

confined spaces, year built markings, and for all material, labor, equipment (including safety equipment), tools, and incidentals necessary to complete the work.

The construction of drainage and weep holes, any pipe necessary, expansion material, flashing, dampproofing, membrane waterproofing, epoxy bonding compound, joints and their placement will not be paid for but the cost will be incidental to the lightweight concrete item. No deduction in lightweight concrete quantities will be made for pipes or conduits having diameters less than 8 in., reinforcement steel, anchors, or any other appurtenances.

425.04.01 Lightweight Superstructure Concrete will not be measured but will be paid for at the Contract lump sum price unless otherwise specified in the Contract Documents.

425.04.02 Lightweight concrete parapets and median barriers will not be measured but will be paid for at the Contract lump sum price for the pertinent Lightweight Concrete Parapet or Lightweight Concrete Median Barrier items.

425.04.03 Floodlighting will be measured and paid for as specified in 420.04.06.

425.04.04 Linseed Oil Protective Coating will be measured and paid for as specified in 420.04.07.

SECTION 426 — LATEX MODIFIED CONCRETE OVERLAY FOR BRIDGE DECKS

426.01 DESCRIPTION. This work shall consist of removing a specified amount of the existing bridge deck mechanically or through hydromilling, removal of additional areas of deteriorated concrete, cleaning all surface areas to be overlaid, replacing deteriorated reinforcement steel, and placing latex modified concrete (LMC), all as specified in the Contract Documents.

Restrictions. Placement of LMC on bridge decks is prohibited between November 30 and April 30. The Contractor shall not scarify any bridge deck that will not be overlaid and cured prior to this restriction.

426.02 MATERIALS.

Fine Aggregate	901.01
Coarse Aggregate	901.01, Size No. 7

Portland Cement Type I	902.03
Concrete for Patching	902.10
Latex Modified Concrete	902.13
Reinforcement	908
Water	921.01

426.03 CONSTRUCTION. All removed material shall become the property of the Contractor and shall be disposed of at approved spoil areas.

426.03.01 Equipment. All equipment proposed for use by the Contractor shall be approved by the Engineer prior to use and shall conform to the following:

Deck Removal Equipment.

- (a) **Existing Wearing Surface Removal.** This equipment shall only be required when the existing bridge contains a hot mix asphalt wearing surface. It shall be capable of removing the wearing surface without damaging armored joints that are to remain or the existing concrete surfaces beyond the specified minimum removal depth. When pavement breakers are proposed, broad faced chisel blades shall be used and operated at a slight angle with the horizontal to peel the wearing surface off.
- (b) **Deck Surface Removal.** Power operated mechanical type or a high pressure water jet type equipment shall be capable of uniformly removing the specified minimum depth from the existing concrete surface.
 - (1) **Mechanical Type.** This equipment shall be limited to depths not closer than 1/2 in. from the top of the existing reinforcement. When additional removal is required, it shall be performed by high pressure water jet, power driven hand tools, or hand tools.
 - (2) **High Pressure Water Jet.** This equipment may be used to any depth above and below the reinforcement steel. The runoff water shall be satisfactorily controlled to prevent it from reaching any traveled roadway, waterways, or any other areas designated in the Contract Documents or by the Engineer. Insufficient means of controlling runoff water or the concrete removal depth may be cause for rejection of this equipment. When this is the case, the Contractor shall revert to the mechanical type, power driven hand tools, or handchipping at no additional cost to the Administration. However, the Contractor shall revert only to the mechanical

type equipment for removal of the specified minimum depth when the specified minimum depth is at least 1/2 in. above the existing reinforcement.

- (c) **Power Driven Hand Tools.** This equipment shall be used for removal of unsound concrete or to achieve the required depth when deeper than 1/2 in. above the top of existing reinforcement. This equipment will be permitted with the following restrictions:
- (1) Pavement breakers heavier than nominal 30 lb class are prohibited.
 - (2) Pavement breakers or mechanical chipping tools shall not be operated at an angle in excess of 45 degrees measured from the surface of the deck.
 - (3) Chipping hammers heavier than a nominal 15 lb class shall not be used to remove concrete from beneath any reinforcement bars.
- (d) **Hand Tools.** Hand tools such as hammers and chisels shall be provided for removal of remaining particles of unsound concrete from beneath any reinforcement bar or to achieve the required depth.
- (e) **Abrasive Blasting.** This equipment shall be capable of removing rust scale and old concrete from reinforcement bars and of removing small chips of concrete partially loosened by the removal operation.

LMC Proportioning and Mixing Equipment. Equipment used for mixing shall be self-contained, mobile, continuous mixing, and subject to the following:

- (a) The mixer shall be self-propelled and be capable of carrying sufficient unmixed dry bulk cement, sand, coarse aggregate, latex modifier, and water to produce on the site a minimum of 6 yd³ of concrete. Storing aggregate in the mixing equipment overnight is prohibited.
- (b) The mixer shall be capable of positive measurement of cement being introduced into the mix, have a recording meter visible at all times, and be equipped with a ticket printout which shall indicate the quantities being mixed.
- (c) The mixer shall be calibrated to accurately proportion the mix. Certification of the calibration by an approved testing authority

will be accepted as evidence of the accuracy if the yield is shown to be true within a tolerance of 1.0 percent in conformance with MSMT 558.

- (d) The mixer shall provide positive control of the flow of water and latex emulsion into the mixing chamber. Water flow shall be indicated by flow meter and be readily adjustable to provide for minor variations in aggregate moisture.
- (e) The mixer shall be capable of being calibrated to automatically proportion and blend all components of indicated composition on a continuous or intermittent basis as required by the finishing operation, and shall discharge mixed material through a conventional chute directly in front of the finishing machine.
- (f) The mixer shall be capable of spraying water over the entire placement width as it moves ahead to ensure that the surface to be overlaid is wetted to receive the LMC.

Placing and Finishing Equipment. The combination of labor and equipment for proportioning, mixing, placing, and finishing LMC shall conform to the following minimum requirements except when otherwise specified in the Contract Documents:

TOTAL OVERLAY AREA PER BRIDGE yd ²	MINIMUM OVERLAY RATE PER HR yd ³
0-328	1.0
329-492	1.5
493-656	2.0
over 656	2.5

- (a) Placing and finishing equipment shall include hand tools for placement and brushing in freshly mixed LMC mortar and for distributing it to approximately the correct level for striking off with the screed.
- (b) An approved finishing machine shall be used for finishing all areas of work. The finishing machine shall be self-propelled and capable of forward and reverse movement under positive control. Provisions shall be made for raising all screeds to clear the screeded surface for traveling in reverse. A rotating cylinder type finishing machine shall be used. It shall be equipped with one or

more rotating steel cylinders, augers, and vibratory pans and span the placement transversely.

- (c) The finishing machine shall be designed so that when LMC is being mixed and placed under normal operating conditions at the minimum rate, the elapsed time between depositing the LMC on the concrete deck and final screeding shall not exceed 10 minutes.
- (d) The construction shall be supervised by a representative of the manufacturer of the LMC mixture or as directed by the Engineer.

426.03.02 Deck Removal and Repairs. Removal shall be performed to the limits shown in the Contract Documents. After removal the Engineer will inspect the entire exposed portion of the deck and indicate if any repairs are required including the type and extent of the repair. Deteriorated areas of deck shall be removed down to sound concrete by use of power driven hand tools, hand tools, or high pressure water jet. After completion of removal of deteriorated concrete, remove all rust, oil or other foreign materials detrimental to achieving bond, followed by abrasive blasting and air blast or vacuum as determined by the Engineer.

The Engineer will determine any extraneous damage to the existing bridge caused by the Contractor's operations, which the Contractor shall repair at no additional cost to the Administration.

Existing reinforcement steel to be utilized in the finished deck shall conform to 421.03.07 except all bars shall be thoroughly cleaned by abrasive blasting. Where the bond between existing concrete and reinforcement steel has been destroyed, or where more than half the diameter of the steel is exposed, the concrete adjacent to the bar shall be removed to a depth that will permit concrete bond to the entire periphery of the exposed bar. This clearance shall be a minimum of 1 in. unless lower bar mats make it impractical. Care shall be exercised to prevent cutting, stretching, or damaging any exposed reinforcement steel.

Areas from which unsound concrete has been removed shall be kept free of slurry produced by hydromilling of concrete in adjacent areas. Work shall be planned so that this slurry will drain away from all open areas. All slurry shall be removed from prepared areas before proceeding with the surface preparation.

Spalled concrete, voids and other defects that are located within the proposed LMC overlay area shall then be repaired in conformance with the methods specified herein. Each repair shall include the removal of the additional deck material, all handchipping, and repairing material. If the Contractor elects to use Mix No. 5/Mix No. 6 concrete to make repairs, the concrete shall be placed even with the top of the remaining deck prior

to placing the overlay material. The top surface of these deck repairs shall be given a final textured finish consisting of 1/8 in. wide by 1/8 in. deep transverse corrugations spaced approximately 1/4 in. apart. The method of texturing shall be approved by the Engineer prior to placing the material for the deck repair. The repaired areas shall be covered with wet burlap or wet cotton mats and shall be kept continuously wet for 120 hours.

- (a) **Type I Deck Repairs.** This repair shall include cavities less than 1 in. deep. The cavity may require handchipping, but the void shall be filled with LMC overlay while applying the overlay.
- (b) **Type II Deck Repairs.** This repair shall include cavities 1 to 3 in. deep which the Contractor has the option of repairing with Mix No. 5 concrete or filling the void with LMC overlay while applying the overlay. Wire fabric shall be placed as specified in 423.03.04. Wire fabric will not be required for repair areas less than 2 ft².
- (c) **Type III Deck Repairs.** This repair shall include areas where the depth of deck removal is over 3 in. deep but not full depth. The Contractor may opt to repair with Mix No. 6 concrete or fill the void with LMC overlay while applying the overlay. If the repair crosses a proposed construction joint, a 1-1/2 × 3 in. keyway shall be provided at the vertical joint.

The Contractor shall furnish and erect temporary protective shields as specified in 405.03.01 when the depth of removal reaches half of the original concrete deck thickness and deeper removal is anticipated.

- (d) **Type IV Deck Repairs.** This repair shall include areas where the depth of deck removal is full depth. The option and requirements of (c) shall also apply. In large areas forms supplied to enable placement of the concrete shall be supported by blocking erected from the stringers. In small areas forms supplied to enable placement of the concrete/LMC may be suspended from existing reinforcement bars by wire ties.

The top surface of all deck repairs shall be even with the top of the remaining deck.

426.03.03 Surface Preparation. The entire surface shall be thoroughly cleaned and abrasive blasted before placing the overlay. The abrasive blasting shall clean all reinforcement of visible rust and clinging concrete detached from the deck and all areas of concrete against which the overlay is to be placed. Abrasive blasting may be required on the day the

overlay is to be placed so that reinforcement is free of visible rust. Abrasive blasting shall not be performed more than 24 hours prior to placing the LMC overlay. When the Contractor opts to fill repaired voids with concrete in conformance with 426.03.02, they shall be completely cured prior to performing this surface preparation.

The surface shall be further cleaned by air blast followed by flushing with water. Prior to placing the LMC overlay, the surface shall be wetted and kept wet for at least one hour and puddles of free water shall be removed.

426.03.04 Proportioning and Mixing LMC Materials. Mixers shall be clean and the ingredients accurately proportioned.

LMC materials shall be mixed at the site in conformance with the specified requirements for the equipment used. The LMC discharged from the mixer shall be uniform in composition and consistency. Mixing shall be capable of permitting finishing operations to proceed at a steady pace with final finishing completed before the formation of the plastic surface film.

426.03.05 Placing and Finishing LMC Overlay. The LMC overlay will be the riding surface of the bridge. The top of the LMC overlay shall be placed to the true as planned line and grade of the roadways. The Contractor shall take all necessary precautions to produce a finished top of LMC overlay that shall be smooth riding by placing the LMC overlay in a manner that meets the grade of the proposed adjoining portions of the new bridge decks and adjoining roadways.

Screed rails shall be placed and fastened in position to ensure finishing the new surface to the required profile. Anchorage for supporting rails shall provide horizontal and vertical stability. Screed rails shall not be treated with any compound to facilitate their removal.

The location of longitudinal joints may be shown in the Contract Documents. If not shown, the locations shall be as directed by the Engineer based on avoiding joints in the vehicular wheel path as much as practical.

The Contractor shall take every reasonable precaution to secure a smooth riding bridge deck in conformance with 420.03.07(d). Prior to placement operations, the equipment, procedures, personnel and previous results shall be reviewed with the Engineer, and the inspection procedures will be reviewed to ensure coordination. Precautions shall include the following:

- (a) All surfaces shall be completely cleaned as approved by the Engineer prior to placing the LMC overlay.
- (b) The LMC mixture shall be brushed onto the wetted, prepared surface. Care shall be exercised to ensure that all vertical and horizontal surfaces receive a thorough, even coating and that the rate of progress is limited so that the brushed material does not become dry before it is covered with additional materials required for the final grade. Brushed material that has dried prior to LMC placement shall be removed and replaced in a manner acceptable to the Engineer. Coarse aggregate that accumulates from the brushing operations shall be disposed.
- (c) The LMC mixture shall be placed to approximately 1/4 in. above grade and then screeded with an approved power operated finishing machine to the line and grade specified in the Contract Documents. A suitable portable lightweight or wheeled work bridge shall be used behind the finishing operation. Hand finishing may be required along the edge of placements. Joints shall be edge tooled except next to metal expansion dams, curbs, and previously placed lanes.
- (d) Screenshot rails and construction bulkheads shall be separated from the newly placed material by passing a pointing trowel along their inside face. The trowel cut shall be for the entire depth and length of screed rails and bulkheads after the mixture has stiffened sufficiently. Metal expansion dams shall not be separated from the overlayment.

426.03.06 Curing. The surface of the LMC overlay shall be covered with a single layer of clean, wet burlap or wet cotton mat as soon as the surface will support it without deformation. Immediately following covering with wet burlap or wet cotton mat, a 4 mil layer of polyethylene film shall be placed on the burlap or cotton mat and the surface cured for 24 hours. After 24 hours, the curing material shall be removed and the LMC air cured for an additional 72 hours. White opaque burlap polyethylene sheeting may be substituted for the polyethylene film with approval of the Engineer, but shall not replace the wet burlap or wet cotton mat.

426.03.07 Grooving. The operation shall conform to the applicable portions of 420.03.07(d)(1), but shall start after the LMC has been cured in conformance with 426.03.06.

426.03.08 Limitation of Operations. LMC placement shall conform to the applicable deck placement restrictions specified in 420.03.04.

All traffic (Contractor's or public) is prohibited on the LMC overlay until the curing of the material is completed and the compressive strength test has reached 3000 psi.

LMC and concrete shall not be placed adjacent to an LMC surface course less than 96 hours old. This restriction does not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

Grinding or chipping the existing concrete pavement within 6 ft of LMC is prohibited until the LMC has cured for a minimum of 48 hours.

LMC shall not be placed at temperatures lower than 45 F. The LMC may be placed at 45 F, if rising temperature is predicted, and anticipated for at least 8 hours.

At temperatures below 55 F, the Engineer will require a longer curing period and conformance with applicable portions of 420.03.13.

LMC that is unsatisfactory shall be removed and replaced at no additional cost to the Administration. Any day during which the curing temperature falls below 50 F shall not be counted as a curing day. When during the curing period the curing temperature falls below 35 F, the work may be considered as being unsatisfactory and rejected.

During minor delays of one hour or less, the end of the placement may be protected from drying with several layers of wet burlap. A construction dam or bulkhead shall be installed when the delay exceeds one hour in duration. Placement operations may proceed after a period of not less than 12 hours. This restriction does not prohibit continuation of placement provided a gap is left in the lane or strip. The gap shall be of sufficient length for the finishing machine to clear the previously placed LMC overlay.

Adequate precautions shall be taken to protect freshly placed LMC overlays from sudden or unexpected rain. All placing operations shall stop when it starts to rain. The Engineer may order the removal and replacement of any material damaged by rainfall at no additional cost to the Administration. The Engineer will determine what material has been damaged.

No linseed oil shall be placed on LMC finished deck surfaces.

426.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all removing and cleaning, abrasive blasting, air blasting, flushing with water, forming, curing, disposal of material