

concrete shall be vibrated with a surface or pan-type vibrator to obtain compaction. Spud type vibrators shall not penetrate to contact with the original concrete. Surface finish and curing shall be in accordance with the specifications for the mixture used.

**505.10.12 Method of Measurement.** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The area of concrete wearing surface will be measured and computed to the nearest square yard. This area will be measured longitudinally from end to end of bridge deck and transversely between roadway face of curbs, excluding from measurement the area of drains and expansion devices. The revision or correction will be computed and added to or deducted from the contract quantity.

**505.10.13 Basis of Payment.** Payment for the above described work shall be considered completely covered by the contract unit price per square yard of concrete wearing surface.

**SECTION 505.20 LATEX MODIFIED CONCRETE.**

**505.20.1 Description.** This work shall consist of constructing a wearing surface of latex modified concrete on a prepared surface in accordance with these specifications as shown on the plans or as directed by the engineer.

**505.20.2 Material.** All material shall be in accordance with [Division 1000](#), Material Details, and specifically as follows:

Item	Section
Type I or II Cement	<a href="#">1019</a>
Latex Emulsion Admixture	<a href="#">1054</a>
Polyethylene Sheeting	<a href="#">1058</a>
Water	<a href="#">1070</a>

**505.20.2.1** Aggregate shall be in accordance with [Sec 505.10.2](#).

**505.20.2.2** Pozzolanic material or Portland pozzolan cements shall not be used.

**505.20.2.3** Latex admixture shall be kept in a suitable enclosure that will protect the admixture from freezing and from exposure to temperatures in excess of 85 F. Drums of latex admixture to be stored at the work site in direct sunlight shall be completely covered with a suitable insulating blanket material to maintain an enclosed temperature below 85 F.

**505.20.3 Concrete Mixture.**

**505.20.3.1** The contractor shall submit a mix design to Construction and Materials meeting the following requirements:

Property	Requirement
Air Content, percent	0 to 6.5
Slump, inches	9 (max.)
Percent Fine Aggregate as percent of Total Aggregate by Absolute Volume	50 to 55
Cement Content, lbs./cubic yard min.	658
Latex Emulsion Admixture, gallons/cubic yard. min.	24.5
Net Water/Cement Ratio, max. lbs. <sup>a</sup> water/lbs. cement	0.40

<sup>a</sup> Net water shall be considered the quantity of mixing water added, plus the non-solid portion of the latex emulsion.

**505.20.3.2** Any change in mix design or proportions shall be approved by the engineer.

**505.20.3.3** Anti-foam additives, as recommended by the latex emulsion manufacturer, may be required if the concrete mixture entrains air above the specified amount.

**505.20.3.4** Air-entraining admixtures shall not be added.

**505.20.4 Testing.** Testing will be done in accordance with [Sec 505.10.4](#), except the slump test will be conducted 4 to 5 minutes after discharge from the mixer. During the waiting period, concrete shall be deposited on the deck and shall not be disturbed.

**505.20.5 Mixing.**

**505.20.5.1** The concrete shall be volumetrically mixed at the bridge site by a continuous mixer in accordance with [Sec 501](#). In addition to other requirements, the mixer shall provide positive control of the latex emulsion into the mixing chamber and the latex emulsion shall calibrate to within  $\pm 2$  percent of that required. The mixer shall be capable of continuously circulating the latex emulsion and shall have a flow-through screen between the storage tank and the discharge.

**505.20.5.2** The concrete discharged from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace. Final finishing shall be completed before the formation of a plastic surface film.

**505.20.5.3** The moisture content of aggregate at the time of proportioning shall be such that water will not drain or drip from a sample. Coarse and fine aggregate shall be furnished and handled to avoid variations in the moisture content affecting the uniform consistency of the concrete.

**505.20.5.4** Each drum of latex admixture shall be mechanically agitated or hand rolled until thoroughly mixed prior to being introduced into the mixer storage compartment. Latex admixture that is stored in the mixer storage compartment overnight or during delays in mixing of four hours or more shall be agitated by at least two complete cycles in a continuous circulating pump or by mechanical means in the storage compartment. The flow through screen shall be cleaned immediately prior to beginning proportioning and as often as necessary thereafter. Latex admixtures of different brands shall not be combined together in any manner.

**505.20.6 Surface Preparation.** Surface preparation shall be in accordance with [Sec 505.10.6](#) except as specified herein.

**505.20.6.1** Prior to scarifying or chipping on concrete adjacent to latex modified concrete, 96 hours of curing shall elapse. If practical, all scarifying by mechanical units shall be completed prior to placing any latex modified concrete, unless otherwise shown on the plans. Areas from which unsound concrete and patches have been removed shall be kept free of slurry produced by wet sawing or wet scarifying by planning the work such that this slurry will drain away from the completed areas of preparation.

**505.20.6.2** On both old and new decks, within 24 hours prior to placing latex modified concrete, the entire surface shall be thoroughly cleaned by sandblasting followed by an air blast.

**505.20.7 Finishing Equipment.**

**505.20.7.1** The finishing machine shall be self-propelled and shall be capable of forward and reverse movement under positive control, with a provision for raising all screeds to clear the screeded surface for traveling in reverse. A self-propelled finishing machine with one or more rollers, augers and 1,500 to 2,500 vpm vibratory pans shall be used. A drag float may be necessary. Any modifications will be subject to approval from the engineer.

**505.20.7.2** Support rails shall be in accordance with [Sec 505.10.7.4](#).

**505.20.8 Placing and Finishing Concrete.** Placing and finishing shall be in accordance with [Sec 505.10.8](#) except as specified herein.

**505.20.8.1** Prior to placement of latex modified concrete, the cleaned surface shall be thoroughly wetted for a minimum of three hours, then covered with polyethylene sheeting until time of concrete placement. The surface shall be damp at the time the overlay is placed. Any standing water in depressions, holes or areas of concrete removal shall be blown out with compressed air. No free water or puddles of standing water shall exist at the time of placement.

**505.20.8.2** Expansion joints and dams shall be formed in the concrete overlay. Formation of the joint by sawing through the overlay will not be permitted.

**505.20.8.3** Texturing shall occur immediately after finishing and before the plastic film forms on the surface. Texturing shall be performed in a manner to prevent pulling the concrete away from an existing vertical face. Care shall be taken not to texture too deep and not to tear the surface.

**505.20.8.4** Screed rails and headers shall be separated from the newly placed material by passing a pointing trowel along the inside face. Metal expansion dams shall not be separated from the overlayment. The trowel cut shall be made for the entire depth and length of rails or headers after the mixture has stiffened sufficiently and shall prevent the concrete from flowing back into the cut.

**505.20.8.5** During placement of the overlay, all joints with adjacent concrete shall be sealed with a mortar paste of equal parts cement and fine aggregate, using latex emulsion in lieu of mixing water.

**505.20.8.6** The wet cure shall be applied promptly after the concrete has been placed on the deck without deforming the finished surface.

**505.20.8.7** The surface shall receive a wet cure for at least 48 hours.

**505.20.8.8** After placement and cure of the latex modified concrete, the finished deck will be tested to detect unbonded areas.

**505.20.8.9** No surface sealing shall be applied to the latex modified concrete wearing surface.

**505.20.9 Limitations of Operations.**

**505.20.9.1** No latex modified concrete shall be placed when the ambient or deck surface temperature is above 85 F. Deck temperature shall be determined in accordance with MoDOT Test Method TM 20.

**505.20.9.2** No latex modified concrete shall be placed at ambient or deck surface temperatures below 45 F. Latex modified concrete shall be protected to maintain a minimum specified curing temperature of 45 F. Any concrete damaged by freezing or that is exposed to a temperature of less than 45 during the first 8 hours after placement shall be removed and replaced at the contractor's expense.

**505.20.9.3** The temperature of the latex modified concrete at time of placement shall be between 45 F and 90 F. If either the aggregate or water is heated, the maximum temperature for each shall be 100 F at the time of addition to the mix. Any method of heating during the mixing of concrete may be used provided the heating apparatus will heat the mass uniformly and avoid hot spots that will burn the material. Cement or aggregate containing lumps or crusts of hardened material or frost shall not be used.

**505.20.9.4** No vehicular traffic shall be permitted on the latex modified concrete surface until the concrete is at least 96 hours old and has attained a minimum compressive strength of 3,000 psi.

**505.20.9.5** Concrete shall not be placed adjacent to a parallel surface course that is less than 96 hours old; however, this restriction will not apply to a continuation of placement in a lane or strip beyond a joint in the same lane or strip.

**505.20.9.6** Preparation of the area, except scarifying, may be started in a lane or strip adjacent to a newly placed surface the day following the surface placement. If this work is started before the end of the 48-hour wet curing period, the work will be restricted such that any interference with the curing process is held to the minimum practical time.

**505.20.9.7** Longitudinal construction joints shall be placed between designated traffic lanes. The location of the longitudinal joints will be subject to the approval from the engineer.

**505.20.9.8** Transverse joints in the overlay may be permitted if approved by the engineer. These joints shall be located a minimum of 10 feet from the centerline of bent.

**505.20.9.9** A header shall be installed in case of delay in the placement operations exceeding one-half hour in duration. During minor delays of one-half hour or less, the end of the placement shall be protected from drying with several layers of wet burlap.

**505.20.9.10** Adequate precautions shall be taken to protect freshly placed concrete from rain. All placing operations shall cease when rain begins. The engineer may order removal of any material damaged by rainfall and such material shall be replaced in accordance with these specifications at the contractor's expense.

**505.20.10 Removal.** Material removal and disposal shall be in accordance with [Sec 505.10.10](#).

**505.20.11 Repair.** Repair shall be in accordance with [Sec 505.10.11](#).

**505.20.12 Method of Measurement.** Measurement of latex modified concrete will be in accordance with [Sec 505.10.12](#).

**505.20.13 Basis of Payment.** Payment for latex modified concrete will be made in accordance with [Sec 505.10.13](#).

#### **SECTION 505.30 SILICA FUME CONCRETE**

**505.30.1 Description.** This work shall consist of constructing a wearing surface of silica fume concrete on a prepared surface in accordance with these specifications as shown on the plans or as directed by the engineer.

**505.30.2 Material.** All material shall be in accordance with [Division 1000](#), Material Details, and specifically as follows:

Item	Section
Type I Cement	<a href="#">1019</a>
Air Entraining Admixture	<a href="#">1054</a>
Retarding Admixture	<a href="#">1054</a>
Water-Reducing Admixture	<a href="#">1054</a>
Burlap	<a href="#">1055</a>
Polyethylene Sheeting	<a href="#">1058</a>
Water	<a href="#">1070</a>

**505.30.2.1** Silica fume shall be in accordance with [Sec 501](#).

**505.30.2.2** Aggregate shall be in accordance with [Sec 505.10.2](#).

**505.30.2.3** Pozzolanic material, other than silica fume or Portland pozzolan cements shall not be used.

**505.30.2.4** A retarding admixture may be permitted, if recommended by the manufacturer of the silica fume admixture.

**505.30.2.5** Approved Type F or G high range water-reducing admixtures will be permitted if specified or recommended by the supplier of the silica fume admixture.

#### **505.30.3 Concrete Mixture.**

**505.30.3.1** The contractor shall submit a mix design to Construction and Materials with the following properties: