

**SPECIAL PROVISIONS**

**PHILLIPSTON**

**Proposed Superstructure Replacement Br. No. P-09-004  
Route 2 over Route 2A**

**ITEM 115.1**

**BRIDGE DEMOLITION**

**DEMOLITION OF STRUCTURE**

The demolition shall conform to the relevant provisions of Sections 112 and 960 of the Standard Specifications and shall include demolition, removal and satisfactory disposal of all materials making up the existing superstructure and substructure as designated on the contract plans. This includes, but is not limited to, the bridge deck, curb, barriers, steel stringers, steel diaphragms, approach slabs, and abutment caps.

The Contractor shall prepare and submit to the Engineer, for approval, a plan indicating the proposed demolition procedures and methods to be used including, but not limited to, equipment, tools, devices, lifting connections, crane capacity and location, and schedule of operations. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61D, Erection, of the Standard Specifications for Highway Bridges and the Supplemental Specifications. The demolition procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

**GENERAL REQUIREMENTS FOR WORK INVOLVING PAINTED STEEL**

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

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

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

**ITEM 115.1 (Continued)**

**Cutting or Burning of Steel**

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

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

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

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

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

**Mechanical Disassembly of Steel**

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

For purposes of limiting the lead dust, the Contractor shall dampen the lead paint work areas.

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

**ITEM 115.1 (Continued)**

Environmental

All applicable portions of Sections 961.65 “Worker Protection” and 961.66 “Environmental Protection and Monitoring” shall be followed when performing this work. During chemical stripping, a hand washing facility maybe used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Section 961.68 “Handling of Hazardous Waste and Reporting Release Programs”. Submittals shall be according to Section 961.69 “Submittals”.

EXISTING SUBSTRUCTURE UNSOUND CONCRETE EXCAVATION

Repairs to significant defects in the existing abutments and wingwalls shall be performed only as needed. The Contractor and the Engineer shall coordinate locations of unsound concrete to be excavated and removed.

The limits of removal shall be neatly delineated with a 1/2” deep saw cut and the minimum depth of excavation shall be 1/2”. The surface of the newly exposed concrete after the removal of unsound concrete shall be cleaned to remove any grease, dust, rust, or laitance.

All concrete excavated shall become the property of the Contractor and shall be removed from the job site and properly disposed.

EXISTING SUBSTRUCTURE CONCRETE PATCHING

Repairs to significant defects in the existing abutments and wingwalls shall be performed only as needed. The Contractor and the Engineer shall coordinate locations for patching.

The Contractor shall excavate all unsound concrete and clean the newly exposed surfaces as defined above.

The material used for concrete patching shall be on the MassDOT Qualified Construction Materials List. The Engineer shall confer with the Research & Materials Division regarding which products are approved for use on Massachusetts Department of Transportation bridge projects.

The Contractor shall strictly follow the recommendations of the manufacturer for mixing, placing, finishing, and curing the patching material. The surface of the concrete patch material shall be finished smooth with adjacent concrete and shall be gray in color.

**ITEM 115.1 (Continued)**

**EXISTING SUBSTRUCTURE PRESSURE INJECTION OF CRACKS**

Repairs to significant defects in the existing abutments and wingwalls shall be performed only as needed. The Contractor and the Engineer shall coordinate locations for crack injection.

Existing cracks designated to be repaired by pressure injection, shall be cleaned with compressed air and bonded by penetration with an epoxy adhesive in accordance with the epoxy manufacturer's recommendations.

The Contractor shall submit manufacturer's literature completely describing the products to be used. The materials shall be delivered and clearly marked with legible and intact labels containing the manufacturer's name, brand name, and identifications of the temperatures that conform to the manufacturer's recommendations and instructions. The Engineer shall confer with the Research & Materials Division regarding which products are approved for use on Massachusetts Department of Transportation bridge projects.

**ITEM 187.3**

**REMOVAL AND DISPOSAL OF  
DRAINAGE STRUCTURE SEDIMENTS**

The work to be done under this item shall include removing the accumulated dirt, refuse, and other debris, as necessary for the Contractor to perform relevant items of work under this Contract, from each drainage structure, including the gutter mouth of curb inlets, and disposing of materials removed.

All material removed from the drainage structures shall be properly handled and disposed of by the Contractor, and this must be done in accordance with all DEP regulations, policies, and guidance.

Material removed from drainage structures shall be transported immediately to the place of disposal in machines or trucks that will not spill the material along the roadway. Any material falling on the roadway shall be removed by the Contractor.

Materials containing free-flowing liquids are prohibited from being accepted at landfills. Material must arrive at the disposal facility sufficiently dry to pass the Paint Filter Liquids Test (or no liquid drips from it when a handful is taken and squeezed).

Catch basin cleanings are classified as a solid waste by the Massachusetts Department of Environmental Protection (DEP) and may be disposed of at any landfill that is permitted by DEP to accept solid waste.

The DEP encourages the beneficial reuse of this material whenever possible; however, use not in accordance with DEP determination, or disposal or use as fill in an unapproved location is not acceptable.

**ITEM 222.**

**FRAME AND GRATE**

**EACH**

**ITEM 222.1**

**FRAME AND GRATE MHD CASCADE TYPE**

**EACH**

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

All catch basins located within the traveled lane or shoulder within the project limits shall be fitted with a Hook Lock Grate for Catch Basins per Engineering Directive E-09-003 dated 6-19-2009.

Grates shall conform to AASHTO M306. Material shall be ASTM A48 Class 30B Gray Cast Iron. No black asphalt coating allowed.

MHD Cascade type grates shall be installed on the proposed catch basin at the Ward Hill Road intersection.

**ITEM 477.**

**MILLED RUMBLE STRIP**

**Description**

The work consists of constructing Rumble Strips at roadway (Route 2) to match existing conditions by cutting ½" deep depressions into finished bituminous concrete surfaces.

**Equipment**

The equipment shall consist of a rotary type cutting head with a maximum outside diameter of 23 5/8" and will be a minimum of 15 3/4" long. The cutting head shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16" between peaks and valleys). The cutting head(s) shall be on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder and/or any irregularities in the shoulder surface. The equipment shall be capable of cutting at least 70 rumble strips per minute.

The Rumble Strips shall have finished dimensions of 7" ( $\pm$  ½") wide in the direction of travel and shall be a minimum of 15 3/4" long measured perpendicular to the direction of travel. The depressions shall have a concave circular shape with a minimum ½" depth at center (maximum allowable depth 5/8"). The Rumble Strips shall be placed in relation to the roadway according to the patterns shown in the plans.

**Construction**

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway and to provide uniformity and consistency throughout the project.

Pavement material suitable for recycling shall become the property of the Contractor for use on the project or for use in his other operations at the Contractor's option.

Excess waste material resulting from the operation shall be removed and disposed of in a manner approved in writing by the Engineer.

At the end of each working day, all equipment shall be removed to a location where it does not present a hazard to traffic. The pavement shall be cleaned by sweeping or flushing, and the work area shall be reopened to traffic.

No rumble strips shall be installed on the bridge decks or at the median edge lines where the paved shoulder is less than 24' in width and where guard rail or concrete barriers are less than five feet away from the edge line.

The Contractor shall demonstrate to the Engineer the ability to achieve the desired surface inside each depression without tearing or snagging the asphalt prior to the beginning of work.

**ITEM 455.**

**SUPERPAVE HMA PAVEMENT**

The work under this item shall conform to the relative provisions of Section 455 of the MassHighway Superpave HMA Pavement Specifications dated April 30, 2008. Superpave HMA shall be installed on Route 2 only.

**ITEM 482.3**

**SAWING ASPHALT PAVEMENT**

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

The work shall include the sawcutting of existing asphalt pavement where shown on the plans, where trenching for proposed drainage, and as required by the Engineer.

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

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

Sawcut edges which become broken, ragged or undermined as a result of the Contractor's operations shall be re-cut prior to the placement of the bituminous concrete material against the surfaces.

Sawcut surfaces shall be sprayed or painted with a uniform, thin coat of RS-1 asphalt emulsion at a rate of 0.1 Gallons per Square Yard immediately before placement of asphalt pavement material against the surfaces.

**ITEM 593.**

**EDGING REMOVED AND STACKED**

The work under this item shall conform to the relative provisions of Section 580 of the Standard Specifications and the following:

The work shall include the removal and stacking of existing granite edging for the purposes of widening the ramps as shown on the Route 2 Detour plan. Existing granite edging shall be stacked in a location behind temporary concrete barrier such that it does not obstruct the traveled way. With the exception of the Ward Hill Road intersection, stacked granite edging shall be reset in its original location after Route 2 is reopened and the temporary pavement has been removed from the ramps. The granite edging at the Ward Hill Road intersection shall be reset as specified on the plans.

**ITEM 657.**

**TEMPORARY FENCE**

The work under this Item shall conform to the relevant provisions of Section 600 of the Standard Specifications and includes installation of a chain link fence shown on the plans and the following:

The temporary 6 foot high chain link fence shall be placed around the work area to protect areas with excavations as required by the Engineer and shall meet the requirements of the Standard Specifications and the Construction Standards, except the material need not be in new condition. Gates shall be used at all locations that are to be opened on a regular basis. Temporary fence shall be reset as often as required by Contractor activities to meet the project schedule and to stage the construction, subject to approval by the Engineer.



**ITEM 698.3**

**GEOTEXTILE FABRIC FOR SEPARATION**

**DESCRIPTION**

The work shall consist of furnishing and installing approved geotextile filter fabric at the locations and in the manner shown on the plans or as directed by the Engineer.

**MATERIALS**

Shall conform the requirements of Subsection M9.50.0, Type I, and be **non woven**.

**CONSTRUCTION METHODS**

The geotextiles shall be protected from exposure to sunlight during transport and storage. After placement, the geotextile shall not be left uncovered for more than two (2) weeks.

Traffic or construction equipment will not be permitted directly on the geotextile. Geotextiles may be joined either by sewing or overlapping. Sewn seams shall be lapped a minimum of four inches and double sewn. The thread used to sew the seam shall be nylon or polypropylene. Overlapped seams shall have a minimum overlap of 18 inches. All seams shall be subject to the approval of the Engineer. Geotextile that becomes torn or damaged shall be replaced or patched. The patch shall extend 3 feet beyond the perimeter of the tear or damage.

Bedding and Slope Protection: The geotextile shall be placed and anchored on a prepared surface approved by the Engineer. The geotextile shall be laid loosely so that placement of the overlaying materials will not stretch or tear the geotextile. The backfill placement shall begin at the toe and proceed up the slope. Successive geotextile sheets shall be overlapped in such a manner that the upstream sheet is placed over the downstream sheet.

Riprap shall not be dropped onto the geotextile from a height greater than 12 inches. Slope protection and smaller sizes of stone filling shall not be dropped onto the geotextile from a height exceeding 3 feet.

The surface upon which the geotextile is to be placed shall be within reasonable conformity to the proposed grade. The overlaying course shall be placed in one (1) lift and compacted as approved by the Engineer.

**ITEM 734**

**SIGN REMOVED AND RESET**

The work under this Item shall conform to the relevant provisions of Section 734 of the Standards Specifications and the following:

The Contractor shall carefully remove and reset at new locations all existing signs, attachment hardware and sign support posts not included under other sign Items as shown on the drawings and as required by the Engineer.

Signs, attachment hardware and sign support posts lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new materials. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

**ITEM 851.1**

**TEMPORARY HIGHWAY LANE SEPARATORS**

Route 2 Detour

The temporary highway lane separators used to separate eastbound and westbound traffic for the Route 2 Detour shall be Pexco DP200 round channelizer posts or equivalent, as approved by the engineer. Posts shall be spaced 10' on center, or as otherwise required by the Engineer.

**ITEM 851.2**

**PERMANENT HIGHWAY LANE SEPARATORS**

Route 2

The existing Qwik Kurb highway lane separators on Route 2 shall be removed and reset. If any sections of the existing highway lane separation system become damaged as a result of the work, the Contractor shall replace them with Qwik Kurb similar in kind to the existing separators.

All Qwik Kurb shall be assembled and attached to the roadway per the manufacturer's specifications. New Qwik Kurb installed in the roadway shall be attached with the anchor bolts specified by the manufacturer. Qwik Kurb installed across the bridge shall be attached with the permanent adhesive specified by the manufacturer. Mechanical anchors shall not be allowed over the bridge.

New upright spacing markers shall be Model L104 "Mega Markers" and yellow in color to match existing. Upright markers shall be spaced at 15' on center to match existing spacing. Upright markers shall be attached to base units per manufacturer's specifications.

New Qwik Kurb base units shall be Model L 60 "Category A Lane Separator" to match existing. New lane separator bases shall be furnished with Model L 65 "Reflective Arc" per manufacturers specifications.

**ITEM 853.41**

**TEMP. IMP. ATTENUATOR FOR SHOULDER,  
INCAPABLE OF REDIRECTION**

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

These items shall consist of furnishing and installing temporary impact attenuators in conformance with the manufacturer's specifications and in conformance with the location, lines and grades shown on the Plans and/or designated in the Special Provisions. This work also includes maintaining, removing and reinstalling temporary impact attenuators where indicated on the Plans, or as directed by the Engineer.

All materials used in the foundation and anchorage of temporary impact attenuators shall meet the requirements of Division III, materials. The temporary impact attenuator may be any impact attenuator which meets the requirements of the National Cooperative Highway Research Program, Report 350, Test Level 3 and its subsequent revisions, and has been accepted by the Federal Highway Administration for general use in the location intended. The temporary impact attenuator shall be designed for the speeds noted on the traffic management plans. The temporary impact attenuator shall be compatible with the barrier or other device it is attached to. The temporary impact attenuator shall meet the design speed of the roadway it is installed on.

The Contractor shall submit shop drawings of the temporary impact attenuator for approval by the Engineer prior to installation.

**ITEM 853.8**      **TEMPORARY ILLUMINATION FOR NIGHT WORK**

The work under this Item shall conform to Section 820 and shall consist of illuminating the work area for the purpose of conducting nighttime work at a stationary location. The following illumination standards shall be maintained at all times during night operations. The entire work area during the night time shall be illuminated to a minimum average ten (10) foot candles measured on a horizontal plane or vertical plane 6 inches above the work surface.

A uniformity ratio (average to minimum) of 4:1 or better shall be maintained at all times in the work area. This shall apply to the work areas only. All lighting units shall be placed in such a manner as to avoid shadows on the work area or the travel way and to prevent excess glare to the motorist.

**Equipment**

All flood lights shall have flat tempered glass or polycarbonate lenses securely fastened to the housing to prevent personal injury in the event of lamp breakage. Floodlights shall be mounted on portable or fixed tripod s or staging of the Contractor's choice in a location off the travel way.

The lighting staging areas shall be roped off to all personnel except the lighting technicians and the Engineer or his designee. All generators and wiring shall be within the restricted area and shall conform to the Massachusetts Electrical Code. Floodlights used to illuminate shall be mounted at a sufficient height to allow for an aiming angle of 45° from the vertical to illuminate work on the ground. The floodlights shall be positioned at a height that eliminates direct light and limits glare to the motorist. The Contractor shall maintain an inventory of spare lamps and fixtures on the job site and all lamps or fixtures shall be repaired or replaced immediately.

**Lighting Schedule**

The Contractor shall submit for approval a layout of his proposed lighting complete with equipment, specifications, photometrics, and calculations prepared by a Massachusetts Registered Professional Engineer prior to beginning any work.

**ITEM 853.9**

**TEMP. ILLUMINATION FOR NIGHT  
PAVING & PLANING OPERATIONS**

The work under this Item shall conform to Section 620 and shall consist of illuminating a mobile work area for the purpose of conducting nighttime planing/paving operations. The following illumination standards shall be maintained at all times during night operations.

The entire work area during night time shall be illuminated to a minimum average ten (10) foot candles measured on a horizontal plane or vertical plane 6 inches above the work surface. A uniformity ratio (average to minimum) of 4:1 or better shall be maintained at all times in the work area. This shall apply to the work areas only. All lighting units shall be placed in such a manner as to avoid shadows on the work area or the travel way and to prevent excess glare to the motorist.

**Equipment**

All floodlights shall have flat tempered glass or polycarbonate lenses securely fastened to the housing to prevent personal injury in the event of lamp breakage. Floodlights shall be mounted on portable or fixed tripods or staging of the Contractor's choice in a location off the travel way. The lighting staging areas shall be roped off to all personnel except the lighting technicians and the Engineer or his designee. All generators and wiring shall be within the restricted area and shall conform to the Massachusetts Electrical Code. Floodlights used to illuminate shall be mounted at a sufficient height to allow for an aiming angle of 45° from the vertical to illuminate work on the ground. The floodlights shall be positioned at a height that eliminates direct light and limits glare to the motorist. The Contractor shall maintain an inventory of spare lamps and fixtures on the job site and all lamps or fixtures shall be repaired or replaced immediately.

**Lighting Schedule**

The Contractor shall submit for approval a layout of his proposed lighting complete with equipment, specifications, photometrics, and calculations prepared by a Massachusetts Registered Professional Engineer prior to beginning any work.

**ITEM 877.1**

**SIGN POST REMOVED AND DISCARDED**

Signs shall be removed and discarded as directed on the plans. Included in this item shall be the removal of the signs and posts including the foundation material. The resulting hole shall be backfilled with ordinary borrow, compacted and furnished with 4" loam and seed.

**ITEM 995.05**  
**ITEM 995.06****BRIDGE STRUCTURE – SUBSTRUCTURE**  
**BRIDGE STRUCTURE - SUPERSTRUCTURE****TEMPORARY PROTECTIVE SHIELDING**

The temporary shielding shall protect the roadway and people below the bridge from falling or flying debris during construction of the bridge. The shielding shall prevent any debris, tools or incidental items from falling onto the roadway below.

The Contractor shall submit calculations and detailed drawings of the proposed shielding, stamped by a professional engineer registered in Massachusetts, to the Engineer and for review and approval.

**TEMPORARY SUPPORTS**

Temporary supports shall be utilized during construction to support the proposed superstructure over Route 2A as shown on the Plans.

The Contractor shall submit calculations and detailed drawings of the proposed temporary supports and their foundation system, stamped by a professional engineer registered in Massachusetts, to the Engineer and for review and approval. The temporary supports shall consist of a pre-engineered system and the design shall conform to the AASHTO LRFD Bridge Design Specifications, the AASHTO Standard Specifications for Highway Bridges, or the AASHTO Guide Specification for Temporary Works.

**BRIDGE DECK**

In addition to the requirements contained herein, all weather and concrete temperature requirements contained in Subsection 901.64 shall be satisfied. Cement concrete for bridge decks shall not be placed when the ambient air temperature exceeds 85°F or is expected to exceed 85°F during the placement of the deck. When placing concrete, the Contractor must provide suitable equipment and take appropriate actions as approved by the Engineer to limit the evaporation rate of the exposed concrete surface to less than 0.15 lb/ft<sup>2</sup>/hr. The deck surface evaporation rate shall be determined in accordance with Figure 1 of these Specifications (obtained from "Plastic Cracking of Concrete" by Delmar Bloem for the National Ready Mixed Concrete Association and published in ACI 305R-89) and all data contained in the Bridge Deck Placement Environment table below shall be determined by the Contractor and agreed upon by the Engineer prior to and after casting the bridge deck. To maintain the deck surface evaporation rate below 0.15 lb/ft<sup>2</sup>/hr the Contractor shall take one or more of the following actions:

1. Misting the surface of the concrete with pressurized equipment attached to the finishing machine until the curing cover is applied. The water mist shall be distributed at a rate of at least 0.10 gallons/square foot/hour. For example, on a deck that is 30 feet wide, the system must be able to apply at least 3.0 gallons of water per linear foot per hour. The fog spray must be produced from nozzles that produce an atomized fog mist that will maintain a sheen of moisture on the concrete surface without ponding. The atomized

**ITEMS 995.05 & 995.06 (Continued)**

water droplets shall have an average droplet diameter of 0.003 inches or less. The area of coverage from each nozzle shall overlap all adjacent coverage areas by at least 12 inches.

Water that drips from the nozzles shall not be allowed to fall onto the concrete that is being cured.

2. Reduce the temperature of the concrete.
3. Reschedule the placement until such time as the environmental conditions are acceptable, such as at night or during early morning hours.

Bridge Deck Placement Environment						
City/Town:				Date:		
Bridge Number:				Contract Number:		
Start Station:				End Station:		
X	Time Measured	Air Temp.	Relative Humidity (%)	Concrete Temp.	Wind Velocity	Evaporation Rate
Prior to Casting						
After Casting						
Signature – Contractor’s Authorized Representative:				Printed Name:		
Signature – MASSDOT Resident Engineer:				Printed Name:		

Cement Concrete crack sealing requirements defined herein are for the repair and sealing of cast-in-place cement concrete to prevent water infiltration to the steel reinforcement bars. The width of cracks shall be determined by the Engineer using a width indicating comparator card made of clear plastic with lines of specified width on the cards. The crack width comparator cards shall be held on concrete surfaces to allow the widths of any concrete cracks to be determined by direct visual comparison of the crack width with the widths of the lines marked on the card surface. These cracks are assumed to be non-moving and to have been caused by inadequate control of shrinkage or temperature stresses during curing. Cracks that are of structural concern shall be repaired by other methods determined by the Engineer.

**ITEMS 995.05 & 995.06 (Continued)**

Cracks shall be sealed after construction movement is substantially stable and before waterproofing, pavement, or other construction covers the cracked surface. Crack sealing materials shall be applied by skilled applicators under a supervisor with proven successful experience in applications with similar scope of work. Crack sealing materials shall be applied when the concrete and the ambient air temperatures are above 40°F. If a heated enclosure is used to accomplish this, the heating units shall be properly vented to the outside of the enclosure to prevent products of combustion from exhausting within the enclosure.

Before containers of sealing materials are opened, the labels shall be checked and the label information shall be documented. If multi-component systems are used, mixing shall be completed prior to application. Manufacturer's instructions shall be followed. An initial crack sealing demonstration application shall be satisfactorily made in the presence of the Engineer before the application is continued.

Before sealing, the concrete must be clean, sound, and free of contaminants and surface moisture. Any curing compounds, sealers, oils, greases, coatings, or other impregnations shall be removed by sandblasting. Once any concrete surface contaminants are removed, the concrete shall be swept clean and blown off using oil free compressed air immediately prior to applying the sealer.

Methacrylate crack sealing shall be performed in accordance with the manufacturer's instructions within the allowable ambient temperature range. The cracks shall be v-notched to a minimum depth of ½" and shall be cleaned with compressed air. The notch shall then be inspected to confirm that the crack was intercepted. If the crack was not intercepted, the notch shall be expanded to intercept the crack and shall then be re-cleaned with compressed air. Methacrylate shall then be poured into the crack. The crack shall then be observed for seepage of methacrylate and shall be refilled as necessary to ensure the crack is completely filled. If large quantities of methacrylate are used and the crack is not getting filled, the crack should be filled with pre-bagged dried silica sand filler and the crack shall then be re-filled with methacrylate. Methacrylate crack sealer shall consist of a high molecular weight low viscosity methacrylate monomer that when catalyzed will produce a crack-healer/penetrating-sealer that is a rapid-curing, modified-methacrylate resin. The methacrylate material shall, as a minimum, provide the following as applied properties:

Property	Value	Test
Viscosity	< 25 cps	ASTM D2393
Bond Strength	> 1500 psi	ASTM C882
Tensile Elongation	> 3%	ASTM D638



**ITEMS 995.05 & 995.06 (Continued)**

In addition, the methacrylate material shall demonstrate full penetration of concrete cracks in mock-up testing. Mock-up testing shall consist of preparing the deck surface, applying the methacrylate sealer and removing cores to evaluate the depth and quality of methacrylate sealer penetration. Successful methacrylate penetration of the concrete cracks shall be demonstrated visually in nominal 3 inch deep cores that intersect crack widths in the 7 to 20 mil width range. The cores shall be sliced longitudinally, perpendicular to the crack, and examined in an AASHTO accredited laboratory using ultraviolet light in order to fluoresce the methacrylate to determine the methacrylate penetration depth (the deepest point to which the methacrylate reached) and the sealer-filled crack depth (the depth to which the crack was filled wall-to-wall). The results of mock-up testing shall be documented in a report prepared by the AASHTO accredited laboratory.

Epoxy injection crack sealing shall be performed in accordance with the manufacturer's instructions within the allowable ambient temperature range. Epoxy-Resin for Cement Concrete Crack Injection shall conform to AASHTO M235, Type IV, Grade I. The cracks shall be cleaned with compressed air. Surface mounted injection ports shall then be installed over the centers of the cracks. The spacing of these ports shall be contingent upon the material and the injection equipment chosen. Socket porting shall be allowed provided that a hollow drill bit and vacuum system is used to prevent debris from entering the cracks. Surface ports shall be mounted with rapid setting epoxy material. The crack widths shall be noted during port installation. After the ports are installed, the crack surfaces shall be sealed with high modulus, 100% solids, moisture tolerant epoxy paste adhesive. This material shall be capped with fine sand before it is cured. After the capping material has cured, the cracks shall be injected with an epoxy resin compound. The injection pressure used to seal the cracks shall be based upon a number of factors including crack width, crack depth, and the epoxy material used. Injection shall be accomplished using a metered system. The system shall be equipped with a pressure gauge accurate for the pressures anticipated for this work. Injection shall start at the widest point of the crack and shall continue until the narrowest portions of the crack have been filled. Injection shall continue until refusal. If epoxy is observed at adjacent ports, the adjacent port shall be capped and injection shall continue until refusal occurs. Once refusal occurs, injection shall continue at the next wet port until refusal is reached.

Silane Crack Sealer shall consist of a clear, breathable, high-performance, 100 percent solids by weight silane sealer for protecting new and existing concrete surfaces. It must penetrate deeply, sealing out water, chloride ions, and acids, and prevent damage from freeze/thaw cycles. Silane Crack Sealer material shall, as a minimum, provide the following as applied properties:

Property	Value	Test
Water Weight Gain at 250 ft <sup>2</sup> /gal	88% reduction	NCHRP 244 Series II – Cube Test
Absorbed Chloride at 250 ft <sup>2</sup> /gal	89% reduction	NCHRP 244 Series II – Cube Test
Absorbed Chloride at 250 ft <sup>2</sup> /gal	94% reduction	NCHRP 244 Series IV – Northern Climate

### **ITEMS 995.05 & 995.06 (Continued)**

The type of Cement Concrete crack sealing required shall be determined as a function of the surface type and maximum crack width as follows:

- Cracks less than 0.006" wide shall be ignored;
- Cracks greater than or equal to 0.006" wide and less than 0.012" wide shall be sealed with an approved methacrylate;
- Cracks greater than or equal to 0.012" wide shall be sealed using either epoxy injection or methacrylate with a sand filler.

### **PRECAST CONCRETE GROUTED JOINTS**

The grout to be used for the precast concrete grouted joints shall be a high-strength, non-shrink, flowable grout. The product shall be "FX-228®" as manufactured by Fox Industries, Inc. of Baltimore, Maryland; "Sure-Grip High Performance Grout™" as manufactured by Dayton Superior Corp. of Miamisburg Ohio; or an approved equal. The Engineer shall confer with the Research & Materials Division regarding which products are approved for use on Massachusetts Department of Transportation bridge projects.

### **STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED**

Steel reinforcement shall conform to relevant provisions of Section 901 and as follows: Special procedures shall be used during handling, storage, and installation to prevent damaging epoxy coating, as outlined in the Concrete Reinforcing Steel Institute (CRSI) Engineering Data Report No. 19. Any damage to the epoxy coating shall be repaired following the "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Bars" by CRSI. A copy of these reports must be available at the jobsite for reference.

Accessories supporting epoxy coated bars or welded wire fabric shall be epoxy coated. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting a 300-lb load without damage or permanent distortion.

### **MECHANICAL REINFORCING BAR SPLICERS**

Mechanical reinforcing bar splicers shall meet the requirements of M8.01.9 of the MassDOT Supplemental Specifications.

### **SHEAR CONNECTORS**

Shear connectors shall conform to the applicable provisions of Section 960 of the Standard Specifications and the requirements outlined in M8.04.1.

**ITEMS 995.05 & 995.06 (Continued)****DRILLED/CORED AND GROUTED DOWELS**

The steel dowels/bars shall be standard reinforcing bars and meet the requirements of AASHTO M31 (ASTM A 615) Grade 60 for reinforcement unless otherwise noted. All steel reinforcement dowels shall be either epoxy coated in accordance with AASHTO M284 or ASTM A 934 or galvanized in accordance with AASHTO M 232 (ASTM A 153).

The grout to be used for these dowels shall be "Garonite<sup>TM</sup> HD" as manufactured by Garon Products, Inc. of Wall, New Jersey; "Quik-Rok®" as manufactured by Ameristar of Tulsa, Oklahoma; "FX-228®" as manufactured by Fox Industries, Inc. of Baltimore, Maryland; "Five Star® Grout" as manufactured by Five Star Products, Inc. of Fairfield, Connecticut; or an approved equal. Epoxy, vinyl, or polyester resin adhesives shall not be utilized. The Engineer shall confer with the Research & Materials Division regarding which products are approved for use on Massachusetts Department of Transportation bridge projects.

All dowel holes shall be air drilled provided that the minimum edge distance of 6 inches is observed. Should, in the Engineer's opinion, air drilling be inappropriate due to questionable strength of the existing concrete or insufficient edge distance, the dowel holes shall be diamond core drilled. The inner surfaces of diamond core drilled dowel holes shall be scored to develop sufficient keying action. The method of scoring of the dowel hole inner surfaces shall be subject to the approval of the Engineer. The diameter of the drilled dowel holes shall be in accordance with the recommendations of the grout manufacturer (generally 1/8 inch larger than the dowel diameter). The holes shall be blown clear of any debris and shall have the approval of the Engineer prior to the placement of any grout material.

The Contractor shall strictly follow the recommendations of the manufacturer for mixing and placing the grout material prior to the placement of the dowels. The Contractor shall, at a minimum, adhere to the ACI code requirements regarding minimum and maximum temperatures while placing the grout. Any excessive grout around the hole after placement of the dowel shall be struck off smooth while the grout is still fresh.

Two test dowel bars of each dowel size shall be installed in the existing concrete substructure and tested by the Contractor for pullout. The tension test shall conform to ASTM E488 and the pullout force shall correspond to 125% of the yield strength of the bar. If any of the tested bars pull out or if the surrounding concrete shows signs of cracking, the Contractor must adjust the hole diameter, embedment length, and/or grouting material to meet this test requirement. All holes or cracks caused by testing shall be repaired by the Contractor.

**LAMINATED ELASTOMERIC BEARING W/O ANCHOR BOLTS**

Elastomeric bearings shall meet the requirements of M9.14.5.

**ITEM 996.003****PRECAST BRIDGE COMPONENTS**  
**(PRECASTING AND DELIVERY)**

Precast concrete shall be fabricated in accordance with the dimensions shown on the plans and the applicable provisions of M4.02.14 of the Standard Specifications. Precast components shall be lifted by handling hooks or slings. The utmost care shall be taken to prevent distortion of the components during handling, transporting, and storing. The precast components shall be free from cracks, spalls, and other defects to the satisfaction of the Engineer.

Specifications for steel reinforcement for structures and mechanical reinforcing bar splicers shall be the same as given under Items 995.05 & 995.06.

The Contractor shall prepare and submit to the Engineer, for approval, a plan indicating the proposed erection procedures and methods to be used including, but not limited to, equipment, tools, devices, lifting connections, equipment location, and schedule of operations. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61D, Erection, of the Standard Specifications for Highway Bridges and the Supplemental Specifications. The procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

**ITEM 999.009****SELF PROPELLED MODULAR**  
**TRANSPORTER (SPMT)/HEAVY LIFT/CRANE/**  
**OTHER BRIDGE MOVING TECHNOLOGY**

The proposed superstructure shall be built on temporary supports in a location approximately 130 feet north of the existing bridge and then moved into place on the existing abutments as shown on the plans.

The Contractor shall prepare and submit to the Engineer, for approval, a plan indicating the proposed superstructure move procedures and methods to be used including, but not limited to, equipment, tools, devices, lifting connections, equipment location, and schedule of operations. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61D, Erection, of the Standard Specifications for Highway Bridges and the Supplemental Specifications unless otherwise modified herein. The superstructure move procedure and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The Contractor shall include a contingency plan as a part of the superstructure move procedures. The contingency plan shall identify potential events which could disrupt the schedule and identify mitigating actions that will be taken.

The design of all supports, shoring, jacking/lifting systems, blocking, and header beams used during the bridge move shall conform to the AASHTO LRFD Bridge Design Specifications, the AASHTO Standard Specifications for Highway Bridges, or the AASHTO Guide Specification for Temporary Works. The loads on the heavy lift equipment and any supports associated with it shall receive an additional factor of 1.15 to account for dynamic effects during the move.

**ITEM 999.009 (Continued)**

The superstructure shall be moved from the temporary shoring and placed on the proposed abutments as shown on the plans. The placement tolerance in the bridge's longitudinal direction shall be 1/2" and the placement tolerance in the bridge's transverse direction shall be 1/2".

The superstructure shall be monitored for damage during the lifting, moving, and placing procedures. Prior to lifting and after the span is set on the final abutments, the Contractor shall catalog all of the cracks in the concrete deck, as seen from above and below, and in the concrete barrier. The catalogs from before and after the move shall be compared to identify possible locations of damage induced by the lifting and moving procedure. Cracks equal to or greater than 0.006" shall be sealed by the methods described under Items 995.05 & 995.06 of this document. Any concrete spalls that occur shall be patched as outlined in Item 115.1 of this document.