

SPECIAL PROVISIONS

PROJECT No. 608079

Maskwonicut Street Over Amtrak/MBTA

Sharon, Massachusetts

100% DESIGN

Prepared for: Massachusetts Department of Transportation
Highway Division
Boston, Massachusetts

Prepared by: Weston & Sampson
Foxborough, Massachusetts

August 17th, 2020

**AKB Comments Item 995.
8/19/2020**

SPECIAL PROVISIONS

SHARON

Federal Aid Project Number:

Maskwonicut Street Bridge Replacement, Bridge No. S-09-003

Maskwonicut Street over Amtrak/MBTA

Labor participation goals for this project shall be XX% for minorities and XX% 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

June 30, 2020

All work under this contract shall be done in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 2020, the *Supplemental Specifications* dated March 31, 2020, and the *Interim Supplemental Specifications* contained in this book; the *2017 Construction Standard Details*, the *1990 Standard Drawings for Signs and Supports*; the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with *Massachusetts Amendments* and the *Standard Municipal Traffic Code*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Plans and these Special Provisions.

The proposed project was initiated by the Town of Sharon to replace the Maskwonicut Street bridge over Amtrak/MBTA in the Town of Sharon, Massachusetts. The project comprises the construction of superstructure and substructure elements of a new bridge, utility relocation, and reconstruction of the roadway approaches to the bridge. The design will be reviewed and constructed by the Massachusetts Department of Transportation (MassDOT).

The purpose of the project design is to restore the continuity of Maskwonicut Street lost due to a collapsed bridge. The work includes the construction of rolled steel girders, cast-in-place abutments on spread footings, minor realignment and widening for roadway approaches, full-depth pavement, drainage improvements, erosion control, curbing, highway guardrail, pavement markings, signage, tree removal and protection, utility relocation, Overhead Catenary System modifications, and other incidental work. The proposed roadway section over the bridge consists of two 10-foot travel lanes with a 2-foot shoulder on the north side and a 4-foot shoulder on the south side. A 6-foot sidewalk is included on the north side of the bridge.

Overhead utilities will be temporarily and permanently relocated by others.

SUBSECTION 7.05 INSURANCE REQUIREMENTS

B. Public Liability Insurance

The insurance requirements set forth in this section are in addition to the requirements of the Standard Specifications and supercede all other requirements.

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Paragraph 4

Asbestos Liability Insurance shall be obtained for this project.

WORK HOURS

For the specific construction operations affecting the railroad that require weekend or night work, the Contractor shall notify and obtain approval from the Engineer prior to commencing. The Contractor shall coordinate with the affected railroad company(s) the times when the existing superstructure and substructure elements may be demolished and replaced, and when the proposed beams, deck and utilities will be placed over the railroad right-of-way. This will involve work after-hours, and railroad windows of operation where construction is active on, adjacent to or over the railroad right-of-way are limited:

- New Abutment – work hours will be 8 hours a day in the daytime hours, as long as all equipment and operations are a minimum of 8' – 6" from the centerline of track.
- Abutment Demolition and Superstructure – a maximum of approximately 5 work hours on Friday nights and 5 hours on Saturday nights. On these nights the last train departure is scheduled for XX:XX am and the first train departure is scheduled for X:XX am. On weeknights, a maximum of approximately 2.5 to 3 hours may be available between the hours of 1:00 AM to 4:00 AM.

The above work hours are to be used as a guide and are not guaranteed. The Contractor shall coordinate with AMTRAK/MBTA on work schedules.

No additional compensation will be provided for work hours due to limitations by the railroad. All work on roadways shall be performed during normal work hours. The work shall be done on an 8-hour day, 5-day week (Monday through Friday) between the hours of 7:00 AM and 3:30 PM with the prime Contractor and all Subcontractors working on the same shift. The Contractor must maintain access to adjacent properties at all times. No work on roadways shall be done on this contract on Saturdays, Sundays, or holidays.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

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

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

ENGINEERING DIRECTIVES

Contractors can access MassDOT, Highway Division Engineering Directives at:

<http://www.mass.gov/massdot/highway>

Select Doing business with us

Select Design/Engineering

Select Engineering & Policy Directives

Select Engineering Directives

CONTRACTOR/SUBCONTRACTOR CERTIFICATION – CONTRACT COMPLIANCE

(Revision 03-23-10)

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

RAILROAD REQUIREMENTS

Work under this contract will require access to MBTA right-of- way. Property ownership is shown on the plans. Permits and approvals may be applicable to the railroad entities, depending on the work proposed and its impact on right-of-way.

The Contractor must comply with all provisions of the *MBTA Railroad Operations Directorate*, and the following:

- Flaggers will be required for all work within the foul zone area of the tracks. The Contractor shall enter into agreements directly with Amtrak to facilitate payment for flagging.
- Before proceeding with any construction or demolition work on, over, within or adjacent to the MBTA property, the Contractor shall submit plans and calculations for his or her operations including but not limited to utility main relocation, demolition, excavation, protective shielding, erection and protection of workers and equipment for approval. The Contractor is responsible for all design review fees which may be required by the MBTA and Amtrak.
- In accordance with the MBTA Railroad Operations Directorate, Contractor must notify MBTA at least twenty-one (21) days in advance of the date Contractor proposes to begin work on MBTA property, or locate equipment at the site. The Contractor shall at that time file a copy of such notice with the Engineer.
- Permanent work zone protection cannot be installed by the Contractor within the 15-foot clear zone limit from the centerline of tracks. It will need to be temporary and

removed beyond the 15-foot clear zone at the end of the workday.

RAILROADREQUIREMENTS (Continued)

- The Contractor's equipment can be located up to 8 feet 6 inches from the centerline of the MBTA tracks but by the end of the day the equipment will need to be moved beyond the 15-foot clear zone.
- Any equipment to be located between 8 feet 6 inches and 15 feet from the centerline of track will need to be delineated with cones/snow fencing, painted orange or similar (the color will need to be coordinated with the MBTA). Fencing must be at least 7 feet from the centerline of the tracks. This is to provide advance warning to train operators. Snow fence is acceptable but must be secured. Flexible plastic or other similar fencing is not acceptable due to the potential hazard of becoming loose. No additional compensation will be paid for snow fencing and other advance warning devices required for work on the MBTA right-of-way.
- Any railroad ballast displaced/excavated during work on the abutments will be re-installed in place. Ballast which is fouled or contaminated shall be replaced. Ballast shall conform to AREMA size 4. Re-installing ballast and/or providing new ballast will be done at no additional cost to the Department.
- All personnel working within the railroad property must pass the Right-of-Way Safety Course from MBTA and Amtrak. Safety training shall be provided at no additional cost to the Department.

SUBSECTION 4.04 CHANGED CONDITIONS.

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

PROTECTION OF UNDERGROUND FACILITIES

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

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 811 or 1-888-344-7233.

DESIGNER/PROJECT MANAGER

DESIGNER
Weston & Sampson Engineers, Inc.
Scott Bruso, P.E.
(508) 698-3034

MassDOT PROJECT MANAGER
Stephen Soma, P.E., Project Manager
(857) 368- 9280

PROCEDURE FOR RELEASING AUTOCAD FILES TO THE GENERAL CONTRACTOR

After the bid opening the low bidder may submit the Request for Release of MassDOT AutoCAD Files Form to the Highway Design Engineer. When the Highway Design Section has received both the AutoCAD files from the designer and the Request for Release of MassDOT AutoCAD Files Form from the Contractor, Highway Design will email the contractor a link through Dropbox.com with a reminder disclaimer of use (copy to Project Manager and District Construction Engineer).

HOLIDAY WORK RESTRICTIONS FOR CALENDAR YEAR 2021/2022 (Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public.

Below are the holiday work restrictions for the calendar year 2021 and 2022. The dates and days of the week are subject to change based upon the year of construction; the holiday restrictions provided below for specific holidays will apply regardless of the year.

2021

New Years Day (Federal Holiday)

Friday, January 1, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)

Monday, January 18, 2021:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)

Monday, February 15, 2021:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Patriot's Day (State Holiday)

Monday, April 19, 2021:

Work restrictions will be in place for Districts 3, 4 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Memorial Day (Federal Holiday)

Monday, May 31, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Independence Day (observed) (Federal Holiday)

Monday, July 5, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)

Monday, September 6, 2021:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Columbus Day (Federal Holiday)

Monday, October 11, 2021:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Veterans' Day (Federal Holiday)

Thursday November 11, 2021:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Thanksgiving Day (Federal Holiday)

Thursday, November 25, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Christmas Day (observed) (Federal Holiday)

Friday, December 24, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

New Years Day (observed) (Federal Holiday)

Friday, December 31, 2021:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

2022

Martin Luther King's Birthday (Federal Holiday)

Monday, January 17, 2022:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)

Monday, February 21, 2022:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Patriot's Day (State Holiday)

Monday, April 18, 2022:

Work restrictions will be in place for Districts 3, 4 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Memorial Day (Federal Holiday)

Monday, May 30, 2022:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Independence Day (Federal Holiday)

Monday, July 4, 2022:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Labor Day (Federal Holiday)

Monday, September 5, 2022:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Columbus Day (Federal Holiday)

Monday, October 12, 2022:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Veterans' Day (Federal Holiday)

Friday, November 11, 2022:

No work restrictions due to traffic concerns however work on local roadways requires permission by the DHD and local police chief.

Thanksgiving Day (Federal Holiday)

Thursday, November 24, 2022:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

Christmas Day (observed) (Federal Holiday)

Monday, December 26, 2022:

No work on local roadways on the holiday without permission by the DHD and the local police chief.

NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

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

Any required de-energizing or the overhead electric utilities shall be coordinated directly with the affected utility company and must occur in the spring or fall and only for a duration of up to 6 hours.

Following are the names of owners and representatives of the principal utilities affected, but completeness of the list is not guaranteed by the Department:

OWNERS OF UTILITIES

| | |
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| <u>Electric</u> Terence Doonan Eversource Electric "A" 1165 Massachusetts Ave Dorchester, MA 02125 617-541-5714 terence.doonan@eversource.com | <u>Telephone</u> Karen Mealey Verizon 385 Myles Standish Blvd. Taunton MA 02780 774-409-3160 karen.m.mealey@verizon.com |
| <u>Gas</u> Chris Fontaine Columbia Gas of Massachusetts 995 Belmont Street Brockton, MA 02301 508-895-4818 cfontaine@nisource.com | <u>Water</u> David Masciarelli Sharon Water Department 217 South Main Street Sharon, MA 02067 781-784-1525 |
| <u>Gas</u> Kathy M. Aruda Enbridge 8 Wilson Way Westwood, MA 02090 508-938-7728 kathleen.aruda@enbridge.com | <u>Cable</u> Wendy Brown Comcast Cable Corporation PO Box 6505, Omni Way Chelmsford, MA 01824 978-848-5163 Wendy_brown@comcast.com |
| <u>Sewer</u> Jim Andrews Sharon Sewer Commission 217 South Main Street Sharon, MA 02067 781-784-1529 | <u>Cable</u> Mark Bonanno Crown Castle 80 Central Street Boxborough, MA 01719 508-616-7818 mark.bonanno@crowncastle.com |
| <u>Cable</u> Stephen Parretti MCI – Verizon Business P.O. Box 600 Charlton, MA 01507 508-248-1305 Stephen.parretti@verizon.com | <u>Cable</u> Tomi Fadipe Eversource Fiber 247 Station Drive Westwood, MA 02090 781-441-3864 oloruntomi.fadipe@eversource.com |

| | |
|---|--|
| <u>DPW</u> Peter O’Cain – Town Engineer Department of Public Works 217 South Main Street Sharon, MA 02067 781-784-1529 | <u>Railroad</u> Tyler Scott MBTA 500 Arborway Boston, MA 02130 tscott@mbta.com |
| <u>Amtrak</u> Kate McGrath Amtrak 215-349-1750 McgrathM@amtrak.com | |

PROMPT PAYMENT AND RELEASE OF RETAINAGE TO SUBCONTRACTORS

Contractors are required to promptly pay Subcontractors under this Prime Contract within ten (10) business days from the receipt of each payment the Prime Contractor receives from MassDOT. Failure to comply with this requirement may result in the withholding of payment to the Prime Contractor until such time as all payments due under this provision have been received by the Subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the Contractor’s prequalification status. The Contractor further agrees to make payment in full, including Retainage, to each Subcontractor no later than ten (10) business days after the Subcontractor has completed all of the work required under its subcontract.

MASSDOT HIGHWAY DIVISION CONSTRUCTION SECTION **SOP CSD 27-20-2-000 ATTACHMENT A** **LANGUAGE FOR SUBCONTRACTOR COMPLETION** **TO BE ADDED TO SUBCONTRACTOR APPROVAL PAPERWORK** **Issued September 2, 2013**

Consistent with the Special Provisions section titled Prompt Payment and Release of Retainage to Subcontractors and State and Federal prompt payment regulations; 49 CFR Part 26.29 and MGL Chapter 30, Section 39F, the Contractor and Subcontractor are reminded that upon successful completion of the Subcontractor's work, all retainage held by the Prime Contractor must be returned to the Subcontractor, regardless of the status of the contract work as a whole.

The Subcontractor must notify the Contractor and MassDOT in writing that the Subcontractor has completed all of its work scope and request a final inspection of the work and release of retainage.

The Contractor may, in turn, request in writing that the Department also conduct an inspection of the Subcontractor's work before the Contractor releases retainage to the Subcontractor. The request must include a certification by the Contractor that the Subcontractor's work is complete and in conformance with the terms and conditions of the MassDOT contract.

If the Contractor decides for any reason that the retainage should not be released to the Subcontractor, the Contractor must notify MassDOT in writing what those reasons are, in sufficient detail for MassDOT to determine whether the Contractor's decision is appropriate.

If the Department has held retainage on the Subcontractor's work, and the Contractor wishes to have the retainage released, the Contractor must submit in writing a request to MassDOT for inspection of the work and release of retainage on the Subcontractor's work. The request must include a certification by the Contractor that the Subcontractor's work is complete and in conformance with the terms and conditions of the MassDOT contract. Retainage released by MassDOT for a Subcontractor's completed work shall be promptly passed on to the Subcontractor in accordance with the Prompt Payment provisions.

Upon receipt of full payment by the Subcontractor, the Subcontractor shall promptly record in the EBO system that full payment has been received.

The Contractor and Subcontractor are directed to the following: Division I, Section 9.02 Scope of Payments, 2nd paragraph, which provides that the release of retainage shall not constitute acceptance of the work and that any defects found before the Final Acceptance of the work shall be corrected at no cost to the Department. Division I, Section 5.09 Inspection of Work, 7th paragraph, which provides that inspection of the work shall not relieve the Contractor of any obligations to fulfill the terms of the contract.

SUBSECTION 4.03 EXTRA WORK (Also see Subsection 4.05).

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

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

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

Payment for Extra Work will be provided in Subsection 9.03.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

Work on this project is restricted to an extended 10-hour, six-day week, with the Contractor and all Subcontractors working on the same shift.

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 Contractor 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 Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor 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 Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor 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 Contractor.
- Any communication, initiated by the Contractor, 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 Contractor 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) Contractor'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 Contractor 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.

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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor believes to be a utility delay. After such notice, the Engineer and the Contractor 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 Contractor 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 Contractor.

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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor 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 Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

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 Contractor as the work progresses.

I. - ACCESS AND INSPECTION

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

SECTION 722 CONSTRUCTION SCHEDULING

DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded

Construction Schedule when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

The requirements for scheduling submissions are established based on the Project Value at the time of the bid and are designated as Type A, B, C or D. The definitions of these Schedule Requirement Types are summarized below. Complete descriptions of all detailed requirements are established elsewhere in this specification.

Type A – for all Site-Specific Contracts with a Project Value over \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Resource-Loading
- Resources Graphic Reporting
- Cash Flow Projections from the CPM
- Cash Flow Charts
- Cost-loaded CPM
- Contractor-furnished CPM software, computer and training

Type B – for all Site-Specific Contracts with a Project Value between \$10 Million and \$20 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Cost-loaded CPM
- Resource-Loading
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

Type C – for all Site-Specific Contracts with a Project Value between \$3 Million and \$10 Million

- Schedule Planning Session
- Baseline CPM Schedule
- Monthly Update CPM Schedule
- Short-term Construction Schedule
- Contract Schedule Update Meeting
- Monthly Projected Spending Report (PSR)
- Contractor-furnished CPM software, computer and training

Type D - for all contracts with a Project Value less than \$3 Million; various locations contracts of any dollar amount; contracts with durations less than one-hundred and eighty (180) Calendar Days; and other contracts as determined by the Engineer.

- Bar chart schedule updated monthly or at the request of the Engineer (See Section 722.62.B - Bar Charts.)

- Monthly Projected Spending Report (PSR) (See Section 722.62.F - Projected Spending Reports.)

MATERIALS, EQUIPMENT, PERSONNEL

722.40 General

A. Software Requirements (Types A, B and C)

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Section 740 – Engineer’s Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer’s Field Office within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

B. Scheduler Requirements

For all schedule types, if the Contractor plans to use outside scheduling services, the scheduler shall be approved as a subcontractor by the Engineer.

For Type A, B and C Schedules the name of the Contractor’s Project Scheduler together with his/her qualifications shall be submitted to the Department for approval by the Engineer within seven (7) Calendar Days after NTP. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value as the project for which the Project Scheduler is being proposed.

References shall be provided from past projects that can attest to the capabilities of the Project Scheduler.

CONSTRUCTION METHODS

722.60 General

A. Schedule Planning Session

(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

1. the Work to be performed by the Contractor and its subcontractors;
2. the planned construction sequence and phasing; planned crew sizes;
3. summary of equipment types, sizes, and numbers to be used for each work activity;
4. all early work related to third party utilities;
5. identification of the most critical submittals and projected submission timelines;
6. estimated durations of major work activities;

7. the anticipated Critical Path of the project and a summary of the activities on that Critical Path;
8. a summary of the most difficult schedule challenges the Contractor is anticipating and how it plans to manage and control those challenges;
9. a summary of the anticipated quarterly cash flow over the life of the project.

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a minimum of five (5) copies of a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

B. Schedule Reviews by the Department (All Types)

1. Baseline Schedule Reviews

The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews

The Engineer will respond to each submittal within twenty one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

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

722.61 Schedule Content and Preparation Requirements (Types A, B and C unless otherwise noted)

Each Contract Progress Schedule shall fully conform to these requirements.

A. LOGIC

The schedules shall divide the Work into activities with appropriate logic ties to show:

1. conformance with the requirements of this Section and Division I, Subsection 8.02 - Schedule of Operations
2. the Contractor's overall approach to the planning, scheduling and execution of the Work
3. conformance with any additional sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

B. ACTIVITIES

The schedules shall clearly define the progression of the Work from NTP to Contractor Field Completion (CFC) by using separate activities for each of the following items:

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements

4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. The preparation and submission of shop drawings, procedures and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable
6. The review and return of shop drawings, procedures and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting the Contract
8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Subcontractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor's request for validation of FBU (ready to open to traffic)
15. The Department's confirmation of completed work to allow for FBU
16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
19. Contractor confirmation that all punchlist work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Section 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:
<http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/ConstructionScheduleToolkit.aspx>

29. For Type A and B Contracts only: All items to be paid, including all Unit Price and Lump Sum pay items, shall be identified by activity. This shall include all non-construction activities such as engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

C. EARLY AND LATE DATES

Early Dates shall be based on proceeding with the Work or a designated part of the Work exactly on the date when the corresponding Contract Time commences. Late Dates shall be based on completing the Work or a designated part of the Work exactly on the corresponding Contract Time, even if the Contractor anticipates early completion.

D. DURATIONS

Activity durations shall be in Work Days. Planned Original Durations shall be established with consideration to resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

Should there be an activity with a duration that is determined by the Engineer to be unreasonable, the Contractor will be asked to provide a basis of the duration using bid documents, historic production rates for similar work, or other form of validation that is acceptable to the Engineer. Should the Contractor and the Engineer be unable to agree on reasonable activity durations, the Engineer will, at a minimum, note the disagreement in the Baseline Schedule Review along with a duration the Engineer considers reasonable and the basis for that duration. A schedule that contains a substantial number of activities with durations that are deemed unreasonable by the Engineer will not be accepted.

E. MATERIALS ON HAND (for Types A and B only)

The Contractor shall identify in the Baseline Schedule all items of permanent materials (Materials On Hand) for which the Contractor intends to request payment prior to the incorporation of such items into the Work.

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/ConstructionScheduleToolkit.aspx>

G. ACTIVITY IDENTIFICATION NUMBERS

The Contractor shall use the activity identification numbering system specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

H. ACTIVITY CODES

The Contractor shall use the activity codes specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located online at the address above.

I. CALENDARS

Different calendars may be created and assigned to all activities or to individual activities. Calendars define the available hours of work in each Calendar Day, holidays and general or project-specific non-Work Days such as Fish Migration Periods, time of year (TOY) restrictions and/or area roadway restrictions.

Examples of special calendars include, but are not limited to:

- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced. Refer to the Project Special Provisions for specific restrictions.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. FLOAT

For the calculation of float in the CPM schedule, the setting for *Retained Logic* is required for all schedule submissions, starting with the Baseline Schedule Submission. Should the Contractor have a reason to propose that an alternative calculation setting such as *Progress Override* be used, the Contractor shall obtain the Engineer's approval prior to modifying to this setting.

K. COST AND RESOURCE LOADING (Types A and B only)

For all Type A and B Schedules, the Contractor shall provide a cost and resource-loaded schedule with an accurate allocation of the costs and resources necessary to complete the Work. The costs and resources shall be assigned to all schedule activities in order to enable the Contractor to efficiently execute the Contract requirements and the Engineer to validate the original plan, monitor progress, provide cash flow projections and analyze delays.

1. Each schedule activity shall have an assigned cost that accurately represents the value of the Work. Each schedule activity shall have its resources assigned to it by craft and the anticipated hours to accomplish the work. Each schedule activity's equipment resources shall be assigned to it by equipment type and hours operated. Front-loading or other unbalancing of the cost distribution will not be permitted.
2. The sum of the cost of all schedule activities shall be equal to the Contractor's Bid

- Price.
3. Indicating the labor hours per individual, per day, by craft and equipment hours/day will be acceptable.
 4. The Engineer reserves the right to use the cost-loading as a means to resolve changes, disputes, time entitlement evaluations, increases or decreases in the scope of Work, unit price renegotiations and/or claims.
 5. For all Type A and B Schedules, all subnets, fragnets, Proposal Schedules, and Recovery Schedules shall be cost and resource- loaded to help to quickly validate and monitor the duration of the Work to be performed.
 6. For Type A Schedules, cost-loading of the schedule will also be used for cash flow projection purposes.
 7. The cost-loading of each activity shall indicate the portion of the cost for that activity that is applicable to a specific bid item (cost account.) The total cost for each cost account must equal the bid item price.
 8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum items.

L. NOT TO BE USED IN THE CONTRACTOR'S CPM SCHEDULE

1. Milestones or constraint dates not specified in the Contract
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer
4. Delayed starts of follow-on trades
5. Float suppression techniques

722.62 Submittal Requirements

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

Except as stated elsewhere in this subsection, schedule submittals shall include each of the documents listed below, prepared in two formats, for distribution as follows:

- a. four (4) compact discs (CD); one (1) each for the Office of Project Controls and Performance Oversight (O-PC&PO), the Boston Construction Section Office, the District Construction Office and the Resident Engineer's Office. Additional copies shall be required if the work is performed in more than one district.
- b. two (2) hard copies plotted in color on 24" X 36" paper; one (1) copy each for the District Construction Office and the Resident Engineer's Office. No copies for the O-PC&PO and the Boston Construction Section Office. Additional copies shall be required if the work is performed in more than one district.

A. Narratives

A written narrative shall be submitted with every schedule submittal. The narrative shall:

1. itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress

- Schedule / Monthly Update or the Baseline Schedule, whichever is most recent;
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements;
3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A - Notice of Delay;
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record;
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path;
6. provide a description of any possible considerations to improve the probability of completing the project early or on-time;
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths ;
8. describe the Contractor's plan, approach, methodologies and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required;
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule;
10. describe any out-of-sequence logic and provide an explanation of why each out-of-sequence activity does not require a correction, if one has not been provided, and an adequate demonstration that these changes represent the basis of how these activities will be built, including considerations for resources, dependencies and previously-approved production rates;
11. identify any possible duration increases resulting from actual or anticipated unit price item quantity overruns as compared to the baseline duration, with a corresponding suggestion to mitigate any possible delays to the Critical Path. If the delay is anticipated to impact the Critical Path, refer to Subsections 4.06 - Increased or Decreased Contract Quantities and 8.10 - Determination and Extension of Contract Time for Completion and submit a letter to the Engineer notifying of a potential delay;
12. include a schedule log consisting of the name of the schedule, the data date and the date submitted.

B. Bar Charts (Types A, B, C and D)

One (1) time-scaled bar chart containing all activities shall be prepared and submitted using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation Requirements Activities shall be linked by logic ties and shown on their Early Dates. Critical Paths shall be highlighted and Total Float shall be shown for all activities.

A second time-scaled bar chart shall also be prepared containing only the Critical Path or, if the Critical Path is not the longest path, the Longest Path using a scale that yields readable plots and that meets the requirements of Subsection 722.61 - Schedule Content and Preparation

Requirements. Activities shall be linked by logic ties and shown on their Early Dates. Total Float shall be shown for all activities.

Bar Charts shall be printed in color and submitted on 11" X 17" paper or, if approved by the Engineer, as a .pdf file.

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. The DASC shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/ConstructionScheduleToolkit.aspx>

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection 722.20 - General:

D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)

With each Contractor Quantity Estimate (CQE), the Contractor shall submit an Activity Cost Report and Cash Flow Projection that includes all activities grouped by Contract Bid Item.

The Activity Cost Report shall be generated from the Schedule of Record and shall be the basis of the Monthly Cash Flow Projection. Within each contract Bid Item, activities shall be sequenced by ascending activity identification number and shall show:

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start and finish dates for each completed activity.

For Unit Price pay items, in addition to the above, estimates to complete and any variance to the estimated Contract quantity shall be shown.

E. Resource Graphs (Type A only)

Monthly and cumulative resource graphs for the remaining Contract period using the Early Dates and Late Dates in the Contract Progress Schedule shall be included as part of each schedule submittal.

F. Projected Spending Reports (Types B, C and D)

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions

and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/Construction/ConstructionScheduleToolkit.aspx> or consult with the District Construction Scheduler.

722.63. Progress Schedule Requirements

A. Baseline Schedule

The Baseline Schedule shall be due thirty (30) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving Extra Work Orders or any other type of alleged delay. The Baseline Schedule shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements. Once the Baseline Schedule has been accepted by the Engineer, with or without comments, it shall represent the as-planned schedule for the Work and become the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 722.63.C - Contract Progress Schedules / Monthly Updates, 722.64.C - Recovery Schedules and 722.64.D - Proposal Schedules.

The Cost and Resource-Loading information (Types A and B only) shall be provided by the Contractor within forty-five (45) Calendar Days after NTP.

The Engineer's review comments on the Baseline Schedule and the Contractor's responses to them will be maintained for the duration of the Contract and will be used by the Engineer to monitor the Contractor's work progress by comparing it to the Contract Progress Schedule / Monthly Update.

B. Interim Progress-Only Schedule Submissions

The first monthly update of the Contract Progress Schedule/Monthly Update is due within seventy (70) Calendar Days after Notice to Proceed (NTP.) The Baseline Schedule review period ends at sixty (60) Calendar Days after NTP, see Subsection 722.60.B - Schedule Reviews by the Department. If the Baseline Schedule has not been accepted within sixty (60) Calendar Days after NTP, an Interim Progress-Only Schedule shall be due within seventy (70) Calendar Days after NTP. The purpose of the Interim Progress-Only Schedule is to document the actual progress of all activities, including non-construction activities, from NTP until the Baseline Schedule is accepted.

C. Contract Progress Schedules / Monthly Updates (Types A, B, C and D)

The first Contract Progress Schedule shall be submitted by the Contractor no later than seventy (70) Calendar Days after NTP. The data date for this first Progress Schedule shall be sixty (60) Calendar Days after NTP. Subsequent Progress Schedules shall be submitted monthly.

Each Contract Progress Schedule shall reflect progress up to the data date. Updated progress shall be limited to as-built sequencing and as-built dates for completed and in-progress activities. As-built data shall include actual start dates, remaining Work Days and actual finish dates for each activity, but shall not change any activity descriptions, the Original Durations, or the Original Resources (as planned at the time of bid), without the acceptance of the Engineer. If any activities have been completed out-of-sequence, the Contractor shall propose new logic ties for affected in-progress and future activities that accurately reflect the previously-approved sequencing. Alternatively, the Contractor may submit to the Engineer for approval an explanation of why an out-of-sequence activity does not require a correction and an adequate demonstration that the changes accurately represent how the activities will be built, including considerations for resources, dependencies and previously approved production rates. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress

Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

No revisions to logic ties; sequence, description or duration of future activities; or planned resource costs shall be made without prior approval by the Engineer.

Any proposed logic changes for in-progress or future activities shall be submitted to the Engineer for approval before being incorporated into a Contract Progress Schedule. The logic changes must be submitted using a Proposal Schedule or a schedule fragnet submission. Once approved by the Engineer, the Contractor may incorporate the logic in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

For any proposed changes to the original sequence, description or duration of future activities, the Contractor shall submit to the Engineer for approval an explanation of how the proposed description or duration change reflects how the activity will be progressed, including considerations for resources and previously approved production rates. Any description or duration change that does not accurately reflect how the activity will be progressed will not be approved by the Engineer. Once approved by the Engineer, the Contractor may incorporate the changes in the next Contract Progress Schedule/Monthly Update with the affected activities clearly identified and explained in the Schedule Narrative.

Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule if any Contract Progress Schedule/Monthly Update indicates a failure to meet the Contract Dates.

D. Short-Term Construction Schedule

The Contractor shall provide a Short-Term Construction Schedule that details daily work activities, including any multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall directly correspond to the Contract Progress Schedule activities, with a matching reference to the activity identification number in the Contract Progress Schedule, and may be at a greater level of detail.

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

The Contractor shall be prepared to discuss the Short-Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, the schedule of work affecting abutters and any corresponding work with affected utilities. Short-Term Construction Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements.

Failure to submit Short-Term Construction Schedules every two (2) weeks may result in withholding of full or partial payments by the Engineer.

722.64 Impacted Schedule Requirements

A. Notice of Delay

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within three (3) Calendar Days of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor.

Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

B. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) shall consist of a descriptive narrative, prepared in accordance with Subsection 722.62.A - Narratives, and an as-built CPM schedule, which may be in the form of a schedule fragnet (that has been developed from the project's Contract Progress Schedule of Record, and illustrates the impact of a delay to the Critical Path, Contract Milestones and/or Contract Completion Date as required in Subsection 8.10 - Determination and Extension of Contract Time for Completion. TEAs shall also be used to determine the schedule impact of proposed Extra Work Orders (EWO) as also required in Subsection 8.10.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements and shall be based on the Contract Progress Schedule of Record applicable at the start of the delay or impact from an EWO. A TEA fragnet must start with a specific new activity describing the work contained in either a Notice of Delay previously submitted to the Department per Subsection 722.64.A - Notice of Delay or an EWO.

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fourteen (14) Calendar Days after a request for a TEA by the Engineer for any other reason.

A TEA shall be submitted to the Engineer before any Time Extension is granted to the Contractor. Time Extensions will not be granted unless the TEA accurately reflects an evaluation of all past delays and the actual events that occurred that impacted the Critical Path. The TEA must also demonstrate a plan for the efficient completion of all of the remaining work through an optimized CPM Schedule. The analysis shall include all delays, including Contractor-caused delays, and shall be subdivided into timeframes and causes of delays.

TEAs shall incorporate any proposed activities, logic ties, resource considerations, and activity costs required to most efficiently demonstrate the schedule impacts in addition to detailing all impacts to existing activities, logic ties, the Critical Path, Contract Milestones and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, restraints and activity costs, necessitated by an Extra Work Order or other schedule impact, for the completion of the remaining work. The Contractor shall provide TEAs that demonstrate that all delays have been mitigated to the fullest extent possible without requiring an Equitable Adjustment to the original bid basis.

All TEAs shall clearly indicate any overtime hours, additional shifts and the resource that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts. The Engineer shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions if it is determined to be in the best interest of the Department to do so.

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates.

During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

The Engineer may request that the Contractor prepare a Proposal Schedule or a Recovery Schedule to further mitigate any delays that are shown in the accepted TEA/Contract Progress Schedule.

C. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work. Except as otherwise designated by a Contract Modification, no Contract Progress Schedule that extends performance beyond the Contract Time and/or beyond any Contract Milestone shall be approved by the Engineer. The Contractor shall submit a Recovery Schedule within fourteen (14) Calendar Days of a Contract Progress Schedule submission that shows failure to meet the Contract Dates. This requirement is critical to the Department's ability to make informed decisions regarding Contract Time and costs.

During the prosecution of the Work, should the Contractor's progress on a critical operation clearly not meet anticipated production, without cause by fault of the Department, or should a critical activity or series of activities not be staffed in accordance with the Contractor's approved Baseline Schedule resource planning, the Contractor shall be obligated to recover such delay. Recovery Schedules shall be prepared and submitted in accordance with Subsections 722.61 - Schedule Content and Preparation Requirements and 722.62 - Submittal Requirements within fourteen (14) Calendar Days of any of the cases listed above.

Recovery Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in to the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of Time Extensions, without additional compensation for any Contractor delays, if it is determined to be in the best interest of the Department to do so.

During the review of any Recovery Schedule, all Contract Progress Schedules shall continue to be required every month.

The Engineer may request that the Contractor prepare a Recovery Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

Changes represented in accepted Recovery Schedules shall be incorporated into the next Contract Progress Schedule.

D. Proposal Schedules

A Proposal Schedule is an alternative schedule used to evaluate proposed changes to the Contract scope or significant alternatives to previously approved approaches to complete the Work, which may include changes to activity durations, logic and sequence. For Types A and B Schedules, the Proposal Schedule shall be cost and resource-loaded.

A Proposal Schedule may be requested by the Department at any time or may be offered by the Contractor. The Engineer may request that the Contractor prepare a Proposal Schedule to further mitigate any delays that are shown in an accepted TEA/Contract Progress Schedule.

The Contractor shall submit the Proposal Schedule within thirty (30) Calendar Days of a request from the Department.

The Proposal Schedule shall not be considered a Schedule of Record until the logic, durations,

narrative and basis of the Proposal Schedule have been accepted by the Engineer. If the Proposal Schedule took the form of a fragnet, it must be incorporated into the Contract Progress Schedule of Record showing the current progress of all other activities and the impacts/results of the changes made by the Proposal Schedule before the Proposal Schedule is accepted by the Department.

Proposal Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts.

Changes represented in accepted Proposal Schedules shall be incorporated into the next Contract Progress Schedule. During the review of any Proposal Schedule, all Contract Progress Schedules shall continue to be required every month.

E. Disputes (Types A, B, C and D)

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

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer. Pending resolution of any dispute, the last schedule accepted by the Engineer will remain the Contract Schedule of Record.

COMPENSATION

722.80 Method of Measurement and Basis of Payment (Types A, B, C and D)

The Special Provisions will specify the fixed-price amount to be paid to the Contractor for the Project Schedule requirements contained herein. Each bidder shall include this lump-sum, fixed-price bid item amount in his/her bid. Failure to do so may be grounds for the rejection of the bid.

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

Twenty percent (20%) of this pay item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 8.02.C.

The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

$$\text{Monthly Payment} = \frac{\text{Remaining Fixed Price amount (80\% of Item 100.)}}{\text{Contract Duration in whole months} - 2 \text{ months}}$$

The timely and accurate submission of the Baseline Schedule is critical to the Contract and

the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 – Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

No payment for any other pay item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. Late submittal of missed Contract Progress Monthly Updates will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the withholding of full or partial payments by the Engineer.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

722.82 Payment Items

| | | |
|------|---|----------|
| 100. | SCHEDULE OF OPERATIONS - FIXED PRICE \$35,500 | LUMP SUM |
|------|---|----------|

BIDDERS LIST

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

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

BUY AMERICA PROVISIONS (23 CFR 635.410)

(Supplementing Subsection 6.01 Source of Supply and Quality)

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

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

ARCHITECTURAL ACCESS BOARD TOLERANCES

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

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

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

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

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN

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

For this project the Massachusetts Department of Environmental Protection File Number is **XXXXXXX**.

SAWCUTS

Sawcuts shall be made in the existing pavement at areas of new or reset curb, limits of full depth pavement construction and as directed by the Engineer. Payment for this work shall be included in the unit price under the applicable items.

DRIVEWAY ACCESS

The contractor is responsible for maintaining access to all driveways throughout the project or providing temporary driveways as shown on the plans.

PIGEON WASTE

The contractor shall remove and disposal 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 contaminates will require special handling and disposal in accordance with all Federal, state, and local requirements.

EMERALD ASH BORER ADVISORY

To the extent possible, all trees and brush shall be disposed on site, typically chipped and spread in place. When trees or brush must be removed, such as in urban, or otherwise populated areas, contractor shall identify, for approval by Engineer, proposed location for disposal. Disposal shall be in city or town of project, or at minimum, within county, of construction operations. For more information see the following:

<http://www.mass.gov/eea/docs/dcr/news/2014/2014-11-12pr.pdf>

NEW INTRODUCTIONS OF INVASIVE PLANTS INTO OR AROUND THE SITE

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

The Contractor shall ensure that no invasive plant species, as defined and listed by the Massachusetts Invasive Plant Advisory Group, are introduced or moved around the site by construction activities either by improperly cleaned construction equipment or importation of infected materials such as borrow, compost, nursery stock, seed, or hay bales. Corrective measures, if necessary, shall be made by the Contractor as directed by the Engineer. The Contractor shall be solely responsible for all costs associated with ensuring that invasive species are not introduced or moved around the site by construction activities and for all corrective measures required for as long as necessary to eliminate the introduced invasive plant species and prevent re-establishment of same.

NORTHERN LONG-EARED BAT PROTECTION

The U.S. Fish and Wildlife Service has listed the northern long-eared bat as threatened under the Endangered Species Act (ESA) and the following requirements exist to protect the bat and its habitat. This project has been authorized under the Federal Highway Administration and Federal Railroad Administration: Range-Wide Biological Assessment for Transportation Projects for Indiana Bat and Northern Long-Eared Bat; compliance with the below provisions for tree cutting/clearing, bat inspections, and lighting are necessary to ensure compliance under the ESA.

TREE CUTTING AND CLEARING RESTRICTION

Tree cutting/ clearing is prohibited from April 15 through August 31 of each year. The Contractor shall ensure tree removal is limited to that specified in project plans. Prior to tree removal the Contractor shall demarcate the clearing limits in the field (e.g. with bright orange flagging/fencing or another marking method) to ensure all tree cutting staff know and work within the tree clearing limits.

BAT INSPECTION AT BRIDGES

Prior to initiating work at any bridge, a bat inventory form must be completed no less than 7 days prior to initiating the work at each bridge. The form is included within the “DOT Preliminary Bat Inventory Guidelines for Bridges/Structures” document included in the contract package. Any bridge suspected of providing habitat for any species of bat will be removed from work schedules until such time that the DOT has obtained clearance from the USFWS, if required. The bat inventory form shall be provided to the Resident Engineer and the District Environmental Engineer.

LIGHTING

The Contractor shall direct lighting away from suitable habitat (e.g. forested habitat). Use downward-facing, full cut-off lens lights, and direct lighting away from suitable habitat when installing new or replacing existing permanent lights.

PROVISIONS FOR TRAFFIC AND PROSECUTION OF THE WORK **(Supplementing Subsection 7.09)**

As indicated in the traffic control plans, the Contractor shall close the bridge to traffic for the full duration of construction. The Contractor shall refer to the Detour on the Temporary Traffic Control Plan on sheet no. 8 of the plan set (under separate cover). Any changes to the Detour Plan must be approved by the District prior to being implemented during construction.

Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day.

The Contractor shall install all required construction zone signing, traffic lane transitions and channelization, pavement markings, flashing arrow boards and other items specified for maintenance of traffic during construction prior to commencing with construction activities. The work areas shall at least have a gravel surface with ramps at all access driveways to the adjacent properties.

Construction of the roadways and structures shall be undertaken so as to maintain all access driveways unless otherwise shown on the plans or directed by the Engineer.

The Contractor shall assign a responsible person to coordinate the construction activities with the Police and Fire Chiefs. This will ensure that satisfactory access for emergency vehicles shall be maintained at all times. Temporary grade transition ramps shall be provided at the end of work areas for emergency vehicle movements in the areas of construction.

The Town of Sharon Police and Fire Departments as well as all School Departments in the town shall be notified of the temporary closing of traveled ways.

Every reasonable effort shall be made to reduce to a minimum any interference with or inconvenience to business concerns and abutters due to the construction work. Excavated material shall be hauled away and returned if the Engineer deems it necessary and practical as a means of avoiding serious interference with and inconvenience to business concerns and abutters.

At the end of each day's activities or when work is not in progress, the Contractor shall leave the roadways in a condition such that each abutter has acceptable vehicular and pedestrian access to their property.

All work shown on the plans shall be accomplished within State Highway or Town Layout or within takings and easements that have been acquired for the project.

Portable Changeable Message Signs shall be operated on the approaches to the work zone 21 days prior to the approved work schedule to alert the public regarding proposed roadway detour or other traffic restrictions. Locations shall be coordinated with the Town of Sharon.

PUBLIC SAFETY AND CONVENIENCE (Supplementing Subsection 7.09)

The Contractor shall provide necessary access for fire apparatus and other emergency vehicles through the work zones to abutting properties at all times.

Sweeping and cleaning of surfaces beyond the limits of the project to clean up material caused by spillage or vehicle tracking during the various phases of the work shall be considered as incidental to the work being performed under the Contract and there will be no additional compensation.

SCHEDULE OF OPERATIONS (Supplementing Subsection 7.09)

Work hours shall be extended six day ten hour shifts.
Work during the following times shall be restricted:

SUBSECTION 8.03 PROSECUTION OF WORK

Add/amend the following at the end of the Section:

Contractual Milestones

This Contract contains the following Contractual Milestones that are to be included in the Contractor's Baseline Contract Progress Schedule submission. The contractor shall identify the completion of the work pertaining to each Contractual Milestone through the inclusion of a Finish Milestone in the accepted baseline Contract Progress Schedule.

- **MS#01 – Contractor Field Completion:** The Contractor shall achieve Contractor Field Completion within 409 calendar days from Notice to Proceed.

Contractor Field Completion shall be defined as the date that completion of all physical contract Work has been performed, including the completion of the punch-list work and the Contractor has fully de-mobilized from the field operations.

- **MS#02 – Substantial Completion:** The Contractor shall achieve Substantial Completion within 378 calendar days from Notice to Proceed.

Substantial Completion shall be described as the date that a walkthrough of the entire contract Work has been performed by the Resident Engineer, and the Work required by the Contract, including paperwork, has been completed, except for work having a contract price of less than one percent of the adjusted contract price, including overruns, under runs and all contract amendments. All Material submittals must have been received by the District Materials Lab.

- **MS#03 – Full Beneficial Use:** The Contractor shall achieve Full Beneficial Use within 348 calendar days from Notice to Proceed.

Full Beneficial Use shall be described as the date that the majority of the contract Work has been completed and the asset(s) has been opened for full multi-modal transportation use, except for limited contract work items that do not materially impair or hinder the intended public use of the transportation facility. All anticipated lane takings have been completed, except for minor, short term work items.

SUBSECTION 8.06 LIMITATIONS OF OPERATIONS

Add/amend the following at the end of the Section:

Access Restraints

This contract will contain Access Restraint(s) to provide an anticipated start date of certain portions of the Work that are restrained by a Utility Party or other 3rd Parties. An Access Restraint is a restriction of physical work, of a specific area or operation in the Contract, to allow all bidders to evaluate anticipated work restrictions, equally, during the pre-bid planning stages. The Contract Time (duration) has considered these portions of the utility work and has been developed with the initial information that has been provided by the Utility Party, and accepted by MassDOT. The Contractor shall be required to communicate and coordinate with all affected Utilities, and may be required to perform support aspects of the utility relocation (as noted in the Contract Documents) well in advance of the start of the applicable utility relocation. The Contractor must clearly identify all aspects of this work in the preparation of the Construction Schedule and throughout the contract duration.

This contract contains the following Access Restraints that are to be included in the Contractor's

Baseline Schedule submission:

- **AR#01 – Access Restraint #01:** The Contractor shall allow all Utility Companies 25 working days to complete their initial relocations and the Contractor cannot work on site during the utility relocations in accordance with the Project Utilities Coordination form. The Contractor will coordinate their work with the appropriate Utility Companies.
- **AR#02 – Access Restraint #02:** The Contractor shall not schedule work requiring closure of the roadway for demolition and construction of the new bridge until the March 15th 2019.
- **AR#03 – Access Restraint #03:** The Contractor shall allow all Utility Companies 13 working days to complete their final relocations and the Contractor cannot work on site during the utility

relocations in accordance with the Project Utilities Coordination form. The Contractor will coordinate their work with the appropriate Utility Companies.

Other

The Contractor is reminded that, in bidding this work, the Contractor is obligated to meet the Contract Milestones (Time) and is obligated to plan the successful completion of Work, prior to submitting the bid.

In submitting a bid price for this contract, the Contractor acknowledges that a detailed plan has been developed to meet the Contract Time for all aspects of the Contract; including shift work; extended work hour requirements/restrictions; all of the limitations of operations; utility coordination, as well as the planning of all subcontractor and supplier operations.

The contract time has been developed utilizing a six day, 10 hour work week.

The contract time has been developed assuming that the bridge and roadway closure will not be allowed in the winter. A typical winter shutdown period between Decemebr 1st and March 15th of each calendar year has been assumed.

DISPOSAL OF SURPLUS MATERIALS

All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of. No separate payment will be made for this work, but all costs in connection therewith shall be included in the prices bid for various Contract items.

DRAINAGE

The Contractor shall maintain the drainage system in the project areas to provide continuous drainage of the roadway and construction area.

All drainage castings in new pavement areas shall be installed at base or binder course grade, as directed by the Engineer, and reset to proposed finish surface grade prior to placement of the pavement surface course.

All pipes and structures installed as part of this Contract shall be left in a clean and operable condition at the completion of the work.

All existing pipes to be abandoned shall be plugged with brick masonry not less than 8 inches in thickness in conformance with the Standard Specifications, Section 201.62.

No separate payment will be made for the maintenance or cleaning of the existing drainage system or for plugging or unplugging of pipes, but all costs in connection therewith shall be included in the unit prices bid for the various Contract items.

DRAINAGE STRUCTURES

Where new pipe is shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material. The existing structure wall shall be carefully and neatly cored using mechanical means to provide the minimum size opening required for the insertion of the new pipe. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall.

Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes into existing structures, cleaning and necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

MATERIALS AND EQUIPMENT REMOVED AND STACKED

All materials scheduled to be removed and stacked shall be delivered to the Department of Public Works located at 217R South Main Street, Box 517, Sharon, MA 02067. If the Engineer determines that any part of the stacked materials is unsuitable for re-use, or if the Town decides to abandon part or all of such materials, said materials shall become the property of the Contractor and he shall dispose of them outside and away from the limits of the project, without additional compensation.

PROPERTY ACCESS

The Contractor shall provide and maintain access at all times to all properties abutting the work. Final pavement installation on the public ways shall be performed after all other work is finished.

CONCRETE FOUNDATIONS

Concrete foundations of items to be removed, if not interfering with the proposed construction, may be abandoned in place with written acceptance of the Engineer. Foundations left in place under the roadway surface shall be removed to a depth of three feet (3') below the finished grade; all other foundations left in place shall be removed to a depth of six inches (6") below the finished grade. The top six inches (6") shall be restored to match the existing grade with materials similar in kind to the adjacent materials.

ENVIRONMENTAL PERMITTING

Environmental permits have either been applied for or have been obtained. The Contractor must notify the District #5 Highway Director and Resident Engineer in writing at least 60 days prior to desired commencement of the proposed activity. The Contractor is expected to fully cooperate with requests for information and provide same in a timely manner. As a supplement to Section 7.00 of the Standard Specifications, the Contractor is reminded that no debris of any type shall be allowed to enter water or wetland resource areas, either temporarily or permanently.

BOUNDS

The Contractor shall exercise due care when working around all bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, it shall be replaced and/or realigned by the Contractor as directed by the Engineer. No further compensation will be due the Contractor for the materials and labor required to reestablish the bound in its proper orientation. All bounds, including new bounds as shown on the plans, and bounds replaced or realigned shall be installed by a Land Surveyor registered in the Commonwealth of Massachusetts.

Bounds shown on the plans to be removed shall be carefully removed and delivered and stacked at the Department of Public Works located at 217R South Main Street, Box 517, Sharon, MA 02067 unless otherwise directed. The cost of this work shall be considered incidental to the project.

100. SCHEDULE OF OPERATIONS - FIXED PRICE (\$35,500) LS

A. General Requirements

For Definition of Terms, see Subsection 8.02.B.

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

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

Contract Progress Schedules

Short-Term Construction Schedules

Summary Contract Progress Schedules

Time Entitlement Analyses

Recovery Schedules

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

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

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

on software (within fourteen (14) Calendar Days after NTP) if there are any objections to the CPM software selected.

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

B. Definition of Terms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Pay Estimate - See CQE.

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

Recovery Schedule - A Recovery Schedule is a detailed Revised Contract Progress Schedule that changes the Contract Progress Schedule of Record to show how the Contractor plans to recover

from or make up the contract time lost on the project's critical path due to a delay. See also Subsection 8.02.E.9.

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

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

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

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

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

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

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

C. Schedule Reviews

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

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

The planning, scheduling, and execution of the Work and the accuracy of their representation in the Contract Progress Schedule shall remain the sole responsibility of the Contractor.

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

D. THIS SECTION NOT USED.

E. Contract Progress Schedules

1. Requirements for all Contract Progress Schedules

The Contract Progress Schedule shall show the Work being completed in accordance with the Contract Milestones contained in Special Provisions Subsection 8.03 – Prosecution of Work.

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 thru .9, shall clearly define the progression of the Work from Notice to Proceed to Final Acceptance by using separate activities for each of the following items:

Notice to Proceed

Each component of the Work

Procurement of permit modifications by the Contractor or the Engineer

The preparation and submission of shop drawings and other required submittals, the duration of which shall be determined by the Contractor

The review and return of shop drawings and other required submittals, approved or with comments, the duration of which shall be a minimum of thirty (30) Calendar Days, unless otherwise approved by the Engineer

Items to be paid, such as, engineering work, permanent materials and permanent equipment (material on hand), unfabricated structural steel (raw materials), equipment procurement, and equipment delivery to the site or storage location

Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting this Contract

Interim Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents

The critical path, clearly defined and labeled

Float shall be clearly identified as defined in Subsection 8.02.B

Substantial Completion per the requirements of Subsection 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes

Punchlist Completion Period

Physical Completion per the requirements of Subsection 5.11 - Final Acceptance

Documentation Completion per the requirements of Subsection 5.11 - Final Acceptance

Final Acceptance per the requirements of Subsection 5.11 - Final Acceptance

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

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

a. LOGIC: The Contract Progress Schedule shall divide the Work into activities with appropriate logic ties, to show; (i) the Contractor's overall approach to the planning, scheduling and execution of the Work, (ii) consistency with the requirements of this Subsection, (iii) the Contractor's approach to conformance with any sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

b. ACTIVITIES: The Contract Progress Schedule shall clearly and separately define the progression of Work from Notice to Proceed to Final Acceptance by using separate activities as described in Subsection 8.02.E.1.

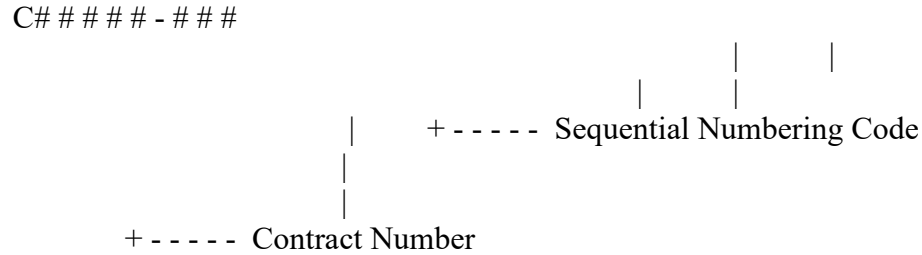
c. EARLY AND LATE DATES: Early Dates consist of Early Start and Early Finish dates. The Early Start date is the earliest date an activity can start or commence. The Early Finish date is the earliest date an activity can finish or be completed. Late Dates consist of Late Start and Late Finish dates. The Late Start date is the latest date an activity can start without delaying or lengthening the duration of the project. The Late Finish date is the latest date an activity can finish or be completed without delaying or lengthening the duration of the project.

d. DURATIONS: Activity durations shall be in Work Days. Durations shall be regulated by a work breakdown structure (WBS) of physical elements of the Work determined by work discipline, station number, or structure, which reflect the time the Contractor and/or Subcontractor(s) require to perform the related work.

e. ITEMS TO BE PAID: The Contractor shall specifically identify in the Contract Progress Schedule all items of permanent materials and equipment (Materials On Hand) for which the Contractor intends to request payment, in accordance with Subsection 9.04 - Partial Payments, prior to the incorporation of such items into the Work.

f. ACTIVITY DESCRIPTIONS: The Contractor shall use standard activity descriptions in all Contract Progress Schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.

g. ACTIVITY IDENTIFICATION NUMBERS: The Contractor shall use the standard activity identification numbering system specified below for all activities in all Contract Progress Schedules:



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

Sequential Numbering Code - The second set of characters in the activity identification number, the actual number of characters to be determined by the Contractor, shall consist of a sequential numbering system created by the Contractor denoting work breakdown structure (WBS), locations, station numbers, major areas of construction, structure types, structure designations, class of work, type of activity, bid item number, milestone number, phase of the Work and/or any other type of information that the Contractor wishes to include in its activity identification numbering code.

h. ACTIVITY CODES: The Contractor shall use all of the following sortable standard activity codes in all Contract Progress Schedules:

| | |
|-------|---|
| Code | Code Designation |
| DIST | MassDOT Highway Division District Number |
| TOWN | City / Town Name |
| MSNO | Contract Milestone Number Designation |
| BIDI | Bid Item Number Designation |
| STRUC | Type of Structure Designation |
| RESP | Organization Responsibility Code |
| OTHR | Other Field |
| PHAS | Phase of the Work or of the Construction Schedule |

DIST – MassDOT Highway Division District Number: A one-digit code corresponding to the MassDOT Highway Division District in which the project is located:

- 1 MassDOT Highway Division District 1
- 2 MassDOT Highway Division District 2
- 3 MassDOT Highway Division District 3
- 4 MassDOT Highway Division District 4
- 5 MassDOT Highway Division District 5

6 MassDOT Highway Division District 6
 S MassDOT Highway Division Statewide

TOWN - City / Town Name: A four letter code using the first four letters of the name of the city or town in which the project is located.

Example:

MANS Mansfield

MSNO – Contract Milestone Number Designation: A two digit code corresponding to the Contract Milestone number contained in Subsection 8.03 - Prosecution of Work that is at the end of the activity's sequence chain.

Example:

03 Milestone No. 3 – Substantial Completion

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

Examples:

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

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

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

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

MIW McGrath Iron Works
 BCEC Bay City Electric Company

MBTA Massachusetts Bay Transportation Authority
CSX CSX Railroad Corporation
MDOT Massachusetts Department of Transportation Highway
 Division

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

XXXXXXXX A description of something other than the above.

i. CALENDARS: Different calendars may be created and assigned globally, i.e., applying to all activities, or individually to each activity. Calendars define the available hours of work in each Calendar Day, Holidays and general or project-specific non-Work Days. Examples of non-Work Days include, but are not limited to:

Winter Shutdown Period: December 1 thru March 15. This may be optional depending on any requirements that may be stated elsewhere in this Contract.

Peak traffic hours on heavily traveled roadways

Special requirements by sensitive abutters, railroads, utilities and/or other state agencies.

Cape Cod Summer Roadway Work Restrictions: While these restrictions may be project-specific based on such factors as the exact location of the project, whether or not the roadway involved has a high traffic volume and/or is a main route, its proximity to beaches and other popular tourist attractions, and its overall impacts on traffic and tourism, they are generally enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer.

Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod, project-specific restrictions may be enforced based on the same factors listed above for Cape Cod.

Turtle and Fish Migration Periods and/or other in-water work restrictions: Project-specific

Working over Waterways Restricted Periods: Project-specific

Night-time paving and striping operations temperature restrictions: Project-specific

j. NOT TO BE USED: Unspecified milestones or constrained dates, scheduled work not required for the accomplishment of a Contract Milestone, use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer, delayed starts of follow-on trades, or use of float suppression techniques contrary to the provisions of Subsection 8.05 – Claim for Delay or Suspension of the Work shall not be used in the Contractor's Progress Schedule.

k. FLOAT: See Subsection 8.02.B.

1. THIS SECTION NOT USED.

2. Contract Progress Schedule Reporting and Submittal Requirements

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

Each Contract Progress Schedule submittal shall be uniquely identified.

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

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

a. Narratives

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

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

b. Bar Charts

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

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

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

c. Time-scaled Logic Diagrams

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

d. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information.

The Detailed Activity Schedule Comparison consists of an updated bar chart that overlays the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. Simple instructions for creating Detailed Activity Schedule Comparisons appear on the MassDOT Highway Division website at: <http://www.massdot.state.ma.us/Highway/>

e. THIS SECTION NOT USED.

f. THIS SECTION NOT USED.

g. THIS SECTION NOT USED.

3. Baseline Contract Progress Schedule

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

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

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

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

4. Revised Contract Progress Schedules

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

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

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

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

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

5. Stated Contract Progress Schedules

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

A Stated Contract Progress Schedule shall consist of the following:

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

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

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

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

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

6. Short Term Construction Schedule

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

The Short- Term Construction Schedule shall be submitted at each Weekly or Bi-Weekly (every two (2) weeks) Contract Progress Meeting, but, regardless of the frequency of progress meetings, shall be submitted no less often than once every two (2) weeks. It shall display all work for a thirty-five (35) Calendar Day period: completed work for the two (2) week period prior and all planned work for the three (3) week period following the Contract Progress Meeting or the end of the previous two (2) week period.

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

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

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

7. Summary Contract Progress Schedule

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

8. Time Entitlement Analysis

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

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

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

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

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

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

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

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

9. Recovery Schedules

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

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

- a.) A delay of twenty (20) Calendar Days, or
- b.) A delay equal to 5% of the Calendar Days remaining until the Contract Completion Date

due to any of the three situations listed below:

1. If the contractor is behind schedule due to the fault of the contractor.
2. If the contractor anticipates becoming behind schedule due to the fault of the contractor.
3. When the delay is not the fault of the Contractor and the Department chooses to recover the lost time and requests a proposal to achieve that.

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

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

10. Disputes

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

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

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

F. Basis of Payment

1. All required schedule-related work, including, but not limited to, computer, computer software, training, schedule preparation, and schedule submittals will be paid for under Pay Item 100.01 as defined below.
2. Failure to submit schedules within the time periods stated elsewhere in this subsection could result in the withholding of full or partial pay estimate payments by the Engineer.
3. A fixed price of \$35,500 will be provided to the Contractor for the Project Schedule Submittal requirements contained herein. The Contractor is advised that this “fixed price” value is separated from what the Department considers to be the Contractor’s general condition costs for payment purposes only. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor’s general conditions. The fixed price payment item shall be earned as a fixed amount set by the Department at the time of the bid. Each bidder shall include this fixed price bid item value in the total bid value. Failure to do so will be grounds for the rejection of the bid.
4. Twenty percent (20%) of this pay item will be paid upon receipt by the Engineer of the Contractor’s Baseline Schedule, prepared and submitted in accordance with Subsection 8.02.E.3.
5. The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the time remaining until the time that the payment occurring immediately after Substantial Completion has been made. This calculation will be subject to revision should Substantial Completion be delayed beyond the original calculation date.

PAY ITEM

100. SCHEDULE OF OPERATIONS - FIXED PRICE \$35,500 LS

ITEM 102.511 TREE PROTECTION – ARMORING & PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for limb pruning to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch or as recommended by the Arborist. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or an Arborist.

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist, if specified, shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES & PENALTIES

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a

replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

6/29/2016

ITEM 102.521 TREE AND PLANT PROTECTION FENCE FOOT

The work under this Item shall conform to the relevant provisions of Sections 644 and 771 of the Standard Specifications and the following:

Work under this item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

MATERIALS

Temporary Fence shall be such that it provides a minimum 48-inch tall barrier that remains vertical and effective (not sagging) for the duration of period required. Fence shall be plastic orange safety fence (recommended where high visibility is necessary), wooden snow fencing, or other approved material.

Per the Arborist or Engineer, additional posts, deeper post depths, and/or additional attachments will be used if the fabric or fence sags, leans or otherwise shows signs of failing to create a sufficient barrier to access.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this item.

ESTABLISHMENT OF TPPZ

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

METHOD OF WORK

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance. In the event of spills, compaction or damage, the Contractor shall take corrective action immediately using methods approved by the Engineer in coordination with an Arborist.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

TREE AND PLANT DAMAGES OR LOSS

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available. The Engineer will approve the size and quality of the replacement plant. Replacement will include a minimum of one year of watering and care.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.521 will be measured and paid for payment by the foot of Tree and Plant Protection Fence, complete in place. This includes all labor, materials, equipment, maintenance, final removal and disposal of the protective materials, damages repair, and all incidental cost required to complete the work.

Payment of 40 percent of value will be made upon installation of Fence. The remaining 60 percent will be made when protection materials have been removed and disposed off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, or arborist services, but all costs in connection therewith shall be included in the Contract unit price bid.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

ITEM 120. **EARTH EXCAVATION** **CUBIC YARDS**

Work under this item shall conform to Section 100 of the Standard Specification and the following:

Earth Excavation shall include the removal of tree pits, fences, drain pipe, and any other items to be removed not covered under other items of work.

Work under this item shall also include the excavation of materials between the existing and proposed abutments, including the removal and disposal of all bituminous concrete and cement or bituminous concrete pavements, utilities, and vegetation which interferes with the proposed construction.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Method of measurement and basis of payment shall conform to Subsection 120 of the Standard Specification.

ITEM 127.1 **REINFORCED CONCRETE EXCAVATION** **CUBIC YARD**

Work under this item will conform to the relevant provisions of Section 120 of the Standard Specifications, the Plans and the following:

The work under this Item 127.1 consists of furnishing all labor, materials and equipment necessary for the removal and disposal of the existing concrete abutments and wing walls to the limits shown on the Plans.

The Contractor is advised to conduct a field investigation prior to bidding. Contractor shall verify all conditions, dimensions and materials in the field and shall base his/her bid on his/her own findings without any additional compensation for variances from the Plans or these Special Provisions regarding actual conditions for the materials to be removed.

All materials removed under this item shall become the property of the Contractor and shall be removed from the job site. The Contractor shall be responsible for satisfactory disposal of all materials removed from the site.

The Massachusetts Department of Transportation does not guarantee or represent that the bridge materials will actually coincide with any descriptions contained herein or represented on Drawings. The Contractor must visit the bridge site prior to submitting bids to get familiar

with the scope of work and bridge condition. No additional compensation, other than the contract unit price bid for this Item, shall be made if the materials or work provided is different than that inferred or described herein or shown on the drawings. Drawings of the existing bridge are available on request from the office of the Director of Bridges and Structures, Massachusetts Department of Transportation, 10 Park Plaza, Boston, MA 02116.

The Contractor shall use suitable means to prevent demolition material and debris from falling into the railway. The Contractor shall be responsible for removing any debris falling into the railway. The Contractor shall take necessary precautions to protect existing utilities in place from damage during his/her operations.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Substructure demolition will be measured by volume of material, in cubic yards, within specified limits as shown on the Plans.

Compensation for this work will be measured and paid at the Contract unit price per cubic yard within the specified limits as shown on the Plans, which prices shall be full compensation for furnishing all labor, materials, equipment, tools, and other incidentals necessary for the satisfactory completion of the work.

ITEM 140.

BRIDGE EXCAVATION

CUBIC YARD

Work under this item shall conform to the relevant provisions of Section 140 of the Standard Specifications and shall consist of the excavation required to construct the new approach slabs, abutments, wingwalls, and guardrail transitions. All materials removed shall become the property of the Contractor and shall be properly disposed of by him away from the work site.

Excavation outside the limits of Bridge Excavation will be considered as made for the Contractor's convenience and will not be included for payment under Item 140, except for excavation for the new approach slabs below the roadway subbase.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment under Item 140. Bridge Excavation will be made at the contract unit bid price per cubic yard of bridge excavation, which the price shall include full compensation for all materials, tools, equipment, and all incidental work necessary to complete all work.

ITEM 144.

CLASS B ROCK EXCAVATION

CUBIC YARD

The work under this item shall conform to the applicable provisions of Section 140 of the Standard Specifications and the specific requirements stipulated below for the component parts of this item.

Prior to the start of work, the Contractor shall submit demolition plan for approval by Amtrak and MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the planned demolition
2. A plan showing the anticipated location(s) of rock to be removed.

The Contractor shall contact and coordinate development of this plan with Amtrak prior to submission.

The work for this item includes removal and legal disposal of the existing stone substructures as indicated on the Contract Drawings.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Work under this item will be measured and paid in the unit of CUBIC YARD at the Contract Bid Price, which price shall be considered full compensation for all bracing, labor, tools, equipment, materials, loading, transportation, disposal fees necessary or incidental, approvals, permits, and incidental work necessary for the completion of the work as specified above, as shown on the Contract Plans and/or directed by the Engineer.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work under this item shall consist of ensuring the health and safety of the Contractor'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 Contractor shall 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 shall 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 shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall 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 Contractor shall 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 shall 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 shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Subcontractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor 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 shall 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.

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall 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 shall 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 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.

PAYMENT ITEMS

Environmental Health and Safety Program.....Lump Sum

ITEM 180.02 PERSONAL PROTECTION LEVEL C UPGRADE HOUR

The work shall 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 Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

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 Contractor to provide Level D PPE.

ITEM 180.03 LICENSED SITE PROFESSIONAL SERVICES HOUR

Within limited areas of the project site, soils, sediments and/or groundwater may be contaminated. 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 sampling, analysis and characterization of potentially contaminated media, preparation 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 Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

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 DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be 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 soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. 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. The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results 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 Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

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.

In order to maintain compliance with the MCP 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. 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), semivolatile 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. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

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. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal items.

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.

201.3**SPECIAL CATCH BASIN****EACH**

All work performed under these Items shall be in accordance with the relevant provisions of Section 201 of the Standard Specifications and the following:

Special Catch Basins will be used where there are conflicts with existing utilities which result in the need for a flat top catch basin.

SUBMITTALS

A minimum of thirty (30) days prior to the start of any construction activity the contractor shall submit shop drawings for the catch basins for review and approval.

MATERIALS AND CONSTRUCTION METHODS

The unit shall conform to the requirements of Section M4.02.14. Components shall be constructed of Pre-cast Portland Cement concrete to withstand AASHTO HS-20 loading. All materials will be subject to the approval of the Engineer.

Special Catch Basin shall be constructed in accordance with the detail indicated on the contract drawings.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Work under this item will be measured and paid in the unit of EACH at the Contract Bid Price.

PAYMENT ITEMS

Special Catch BasinEach

ITEM 203.2 **STORMWATER SEPARATOR UNIT** **LUMP SUM**

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

GENERAL

The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer’s acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close textured and free of blisters, cracks, roughness and exposure of reinforcement.

Imperfections may be repaired, subject to the acceptance of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C109. Epoxy mortar may be utilized for repairs.

SUBMITTALS

1. Shop Drawings

Structural design calculations and shop drawings shall be certified by a Professional Engineer retained by the system manufacturer or Contractor and licensed in the state where the system is to be installed. Six (6) copies of said shop drawings shall be submitted to the Engineer for review and approval.

2. Affidavit on patent infringement

The Contractor shall submit to the Engineer, prior to installation of the stormwater treatment system, an affidavit regarding patent infringement rights stating that any suit or claim against the Owner due to alleged infringement rights shall be defended by the Contractor who will bear all the costs, expenses and attorney's fees incurred thereof.

3. Performance Documentation

The following documentation must be submitted by the Contractor and approved by the Engineer prior to the manufacture and delivery of any materials.

4. Laboratory Data

The stormwater treatment system supplier shall provide documentation of Total Suspended Solids (TSS) removal efficiency from laboratory testing conducted on the supplier's full-scale system. The documentation shall include:

TSS removal efficiency versus operating rate for the full operating range of the stormwater treatment system for a uniform 50-micron particle size.

TSS removal calculations for each system specified herein. The calculations must demonstrate that the system(s) can achieve a net annual TSS removal efficiency as required by local regulations and as based upon a uniform 50-micron particle size and the best available rainfall data for the project site location.

5. Field Test Data

The stormwater treatment system supplier shall provide documentation of TSS removal efficiency from field testing conducted on an installed system. The documentation shall be in accordance with the following:

The testing and documentation shall have been conducted by an independent third party.

The testing and documentation shall include at least 10 storms.

The testing and documentation must show TSS removal results that meet or exceed the performance requirements for the system(s) specified herein.

6. Manufacturing Experience

The stormwater treatment supplier shall provide evidence of at least 5 years of successful product design and use. The supplier shall provide an installation list of projects, model sizes installed and installation dates where the same type systems as specified herein have been designed and produced by the supplier.

7. Operation and Maintenance Manuals

Furnish four copies of the operation and maintenance manual for the stormwater treatment system.

MATERIALS

Concrete for precast storm-water treatment systems shall conform to ASTM C857 and C858 and meet the following additional requirements:

The wall thickness shall not be less than 6-inches or as shown on the dimensional drawings. In all cases, the top slab and wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 loading requirements as determined by a Licensed Professional Engineer.

Sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C990.

Cement shall be Type II Portland cement conforming to ASTM C150.

All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi or until 5 days after fabrication and/or repair, whichever is the longer.

Pipe openings shall be sized to accept pipes of the specified size(s) and material(s) and shall be sealed by the Contractor with a rubber seal system meeting the requirements of ASTM C923.

Internal aluminum plate components shall be ¼-inch thick aluminum alloy 5052-H32 in accordance with ASTM B209.

Internal aluminum angle components shall be ¼-inch thick aluminum alloy 6063 in accordance with ASTM B308.

Brick or masonry used to build the manhole frame to grade shall conform to ASTM C32 or ASTM C139 and shall be installed in conformance with all local requirements.

Casting for manhole frames and covers shall be in accordance with ASTM A48, CLASS 30B and AASHTO M105.

A bitumen sealant in conformance with ASTM C990 shall be utilized in affixing the aluminum swirl chamber to the concrete vault.

PERFORMANCE

Unless otherwise indicated, all equipment used shall provide the results listed in the schedule below. Proposed equipment shall be submitted in writing to the Engineer, along with sufficient data supported by certified tests that the system can meet the end results shown in the table and this specification section:

Table 2.02

| Location | Model | Design Treatment Capacity (cfs) (2) | Sediment Storage (ft³) (2) |
|-----------------|--------------|--|--|
| ALL | HS 4 | 0.64 | Max. 30 |

- (1) Systems shall be Hydroworks HydroStorm as noted or approved equal.
- (2) The systems shall be capable of providing above flow capacities and sediment storage volumes.

Each stormwater treatment system shall include a circular aluminum “swirl chamber” (or “grit chamber”) with a tangential inlet to induce a swirling flow pattern that will accumulate and store settleable solids in a manner and a location that will prevent re-suspension of previously captured particulates.

Each stormwater treatment system shall be of a hydraulic design that includes flow controls designed and certified by a professional engineer using accepted principles of fluid mechanics that raise the water surface inside the tank to a pre-determined level in order to prevent the re-entrainment of trapped floating contaminants.

Each stormwater treatment system shall be capable of removing 80% of the net annual Total Suspended Solids (TSS) load based on a uniform 50-micron particle size. Annual TSS removal

efficiency models shall be based on documented removal efficiency performance from full scale laboratory tests. Annual TSS removal efficiency models shall only be considered valid if they are corroborated by independent third-party field testing. Said field testing shall include influent and effluent composite samples from a minimum of ten storms at one location. Individual stormwater treatment systems shall have the Design Treatment Capacity listed in Table 2.02 and shall not resuspend trapped sediments or reentrain floating contaminants at flow rates up to and including the specified Design Treatment Capacity.

Individual stormwater treatment systems shall have usable sediment storage capacity of not less than the corresponding volume listed in Table 2.02. The systems shall be designed such that the pump-out volume is less than $\frac{1}{2}$ of the total system volume. The systems shall be designed to not allow surcharge of the upstream piping network during dry weather conditions.

A feature shall be incorporated into the design of the stormwater treatment system to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance and to ensure that no oil escapes the system during the ensuing rain event. Direct access shall be provided to the sediment and floatable contaminant storage chambers to facilitate maintenance. There shall be no appurtenances or restrictions within these chambers.

The stormwater treatment system manufacturer shall furnish documentation which supports all product performance claims and features, storage capacities and maintenance requirements.

Stormwater treatment systems shall be completely housed within one structure.

MANUFACTURER:

Each stormwater treatment system shall be of a type that has been installed and used successfully for a minimum of 5 years. The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff during the aforementioned period.

Each stormwater treatment system shall be a HydroStorm Separator as manufactured by Hydroworks, or approved equal.

CONSTRUCTION METHODS

Each stormwater treatment system shall be constructed according to the sizes shown on the drawings and as specified herein. Install at elevations and locations shown on the drawings or as otherwise required by the Engineer.

Place the precast base unit on a granular subbase of minimum thickness of six inches after compaction or of greater thickness and compaction if specified elsewhere. The granular subbase shall be checked for level prior to setting and the precast base section of the trap shall be checked for level at all four corners after it is set. If the slope from any corner to any other corner exceeds 0.5% the base section shall be removed and the granular subbase material re-leveled.

Prior to setting subsequent sections place bitumen sealant in conformance with ASTM C990-91 along the construction joint in the section that is already in place.

After setting the base and wall or riser sections, install the circular swirl chamber wall by bolting the swirl chamber to the side walls at the three (3) tangent points and at the 3-inch wide inlet tab using HILTI brand concrete anchors or equivalent 1/2-inch diameter by 2-3/4-inch minimum length at heights of approximately 3-inches off the floor and at the mid-height of the completed trap (at locations of pre-drilled holes in aluminum components). Seal the bottom edge of the swirl chamber to the trap floor with the supplied aluminum angle flange. Adhere 1/4-inch thick by 1-inch wide neoprene sponge material to the flange with half of its width on the horizontal leg of the flange and half of its width on the vertical leg. The aluminum angle flange shall be affixed to the floor with a minimum 3/8-inch diameter by 2-3/4-inch drop in wedge anchor at the location of the predrilled holes. Affix the swirl chamber to the flange with hex head 1/4-inch x 1-1/2-inch zinc coated self-tapping screws at the location of the predrilled holes. Seal the vault sidewalls to the outside of the swirl chamber from the floor to the same height as the inlet pipe invert using butyl mastic or approved equal.

Prior to setting the precast roof section, bitumen sealant equal to ASTM C990 shall be placed along the top of the baffle wall, using more than one layer of mastic if necessary, to a thickness at least 1-inch greater than the nominal gap between the top of the baffle and the roof section. The nominal gap shall be determined either by field measurement or the shop drawings. After placement of the roof section has compressed the butyl mastic sealant in the gap, finish sealing the gap with an approved non-shrink grout on both sides of the gap using the butyl mastic as a backing material to which to apply the grout. Also apply non-shrink grout to the joints at the side edges of the baffle wall.

After setting the precast roof section of the storm-water treatment system, set precast concrete manhole riser sections, to the height required to bring the cast iron manhole covers to grade, so that the sections are vertical and in true alignment with a 1/4-inch maximum tolerance allowed. Backfill in a careful manner, bringing the fill up in 6-inch lifts on all sides. If leaks appear, clean the inside joints and caulk with lead wool to the satisfaction of the Engineer. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of Stormwater Treatment Systems shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures".

Holes made in the concrete sections for handling or other purposes shall be plugged with a nonshrink grout or by using grout in combination with concrete plugs.

Where holes must be cut in the precast sections to accommodate pipes, do all cutting before setting the sections in place to prevent any subsequent jarring which may loosen the mortar joints. The Contractor shall make all pipe connections.

METHOD OF MEASUREMENT

Stormwater Separator Unit will be measured for payment by lump sum complete and in place including excavation.

BASIS OF PAYMENT

Payment will be made at the Contract Bid Lump Sum Price for each Stormwater Separator Unit complete in place, which price shall be the full payment for all labor, materials, excavation and all incidentals necessary to complete the work as specified.

PAYMENT ITEMS

Stormwater Separator Unit.....Lump Sum

| | | |
|---------------------------|--|--------------------|
| <u>ITEM 222.3</u> | <u>FRAME & GRATE (OR COVER) MUN STD</u> | <u>EACH</u> |
| <u>ITEM 223.1</u> | <u>FRAME & GRATE (OR COVER) REMOVED AND STACKED</u> | <u>EACH</u> |
| <u>ITEM 225.52</u> | <u>TRAP AND HOOD MUNICIPAL STANDARD</u> | <u>EACH</u> |

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

EXECUTION

Frame and Grate (or cover) Removed and Stacked shall be removed in its entirety and stacked at the Department of Public Works located at 217R South Main Street, Box 517, Sharon, MA 02067.

The Trap and Hood Municipal Standard shall be the “Eliminator” by Ground Water Rescue, INC. of Quincy MA or approved equal.

Frame and Grate Municipal Standard shall be frames with 2-inch square openings and 23-7/8-inch square grates, shall be 8 inches in height and 453 pounds at minimum. They shall be Neenah Foundry Co. No. 3405; Quality Water Products No. 45; East Jordan Iron Works Type F; or approved equal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Frame and Grate Municipal Standard shall be measured and paid for at the unit EACH including materials, installation, and all needed to set each frame and grate.

Trap and Hood Municipal Standard and Frame and Grate (or cover) Removed and Stacked will be measured for payment by EACH as shown on the plans or as directed by the Engineer.

Frame and Grate (or cover) Municipal Standard, Frame and Grate (or cover) Removed and Stacked, and Trap and Hood Municipal Standard, will all be paid for by the unit EACH as shown on the plans or as directed by the Engineer.

| | | |
|---------------------------|--|--------------------|
| <u>ITEM 325.18</u> | <u>18” STEEL PIPE CASING FOR WATER PIPE</u> | <u>FOOT</u> |
|---------------------------|--|--------------------|

Work under this item shall conform to Section 960 of the Standard Specification and the following:

Steel pipe casing shall be fabricated and installed as shown on the plans. Pipe casings shall conform to the requirements of ASTM A53, Grade A or B.

PAYMENT ITEMS

18” Steel Pipe Casing for Water PipeFoot

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Work under this item will be measured and paid in the unit of FOOT at the Contract Bid Price, which price shall be considered full compensation for all bracing, labor, tools, equipment, materials, loading, transportation, disposal fees necessary or incidental, approvals, permits, and incidental work necessary for the completion of the work as specified above, as shown on the Contract Plans and/or directed by the Engineer.

ITEM 358.1 **GATE BOX REMOVED AND STACKED** **EACH**

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

Gate Box Removed and Stacked shall be removed as indicated on the plans and transported to the Department of Public Works located at 217R South Main Street, Box 517, Sharon, MA 02067.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Gate Box Removed and Stacked will be measured and paid for payment by the unit Each, including removal and transportation as shown on the plans or as directed by the Engineer and capping of the existing pipe if required.

ITEM 370.1 **8 X 6 INCH TAPPING SLEEVE, VALVE & BOX** **EACH**

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

8X6 Inch Tapping Sleeve, Valve & Box shall consist of a split cast iron or ductile iron sleeve tee with mechanical joint ends on the main and a flange on the branch. Tapping type gate valves shall have one flange and one mechanical joint end. The valves shall conform to the requirements hereinbefore specified for gate valves and shall be furnished with a 2 inch square operating nut. The Contractor shall be responsible for verifying the outside diameter of the pipe to be tapped.

Oversized valves shall be provided as required to permit the use of full size cutters. Before backfilling, all exposed portions of bolts used to hold the two halves of the sleeve together shall be heavily coated with two coats of bituminous paint comparable to Inertol No. 66, Special Heavy. Sleeves shall be of cast iron furnished with rubber gaskets. Gaskets shall cover the entire area of flange surfaces.

8X6 Inch Tapping sleeves and valves shall be as manufactured by Clow Valve Co., Oskaloosa, IA; Mueller Co., Decatur, IL; American Valve and Hydrant, Birmingham, AL; MH Valve, Anniston, AL; Kennedy Valve, Elmira, NY; US Pipe, Chattanooga, TN; or approved equal.

METHOD OF MEASUREMENT

Quality Meeting required under Section 450. Unless otherwise specified, the milled material shall become the property of the Contractor.

Construction Procedures

415.60 General.

All construction procedures under Pavement Micromilling shall also conform to any of the following relevant provisions of Pavement Milling:

Milling Equipment Requirements.

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

- (a) A built in automatic grade control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results.
- (b) Longitudinal controls capable of operating from any longitudinal grade reference, including string line, 30-foot (10 meter) ski minimum, 30-foot (10 meter) mobile string line minimum, or a matching shoe.
- (c) The transverse controls shall have an automatic system for controlling cross-slope at a given rate.
- (d) Cutting heads able to provide a minimum 6 foot (2 meter) cutting width and a 0 to 4 inch (0 to 100 mm) deep cut in one pass. The teeth on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.
- (e) An integral pickup and conveying device to immediately remove milled material from the roadway and discharge the millings into a truck, all in one operation.
- (f) All necessary safety devices such as reflectors, headlights, taillights, flashing lights and back up signals so as to operate safely in both day and night.
- (g) A means of effectively limiting the amount of dust escaping from the milling and removal operation in accordance with local, State, and Federal air pollution control laws and regulations.

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

Sweeper Equipment Requirements.

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

Milling Operations.

The milling operations shall be scheduled to minimize the duration and placement of traffic on the milled surface. The milling operations shall not proceed more than 3 miles ahead of the paving operations. Under no circumstances shall the milled surface be left exposed to traffic for a period exceeding seven days. The Engineer may allow the Contractor to adjust the above limitations on milling production when necessary.

The Contractor shall coordinate milling and paving operations to minimize the exposure of milled surfaces to traffic. The Contractor shall ensure that milled surfaces are overlaid in a timely manner to avoid damage to the pavement structure. Any damage to the pavement structure resulting from extended exposure of the milled surface to traffic shall be repaired as directed by the Engineer at the Contractor's expense.

The existing pavement shall be removed to the average depth shown on the plans, in a manner that will restore the pavement surface to a uniform cross-section and longitudinal profile. The longitudinal profile of the milled surface shall be established using a 30 foot (10 meter) mobile ski, mobile string line, or stationary string line. The cross-slope of the milled surface shall be established by a second sensing device or by an automatic cross-slope control mechanism. The Contractor will be responsible for providing all grades necessary to remove the material to the proper line, grade, cross section, superelevation, and transitions shown on the plans or as directed by the Engineer. The requirement for automatic grade or slope controls may be waived by the Engineer in locations warranted by the situation, including intersections and closely confined areas.

The Engineer may adjust the average milling depth specified on the plans by $\pm 3/4"$ ($\pm 20\text{mm}$) during each milling pass at no additional payment to minimize delamination of the underlying pavement course or to otherwise provide a more stable surface. If delamination or exposure of concrete occurs when milling a HMA pavement course from an underlying Portland Cement Concrete (PCC) pavement, the Contractor shall cease milling operations and consult the Engineer to determine whether to reduce the milling depth or make other adjustments to the operation.

Protection of Inlets and Utilities.

Throughout the milling operation, protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense. To prevent the infiltration of milled material into the storm sewer system the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that falls into inlet openings or inlet grates shall be removed at the Contractor's expense.

Vertical Faces.

All permanent limits of the milled area shall be sawcut or otherwise neatly cut by mechanical means to provide a clean and sound vertical face. No vertical faces, transverse or longitudinal, shall be left exposed to traffic. If any vertical face is formed in an area exposed to traffic a temporary paved transition with a maximum 12:1 slope shall be established. If the milling machine is used to temporarily transition the milled pavement surface to the existing pavement surface, the temporary transition shall be constructed at a maximum 12:1 slope.

Opening to Traffic.

Prior to opening a milled area to traffic, the milled surface shall be thoroughly swept with a mechanical sweeper to remove all remaining millings and dust. This operation shall be conducted in a manner so as to minimize the potential for creation of a traffic hazard and to comply with local, State, and Federal air pollution control laws and regulations. Any damage to vehicular traffic as a result of milled material becoming airborne is the responsibility of the Contractor and shall be repaired at the Contractor's expense. Temporary pavement markings shall be placed in accordance with the provisions of Subsection 850.64.

Milled Surface Inspection.

The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced shall be corrected by re-milling at the Contractor's expense and to the satisfaction of the Engineer.

The Contractor shall perform Quality Control inspection of all work items addressed as specified in the table below. Inspection activities during milling of HMA pavement may be performed by qualified Production personnel (e.g. Skilled Laborers, Foremen, Superintendents). However, the Contractor's QC personnel shall have overall responsibility for QC inspection. The Contractor shall not rely on the results of Department Acceptance inspection for Quality Control purposes. The Engineer shall be provided the opportunity to monitor and witness all QC inspection.

The milled surface of each travel lane shall be divided into longitudinal Sublots of 500 feet (150 meters). The Contractor shall perform a minimum of one random QC measurement within each Sublot with a 10-foot (3 meter) straightedge in the transverse direction across the milled surface. Additional selective QC measurements within each Sublot will be performed as deemed necessary by the QC personnel. All QC inspection results shall be recorded on NETTCP Inspection Report Forms. The Engineer will also randomly inspect a minimum of 25% of the Sublots. The Contractor shall perform surface texture measurements with a 10-foot (3 meter) straightedge in the transverse direction across the milled surface. The milled surface shall have a texture such that the variation from the edge of the straightedge to the top of ridges between any two ridge contact points shall not exceed 1/8 inch (3 mm). The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16" (1.6 mm). Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor's expense.

In isolated areas where surface delamination between existing HMA layers or a surface delamination of HMA on Portland Cement Concrete causes a non-uniform texture to occur, the straightedge surface measurement requirements stated in the preceding paragraph may be waived, subject to the approval of the Engineer.

Minimum QC Inspection of Milling Operations

| Inspection Component | Items Inspected | Minimum Inspection Frequency | Point of Inspection | Inspection Method |
|--------------------------|----------------------------------|--|--------------------------------------|---|
| Equipment | As specified in QC Plan | Per QC Plan | Per QC Plan | Per QC Plan |
| Environmental Conditions | Protection of Inlets & Utilities | Per QC Plan | Existing Surface | Visual Check |
| | Removal of Millings & Dust | Per QC Plan | Milled Surface | Visual Check |
| Workmanship | Milling Depth | Per QC Plan | Milled Surface | Check Measurement |
| | Cross-Slope & Profile | Per QC Plan | Milled Surface | Check Measurement |
| | Milled Surface Texture | Per QC Plan | Milled Surface | Visual Check |
| | Milled Surface Roughness | Once per 500 feet (150 meters) per milled lane | Milled Surface per Subsection 410.67 | 10 foot (3 meter) standard straightedge |
| | Sawcut Limit Vertical Face | Per QC Plan | Sawcut Limits | Visual Check |

415.61 Micromilling Equipment Requirements.

The micromilling machine shall be equipped with a drum specifically designed to provide the surface specified below.

415.62 Control Strip.

The Contractor shall micromill a control strip. The control strip shall be 500 feet minimum in length with a uniformly textured surface and cross slope, as approved by the Engineer.

The micromilled surface of the control strip shall provide a satisfactory riding surface with a uniform textured appearance. The micromilled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced in the control strip shall be corrected by additional micromilling at the Contractor's expense and to the satisfaction of the Engineer.

The micromilled pavement surface shall have a transverse pattern of 0.2–0.3 inches center to center of each strike area. The Contractor shall perform surface texture measurements with a 10-foot (3 meter) straightedge in the transverse direction across the milled surface. The milled surface shall have a texture such that the variation from the edge of the straightedge to the top of

ridges between any two ridge contact points shall not exceed 1/8 inch (3 mm). The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16” (1.6 mm). Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor’s expense.

415.67 Micromilled Surface Inspection.

The Contractor shall perform Quality Control inspection of all work items addressed under Section 415.3 The Contractor shall not rely on the results of Department Acceptance inspection for Quality Control purposes.

The micromilled surface shall meet the requirements of 415.62.

Compensation

415.80 Method of Measurement.

Micromilling - Micromilling will be measured for payment by the number of square yards (square meters) of area from which the milling of existing HMA pavement has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar utility structures.

415.81 Basis of Payment.

Micromilling - Micromilling, removal and disposal of existing HMA pavement will be paid for at the contract unit price per square yard (square meter). This price shall include all equipment, tools, labor, and materials incidental thereto. No additional payments will be made for multiple passes with the milling machine to remove the existing HMA surface to the grade specified.

No separate payments will be made for: performing handwork removal of existing pavement and providing protection around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractor’s negligence; providing protection to underground utilities from the vibration of the milling operation; sawcutting micromilled limits and drives; installing and removing any temporary transition; removing and disposing of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price for Pay Item 415.3, Pavement Micromilling.

415.82 Payment Items.

| | | |
|--------------------|--|-------------|
| 415.3 | Pavement Micromilling | Square Yard |
| <u>ITEM 451.</u> | <u>HMA FOR PATCHING</u> | <u>TON</u> |
| <u>ITEM 452.</u> | <u>ASPHALT EMULSION FOR TACK COAT</u> | <u>GAL</u> |
| <u>ITEM 453.</u> | <u>HMA JOINT SEALANT</u> | <u>FOOT</u> |
| <u>ITEM 450.31</u> | <u>SUPERPAVE INTERMEDIATE COURSE-12.5 (SIC-12.5)</u> | <u>TON</u> |
| <u>ITEM 450.42</u> | <u>SUPERPAVE BASE COURSE-37.5 (SBC-37.5)</u> | <u>TON</u> |
| <u>ITEM 450.60</u> | <u>SUPERPAVE BRIDGE SURFACE COURSE-9.5 (SSC-B-9.5)</u> | <u>TON</u> |
| <u>ITEM 450.70</u> | <u>SUPERPAVE BRIDGE PROTECTIVE COURSE -</u> | <u>TON</u> |
| | <u>9.5 (SPC-B – 9.5)</u> | |

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

The Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is < 0.3 Million 18-kip (80-kn) ESALs. The PGAB Grade selected for this Contract is PG 64-28.

The emulsion under this specification shall be Grade RS-1h and shall meet the requirements of AASHTO M 140.

All required sawcutting in the existing pavement in accordance with Section 450 (Document 00717) will be included in the contract unit price for each HMA pavement course, except sawcutting asphalt pavement for box widening which will be paid under Item 482.5.

Warm-Mix Asphalt Additive

All Hot Mix Asphalt mixtures shall be modified using a WMA additive capable of lowering plant production temperatures of unmodified binders to below 260°F. The WMA additive shall be a product listed on the Northeast Asphalt User Producer Group (NEAUPG) website (http://www.neaupg.uconn.edu/?attachment_id=345), except that no WMA foaming technology which requires the mechanical injection of steam or water into the liquid asphalt will be permitted.

For HMA mixtures placed on Bridge decks, the WMA additives shall serve as a compaction aide. Mixture production temperatures shall not be lowered for HMA placed on bridge decks.

The WMA additive must be compatible with polyphosphoric acid modified binders, polymer modified binders, and the HMA Producer's HMA anti-stripping agents. The WMA additive shall be introduced in accordance with the Manufacturer's dosing rates and approved blending methods. The Manufacturer of the WMA additive shall have an on-site representative at the beginning of paving operations. The Manufacturer's representative shall be available for additional consultation during the remaining production.

Work shall conform to the provisions of Section 450. The WMA mixture design shall incorporate the requirements of AASHTO R35 Appendix X2: Special Mixture Design Considerations and Practices for Warm Mix Asphalt (WMA).

When the asphalt binder is modified with the WMA additive at the HMA plant, all WMA additive equipment shall be fully automated and integrated into the plant controls and shall record actual dosage rates on the plant printouts.

The HMA QC Plan shall provide mixture production and placement alterations due to the WMA additive and shall incorporate the modification of asphalt binders when the WMA additive is blended with the asphalt binder at the plant. This plan shall specifically address WMA metering requirements, tolerances and other QC measures.

All costs including the WMA additive, equipment, labor, Manufacturer's representative, production of samples and incidental costs required to modify the HMA shall be incidental to the associated HMA pay items with no additional compensation.

ITEM 458.7**LIGHTWEIGHT AGGREGATE****CUBIC YARD**

Work under this Item consists of furnishing and installing foamed glass aggregate fill in designated locations or as directed by the Owner or Owner's Representative.

SUBMITTALS**A. CERTIFICATION**

1. Prior to material delivery to project site, the Contractor shall provide the Owner or Owner's Representative with a written certification or manufacturer's quality control data which displays that the products meet or exceed the values specified herein.
2. Prior to material delivery to project site, the Contractor shall provide the Owner or Owner's Representative with documentation that the Manufacturer has manufactured a minimum of 80,000 cubic yards of product meeting the requirements of Section 2.1.

B. SAMPLE

1. The Contractor shall provide a sample of the products described herein at the request of the Owner or Owner's Representative.

C. EQUIPMENT

1. Prior to foamed glass aggregate installation, the Contractor shall provide to the Owner or Owner's Representative the equipment cut sheets for the equipment the Contractor will be using for foamed glass aggregate placement and compaction.

MATERIALS**FOAMED GLASS AGGREGATE**

- A. Foamed glass aggregate shall be made from of a minimum of 98% recycled glass.
- B. Foamed glass aggregate shall meet the following gradation specifications:

| Sieve Size | Total Percent Passing |
|------------|-----------------------|
| 4" | 100 |
| 2 1/2" | 85-100 |
| 3/8" | 0-15 |

- C. The as-delivered foamed glass aggregate should have a maximum dry bulk density of no more than 15 lbs/ft³. The loose bulk density of delivered foamed glass aggregate may be determined per ASTM C29/C29M Method C. If necessary, this value shall be adjusted by the moisture content of the foamed glass aggregate to determine the dry, loose bulk density. Moisture content shall be determined using ASTM D2216 or ASTM D4959 or ASTM D4643.
- D. The foamed glass aggregate shall be made using a dry foaming process to produce a closed cell structure and shall be non-leaching.
- E. The foamed glass aggregate manufacturer must demonstrate experience of manufacturing a minimum of 80,000 cubic yards of foamed glass aggregate meeting the requirements of this Section.

GEOTEXTILE

- A. The geotextile construction shall be a nonwoven, staple fiber, needle-punched, polypropylene geotextile.
- B. The geotextile shall have a minimum mass per unit area of 6 oz./yd² per ASTM D5261.
- C. The minimum grab tensile strength (MARV) of the geotextile shall be 160 lbs. per ASTM D4632.

INSTALLATION

DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in accordance with manufacturer's recommendations.
- B. During all stages of manufacture, shipment, storage, and construction, minimize the amount of material moves to prevent physical damage. Minimize the amount of trafficking on foamed glass aggregate until an adequate thickness of cover material is placed over the foamed glass aggregate.

CONSTRUCTION

- A. Place geotextile and foamed glass aggregate at locations indicated on the drawings. The area to be filled should not have any standing water (including ice) in it prior to placement of the foamed glass aggregate.
- B. Construction equipment, other than for placement and compaction, shall not operate on the exposed foamed glass aggregate in order to minimize additional compaction of the foamed glass aggregate.
- C. For compaction using tracked equipment, foamed glass aggregate shall be placed in uncompacted lift thicknesses of 24 inches and compaction shall be performed with a tracked excavator or dozer with ground pressures of 625 - 1,025 psf. Compaction using tracked equipment shall be completed by placing the initial lift thickness, and then raising the blade or bucket and tracking over the layer for a total of four (4) full passes. One (1) full pass is defined as a minimum of 100% coverage of the tracks passing over the top of the lift.
- D. For areas not accessible by tracked equipment (e.g. around structures and utilities) or to compact thinner lifts, foamed glass aggregate shall be placed in maximum uncompacted lifts of 12 inches and compacted with a plate compactor 110-220 lbs. Compaction shall be complete after a minimum of four (4) full passes with the plate compactor.
- E. If the Contractor must vary the method described in 3.2.C or 3.2.D (i.e., differing lift thickness or equipment), the Contractor should reach out to Aero Aggregates for installation guidance
- F. For areas that will not experience typical highway loading, the number of passes used to compact the foamed glass aggregate lift may be reduced in accordance with the Project Documents.
- G. The geotextile will be placed as a separator between subgrade and the initial lifts of foamed glass aggregate as well as above the final lift and on side slopes as a separator between the foamed glass aggregate and capping layer. Care should be taken during placement of capping layer to prevent damage to geotextile. Adjacent panels of geotextile may be sewn together or overlapped a minimum of 12 inches. The geotextile shall not be left exposed for longer than 14 days.

METHOD OF MEASUREMENT

This work will be measured for payment by the actual number of cubic yards of Lightweight Aggregate complete and in place.

BASIS OF PAYMENT

Payment will be made at the Contract Bid Unit Price per cubic yard for Lightweight Aggregate, complete in place, which price shall be the full payment for all labor, materials, equipment, tools and all incidentals necessary to complete the work as specified.

PAYMENT ITEMS

Lightweight
Aggregate.....Cubic Yard

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

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

The work shall include the installation of HMA Berm Type A, modified, as indicated on the project plans and details. The details for the berm require that the length of the berm is modified to 12 inches and the reveal shall be 1 inch (see sheet no. 3 of the plan set for detail).

Hot Mix Asphalt Berm, Type A, Modified shall be measured and paid for by the unit FOOT including all necessary materials, equipment and labor to install the berm as indicated on the contract drawings.

ITEM 482.31 **SAWING AND SEALING JOINTS IN ASPHALT** **FOOT**
PAVEMENT AT BRIDGES

Work under this Item consists of saw cutting the existing pavement at the bridge to the depth, width and shape shown on the Plans.

Prior to the start of the asphalt pavement operation, the Contractor shall place a mark on each curb or barrier on either side of the paved roadway. These marks shall be aligned with the actual end of the bridge deck and shall be placed so that they will not be covered or otherwise obscured by the asphalt pavement.

After the completion of the paving operation, the Contractor shall snap a straight chalk line on the pavement between these two marks. The Contractor shall then saw cut the pavement along this line to the depth, width and shape shown on the Plans. The equipment shall be approved by the Engineer prior to commencing work.

After completing the saw cutting, the Contractor shall clean the saw groove of any dust and debris with an oil free air blast. If the groove was wet sawn, the groove shall be cleaned with a water blast to remove any remaining slurry and debris, vacuumed with a Wet-or-Dry vacuum to remove any standing water, and then dried with an air blast from a Hot-Air-Lance.

Once the groove is clean and dry, the Contractor shall fill it completely with a hot-applied bituminous crack sealer meeting the requirements of M3.05.4 in accordance with the manufacturer's application instructions and restrictions regarding ambient and material temperatures. The crack sealer shall be thoroughly cured prior to opening the road to traffic. To reduce tackiness, only boiler slag aggregate (black beauty) shall be scattered over the sealer when deemed necessary by the Engineer. Conventional sand shall not be used for this purpose.

METHOD OF MEASUREMENT

This work will be measured for payment by the actual number of feet of joints properly sawed and sealed in the asphalt surface in place and accepted.

BASIS OF PAYMENT

Payment will be made at the Contract Bid Price per foot for Item 482.31 complete in place, which price shall be the full payment for all labor, materials, equipment, tools and all incidentals necessary to complete the work as specified.

ITEM 630.2 **HIGHWAY GUARD REMOVED AND DISCARDED** **FOOT**

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

The work shall include the removal of existing highway guard along with existing wood covering as indicated on the project plans and discarded legally by the Contractor.

Highway Guard Removed and Discarded shall be measured and paid for by the unit FOOT including all necessary materials, equipment and labor to remove and discard existing highway guard.

ITEM 657. **TEMPORARY FENCE** **FOOT**

The work under this item shall conform to the relevant provisions of Section 644 of the Standard Specifications and the following:

The work shall include installation of chain link fence at both sides of the bridge reconstruction site, Beaver Hole Meadow Brook, and Amtrak/MBTA railroad tracks to prevent access by the public during construction where shown on the plans, and as directed by the Engineer.

The chain link fence shall be at least 6 feet in height and erected to ensure controlled access to authorized personnel only. The fence shall be positioned around the closed area of the road so as not to encourage the public from using the fence to climb onto the bridge reconstruction area, neither it shall block any access to the abutting properties. The fence shall be fixed with signs that make it clear that access to the work area is not allowed. The fence shall be supported independently and not fixed to any existing facility. The fence shall contain gates with locks due to the proximity of the railroad.

Temporary Fence will be measured for payment by the foot of fence erected, which price shall include all labor, materials, equipment, and incidental costs required to establish a safe perimeter around the existing culvert.

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

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

An English measuring wheel which shall remain the property of the Contractor.

For those contracts that require concrete testing, two sets of 2 neoprene pads for the concrete compression machine. The pads shall be 6"–70 durometers. Supply a minimum of 4 pads (2 sets).

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

| | |
|----------------|---|
| Computer: | DELL, Compaq, or IBM, Small form factor (Approx.: 4"x12"x14", H x W x D), with speakers |
| CPU: | 2.8 GHz Pentium 4 CPU with 800 MHz front side bus or better |
| RAM: | 1 Gb of 400 MHz PC-3200 DDR (Dual Channel) or better |
| Video: | Internal Extreme Graphics 2 w/DVI capability for digital flat panels; |
| Hard Disk: | 100Gb, 7200RPM, SATA-100 or better |
| Monitor: | 19" LCD, TFT Height adjustable stand, 1280x1024 pixel pitch DVI, 24pin |
| DVI Flat Panel | |
| DVD-RW: | DVD-RW and 10 DVD-RW discs |
| Modem: | 56K/V.90 internal or external modem |
| Floppy: | Standard 3.5" 1.44MB floppy disk drive and 10-1.4Mb Diskettes |
| Keyboard: | Standard 104-key |
| Printer: | HP 1200 LaserJet printer |
| OS: | Windows XP Professional |
| Office: | MS Office Professional (latest edition) |
| Software: | AutoCAD Light (latest version); McAfee Virus Scan |
| Connectivity: | 8 high-speed USB 2.0 ports |

Copier: One (1) plain paper copier, capable of producing Letter and Legal sized copies. The copier must be capable of copying Letter or Legal sized originals. The copier must be a separate machine from any other facsimile machine or printer. The copier must be equipped with an internal cartridge, cassette, or paper tray capable of holding at least 250 sheets of blank paper. The copier must be equipped with a fixed platen (copy glass). The copier must have a zoom function, capable of producing enlargements up to 140%, and reductions to 50%. The copier must be capable of producing at least 12 letter-sized copies per minute. Included shall be the cost of paper and chemicals. The total cost for the paper and chemicals shall not exceed \$500 for the life of the project. Only one copier will be required if there is more than one Field Office in the Contract.

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

All computers must have an Internet access account. DSL (digital subscriber line) is preferred where available. If DSL is not available, a cable internet service provider will be acceptable.

Only high speed internet access will be provided. Dial-up internet access is acceptable; if no other service is available. (America Online is not acceptable service.)

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

ITEM 756. NPDES STORWATER POLLUTION PREVENTION LUMP SUM
PLAN (SWPPP)

This item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (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. On February 16, 2012 (77 FR 12286), EPA issued the final NPDES Construction General Permit (CGP) for construction activity. The Contractor shall be fully responsible for compliance with the CGP. 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 Contractor 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 14 day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (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 Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the aforementioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least 4

weeks prior to any site activities. It is the responsibility of the Contractor 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 (reference to Part 9.1.1 of the 2012 CGP).

It is the responsibility of the Contractor 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, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual. 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 is 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 Engineer must approve the Contractor's inspector. 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 Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports, and any and all corrective actions necessary to comply with the provisions of the CGP. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. 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 Contractor to replace or modify the control for site conditions at no additional cost to the Department. The Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods, and prosecution of the work shall be considered incidental to this item.

The Contractor is advised 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, etcetera. 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 is required to use EPA’s electronic NOI system or “eNOI system” to prepare and submit NOT. The electronic NOT form can be found at www.epa.gov/npdes/stormwater/cgpenoi. If you are given approval by the EPA Regional Office to use a paper NOT, you must complete the form in Appendix K of the 2012 CGP.

COMPENSATION

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

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

ITEM 767.121

SEDIMENT CONTROL BARRIER

FOOT

The purpose of this item is to provide a linear, compost-filled tube for filtering suspended sediments from storm water flow. This item shall conform to the requirements of Section 751 and 767 of the Standard Specifications and the following.

MATERIALS

Material for the filter tubes shall be compost meeting M1.06.0, except that no manure or bio-solids shall be used. In addition, no kiln-dried wood or construction debris shall be allowed. Particle size analysis: 98% shall pass through a 3-inch (75mm) sieve; 30-50% shall pass 3/8 inches (10mm) sieve.

Tubes for compost filters shall be a minimum of 12 inches (300 mm), a maximum of 18” (450mm) in diameter. Tube material shall be a knitted mesh with 1/8” - 3/8” (3-10 mm) openings, and made of biodegradable (cotton or jute) materials. **Photodegradable fabric may be used; however, photodegradable fabric must be removed and disposed of by the contractor, at his expense, at the end of the contract.** Additional tubes shall be used at the direction of the Engineer.

As shown in the detail, the 1 foot (0.2 meters) wide by 2 inch (50 mm) deep wedge of compost spread along the top of the filter tube shall be incidental to this item.

Stakes for anchors, if required, shall be nominal 2 x 2 stakes.

METHODS

Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil.

The Contractor shall ensure that the filter tubes function as intended at all times. Tubes shall be inspected after each rainfall and at least daily during prolonged rainfall. The Contractor shall immediately correct all deficiencies, including, but not limited, to washout, overtopping, clogging due to sediment, and erosion. The contractor shall review location of tubes in areas where construction activity causes drainage runoff to ensure that the tubes are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking or compost material shall be installed as directed by the Engineer. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition. The functional integrity of filter tubes shall be maintained in sound condition at all times. Filter tubes that are decomposing, cut, or otherwise compromised shall be repaired or replaced as directed by the Engineer and be incidental to this item.

Filter tube fabric and stakes shall be removed by the Contractor when site conditions are sufficiently stable to prevent surface erosion, and after receiving permission to do so from the Engineer. All biodegradable tube fabric shall be cut and laid flat in place to decompose on-site at the direction of the Engineer. Tube fabric that is not decomposing satisfactorily shall be removed and disposed off-site by the Contractor. At the direction of the Engineer, the Contractor may rake out and seed compost so that it is no greater than 2 inches (50 mm) in depth on soil substrate.

COMPENSATION

Measurement for this item shall be by the FOOT of Sediment Control Barrier installed, approved, and maintained in place. Payment shall be the bid price and shall be compensation for all labor equipment and materials necessary to complete the work specified above, including, but not limited to, stakes and tube fabric, compost mulch wedge along top of tubes, removal and disposal of fabric and stakes, raking and seeding of compost.

ITEM 801.52 5 INCH ELECTRICAL CONDUIT – TYPE NM (DOUBLE) FOOT
ITEM 801.54 5 INCH ELECTRICAL CONDUIT – TYPE NM (4 BANK) FOOT

The work under these Items shall conform to the relevant provisions of Section 800 and the following:

The trench shall be excavated to the width and depth shown on the plans. All construction of duct banks including trench, excavation, and backfill shall conform to Eversource details and

specifications. A representative from Eversource shall be present for all electrical conduit installed. The work must be performed by an Eversource approved Contractor.

For all conduits encased in concrete, use plastic spacers to maintain conduit spacing. Spacers shall meet Eversource specifications for design and spacing.

All trench excavation activities shall comply with all appropriate OSHA standards.

Duct bank shall have 6-inch red warning tape installed above the concrete encasement as shown on the plans.

Conduits shall be blown clean using compressed air. Run mandrel thru each conduit to confirm viable pathway.

Woven polyester mule tape with minimum strength of 2500 lb. tensile strength to be installed within each conduit.

PVC conduits shall be schedule 40.

Concrete encasement shall be 2,500 psi, 3/8 inch, 520 cement concrete. Duct bank shall include 4/0 bare CU for ground as shown on the plans.

Across the bridge, 5 Inch Electrical Conduit Type RM – Galvanized Steel with Fiberglass Support Hangers shall be used and paid for under Item 806.5 (Bond 4/0 bare CU ground to each steel riser, sweep and conduit crossing the bridge at back of abutments.)

METHOD OF MEASUREMENT

Measurement for these Items shall be per FOOT of conduit installed, approved, and maintained in place.

BASIS OF PAYMENT

Payment shall be made at the contract unit price per FOOT; which price shall be considered full compensation for all labor equipment and materials necessary to complete the work specified above, including, but not limited to, excavation and backfill, conduit, warning tape, spacers, concrete encasement, 4/0 bare CU and grounding clamps for ground.

ITEM 803.43 4 INCH CATV & TELEPHONE CONDUIT – TYPE NM (3 BANK) FOOT

The work under these Items shall conform to the relevant provisions of Section 800 and the following:

The trench shall be excavated to the width and depth shown on the plans. All construction of duct banks including trench, excavation, and backfill shall conform to Comcast and Verizon details and specifications. All work shall be performed by a Comcast and Verizon approved Contractor. A representative from Comcast and Verizon shall be present for all CATV and Telephone conduit installed.

For all conduits encased in concrete, use plastic spacers to maintain conduit spacing. Spacers shall meet Comcast and Verizon specifications for design and spacing.

All trench excavation activities shall comply with all appropriate OSHA standards.

Duct bank shall have 6-inch orange warning tape installed above the concrete encasement as shown on the plans.

Conduits shall be blown clean using compressed air. Run mandrel thru each conduit to confirm viable pathway.

Woven polyester mule tape with minimum strength of 2500 lb. tensile strength to be installed within each conduit.

PVC conduits shall be Schedule 40.

Concrete encasement shall be 2,500 psi, 3/8 inch, 520 cement concrete.

Across the bridge, 4 Inch IPS Telephone Fiberglass Conduit & Support Hangers shall be used and paid for under Item 803.43. Reference American U-Tel catalog.

METHOD OF MEASUREMENT

Measurement for these Items shall be per the FOOT of conduit installed, approved, and maintained in place.

BASIS OF PAYMENT

Payment shall be at the contract unit price per FOOT; which price shall be considered full compensation for all labor equipment and materials necessary to complete the work specified above, including, but not limited to, excavation, backfill, conduit, warning tape, spacers, concrete encasement.

ITEM 811.121

ELECTRIC MANHOLE

EACH

Work under these Items shall conform to the relevant provisions of Section 800 of the Standard Specifications, and the following:

Electric manholes shall be in conformance with Eversource Standard Specifications.

Manholes shall be placed on a 6" layer of ¾" crushed stone in conformance with Section M2.01.4 of the Standard Specifications.

A representative from Eversource shall be present for all electric manhole installations. Utility work shall be performed by an Eversource approved Contractor.

METHOD OF MEASUREMENT

Measurement for these Items shall be per EACH Item installed, approved, and maintained in place.

BASIS OF PAYMENT

Payment shall be the contract unit price per EACH installed and shall be considered full compensation for all labor equipment, including ground ring and rods for equipment grounding, frame and covers, and materials necessary to complete the work.

ITEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS DAY

Work under this item shall conform to the relevant provisions of Section 850 of the Standard Specifications, as amended, and the following:

DESCRIPTION

Work under this Section 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 retro-reflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCS D.
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 drums in any merging or shifting taper as designated in the 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.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per day, which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

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| <u>ITEM 868.06</u> | <u>6 INCH REFLECTORIZED WHITE LINE (EPOXY)</u> | <u>FOOT</u> |
| <u>ITEM 869.06</u> | <u>6 INCH REFLECTORIZED YELLOW LINE (EPOXY)</u> | <u>FOOT</u> |

The work under these items shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

Items 868.06 and 869.06 will be measured for payment by the linear foot of actual markings installed, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

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| <u>ITEM 874.2</u> | <u>TRAFFIC SIGN REMOVED AND RESET</u> | <u>EACH</u> |
| <u>ITEM 874.4</u> | <u>TRAFFIC SIGN REMOVED AND STACKED</u> | <u>EACH</u> |

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

The contractor shall take all necessary precautions not to damage any of the signs during the removal process. Any signs damaged beyond use shall be replaced by the Contractor at no cost to MassDOT or the Town of Sharon.

All signs removed and stacked shall be delivered to the Department of Public Works located at 217R South Main Street, Box 517, Sharon, MA 02067, at no additional cost.

All signs shall be reset as directed by the engineer at no additional cost.

All signposts to be removed and discarded shall be removed by the Contractor and legally disposed of.

BASIS OF PAYMENT

Work under these Items shall be paid at the Contractor bid price, per each unit, which payment shall be considered compensation for all labor, tools, equipment and materials needed to do the work as described above.

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| <u>ITEM 953.3</u> | <u>INTERIM EXCAVATION SUPPORT SYSTEM</u> | <u>SQUARE YARD</u> |
|--------------------------|---|---------------------------|

All work under this Item shall conform to the relevant portions of Sections 140 and 950, and the following:

These excavation support systems shall be designed by the Contractor.

The Excavation Support System shall consist of sheet piling; or soldier piles and timber lagging reinforced, as required, by the framework of wales, struts, tie-backs, deadman soil anchors, corner braces and vertical spacers; or any other system approved by the Engineer. The approximate layout of the Excavation Support System is shown on the plans. Steel sheeting, if used, shall conform to M202M/M 202-08 (2016). Foreign source of supply may be submitted for approval if sufficient documentation is provided demonstrating that domestic material is unavailable and that M202M/M 202-08 (2016) compatibility is achieved.

The Contractor shall be aware of the following:

- A. The Excavation Support System shall be designed to resist a surcharge live load of at least H20 truck loading and any construction equipment loading.
- B. The Contractor shall make his own evaluation of existing conditions and facilities, and of the effects of the proposed Excavation Support System and construction methods, and shall provide in his design for all loads and methods necessary to permit the construction of the proposed abutments and wingwalls while maintaining public safety and protecting completed work and all third party property from damage caused by this operation.
- C. Timber lagging, if used, shall be southern yellow pine, mixed hardwoods or equivalent of Grade 2 or better, having $F_b = 1,500$ psi, minimum. Install lagging tightly against the soil to minimize loss of ground. If necessary, install the lagging one board at a time as required to minimize loss of ground in any local areas having unstable soil conditions. Immediately backpack the lagging tightly with gravel backfill as required to fill any voids that develop behind the lagging.

Utility lines shall be accurately located to ensure that the proposed Excavation Support System will not interfere with them or with the utility company's access to them.

Prior to the start of work, the Contractor shall submit excavation support plan for approval by Amtrak and MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the planned excavations and excavation support.
2. A plan showing the anticipated location(s) of excavation support

The Contractor shall contact and coordinate development of this plan with Amtrak prior to submission.

All work shall be performed in such a manner to minimize impacts on the adjacent properties.

DESIGN

The Excavation Support System at the locations shown on the proposed bridge plans shall be fully designed in accordance with the AREMA Requirements as well as AASHTO Guide Design Specifications for Bridge Temporary Works latest edition and all interims published as of the bid opening date.

SUBMISSION OF DESIGN CALCULATIONS

The complete Excavation Support System design and plans shall be completed and stamped by a Professional Structural Engineer registered in Massachusetts. Prior to the installation, the plans and calculations shall be submitted to the Engineer for his information, approval, and as evidence that the requirements of these provisions have been fulfilled. Furnishing such plans and calculations shall not relieve the Contractor of the sole responsibility for safety of the public, personnel, equipment, and structures, as well as successful project completion.

The design documents prepared by the Contractor shall show the horizontal and vertical extents of the Excavation Support System, the sizes and dimensions of the components of the system, its proposed method of bracing, construction notes, and any other necessary measures required to allow for the proposed construction. The Excavation Support System shall not be installed until the Contractor's design has been reviewed and approved by the Engineer. Any work done or materials ordered for the work involved prior to acceptance of the design calculations, plans, and detailed drawings shall be at the Contractor's own risk.

MATERIALS

Structural steel shapes for soldier piles shall conform to M8.05.1, and other structural steel components shall conform to M8.05.0. All material used for the Excavation Support System shall be new (or used but in like-new condition), sound and free from strength-impairing defects. Any materials removed after the proposed construction is in place shall be salvaged to the Contractor.

Fabricated sections and corners shall be bolted and satisfactory for the use intended.

High strength steel may be used at the Contractor's option at no additional cost.

The Contractor shall furnish the manufacturer's sworn statement, in lieu of mill inspection, for the material furnished and in full accordance with Section 6.00

CONSTRUCTION METHODS

Excavation Support System shall be driven entirely outside the neat lines of the existing building foundations and and/or existing walls to remain, as shown on the plans. Guide wales or other devices shall be used to insure accurate driving and aligning of the piles.

Any movement in the Excavation Support System that would prevent the proper construction of the proposed foundation shall be corrected at the expense of the Contractor.

All welding and the preparations and assembly of material for welding shall conform to the MassDOT Standard Specifications., the AASHTO AWS Bridge Welding Specifications latest edition including interim revisions published by AASHTO as of the bid opening date.

Any portion of the Excavation Support System that becomes tilted or damage shall be repaired, or if in the opinion of the Engineer it cannot properly be adjusted, the Contractor shall replace at no additional cost.

The interim excavation support system shall be left in place and shall be cut off a minimum of 3 feet below finished grade.

Prior to the start of work, the Contractor shall submit demolition plan for approval by Amtrak and MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the planned demolition
2. A plan showing the anticipated location(s) of rock to be removed.

The Contractor shall contact and coordinate development of this plan with Amtrak prior to submission.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The quantity of Excavation Support System to be paid for shall be the number of square yards obtained by multiplying the vertical length measured between the original ground surface at the site at the time the work commences and the bottom of the excavation immediately adjacent to the Excavation Support System by the actual length of protection system installed measured as shown on the Construction Drawings. Payment for all work under this item shall be measured and paid at the Contract Unit Price per Square Yard. Said price shall constitute full compensation for the Contractor's design and plans; all material, labor, tools and equipment furnished; and driving, bracing, cutting and all other work and incidentals necessary for the proper completion of the work specified.

Payment for dewatering shall be included under item 991.1

Bridge Excavation and Class B Rock Excavation are not included in this item, but will be paid under the applicable payment items.

Payment under this item will be based on the following percentages: Approved design 10%, installation 60%, and removal 30%.

ITEM 994.1 TEMPORARY PROTECTIVE SHIELDING SQUARE FOOT

The work to be done under this Item shall provide for the protection of the railway from falling debris during construction of the new bridge superstructure.

This shall be accomplished by utilization of adequate shielding placed over the railway prior to beginning construction of the new bridge superstructure.

All shielding shall meet the following requirements:

1. The Contractor is responsible for designing, furnishing, installing, maintaining, removing, and disposing of all shielding materials.
2. The Contractor shall submit for review Plans of proposed shielding stamped by a Professional Structural Engineer Registered in the Commonwealth of Massachusetts, for

conformance to the Contract Documents, prior to installation of shielding. The drawings shall include details of all connections, brackets and fasteners and shall be submitted at the preconstruction conference.

3. Protective shielding shall not be installed until the Engineer's review has been completed and approved. No portion of the bridge deck shall be removed until the protective shielding is in place and complete.
4. The shielding shall extend a sufficient distance beyond the deck limits, and have walls sufficient to contain any debris. The shielding shall extend the full length of the bridge. All spaces along the perimeter of the shielding and at the seams shall be sealed to prevent dust and debris from escaping and falling onto the railway below.
5. Shielding shall be designed to safely withstand all loads it would be subjected to during construction. The allowable design stresses shall be in accordance with AASHTO Standard Specifications for Highway Bridges. The design shall also include a complete description of the equipment and construction methods proposed for the deck removal and the maximum size of deck area excavated.
6. The shielding shall be maintained and remain in place until the deck and parapets are completely constructed. Shielding shall be removed only upon approval of the Engineer. After completion, the shielding shall be removed and disposed of the satisfaction of the Engineer.

All materials used in the shielding system shall be the property of the Contractor and shall be properly removed from this site at the completion of the project.

Prior to the start of work, the Contractor shall submit temporary shielding for approval by Amtrak and MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the shielding.
2. A plan showing the anticipated location(s) of temporary shielding.

The Contractor shall contact and coordinate development of this plan with Amtrak prior to submission.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The method of measurement will be made on a Square Foot basis.

Payment of 75% of the Lump Sum bid price of this item will be made upon complete installation to the satisfaction and approval of the Engineer. The remaining 25% of the Lump Sum Bid Price of this item will be paid following proper removal and disposal of the shielding from the project.

ITEM 995.01

BRIDGE STRUCTURE, BRIDGE NO. S-09-003

LUMP SUM

The work under this item shall conform to the applicable provisions of Section 995 of the

Standard Specifications and the specific requirements stipulated below for the component parts of this Item. For those component parts where no specific requirement is stipulated, the Standard Specifications shall apply except for payment.

Work under this Item shall include all materials, equipment and labor needed to construct the following:

- Structural steel
- Post-tensioned precast concrete deck panels
- Cast-in-place concrete abutments and wingwalls
- Cast-in-place concrete approach slabs
- Cast-in-place transition bases and transitions
- Cast-in-place concrete end diaphragms
- Cast-in place reinforced concrete safety curbs
- Elastomeric bearing assemblies
- CP-PL2 bridge parapet
- Type II electrification barrier
- Ashlar stone veneer
- Spray applied membrane waterproofing
- ~~Bituminous~~ damp-proofing

The following items shall be considered as incidental to in the unit price of concrete, as stated by the Contractor and as approved by the Engineer in the respective "Basis for Partial Payments": Development of Assembly Plan, form liners, neoprene seals, backer rods, preformed and premolded filler, joint sealer, grout ports, keyway grout, concrete for precast voids, leveling devices, corrugated metal pipe, grouted splice couplers, lifting hardware, bedding grouts, caulking, closed cell foam, weep holes with crushed stone, all piping and drains, waterproofing protective course.

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of this bridge structure or which may be incidental to its construction and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unit price of the component of which they are a part.

STRUCTURAL STEEL

The work under this Item shall conform to the relevant provisions of Section 960.

Prior to the start of work, the Contractor shall submit erection for approval by Amtrak and MassDOT. Such plan should include, at minimum:

1. A detailed description of the means, methods, equipment, and sequence of the planned erection

The Contractor shall contact and coordinate development of this plan with Amtrak prior to submission.

4000 PSI, 1.5 IN., 565 CEMENT CONCRETE**4000 PSI, ¾ IN., 610 CEMENT CONCRETE****5000 PSI, ¾ IN., 685 HIGH PERFORMANCE CEMENT CONCRETE****4000 PSI, ¾ IN., 585 HIGH PERFORMANCE CEMENT CONCRETE**

The following list is a breakdown of the concrete materials to be used for various elements of the bridge:

4000 PSI, 1.5 IN., 565 CEMENT CONCRETE

- Approach Slabs
- Abutments
- Wingwalls

4000 PSI, ¾ IN., 610 CEMENT CONCRETE

- Abutment Backwall
- Curtain Walls

5000 PSI, ¾ IN., 685 HIGH PERFORMANCE CEMENT CONCRETE

- Highway Guardrail Transitions
- Parapets

4000 PSI, ¾ IN., 585 HIGH PERFORMANCE CEMENT CONCRETE

- Precast Deck Panels
- Intermediate Diaphragms
- End Diaphragms
- Deck Closure Pours

The work under these headings shall conform to the applicable provisions of Section 901 of the Standard Specifications with the following additions:

The following miscellaneous items shall be considered incidental and included in the unit price per cubic yard of concrete, as stated by the Contractor and as approved by the Engineer in the respective “Basis for Partial Payments”:

- Threaded inserts for precast backwalls
- Neoprene seals and backer rods
- Preformed and premolded filler
- Joint sealer
- Non-shrink grout
- Closed cell foam
- Closed cell neoprene joint seal
- PVC drains and sub drains
- All other work considered as incidental to the work involved in furnishing and placing the precast concrete elements.
- Controlled Density Fill (Non-Excavatable) – or Flowable Concrete Fill (see below)

MATERIALS

Vertical Joint Seals - Vertical joints seals for waterproofing wall joints shall be natural rubber or neoprene sheet with a durometer of 50-60, meeting the requirements of ASTM D2240.

Closed Cell Neoprene Joint Seal - A preformed joint seal comprised of cellular neoprene expanded rubber that can accommodate both compression and tension due to anticipated movement. Neoprene joint seals shall be installed and be fastened to clean, dry concrete surfaces using a two component epoxy adhesive per the selected manufacturers technical specification.

Non-Shrink Grout - Non-shrink grout shall be chosen from the current MassDOT Qualified Construction Materials List.

STEEL REINFORCMENT FOR STRUCTURES

STEEL REINFORCMENT FOR STRUCTURES – EPOXY COATED

Steel reinforcement for structures shall be used for all cast-in-place concrete work.

Steel reinforcement for structures – epoxy coated shall be used for the closure pours, sidewalks, end diaphragms, keeper blocks, abutment backwalls, wingwall copings, retaining wall footing and stem, abutment beam seats, and guardrail transition barriers.

LAMINATED ELASTOMERIC BEARING W/O ANCHOR BOLTS (101-150)

Steel Reinforced Elastomeric Bearings shall conform to the relevant provisions of M9.14.5 as modified by the following. The bearing dimensions including elastomer thickness and edge cover, number and thickness of steel reinforcing laminates, dimensions of load plates (if any), and the design shear modulus of the elastomer shall be as shown on the Plans. The elastomeric compound shall be composed of 100% low temperature Grade 3 virgin crystallization resistant polychloroprene (neoprene). The bearings shall be fabricated in accordance with M9.14.5 and the requirements and tolerances of AASHTO M251-06. The tolerances on the overall dimensions for the bearings shall be according to Table 2 of AASHTO M251-06, except that the tolerance on the overall vertical dimension shall be limited to -0, +1/8" regardless of the design thickness.

Acceptance testing shall be performed by a nationally recognized testing laboratory approved by the Engineer. At a minimum, the following testing shall be performed:

- Materials shall meet Sections 4.1 thru 4.6 of AASHTO M251-06
- Compressive Strain at maximum dead and live load (service) per Section 9.1 of AASHTO M25106. The compressive deflection of each bearing shall not exceed 10% of the design effective rubber thickness at a compressive load equal to the maximum design load
- Short Duration Compression Test per Section 8.8.2 of AASHTO M251-06
- Shear Modulus of the Elastomer per Section 9.2 of AASHTO M251-06
- Tensile Strength, Ultimate Elongation per ASTM D412
- Shear Bond Strength per ASTM D429
- Heat Resistance per ASTM D573
- Compression Set per ASTM D395

These are not the latest specs - download them from Bridge Manual Website

• Low Temperature Brittleness per ASTM D746 for Elastomer Grades 3

• Sampling for the acceptance testing shall be made on a lot basis and the sampling rate shall be one full size bearing per every ten per lot with a minimum of two bearings. For the purposes of this project, a lot shall be defined as the smallest number of bearings determined by the following criteria:

- A lot shall not exceed a single contract quantity
- A lot shall consist of bearings with the elastomer being of the same size and configuration
- A lot shall consist of bearings produced in a continuous manner from the same batch of elastomer and cured under the same conditions

• Requirements for providing notification to the Department prior to the start of bearing production and provisions for random sampling of the bearings by the Department at the job site for additional destructive testing shall be in accordance with M9.14.5.

TYPE II ELECTRIFICATION BARRIER

The work under this Item shall conform to applicable sections of Section 975 of the Standard Specifications.

GRANITE STONE VENEER

The work to be done under this item shall conform to the relevant provisions of section 685 of the Standard Specifications and the following:

Description

Work under this item consists of installing the granite stone masonry from the demolished existing abutment as a veneer on the exposed face of cast-in-place abutments and wingwalls as shown on the plans.

The existing granite stone masonry shall be placed in a pattern similar to the previously existing stone masonry abutment.

Material Specifications

Mortar:

Site mixed Portland cement mortar complying with ASTM C270 as specified herein:

1. Admixtures and not permitted except where expressly specified herein or as otherwise approved by the Engineer for specific field conditions.
2. Portland cement for masonry shall comply with ASTM C150, Type I, non-staining, without air entrainment. Use Type II as necessary for laying masonry in cold weather.
3. Aggregates for mortar shall be clean, sand, washed uniformly and well graded conforming to ASTM C144 for fine aggregate and ASTM C404 for size 8 and 89 aggregate.

4. Lime shall be an approved brand of plastic hydrated lime, conforming to ASTM C207, Type S.
5. Water shall be clean and fresh without contaminants.

Mortar Types:

1. Mortar for masonry below grade or in contact with earth shall be in conformance with ASTM C270 Type M.
2. Mortar for non-load bearing masonry above grade shall conform to ASTM 270 Type N.
3. Mortar for pointing, dirt and stain resistant type shall conform to ASTM C270, Type N with added aluminum tristearate, calcium stearate or ammonium stearate to a quantity of 3% of Portland cement weight.

Veneer Anchorage:

1. Stainless Steel split tail strap anchor with a minimum thickness of 1/4”.

Masonry Anchorage:

1. Anchors for strap ties to concrete shall be 3/8” diameter stainless steel screw anchors, with a minimum embedment into concrete of 3 inches.

Flashing Materials

1. Concealed through-wall flashing shall be copper fabric flashing consisting of 5 ounce per square foot sheet copper permanently bonded between two layers of ductile asphalt impregnated woven fiberglass fabric equal to:
 - a. Advanced Building Products, Inc., Springvale, Maine, product “Copper Fabric Flashing”.
 - b. Sandell Manufacturing Company, Inc., Amsterdam NY, product “Copper Fabric”.
 - c. York Manufacturing, Inc., Sanford, Maine, product “York Copper Fabric”.
2. Lap sealant for concealed flashing shall be mastic or manufacturer approved sealant (BIA Technical Note 21B).
3. Flashing drip edge shall be fabricated sheet metal flashing from unpolished 26 gage Type 302/304 stainless steel with a 45 degree exposed hemmed edge designed to extend beyond the masonry face a minimum of 3/16 inch and into the masonry veneer a minimum of 5 inches.
4. Provide weeps for veneer masonry in head joints in first course of veneer immediately above all through wall flashing at bottom shelf. Weeps shall be compatible with below grade installations and shall be spaced no more than 24 inches on center. Weep holes shall be kept free from mortar droppings.

Laying Technique Specified

All the stones shall be thoroughly wetted before laying. Every course of stone shall be hammer dressed and laid with faces shall be accurately matched and each face joint shall be dressed at right angles. The masonry shall be carried up regularly and true to plumb. The thickness of joints shall not exceed 1 in.

Curing Method

The work shall be protected from rain or sun while it is green. At the end of the day's work, the top surface of the walls shall be kept flooded so that it acquires the required strength. The masonry shall be kept moist on all the faces for at least 7 days.

Method of Measurement and Payment

Granite Stone Veneer shall be measured and paid for by square foot of veneer placed to the limits shown on the drawings, which price shall include full compensation for all materials, labor, tools and equipment that is required to complete the work in a satisfactory manner.

No separate payment will be made for masonry anchorage, flashing and weep holes but all costs in connection therewith shall be in the unit price bid.

MEMBRANE WATERPROOFING FOR BRIDGE DECKS - SPRAY APPLIED

DESCRIPTION OF WORK

The work under this Item shall conform to applicable sections of Section 965 of the Standard Specifications and the following:

The work to be performed shall consist of the furnishing and application of an approved cold liquid spray applied, seamless methyl methacrylate or polyurea membrane system and all concrete surface preparation work necessary to install the membrane system. The membrane system shall consist of the primer, the membrane, aggregated keycoat layer, and polymer modified tack coat.

This is now a standard spec in the June 2020 Supplemental Specs. Special Provision no longer needed - delete.

GENERAL

Membrane waterproofing application shall be in accordance with the manufacturer's instructions. The Manufacturer's representative shall be present during the entire application and shall oversee surface preparation, installation and quality control testing. The handling, mixing, and addition of membrane components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations. All open flames and spark producing equipment shall be removed from the work area prior to commencement of application in accordance with the Manufacturer's recommendations. No smoking signs shall be posted at the entrances to the work. The Applicator shall be responsible for the protection of equipment and adjacent areas from overspray or other contamination.

Product approval shall require the demonstration, by the Manufacturer, that the membrane system meets the material specifications and that the entire membrane system is designed and tested as waterproofing for use on bridge deck applications. The Contractor and the Applicator shall agree upon a schedule for coordination between trades working in the areas that are to receive the membrane waterproofing system.

SUBMITTALS

The Contractor shall submit to the Engineer for approval the following documents:

1. Initial submission:
 - a. The membrane system material specifications including product performance data.
 - b. Certified independent test reports demonstrating conformance to Table 965.2-1.
 - i. The independent lab shall be recognized by the National Cooperation for Laboratory Accreditation (NACLA) in Construction Materials Engineering and Testing (CMET) or an equal program approved by the Engineer.
 - All testing shall be performed by one independent lab unless approved by the Engineer.
 - ii. Independent testing reports must be dated within two (2) years from the anticipated start of membrane installation.
 - Samples for all required testing shall be fabricated at the same time. Test reports shall denote the lot of material as well as the sample fabrication and testing dates.
 - c. Safety data sheets (SDS) for all components.
 - d. MassDOT shall perform prequalification testing on the membrane.
 - i. Two (2) 10 inch by 10 inch square samples of the proposed membrane with smooth surfaces (no primer or aggregate in the keycoat) shall be provided to the Engineer. The samples shall be a minimum of 80 mils thick or the thickness used to pass the crack bridging requirement found in table 965.2-1.
2. At the pre-application meeting:
 - a. Manufacturer's written approval of the Applicator's qualifications
 - b. List of personnel performing the installation and the Manufacturer's representative performing the inspection and testing.
 - c. Installation procedure including storage and protection instructions as well as handling and mixing instructions.
 - d. List of application equipment to be used.
 - e. Manufacturer's written approval of the proposed polymer modified tack coat and the application rate that it shall be applied at.
3. A minimum of 48 hours prior to installation:
 - a. A certificate of analysis for the proposed polymer modified tack coat shall be submitted by the supplier of the tack coat to the Engineer for approval.
4. Upon completion of installation:
 - a. All QC installation test results for the tests specified in the materials section, including the name, address and contact person of the laboratory that performed the tests and the date of the tests.
 - b. A Certificate of Compliance certifying that the membrane waterproofing system materials and installation meet the requirements of the Manufacturer and the contract specifications.

MATERIALS

Only products pre-approved by the MassDOT Research and Materials section will be accepted for use. The membrane waterproofing system shall consist of:

- primer
- one or two coat rapid curing cold liquid spray applied seamless methyl methacrylate, polyurea, or polyurethane methyl methacrylate membrane
- aggregated keycoat layer
- polymer modified tack coat

The total minimum base thickness for the membrane shall be 80 mils measured over peaks. The membrane shall easily accommodate the need for day joints and patch repairs. The membrane shall be able to bridge live cracks up to 1/8 inch in width and meet the criteria specified in Table 965.2-1.

The membrane waterproofing system shall be asbestos-free. The primer shall promote adhesion of the membrane to the concrete surface. The chemical composition of the primer, membrane, aggregate keycoat and tack coat that make up the membrane waterproofing system shall conform to the Manufacturer's specifications for the material. All components shall be approved by the Manufacturer as being compatible for use with the specified membrane. Cleaning solvents shall also be approved by the Manufacturer for use with the membrane.

APPLICATOR QUALIFICATION

The waterproofing system shall be applied by an Applicator who is approved by the membrane waterproofing system Manufacturer. The Applicator shall be certified by the membrane waterproofing Manufacturer and have at least 2 years of experience in membrane installation. The Engineer shall receive the Manufacturer's written approval of the Applicator's qualifications at least fourteen (14) days prior to the application of any system component. This approval shall apply only to the named individuals performing the application.

MATERIAL DELIVERY AND STORAGE

All components of the membrane system shall be delivered to the site in the Manufacturer's original packaging, clearly identified with the products type and batch number. The Contractor shall provide the Applicator with a storage area for all components. The area shall be cool, dry, out of direct sunlight, and comply with relevant health and safety regulations. Copies of material safety data sheets for all components shall be kept on site at the Contractor's field office.

PRE-APPLICATION MEETING

A minimum of fourteen (14) days before the anticipated start of membrane application, the Contractor shall schedule and conduct a pre-application meeting at the site to review the approved submittals, and other pertinent matters related to the application including the schedule for coordination between trades. At a minimum, the Contractor, the Applicator, the Manufacturer's field representative and the Engineer shall be present at the meeting.

Table 965.2-1: Spray Applied Waterproofing Membrane Material Properties

| PROPERTY | TEST | REQUIREMENTS |
|----------|------|--------------|
|----------|------|--------------|

| | | |
|---|---|---|
| Solids Content | | 100% |
| Stability | ASTM C836 | ≥ 6 months |
| Crack Bridging (Neat Material + Aggregated Keycoat) | ASTM C1305* | Pass, no cracking |
| Extensibility after Heat Aging | ASTM C1522 | For information only |
| Percent Elongation at Break | ASTM D638 | $\geq 130\%$ |
| Tensile Strength | ASTM D638 Type IV @ 2 in/min | $> 1,100$ psi |
| Shore Hardness | ASTM D2240 | ≥ 40 D |
| Minimum Thickness (Membrane only) | ASTM D6132 or other approved method | ≥ 80 mils minimum measured over peaks or \geq thickness used to pass ASTM C1305 (Whichever thickness is greater) |
| Membrane Waterproofing System Adhesion to Concrete | ASTM D7234 | ≥ 100 psi minimum and failure in concrete |
| Water Vapor Transmission – Permeance | ASTM E96 Water Method Procedure B | ≤ 1.0 perms [grains / (hr·ft ² ·in. Hg)] |
| Notes: * ASTM C1305 shall be modified to 25 cycles at -15°F no failure at 1/8 inch per hour. | | |

APPLICATION PROCEDURE

The installation procedure shall consist of preparation of the concrete surface and application of primer, membrane, aggregated keycoat layer, and polymer modified tack coat. Special attention shall be paid to the bridge deck surface preparation prior to the membrane waterproofing system application. A representative from the membrane manufacturing company shall be present for the entire duration of the membrane system application and shall have the responsibility to ensure that the membrane system is installed in accordance with the Manufacturer's requirements. The Manufacturer's representative shall be also responsible for the field testing including but not limited to adhesion bond testing, deck moisture content measurement, and all other required documentation and reporting.

The membrane waterproofing system shall not be applied in either wet, damp or foggy weather, or when the ambient temperature is 40°F or below or is forecast to fall below 40°F during the application period. The temperature of the concrete deck surface shall also exceed the dew point by at least 5°F.

The membrane waterproofing on bridge decks shall not be placed until the Contractor is ready to follow within 24 hours with the first layer of hot mix asphalt pavement; a longer period of time will be allowed only with prior written approval from the Engineer.

Where the areas to be waterproofed are bound by a vertical surface including, but not limited to, a curb or a wall, the membrane waterproofing system shall be continued up the vertical as necessary. A neat finish with well-defined boundaries and straight edges shall be provided.

1. CONCRETE SURFACE PREPARATION

Concrete surfaces which are to be waterproofed shall be screeded to the true cross section and sounded. All spalls and depressions shall be repaired prior to the application of the primer. Depressions shall be filled to a smooth flush surface with 1:2 mortar (1 part cement to two parts sand) or an approved rapid setting patching mortar that is compatible with the membrane waterproofing system. Other surfaces shall be trimmed free of rough spots, projections, or other defects which might cause puncture of the membrane so that the surface profile of the prepared concrete surface shall not exceed a ¼ inch amplitude, peak to valley.

The use of resin or wax-based deck curing membranes is not acceptable. Unless otherwise approved by the Engineer the concrete shall be cured for a minimum of seven (7) days and aged a minimum of 28 days including curing time, before application of the membrane waterproofing system. For precast, high early strength, or rapid setting concrete mixtures for closure pours the Engineer may consider a curing period less than 7 days. This consideration will be subject to the approval of the Manufacturer and the Engineer and may require a mockup simulating the anticipated construction schedule. If an expedited schedule is approved then results of moisture testing and adhesion testing performed on the actual bridge deck and closure pours by the Manufacturer's representative in accordance with these specifications must be performed and all results shall be submitted to the Engineer for approval prior to primer placement.

Immediately prior to the application of the primer, the concrete to which the membrane is to be applied shall be cleaned of all existing bond inhibiting materials in accordance with ASTM

D4259 or as required by the Manufacturer. Dust or loose particles shall be removed using clean, dry, oil-free compressed air or industrial vacuums. The surface preparation shall produce a clean dry surface and insure that the concrete surface is free of bituminous product, surface laitance, oil staining, soiling, and dust.

Any exposed steel components to receive membrane waterproofing shall be blast cleaned in accordance with SSPC SP6 or as required by the Manufacturer and coated with the membrane waterproofing system within the same work shift.

2. APPLYING PRIMER

The primer shall only be applied when the temperature of the concrete deck surface exceeds the dew point by at least 5°F and when the concrete deck surface has a moisture content of 5% or less as confirmed by a portable electronic surface moisture meter supplied by the Contractor.

The primer shall be applied in a manner to ensure full coverage. The primer shall consist of one coat with an overall coverage rate of 125-175 ft²/gal unless otherwise recommended in the Manufacturer's written instructions. All components shall be measured and mixed in accordance with the Manufacturer's recommendations. The primer shall be spray applied using a single or multiple component spray system approved for use by the Manufacturer. If required by site conditions, brush or roller application shall be allowed. The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the Manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

A second coat of primer shall be required if the first coat is absorbed by the concrete. The membrane shall be applied within the primer re-coat drying time allowed by the Manufacturer but in no case shall it exceed 24 hours. Beyond this period, the surface shall be prepared again and re-primed following the Manufacturer's recommendations prior to membrane application.

3. APPLYING MEMBRANE

The waterproofing membrane shall be applied in a methodical manner. The Applicator shall follow the approved mixing and application procedure. Unless approved by the Engineer, the membrane shall be spray applied, with the mixing of the two components taking place at the nozzle, and shall be applied to the primed deck in accordance with the Manufacturer's instructions. The spray equipment shall be controlled so that the quantities applied may be monitored and shall allow for coverage rates to be checked.

Following the application of the membrane waterproofing system, the cured surface shall be visually inspected. If any defects or pinholes are found, an appropriate quantity of membrane material shall be mixed and repaired in accordance with Section 7 Repairs below. In all cases, the thickness of the repair shall be sufficient to bring the area up to the specified thickness. The thickness of the repair patch shall be a minimum of 80 mils, measured over peaks, or the thickness used to pass the ASTM C1305 Crack Bridging Test.

4. APPLYING AGGREGATED KEYCOAT

Following the membrane application, an additional layer of membrane or resin, compatible with the membrane, shall be spray applied to a thickness of 30 to 40 mils into which an aggregate

approved by the membrane Manufacturer shall be broadcast ensuring a minimum coverage of 95%. The coverage rate shall be designated by the Manufacturer. The broadcast aggregate shall be durable and provide the required shear resistant to prevent the hot mix asphalt (HMA) from shoving. Aggregate shall have a minimum Mohs hardness rating of seven (7). Loose aggregate shall be removed with brooms or oil/moisture-free compressed air before applying the tack coat.

5. APPLYING POLYMER MODIFIED TACK COAT

The polymer modified tack coat shall be applied in accordance with the membrane Manufacturer's recommendations after a minimum of three hours from initial membrane application. The tack coat shall consist of either a polymer modified asphalt emulsion or a polymer modified asphalt binder approved for use by the membrane waterproofing Manufacturer and the Engineer. The tack coat shall be allowed to cool for a minimum of 1 hour prior to the application of the hot mix asphalt. The tack coat application rate shall be in accordance with the Manufacturer's recommendation. The application rate shall be monitored by the Quality Control personnel from the paving contractor in accordance with MassDOT approved procedures and shall be verified by the Engineer.

6. PAVING OVER MEMBRANE

Placement of the HMA surface shall be in conformance with Section 450.58 and the contract specifications. During paving, a light soap spray should be applied to the paving equipment wheels to prevent removal of the tack coat.

7. REPAIRS

If an area of membrane requires repair or if the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the membrane waterproofing system. The damaged area shall be cut back to sound materials and wiped with a solvent up to a width of at least 6 inches beyond the periphery of the damaged area, removing contaminants. The concrete shall be primed as necessary, followed by the application of the membrane. A continuous layer shall be obtained over the concrete with a 6 inch overlap onto the existing membrane. The solvent shall be as approved by the membrane waterproofing manufacturer. Repairs shall comply with the Manufacturer's guidelines for any over-coating times.

Where the membrane is to be joined to existing cured material and at day joints, the new application shall overlap the existing membrane/day joint by at least 4 inches. The existing membrane/day joint shall be cleaned of all contamination including tack coat material or dirt to an edge distance of a least 6 inches and wiped with a solvent as approved by the membrane waterproofing manufacturer.

8. MOCKUP TO VALIDATE BOND STRENGTH

A mockup shall be performed for those projects where the available concrete cure time may adversely affect the required bond strength of the spray applied membrane waterproofing system. A mockup using the approved spray applied waterproofing membrane shall be required before and as close as possible to the intended date of the deck slab waterproofing placement to emulate actual placement conditions. The mockup shall take place offsite and be representative of the specified final bridge placement and shall include placement and surface preparation of the

concrete, installation of membrane waterproofing system, and placement of HMA pavement. The intent is to validate the adhesion tensile bond strength in accordance with ASTM D7234 using the membrane Manufacturer's primer and membrane.

Testing shall be performed as directed by the Engineer. Testing shall verify the adhesion bond strength and the moisture content on the deck. The moisture content shall be in accordance with Table 965.2-2. The mockup shall simulate the actual job conditions in all respects including air temperature, transit equipment, travel conditions, admixtures, forming, placement equipment, and personnel. If there are problems, the Engineer may require the Contractor to conduct more trial placements.

If weather conditions change between completion of trial testing and actual placement, adhesion bond testing and deck moisture testing shall be repeated as directed by the Engineer. Removal of the mockup concrete from the job site is the responsibility of the Contractor. In addition to the requirements contained herein, all weather and concrete temperature requirements contained in Subsection 901.64 shall be satisfied.

Acceptance of the mockup shall be the responsibility of the Engineer.

PROTECTION OF EXPOSED SURFACES

The Contractor shall exercise care in the application of the waterproofing materials to prevent surfaces not receiving treatment from being spattered or marred. Particular reference is made to the face of curbs, copings, finished surfaces, substructure exposed surfaces, and outside faces of the bridge. Any material that spatters on these surfaces shall be removed and the surfaces cleaned to the satisfaction of the Engineer.

CONTRACTOR QUALITY CONTROL

The following tests shall be conducted by the Manufacturer's representative and recorded on a test report form to be submitted to the Engineer. All test reports shall be submitted to the Engineer within 72 hours of the test completion. Testing shall be in accordance with Table 965.2-2.

- a. Deck moisture: The concrete deck surface moisture content shall be measured by the Manufacturer's representative. The representative shall determine if the deck moisture is suitable to allow for installation to proceed.
- b. Primer Adhesion: Random tests for adequate tensile bond strength shall be conducted in accordance with ASTM D7234 using the membrane Manufacturer's primer. Minimum bond strength of 100 psi and failure in the concrete will be required for acceptance.

Testing shall be at a frequency of 1 test per 5,000 square feet with a minimum of 3 tests per day. Areas smaller than 5,000 square feet shall receive a minimum of 3 tests.

- c. Film Thickness:
 - a. Wet film thickness shall be checked every 300 square feet in accordance with ASTM D4414 using a gauge pin or standard comb type thickness gauge or a magnetic gauge. Film thickness checks shall be carried throughout the application process.

- b. **Dry Film Thickness:** If the membrane waterproofing system cures too quickly to perform wet film thickness testing, dry film thickness shall be checked every 300 square feet in accordance with ASTM D6132 using magnetic or ultrasonic gauges, or using a destructive method. If a destructive method is used, areas shall be repaired in accordance with Section 10 Repairs.
- c. During the Final Review, the cured membrane film thickness shall be checked by a dial thickness gauge.
- d. **Pin Hole/Holidays:** The entire surface of the membrane shall be inspected for pin holes and/or holidays by the Manufacturer's representative. All pin hole/holidays shall be located, marked for repair, documented, and repaired in accordance with a repair procedure developed by the Manufacturer and approved by the Engineer.
- e. **Membrane Adhesion:** Random tests for adequate tensile bond strength shall be conducted in accordance with ASTM D7234 using the membrane Manufacturer's primer and membrane. The portion of the membrane to be tested shall be separated from the rest of the membrane prior to performing the test so that only the portion under the dolly receives the tensile force. A minimum bond strength of 100 psi and failure in the concrete will be required for acceptance.
- Testing shall be at a frequency of 1 test per 5,000 square feet with a minimum of 3 tests per day. Areas smaller than 5,000 square feet shall receive a minimum of 3 tests.
- f. **Coverage Rates:** Rates for all layers shall be monitored by checking quantity of material used against the area covered.
- g. Visual inspections shall be conducted throughout the application process. The Manufacturer's field representative shall take progress photos for incorporation with his final review report to the Engineer.
- h. The Manufacturer's representative shall a take representative sample of the membrane from that day's installation. The samples shall consist of two (2) 10 inch by 10 inch square samples of the membrane with smooth surfaces. The primer and aggregate shall not be incorporated into the sample. The sample shall be sprayed separate from the bridge deck on a non-adhesive surface using the same application techniques used for the deck. These samples shall be provided to the Engineer to be tested by MassDOT Research & Materials.

Table 965.2-2: Installation Quality Control Testing and Inspection Requirements

| PROPERTY | TEST | FREQUENCY | REQUIREMENTS |
|------------------------|-------------------------------|--|-------------------------------|
| Deck Concrete Moisture | Manufacturer's recommendation | 1 per 5,000 ft ² and minimum of 3 tests | Manufacturer's recommendation |
| Primer Adhesion | ASTM D7234 | 1 per 5,000 ft ² and minimum | ≥ 100 psi minimum and |

| | | | |
|-------------------------------|---|--|---|
| to Concrete | | of 3 tests | failure in concrete |
| Film Thickness | Wet: ASTM D4414 Dry: ASTM D6132 or other approved method | 1 per 300 ft ² and minimum of 3 tests | ≥ 80 mils minimum measured over peaks or \geq thickness used to pass ASTM C1305 (Whichever thickness is greater) |
| Pin Holes | Visual Inspection | Entire surface | No visible defects |
| Membrane Adhesion to Concrete | ASTM D7234 | 1 per 5,000 ft ² and minimum of 3 tests | ≥ 100 psi minimum and failure in concrete |

MASSDOT ACCEPTANCE

Acceptance of the membrane waterproofing system shall only take place once it is determined by the Engineer that the membrane has been installed in accordance with the special provisions and plans and that all necessary documentation has been submitted.

MassDOT shall perform visual inspection of the application and Quality Control during the installation of the membrane system. The two (2) 10 inch by 10 inch samples taken during installation shall be submitted to the Research & Materials section for verification testing.

Table 965.2-3: MassDOT Verification Testing

| PROPERTY | TEST | REQUIREMENTS |
|--------------------------------------|-------------------------------------|--|
| Minimum Thickness (Membrane only) | ASTM D6132 or other approved method | ≥ 80 mils minimum measured over peaks or \geq thickness used to pass ASTM C1305 (Whichever thickness is greater) |
| Percent Elongation at Break | ASTM D638 | $\geq 130\%$ |
| Tensile Strength | ASTM D638 Type IV @ 2 in/min | $> 1,100$ psi |
| Shore Hardness | ASTM D2240 | ≥ 40 D |

FINAL REVIEW

The final review and visual inspection shall be conducted jointly by the Applicator, Contractor, Manufacturer’s field representative and Engineer. Irregularities or other items that do not meet the requirements of the special provisions and the plans shall be addressed/repared at this time, at no additional cost to the MassDOT.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

At the time of bid, the Contractor shall submit on his/her proposal form a schedule of unit priced for the major component Sub-Items that make up Item 995.01 as well as his/her total bridge structure Lump Sum cost for Bridge Structure No. S-09-003. The bridge structure Lump Sum breakdown quantities provided in the proposal form are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.01 and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge Structure No. S-09-003. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

| Sub-Item | Description | Quantity | Units | Unit Price | Total |
|----------|-------------|----------|-------|------------|-------|
|----------|-------------|----------|-------|------------|-------|

| | | | | | |
|---|---|---------|----|--|--|
| 901. | 4000 PSI, 1-1/2 IN., 565 CEMENT CONCRETE | 760 | CY | | |
| 904. | 4000 PSI, 3/4 IN., 610 CEMENT CONCRETE | 20 | CY | | |
| 904.3 | 5000 PSI, 3/4 IN., 685 HP CEMENT CONCRETE | 140 | CY | | |
| 904.4 | 4000 PSI, 3/4 IN., 585 HP CEMENT CONCRETE | 80 | CY | | |
| 908.4 | ASHLAR STONE VENEER | 2800 | SF | | |
| 910.1 | STEEL REINFORCEMENT FOR STRUCTURES-EPOXY COATED | 126,300 | LB | | |
| 922.2 | LAMINATED ELASTOMERIC BEARING W/O ANCHOR BOLTS (51-100) | 12 | EA | | |
| 960. | STRUCTURAL STEEL | 73,100 | LB | | |
| 965.2 | MEMBRANE WATERPROOFING FOR BRIDGE DECKS - SPRAY APPLIED | 2200 | SF | | |
| 970. | BITUMINOUS DAMP PROOFING | 85 | SY | | |
| 975.5 | ALUMINUM HANDRAIL | 132 | FT | | |
| 975.6 | TYPE II ELECTRIFICATION BARRIER | 165 | FT | | |
| Contract Bid Price for LUMP SUM Item 995.01 = | | | | | |

TOTAL LUMP SUM FOR ITEM 995.01 =

The above schedule on the proposal form applies only to Bridge Structure No S-09-003. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

The plans call for precast Highway Guardrail Transitions, however you do not have the required Special Provision in Item 995 and you do not have a pay item in the breakdown above. So, what is it? Precast or not? Make the project specs and plans consistent.

ITEM 998.1

RAILROAD FLAGGER

HOUR

The work under this Item shall be performed by the railroad flagger provided by the Operating Railroad.

No work will be permitted by the Contractor within or over the railroad right-of-way without the Operating Railroad's flagger being present. Each workday will begin with the required Job Briefing which will be given by the flagger.

The Contractor shall be responsible for coordinating their work with the Operating Railroad and retain the flagger service from the Operating Railroad.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment under this item will be made at the contract unit bid price per hour under Item 998.1.

END OF DOCUMENT
