

739 – SLURRY POLYMER CONCRETE OVERLAY

SECTION 739

SLURRY POLYMER CONCRETE OVERLAY

739.1 DESCRIPTION

Prepare the surface of the reinforced concrete bridge deck and construct a slurry polymer concrete overlay (overlay) as shown on the Contract Documents.

Provide an overall combination of labor and equipment with the capability of proportioning and mixing the primer, polymer resin components, aggregate and seal coat, and placing the primer, slurry polymer overlay material, broadcast sand or aggregate, and seal coat in accordance with this specification and the manufacturer/supplier's recommendations.

BID ITEMS

Slurry Polymer Concrete Overlay (*)
Material for Slurry Polymer Concrete Overlay (Set Price)
* Thickness

UNITS

Square Yard
Cubic Yard

739.2 MATERIALS

a. General.

- (1) Proportion all polymer materials according to the manufacturer/supplier's recommendations.
- (2) Provide the Engineer with a copy of the polymer material's manufacturer/supplier's mixing and application recommendations.
- (3) If concrete bridge deck patching is specified, polymer concrete materials may be used for patching of the concrete bridge deck. See SECTION 731.

b. Epoxy. Provide a Type III epoxy resin as defined in DIVISION 1700.

c. Polyester. Provide a polyester resin as defined in DIVISION 1700.

d. Methyl Methacrylate. Provide a methyl methacrylate resin as defined in DIVISION 1700.

e. Broadcast Aggregate and Broadcast Sand.

- (1) Provide FA-C aggregate meeting TABLE 1102-5 and TABLE 1102-6, or
- (2) Aggregate provided by the slurry polymer concrete overlay manufacturer/supplier in a prequalified system, DIVISION 1700.
- (3) Provide clean dry silica broadcast sand meeting a commercial blast sand 20/40 gradation.
- (4) The use of broadcast aggregate and/or broadcast sand is determined by the slurry polymer overlay manufacturer/supplier.

739.3 CONSTRUCTION REQUIREMENTS

a. General. Wet cure concrete on new bridge decks for 14 days and allow the deck to dry for 21 days before applying the overlay.

Portland cement concrete patches require a minimum cure period of 28 days before application of the overlay.

At the preconstruction conference, discuss the patching material and the corresponding curing period. Submit changes, including a written statement from the polymer manufacturer/supplier recommending changes, to the Engineer for approval.

Some overlay systems require the placement of a polymer primer coat and/or a polymer seal top coat, with or without broadcast sand or aggregate. In the following requirements, the polymer primer coat and polymer seal top coat will be referenced with the understanding they are system specific.

b. Equipment. Equipment is subject to approval of the Engineer and must comply with these requirements:

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- (1) Surface Preparation Equipment.
 - (a) Shot blasting equipment capable of producing a surface relief equal to the International Concrete Repair Institute (ICRI) Surface Preparation Level 6 to 7 or ASTM E 965 Pavement Macrotexture Depth of 0.04 to 0.08 inch. Final acceptance is based on testing procedures as outlined in KT-70, Part V.
 - (b) Shot/Sand blast equipment capable of producing the required surface relief on the deck adjacent to bridge rails and barriers and areas not accessible with shot blast equipment.
 - (c) Empty shot blasters and dispose of waste material a minimum of 50 feet from the prepared bridge deck. On long structures empty shot blasters on the unprepared surface a minimum of 50 feet from prepared surface to prevent contamination of the deck by return of dust to the prepared surface.
 - (d) The Engineer must approve the use of scarifiers, scrubbers or milling machines.
 - (e) Wet sand blasting is prohibited for final cleanup and preparation.
 - (f) Any surface preparation equipment used must produce a constant uniform surface that can be shot blasted if necessary and prevent overrun of the quantities of overlay material.
- (2) Mechanical Application Equipment.
 - (a) A mixing and distribution system capable of metered mixing and uniform distribution of primer and seal coat uniformly at the specific rate on 100% of the work area.
 - (b) A polymer mixing and distribution system capable of accurate and complete mixing of the polymer resin, hardening agent and aggregates, metered verification of the mix ratio and aggregate proportions and uniform and accurate distribution of the polymer materials at the specified rate or thickness on 100% of the work area.
 - (c) A self-propelled aggregate spreader capable of uniform and accurate application of the broadcast sand and/or broadcast aggregate over 100% of the work area.
 - (d) An air compressor capable of producing a sufficient amount of oil free and moisture free compressed air to remove all dust and loose material.
 - (e) Adequate additional hand tools to facilitate the placement of the overlay according to this specification and the manufacturer/supplier's recommendations.
- (3) Hand Application Equipment.
 - (a) Calibrated containers for accurate measurement of the polymer components.
 - (b) Paddle type mixer or other mixing device capable of accurate and complete mixing of the polymer resin and hardening agent.
 - (c) Notched squeegees and brooms capable of spreading the polymer material in accordance with this specification and the manufacturer/supplier's recommendations.
 - (d) Gage rakes or manual/power screeds capable of placing the overlay according to this specification and the manufacturer/supplier's recommendations.
 - (e) Aggregate spreader capable of uniform and accurate application of the dry aggregate.
 - (f) Adequate additional hand tools to facilitate the placement of the polymer concrete overlay in accordance with this specification and the manufacturer/supplier's recommendations.

c. Preparation of Surface.

- (1) When specified, perform any required repairs under **SECTION 731** and cure repairs, before preparation of the surface, unless placed with the overlay.
- (2) Protect metal deck drains and areas of the curb or railing above the proposed surface from the shot blast.
- (3) Close deck drains so the overlay materials will not pass through the drains.
- (4) Remove any remaining contamination of the prepared deck surface or surface of subsequent courses. Sand blast or bush hammer contaminated areas to produce an acceptable surface for placement of the overlay.
- (5) As the final preparation for the placement of the overlay, make a complete cleanup by shot blasting and/or other approved means, followed by an air blast with dry, oil free air or vacuum. Brooming is not acceptable. Remove all pavement marking, loose disintegrated concrete, dirt, paint, oil, asphalt, laitance, carbonation and curing materials from patches and other foreign material from the surface of the deck.
- (6) Produce a surface relief equal to the International Concrete Repair Institute (ICRI) Surface Preparation Level 6 to 7 or ASTM E 965 Pavement Macrotexture Depth of 0.04 to 0.08 inch.
- (7) Place the first coat of the overlay within 24 hours of preparing the deck surface. Prepared surfaces exposed for more than 24 hours must be lightly sand blasted prior to application of the overlay.

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d. Placing the Slurry Polymer Concrete Overlay. Place the overlay to the grades, thickness and cross-sections as shown in the Contract Documents. Provide a technical representative of the polymer manufacturer/supplier on the job site during the placement of the overlay at no additional cost. The representative is to provide technical expertise to the Contractor and the Engineer regarding safe handling, placement and curing of the overlay.

(1) Visible moisture on the prepared deck at the time of placing the overlay is unacceptable. Identify moisture in the deck by taping a plastic sheet to the deck for a minimum of 2 hours (ASTM D 4263).

(2) Rain will not necessarily contaminate the surface. However, take care so no contamination has occurred. Traffic adjacent to the prepared surface during a rain will contaminate the surface.

(3) Follow all manufacturer/supplier suggested safety precautions while mixing and handling polymer components.

(4) Apply High Molecular Weight Methacrylate Primer and broadcast sand at application rates shown in **TABLE 739-1** or as directed by the materials manufacturer/supplier.

(5) Use gage rakes or mechanical application equipment to place the prepared slurry polymer concrete on the deck uniformly at the prescribed rate. Primers may require a cure time, **subsection 739.3g**.

(6) If mechanical application equipment is used, take 2 ounce samples for each 100 gallons of resin placed to verify resin and hardener mix ratios and curing times. Place samples on the bridge rail or deck and note time to cure.

(7) The bridge deck and all polymer and aggregate components must be at least 60°F at the time of application.

(8) Apply dry broadcast sand or broadcast aggregate, when required, to cover the polymer uniformly and completely within 10 minutes of application.

(9) Vacuum or broom excess sand/aggregate from the primer, the overlay and/or seal coats after sufficiently cured. If damage or tearing occurs, stop brooming or vacuuming and allow additional curing time. See **subsection 739.3g** for curing guidelines.

(10) Recoat areas of primer, the overlay and/or seal coat that do not receive enough sand/aggregate before gelling of the polymer with additional polymer and sand/aggregate.

(11) Locate any longitudinal joints along lane lines, or as approved by the Engineer. Keep the joints clear of wheel paths as much as practical.

(12) Produce and place the overlay within the specified limits in a continuous and uniform operation.

(13) Correct completed surface variations exceeding 1/8 inch in 10 feet unless directed otherwise by the Engineer.

(14) Tape all construction joints to provide a clean straight edge for adjacent polymer concrete placement. This includes joints between previously placed overlay materials and at centerline.

(15) Finish the exposed edges at the ends of the bridge and at expansion joints to minimize bridge deck roughness.

(16) Apply a bond breaker to all expansion joints.

e. Face of Curbs, Barriers, and Corral Rail Posts. Use a paintbrush or roller to apply the polymer resin on the face of curbs, barriers, and corral rail posts.

- On bridges with a corral rail, apply the polymer resin to the front face and adjacent sides of all posts.
- On bridges with curbs, apply the polymer resin to the top of the curb face.
- On bridges without curbs, apply the polymer resin to the edge of the deck.
- On bridges with continuous concrete barrier rails, apply the polymer resin to the first break in the geometry of the barrier or a minimum of 6 inches, uniform. Protect areas above the break line (or minimum of 6 inches) from resin. Apply so the top threshold of the resin follows a uniform line along the rail.

This work is subsidiary to the bid item Slurry Polymer Concrete Overlay.

Apply polymer to the curb or barrier as each of the overlay applications are performed.

f. Application Rates. Place the overlay to the thickness and grades as shown in the Contract Documents. Place primer, broadcast sand and seal coat (if required) at the application rates shown in **TABLE 739-1**.

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TABLE 739-1: PRIMER AND SEAL COAT APPLICATION RATE for SLURRY POLYMER CONCRETE OVERLAYS		
Course	Material Rate	Broadcast Sand Rate *
Primer	Not Less Than 0.09 gal./sq yd	Not Less Than 0.4 lbs./sq yd
Seal (one coat)	Not Less Than 0.23 gal./sq yd	N/A

*Apply enough broadcast sand to cover the primer coat uniformly and completely.

g. Curing.

(1) Epoxy. Minimum curing times are noted in **TABLE 739-2**.

TABLE 739-2: EPOXY CURE TIMES for SLURRY POLYMER CONCRETE OVERLAYS							
Course	Average Temperature of Overlay Components, °F						
	55-59	60-64	65-69	70-74	75-79	80-85	85+
	Minimum Cure Time (hours)						
Primer	5	4	3	2.5	2	1.5	1
Polymer Concrete	6.5	6.5	5	4	3	3	3

Cure the slurry polymer concrete for 8 hours if the air temperature falls below 55°F during the curing period before opening to traffic.

(2) Polyester. Polyester will be proportioned such that the cure times are between 30 and 120 minutes. Accelerators and inhibitors may be required to achieve proper set times. Proportion all materials as recommended by the material manufacturer/supplier.

(3) Methyl Methacrylate. Minimum curing times are noted in **TABLE 739-3**.

TABLE 739-3: METHYL METHACRYLATE CURE TIMES for SLURRY POLYMER CONCRETE OVERLAYS						
Course	Ambient Temperature °F					
	30-40	40-50	50-60	60-70	70-80	80-90
Primer	30	25	22	20	15	10
Polymer Concrete	50	40	35	30	25	20
Seal (one coat)	35	30	25	22	20	15

These times can be adjusted (longer or shorter) by changing the hardener in the mix as recommended by the manufacturer/supplier.

(4) Plan and perform the work in such a way as to provide for the minimum curing times specified in this specification or as specified by the material manufacturer/supplier.

h. Testing. Perform Polymer Concrete Overlay Bond Evaluation as outlined in KT-70, Part V.

(1) Place a polymer concrete test patch of not less than 0.5 square yards per lane or planned completed day's work whichever is smaller. Submit a sequence plan to the Engineer. Test patches shall be full depth, placed by the normal construction sequence. Test patches should be representative of the work being performed.

(2) Perform a minimum of 4 pull-off tests on each patch as outlined in KT-70, Part V.

(3) Final acceptance will be based on the following results of the test outlined in KT-70, Part V:

- Type 1 – Failure in the concrete at a depth greater than or equal to ¼ inch over more than 50% of the test area for 3 out of 4 tests in the test patch.
- Type 2 – Failure in the concrete at a depth less than ¼ inch over more than 50% of the test area for 3 out of 4 tests in the test patch.
- Minimum Tensile Rupture Strength of 250 psi from an average of 3 out of 4 tests on a test patch regardless of depth of failure.

(4) If failure in the concrete is at a depth less than ¼ inch and the Minimum Tensile Rupture Strength is less than 250 psi, or the failure in the concrete is less than 50% of the test area, additional surface preparation is necessary.

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(5) A failure in the concrete below 250 psi and greater than ¼ inch deep indicates weak concrete, not poor overlay bond. No additional surface preparation is required.

(6) Do not perform tensile adhesion tests when ambient or deck temperatures are above 85°F.

i. Weather Limitations.

(1) Epoxy. Do not place the overlay if the air temperature is expected to drop below 55°F within 8 hours of placement.

(2) Polyester. Do not place any component of the overlay if the air or substrate temperature is at or expected to drop below 40°F during installation.

(3) Methyl Methacrylate. Do not place any component of the polymer concrete overlay if the air or substrate temperature is at or expected to drop below 40°F during installation without inclusion of cold temperature additive at the dosage specified by methacrylate manufacturer/supplier's mixing guide.

(4) General. Do not place the overlay when the deck temperature will exceed 90°F.

Do not place the overlay if gel time is less than 10 minutes.

The overlay may be placed outside the specified temperature ranges with the approval of the Engineer and the material manufacturer/supplier. Discuss changes to temperature limitations at the preconstruction conference. Submit changes, including a written statement from the polymer manufacturer/supplier recommending the changes, to the Engineer for approval.

j. Correction of Unbonded or Damaged Areas. Repair new overlay areas discovered to be unbonded by tapping or chaining and areas where the overlay was damaged by the Contractor's operation. Saw cut the unbonded or damaged areas to the top of the deck surface, remove the overlay with small air tools (15-pound class maximum) or shot blasting. Aggressively sandblast or shot blast the concrete bridge deck surface at the unbonded area to remove contaminants. Replace the overlay according to standard placement procedures at no additional compensation.

739.4 MEASUREMENT AND PAYMENT

The Engineer will measure slurry polymer concrete overlay by the square yard. The Engineer will measure the bridge roadway width and the bridge length from end of wearing surface to end of wearing surface.

The Engineer will measure material for slurry polymer concrete overlay by the cubic yard according to the following:

(1) When approved by District on repair of existing bridges, this pay item will be used to compensate the Contractor for the additional overlay material that will be required to fill the areas greater than the thickness of overlay shown in the Contract Documents. The Contractor is responsible for maintaining adequate quality control of the demolition process to minimize deviations from the plan grades.

(2) The Engineer will keep a running account of the volume of overlay material that is produced and delivered to the deck. When approved, the Contractor will be paid, at the set price per cubic yard, for all overlay material in excess of 110% of the theoretical volume to cover the deck area with the thickness of overlay shown in the Contract Documents.

Payment for "Slurry Polymer Concrete Overlay" at the contract unit price and "Material for Slurry Polymer Concrete Overlay (Set Price)" at the contract set price is full compensation for the specified work.