

TECHNICAL SPECIFICATIONS AND SPECIAL PROVISIONS

Project:

King Corner Culvert Replacement

Project Location:

Route 8A at King Brook

Hawley, MA

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TECHNICAL SPECIFICATIONS

All work done under this Contract shall be in conformance with the current editions of the Commonwealth of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges and all superseded editions; the Massachusetts Department of Transportation Highway Department Construction Standard Details; Traffic Management Plans and Detail Drawings; Massachusetts Department of Transportation Highway Department Standard Drawings for Signs and Supports; the latest "Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)" with the current Massachusetts amendments; the latest edition of American Standards for Nursery Stock, Town of Hawley Standards, the Plans, and these Special Provisions.

The General Conditions, Supplementary Conditions and Special Provisions shall take precedence over the General Requirements of Division 1 and 2 of the Standard Specifications.

SPECIAL PROVISIONS

ITEM 101.

CLEARING AND GRUBBING

ACRE

Work under this item shall conform to the relevant provision of Section 101 of the Standard Specifications and the following:

Trees and shrubs that are specifically designated by the Engineer not to be cut, removed, destroyed or trimmed shall be saved from harm and injury. All damage done to trees by the Contractor's operation and all branches of trees extending within the roadway shall be trimmed as directed to provide the minimum vertical clearance including selective trimming of such trees as directed. When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.

Except for materials used for making wood chip mulch or as otherwise designated by the Engineer, the Contractor shall make all arrangements and negotiations necessary for the satisfactory disposal of trees, shrubs, stumps, roots, dead wood and other litter, in areas outside the Right-of-Way and in such manner that no condition or accumulation of material shall be permitted to disfigure or mar the finished landscape. The burning of trees, brush, stumps, etcetera, will not be permitted. All such areas shall be restored to a condition acceptable to the Engineer including necessary mulching, seeding, and planting without additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 101 Clearing and Grubbing will be measured by the horizontal plane area and will be the actual number of acres cleared and grubbed within those areas designated on the plans, or as directed by the Engineer.

BASIS OF PAYMENT

Item 101 Clearing and Grubbing will be paid for at the contract unit price per acre, which price shall be full compensation for furnishing all tools, labor, equipment and all incidentals necessary to complete the work.

ITEM 120.1**UNCLASSIFIED EXCAVATION****CUBIC YARD**

Work under this Item shall conform to the relevant provision of Section 120 of the Standard Specifications and the following:

The work under this Item consists of the excavation of existing concrete guard posts, existing pavement, pavement sub-base materials and topsoil at the locations shown on the plans, or as required to complete the work of the contract. All materials removed shall become the property of the Contractor and shall be properly disposed of by the Contractor in accordance with applicable local, state and federal regulations.

Grading and compacting the subgrade, as directed, shall be included in the price bid under this item. Use of a grader and roller, or other suitable compaction equipment, will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 120.1 Unclassified Excavation will be measured in Cubic Yards in place by the cross-section method, to the limits specified on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 120.1 Unclassified Excavation will be paid for at the contract unit price cubic yard, which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 123.**MUCK EXCAVATION****CUBIC YARD**

Work under this Item shall conform to the relevant provisions of Section 120 of the Standard Specifications and the following:

The work under this Item consists of the excavation of the saturated soil within the area of the existing stream after the stream has been dewatered. Excavated material shall be sufficiently dewatered within the site to allow material to be properly handled and contained fully within the containers used for transport. No sediments shall be transported to the disposal area unless the material is sufficiently dry as to not drip sediments onto travel lanes. All materials removed shall become the property of the Contractor and shall be properly disposed of by the Contractor in accordance with applicable local, state and federal regulations.

METHOD OF MEASUREMENT

Item 123. Muck Excavation will be measured in Cubic Yards in place by the cross-section method within the Mean Annual High-Water delineation as shown on the plans, or as directed by the Engineer.

BASIS OF PAYMENT

Item 123. Muck Excavation will be paid for at the contract unit price per cubic yard, which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 140.1**BRIDGE EXCAVATION WITHIN COFFERDAM****CUBIC YARD**

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

The work shall consist of the excavation required to construct the new 3-sided precast concrete bridge. The excavation shall include the removal and satisfactory disposal of materials including existing 90" corrugated metal pipe culvert, masonry training walls, and masonry headwalls encountered in the excavation for proposed precast bridge.

Excavation outside the limits of Bridge Excavation Within Cofferdam will be considered as made for the Contractor's convenience and will not be included for payment under Item 140.1.

Suitable material may be stockpiled to be reused by the contractor for backfill. Excess or otherwise unsuitable material shall become the property of the Contractor and shall be properly disposed of by the Contractor in accordance with applicable local, state and federal regulations.

Grading and compacting the subgrade, as directed, shall be included in the price bid under this item. Use of a grader and roller, or other suitable compaction equipment, will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 140.1 Bridge Excavation Within Cofferdam will be measured in Cubic Yards in place by the cross-section method within the area as shown on the plans, or as directed by the Engineer. Measurement shall be to vertical limits of crushed stone under the bridge foundation as shown on the plans.

Excavation made outside the lines prescribed for payment will be considered made for the Contractor's convenience and will not be included for payment under this item, nor will the refilling of any such area be included under any item of filling material.

BASIS OF PAYMENT

Item 140.1 Bridge Excavation Within Cofferdam will be paid at the contract unit bid price per cubic yard, which the price shall include full compensation for all materials, tools, equipment, and all incidental work necessary to complete all work.

ITEM 143.**CHANNEL EXCAVATION****CUBIC YARD**

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

The work shall consist of excavation of the existing stream channel outside of the footprint of the bridge for the installation of the new streambed material and riprap slope protection outside the Mean Annual High-Water delineation to the limits and depths shown on the plans, or as directed by the Engineer. All materials removed shall become the property of the Contractor and shall be properly disposed of by the Contractor in accordance with applicable local, state and federal regulations.

(Item 143 Continued)

Grading and compacting the subgrade, as directed, shall be included in the price bid under this item. Use of a grader and roller, or other suitable compaction equipment, will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 143. Channel Excavation will be measured in Cubic Yards in place by the cross-section method outside the Mean Annual High-Water delineation as shown on the plans, or as directed by the Engineer.

BASIS OF PAYMENT

Item 143. Channel Excavation will be paid for at the contract unit price per cubic yard which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 150.

ORDINARY BORROW

CUBIC YARD

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

Ordinary borrow shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M1.01.0: *Ordinary Borrow*. Ordinary borrow shall be used as required to reestablish embankments to the lines and grades shown on the plans and as directed by the Engineer.

Grading and compacting the subgrade, as directed, shall be included in the price bid under this item. Use of a grader and roller, or other suitable compaction equipment, will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 150. Ordinary Borrow will be measured in cubic yard compacted in place by the cross-section method, to the limits specified on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 150. Ordinary Borrow will be paid for at the contract unit price per cubic yard which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 151.

GRAVEL BORROW

CUBIC YARD

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

Gravel Borrow shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M1.03.0, Type B Gravel Borrow. Gravel Borrow shall be used for reestablishing subgrade as shown on Project Plans and as directed by the Engineer.

(Item 151. Continued)

Grading and compacting the subgrade, as directed, shall be included in the price bid under this item. Use of a grader and roller, or other suitable compaction equipment, will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 151. Gravel Borrow will be measured in cubic yard compacted in place by the cross-section method, to the limits specified on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 151. Gravel Borrow will be paid for at the contract unit price per cubic yard which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 156.

CRUSHED STONE

CUBIC YARD

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

Crushed stone shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M2.01.4, *3/4" Crushed Stone*. Crushed stone shall be used for a stabilization bed for RIPRAP slope protection, Streambed Material, as shown on Project Plans and as directed by the Engineer.

Grading and compacting of crushed stone, as directed, shall be included in the bid price under this item. Use of a vibratory compactor will be required when ordered by the Engineer.

METHOD OF MEASUREMENT

Item 156. Crushed Stone will be measured by the cubic yard, complete in place, by the cross-section method, to the limits specified on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 156. Crushed Stone will be paid for at the contract unit price per cubic yard completed in place, which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 156.1

CRUSHED STONE FOR BRIDGE FOUNDATION

CUBIC YARD

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

Crushed stone for bridge foundation shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M2.01.4, *3/4" Crushed Stone*. Crushed stone for bridge foundation shall be used for a stabilization bed for under precast bridge footings.

Grading and compacting of crushed stone for bridge foundation, as directed, shall be included in the bid price under this item. Use of a vibratory compactor will be required when ordered by the Engineer.

(Item 156.1 Continued)

METHOD OF MEASUREMENT

Item 156.1 Crushed stone for bridge foundation will be measured by the cubic yard, complete in place, by the cross-section method, to the limits specified on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 156.1 Crushed stone for bridge foundation will be paid for at the contract unit price per cubic yard completed in place, which price shall be full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 170. **FINE GRADING AND COMPACTING – SUBGRADE AREAS** **SQUARE YARD**

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

The work shall consist of the shaping the subgrade to the proposed cross-section and the compaction of said subgrade in accordance with the provision of 150.60: General and 150.62: Embankment Construction with Materials Other Than Rock. Any depressions shall be filled with suitable material and high spots shall be removed and the area shall be compacted until the surface is smooth and satisfactory compacted. Work shall include the fine grading and compacting of the subgrade for the bridge footings.

Grading tolerance of ½ in. above or below the finished subgrade will be allowed provided that this ½ in. above or below grade is not maintained for a distance longer than 50 ft and that the required crown for roadway subgrade is maintained.

METHOD OF MEASUREMENT

Item 170. Fine grading and compacting of the subgrade shall be measured by the square yard, in place, to the limits specified on the plans or as directed by the Engineer. Fine grading for areas to be loamed and seeded shall be included under Item 751. Loam for Roadsides.

BASIS OF PAYMENT

Item 170. Fine grading and compacting of the subgrade will be paid for at the contract unit price per square yard, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work. Grading and compacting of work not included under this section shall be paid for at the unit contract price for the associated contract item.

ITEM 376.2 **HYDRANT – REMOVED AND RESET** **EACH**

Work under this item shall consist of the removal and reinstallation of the existing dry hydrant located along West Hawley Road. The Contractor shall coordinate the removal, stacking, and reinstallations of portions of the existing dry hydrant system that interfere with the installation of the modular block retaining wall.

Dry hydrant and supply line shall be carefully exposed, to the limits required for completion of the work of the contract, and the supply line shall be cut cleanly and temporarily plugged to enable reinstallation

(Item 376.2 Continued)

of the hydrant. The Contractor shall remove the dry hydrant supply line only to the extent required to accommodate the other work of the contract. The Contractor shall cut the supply line outside of the wetland resource area. Removed dry hydrant shall be stored in a safe, covered location on-site or within the approved laydown area, and protected for the duration of the work prior to reinstallation. The Town shall be notified for inspection of the dry hydrant prior to re-installation and after installation, but prior to backfilling.

Additional pipe and fittings required for the re-installation of the dry hydrant shall be incidental to this item. No additional payment will be made.

METHOD OF MEASUREMENT

Item 376.2 Hydrant – Removed and Reset shall be measured by each hydrant installation in place accepted by the Engineer. No measurement shall be made for any additional pipe and/or fittings for the reinstallation of the dry hydrant.

BASIS OF PAYMENT

Item 376.2 Hydrant – Removed and Reset will be paid for at the unit contract price per each hydrant accepted by the Engineer, which price include full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 402.

DENSE GRADED CRUSHED STONE FOR SUB-BASE

CUBIC YARD

Work under this item shall conform to the relevant provisions of Section 402 of the Standard Specifications and the following:

Dense graded crushed stone for sub-base shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M2.01.7, *Dense Graded Crushed Stone for Sub-base*. Stone shall consist of hard, durable particles or fragments of stone, and free from clay, loam, trash or other deleterious materials. Dense graded crushed stone shall conform to the following gradation:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
2 in.	100
1 ½ in.	70-100
¾ in.	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

METHOD OF MEASUREMENT

Item 402. Dense graded crushed stone for sub-base shall be measured by the square yard, in place, to the limits specified on the plans or as directed by the Engineer, with no percentage added.

(Item 402 Continued)

BASIS OF PAYMENT

Item 402. Dense graded crushed stone for sub-base shall be paid for at the contract unit price per cubic yard, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 402.13

PAVEMENT MILLING MULCH FOR SHOULDERS

FOOT

Work under this item shall conform to the relevant provisions of Section 445 of the Standard Specifications and the following:

The work shall consist of placing 4-inch-thick layer of pavement millings on top of geotextile fabric to the lines and grades shown on the plans or as directed by the Engineer. Generally, pavement millings will generally be 3 feet wide and extend along both sides of the entire length of the edge of the roadway pavement where there is no guardrail.

Pavement millings are to consists of recently milled bituminous concrete (asphalt) pavement. The milled material shall meet the following gradation requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 ½ in.	100
1 in.	85-100
½ in.	10-50
No. 4	0-10

The geotextile fabric shall conform to the requirements of Division III: Materials Specification of the Standard Specification for M9.50.0 *Stabilization Fabric*.

METHOD OF MEASUREMENT

Item 402.13 Pavement milling mulch for shoulders shall be measured by the linear foot of actual placed millings along the edge of roadway, to the limits shown on the plans or as directed by the Engineer.

BASIS OF PAYMENT

Item 402.13 Pavement milling mulch for shoulders will be paid for at the contract unit price per linear foot, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work.

ITEM 443.

WATER FOR DUST CONTROL

M. GALLON

Work under this item shall conform to the relevant provisions of Section 440 of the Standard Specifications and the following:

Water for dust control shall be applied at the locations at such times, and in the amount as directed by the Engineer. Quantities of water wasted or applied without authorization will not be paid for.

(Item 443. Continued)

Water for dust control shall not be taken from King Brook without written authorization from the Hawley Conservation Commission. Watering equipment shall consist of pipelines, tanks, tank trucks, or other devices, approved by the Engineer, which are capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operational control.

METHOD OF MEASUREMENT

Item 443. Water for Dust Control will be measured by the M. Gallons (1,000 gallons) in tanks or tank trucks of predetermined capacity, or by means of satisfactorily installed measuring device. All measuring devices shall be furnished by the Contractor. Should water from King Brook be approved for use, there will be no measurement for Water for dust control.

BASIS OF PAYMENT

Item 443. Water for Dust Control will be paid for at the contract unit price per M. Gallons applied for dust control, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidental costs required to complete the work. Should water from King Brook be approved for use, there will be no payment for Water for dust control.

<u>ITEM 450.23</u>	<u>SUPERPAVE SURFACE COURSE – 12.5 (SSC – 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 452.</u>	<u>ASPHALT EMULSION FOR TACK COAT</u>	<u>GALLON</u>
<u>ITEM 453.</u>	<u>HMA JOINT ADHESIVE</u>	<u>FOOT</u>

Work under this item shall conform to the relevant provisions of Section 450 of the Standard Specifications, MassDOT Document 00717 (Superpave Requirements) and the following:

The Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period for West Hawley Road (Route 8A) is a Traffic Level 2, 0.3 to 4 Million 18-kip (80-kn) ESALs.

The emulsion shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M3.03.1: *Anionic Emulsified Asphalt*.

Hot Mixed Asphalt joint adhesive shall conform to the requirements of Division III: Material Specifications of the Standard Specifications for M3.05.4: *Hot Applied Pavement Joint Adhesive*.

METHOD OF MEASUREMENT

Items shall be measured in accordance with the relevant sections of the Standard Specifications.

BASIS OF PAYMENT

Items will be paid for in accordance with the relevant sections of the Standard Specifications.

ITEM 482.3**SAWCUTTING ASPHALT PAVEMENT****FOOT**

Work under this item shall conform to the relevant provisions of Section 482 of the Standard Specifications and the following:

The work under this item shall include the sawing of existing bituminous pavement. The sawcuts shall be made vertical and to a depth as directed. Care shall be taken to keep the face of all cuts smooth. The use of a cutting wheel or cutting by jackhammering is prohibited. Sawcuts shall be made only where shown on the plans, or where directed by the Engineer.

When saw cutting hot mix asphalt surfaces, the Contractor shall paint the entire exposed surface of the cut with an application of emulsified asphalt adequate and/or HMA joint adhesive to ensure proper bonding of the new pavement.

METHOD OF MEASUREMENT

Item 482.3 Sawcutting asphalt pavement shall be measured per linear foot of pavement cut in field.

BASIS OF PAYMENT

Item 482.3 Sawcutting asphalt pavement will be measured per the unit price per foot, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidentals necessary to complete the work.

Any water that is necessary in the performance of this item of work shall be considered as incidental to the item.

ITEM 620.13**GUARDRAIL, TL-3 (SINGLE FACED)****FOOT****ITEM 627.1****TRAILING ANCHORAGE****EACH****ITEM 627.83****GUARDRAIL TANGENT END TREATMENT, TL-3****EACH****ITEM 628.83****TRANSITION TO BRIDGE RAIL****EACH**

Work under these items shall conform to the relevant provisions of Section 600 of the Standard Specifications, Engineering Directive E-17-001, the October 2017 Construction Standards Details for W-Beam Guardrail and Guardrail End Terminals and the performance requirements contained in the 2016 edition of the Manual for Assessing Safety Hardware (MASH), and the following:

If a post cannot be installed to the minimum depth as specified by the Standard Specifications and Construction Standard Details due to an obstruction, or where specifically indicated on the Plans, or as directed by the Engineer, a Modified Post Installation shall be performed in accordance with the provisions outlined in MassDOT Construction Standard M/E 401.12.0. The use of the Modified Post Installation must be authorized by the Engineer. The still posts shall be installed with a concrete foundation with dimensions based on embedment depths. The concrete foundation shall be at least 4,000 psi concrete and shall be furnished and installed in accordance with relevant provisions of Section 900 of the Standard Specifications. The dimensions of the concrete foundation shall be as indicated as follows:

(Items 620.13, 627.1, 627.83, 628.83 Continued)

Post Embedment Depth Range (in)	Dimensions of Concrete Foundation		
	Height (in)	Width (in)	Length (in)
12-18	12-18	30	30
18-30	18-30	24	24
Over 30	30	18	18

METHOD OF MEASUREMENT

Item 620.13 Guardrail will be measured along the top edge of the rail element from the center of the first mid-span splice to the center of the last mid-span splice.

Item 627.1 Trailing anchorage will be measured as an individual unit 9 ft-4.5 in. in length, measured from the mid-span splice with the guardrail to the centerline of the short timber breakaway post, as shown on the plans.

Item 627.83 Tangent end treatments will be measured as individual units, measured from the Begin Length of Need to the face of the impact head, as shown on the plans.

Item 628.83 Transition to Bridge Rail will be measured as individual units 33 ft.-9 in. in length, measured from the mid-span splice with the guardrail or end terminal to the end of the thrie beam terminal connector, as shown on the plans.

BASIS OF PAYMENT

The construction of all guardrail items shall include the assembly and erection of all components, parts and materials complete at the intended locations.

Item 620.13 Guardrail will be paid for at the contract price per foot, complete in place, including posts, offset blocks, panels and connecting hardware.

Item 627.1 Trailing anchorage will be paid for at the contract unit price each, complete in place.

Item 627.83 Tangent end treatment will be paid for at the contract unit price each, complete in place.

Item 628.83 Transition to Bridge Rail will be paid for at the contract unit price each, complete in place.

Guardrail delineators shall be considered incidental to the cost of the guardrail, guardrail end treatment or guardrail trailing anchorage.

The use of special post designs, where necessary or directed by Engineer, shall be incidental to the work with no additional compensation.

ITEM 690.1 **STONE MASONRY WALL REMOVED AND REBUILT, DRY** **SQUARE YARD**

Work under this item shall conform to the relevant provisions of Section 690 of the Standard Specifications and as follows:

The work under this item shall consist of the removal of the existing stone training walls, temporary storage of the existing stone wall materials, and the reconstruction of dry stack stone masonry training walls to the lines and grades shown on the Plans and as directed by the Engineer.

METHOD OF MEASUREMENT

Item 690.1 Stone masonry wall removed and rebuilt, dry will be measured by the square yard of vertical face of stone wall actually laid in place and approved by the Engineer.

BASIS OF PAYMENT

Item 690.1 Stone masonry wall removed and rebuilt, dry shall be paid for at the contract unit price per square yard complete in place, which price shall include full compensation for furnishing all tools, labor, equipment, excavation, backfill and all incidentals necessary to complete the work.

ITEM 698.3 **GEOTEXTILE FABRIC FOR SEPARATION** **SQUARE YARD**

The work under this Item consists of furnishing all labor, materials, tools and equipment and perform all operations necessary for the installation of geotextile fabrics for separation, as indicated on the Plans and as specified herein.

MATERIALS

Materials shall meet the requirements specified herein and the following Subsection of Division III: Materials Specifications:

Geotextile FabricsM9.50.0

Geotextile fabric for Separation:

Geotextile fabric for separation applications shall be a non-woven polypropylene fabric, such as Mirafi 180N or equal. Equal shall be found on the MassDOT Quality Construction Material List (QCML) for non-woven subsurface separation.

Geotextile fabric for separation shall meet the following properties:

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE
Grab Tensile Strength	ASTM D4632	lbs	205
Grab Tensile Elongation	ASTM D4632	%	50
Trapezoid Tear Strength	ASTM D4533	lbs	80
CBR Puncture Strength	ASTM D6241	lbs	500
Apparent Opening Size (AOS)	ASTM D4751	U.S. Seive	80
Permittivity	ASTM D4491	sec ⁻¹	1.2
Flow Rate	ASTM D4491	gal/min/ft ²	95

(Item 698.3 Continued)

METHOD OF MEASUREMENT

Item 698.3 Geotextile fabric for separation shall be measured in place, for Geotextile fabric for separation to the limits specified on the plans or as directed by the Town.

BASIS OF PAYMENT

Item 698.3 Geotextile fabric for separation will be paid for at the Contract Unit price per square yard of geotextile fabric for separation, which price shall include all labor, material, equipment and incidental costs required to complete the work.

<u>ITEM 741.</u>	<u>ENGINEER'S FIELD OFFICE AND EQUIPMENT (TYPE B)</u>	<u>MONTH</u>
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Work under this item shall conform to the relevant provisions of Section 740 of the Standard Specifications and as follows:

Engineering field office is to be established in an area located off West Hawley Road approved by the Town.

Contractor may provide a trailer that meets the requirements of the relevant provisions of Section 740 of the Standard Specifications with the following exceptions:

Contractor shall provide the Engineer with temporary sanitary facilities in the form of portable toilets (Porta-Potty®).

Portable water shall be provided by the Contractor within suitable containers as no municipal drinking water is within the project area.

METHOD OF MEASUREMENT

Item 741. Engineer's field office and equipment (type b) will be measured by the length of time, per month, the trailer and associated equipment and connections are in place.

BASIS OF PAYMENT

Item 741. Engineer's field office and equipment (type b) shall be paid for at the contract unit price per month, which price shall include full compensation for all labor, material, fencing, surfacing, equipment service, and incidentals necessary to provide, equip, maintain, insure, remove, and dispose of trailer and clean the site as specified and directed by the Engineer.

<u>ITEM 748.</u>	<u>MOBILIZATION</u>	<u>LUMP SUM</u>
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Work under this item shall conform to the relevant provisions of Subsection 748 of the Standard Specifications and as follows:

Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of all contractor's field offices, buildings, and other facilities necessary for work on the project, the development of a spill prevention and countermeasures plan and health and safety plan, and

(Item 748 Continued)

all other work and operations which must be performed or for costs which must be incurred prior to beginning of work.

SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN (SPCCP)

The Contractor shall provide the Town, ten (10) working days prior to the commencement of work, a written Spill Prevention Control and Countermeasures Plan / Emergency Action Plan (SPCCP/EAP). This plan shall include, at a minimum, (1) a plan for containing anticipated construction materials to prevent possible spills; (2) telephone numbers of key management personnel including local and state public safety agencies; (3) and inventory of spill mitigation equipment such as sorbent booms, etc. which are to be kept on site; and (4) standard procedures for containing possible spills.

HEALTH AND SAFETY PLAN (HASP)

Health and Safety on the project site shall be the sole responsibility of the Contractor. The Contractor shall be responsible for monitoring the health and safety practices of its own personnel and those of all sub-contractors present on the site. The Contractor shall be responsible for knowledge of and compliance with all relevant OSHA regulations, as well as all other Federal, State, and Local laws, ordinances, codes, and regulations pertaining to health and safety.

A general and site specific Health and Safety Plan (Contractor's HASP) shall be in place prior to the Start of Work. The Contractor is hereby notified that the Town of Hawley shall place the utmost importance on the proper planning, execution and adherence to the safety plan and all required general safety procedures. Review of Contractor's HASP by the Town, its Design Consultant, and/or the Engineer in no way implies acceptance of responsibility for job site safety by the Town, its Design Consultant, and/or the Engineer. The Contractor shall be solely responsible for job site safety.

The Contractor's HASP shall specifically address fall protection, water safety, and traffic safety, as well as all other areas deemed necessary by the Contractor.

Neither the professional activities of the Town, the Engineer, or the Town's Design Consultant, nor the presence of the Town, the Engineer, or the Design Consultant's employees and/or subcontractors shall be construed by any party to imply that the Town, the Engineer, or its Design Consultant has any responsibility for any Contractor's methods of work performance, procedures, superintendence, sequencing of operations, or safety in, on or about the project site. With respect to site safety, the Town will be solely responsible for the on-site activities of its own employees and subcontractors, and this responsibility will not be construed to relieve the Contractor from their obligations to maintain a safe project site.

STATE HIGHWAY ACCESS PERMIT

The Contractor shall be responsible for obtaining a State Highway Access Permit for installation of traffic controls associated with the required detour and all other work within the State Highway right-of-way requiring such approval from MassDOT through the MassDOT State Highway Access Permit System (SHAPS). Obtaining a State Highway Access Permit(s) as needed shall be considered incidental to the work requiring the permit and no separate payment shall be made for obtaining and maintaining such permits.

(Item 748 Continued)

METHOD OF MEASUREMENT

Item 748. Mobilization will be paid for under a contract unit lump sum price, which price shall not exceed 3% of the contract bid total, exclusive of the Mobilization item. Failure to observe this requirement may result in rejection of the bid in accordance with Subsection 2.04: *Preparation of Proposals*

BASIS OF PAYMENT

Item 748. Mobilization shall be paid for at a contract unit lump sum price, which price shall include full compensation for furnishing all tools, labor, equipment, and all incidentals necessary to complete the work. Mobilization shall be paid as three payments. The payment schedule shall be as follows:

1. The first payment of one third of the lump sum price for Mobilization or 1.0% of the total bid price, whichever is less, will be made on the first estimate.
2. The second payment of one third of the lump sum price for Mobilization or 1.0% of the total bid price, whichever is less, will be made following the completion of 5% of the total Contract price.
3. The third payment of one third of the lump sum price for Mobilization or 1.0% of the total bid price, whichever is less, will be made following the completion of 10% of the total Contract price.
4. Upon completion of all the work on the project, payment of any amount bid for Mobilization in excess of the total amount previously paid, will be paid.

ITEM 751.

LOAM FOR ROADSIDES

CUBIC YARD

Work under this item shall conform to the relevant provisions of Subsection 751 of the Standard Specifications and as follows:

Work included under this item shall include but not limited to: testing, furnishing, stockpiling, spreading and fine grading loam borrow. A minimum depth of 4 in. of loam borrow shall be applied in all lawn or vegetated areas as shown on the plans, areas that have been impacted by construction, or as directed by the Engineer.

Areas requiring 4 in. of depth or less shall be covered with loam and then seeded, areas requiring greater than 4 in. of depth shall be back-filled with Ordinary Borrow then established to grade with 4 in. of loam then seeded.

Materials shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M1.05.0: *Loam*, M1.06.0: *Organic Soil Additives*, M6.01.0: *Inorganic Amendments*. Off-site loam shall conform to the following gradation:

Sieve Size	Percentage Passing
No. 10	85-100
No. 40	35-85
No. 200	10-35
<20 mm	<5

(Item 751. Continued)

At least 30 days prior to ordering, the Contractor shall submit to the Town, and the Engineer samples, certificates, and certified test results for materials. Any imported material which does not meet the requirements shall be rejected and removed from the site.

METHOD OF MEASUREMENT

Item 751. Loam for roadsides will be measured in cubic yards in place after compaction to the depth specified on the Plans, or as directed, and there shall be no additional compensation to account for such loss as may be due to settlement, shrinkage and penetration into the underlying material.

BASIS OF PAYMENT

Item 751. Loam for roadsides shall be paid for at the unit contract price per cubic yard, complete in place, which prices shall include full compensation for furnishing all tools, labor, equipment, testing, analysis, grading and all incidentals necessary to complete the work.

ITEM 753

STREAMBED MATERIAL BORROW

CUBIC YARD

The work of this item includes furnishing all labor, materials, equipment and incidentals required to furnish and install streambed material inside, directly upstream and downstream of the 3-sided precast concrete bridge as shown on the Plans, or as directed by the Engineer.

1. Grades shown on the Plans are the top of the reconstructed streambed with the exception of any larger boulders noted. These larger boulders should be placed in the first or second upper lifts to create embedment and avoid them being placed on top of the surface although they may protrude above the stream surface.
2. Imported material shall be of natural origin, shall match the material identified in the reference reach in surface type, shape, composition and geological classification and consists of rounded to sub-rounded cobbles and stones within a mix meeting the gradation shown herein and similar in appearance and texture to the existing stream bed material upstream and downstream of the work area. The material shall be substantially free of deleterious material, substantial organics, recycled asphalt, shall or products from crushing or blasting operations. Stones greater than 4 in. in diameter shall be generally free of fractured faces.
3. Any material or stone excavated from the existing and/or historical streambed can be stockpiled, within the laydown/staging area, and reused for streambed restoration, provided the excavated
4. material is characteristic of the existing stream material upstream and downstream of the work area and is approved by the Engineer.
5. The Contractor shall submit a work plan to the Engineer describing the methodology and equipment that will be utilized to complete the stockpiling and placing of the streambed materials.
6. Materials for streambed replacement including stones/cobbles/fines shall be placed as specified in the Plans and shall reasonably meet these typical gradation requirements.

(Item 753. Continued)

SIEVE DESIGNATION	PERCENT PASSING BY MASS
12 in.	100
10 in.	75-95
8 in.	55-75
6 in.	45-55
3 in.	30-45
1 in.	15-30
½ in.	0-15

One dozen semi-random boulders shall be placed randomly throughout the installation in addition to the above noted streambed material and shall consist of similar composition material (rounded boulders) and range in diameter from 18 in. – 36 in.

7. A sample of the streambed material from a proposed import source shall be submitted to the Engineer for approval. Alternatively, the Contractor may specify potential sources for the Engineer to visit with the Contractor for source approval. Engineer may provide visual approval of material to meet gradation however costs for up to two (2) sieve analysis tests to confirm source/sample gradation will be borne by the Contractor and will be incidental to this item.

METHOD OF MEASUREMENT

Item 753. Streambed material borrow will be measured in cubic yards in place after compaction to the depth specified on the Plans, or as directed, and there shall be no additional compensation to account for such loss as may be due to settlement, shrinkage and penetration into the underlying material.

BASIS OF PAYMENT

Item 753 Streambed material borrow shall be paid for at the unit contract price per cubic yard, complete in place, which prices shall include full compensation for furnishing all tools, labor, equipment, testing, analysis, grading and all incidentals necessary to complete the work.

The one-dozen boulders specified to be placed within the streambed material as shown on the Drawings shall be incidental to the work of this item, and will not have separate payment.

ITEM 765.

SEEDING

SQUARE YARD

The work under this Item shall conform to the relevant provisions of Section 765 of the MassDOT Standard Specifications.

This Item shall be measured and paid for in accordance with the relevant provisions of Section 765 of the MassDOT Standard Specifications.

ITEM 767.121

SEDIMENT CONTROL BARRIER

FOOT

The work under this Item shall conform to the relevant provisions of Sections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier.

(Item 767.121 Continued)

Sediment control barrier shall be installed in the locations as shown on the Plans prior to disturbing upslope soil.

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

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier. Photo-biodegradable fabric shall not be used.

For small areas of disturbance with minimal slope and slope length, the Town may approve the following sediment control methods:

- 9-inch compost filter tubes

Straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barriers shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, sedimentation fence shall be used in addition to compost filter tubes and straw bales and shall be compensated under that item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Town. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Town shall review locations specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no peat, manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ration shall be disregarded.

(Item 767.121 Continued)

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Sedimentation Fence

Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and the following:

Sedimentation fence shall only be used if shown on the plans or when specified by Orders of Conditions or other permit requirements.

When used with compost filter tubes, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per section 670.60 of the Standard Specifications or per the Stormwater Pollution Prevention Plan (SWPPP), if required, whichever is more restrictive.

The Contractor shall inspect the sediment barrier in accordance with the relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Town.

Regardless of site context, nonbiodegradable materials and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and sedimentation fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

(Item 767.121 Continued)

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Sedimentation fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

METHOD OF MEASUREMENT

Item 767.121 Sediment control barrier will be measured per foot of sediment control barrier installed and approved by the Engineer. No measurement shall be used for sedimentation fence used in conjuncture with compost filter tubes. Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Town shall not be measured for payment.

BASIS OF PAYMENT

Item 767.121 Sediment control barrier shall be paid for at the contract unit price per foot of sediment control barrier installed, which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration or soil, and all incidental costs required to complete the work.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Town at the Contractors expense.

Sedimentation fence used in conjunction with compost filter tube will be incidental to the compost filter tube and not be paid for.

ITEM 767.31

STRAW MULCH

SQUARE YARD

The work to be performed under this Item shall conform to the relevant provisions of Section 767 of the MassDOT Standard Specifications.

This Item shall be measured and paid for in accordance with the relevant provisions of Section 767 of the MassDOT Standard Specifications.

ITEM 769.

PAVEMENT MILLING MULCH UNDER GUARD RAIL

FOOT

The work to be performed under this Item shall conform to the relevant provisions of Section 769 of the MassDOT Standard Specifications.

This Item shall be measured and paid for in accordance with the relevant provisions of Section 769 of the MassDOT Standard Specifications

ITEM 850.41**ROADWAY FLAGGER****HOUR**

The Contractor shall provide the number of flaggers required in either the appropriate Traffic Management Plan (TMP) template (See MassDOT's website at <http://www.mass.gov/traffic-management-plans>) or that the Engineer deems necessary of the direction and control of traffic within the site. A flagger shall be used as directed by the Engineer in accordance with 701 CMR 7.00, this section, and the TMP. Any flagger determined by the Engineer to be ineffective in controlling traffic may be removed at the discretion of the Engineer. If a flagger is directed to be removed, the Contractor shall immediately comply with the directive from the Engineer and shall suspend operations as necessary until a qualified replacement can be provided. Such a suspension of operations shall not be considered as a basis for a claim or extension of time.

Flaggers utilized during the performance of the work must possess a certificate of satisfactory completion from a training program, such as, but not limited to, those offered by the Associated General Contractors (AGC), the American Traffic Safety Services Association (ATSSA), American Flagging and Traffic Control (Item 850.41 Continued)

(AFTC), or the National Safety Council (NSC), within the previous three (3) years. Prior to the start of work, the Contractor shall provide a written list of certified flaggers to be used, including the most recent date of certification or re-certification for each person listed. All flaggers shall carry their approved flagging training program certification card with them while performing flagging duties. All flaggers shall have completed Cardiopulmonary Resuscitation (CPR) and First Aid training according to the standards and guidelines of the American Heart Association or the American Red Cross. All flaggers shall carry their CPR/First Aid certification cards with them while performing flagging duties. All certifications shall remain valid for the duration of the project or the flagger shall be removed from the project.

METHOD OF MEASUREMENT

Item 850.41 Roadway flagger will be measured on an hourly basis for only the actual time spent flagging for each flagger. Travel time will not be measured as part of this Item.

BASIS OF PAYMENT

Item 850.41 Roadway flagger will be paid on an hourly basis for only the actual time spent flagging and payment will be under the Contract Unit Price. No allowance or additional payment will be made for required training, equipment, travel time, transportation, or any administrative charges associated with the costs of flaggers.

<u>ITEM 852.</u>	<u>SAFETY SIGNING FOR TRAFFIC MANAGEMENT</u>	<u>SQUARE FOOT</u>
<u>ITEM 853.1</u>	<u>PORTABLE BREAKAWAY BARRICADE TYPE III</u>	<u>EACH</u>
<u>ITEM 856.12</u>	<u>PORTABLE CHANGEABLE MESSAGE SIGN</u>	<u>WEEK</u>
<u>ITEM 859.1</u>	<u>REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS</u>	<u>DAY</u>

The work under these items shall conform to the relevant provisions of Section 850 of the Standard Specifications and the following:

GENERAL

Work under these items shall consist of furnishing, installing and maintaining in proper operating condition various traffic control devices for the protection of the traveling public and working personnel during construction, including establishing required detours as shown on the project plans and any additional direction provided by MassDOT. The design, application, and installation of all devices shall conform to MassDOT's "Standard Details and Drawings for the Development of Temporary Traffic Control Plans" and the MUTCD, and/or as directed.

The Contractor shall be responsible for the installation of adequate safety precautions for the protection of the traveling public and all project personnel.

All materials provided by the Contractor under the items of this section shall remain the property of the Contractor upon completion of the project.

STATE HIGHWAY ACCESS PERMIT

The Contractor shall be responsible for obtaining a State Highway Access Permit for installation of traffic controls associated with the required detour and all other work within the State Highway right-of-way requiring such approval from MassDOT through the MassDOT State Highway Access Permit System (SHAPS). Obtaining a State Highway Access Permit(s) as needed shall be considered incidental to the work requiring the permit and no separate payment shall be made for obtaining and maintaining such permits. See Supplementary Conditions for additional information.

SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Safety signing shall be installed according to the Manual on Uniform Traffic Control Devices (MUTCD), and Massachusetts Amendments to MUTCD. Signage shall be installed to complete the approved Traffic Management Plan or as directed by the Town or MassDOT.

PORTABLE BREAKAWAY BARRICADE TYPE III

Portable Breakaway Barricade Type III consist of furnishing, positioning, repositioning, maintaining, and removing barricades as directed by the Town. Barricades shall be of adequate size for roadway closures and for roadway closure sign supports.

PORTABLE CHANGEABLE MESSAGE SIGN

Portable Changeable Message Sign consists of furnishing, positioning, repositioning, operating, maintaining, and removing a portable changeable message sign as needed and/or as directed by the Engineer.

(Items 852., 853.1, 856.12, 859. Continued)

Portable Changeable Message Signs shall display video messages as described on the Plans.

REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS

Reflectorized Drums with Sequential Flashing Warning Lights shall consist of furnishing, positioning, repositioning, operating, maintaining, and removing drums as needed and/or as directed by the Engineer. At minimum, reflectorized drums with sequential flashing warning lights shall be placed at the portable breakaway barricades for the roadway closure.

MATERIALS

Materials shall conform to the relevant sections of Section 850 of the Standard Specifications.

METHOD OF MEASUREMENT

Item 852. SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Safety Signing for Traffic Management will be measured by the square foot and the quantity will be only that which is actually used on the project. Regardless of the number of times that a sign may be reused on the project, it will not be measured for payment more than once.

Item 853.1 PORTABLE BREAKAWAY BARRICADE TYPE III

Portable Breakaway Barricade Type III will be measured as one unit each regardless of size.

Item 856.12 PORTABLE CHANGEABLE MESSAGE SIGN

Portable Changeable Message Sign will be measured per week message signs are actually used on the project. Regardless of the number of times that a sign may be relocated on the project, it will not be measured for payment more than once.

Item 859.1 REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHTS

Reflectorized Drums with sequential flashing warning lights will be measured by the day. Each period of up to 24 hours during which a reflectorized drum is in use will be measured as one day regardless of the number of times that the drum is positioned, repositioned, removed or returned to service.

BASIS OF PAYMENT

Item 852. SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Safety Signing for Traffic Management will be paid for at the contract unit price per square foot which price shall constitute full compensation for furnishing, maintaining, positioning, repositioning, and removing the signs and all other labor, tools, equipment, materials and incidentals necessary to complete the work.

Item 853.1 PORTABLE BREAKAWAY BARRICADE TYPE III

Portable Breakaway Barricades Type III will be paid for at the contract unit price each which shall provide full compensation for all material, labor and equipment necessary to furnish, install, maintain, move and remove the barricades.

(Items 852., 853.1, 856.12, 859. Continued)

Item 856.12 PORTABLE CHANGEABLE MESSAGE SIGN

Portable Changeable Message Signs will be paid for at the contract unit price per week portable changeable message signs are on site. Contract unit price shall include full compensation for furnishing, positioning, repositioning, and removing Portable Changeable Message Signs as specified or as directed by the Engineer.

Item 859.1 REFLECTORIZED DRUM WITH SEQUENTIAL FLASHING WARNING LIGHTS

Reflectorized Drums will be paid for at the contract unit price per day which shall include full compensation for furnishing, positioning, repositioning, and removing Reflectorized Drums as directed by the Engineer. Flashing lights as shown on the Temporary Traffic Control Plan shall be considered incidental to Item 859. Reflectorized Drum.

Obtaining a MassDOT SHAPS shall be considered incidental to the work of these items, and no separate payment will be made.

<u>ITEM 874.2</u>	<u>TRAFFIC SIGN REMOVED AND RESET</u>	<u>EACH</u>
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The work to be done under this Item shall conform to the relevant provisions of Section 840 of the MassDOT Standard Specifications.

Any sign scheduled to be removed and reset, regardless of type or size, will be included in this Item, unless specifically designated for inclusion under another Item. Any additional hardware (bolts, nuts, washers, brackets, etc.) necessary to install the specified signs at the designated locations on new or existing posts will be included and supplied under this Item. This includes the removal and disposal of the existing sign support foundations and the backfilling of resulting holes with necessary material as required and approved by the Engineer.

CONSTRUCTION METHODS

The signs and supports shall be carefully dismantled and stacked on boards at a location designated by the Town. The holes caused by the removal of the supports and foundations shall be backfilled with suitable material and thoroughly compacted. This may require removing and resetting the existing signs, in temporary locations, prior to stacking.

METHOD OF MEASUREMENT

Item 874.2 Traffic sign removed and reset will be measured by each sign removed and reset, complete in place.

BASIS OF PAYMENT

Item 874.2 Traffic sign removed and reset will be paid for at the contract unit price per each which price shall constitute full compensation for any additional mounting hardware, posts, transportation, stacking, removal and disposal of existing sign foundations and all other labor, tools, equipment, materials, and incidentals necessary to complete the work.

ITEM 975.1**METAL BRIDGE RAILING (3 RAIL), STEEL (TYPE S3-TL4)****FOOT**

The work to be done under this Item shall conform to the applicable provisions of Section 975 of the MassDOT Standard Specifications.

This item shall be measured and paid for in accordance with the relevant provisions of Section 975 of the MassDOT Standard Specifications.

ITEM 983.1**RIPRAP****TON**

The work to be done under this Item shall conform to the applicable provisions of Section 983 of the Standard Specifications and the following:

GENERAL

The work of this Item shall consist of the excavation for, procurement, handling, placement of modified riprap to armor adjacent slopes at the ends of the culvert in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Town of Hawley.

MATERIALS

Modified riprap shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M2.02.0, *Riprap*; and the following:

Modified riprap shall be sound, durable rock which is angular in shape. Rounded stones, sandstone or similar soft stone, or relatively thin slabs will not be acceptable. Each stone shall weigh not less than 50 lb. and at least 75% of the volume shall consist of stones weighing not less than 155 lb each.

The remainder of the stones shall be so graded that when placed with the larger stones the entire mass will be compact.

All imported riprap stone shall be of the same parent rock from the same quarry and shall be visually similar.

Geotextile fabric shall conform to the requirements of Division III: Materials Specifications of the Standard Specifications for M9.50.0, *Geotextile Fabrics for Separation Fabric*.

CONSTRUCTION METHODS

Areas to be protected by modified riprap shall be free of brush, trees, stumps and other organic material and be dressed to a smooth surface. All soft or spongy material shall be removed to a depth shown on the plans or as directed by the Town of Hawley and replaced with approved materials.

Each stone shall be carefully placed by hand or machine, on a prepared bed of crushed stone over geotextile separation fabric, normal to the slope and firmly bedded thereon. Larger stones shall be placed closely together and then intervening spaces filled with smaller stones in such a manner that the entire surface will form a compact mass.

The riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection as may be necessary to allow for proper construction of the portion of the embankment protected and to prevent mixture of embankment and riprap material.

(Items 983.1 Continued)

In no case will the elevation of the embankment be greater than 5 ft above the elevation of the riprap material.

METHOD OF MEASUREMENT

Item 983.1 Riprap will be measured on a basis of the certified weight, in tons, of modified riprap accepted in place. Certified weight slips for all trucks shall be provided by the Contractor and confirmed by the Town as material having been used.

Excavation for the placement of Riprap will be incidental to Item 983.1.

Crushed stone will be measured under Item 156. Crushed Stone.

Geotextile fabric will be measured under Item 698.3 Geotextile Fabric

BASIS OF PAYMENT

Item 983.1 Riprap shall be paid for at the contract unit price per ton, complete and accepted in place, which price shall include all materials, labor, equipment and all incidental costs.

Crushed stone for modified riprap will be paid for at the unit contract price for Item 156. Crushed Stone.

Geotextile fabric will be paid for at the unit contract price for Item 698.3 Geotextile Fabric for Separation.

<u>ITEM 990.1</u>	COFFERDAM STRUCTURE NO.1 - UPSTREAM	<u>LUMP SUM</u>
<u>ITEM 990.2</u>	COFFERDAM STRUCTURE NO.2 - DOWNSTREAM	<u>LUMP SUM</u>

The Contractor shall furnish, install, monitor, maintain and remove cofferdams upstream and downstream of the project location to control surface water to conduct all necessary work in the dry. The Contractor shall be responsible for the proper design and execution of any cofferdam system necessary to control surface water to conduct any necessary work in the dry. Manufacturer's and/or Contractor's design/plan shall be submitted to the Owner and the Engineer for review and approval. The responsibility for design and control shall remain with the Contractor.

MATERIALS

Temporary cofferdams shall be constructed from Super Sacks® as shown on the drawings, heavy sandbags, approved pre-manufactured system, or approved equal. Sand fill and bag material (fabric) shall be clean of contaminants, invasive species, and any other materials that could adversely impact water quality. Use of loose fill for construction of cofferdam shall not be permitted.

Sandbags shall be free of rips or tears which would lead to a loss of sand into the stream or impoundment and bag openings shall be tied or otherwise secured closed to prevent the same.

Loose soil material is not an acceptable material for the construction of the temporary cofferdams. All temporary cofferdams must be capable of being overtopped without damage to the unit or to areas upstream or downstream.

(Items 990.1, 990.2 Continued)

METHOD OF MEASUREMENT

Items 990.1 and 990.2 will be made on a lump sum basis.

BASIS OF PAYMENT

Item 990.1 and 990.2 will be paid for at the contract Lump Sum price, which price shall include all materials, equipment, labor, and materials to install, monitor, maintain and remove cofferdam structures as shown on the plans and directed by the Town.

ITEM 991.1

CONTROL OF WATER – STRUCTURE NO. 1

LUMP SUM

Part A of this Item describes Temporary Surface Water Control.

Part B of this Item describes Temporary Construction Dewatering and Groundwater Control.

All temporary water control, surface and groundwater, shall be paid under a single pay item.

PART A – TEMPORARY SURFACE WATER CONTROL

GENERAL

This Item specifies the removal and control of water in the work area in order to permit all excavation, construction, installations, and repairs to be performed in the dry (to the extent practicable). The Work under this Item includes the furnishing of all labor, equipment, supplies, materials, and utilities required for the operation, maintenance and supervision of the control of water (except as specifically specified under other Items) such that all Work can proceed unhindered by water and flow into or through the work area. Water control shall also extend to all provisions necessary to control water in and from the limits of work, and surface drainage from upland areas from flowing into, disrupting, and damaging the work area. All work shall be performed in accordance with the Plans and Specifications and to the satisfaction of the Town. Water control is of the utmost importance.

The Contractor shall be responsible for determining the need for and the means and methods of implementing water control during the Work, except as specifically stated herein and in other Items. The

Town may monitor conditions at the Site and the effects of water levels and flows on the Work. If, in the Town's opinion, the presence of water has the potential to create a deleterious effect on the Work, then the Contractor shall take measures to control such water to the satisfaction of the Town at no additional cost to the Town. Monitoring of the Site by the Town shall not remove the Contractor's responsibility to monitor conditions at the Site and the effects of water levels and flows on the Work and properly control water and protect all installed Work.

The control of surface water shall consist of installing such provisions, as needed, to divert, reduce, or stop water which may be flowing into, on, or through the work area. The need for control of surface water may change over the course of the project depending on the work underway, as well as rainfall/runoff conditions encountered. Pumping, siphoning, and/or diversion channels may be required for certain activities.

(Item 991.1 Continued)

Temporary construction dewatering systems may be necessary for completion of the Work. The temporary construction dewatering systems which shall be provided are described in Part B of this Item. Temporary construction dewatering systems shall act in concert with the surface water control and temporary cofferdams.

The Contractor shall take all necessary precautions during construction to provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all water entering work area and keep work areas dry, as necessary. The Contractor shall implement such temporary surface water control measures as necessary to maintain the water level such that all Work, where judged necessary, proceeds in the dry. Temporary water control work may include, but shall not be limited to diversion pipes, channels, swales, pumps, siphons, culverts, temporary cofferdams, etc.

Water control measures shall be in operation as needed until all work within those areas of the work zone subject to interference by surface water is complete and accepted by the Town.

The Contractor shall remove all channeled, pumped, diverted, or siphoned surface water away from the work area, and provide sedimentation control and recharge in accordance with all applicable local codes and laws. Requirements specified in the Hawley Conservation Commission Order of Conditions shall be met during this process. All water which is discharged by water control measures shall be passed through appropriate and adequate sediment and/or filtration measures such that the effluent meets the standards provided below. Water diverted or pumped by the Contractor shall be discharged downstream of the work area, and shall maintain water quality standards. Adequate provisions for erosion control at the discharge point shall be provided as part of the Work of this Item.

All temporary surface water control Work shall be coordinated with the sediment and erosion control work of Item 767.121.

ADHERENCE TO REGULATORY CONDITIONS

All Work shall comply with all codes, rules, regulations, laws and ordinances and executed in conformance with any permits, licenses, etc., as issued by the Town of Hawley, Commonwealth of Massachusetts Department of Environmental Protection (DEP), the U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), and all other authorities having jurisdiction within the project area. All Work necessary to make the Site comply with such requirements shall be provided without additional cost to the Town.

The Contractor shall be responsible for conducting their work in accordance with all provisions of any permit required for this Work.

The Contractor shall procure all other required permits and licenses, (except for those to be obtained by the Town), pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work under this Contract. The cost thereof shall be included in the prices bid for the various items specified herein the work of this Contract. Copies of all required permits and licenses shall be filed with the Town prior to the beginning of the Work.

(Item 991.1 Continued)

The Contractor shall be responsible for complying with all orders and permits conditions of the Hawley Conservation Commission and other regulatory bodies for the installation, maintenance, and removal of all erosion and sedimentation control measures.

No work of any type in any area shall commence until sedimentation control measures are in place to the satisfaction of the Town.

SUBMITTALS

Not less than ten (10) days prior to the scheduled start of work, the Contractor shall submit their proposed method of controlling surface water and maintaining dry conditions, to the Town for review. The Temporary Water Control Plan shall be stamped by a Professional Engineer registered in Massachusetts. The submittal shall include as a minimum the following items:

- The Contractor's proposed design, sequence of operation, maintenance and supervisions of the surface water and control systems, as needed for each phase of the work, and coordination with temporary groundwater control and any temporary cofferdam.
- The Contractor's proposed contingency plan for additional surface water measures for all systems in the event of system failure – monitoring, instrumentation, on-call repair, etc.
- The Contractor's proposed contingency plan for potential storm emergency conditions (e.g., anticipated heavy rainfall). The contingency plan should address, but not to be limited to, measures for protection of installed Work from flooding, handling flooding of the Work area and removing equipment and materials from the Work area.

WATER CONTROL RESTRICTIONS

The Contractor shall abide by the conditions of all relevant permits issued to the Project which pertain to water control. The Contractor alone shall be responsible for meeting the conditions of the permits and shall be held accountable for penalties as a result of violations of permit conditions.

The Town makes no guarantee regarding the water surface elevation or stream flows at the start or at any time during the project.

The Contractor is hereby made aware that inflow to the Project Site cannot be fully controlled or predicted. Rainfall events may cause the level within the stream to rise rapidly and lead to potential inundation of the work sites. In the event of uncontrolled increases in the stream, the Contractor shall undertake measures to protect existing structures and new work at no additional cost to the Town.

MAXIMUM WATER CONTROL DISCHARGE RATE

To protect the downstream portions of the stream and reduce potential for increased erosion due to the Contractor's activities, the total flow rate from all Contractor water control operations shall be such that significant downstream erosion, flooding, or other damage is avoided, in the opinion of the Town, or regulatory authority. The Contractor's water control measures shall not lead to an increase in downstream flood impacts.

(Item 991.1 Continued)

PROTECTION OF WORK FROM FLOOD CONDITIONS

The Contractor shall take all such precautions necessary to protect the Site and the Work, either completed or incomplete, from flood waters and flows which would either damage the Work or the Site or cause a delay to the Work.

The Contractor shall be aware of the potential for the water levels within the stream to rise rapidly in response to significant rainfall events. No hydraulic and hydrologic data for the subject portion of the intermittent stream is available.

If a significant rainfall, or extensive flooding is expected, the Contractor shall implement their contingency plan to prepare for increased stream flows. The Contractor shall remove all equipment and erosion-susceptible material from areas liable to be inundated or otherwise impacted by flooding. The Contractor shall secure the Site and make all efforts to protect completed and incomplete Work. The cost of these efforts shall be considered incidental to the Work.

MATERIALS

DIVERSION BARRIER / MINOR COFFERDAM MATERIALS

All materials used in the construction of minor cofferdams or diversion barriers, if used, shall be clean and free of substances or materials which might lead to contamination of rivers, wetlands, or other water courses.

Any sandbags shall be free of rips or tears which would lead to a loss of sand into the rivers or wetlands, and bag openings shall be tied or otherwise secured closed to prevent the same.

Loose soil material is not an acceptable material for the construction of cofferdams or diversion barriers.

Sandbags shall consist of polypropylene bags about 14" to 18" wide, and 24" to 30" deep. Sandbags shall be filled with Granular Fill or other approved material. "Super Sacks" may be used as appropriate.

PUMPS, HOSES, SIPHONS

Pumps, hoses, or siphons used at the Site shall be sized appropriately and shall be maintained in good working order by the Contractor.

All equipment shall be thoroughly cleaned and free from contaminants prior to being brought to the Site.

Pumps shall be sized appropriately by the Contractor and shall operate in a manner which does not create a nuisance to abutters (i.e., quietly and without significant exhaust).

Pumps must be properly baffled against excessive noise.

Secondary containment shall be provided for gasoline or diesel-powered pumping equipment.

(Item 991.1 Continued)

PIPE

Pipe used for water control and/or diversions shall be sized appropriately and shall be in good condition without leaks or cracks. Pipe pressure ratings shall be adequate for static head loading when pressure flow is expected. Pipe joints shall be watertight and installed as per the manufacturer's recommendations.

Pipe shall be clean and free from contaminants.

CONSTRUCTION METHODS

The Contractor is responsible for means and methods and compliance with the specification will be judged on a performance criteria. The Contractor shall submit a water control plan to the Town for review and may, at that time, propose alternative water control strategies. The Contractor's water control plan must however satisfy the terms and conditions of all permits issued to the project.

If pumps or similar equipment are utilized, the Contractor shall maintain ready access to back-up electrical generators, fuel, pumps, and related equipment and supplies with output capacity sufficient to maintain continuous operation of the water control systems in the event the original water control equipment or power source(s) which is in use becomes inoperable. The back-up generator, pumps and necessary equipment and supplies shall be capable of rapid deployment for replacement for the inoperable equipment.

The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain proper equipment and facilities to control and divert water.

If necessary, water control systems shall be operated continuously during all construction specified herein. The operation time may include breaks, nights, weekends, holidays and other times when work is not otherwise being performed on the sites.

Water control in the sites shall account for the range of flow reasonably expected into and out of the work areas during the course of the Project. Pumps, siphons, pipes, channels, etc. shall be sized appropriately. Any cofferdam / diversion barrier shall be constructed of such materials and to such extents that it will withstand the forces and pressures exerted by flows and depths of a reasonably expected magnitude. The cofferdams / diversion barriers shall be compatible with other dewatering, water control, and sedimentation control procedures. Dewatering equipment shall be provided as needed to remove water from the interior areas of cofferdams / diversion barriers.

All cofferdams / diversion barriers constructed by the Contractor shall be completely removed upon the completion of the Project. All material shall be legally disposed of off-site at the Contractor's expense. No material shall be left within the work area.

If deployed by the Contractor, pumps must be operated in such a way as to not disturb abutters (e.g. noise). Pump intakes shall be placed so as to reduce the potential for sediment entrainment and pump discharge points shall make provisions for reducing erosion potential through energy dissipation, riprap, protection, etc.

(Item 991.1 Continued)

In general, the Contractor shall only work in the dry to the extent practicable, unless approved otherwise by the Town. If the Town approves the Contractor to work in the wet, the Work shall be performed such that the intent of the Work underway is not violated and the quality of the finished product is not reduced. The Town may monitor conditions at the Site and the effects of water surface levels and flows on the Work. If it is judged that the Contractor cannot appropriately complete the Work under the conditions present, the Town will notify the Contractor and the Contractor shall make provisions for water controls beyond what is already-in-place.

Sandbags used to direct runoff or for other purposes shall be included as Work of this Item.

WATER CONTROL IS OF THE UTMOST IMPORTANCE DURING THE WORK OF THIS CONTRACT.

PART B – TEMPORARY CONSTRUCTION DEWATERING AND GROUNDWATER CONTROL

GENERAL

This section specifies the removal and control of groundwater and hydrostatic pressures in the work area in order to permit excavation, construction, installations, and repairs to be performed in the dry. The work under this section includes the furnishing of all labor, equipment, supplies, materials and utilities required for the operation, maintenance and supervision of the dewatering system and control of water such that the excavation and/or backfilling operation can proceed unhindered by groundwater and flow into or through the work area. All work shall be performed in accordance with the Plans and Specifications and to the satisfaction of the Town.

The Contractor shall implement groundwater dewatering and control measures to maintain the groundwater level such that excavation work proceeds in the dry, to the extent practicable.

The Contractor shall take all reasonable and prudent precautions during construction to provide and maintain proper equipment and facilities to remove promptly and dispose of properly, all groundwater entering work areas and keep such areas dry so as to obtain a satisfactory undisturbed subgrade condition.

Shallow sumps and/or other measures may be required to maintain the lowered groundwater level until work has been completed. When used, sumps shall be surrounded by suitable filter material to mitigate the movement of soil/fines during pumping.

The Contractor shall remove all pumped water away from the work area and provide sedimentation control and recharge in accordance with all applicable local codes and laws as well as the Sedimentation and Erosion Control and Surface Water Control Items. All water which is discharged by dewatering measures shall be passed through appropriate and adequate sediment removal and/or filtration measures such that the effluent meets the standards set out this Item. The Contractor shall not discharge dewatering and groundwater control effluent directly into the adjacent watercourses, waterbodies or wetlands.

Dewatering systems shall act in concert with surface water control systems and with any temporary cofferdams erected.

(Item 991.1 Continued)

ADHERENCE TO REGULATORY CONDITIONS

All work shall comply with all codes, rules, regulations, laws and ordinances and executed in conformance with any permits, licenses, etc., as issued by the Town of Hawley, Commonwealth of Massachusetts Department of Environmental (DEP), the U.S. Army Corps of Engineers (USACE), and all other authorities having jurisdiction within the project areas. All work necessary to make the work site comply with such requirements shall be provided without additional cost to the Town.

The Contractor shall be responsible for conducting their work in accordance with all provisions of permits required and obtained for this Project.

The Contractor shall procure all other required permits and licenses, (except those to be obtained by the Town), pay all charges, fees and taxes and shall give all notices necessary and incidental to the due and lawful prosecution of the work. The cost thereof shall be included in the prices bid for the various items specified herein for the work. Copies of all required permits and licenses shall be filed with the Town prior to the beginning of the work.

The Contractor shall be responsible for working with representatives of the Hawley Conservation Commission or other regulatory bodies for the installation, maintenance, and removal of all erosion and sedimentation control measures.

No work of any type in any area shall commence until sediment and erosion control measures are in place to the satisfaction of the Town.

The Contractor shall be responsible for submitting a Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under a NPDES General Permit and preparation of a project specific Storm Water Pollution Prevention Plan (Contractor's SWPPP). All temporary water control work shall be performed in accordance with the applicable permits and the Contractor's SWPPP. All temporary dewatering and water control measures must be installed and maintained in accordance with the approved sediment and erosion control plan (or SWPPP).

The Contractor shall be responsible for obtaining all other necessary permits required for the work of this Project, including permits relating to temporary dewatering and water control. If necessary, the Contractor shall file all the necessary applications and documentation with the appropriate issuing authority(s). The Contractor shall obtain all permits required for planned dewatering and water control operations and shall abide by all appropriate terms and conditions as part of the Work of this Item.

DISCHARGE OF WATER

The general performance standard for the discharge of effluent into State Waters states that the discharge water shall not have a significant impact on the receiving waters. The discharged water shall therefore meet the following standards:

Solids - Discharge waters shall be free from floating, suspended and settleable solids in concentrations or combinations greater than that of the receiving waters, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

(Item 991.1 Continued)

Color and Turbidity - These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or are significantly different from the receiving waters.

SUBMITTALS

Not less than ten (10) days prior to the scheduled start of work, the Contractor shall submit their proposed method of dewatering and maintaining dry conditions, to the Town, for review. The submittal shall include as a minimum the following items:

- The Contractor's proposed design, sequence of operation, maintenance and supervision of the dewatering system for the maintenance of groundwater levels as specified herein and as needed for the Contractor's operations.
- The Contractor's proposed contingency plan for groundwater control measures for all systems.
- Scheduling requirements with regard to sedimentation control.

CONSTRUCTION METHODS

The Contractor shall provide a back-up electrical generator(s), pumps and related equipment and supplies on-site with output capacity sufficient to maintain continuous operation of the dewatering systems in the event the original dewatering equipment or power source(s) which is in use becomes inoperable. The back-up generator(s), pumps and necessary equipment and supplies shall be connected to the operating system to the greatest degree possible prior to the start of all dewatering operations in such a manner to allow immediate replacement of the inoperable equipment.

Dewatering systems shall be operated continuously and groundwater levels monitored and maintained at specified levels during all construction specified herein. The operation time is to include breaks, nights, weekends, holidays and other times when other work is not otherwise being performed on the Site.

Prior to dewatering, all sedimentation controls shall be in-place and operable. Prior to excavation, groundwater levels shall be lowered and maintained by the dewatering system submitted by the Contractor and approved by the Engineer to the subgrade elevation in all work areas. Compliance of the dewatered levels with the level specified herein shall be determined by visual observation of sumps, subgrades, etc.

Where the Contractor proposes to remove groundwater from the bottom of the excavation by sumping as approved by the Town, the sump shall be surrounded by a suitable filter to prevent removal of soil fines. Pumping from sumps which remove fines from the soil shall be immediately terminated and the dewatering method revised accordingly.

All pumped water shall be discharged in accordance with project permits and applicable regulations.

The Contractor may stage their dewatering plan such that dewatering and groundwater control is limited to areas where work is or soon will be occurring. Groundwater control may cease when the Contractor and

Town are satisfied that groundwater will no longer affect the Work of the Contract or the integrity of the structure in the area.

(Item 991.1 Continued)

GENERAL WATER CONTROL METHODOLOGY LIMITATIONS

To maintain the quality of dewatering and water control effluent and to prevent the discharge of unacceptable quantities of sediment, the following minimum restrictions shall be observed:

- When sumps are required, the intake must be protected with a filtration system acceptable to the Town.
- Discharge water may be passed through "Silt socks," "Dirt Bags," or other proprietary devices which mitigate turbidity delivered to receiving waters. These devices should have a supplemental perimeter line of turbidity curtains or siltation barrier, as appropriate.
- Discharge may also be passed through a temporary sedimentation tank sized appropriately for the flow rate.

Below applies to the work of both Part A and Part B of this Item.

METHOD OF MEASUREMENT

There will be no measurement for Item 991.1. The bid item under this section, including both temporary surface water control and temporary construction dewatering and groundwater control is a single lump sum quantity.

BASIS OF PAYMENT

Item 991.1 shall be paid for at the lump sum bid price, which price shall include all labor, materials, equipment, permits, mobilization/demobilization and incidentals to provide Temporary Water Controls associated with the Project, including both temporary surface water control and temporary construction dewatering and groundwater control.

Partial payments for this Item shall be billable in four (4) equal payments of twenty-five percent (25%) of the lump sum bid price over the duration of the Project.

ITEM 995.

BRIDGE STRUCTURE BRIDGE NO. 1

LUMP SUM

**PRECAST 3-SIDED FRAMES, PRECAST FOOTING UNITS,
PRECAST HEADWALL AND MOMENT SLAB, PRECAST HIGHWAY GUARDRAIL TRANSITIONS**

GENERAL

The work of this Item consists of providing final engineering design (Delegated Design) of Bridge Structure Bridge No. 1 and preparation of engineered shop drawings in accordance with MassDOT requirements, fabricating, transporting and installing precast 3-sided frames, precast footing units, precast headwall and moment slab, precast highway guardrail transitions, bituminous damp-proofing, membrane waterproofing and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The Precast Concrete Bridge Elements shall meet the requirements of Section M4: Cement Concrete and Related Materials.

(Item 995. Continued)

PRECAST CEMENT CONCRETE

QUALITY ASSURANCE FOR PRECAST CONCRETE

GENERAL

Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by the Town). Quality Control is the system used by the Contractor and Fabricator to monitor and assess their production processes at the plant facility and installation activities at the project site to ensure that the final product will meet the specified level of quality. Acceptance includes all factors typically used by MassDOT to determine the corresponding value for the product. MassDOT-type Acceptance Inspection at the plant facility, if performed by the Town or others (MassDOT), is intended as a means of evaluation of compliance with contract requirements. Contractor and Fabricator Quality Control activities and MassDOT-type Acceptance activities shall remain independent from one another. MassDOT-type Acceptance activities, if performed by the Town or others, shall not replace Fabricator Quality Control activities.

FABRICATOR QUALITY CONTROL

Quality Control shall be performed by the Fabricator to ensure that the product is fabricated in conformance with the specifications herein. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the PBU(s) meet the specified level of quality, through sufficient Quality Control sampling, testing, inspection, and corrective action (where required). The Fabricator's Quality Control system shall address all key activities during the placement and fabrication and shall be performed in conformance with the Fabricator's NPCA or PCI Certification. Quality Control documentation shall meet the requirements of the *Fabricator Quality Control – Documentation* section below. Upon request, Fabricator Quality Control documentation shall be provided to the Town's or MassDOT's Plant Inspector.

1. Plant.

Prior to the fabrication of PBUs, the Fabricator's precast concrete plant shall obtain the following:

- (a) Certification by the National Precast Concrete Association (NPCA) Plant Certification Program or Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for PBU fabrication
- (b) MassDOT Prequalification
- (c) MassDOT Mix Design Approval

All concrete for a given PBU shall be produced by a single company and plant, unless otherwise approved by the Engineer.

(Item 995. Continued)

2. Personnel.

The Fabricator shall provide adequate training for all QC personnel in accordance with NPCA or PCI certification. There shall be sufficient personnel trained and certified to perform the tests listed under Subsection M4.02.13, Part D. At a minimum, the Fabricator's Quality Control Personnel shall maintain the following qualifications and certifications:

- (a) QC Manager with an active NETTCP Field Technician or ACI Concrete Field Testing Technician – Grade I certification or higher, and a minimum of 5 years continuous experience in the manufacture of PBUs for state transportation departments. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
- (b) A Technician/Inspector having the Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level I or NorthEast Transportation Training and Certification Program (NETTCP) Precast Concrete Inspector, or higher.
- (c) The Contractor shall submit to the Engineer a copy of the Fabricator's Quality Control Personnel required qualifications, as specified above.

3. Laboratory.

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders, and it shall be thermostatically controlled to maintain temperatures consistent with AASHTO T 23. It shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

4. Testing Equipment.

At a minimum, the Fabricator's plant facility shall have the following testing equipment:

- (a) Air Content Meter Type A or B: AASHTO T 152
- (b) Air Content Meter Volumetric Method: AASHTO T 196 (Required for Lightweight Concrete)
- (c) Slump Cone: AASHTO T 119
- (d) Cylinder Molds AASHTO M 205
- (e) Concrete Testing Machine: AASHTO T 22
- (f) Screening Sieve: AASHTO T 27, AASHTO T 11
- (g) Curing Box: AASHTO T 23
- (h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM C1611
- (i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

(Item 995. Continued)

5. Inspection.

Quality Control personnel shall monitor and inspect the fabrication of each PBU. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as specified herein.

6. Temperature Monitoring.

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form, ambient temperatures surrounding the concrete, and temperatures of the concrete continuously, without interruption as specified below:

- (a) Prior to placement of concrete to verify that $T_i \geq 50^\circ\text{F}$.
- (b) Immediately after placement to verify that $T_i \geq 50^\circ\text{F}$ is maintained.
- (c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 100% Design Strength (f'_c) is attained and concrete has cooled to within 40°F of the ambient temperature surrounding the Prefabricated Bridge Unit.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F . At least two temperature sensors (thermocouples) shall be positioned to record the maximum and minimum anticipated concrete temperatures. The anticipated minimum temperature shall be measured with one or more thermocouples at a

distance no greater than 2 inches from the surface of the thinnest section. The anticipated maximum temperature shall be measured with one or more thermocouples at the center of the thickest section. Proposed temperature measurement locations shall be submitted to the Engineer for approval. Temperature recording devices shall be located within the curing enclosure and calibrated as required by PCI MNL-116 Section 4.18.4. Maximum heat increase and cool down rates shall comply with PCI MNL-116, Section 4.19. The Contractor shall furnish temperature logs recorded at a minimum frequency of once per hour to the Inspector as required, with each post-pour QC inspection report.

7. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing as specified in *Table 1: Quality Control Sampling and Testing*. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60, with the exception of the Stripping ($80\% f'_c$) set of cylinders. Stripping ($80\% f'_c$) cylinders shall be cured in the same location and environment as the PBU they represent. If approved by the Engineer, compressive strength cylinder match curing equipment, that maintains the same concrete conditions that the corresponding PBU is exposed to, may be utilized in lieu of Stripping ($80\% f'_c$) field cured cylinders, with the use of thermocouples, controllers, and heaters.

(Item 995. Continued)

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of PBUs fabricated on a Contract, per Bid Item, per Mix Design	One (1) PBU	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 80% f' c at Stripping				
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' c at 56 days ^(b)				

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f' c).
- (c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

8. Certificate of Compliance.

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Section 6.01, stating that QC test cylinders have achieved the design strength, f' c. A Certificate of Compliance shall accompany each shipment and shall be presented to the Town or Engineer upon delivery to the site.

(Item 995. Continued)

9. Documentation.

At a minimum, the Fabricator shall maintain a filing system for the following QC records and documentation. All QC records and documentation shall be made available to the Town or MassDOT upon the request.

- (a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
- (b) PCI or NPCA Certification
- (c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
- (d) Most current set of Approved Shop Drawings
- (e) Approved Placement, Finishing and Curing Plan
- (f) Approved Dunnage Plan
- (g) Fabricator Certificate of Compliance for each fabricated PBU
- (h) Admixture Manufacturer's Certification of Compliance for each approved Admixture
- (i) Completed QC Inspection Report for each fabricated PBU
- (j) Identification Number for each fabricated PBU
- (k) Time and date of casting of each fabricated PBU
- (l) Date of stripping of each fabricated PBU
- (m) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
- (n) Concrete temperature records for each fabricated PBU
- (o) QC Test Report Forms for each subplot of concrete produced
- (p) Non-Conformance Reports (NCRs)
- (q) Documentation of Repairs (if applicable)

ACCEPTANCE

The Town or MassDOT may perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated PBU to MassDOT specifications. Additionally, the Town's Inspectors may monitor the Fabricator's Quality Control activities to ensure the Fabricator is properly administering Quality Control in conformance with the Fabricator's NPCA or PCI Certification. Acceptance inspection and test results not meeting MassDOT specifications may be reported to the Town or MassDOT and result in Non-conformance Reports (NCR) being issued by the Town or MassDOT to the Fabricator or Contractor for corrective action. Final Acceptance for the fabricated PBUs shall be determined by the Town.

1. Inspection.

The Town or MassDOT may assign an inspector to perform Acceptance activities during fabrication, which includes the inspection of the materials, work procedures, and PBUs. At least seven (7) days prior to the scheduled start of fabrication, the Fabricator shall contact the Town

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and inspector the inspector to provide notice of the scheduled fabrication start date. The Fabricator shall complete the following activities prior to notifying inspector of the scheduled start date:

- (a) Receive approval for all submitted Fabricator cement concrete mix designs from the the Town for the current year, as specified under the MassDOT *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.
- (b) Receive approval for the submitted Fabricator Placement, Finishing, and Curing Plan from the Town, as specified under the *Placement, Finishing, and Curing Plan* section of the MassDOT Standard Specifications.
- (c) Receive Engineer of Record approved shop drawings from the Town as specified under the *Shop Drawings* section of the MassDOT Standard Specifications.
- (d) Participate in the pre-production meeting, as described under the *Pre-Production Meeting* section (if required).

Prior to the start of fabrication, the Fabricator shall review the fabrication schedule with the Town or MassDOT Inspector. Fabrication shall only proceed when:

- (a) The QC Inspector and Town or MassDOT Inspector are present to inspect the PBU(s) being fabricated.
- (b) The QC Manager is present at the Fabricator's plant.

The Fabricator shall grant access to all required areas of the Fabricator's plant to the Town or MassDOT Inspector, during the hours of fabrication. Fabrication without Town or MassDOT Inspector access to required areas is prohibited, and will result in the rejection of the PBU(s).

Additionally, the Town or MassDOT Inspector may monitor the adequacy of the Fabricator's Quality Control activities. Town or MassDOT Inspector Acceptance activities performed at the Fabricator's plant shall remain independent from the Fabricator, and does not replace the Fabricator's required Quality Control activities. Omission of monitoring/inspection of Fabricator's Quality Control activities by the Town or MassDOT shall not relieve the Fabricator's responsibility for performing Quality Control activities.

2. Sampling and Testing.

The Town or MassDOT Inspector may perform random Acceptance sampling and testing for each Sublot of concrete produced as specified in *Table 2: Acceptance Sampling and Testing*. The Town or MassDOT Inspector may also perform Acceptance sampling and testing on concrete that has been retempered with admixtures or hold-back water during production. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60.

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Table 2: Acceptance Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of PBUs fabricated on a Contract, per Bid Item, per Mix Design	One (1) PBU	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' _c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f' _c at 56 days ^(b)				

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f' _c).
- (c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

MATERIALS

Materials shall conform to M4.09.1 and the following:

Non-Shrink Grout Products	M4.04.5
Controlled Low-Strength Material – Structural Non-Excavatable	M4.08.0
Welded Steel Wire Fabric	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Corrugated Metal Pipe	AASHTO M 36

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1. Vertical Adjustment Assembly.

Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer of Record for approval.

2. Threaded Inserts.

Threaded inserts are permissible to facilitate forming the keyway pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not come in contact with the reinforcing steel.

3. Corrugated Metal Pipe.

Corrugated Metal Pipe if used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

CONSTRUCTION METHODS – PLANT FABRICATION

Box Culverts, Three-Sided Frames and Arches.

The Contractor shall submit design computations and shop drawings for the box culvert, rigid frame or arch bridge elements to the Engineer and MassDOT for review and approval. The computations shall be prepared in accordance with the latest AASHTO LRFD Bridge Design Specifications, the MassDOT Bridge Manual (Hundredth Anniversary Edition, as amended), and the Plans using English units and HL-93 live loading. The design computations shall consider all Strength, Extreme Event and Service Limit States as are appropriate for each stage of fabrication, shipment, construction, and for the final in-service condition. Design computations and shop drawings shall be prepared and stamped by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts. The shop drawings shall be prepared and submitted in accordance with M4.09.2B.

The frame dimensions provided on the plans are shown to establish the required size of the proposed opening. The width and thickness of each frame unit may vary depending upon the manufacturer's specifications provided that the opening size is maintained. The Contractor shall be responsible for modifying the dimensions of the frame bridge elements as required to compensate for elastic shortening, shrinkage, grade corrections, and other phenomena that make in-process fabricating dimensions different from those shown on the drawings. Approval of the shop drawings by the Town and MassDOT shall not relieve the Contractor from responsibility for the correctness of the dimensions shown.

1. Joints.

The precast reinforced concrete three-sided frame shall be produced with grout-filled keyways per the details on the plans, the manufacturer's recommendations, and as approved by MassDOT and the Engineer. The ends shall be manufactured such that when the sections are laid together they will make a continuous line of frames with a smooth interior surface free of appreciable irregularities, and in compliance with the permissible variations.

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2. Marking.

The following information shall be clearly marked on the interior of each frame by indentation, waterproof paint, or other approved means:

- (a) Frame span and rise
- (b) Date of manufacture and lot number
- (c) Name and trademark of the manufacturer

Pre-Production Meeting.

The Contractor shall notify the Town and MassDOT to determine if a pre-production meeting will be required to review the specification, shop drawings, curing plan, schedule, and discuss any specific requirements. The meeting shall be held prior to scheduling a Town or MassDOT inspector, and at least seven (7) days prior to the scheduled casting of any Precast Concrete Bridge Element or control section. The Contractor shall schedule the meeting, which shall include representatives of the Fabricator and the Town and/or MassDOT.

Reinforcement.

The reinforcing bars shall be installed in accordance with Subsection 901.35, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

Where reinforcing bars are to protrude from one Precast Concrete Bridge Element in order to mate with reinforcing bar splicers in a second precast concrete element, the fabricator shall set the reinforcing bars and the reinforcing bar splicers with a template in order to ensure proper fit up within the tolerances specified on the plans.

Tolerances.

Fabrication shall comply with tolerances specified on the approved shop drawings. Tolerances for steel reinforcement placement shall be in accordance with Subsection 901.35. In the absence of specifications on the approved shop drawings, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Bridge Elements within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. If threaded inserts are cast into the elements

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for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

General.

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Bridge Elements shall have knowledge of and follow the approved Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly.

Prior to installation, the following documentation shall be reviewed and confirmed by the MassDOT Resident Engineer or designee:

- (a) QC Compressive Strength Test Report Forms attaining Design Strength (f'_c) for the Precast Concrete Bridge Element's representative subplot.
- (b) Certificate of Compliance generated by the Fabricator as described under the Fabricator Quality Control section.
- (c) QC Inspection Reports signed by the Quality Control Manager.

Field construction staff shall verify that the Resident Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly.

Prior to the erection, the Contractor shall submit an Erection Procedure and a Quality Control Plan for Precast Concrete Bridge Element Assembly for approval by the Town and MassDOT. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Precast Concrete Bridge Elements. The Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly shall, at a minimum, include the following:

1. Erection Procedure

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Design, Fabrication and Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (eighth edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

- (a) Minimum concrete compressive strength for handling the Precast Concrete Bridge Elements.
- (b) Concrete stresses during handling, transport, and erection.
- (c) Crane capacities, pick radii, sling geometry, and lifting hardware.
- (d) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
- (e) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Precast Concrete Bridge Elements and setting them as shown on the plans.
- (f) Design of crane supports including verification of subgrade for support.

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(g) Location and design of all temporary bracing that will be required during erection.

Non-shrink grout and concrete materials, approved by the Town, shall be placed as shown on the plans. Fill joints, keyways, and voids, in strict accordance with the specifications and manufacturer's recommendations and instructions.

For footings, approach slabs and highway guardrail transitions, once these Precast Concrete Bridge Elements have been set to the correct horizontal and vertical alignment, the void between them and the supporting soil shall be filled with Controlled Low-Strength Material – Structural Non-Excavatable to the limits as shown on the plans. Add additional grout ports in the footings to facilitate the bedding process if required.

Except in approach slabs, joints shall be filled flush to the top with non-shrink grout, and any vertical misalignment between adjacent elements shall be feathered out on a slope of 1 to 12.

Curing of grout or concrete shall be performed in strict accordance with the specifications and manufacturer's recommendations. Filling shall not be completed in cold weather when either the ambient temperature or the precast member's temperature is below the manufacturer's recommendation. No localized heating of either the precast members or of the air surrounding the element will be permitted in an attempt to reach application temperatures.

If the joints or voids are not filled within five days after the Precast Bridge Elements are erected, the Contractor shall cover and protect the openings from weather and debris until they are filled.

Quality Control Plan for Precast Concrete Bridge Element Assembly

The Quality Control Plan for Precast Concrete Bridge Element Assembly is a document prepared and submitted by the Contractor prior to the start of work which requires the Contractor to identify and detail the sequence of construction in accordance with the project schedule and which clearly identifies all stages of field construction. The assembly procedures for the Precast Concrete Bridge Elements shall be submitted in PDF format on 24"x36" sheets. This document will be treated as a Construction Procedure and will be reviewed by both the Designer and the District Construction Office. The approval of this document will serve as a guideline for setting interim concrete and grout strengths and curing procedures to allow construction to proceed without waiting for the final in-service strengths to be achieved.

The following list details the minimum criteria that should be included in the Quality Control Plan for Precast Concrete Bridge Element Assembly:

- (a) A detailed schedule showing the sequence of operations that the Contractor will follow. The schedule shall include a timeline for installation of all major elements of the bridge accounting for the installation of temporary works and cure times of grouts or closure pour concrete and other selected materials.
- (b) Calculations that support the schedule outlined above should be included verifying that the selected materials have adequate interim strength to proceed from one step to another. Final material strengths are not normally required until the bridge is opened to vehicular traffic. The minimum factor of safety of two (2) will be required for the interim strength of grouts and closure pour concrete before construction is allowed to proceed to subsequent steps. The factor

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of safety is applied to the service loads that are supported by the elements and materials during various stages of construction. For example, if the Contractor calculates that the grout between the precast pier cap and pier wall requires a strength of 100 psi to support the dead load of the beams in the next step, a cylinder break of 200 psi will be required prior to allowing the pier cap to be loaded with the beams. The required strength of materials for subsequent construction stages shall also be calculated and the material strength verified.

- (c) The Contractor is responsible for determining the center of gravity for all elements. Special care shall be used for unusual elements that are not symmetric. These elements may require special lifting hardware to allow for installation in a plumb or flat position.
- (d) Plan of the work area, depicting items such as temporary earth support, utilities within the immediate vicinity of the work, drainage structures, etc. The Contractor shall coordinate the various subcontractors that will need to occupy the same area and shall ensure that there are no conflicts. For example, if the Contractor is having different Subcontractors prepare and submit plans for temporary earth support and demolition, and the earth support is required to be installed prior to the demolition, it shall be the Contractor's responsibility to ensure that the Quality Control Plan for Precast Concrete Bridge Element Assembly submission allows both operations to be performed without field modification.
- (e) Details of all equipment that shall be employed for the construction of the bridge.
- (f) Methods of providing temporary support of the elements. Include methods of adjusting and securing the element after placement.
- (g) Vertical Adjustment Assemblies to be used as a means of setting precast concrete footings to the correct elevations.
- (h) Procedures for controlling the overall horizontal dimensions and the vertical elevations as each precast concrete bridge element is erected by using the tolerance limits of the joints as detailed on the plans.
- (i) Methods for curing grout.
- (j) Proposed methods for installing non-shrink grout and the sequence and equipment for the grouting operation.
- (k) Methods for sealing the keyways in preparation for filling with non-shrink grout, including the use of backer rods. The Contractor shall not assume that the backer rods will restrain the pressure from the grout in vertical grout joints. Provide additional forming to retain the backer rod.

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Survey and Layout.

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. The Town reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

Preparation of Closure Pours and Grouted Keyways.

Immediately prior to erecting the Precast Concrete Bridge Elements, the closure pours and grouted keyways shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete or grout and precast concrete using a high-pressure water blast. Any exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the closure pours and grouted keyways shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition for at least 24 hours prior to the placement of the closure pour concrete.

Erection.

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure and Quality Control Plan for Precast Concrete Bridge Element Assembly. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete bridge element is within proper horizontal and vertical location and tolerances prior to releasing it from the crane and setting the next unit. The Contractor may use shims to maintain proper setting tolerances.

The concrete elements shall be lifted only by the specified lifting devices, and the utmost care shall be taken to prevent distortion of the elements during handling, transportation or storage.

This approval will be contingent on the Contractor demonstrating by calculations, prepared by a Professional Engineer registered in Massachusetts, that the elements will not be damaged by the non-vertical lifting force and by documentation that the capacity of the lifting devices is adequate for the non-vertical lifting force.

After all Precast Concrete Bridge Elements have been placed, the actual overall dimensions of the structure both horizontal and vertical, as laid out shall not deviate from the nominal dimensions shown on the plans beyond a tolerance of +0 inches and -1 inches. Once the layout of Precast Concrete Bridge Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements.

Box Culverts, Three-Sided Frames and Arches.

Backfilling operations shall not begin until the following checks have been made:

- (a) The frame to footing key joints are grouted as shown on the plans;

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- (b) The joints between exterior frame bridge elements and wingwall stems are complete as shown on the plans;
- (c) All joint seals are properly placed.

Backfill shall be paid for under separate items. The backfilling procedures shall be in accordance with Sections 120, 150, and 170 of the Standard Specifications and Supplemental Specifications modified as follows:

- (a) Fill shall be placed and compacted in layers not exceeding one foot in depth;
- (b) Dumping of fill shall not be allowed any nearer to the structure than 3.25 feet from a vertical plane extending from the back of the footing;
- (c) Backfill shall be placed as symmetrically as possible around the structure with differential depths of backfill on each side of the structure not exceeding 1.5 feet with respect to each other;
- (d) Compaction shall be achieved using hand compaction equipment for all fill within one foot of the structure;
- (e) The bare structure shall not be crossed by any equipment heavier than that specified by the frame manufacturer. All damage resulting from equipment damage shall be rectified to the satisfaction of the Engineer at no cost to the Town;
- (f) Construction equipment will not be permitted atop an uncompleted structure;
- (g) Construction equipment whose weight exceeds the design capacity shall not be permitted atop the completed structure under any circumstances;
- (h) The use of vibratory rollers for compaction purposes will not be permitted.

A representative of the manufacturer shall be on site at the commencement of the installation, at no cost to the Town, to assist the Contractor. The representative shall offer advisory assistance only and shall not supplant the Contractor's representative, or the Engineer.

Filling of Blockouts for Lifting Devices and Threaded inserts.

If the blockouts in the Precast Concrete Bridge Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Mortar (M4.04.5).

After the formwork has been removed, all threaded inserts that have been cast into the precast concrete bridge deck for support of the formwork shall be filled with a grout of the same color as that of the precast concrete.

BITUMINOUS DAMP-PROOFING

The work associated with Bituminous Damp-proofing shall conform to the applicable provisions of Section 970 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 under here within, the Standard Specification shall apply except for coal tar pitch materials of any type shall not be used.

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Work under this item shall include all materials, equipment, and labor necessary to apply bituminous damp proofing to below grade concrete structures as shown on the plans and as provided in these special provisions.

MATERIALS

- A. Primer: Use asphalt for primer according to ASTM D 41.
- B. Seal Coat: Use one of the following:
 - a. Hot-Applied Asphalt Seal Coat. Refer to ASTM D 449, Type I.
 - b. Cold-Applied Asphalt Seal Coat. Refer to ASTM D 449, Type I.
 - c. Cold-Applied Emulsified Asphalt Seal Coat. Refer to ASTM 1227, Type III.

SUBMITTALS

Certification: The Contractor shall furnish a notarized Certificate of Compliance that all materials conform to the requirements of this specifications.

CONSTRUCTION METHODS

Bituminous Damp Proofing for Below Grade Concrete Structures shall consist of a primer plus two (2) seal coats (mopped or sprayed). All coats shall be allowed to dry before applying the next coat. All other construction methods shall conform to Section 970.60.

COMPENSATION

Basis of Payment.

The furnishing, fabricating, and erecting of all Precast Concrete Bridge Elements for Bridge Structure Bridge No. 1, including the 3-sided precast frames, precast headwalls, precast moment slabs, precast highway guardrail transitions, bituminous damp-proofing and all other related and required incidental items, shall be paid for at the contract unit price EACH, complete in place, inclusive of all required work.

<u>ITEM 996.41</u>	<u>PREFABRICATED MODULAR BLOCK RETAINING WALL NO.1</u>	<u>LUMP SUM</u>
<u>ITEM 996.42</u>	<u>PREFABRICATED MODULAR BLOCK RETAINING WALL NO.2</u>	<u>LUMP SUM</u>

The work shall consist of the design, fabrication and construction of a prefabricated modular reinforced concrete gravity wall for the purpose of headwalls in accordance with these specifications and in reasonably close conformance to the lines and grades shown on the plans or established by the Engineer. Included in the scope of the Item work are all grading necessary for wall construction, excavation, support of excavation, backfill, construction of leveling pads, segmental unit erection, concrete inserts for utility brackets and miscellaneous items necessary for a complete installation.

The prefabricated concrete modular gravity wall design shall be by a Professional Engineer Registered in the Commonwealth of Massachusetts and follow the general dimensions of the wall envelope shown in the contract plans.

(Items 996.41, 996.42 Continued)

Quality Assurance

Prefabricated Concrete Modular Gravity Walls shall be designed and constructed as specified herein. The design shall be subject to review and acceptance by the Engineer. The acceptability of a Prefabricated Concrete Modular Gravity Wall design shall be at the sole discretion of the Engineer. Any additional design, construction, or other costs arising as a result of rejection of a retaining wall design by the Engineer shall be borne by the Contractor.

Precast concrete segmental unit blocks design calculations and Shop Drawings shall be signed and stamped by a Professional Engineer specializing in geotechnical construction and is registered in the Commonwealth of Massachusetts.

Approved Prefabricated Concrete Modular Gravity Wall systems are:

- A. Stone Strong Retaining Wall by MBO Precast
- B. T-wall Retaining wall ® by Concrete Systems, Inc.
- C. Redi Rock Retaining Wall ™ Michie Corporation/Capital Concrete Products

The Contractor installing the Prefabricated Concrete Modular Gravity Walls shall have demonstrated experience constructing Prefabricated Concrete Modular Gravity Walls and shall use personnel having demonstrated experience in the installation procedures recommended by the manufacturers and as specified herein.

All Prefabricated Concrete Modular Gravity Walls shall be built in accordance with the Plan and accepted Shop Drawings for the proposed wall system.

Design Requirements

Work includes engineering design, manufacturing, furnishing and installing concrete retaining/headwall units to the lines and grades designated on the Contract Drawings and as specified herein. Base of footing elevation shall be shown on the Plans.

In general, the prefabricated concrete modular block wall system shall be designed in accordance with the manufacturer's requirements, as specified herein and shown on the Plans, and in accordance with AASHTO (Items 996.41, 996.42 Continued)

LRFD Standard Specification for Highway Bridges, Section 11.11. Where conflicting requirements occur, the more stringent shall govern.

Facing panels shall have tongue and groove, ship lap or similar approved connections along all joints, both vertical and horizontal.

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Prefabricated Concrete Modular blocks shall be installed on crushed stone.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as culvert, guardrail, fences and/or other appurtenances shown on the Plans shall be accounted for in the stability design of the wall. Concrete anchors for utility brackets, if required, are incidental to this item.

MATERIALS

The Contractor shall be responsible for the purchase or manufacture of the precast concrete modular blocks, geotextile filters, panel/reinforcement connections, bearing pads, joint filler, and all other necessary components. Contractor shall follow manufacturer's specifications and requirements for the necessary components for the construction of the Prefabricated Concrete Modular Block walls.

SUBMITTALS

The Contractor shall submit the following to the Engineer:

- A. Manufacturer's product data for the prefabricated modular block wall system, including material, manufacturer, erection specifications, all specified erection equipment necessary, details of buried prefabricated modular block wall elements, structures design properties, type of backfill, and details for connections between facing panels.
- B. Manufacturer's design calculations.
- C. Shop Drawings showing the configuration and all details, dimensions, quantities, and cross-sections necessary to construct the prefabricated modular block wall.

CONSTRUCTION

Delivery, Storage, and Handling

The Contractor shall check the material upon delivery to assure that the proper material has been received. A product certification should be provided with each shipment.

All wall materials and modular block units shall be stored elevated from the ground and protected to prevent all mud, wet cement, epoxy, and like substances from affixing themselves to the panels or

(Items 996.41, 996.42 Continued)

materials. The panels shall be supported during storage to prevent excessive bending stress. For storage exceeding 30 days in duration, all materials shall be stored in or beneath a trailer or covered with a colored tarpaulin to prevent long-term exposure.

(Items 996.41, 996.42 Continued)

Wall Excavation

Earth excavations shall be in accordance with the requirements of Section 120 and in close conformity to the limits and construction stages shown on the Plans. Sections 120.80, 120.81, and 120.82 do not apply to the work covered in this section. Payment for excavation and incidentals to complete the excavation are included in the Prefabricated Concrete Modular Block Wall Item.

Foundation Preparation, Wall Erection, Backfill Placement

The foundation for the structure shall be constructed in accordance with the design prepared, signed, and stamped by a registered professional engineer licensed in the Commonwealth of Massachusetts.

The Contractor shall erect the Prefabricated Concrete Modular Block wall in accordance with the approved Shop Drawings and manufacturer's specifications and requirements.

COMPENSATION

Items 996.41 and 996.42 will be paid for at the Contract unit price per lump sum, which price shall include all labor, materials, equipment, and incidental costs required to complete the work.

No separate payment will be made for excavation and backfill, but all costs in connection therewith shall be included in the Contract unit price bid.

The unit price for Items shall include costs for:

- A. All design work, preparation of written submittals and plans, revisions of submittals, sample submittals, and any other necessary preliminary work prior to and after acceptance of the retaining wall by the Engineer.
- B. All materials, including transportation for the prefabricated concrete modular block walls, attachment devices, fasteners, bearing blocks and shims, joint materials, copings, concrete masonry, reinforcing steel, and incidentals.
- C. All labor and equipment required to excavate and prepare the wall foundation, form and cast the leveling pad, erect the prefabricated concrete modular block wall to the lines and grades shown on the Plans, place and connect attachment devices, install the joint materials, install wall drainage, place and compact backfill, and construct any other items necessary to complete the prefabricated modular block wall.

END