

## 729 - MULTI-LAYER POLYMER CONCRETE OVERLAY

### SECTION 729

#### MULTI-LAYER POLYMER CONCRETE OVERLAY

##### 729.1 DESCRIPTION

Prepare the surface of the existing reinforced concrete bridge deck, and construct a multi-layer polymer concrete overlay (overlay).

**BID ITEM**

Multi-Layer Polymer Concrete Overlay

**UNITS**

Square Yard

##### 729.2 MATERIALS

**a. Epoxy.** Provide a Type III overlay epoxy as defined in **SECTION 1705**.

The epoxy supplied must have a minimum application history of 3 years in the State of Kansas. Include a list of bridges in Kansas on which the material has been applied, the name of the owner agency and a contact at the owner agency for each structure submitted.

**b. Aggregate.** Provide aggregates meeting **SECTION 1102**.

##### 729.3 CONSTRUCTION REQUIREMENTS

This procedure may involve hazardous materials, operations and equipment.

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

(1) Surface Preparation Equipment. 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 Macrottexture Depth of 0.04 to 0.08 inch. Final acceptance is based on testing procedures as outlined in KT-70, Part V.

(2) Mechanical Application Equipment. Use the following equipment.

- An epoxy distribution system capable of accurate and complete mixing of the epoxy resin and hardening agent, verification of the mix ratio and uniform and accurate distribution of the epoxy materials at the specified rate on 100% of the work area;
- A self propelled aggregate spreader capable of uniform and accurate application of the dry aggregate over 100% of the work area;
- An air compressor capable of producing a sufficient amount of oil free and moisture free compressed air to remove all dust and loose material; and
- Adequate additional hand tools to facilitate the placement of the overlay according to this specification and the manufacturer's recommendations.

(3) Hand Application Equipment. Use the following equipment.

- Calibrated containers for accurate measurement of epoxy components;
- A paddle type or other mixing device capable of accurate and complete mixing of the epoxy resin and hardening agent;
- Notched squeegees and brooms capable of spreading the epoxy material according to this specification and the manufacturer's recommendations;
- An aggregate spreader capable of uniform and accurate application of the dry aggregate; and
- Adequate additional hand tools to facilitate the placement of the overlay according to this specification and the manufacturer's recommendations.

(4) General. Provide an overall combination of labor and equipment with the capability of proportioning and mixing the epoxy components, and placing the epoxy and aggregate in accordance with this specification and the manufacturer's recommendations.

(5) Provide the Engineer with a copy of the epoxy materials manufacturer's recommendations.

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(6) Do not use power driven tools heavier than a 15 pound chipping hammer, during deck preparation.

**b. Proportioning.** Proportion all epoxy materials according to the manufacturer's recommendations.

**c. Preparation of Surface.**

(1) Before preparation of the surface remove deteriorated concrete and repair the area with suitable patch material. Polymer concrete bridge deck material is acceptable. Strike off patches so they are level with the existing deck and finish with wooden floats.

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

(2) 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 loose disintegrated concrete, dirt, paint, oil, asphalt, laitance carbonation and curing materials from patches and other foreign material from the surface of the deck.

(3) 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. The following test will determine if additional surface preparation is necessary.

(a) Place a polymer concrete test patch a minimum of 0.5 square yards for each span or every 300 square yards of prepared deck surface, whichever is smaller. The test patch shall be full depth, placed by the normal construction sequence.

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

- Minimum Tensile Rupture Strength of 250 psi from an average of 3 tests on a test patch regardless of depth of failure (See KT-70); or
- Failure in the concrete at a depth greater than or equal to ¼ inch over more than 50% of the test area for 3 of the 4 tests in the test patch.

(c) 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.

(d) A failure in the concrete below 250 psi and greater than ¼ inch deep indicates weak concrete, not poor overlay bond.

(e) Do not perform tensile adhesion tests when temperatures are above 85°F.

(4) Remove any 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) Protect metal deck drains and areas of the curb or railing above the proposed surface from the shot blast.

(6) Close deck drains so the epoxy and aggregate shall not pass through the drains.

(7) Rain will not necessarily contaminate the surface. However, care must be taken so no contamination occurs.

(8) 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).

(9) Place the first course within 24 hours of preparing the deck surface. Deck surfaces exposed for more than 24 hours must be sand blasted prior to application of the overlay.

(10) The Engineer must approve the use of scarifiers, scabblers or milling machines.

(11) Wet sand blasting shall not be allowed.

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

Follow all manufacturer suggested safety precautions while mixing and handling epoxy components.

Place the overlay in 2 separate courses at application rates shown in **TABLE 729-1**.

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<b>TABLE 729-1: POLYMER CONCRETE OVERLAY APPLICATION RATES</b>		
<b>Course</b>	<b>Epoxy Rate</b>	<b>Aggregate Rate *</b>
1	Not Less Than 0.22 gal./sq yd	10 lbs./sq yd
2	Not Less Than 0.45 gal./sq yd	14.5 lbs./sq yd

\*Apply enough aggregate to completely cover the epoxy.

Use notched squeegees or mechanical application equipment to place the prepared epoxy on the deck immediately and uniformly at the prescribed rate.

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

Use a paintbrush or roller to apply the epoxy on the face of curbs to the top of the curb. On bridges with continuous concrete barrier rails apply the epoxy to the first break in the geometry of the barrier to a minimum height of 6 inches above the deck.

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

The bridge deck and all epoxy and aggregate components must be a minimum of 60°F at the time of application.

Apply the dry aggregate to cover the epoxy completely within 10 minutes of application.

Remove and replace any first course areas that do not receive enough aggregate before gelling of the epoxy occurs.

Vacuum or broom excess aggregate from the first course after sufficiently cured. If damage or tearing occurs, stop brooming or vacuuming.

Do not open the first course to traffic.

Place the epoxy and aggregate for the second course at the prescribed rate and in the same manner as the first course.

Second course areas that do not receive enough aggregate before gelling of the epoxy may be re-coated with epoxy and aggregate.

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

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

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

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

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

Apply a bond breaker to all expansion joints.

**e. Curing.** Minimum curing times are noted in **TABLE 729-2.**

<b>TABLE 729-2: POLYMER CONCRETE OVERLAY CURE TIMES</b>							
<b>Course</b>	<b>Average Temperature of Overlay Components, °F</b>						
	<b>55-59</b>	<b>60-64</b>	<b>65-69</b>	<b>70-74</b>	<b>75-79</b>	<b>80-85</b>	<b>85+</b>
	<b>Minimum Cure Time (hours)</b>						
1	5	4	3	2.5	2	1.5	1
2	6½	6.5	5	4	3	3	3

Cure the second course for 8 hours if the air temperature falls below 55°F during the curing period.

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.

**f. Weather Limitations.** Do not place polymer concrete prior to April 1 or after September 30. The polymer concrete may be placed outside of the allowable dates with approval of the Engineer and the material supplier.

Do not place the overlay when conditions are such that the deck temperature will exceed 100°F.

Do not place the overlay if conditions are such that gel time is less than 10 minutes.

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

**g. Correction of Unbonded or Damaged Areas.** Repair newly overlain areas (discovered to be unbonded by tapping or chaining) and areas of the overlay 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 pounds maximum) or shotblasting. Shotblast the concrete bridge deck surface at the unbonded area to remove contaminants, and replace the overlay according to standard placement procedures at no additional compensation.

### 729.4 MEASUREMENT AND PAYMENT

The Engineer will measure multi-layer polymer concrete overlay by the square yard.

Payment for "Multi-Layer Polymer Concrete Overlay" at the contract unit price is full compensation for the specified work.