutions for each individual. Indicate the responsibilities each will have in this project and how long each has been with the company. Identify subcontractors intended for use and the services they will perform. For this project, the Design-Build Entity must include at least the following roles: Project Manager, local systems manager, local field maintenance and repair personnel, and software specialist. The local system manager must be experienced in maintaining this type of system, certified/trained on all equipment used as part of the system, shall be equipped with an internet connected laptop for mobile device maintenance and calibration, and shall be locally available to service and maintain system components, maintain the system software (or can immediately get in touch with someone who can), maintain the API, move portable devices as necessary, and respond to emergency equipment situations. The local system manager shall be responsible for coordinating the placement of devices in the project areas. The local system manager shall supply a phone number to MassDOT for contact, and at least one alternate phone number. The Design-Build Entity will be required to provide contact information for others responsible for maintenance of the system.

Upon Approval of the qualifications and a maximum of 30 Days after NTP, the Design-Build Entity shall submit the following information to MassDOT for review and approval:

- The Design-Build Entity shall meet with MassDOT (in a manner approved by MassDOT) and then propose the actual initial device layout to MassDOT for approval. Design-Build Entity shall provide a plan at an appropriate scale and detail depicting the initial device layout. The plan shall clearly identify the proposed location for all devices, proposed route segments, system logic, third-party data sources and uses, and PCMS messages based on the route segments impacted by the project. Design-Build Entity may supplement this submission with a Google Earth Keyhole Markup Language Zipped (KMZ) file or similar commonly available and free format for ease of review.

- Upon request by MassDOT, the Design-Build Entity may be required to submit all brochures and cut sheets on all the equipment to be used as part of the RTTM system, with details of how and which communications systems shall be used, and example of the software interface, details on the software system, details on the API, and computer requirements.

- The Design-Build Entity shall provide a written or email request to MassDOT for the names and email addresses of all system users. MassDOT shall supply the information within 15 business days of receipt of the request. MassDOT shall also specify what permission level each user shall be allowed (Viewer, Operator, Administrator etc.) and which shall receive automated system messaging as required herein. The Design-Build Entity shall supply system usernames and passwords a minimum of seven (7) days prior to the start of the operational field test period.

A maximum of 60 days after NTP, the Design-Build Entity shall submit the following information to MassDOT for review and approval:

SUBITEM 856.3 (Continued)

- Final device layout plan: Design-Build Entity shall provide a final device layout plan to specify the location of each device with proposed coordinates in a plan view format at a sufficient viewable scale and detail to clearly convey the proposed location. Design-Build Entity shall label each device or data stream with a unique identifier. Design-Build Entity may supplement this submission with a Google Earth KMZ file or similar commonly available and free format for ease of review. The Design-Build Entity shall field verify that there is sufficient space available for all equipment indicated on the plan.

- Cross-Sectional Layout and Detail Plans: Design-Build Entity shall provide cross-sectional photo views of each proposed device location. The photo view shall show the proposed device location marked in the field. Said plan shall clearly identify the clear zone required, proposed offset from edge of traveled way to the closest edge of the device, any site modifications (leveling pads drainage modifications etc.) needed for installation, and the layout of any protection required. Site modifications and protection layouts will require a site plan depicting the location, materials, and slopes needed to complete the installation in accordance with MassDOT requirements.

- Design-Build Entity shall provide all installation manuals for each traffic sensor type to be utilized on the project for review purposes.

- Design-Build Entity shall submit intended system testing procedures for review and approval.

- Design-Build Entity shall supply sample malfunction email message format for review and approval.

- Design-Build Entity shall verify in writing that communications signal strength and solar requirements have been verified for each device location.

- Design-Build Entity shall confirm requirements of RTTM devices to be crash-worthy according to MassDOT and that the proposed RTTM devices meet any requirements, as necessary.

All the required components of the RTTM system as specified herein shall be installed, fully operational and free from malfunction for a minimum period of seven (7) days prior to the beginning of the operational period. PCMS shall be operational 14 days prior to the Long-Term Shutdown for use in messaging the upcoming road restrictions. **No work shall begin on the project that will reduce the available roadway capacity prior to completion of the operational field test period.**

WEBSITE REQUIREMENTS

Any system Website shall have the following:

- The Website shall be secure (https:// protocol) configured to provide a password protected link for approved personnel to have access to the operational characteristics of the system to manually override messages on the RTTM PCMS'.

- Each RTTM device and data stream shall have a unique and descriptive (Roadway, Direction, device number, Mile Marker, etc.) device identifier. These identifiers shall be coordinated with and approved by MassDOT at the beginning of the project and shall not change unless approved by MassDOT.

SUBITEM 856.3 (Continued)

- The Website shall be configured to display current traffic conditions and real time speed at all locations to the nearest minute. The "real time" travel time information displayed on the PCMS' is updated everyone (1) minute minimum and the system software information is updated simultaneously with the travel time information displayed on the PCMS'.

- The system shall be configured to support the scheduling of message overrides by the operator. Such scheduling shall allow the operator to set a message on a sign or group of signs simultaneously to turn on and to turn off at times set in the future and automatically return to the previous message automation without user intervention.

- Via the internet and the dedicated website, the system shall provide a full color map using Google Maps or equivalent depicting the project area with locations of portable traffic sensors, PCMS, and CCTV Cameras. Using the defined color-coding scheme, the map reflects the current average speed at each portable traffic sensor and displays the entire information message being shown by each PCMS either on the map or on another part of the websites main page. The map and all device data shall be automatically refreshed a minimum of once every minute and GPS location verified a minimum of every 15 minutes (minimum) to automatically display any changes to portable traffic sensor(s), CCTVs, and PCMS's. The system shall also allow for access to, PTZ control of, and live streaming of the CCTV Camera feeds via the same system interface.

- The system travel time and speed information are to be updated simultaneously with the traffic speed information recorded on the Portable Traffic Sensors. The system shall be capable of displaying traffic speeds using a three-tiered color-coded logic. An example typically utilized would be green above 45 mph, yellow 34 –16 mph, and red below 15 mph (as appropriate for each roadway segment monitored). This logic is subject to modification by MassDOT at any time during the Project.

- Provide immediate access to the historical and current real-time (up to the previous minute) traffic data (for speed, volume, and occupancy), malfunction logs, login access, PCMS messages and overrides, and logs being recorded by the RTTM as part of the Project via the system interface. This data shall also be made available for a period of six (6) months following acceptance of the data provided by the Design-Build Entity to MassDOT.

- Access to RTTM website shall be via an external website portal or remote client software access. Full system functionality shall be provided using the latest version of Microsoft Edge or Google Chrome.

- The website shall allow MassDOT's own website or project specific website to link to it.

EQUIPMENT REQUIREMENTS

The RTTM system shall consist of the following equipment as a minimum:

- Portable Traffic Sensors (PTS).

- Portable Changeable Message Signs (PCMS).

SUBITEM 856.3 (Continued)

- Mobile Video CCTV Cameras (CCTV).
- Communication equipment for all above pieces including wireless data networks, base stations, cell phone data interfaces, Ethernet network interfaces, and internet interfaces.
- Customized and secure (https:// protocol) webpage integrated with the RTTM System such that all RTTM devices may be monitored or modified via the RTTM System by MassDOT.
- Software package customized for this project's needs or equivalent.
- Application Programming Interface (API), from the Design-Builder RTTM software to the MassDOT Smart Work Zone Manager (SWZM) software.
- In addition to the above specified equipment, the following requirements shall be met for each RTTM PTS, PCMS, and CCTV:
    - Each shall be individually mounted trailer units with solar, battery, or continuous power sources (non-motorized). Multiple devices may be co-located on a single trailer unit. If multiple devices are co-located on a single trailer unit, battery and power supply shall be provided to meet the minimum requirements for all devices on each platform.
    - Each shall be equipped with digital modems or wireless data interfaces for use with multiple bandwidths as required.
    - Each shall be linked to the RTTM System and accessible to MassDOT.
    - Each device shall have all components secured with locked compartments to prevent unauthorized access.
    - Each PCMS device shall be NTCIP-compliant, and CCTV and PTS shall be NTCIP-compatible.
    - Local operation of each device shall be password protected to restrict unauthorized access.
    - Each device shall be installed such that it cannot be removed or relocated by unauthorized personnel.
    - Design-Build Entity shall verify that adequate communication signal strength is available at each device location to ensure all devices always communicate with system.
    - Design-Build Entity shall ensure that all minimum power requirements are met regarding each device as specified herein and able to be maintained at each device location.

SUBITEM 856.3 (Continued)

Portable Traffic Sensors (PTS)

- The RTTM system PTS at all data collection locations shall be such that the accuracy is not degraded by inclement weather and visibility conditions including precipitation, fog, darkness, excessive dust, and road debris. These sensors shall be capable of acquiring bi-directional traffic data for up to 10 lanes of traffic on a lane-by-lane basis. The data acquired shall provide traffic volume, individual vehicle speed, and lane occupancy on a lane-by-lane basis. Each sensor location shall record data for both directions of travel regardless of whether the data is needed for travel time reporting. This is required for data recording purposes only. If a singular device cannot accurately capture both directions of travel, a supplemental device shall be supplied to record data on the direction of travel that cannot be recorded by the singular device required for travel time reporting unless otherwise approved or directed by MassDOT. Use of Doppler Radars, third party data streams (INRIX etc.), Bluetooth, Wi-Fi or Bluetooth/Wi-Fi combo sensors, and data on any project will require approval by MassDOT prior to the start of the project. These devices shall not be used at any data collection location specified in the Contract Plans.

- Each PTS sensor shall communicate with the RTTM System to modify the appropriate PCMS messages depending on the prevailing traffic speed.

- The PTS shall be capable of being installed along the roadway at a manufacturer recommended height and angle such that recording traffic data on each lane is not occluded by any of the adjacent travel lanes.

- The Design-Build Entity shall utilize existing travel time data from MassDOT's GoTime system. The contract shall request a username and password from MassDOT to access the existing data. Data will be transmitted in an XML format.

Portable Changeable Message Signs (PCMS)

- The signs shall be trailer mounted. The message panel shall be at least seven (7) feet above the pavement, present a level appearance, and be capable of displaying up to a minimum of eight characters in each of three lines at a time. Each PCMS to be used as part of the RTTM system shall be a NTCIP-compliant LED display and shall conform to Section 6 of the MUTCD. All messages shall be as defined on plans, in this specification and as coordinated and approved by MassDOT.

- Due to spatial constraints within the Right of Way (ROW) in some project areas, smaller sized PCMS may be required. It shall be the Design-Build Entitys responsibility to ascertain if sufficient space is available at all proposed PCMS locations, outside of those identified on the Contract plans, to accommodate a full-size PCMS. If a full-size PCMS cannot be accommodated due to spatial constraints within the ROW, an urban or intermediate size PCMS, meeting the criterial detailed in this special provision and having a minimum display size of 36 by 72 inches shall be provided unless otherwise approved by MassDOT.

- The PCMS shall be compliant with the latest approved NTCIP.

SUBITEM 856.3 (Continued)

- The PCMS shall meet the following requirements for Visibility and Legibility:
  - Visibility:
    - PVMS messages shall be visible within a distance range of 1,200 feet from the VMS display face under the following conditions:
    - When the PVMS is mounted so its bottom side is positioned between five (5) and 20 feet above a level roadway surface.
    - 24 hours per day and in most normally encountered weather conditions experienced in Massachusetts.
    - During dawn and dusk hours when sunlight is shining directly on the display face or when the sun is directly behind (silhouetting) the PVMS.
    - When viewed by motorists and travelers that have 20/20 corrected vision.
    - When the motorist eye level is three (3) to 12 feet above the roadway surface.
  - Legibility:
    - At horizontal viewing angles up to 45 degrees from the display, the characters shall be legible from 800 feet.
    - At extreme horizontal viewing angles of up to 82 degrees from the display, the characters shall be legible from 140 feet.
    - The sign shall include automatic dimming for night-time operations.
    - The message sign shall provide for remote sign operation via RTTM system allowing operators to manually override the automated messaging to display a message at any time. The operator shall be able to cancel this override and initiate the systems automated messaging feature. Each message sign shall be capable of password protected manual local operation via a hard-wired keyboard control.
    - All messages are to be center-justified.
    - Messages to be displayed shall have the capability to be modified autonomously at various times of the day and days of the week.
    - Any request to change the messages on the PCMS shall be approved by MassDOT.
    - The RTTM system shall display and record message board solar charge and the battery capacity.
    - The message board shall utilize a hydraulic lift to raise and lower the sign panel to display height and a locking mechanism to prevent rotation.

SUBITEM 856.3 (Continued)

- Solar panel array shall be sized to always provide continuous operation at the proposed field location.

- The battery bank shall have adequate amp-hr capacity to operate the message board continuously in the absence solar recharge for a minimum of 14 days.

CCTV Cameras

The RTTM system shall be configured with the following camera requirements as a minimum:

- The CCTV camera shall be capable of displaying up to eight (8) preset view zones, each with a unique user entered title. The Design-Build Entity shall program the CCTV camera with preset view zones, including: The main directions of travel (i.e., north, south, east, and west directional zones) unless otherwise specified by MassDOT.

- The CCTV camera shall be programmable to blank out up to four (4), four-sided areas to electronically block portions of the camera's field of view from being displayed. These privacy zones shall move and adjust sizing synchronously with camera movements and degree of lens zooming.

- CCTV Camera and all necessary components shall operate in an autonomous manner 24/7 for a minimum of 14 days without a solar charge.

- CCTV Camera images, streaming video and controls shall be always secured from unauthorized remote access.

- The CCTV camera trailers shall provide a telescoping mast that allows for the camera to be located a minimum of 30 feet above the ground surface.

The RTTM system shall be configured with the following streaming video requirements:

- The streaming video from the cameras shall be provided in a format capable of being displayed at the MassDOT HOC and the project web page.

- The web page provided shall allow at least 20 users to access the streaming video on the web page without having the frame rate drop to less than one (1) frame per second.

- The streaming video must be viewable through the RTTM system.

- The RTTM system shall be able to view and control multiple CCTV Cameras from the same screen via the RTTM website.

SUBITEM 856.3 (Continued)

DATA REQUIREMENTS

The following data acquisition requirements are to be met:

- All traffic data acquired by the RTTM system including but not limited to calculated data fields and shall be archived in a log file with time and date stamps for the duration of the project. During the project, MassDOT shall have the ability to immediately access any archived data from the RTTM website.

- The RTTM system vendor shall provide MassDOT all project archive data monthly unless otherwise approved by MassDOT. This logged information will be in a comma delineated spreadsheet format for all traffic data and log information. All data shall be provided in 15-minute intervals reported by device labeled with the approved unique device or data stream identifier. Said intervals shall be provided on a lane-by-lane arrangement by device/data stream. The Design-Build Entity shall coordinate with MassDOT on appropriate method of delivery for all project data (DVD, portable media device, external website posting, FTP, etc.). The Design-Build Entity shall also supply a map displaying the locations of all equipment with its unique device identifier used as part of the RTTM system. Accompanying this map shall be a detailed description of where each device was installed (shoulder, median, overhead structure location), what lanes the devices were collecting data on (if applicable), how lanes relate to the device, and data fields recorded, as well as latitude and longitude coordinates for each device.

- All system log information shall be provided in chronological order by event (malfunction, overrides, speed alert etc.).

- The vendor shall only modify the format of the data to be provided upon approval from MassDOT.

Each RTTM device or data stream shall have a unique device/data stream identifier. These identifiers shall be coordinated with MassDOT and approved by MassDOT at the beginning of the Project and shall not change unless approved by MassDOT.

TRAINING AND SUPPORT

The following personnel, training and support shall be required:

- Design-Build Entity shall ensure that the RTTM system is furnished, installed, and maintained by personnel who are experienced in this type of work. Deploying firm/personnel must have a minimum of five similar deployments.

- Training will be provided to project staff on the use and operation of the RTTM System Software.

- The Design-Build Entity shall provide training of up to eight (8) hours for MassDOT personnel and their agents on the use and operation of both the physical field hardware and the RTTM system software. The Design-Builder is to coordinate with MassDOT as to the exact location and time of the training.

SUBITEM 856.3 (Continued)

- Training shall be completed upon installation of all RTTM devices in the field but prior to the operational field test period or as directed by MassDOT. It is the responsibility of the Design-Build Entity to provide training manuals, class notes, and other instructional materials for up to twenty (20) attendees at the training session. No training shall begin unless and until, in the opinion of MassDOT that, the RTTM system is sufficiently complete and operational such that the training would be useful.

- Design-Build Entity shall ensure that a Local Systems Manager or other vendor equipment certified on-site maintenance specialist, who is capable of troubleshooting and correcting any issues with all the RTTM system equipment and software is locally available 24 hours a day, 7 days a week to maintain the system components. Said activity may require movement of portable devices deployed as part of the RTTM System as necessary to respond to emergency situations within four (4) hours. The specialist shall be equipped with sufficient resources and commonly needed spare equipment (i.e., modem, camera, sensor, PCMS) to make needed corrections of deficiencies within eight (8) hours of written/email notification. The Local Systems Manager shall also attend the MassDOT training session and be introduced and available to MassDOT Project personnel.

SYSTEM OPERATIONAL PERFORMANCE

The following operational performance requirements shall be met:

1. To ensure a prompt response to incidents involving the integrity of the RTTM system devices, the Contractor shall be required to make all necessary corrections to any and all of the components of the RTTM system (with the exception of MassDOT supplied devices and the contractor supplied website) within 12 hours of notification by MassDOT. If all corrections are made within this 12-hour period and the system is brought back on-line, no pay reduction will occur. If the 12-hour timeframe expires and the components of the system are not fully restored to proper working order, payment deductions for the system will be made for that day and daily until the entire system is brought back on-line at the discretion of MassDOT. The payment deduction will be determined as follows:

1 day = $5,000.00	6 days = $30,000.00
2 days = 10,000.00	7 days = $35,000.00
3 days = $15,000.00	8 days = $40.000.00
4 days = $20,000.00	9 days = $45,000.00
5 days = $25,000.00	10 days = $50,000.00

Each 24-hour period in excess of the initial 12-hour period during which the RTTM system is not working will be measured as one (1) day.

2. If the components of the RTTM system are down for more than 10 total days in a month whether they are consecutive or cumulative, then MassDOT reserves the right to require removal of the RTTM system at this time and replacement with a different system. The Contractor shall continue to be penalized at the payment deduction of $10,000.00 per day for each day, after the initial 10-day penalty that the system is out of compliance with this specification.

SUBITEM 856.3 (Continued)

3. MassDOT reserves the right to remove any RTTM system component at any time if it determines the system is not performing in accordance with this specification, in which no further payment shall be made.

4. If the system is not fully approved for use prior to the beginning of the operational period, a pay reduction as detailed above shall occur until the system is approved by MassDOT.

5. The RTTM system shall perform with no major malfunctions throughout the entire contract unless MassDOT requests the system to be removed. Malfunctions include, but are not limited to the inability of the equipment to provide accurate-real time travel time information, inability to withstand a construction roadside environment or normal weather conditions, etc. MassDOT reserves the right to terminate this item at any time if it determines this RTTM system is not performing in accordance with this specification.

COMPENSATION

No separate payment will be made for Subitem 856.3, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS

The work under this Subitem shall conform the relevant provisions of Subsection 850 of the Standard Specifications and the following:

Work under this Subitem consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List.
Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Design-Builder shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCSD.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the approved Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

COMPENSATION

No separate payment will be made for Subitem 859.1, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 851.

SUBITEM 864.07 PAVEMENT ARROW AND LEGENDS (EPOXY)

The work under this subitem shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

DESCRIPTION

The work shall include furnishing and installation of white pavement arrows and legends. As work incidental to these items, the Contractor or pavement marking Material Supplier will measure the performance of the pavement markings upon installation and according to the measurement and sampling procedures outlined in ASTM D7585 *(Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments), ASTM E2177 (Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Wetness), and ASTM E2832 (Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting)*.

MATERIALS

Epoxy will be one of the following products, or approved equivalent:

1. Ennis-Flint HPS-3; or
2. Epoplex LS50; or
3. Dow Poly-Carb MARK-55.3; or
4. Sherwin-Williams Hotline TM8210 Series.

All Liquid Pavement Arrows and Legends will have no-track times that do not exceed 10 minutes.

All Pavement Arrows and Legends will conform to ASTM D6628 (Standard Specification for Color of Pavement Marking Materials).

Wet-Reflective Element products for Liquid Pavement Markings will be specified by the Material Supplier to meet the Pavement Marking Performance subsection of this document.

All Pavement Marking Materials, including reflective elements, will be free of heavy metals.

Construction Methods for Installation of Durable Pavement Markings

All work will be done in accordance with the Material Supplier's specifications and the following:

For Epoxy Pavement Arrows and Legends, the binder will be applied at a rate to achieve a minimum uniform wet thickness and tolerance specified by the pavement marking Material Supplier but will not exceed 30 mils ± 2 mils.

The thickness for all materials will be met across at least the middle 2/3 of the pavement arrows and legends width. Depth plates will be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

Methodology and rate of application for reflective elements in Liquid Pavement Markings willbe per the pavement marking Material Supplier's specifications in order to meet the Pavement Marking Performance subsection of this specification.

SUBITEM 864.07 (Continued)

Newly installed arrows and legends will be protected from tracking during the setting period per Subsection 860.63.

COMPENSATION

No separate payment will be made for Subitem 864.07, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3

SUBITEM 866.206 6 INCH REFLECTORIZED WHITE LINE (POLYUREA)(RECESSED)

SUBITEM 866.212 12 INCH REFLECTORIZED WHITE LINE (POLYUREA)(RECESSED)

SUBITEM 867.206 6 INCH REFLECTORIZED YELLOW LINE (POLYUREA)(RECESSED)

The work to be done under these Subitems shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

Work shall consist of grooving a slot in the pavement surface and the furnishing and installation of wet reflective polyurea pavement markings.

Materials

Wet reflective polyurea pavement markings shall consist of a liquid binder, first drop beads or elements to provide dry and wet retoreflectivity, and second drop glass beads to improve the durability of the pavement marking, reduce track-free times, and provide supplementary dry retroreflectivity.

The Contractor shall use one of the following binders and first drop beads or elements, or approved equivalents:

1. 3M™ Liquid Pavement Marking Series 5000 with 3M™ All Weather Series 90 elements;
2. Epoplex GLOMARC® 90 with Potters VISIMAX® Glass Bead System; or
3. SWARCO MFUA-12 with SWARCO MEGALUX-BEADS®.

Combination of other binder and first drop bead or element series may only be used at the approval of the Engineer.

Second drop beads shall be manufactured from glass of a composition that is highly resistant to traffic wear and to the effects of weathering. If coating is required to meet the performance requirements, the second drop beads shall be coated to ensure satisfactory embedment and adhesion. Second drop beads retained on a No. 40 U.S. Standard Mesh Sieve shall have a minimum crush strength of 30 lbs. when tested in accordance with ASTM D1213.

Second drop beads shall have a minimum refractive index of 1.51 when tested in accordance with AASHTO M247.

Second drop beads passing the No. 30 sieve shall have a minimum of 75 percent true spheres when tested in accordance with ASTM D1155. All second drop beads retained on the No. 20 and No. 30 sieves shall have a minimum of 80 percent true spheres as determined by ASTM D1155.

Second drop beads shall meet the following gradation requirements when tested in accordance with ASTM D1214:

U.S. Standard Sieve No.	Percent Retained
20	3-10
30	15-35
50	45-75
70	0-10
Pan	0-5

SUBITEMS 866.206, 866.212, and 867.206 (Continued)

Construction Methods

Installation of Groove

Prior to cutting out the grooves for all recessed lines, the Contractor shall use a chalk line or other suitable method to layout the proposed pavement markings on the surface course so that the Engineer can inspect the locations. Once the Engineer has inspected and approved the proposed striping layout, the grooves for the proposed pavement markings may be cut. No pavement grooving shall be done without the prior approval of the Engineer.

Groove position shall be a minimum of 4 inches from the edge of the pavement marking to any longitudinal pavement joints. The groove shall not be installed on bridge joints, on drainage structures, or in other areas identified by the Engineer. The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The use of gang stacked diamond cutting blades to grind a smooth square slot is required for producing all grooves. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer.

The diamond grinder shall have an articulating head so that the slots are installed correctly on grades and super elevated sections.

Grooves that are ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Grooves that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finish at no additional cost. Slots ground out of alignment shall be patched using an approved method and materials.

Grooves shall be 1 inch ± ¼ inch wider than the pavement marking material. Groove depth shall be 100 mils ±5 mils, unless otherwise approved by the Engineer. Depth shall be consistent across the full width of the groove. Depth plates shall be provided by the Contractor to the Engineer to assure that desired groove depth is achieved.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Shrouds and a vacuum apparatus shall be included as part of the grinder to remove larger pieces of pavement that are ground out. If water is used to clean the groove or the grooving process takes place during rainfall, a minimum of 24 hours of dry time is required prior to the placement of pavement markings.

After the depth, width, length, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the groove. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the groove. The Contractor shall prevent traffic from traversing the grooves and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost to the Department.

All grooves must be given final approval by the Engineer prior to the placement of pavement markings.

SUBITEMS 866.206, 866.212, and 867.206 (Continued)

Installation of Wet Reflective Polyurea

Installation of wet reflective polyurea pavement markings shall conform to the Manufacturer's specifications and the following:

Application rate for binder and all beads and elements shall consider final pavement surface composition and smoothness in advance of application to ensure proper wet film thickness and embedment of all beads and elements. The Contractor shall provide the Engineer with documentation from the Manufacturer with all recommended application rates in advance of any pavement marking installation.

The minimum uniform wet thickness for the polyurea binder shall be 25-30 mils. The line thickness shall be met across at least the middle ⅔ of the pavement marking width. Depth plates shall be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

The finished white color shall be free from tint, with good opacity and visibility under both daylight and artificial light. The finished yellow color shall be defined by Federal Test Standard 595 - Color Chip Number 13538, using Federal Test Standard 141 (Method 4252). The finished lines shall be uniform in color and have clean, well-defined edges.

First and second drop beads and/or elements shall be applied in a manner that does not induce rolling or bouncing, to ensure that exposed portions of beads are free of binder material. Beads and elements should be embedded in the binder to a depth of approximately 50% of their diameter.

Drop rate for first drop bead or element shall be per the Manufacturer's specifications.

Drop rate for second drop glass bead shall be 6.4-10.2 lbs. per gallon.

Newly installed pavement markings shall be protected from tracking during the setting period per Subsection 860.63.

Once the installed pavement markings have been open for traffic for a minimum of 48 hours, the Contractor shall perform retroreflectance readings per the measurement and sampling procedures contained in ASTM D7585 (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments) using the Referee Evaluation Protocol found in section 6.4. The following tests shall be performed during the measurement and sampling process:

1. ASTM E1710 *(Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer)*; and
2. ASTM E2177 *(Standard Test Method for Measuring the Coefficient of Retroreflected Luminance (R_L) of Pavement Markings in a Standard Condition of Wetness).*

The average initial retroreflectance readings shall exceed the following minimum values:

	*White Markings	*Yellow Markings
ASTM E1710 (Dry)	475 mcd/lux/m^2	375 mcd/lux/m^2
ASTM E2177 (Wet Recovery)	375 mcd/lux/m^2	300 mcd/lux/m^2

*Observation Angle = 1.05°, Entrance Angle = 88.8°

Pavement markings with measured average initial retroreflectance readings that do not meet the specified minimum values using the procedures outlined in subsection 6.4.5 of ASTM D7585 shall be removed by a method approved by the Engineer and reapplied at no additional cost.

SUBITEMS 866.206, 866.212, and 867.206 (Continued)

Pavement Marking Asset Management

Upon completion of the pavement marking installation, the following data shall be tabulated by the Contractor:

1. Retroreflectance readings, including date(s), time(s), and location(s) where readings took place;
2. Liquid binder type(s) and application rate;
3. Reflective element type and drop rate;
4. Date of groove installation;
5. Lot, batch number, or any other material identifiers and manufacturing information;
6. Date and time of final liquid marking installation;
7. Highway location (including direction) of installation;
8. Air and pavement temperature during application;
9. Measured material application thickness, depth of groove; and
10. Any other pertinent information that may assist MassDOT with Quality Control.

Results for all readings shall be provided within 10 business days of testing to the Engineer, with a second copy sent to:

State Traffic Engineer
Attention: Pavement Marking Installation & Testing
10 Park Plaza, Room 7210
Boston, MA 02116

The cost to prepare and submit this data shall be considered incidental to the cost of the items.

COMPENSATION

No separate payment will be made for Subitems 866.206, 866.212, and 867.206, but all costs in connection therewith shall be included in the Contract Lump Sum bid price for Item 100.3

SUBITEM 868.506	**6 INCH WET REFLECTIVE RECESSED WHITE LINE (EPOXY)**
SUBITEM 868.512	**12 INCH WET REFLECTIVE RECESSED WHITE LINE (EPOXY)**
SUBITEM 868.524	**24 INCH WET REFLECTIVE RECESSED WHITE LINE (EPOXY)**
SUBITEM 869.506	**6 INCH WET REFLECTIVE RECESSED YELLOW LINE (EPOXY)**
SUBITEM 869.524	**24 INCH WET REFLECTIVE RECESSED YELLOW LINE (EPOXY)**

Work to be completed under these Subitems shall conform to the relevant provisions of Subsection 860 of the Standard Specifications and the following:

Work shall consist of grooving a slot in the pavement surface and the furnishing and installation of wet reflective epoxy pavement markings.

MATERIALS

Wet reflective epoxy pavement markings shall consists of a liquid binder, first drop beads or elements to provide dry and wet retoreflectivity, and second drop glass beads to improve the durability of the pavement marking, reduce track-free times, and provide supplementary dry retroreflectivity.

The Contractor shall use one of the following binders and first drop beads or elements, or approved equivalents:

1. Ennis-Flint HPS®-3 Fast Cure Epoxy with Ennis-Flint HP300 Glass Beads;
2. Epoplex LS50 with Potters VISIMAX® Glass Bead System; or
3. SWARCO 1180 Series with SWARCO MEGALUX-BEADS®.

Combination of other binder and first drop bead or element series may only be used at the approval of the Engineer.

Second drop beads shall be manufactured from glass of a composition that is highly resistant to traffic wear and to the effects of weathering. If coating is required to meet the performance requirements, the second drop beads shall be coated to ensure satisfactory embedment and adhesion. Second drop beads retained on a No. 40 U.S. Standard Mesh Sieve shall have a minimum crush strength of 30 lbs. when tested in accordance with ASTM D1213.

Second drop beads shall have a minimum refractive index of 1.51 when tested in accordance with AASHTO M247.

Second drop beads passing the No. 30 sieve shall have a minimum of 75 percent true spheres when tested in accordance with ASTM D1155. All second drop beads retained on the No. 20 and No. 30 sieves shall have a minimum of 80 percent true spheres as determined by ASTM D1155.

SUBITEMS 868.506 THROUGH 869.524 (Continued)

Second drop beads shall meet the following gradation requirements when tested in accordance with ASTM D1214:

U.S. Standard Sieve No.	Percent Retained
20	3-10
30	15-35
50	45-75
70	0-10
Pan	0-5

CONSTRUCTION METHODS

Installation of Groove

Prior to cutting out the grooves for all recessed lines, the Contractor shall use a chalk line or other suitable method to layout the proposed pavement markings on the surface course so that the Engineer can inspect the locations. Once the Engineer has inspected and approved the proposed striping layout, the grooves for the proposed pavement markings may be cut. No pavement grooving shall be done without the prior approval of the Engineer.

Groove position shall be a minimum of 4 inches from the edge of the pavement marking to any longitudinal pavement joints. The groove shall not be installed on bridge joints, on drainage structures, or in other areas identified by the Engineer. The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The use of gang stacked diamond cutting blades to grind a smooth square slot is required for producing all grooves. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades. The acceptability of the surface texture will be determined by the Engineer.

The diamond grinder shall have an articulating head so that the slots are installed correctly on grades and super elevated sections.

Grooves that are ground deeper or wider than the specified allowable limits shall be repaired per the direction of the Engineer at no additional cost. Grooves that are ground too shallow, too narrow, or with unacceptable rises between blade cuts shall be reground to the correct size, depth, and surface finish at no additional cost. Slots ground out of alignment shall be patched using an approved method and materials.

Grooves shall be 1 inch ± ¼ inch wider than the pavement marking material. Groove depth shall be 100 mils ±5 mils, unless otherwise approved by the Engineer. Depth shall be consistent across the full width of the groove. Depth plates shall be provided by the Contractor to the Engineer to assure that desired groove depth is achieved.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. Shrouds and a vacuum apparatus shall be included as part of the grinder to remove larger pieces of pavement that are ground out. If water is used to clean the groove or the grooving process takes place during rainfall, a minimum of 24 hours of dry time is required prior to the placement of pavement markings.

SUBITEMS 868.506 THROUGH 869.524 (Continued)

After the depth, width, length, and surface condition has been approved by the Engineer, an air lance shall be used to remove fine particles from the groove. Air compressors shall initially be blown out away from the application area to prevent compressor condensation build-up from entering the groove. The Contractor shall prevent traffic from traversing the grooves and re-clean grooves, as necessary, prior to application of pavement markings at no additional cost to the Department.

All grooves must be given final approval by the Engineer prior to the placement of pavement markings.

Installation of Wet Reflective Epoxy

Installation of wet reflective epoxy pavement markings shall conform to the Manufacturer's specifications and the following:

Application rate for binder and all beads and elements shall consider final pavement surface composition and smoothness in advance of application to ensure proper wet film thickness and embedment of all beads and elements. The Contractor shall provide the Engineer with documentation from the Manufacturer with all recommended application rates in advance of any pavement marking installation.

The minimum uniform wet thickness for the epoxy binder shall be 25 mils. The line thickness shall be met across at least the middle ⅔ of the pavement marking width. Depth plates shall be provided by the Contractor to the Engineer to assure that desired thickness is achieved.

The finished white color shall be free from tint, with good opacity and visibility under both daylight and artificial light. The finished yellow color shall be defined by Federal Test Standard 595 - Color Chip Number 13538, using Federal Test Standard 141 (Method 4252). The finished lines shall be uniform in color and have clean, well-defined edges.

First and second drop beads and/or elements shall be applied in a manner that does not induce rolling or bouncing, to ensure that exposed portions of beads are free of binder material. Beads and elements should be embedded in the binder to a depth of approximately 50% of their diameter.

Drop rate for first drop bead or element shall be per the Manufacturer's specifications.

Drop rate for second drop glass bead shall be 6.4-10.2 lbs. per gallon.

Newly installed pavement markings shall be protected from tracking during the setting period per Subsection 860.63.

Once the installed pavement markings have been open for traffic for a minimum of 48 hours, the Contractor shall perform retroreflectance readings per the measurement and sampling procedures contained in ASTM D7585 (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments) using the Referee Evaluation Protocol found in section 6.4. The following tests shall be performed during the measurement and sampling process:

1. ASTM E1710 *(Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer)*; and
2. ASTM E2177 *(Standard Test Method for Measuring the Coefficient of Retroreflected Luminance (R_L) of Pavement Markings in a Standard Condition of Wetness)*.

SUBITEMS 868.506 THROUGH 869.524 (Continued)

The average initial retroreflectance readings shall exceed the following minimum values:

	*White Markings	*Yellow Markings
ASTM E1710 (Dry)	475 mcd/lux/m^2	375 mcd/lux/m^2
ASTM E2177 (Wet Recovery)	375 mcd/lux/m^2	300 mcd/lux/m^2

*Observation Angle = 1.05°, Entrance Angle = 88.8°

Pavement markings with measured average initial retroreflectance readings that do not meet the specified minimum values using the procedures outlined in subsection 6.4.5 of ASTM D7585 shall be removed by a method approved by the Engineer and reapplied at no additional cost.

Pavement Marking Asset Management

Upon completion of the pavement marking installation, the following data shall be tabulated by the Contractor:

1. Retroreflectance readings, including date(s), time(s), and location(s) where readings took place;
2. Liquid binder type(s) and application rate;
3. Reflective element type and drop rate;
4. Date of groove installation;
5. Lot, batch number, or any other material identifiers and manufacturing information;
6. Date and time of final liquid marking installation;
7. Highway location (including direction) of installation;
8. Air and pavement temperature during application;
9. Measured material application thickness, depth of groove; and
10. Any other pertinent information that may assist MassDOT with Quality Control.

Results for all readings shall be provided within 10 business days of testing to the Engineer, with a second copy sent to:

State Traffic Engineer
Attention: Pavement Marking Installation & Testing
10 Park Plaza, Room 7210
Boston, MA 02116

The cost to prepare and submit this data shall be considered incidental to the cost of the items.

COMPENSATION

No separate payment will be made for Subitems 868.506 through 869.524, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3

ITEM 909.5 RAPID SETTING CONCRETE FOR REPAIRS CUBIC YARD

All work shall conform to the relevant provisions of Subsection 901 of the Standard Specifications, RFP Volume II, Section 4.10.7, and the following:

The work under this Item shall consist of furnishing and placing rapid setting cementitious material that is suitable to repair concrete and pavement surfaces on existing bridges within the limits of the Project as needed to maintain them during construction and directed by MassDOT. This work is intended to be used as a means of providing compensation to the Design-Builder for emergency bridge deck repair activities and to begin work as directed. This work is not intended for the new structures.

The rapid setting cementitious product shall be qualified rapid set material that shall have completed testing through AASHTO's National Transportation Program (NTPEP) and is included on the MassDOT Qualified Construction Material List.

The rapid setting cementitious material shall be expanded with aggregate for placements that are (2") inches or more in depth and must be formulated to develop a minimum compressive strength of 2500 PSI within two (2) hours.

The product shall be expanded using clean non-reactive aggregates from a MassDOT approved source according to a formulation acceptable to the manufacturer. Aggregate specified, labeled and furnished by the rapid set patching material manufacturer may be used with approval of MassDOT. The mixing process for expanding the rapid setting patching material shall be performed per the Manufacturer's recommendations.

CONSTRUCTION METHODS

The surface to receive the rapid setting repair material shall be properly prepared and free from frost, ice, mud, water, grease, dirt, and any other materials that will hamper the bond.

Prior to placing the rapid setting repair material, the patch area shall be flushed with clean potable water to remove all dust and then blasted with oil free compressed air to remove all standing water.

The ambient temperature must be 35 degrees F and rising for placement of the rapid set repair material. Placement of this material when the temperature is below 35 degrees F will require
the following:

1. Heating the mixing water.
2. Heating the aggregate.
3. Using wann cement.
4. Pre-heating the excavated area to be patched using a method approved by MassDOT.
5. Protecting the mixture from freezing after placement until after hydration takes place.

The rapid setting repair material shall be cured and protected until the minimum compressive strength is achieved.

ITEM 909.5 (Continued)

A rubber-blade drum grout mixer, eight (8) cubic foot minimum, can be used for mixing and placing the cement. Two (2) mixers will be required to be on site, of which one mixer can be used as a back-up. Sufficient mixing and placing equipment shall be provided on the construction site by the Contractor to ensure that a breakdown of equipment will not cause significant delays in completing the scheduled work in the shift.

Approval by MassDOT for all formwork shall be required prior to placement of any concrete. MassDOT may require the Contractor to vibrate and/or power screed the patched area. Payment for such equipment shall be considered incidental to this Item.

Rapid setting concrete placements shall be completed no later than 2:00 AM for nighttime operations so that the required compressive strength of 2500 PSI is attained before the area is opened to traffic no later than 5:00 A.M.

Formwork shall be maintained and remain in place a minimum of seventy-two (72) hours after placement.

METHOD OF MEASUREMENT

Item 909.5 will be measured for payment per Cubic Yard of rapid setting concrete furnished and installed, complete in place.

BASIS OF PAYMENT

Item 909.5 will be paid at the Contract unit price per Cubic Yard of concrete installed complete in place. This price shall include all labor, materials, tools, equipment, and any incidental costs required to complete the work as required by MassDOT including the removal of all formwork.

Any required trial batching and acceptance testing including the cost associated with hiring certified technician shall also be incidental to this Item.

Any reinforcing steel that is required to be replaced for deck repairs, due to the existing reinforcing steel being unsuitable, will be paid under Item 910.1.

Payment for the excavation, removal, and satisfactory disposal of all reinforced concrete for the repairs shall be included in the respective Contract unit bid price for Item 127.4, or Item 127.41.

ITEM 910.1 STEEL REINFORCEMENT FOR STRUCTURES EPOXY COATED **POUND**

Work under this Item shall conform to the relevant provisions of Subsection 901 of the Standard Specifications, RFP Volume II, Section 4.10.7.2, and the following:

Work shall include the addition of supplemental steel reinforcement and/or replacement of any existing steel reinforcement that is deemed unsuitable for re-use by MassDOT during the prosecution of work for deck repairs.

Any steel reinforcement that is found deteriorated during concrete deck excavation as determined by the Engineer, shall be replaced with new steel reinforcement of the same size, shape, and spacing as directed by MassDOT. Any steel reinforcement damaged by the Contractor's operations will be replaced by the Contractor at his own expense. All new steel shall be lap spliced or mechanically spliced with existing retained steel reinforcement as directed by MassDOT. Welding of steel reinforcement shall not be allowed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 910.1 will be measured for payment by the actual number of POUNDS of steel reinforcement bar, complete in place, as required by MassDOT which Contract unit bid price shall include full compensation for all labor, materials, tools, and equipment necessary to complete the work as described herein.

Only steel for reinforcing steel for deck patching at bridge M-05-001=W-06-013 and W-06-016 and any emergency deck repairs for existing or proposed bridges is included in this Item for measurement and payment.

All other reinforcing steel is not included for measurement or payment in this Item and is incidental to the appropriate lump sum items.

SUBITEM 940.02 DRILLED-IN PILE SUPPORTED POST AND PANEL RETAINING WALL

Work under this Subitem shall conform to the relevant provisions of Subsection 140 of the Standard Specifications, and the following:

The BTC plans include Post and Panel retaining walls designed to support the Causeway. The Post and Panel wall design is coupled with the lightweight fill ground improvement, and both contribute to increasing the Causeway global stability FOS to an acceptable level and reducing settlement while allowing for widening the Causeway and increasing the grade. Soldier piles for the BTC Post and Panel walls shall be installed in predrilled temporarily cased holes backfilled with concrete to the bottom of the concrete panels. It is anticipated that predrilling and pile installation would not occur until after excavation to remove existing riprap and other obstructions down to the lightweight fill subgrade elevation and deeper if necessary.

COMPENSATION

No separate payment will be made for Subitem 940.02, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 996.12

SUBITEM 942.124 STEEL PILE HP 12X84

The work under this subitem shall conform to the requirements of the relevant Sections of the Standard Specifications and Supplemental Specifications, and the following:

PILE LOAD TESTING

Pile testing and pile design shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications, The MassDOT Bridge Manual, and AASHTO LRFD Bridge Design Specifications.

Piles shall be driven with an impact hammer utilizing fixed-lead pile installation equipment. Pile followers and pile jetting shall not be allowed.

Pile testing and pile design shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications, The MassDOT LRFD Bridge Manual, and AASHTO LRFD Bridge Design Specifications.

Dynamic pile testing using Pile Driving Analyzer (PDA) shall be used to confirm that piles are driven to the required nominal geotechnical resistance.

One indicator pile at each abutment shall be tested during the end of initial driving with PDA followed by a case pile wave analysis program (CAPWAP) analysis. This test is used to determine the pile driving acceptance criteria including blows per inch (or pile set in inches per blow), the hammer energy, and hammer stroke. Pile driving installation criteria, including refusal criteria, shall be determined by the Design Builder's geotechnical engineer, and submitted for review.

A re-strike test with a PDA and CAPWAP analysis shall be completed on previously tested piles a minimum of 48 hours after installation to verify that piles have been driven to the required nominal geotechnical resistance. Indicator piles shall be monitored to ensure that pile driving stresses in the piles are within the allowable limits.

COMPENSATION

No separate payment will be made for Subitem 942.124, but all costs in connection therewith shall be included in the respective Contract lump sum bid price for Items 996.12.

SUBITEM 945.01 DRILLED SHAFTS

The work to be done under this Subitem shall conform to the relevant provisions of Subsection 945 of the Standard Specifications and the following:

The BTC design includes abutment and pier foundations supported on rock-socketed drilled shafts.

There are significant tidal currents at the locations where the drilled shafts will be constructed. As part of the Drilled Shaft Installation Plan, the Design-Builder shall submit details of how the drilled shaft installation will be sequenced and coordinated with the cofferdam sheeting installation, tremie seal placement, and concrete cap construction. The installation plan shall also detail how the drilling fluids, concrete, and other pollutants are to be kept out of the waterbody during construction.

The design of Drilled Shafts shall be in accordance with Geotechnical Engineering Circular No. 10 -Drilled Shafts: Construction Procedures and LRFD Design Methods FHWA-NHI-18-024.

Additional subsurface exploration at the drilled shaft locations may be required depending on the final design of the shafts.

One (1) Bi-directional Axial Compressive Load Test must be completed on a sacrificial (non-production) drilled shaft. The Bi-directional Load Test (previously known as the Osterberg Test) shall be designed to determine nominal side and tip resistances in the rock socket. The location of the Trial Drilled Shaft is to be performed near one of the abutments of Bridge M-05-001=W-06-013

For each drilled shaft, perform inspection of the bottom of the shafts using a shaft inspection device in addition to using cross hole sonic testing.

COMPENSATION

No separate payment will be made for Subitem 945.01, but all costs in connection therewith included in the respective Contract lump sum bid price for Item 995.01 and 995.02.

SUBITEM 950.01 TEMPORARY EARTH SUPPORT SYSTEM

The Design-Builder shall design, furnish, install, maintain, and remove temporary earth support systems, including cofferdams, as required based upon the actual site conditions, for the maintenance of traffic during phased construction, including excavation and backfilling for the Bridge Approaches, Post and Panel Retaining Walls, Abutments, Wingwalls, and other related work as necessary to complete the work. The earth support systems shall be designed by the Design-Builder and shall provide sufficient space to allow for the installation of the temporary traffic barrier system and the required lane widths specified during staged construction as shown on the BTC Plans.

The Design-Builder shall submit shop drawings to MassDOT for acceptance showing their method of support and protection of utilities. Plans and calculations shall be signed and stamped by an Engineer registered in the Commonwealth of Massachusetts.

The temporary earth support systems may consist of sheet piling with or without tiebacks, soldier piles and lagging, or any other system that satisfies the design criteria contained herein. The temporary earth support systems shall be capable of supporting all loads applied during all stages of construction. The temporary earth support systems located adjacent to and supporting traffic shall extend longitudinally such that the maximum longitudinal slope of the excavated surface does not exceed 1 (vertical) to 2 (horizontal). The temporary earth support systems must be configured such that they will serve their intended purpose during all stages of construction without the need for reinstallation or major modifications.

Temporary sheeting is also needed at the toe of the existing embankment slope for slope support and as a turbidity barrier during embankment excavation and backfill as shown on the BTC Drawings.

Cofferdams shall be designed to remove existing pier foundations down to the specified elevations and to construct new concrete caps for the drilled shafts. To allow for in-the-dry construction, the cofferdams shall have properly designed bottom seals.

All material used for the temporary earth support systems shall be sound and free from strength impairing defects. Steel materials used for the temporary earth support systems are permitted to remain in place at the completion of construction. All other materials shall be removed in advance of project completion.

The Design-Builder shall prepare and submit to MassDOT for approval, an Erection and Sequence of Construction Plan, including Operations, indicating his proposed construction procedures and methods to be used including equipment, tools, devices, schedule of operations, methods of utility protection, and methods of structural erection and construction. The requirements for equipment and all procedures utilized shall be in conformance with the intent of the Standard Specifications for Highways and Bridges.

The submittals of demolition procedures, and construction and erection procedures and any necessary calculations and drawings shall be prepared and stamped by a Professional Structural Engineer registered in the Commonwealth of Massachusetts certifying that all existing and proposed structural members are suitably braced and supported throughout the demolition and construction process. Work under this item may not commence until MassDOT has given written approval.

During the prosecution of this work, MassDOT may reject use of any method or equipment which causes vibrations that exceed the threshold or limiting values defined below or possible damage to portions of the adjacent structures. Any damage done to portions of the adjacent structures and/or utilities identified on the Plans to remain shall be replaced or repaired by the Design-Builder at his expense to the satisfaction of MassDOT.

SUBITEM 950.01 (Continued)

The provisions and requirements for vibration monitoring related to installation of temporary earth support systems specified in Subitem 981.01 shall be considered incidental to the Work.

The Design-Builder shall submit to MassDOT for approval a short-term traffic management plan required for the installation of the temporary earth support system for each separate location. The plan submitted shall be sufficiently detailed so that the Design-Builder's method of dealing with operations shall be clearly stated. No construction work shall be allowed before MassDOT approves this traffic management plan.

The Design-Builder shall design and submit to MassDOT for approval temporary earth support system designs that are designed to carry all of the applicable AASHTO loads, including, but not limited to, earth pressure and surcharge due to HS25 truck loading and temporary barriers. The temporary earth support systems shall be designed and sealed by a Professional Engineer registered in the Commonwealth of Massachusetts. Prior to any excavation, MassDOT must approve complete detailed drawings and complete calculations for the temporary earth support systems in writing. Payment for the Design-Builder's design and submittal including Design-Builder's engineering services shall be considered incidental to this item and no further compensation will be allowed.

The Design-Builder shall take into account subsurface conditions, water surface elevations and other appropriate loads. The Design-Builder shall accurately locate all utility lines and structures to ensure that the proposed temporary earth support systems will not interfere with any existing utilities and structures.

The design shall take into account the existing and proposed installation of any drainage piping. Any existing drainage outlets must remain in use throughout the installation of the retaining structure.

The Design-Builder shall keep the surface clean of debris at all times and shall make the surface thoroughly clean at the end of the work. The Design-Builder shall be responsible for any settlement or damage to curbing, structures, utilities, or roadway, which may occur, as a result of his work.

BASIS OF PAYMENT

No separate payment will be made for Subitem 950.01, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 993.01.

SUBITEM 983.521 STREAMBED RESTORATION

DESCRIPTION

This work shall consist of removing, stockpiling, and replacing riverbed material in the proposed bridge replacement and the upstream and downstream approaches in the limits of work. The streambed restoration shall replicate the existing natural channel bed outside the work area in terms of material, roughness, shape, profile, and appearance. The ultimate product will, to the extent possible, replicate the function and appearance of the natural stream channel, as illustrated by photo-documentation herein (Figure 1 and 2).

The Contractor shall coordinate with his/her subcontractors to ensure all required equipment is available on-site to complete the work in this manner. The streambed restoration is required to comply with environmental permits issued for the project. MassDOT Environmental Services will provide a Fluvial Geomorphologist (Geomorphologist) to provide a pre-construction meeting, on-site oversight during construction, and assistance during streambed restoration construction to ensure the restoration is constructed as shown on the Plans, as required by these Special Provisions and in accordance with permit requirements.

At least 30 days prior to the commencement of construction, the Contractor shall coordinate with David Paulson (MassDOT Wildlife Unit Supervisor, (508) 389-6366 / david.j.paulson@state.ma.us) to set up an initial (virtual or in person) meeting with MassDOT's Geomorphologist, Contractor, and Resident Engineer. At this meeting, the Geomorphologist will provide an overview of the restoration work. The Contractor should be prepared to discuss the anticipated means, methods, and schedule.

Process Approval:

In lieu of a mockup, the Contractor shall schedule an onsite meeting to discuss the streambed restoration with the Geomorphologist and respective parties from MassDOT. The Geomorphologist shall be onsite during initial streambed restoration. The Contractor shall provide the Geomorphologist adequate access to observe, direct, and inspect the channel restoration work throughout the duration of the removal, stockpile, and reinstallation of the existing streambed material. If material is being brought to the site for streambed restoration, the Contractor shall provide the Geomorphologist with photographs to see the material.

MATERIAL

The streambed material excavated from the existing streambed at the westernmost pier of W-06-016, and that from the Marion Wareham bridge (M-05-001=W-06-013) shall be removed and stockpiled to facilitiate reinstallation and replication of the natural streambed.

As a result of the 2024 Sediment Sampling, streambed material at the easternmost bridge pier (~STA 105.6) of the Wareham bridge (W-06-016) is not to be reused on-site (See Section 5.7). In the event that the excavated material is not suitable or there is not enough available suitable material, additional streambed restoration material shall be locally sourced that matches the composition of the existing native riverbed. The following gradation sampled from a similar streambed surface shall be used as a guide.

Stream Bed Material Gradation

Particle	**Percent (%) Composition**
Pebble/Gravel/Cobble	28
Sand	62
Silt	10

SUBITEM 983.521 (Continued)

The streambed material shall be approved by the Resident Engineer and Geomorphologist prior to use.

Related Items

Crushed Stone shall conform to the requirements of Subitem 156.2 Crushed Stone for Slope Treatment of the Standard Specifications.

Riprap Stone shall conform to the requirements of Subitem 983 of the Standard Specifications.

CONSTRUCTION

Channel

The streambed material shall be reinstalled in the workspace required for the bridge piers as depicted on the plans, to an average thickness of 1 foot, with variations in thickness as necessary to replicate existing channel conditions. The initial placement of streambed material shall fill the voids in the underlying riprap. Fill voids by shaking stone with the teeth of an excavator bucket, hand tamping with metal tamping rods, and by spraying water to settle fines between large stones. Plate compactors shall not be used. The purpose of filling the voids is to prevent subsurface flow where surface water disappears into large voids between the stone fill below the channel bed surface during low flow conditions. The final streambed shape and appearance shall be finalized in the field as directed by the Geomorphologist.

Reinstallation of the stockpiled streambed material shall be placed on top of the riprap to restore streambed habitat and fish passage. The streambed materials shall be installed during normal low water conditions behind cofferdams in accordance with the environmental permits.

Completion

Once all material has been placed in the stream channel and approved by the Geomorphologist and Resident Engineer, the Contractor shall remove the cofferdams in such a way as to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed shall maintain the general configuration of the existing streambed bedform and there shall be minimal subsurface flow upon final inspection by the Resident Engineer and Geomorphologist. The project must be passable by fish and other aquatic organisms following construction.

The streambed restoration to be measured for payment will be the complete and accepted work for restoration of the streambed within the limits shown on the Plans as approved by the Resident Engineer and Geomorphologist.

FIGURES

Figure 1: View north / northeast from Salt Marsh 1 in Marion downstream of Bridge M-05-001=W-06-013.

Figure 2: View southeast from Salt Marsh 1 in Marion, facing the Weweantic River upstream of the Marion/Wareham bridge (M-05-001=W-06-013).

SUBITEM 983.521 (Continued)

COMPENSATION

No separate payment will be made for Subitem 983.521, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 755.2.

The Geomorphologist will be provided by MassDOT at no cost to the Design-Builder

SUBITEM 981.01 INSTRUMENTATION AND STRUCTURE MONITORING

The work under this subitem includes furnishing, installing, and recording geotechnical and structural monitoring instrumentation to measure vibrations and displacements of the two existing bridges during phased bridge demolition and replacement, and causeway widening construction. Settlement and lateral movement of the new causeway retaining wall during and following embankment reconstruction activities shall also be monitored. This geotechnical and structural monitoring instrumentation program is intended to provide early warning of stability and settlement issues so that construction procedures can be modified in a timely manner, if necessary.

Construction activities that cause vibrations and could result in movement of the existing bridges include the following:

- **SOE Wall Installation**: Prior to the start of bridge demolition activities, excavation support walls (SOE) will be driven between the Stage 1 and Stage 2 work areas and along the toe of the causeway slope as shown on the BTC plans. The Design-Builder shall monitor the lateral movement of temporary earth support walls during construction.
- **Stage 1 Bridge Demolition**: The BTC plans show the southern half of the two bridges will be demolished and replaced during Stage 1 Construction, while traffic is diverted to the northern half of the bridges. Demolition in the Stage 1 area will involve removal of the exiting bridge superstructure, removal of the existing pier stems, partial removal of the existing abutments, extraction of existing timber piles that conflict with new structures, and removal of the existing wingwalls.
- **Stage 1 Bridge Construction**: Following completion of demolition in the Stage 1 area, foundation piles will be driven at the abutments and drilled shafts installed at the pier locations. Steel sheeting for cofferdam construction will then be installed at the pier locations.
- **Stage 1 Bridge Monitoring**: The Design-Builder shall monitor movement of the in-service portion of the existing bridge and any newly constructed Stage 1 Bridge permanent structures during Stage 1 Demolition and Construction.
- **Stage 2 Bridge Demolition, Construction, and Monitoring**: The process will be repeated for Stage 2 with the Design-Builder monitoring movement of the newly constructed Stage 1 permanent bridges during Stage 2 cofferdam construction, pier and abutment demolition, foundation installation, and bridge superstructure construction. Also monitor completed substructures of the Stage 2 bridge during construction of other parts of the Stage 2 bridge.
- **Causeway Retaining Walls:** Monitor lateral movement of the top of the newly constructed Causeway retaining walls prior to and during the Causeway backfilling at optical survey points spaced at 25 ft along the horizontal alignment. In addition, inclinometers should be installed in critical areas to monitor for deep seated lateral movement of the retaining walls. Install inclinometers 5 ft outboard of the Post and Panel wall (river side), midway between the post locations.

MATERIALS

Seismographs:

Portable engineering seismographs shall be used to monitor ground vibrations (frequency and velocity) resulting from vibration-producing construction activities, such as pile driving and demolition. The seismographs used to monitor vibrations will be calibrated within 6 months of use. Geophones shall be coupled to the ground using ballast (e.g., sandbags) or to a structure using epoxy. Based on the anticipated construction activities, air blast monitoring will not be needed. One (1) Seismograph shall be installed at each existing pier and abutment.

SUBITEM 981.01 (Continued)

The seismographs shall have the following minimum features:

- Seismic range: 0.01 to 10 inches per second with an accuracy of 5 percent and no more than 3db roll off at the low frequency.
- Flat frequency response: 20 to 200 Hertz.
- Three component sensor.
- Fourth channel for air blast monitoring.
- Two power sources: Internal rechargeable battery and charger and 115-volt AC. Battery shall be capable of supplying power to monitor vibrations continuously for up to 24 hours.
- Capable of internal dynamic calibration.
- Direct writing to printer and to an electronic data storage device such as a PC computer, or equivalent. Instruments provided will be capable of producing strip chart recordings of readings on-site within one hour of obtaining the readings.
- Continuous monitoring mode shall be capable of recording peak velocities.

Seismographs shall be installed at least 7 days prior to any vibration-producing construction activities to obtain background readings. Threshold and limiting values shown below may need to be adjusted to account for background vibrations, once the baseline vibration levels are better understood.

Deformation Monitoring Points (DMPs):

DMPs shall be used to monitor vertical and horizontal movement of temporary SOE systems, the existing and proposed bridges during phased demolition and replacement, and permanent retaining walls. The DMPs will be clearly marked, labeled, and protected to avoid being obstructed or otherwise damaged by construction operations or the public. Protections such as fixed wood barricades may be used.

Optical Prisms – Optical prisms, such as Sokkia Standard Prism MP12A-726658 or approved equivalent, shall be used to monitor vertical and horizontal deformation by means of optical survey without the need to hold a rod on the monitoring point. Optical prisms are proposed for DMPs on the exiting abutments and piers and permanent retaining walls and at any other locations where, due to the required frequency of measurement and difficulty in accessing points, it is more efficient to use them. Optical prisms or other targets capable of being monitored for horizontal movement should also be installed on the face of SOE walls and permanent retaining walls.

DMPs shall be installed at least seven days prior to any intrusive construction in the area of the structure being monitored. Immediately following installation, the location of each DMP will be surveyed to provide location coordinates to an accuracy of ±0.03 ft, and in elevation to an accuracy of ±0.01 ft. A minimum of two sets of initial readings will be taken to provide pre-construction baseline data and to demonstrate that the survey techniques being used are adequate. All elevation readings will be referenced to the same survey benchmark. Monitoring points that are damaged or no longer functioning will be replaced and re-initialized within five days of discovery of damage.

DMP's for monitoring vertical settlement shall also be installed at regular intervals on the roadway surfaces paved with base coarse and monitored until it can be established that there is no significant ongoing settlement.

SUBITEM 981.01 (Continued)

Inclinometers (INCL):

Inclinometer casing shall be installed at 8 locations along the length of the causeway retaining walls. Each inclinometer casing shall be installed in a cased borehole which extents at least 5 ft into very dense glacial till or bedrock to insure bottom fixity. The casing should be installed 5 feet outboard of the front face of the permanent post and panel retaining wall (on the river side) prior to backfill of the retaining wall. The inclinometers shall be located at the midpoint between adjacent posts of the Post and Panel Retaining wall. Initial reading shall be taken, and the inclinometers monitored on a weekly basis during wall backfilling and for at least 2 months following the completion of final paving of the roadway. The boreholes to install the inclinometers may have to be drilled through riprap in the upper part of the boring.

Inclinometer casing shall be 2.75-inch O.D. ABS plastic casing with 4 grooves machined at 90 degrees. Manufacturer shall be Slope Indicator or approved equal. Inclinometer inner casings and associated couplings and end caps shall be furnished and installed by the Design Builder's Geotechnical Instrumentation Specialist.

Extend inclinometer casing vertically to no less than 2 ft above the ground surface and provide protective casing and cap to prevent damage to inclinometer casing.

The inclinometer probe, readout unit cable and pulley assembly shall be provided by the Design-Builder's Geotechnical Instrumentation Specialist. Provide a suitable Slope Indicator inclinometer or approved equal.

The Design Builder's Geotechnical Instrumentation Specialist shall propose locations and submit to MassDOT for acceptance prior to installation.

Casing Installation:

- Drill inclinometer hole using temporary steel casing and rotary wash drilling methods to a minimum 5 ft into glacial till or bedrock.
- Grout the annular space between the casing and drill hole. Grout shall be a weak bentonite cement grout and extend over the full height of the inclinometer.
- Provide a cap at the top of the inclinometer inner casing to prevent debris from entering the casing. Remove any debris that enters the casing. Replace inclinometer if it becomes blocked or unusable due to construction activities at no additional cost to MassDOT.
- Provide a bolt through the inclinometer inner casing 2 ft above the bottom of the casing to serve as a repeatable start point for each inclinometer reading. Wrap all joints and penetrations in the inclinometer casing with duct tape or acceptable alternative to provide a watertight seal.
- The Design Builder's Geotechnical Instrumentation Specialist shall accurately measure the length of casing cut, label the cut portion, and provide the cut portion to MassDOT.
- Without exception, once the inclinometers have been initialized, the inclinometer casing shall not be cut.

Maintain and protect inclinometers at all times during construction and provide access to the inclinometer casings for reading until no less than 2 months after all construction is completed and as directed by MassDOT.

SUBITEM 981.01 (Continued)

SUBMITTALS

A. Pre-Installation:

Submit instrumentation location plan which shows the Seismographs, DMP and INCL locations and identification numbers. Qualifications of the instrument's installer and surveyor, a list of materials (including dimension, range, accuracy), installation and recording procedures/sequences shall be submitted to MassDOT for approval prior to the start of the construction.

B. Post-Installation:

The Design-Builder shall submit the following to MassDOT for their review and approval:

- As-Built drawings including instrument identification numbers and surveyed locations.
- Baseline Readings for each instrument, taken over one (1) week period prior to the start of any construction activities near the bridges or structure being monitored. Baseline readings shall be taken at different times of day and during different traffic (rush and non-rush periods) and environment conditions (i.e., different ambient air temperature, humidity, sunny/cloudy/rainy, etc.) as practicable to establish the project site trends and natural fluctuation in readings.
- Submit Weekly Summaries of all DMP's, Seismographs, and INCL readings with an interpretive narrative discussing construction activities during the week. Note any Threshold exceedances along with a corresponding explanation, and potential action to be taken.

INSTALLATION

The Design-Builder shall submit to MassDOT an 'Installation Schedule' and MassDOT shall be notified at least 24 hours prior to the installation of each instrument.

Installation of the instruments shall be documented at the time of installation. The documentation shall include, but not be limited to:

- Design-Builder/ Installer name.
- Instrument number, as-built location, orientation, and elevation.
- Instruments' method of installation.
- Date and time of start and completion of installation work.
- Weather conditions at time of installation.
- Comments or notes detailing any issues encountered during installation.

All instruments shall be protected against disturbance and/or damage from traffic, construction equipment, and installation work.

MONITORING AND RECORDING

A. Survey Instruments:

a. Reference Points: Establish fixed reference points (benchmarks) outside the influence of construction activities. Maintain and protect these reference points. Reestablish reference points if they become lost or damaged.

SUBITEM 981.01 (Continued)

b. Readings: Readings shall be performed under the supervision of a Professional Surveyor, licensed in the State of Massachusetts, using appropriate equipment to survey locations in three (3) dimensions (Northing, Easting, and Elevation) accurate to within 0.125 inches.

c. Monitoring Schedule: The minimum monitoring shall be daily for the first week when construction begins, then once per week while construction activities are on-going. The monitoring frequency may be reduced or suspended after the construction activities have ceased and instrument readings have stabilized, following approval by MassDOT.

Threshold and Limiting Values

Immediately after taking a reading, the reading will be compared with the baseline readings and previous readings of that instrument. When a reading indicates that a threshold or limiting value has been exceeded as specified below, the Contractor will initiate the response action(s) specified below in the "Continency Plan" section of this report.

Table 1 - DMP Threshold and Limiting Response Values

Instrumentation Type/Location	Response Values	
	Threshold	**Limiting**
DMPs on Bridge Piers and Abutments	Vertical or horizontal movement = 0.25 in.	Vertical or horizontal movement = 0.5 in.
DMP's - Retaining Walls	0.5 in.	1.0 in.
INCL	0.5 in.	1.0 in.
Seismographs	Refer to Table 2	Refer to Table 2

Table 2 – Threshold and Limiting Response Values – Seismographs

Type	Source M[1]			Source S[2]		
	Freq. (Hz)	**Peak Particle Velocity (PPV)**		**Freq. (Hz)**	**Peak Particle Velocity (PPV)**	
		Threshold Value (in./sec)	**Limiting Value (in./sec)**		**Threshold Value (in./sec)**	**Limiting Value (in./sec)**
Existing/ Proposed Bridges	<30	0.37	0.5	<60	0.9	1.2
	30-60	0.37	0.5-0.7*	60-90	0.9	1.2-1.6**

Notes:
1. Source M: continuous or steady state vibrations such as: vibratory pile drivers, hydromills, large pumps and compressors, bulldozers, trucks, cranes, scrapers and other large machinery, jackhammers, reciprocating pavement breakers and compactors.
2. Source S: transient or impact vibrations such as: blasting with explosives, drop chisels for rock breaking, buckets, impact pile drivers, wrecking balls and building demolition, gravity drop ground compactors and pavement breakers.

SUBITEM 981.01 (Continued)

3. *denotes that the lower value applies to 30 Hz and the upper to 60 Hz, with interpolation in between.
4. **denotes that the lower value applies to 60 Hz and the upper to 90 Hz, with interpolation in between.
5. Vibration acceptance criteria for buildings based on Swiss Standard SN 640312, dated April 1992. This standard allows acceptance criteria, according to building type and the frequency and type of expected construction related vibrations. For the purpose of this project, the acceptance criteria of the Swiss Standard were converted to English units (inches per second), and is incorporated in this table.
    a. Vibration threshold and limiting values have been established for structures in the vicinity of the construction. Due to the close proximity of the construction to some of these structures, construction means and methods may need to be altered or restricted to maintain vibrations below response values.

Contingency Plan

Should any Threshold Values be exceeded, the Design-Builder shall immediately notify MassDOT. Instrument monitoring data will be provided to MassDOT along with a summary of the construction activities that have occurred and an explanation for any exceedance. The Design-Builder, MassDOT, and other invited stakeholders will subsequently meet to discuss the Threshold Value exceedance and possible corrective actions to be implemented.

Should any Limiting Values be exceeded, construction activities will be immediately suspended in the area where the exceedance was recorded and MassDOT will be immediately notified. The Design-Builder, MassDOT, and other invited stakeholders will subsequently meet to discuss the Limiting Value exceedance and possible corrective actions to be implemented.

Communication Plan

Data Reduction, Processing, Plotting and Reporting

Instrumentation data, or a summary of the data, will be provided to MassDOT during the week following when the data is collected, or within 24 hours if a limiting value is identified. Survey data shall be presented on clearly labeled plots of displacement versus time and shall be accompanied by a discussion of the construction activities that occurred during that time period.

COMPENSATION

No separate payment will be made for Subitem 981.01, but all costs in connection therewith shall be included in the respective Contract lump sum bid price for Items 995.01 and 995.02.

SUBITEM 986.1 MODIFIED ROCKFILL

The work under this Subitem shall conform to the relevant provisions of Subsection 983 of the Standard Specifications and the following:

DESCRIPTION

The work to be performed under this subitem shall consist of the furnishing and installing modified rockfill for steep slope protection, check dams, overflow protection and weir construction at the locations shown on the plans, the cross sections and as required by the Engineer.

Modified rockfill shall also be used on slopes steeper than 2 horizontal to 1 vertical.

COMPENSATION

No separate payment will be made for Subitem 986.1, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 100.3.

ITEM 990.1 COFFERDAM STRUCTURE NO. M-05-001=W-06-013 LUMP SUM
ITEM 990.2 COFFERDAM STRUCTURE NO. W-06-016 LUMP SUM

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

The work under these items consist of constructing cofferdams to allow for demolition of existing pier and proposed pier be constructed in the dry. The height of cofferdams shall provide protection from tidal fluctuations in the water level.

The Contractor is directed to the environmental permits for time of year restrictions that may apply to this work.

Permanent Steel Sheeting and supports shall be left in place as a finished structure and cut-off at the elevations shown on the plans or as required by the Engineer.

All materials including sheeting, wales, connections and tremie concrete shall be incidental to these subitems.

Steel sheeting to facilitate the installation of riprap scour protection at the seawall shall be removed and salvaged by the Contractor.

MATERIALS
Sheeting and wales shall conform to the relevant provisions of Subsections 960 and M8.05.4.

All concrete shall be a minimum of 4,000 psi and meet the flow requirements of the Standard Specifications. Tremie concrete shall be placed in voids between the steel sheeting to remain as shown on the plans, as required to control water, and as directed by the Engineer.

CONSTRUCTION METHODS
All such temporary structures or facilities shall be safely designed, extended to sufficient depth and be of such dimensions and watertightness so as to assure construction of the permanent work in the dry. They shall not interfere with proper performance of the work. Their construction shall be such as to permit excavation for the permanent work to the limits shown on the plans. Interior dimensions shall give sufficient clearance for construction and inspection of forms. Movements or failures of the temporary protection facilities, or any portions thereof, which prevents proper completion of the permanent work shall be corrected at the sole expense of the Contractor.

Cofferdam enclosures shall be designed by a Professional Engineer, registered in the Commonwealth of Massachusetts. The Contractor is required to submit calculations and shop drawings to the Engineer for approval. Design drawings shall indicate, at a minimum, layout of cofferdam structure, method of installation, the material and member sizes for all structural elements. No construction under these subitems will proceed until the submittals are approved by the Engineer.

SUBITEM 991.1 CONTROL OF WATER
STRUCTURE NO. M-05-001=W-06-013 (CBJ) AND W-06-016 (CBH)

The work under this subitem shall conform to the relevant provisions of Subsection 140 of the Standard Specifications, the plans, and the following:

The work shall consist of installing and maintaining a temporary water control system to accomplish construction of piers in the river.

Dewatering of excavation shall be conducted to ensure that the construction of the new pile caps is done "in the dry".

As part of the work under this Item, it is the responsibility of the Contractor to determine the need and extent of sedimentation basins, dewatering techniques, and sedimentation controls needed to control water and sediment at the site.

The operations of Control of Water shall not cause the accumulation of siltation nor have any adverse effect to the water or the environment. The Control of Water operations shall incorporate contaminant removal methods to remove contaminants from the discharge water in Zone I groundwater protection areas.

Work under this item shall include all materials, equipment and labor needed to construct and install temporary control of water systems.

Work under this Item also includes pumping operations, installation of earth berms, sandbags, filter fabrics, weirs, stone, and all other means to collect, settle, and discharge water back into the waterways during construction. As part of the work under this item, it is the responsibility of the Contractor to determine the need and extent of dewatering required.

The temporary control of water systems includes water flow diversion and sedimentation and erosion control. The temporary control of water systems shall be non-permanent and shall not harm the ecology of the river, land under water, and surrounding land, and shall be comprised dewatering to facilitate construction activities.

SUBMITTALS

Prior to the commencement of any work at the site, the Contractor shall submit to the Engineer for review and approval, a detailed plan for water control, including the construction of the water control system, and footing placement. The submittals shall include working drawings and calculations detailing the methods and materials proposed to account for all anticipated loads and construction conditions necessary to permit the work while maintaining a safe work area and protecting property from damage.

The Water Control Plan shall include a Sedimentation and Erosion Control Plan and a Water Flow Diversion and Containment Plan. The plans shall be adequate in detail to define specifics regarding materials, sizes, connections, and incidental items associated with the work. The furnishing of such plans shall not serve to relieve the Contractor's responsibility for the safety of the work or his responsibility for the successful completion of the project. The proposed plans submitted shall be designed and stamped by a Professional Engineer Registered in the Commonwealth of Massachusetts. The Contractor's attention is directed to the Environmental Permitting Documents included herein, for additional information on submittal requirements.

SUBITEM 991.1 (Continued)

The Contractor shall make his/her own evaluation of existing conditions and water flow, the effects of his proposed temporary works and construction methods and shall provide design for all loads and construction conditions necessary to permit construction of the specified structures while maintaining public safety and protecting completed work and all third-party property from damage due to construction operations. The Contractor shall also provide a description and details of the intended methods to prevent debris, including airborne particles, from entering the Weweantic River during the entire project duration.

Sedimentation and Erosion Control Plan: The Contractor shall submit to the Engineer, plans and details of the intended sedimentation treatment basin system that will be used along with dewatering techniques, and its location at the bridge site. All discharge resulting from dewatering activities shall be directed to temporary sedimentation treatment basins at locations approved by the Engineer. At no time shall said discharge be directly released into the river or wetland basins. The proposed plan shall include methods and equipment necessary to discharge water from the sedimentation treatment basins. Sedimentation treatment basins shall be sized appropriately to adequately dewater from the proposed work zone while allowing sufficient time for sediments to settle out of the water, and with a depth such that a minimum of 18 inches of freeboard is maintained throughout its use.

Water Flow Diversion and Containment Plan: The Contractor shall submit plans and details along with a complete description showing the proposed cofferdam system for control of water and dewatering plan to the Engineer for his approval prior to the start of the work. The proposed plan shall include methods and equipment necessary to perform the work and shall include water discharge methods and equipment to bring water from the work zone to sedimentation treatment basin.

CONSTRUCTION METHODS

The work to be done under this heading shall include placing and removing the control of water structures at locations shown on the plans. This work shall include dewatering within the cofferdams and as needed to conduct the work. The dewatering discharge shall be directed to a temporary sedimentation treatment basin. Where sandbags are used, the bags shall not decay nor rip or tear during the installation, its service life within the waterway, or during the cofferdam removal process. The Contractor shall not disturb the stream bed prior to placing the cofferdams to avoid migration of silts and sands further downstream. The Contractor is responsible for researching the seasonal flow characteristics of the Weweantic River to determine appropriate cofferdam details.

Measures to control the discharge of sediment or pollutants into the water resource areas shall include, but not be limited to the following:

1. Site construction areas outside the buffer zones and on relatively flat ground.

2. Schedule the work within the resource areas to avoid periods of anticipated high water (i.e., spring floods) and inclement weather.

3. Management of construction operations involving hazardous materials, such as refueling and maintenance of equipment within the resource areas.

4. Installation and continuous maintenance of water control measures throughout the project.

5. Treatment of all discharge resulting from dewatering activities through a sedimentation/detention basin to control turbidity. At no time shall the discharge from dewatering activities be directly released into a resource area.

SUBITEM 991.1 (Continued)

Locations of sedimentation/retention basins will be determined by the Contractor based on the selected methods of construction. Placement of the basins shall be in an upland area that is within the existing right of way.

All dewatering and related water control work shall be conducted in such a manner as to prevent siltation or contamination of the waterway. At a minimum, the settling basin shall be constructed of an earthen berm lined with geotextile fabric and surrounded by staked hay bales. The basin shall meet or exceed the following criteria:

1. The size and location of the basin shall be determined based on the size of the Contractor's pump and the anticipated flows for the river and the need to perform the work in the dry.

2. The outlet/weir of the dewatering basin shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the basin.

3. The Contractor shall not allow any sediment within the settling basin to accumulate to a depth of greater than 12 inches at any point in the basin, nor shall the water level be allowed to rise to a height of more than 24 inches.

4. The sedimentation treatment basin shall be designed with a minimum of 18 inches of freeboard, which must be always maintained.

5. The Contractor shall inspect the settling basin(s) at least twice daily when in operation.

6. Damages shall be repaired immediately.

7. The settling basin outlet shall be cleaned daily.

8. The sediments within the settling basin shall be disposed of as approved by the Engineer.

Upon completion of water control, the materials and equipment used to maintain the cofferdam(s) and sedimentation treatment basin(s) shall become the property of the Contractor and shall be removed to the limits shown on the Contract Drawings by the Contractor from the site. The area affected shall be restored to its natural condition in a manner subject to the Engineer's approval.

COMPENSATION

No separate payment will be made for Subitem 991.1, but all costs in connection therewith shall be included in the respective Contract lump sum bid price for Item 993.01.

SUBITEM 992.3 TEMPORARY SUPPORTS FOR BRIDGE STRUCTURE

Work under this subitem shall conform to the relevant provisions of Subsection 960 of the Standard Specifications and the following:

Work under this item shall consist of inspection and survey of existing condition, designing, furnishing, fabricating, erecting, and removal of temporary beam/bracing system to support the unsupported edge of the existing concrete deck created by the staged construction as shown in the plan.

The temporary beam/bracing support shall be constructed of steel, timber or other materials as shown on the plan, and shall be adequately braced to ensure stability of the existing and proposed slab. The support system shall be configured in such a manner that the loads from the slab supporting the temporary barrier are transferred to the beams supporting the deck carrying the traffic loads.

The contractor shall conduct its own investigation, survey, and research regarding all conditions and materials affecting the work. No additional compensation will be made if the materials or work prove to be different than that inferred or described herein or shown on the plan.

MATERIALS

All structural steel shall conform to the requirements of AASHTO M270, Grade 50, high strength non-shrink grout, elastomeric pads, concrete shall conform to the relevant standard specifications.

All materials used in the temporary bracing support system shall become the property of the Contractor and shall be removed from the site at the completion of the project.

CONSTRUCTION METHOD

Contractor shall perform its own inspection and survey of the existing condition, submit method and procedures with detailed sequences and shop drawings to depict the location, materials, and configuration of the support systems. Stage construction layout for traffic control, barrier locations and deck saw cutting line shall be determined considering the existing condition and construction method.

The submittals shall address all issues that relate to the work of this item in order to maintain the stability and integrity of the bridge during work.

The shop drawing submittal shall be prepared in accordance with MassDOT standard specifications, LRFD bridge design manual, AASHTO LRFD Design Specifications, submittal shall be stamped by a Massachusetts registered professional structural engineer.

When directed by the Engineer, the Contractor shall remove and dispose of the slab support frame to the satisfaction of the Engineer.

DESIGN

Temporary Support/bracing of the deck slab is required at all locations where the gutter line of temporary restrained barrier on bridge is greater than or equal to 12 inches from the edge of the girder flange. For aid in the contractor design of this item, the following design assumptions and design criteria is provided:

1. The condition of the existing concrete deck should be considered in the design of the system. Consider using f'c=2000 psi since the existing deck has a rating of "poor" per the latest inspection report. The Contractor may desire taking concrete cores of the deck to improve the values used for design.

SUBITEM 992.3 (Continued)

2. Temporary barrier is designed as crash test TL-3 level; impact load shall be per AASHTO LRFD Design Specifications.
3. Temporary supporting system shall be installed in stages as shown on the plan prior to the deck saw cutting.
4. The design shall consider, but not be limited to, the structure dead load, barrier dead load, HL-93 vehicle live load, and a barrier impact load of 10 kips.

COMPENSATION

No separate payment will be made for Subitem 992.3, but all costs in connection therewith shall be included in the Contract lump sum bid price for Item 993.01.

SUBITEM 994.01 TEMPORARY PROTECTIVE SHIELDING BRIDGE NO. M-05-001=W-06-013

SUBITEM 994.02 TEMPORARY PROTECTIVE SHIELDING BRIDGE NO. W-06-016

DESCRIPTION

TEMPORARY PROTECTIVE SHIELDING FOR DEMOLITION

The Contractor shall be required to maintain a specific level of protection during the demolition of the superstructure as described below.

Prior to the start of construction, the Contractor shall be required to submit the details (drawings and calculations) of a temporary protective shielding to the Engineer for review and approval. The drawings will be reviewed as to the methods of erection and as to whether the proposed installation will provide the required level of protection. It is the Contractor's responsibility to design the protective shields to conform to all existing laws, regulations, and specifications that govern this type of work. Shielding plans and details shall be designed by a Professional Engineer licensed in the Commonwealth of Massachusetts. The drawings and calculations shall bear the Professional Engineer's seal when submitted for review. Fabrication and erection of shields shall not proceed until written approval of protection shields is obtained. Shielding shall not extend more than 1' below bottom of existing soffit except at concrete pier caps to be removed.

The installation of the protective shield including connections, fasteners, erection procedures and maintenance shall be undertaken in accordance with the following criteria:

The temporary horizontal protection shield shall be designed to safely withstand all loads subjected to during construction. At a minimum the temporary horizontal protection shield shall be designed to support a load of 100 pounds per square foot. The shield, at the minimum, shall cover the area over the waterway and shall extend not less than 3 ft beyond the edge of the structure. The protective shield shall be placed to protect the entire area of demolition, including the areas over riprap.

The vertical shield shall be designed to carry a wind load of 25 pounds per square foot. The height of the vertical shield shall be 3 feet above the top of the adjacent curb or sidewalk. Anti- climb wings shall be installed at each end of the vertical shield to prevent access over the waterway.

The design and construction of the temporary protection shield shall be such as to prevent any dust, debris, concrete, formwork, paint, tools, or anything else from falling into the waterway.

The temporary protection shield shall be erected prior to the start of any work over the waterway. The Engineer shall be the sole judge to determine whether sufficient protection has been provided to perform the work.

Caution shall be taken to control the demolition so that any debris that may fall onto the shield will not exceed the design live load of the shield. The temporary protective shield shall be attached to the structure in accordance with plans submitted by the Contractor and approved by the Engineer.

Temporary protective shields shall remain in place until all work over the waterway has been completed and shall be removed only when permitted by the Engineer.

Surplus material not required for use on this project and all materials used under Subitems 994.01 and 994.02 shall become the property of the Contractor unless otherwise stated in the Contract Drawings or in these Special Provisions and shall be removed from the job site at their expense.

SUBITEMS 994.01 and 994.02 (Continued)

COMPENSATION

No separate payment will be made for Subitems 994.01 and 994.02, but all costs in connection therewith shall be included in the respective Contract lump sum bid price for Items 995.01 and 995.02.

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