

SPECIFICATION FOR EPOXY CHIP SEAL

Description:

The work under this item consists of furnishing all labor, materials and equipment necessary to install a Polymer Epoxy Bridge Deck Overlay in accordance with the project plans, and the requirements of these Special Provisions and as directed by the Engineer. Bridge deck spall repair, as part of preparation effort prior to deck overlay, shall be performed in accordance with this specification and as directed by the Engineer.

Materials:

Epoxy or Epoxy Urethane shall be utilized.

TABLE 9240129-1: Epoxy Requirements			
Viscosity: poises	7 Min 25 Max	ASTM D2393, Brookfield RVT Spindle No. 3 at 20 rpm	
Gel Time: minutes	15 Min 45 Max	ASTM C881 Paragraph 11.2 modified	
Compressive Strength: psi	1000 Min at 3 hours 5000 Min at 24 hours	ASTM C579 modified (with plastic inserts)	Mixed with aggregate
Tensile Strength (neat): psi	2000 Min, 5000 Max at 7 days	ASTM D638	
Elongation (neat): %	45 Min, 80 Max at 7 days	ASTM D638	
Adhesive Strength: psi	250 Min at 24 hours	ACI 503R, Appendix A VTM 92	Mixed with aggregate with
Permeability to Chloride Ion: coulombs	100 Max at 28 days	AASHTO T277	
Absorption (neat): %	1 Max at 24 hours	ASTM D570	
Thermal Compatibility	No delamination of overlav	ASTM C884	Mixed with
Infrared Spectrum	To be established for each component for each mfr.	AASHTO T237 Paragraphs 4 & 5	

Epoxy or Epoxy Urethane resin base and hardener shall be composed of a two-part, 100% solids, thermosetting, moisture-insensitive, flexible, high-elongation compound.

(A) Epoxy: shall meet the following requirements in TABLE 9240129-1

Technical Specifications

(B) Epoxy Urethane: shall meet the following requirements in TABLE 9240129-2

TABLE 9240129-2: Epoxy Urethane Requirements			
Viscosity: poises	10 Min 70 Max	ASTM D2393, Brookfield RVT Spindle No. 3 at 20 rpm	
Gel Time: minutes	15 Min 45 Max	ASTM C881 Paragraph 11.2 modified	
Compressive Strength: psi	1000 Min at 3 hours 5000 Min at 24 hours	ASTM C579 modified (with plastic inserts)	Mixed with aggregate
Tensile Strength (neat): psi	2000 Min, 5000 Max at 7 days	ASTM D638	
Elongation (neat): %	45 Min, 100 Max at 7 days	ASTM D638	
Adhesive Strength: psi	250 Min at 24 hours	ACI 503R, Appendix A VTM 92	Mixed with aggregate with 100% failure in concrete
Permeability to	100 Max at 28 days	AASHTO T277	
Shore D Hardness	60 Min 75 Max	ASTM D2240	
Flexural Creep: inch	0.0065 Min at 7 days	California Test Method 419	
Flexure Yield Strength: psi	2500 Min	ASTM D790	
Absorption (neat): %	1 Max at 24 hours	ASTM D570	
Thermal Compatibility	No delamination of overlay	ASTM C884	Mixed with aggregate
Infrared Spectrum	To be established for each component for each mfr.	AASHTO T237 Paragraphs 4 & 5	

(C) Aggregate: shall be angular grained stone that is free from lumps or balls of clay and shall not contain any calcareous or clay coatings, caliche, synthetic materials, organic matter or foreign substances.

Technical Specifications

Grading shall meet the following requirements when tested in accordance with the requirements of Arizona Test Method 201.

Sieve Size	Percent Passing
No. 4	100
No. 8	30 - 75
No. 16	0 - 5
No. 30	0 - 1
No. 200	0 - 0.2

(D) Technical Assistance:

The epoxy manufacturer's technical representative shall be present during the initial proportioning, mixing, placing, and finishing operations. The technical representative shall demonstrate experience in the inspecting and testing functions required for the placement of polymer epoxy overlays as required by this specification. The Engineer will, at the advice of the technical representative, suspend work that fails to comply with these specifications, the manufacturer's recommendations or the approved contractor's work plan. The County will not be liable for such work stoppage.

(E) Sampling and Testing:

The Contractor shall provide a certified laboratory report, from an approved laboratory, confirming that the epoxy materials to be used meet the requirements of this specification. The certified laboratory report shall include a Fourier Transform Infrared (FTIR) Spectrophotometry spectrum in transmittance mode and a bulk sample of each component tested.

TABLE 9240129-3: Aggregate Requirements			
Soundness Loss: %	8 Max	AASHTO T104	5 cycles in Magnesium Sulfate
Micro-Deval: %	10 Max	AASHTO TP58	
Moh's Hardness	7 Min		
Moisture Content: %	0.2 Max	AASHTO T255	

Technical Specifications

All data shall be maintained as confidential by the County and the Contractor, and shall be used only for informational purpose.

(F) Acceptance:

The bridge and for each phase of construction, the County shall obtain infrared spectrums of the epoxy materials for comparative and informational purposes. The Engineer will provide a single ½ pint sample of each component of the epoxy to ADOT Materials Group for FTIR Spectrometer testing. Said testing shall be compared to the certified laboratory results and the comparative results provided to the Engineer for review prior to overlay construction.

All data shall be maintained as confidential by the Department and the contractor, and shall be used only for informational purpose.

Equipment:

(A) Air Compressor:

Air compressors shall be equipped with oil traps to eliminate oil from being blown onto the bridge deck during possible shot-blasting and air cleaning.

Air compressors shall contain water filters to remove water from the compressed air.

(B) Trucks:

Trucks shall be clean and equipped with traps to eliminate fluids from falling onto the bridge deck.

Construction Requirements:

(A) Submittals:

The contractor shall submit a complete and comprehensive summary of the epoxy manufacturer's recommended construction procedures and requirements to the Engineer for review prior to overlay construction, and epoxy manufacturer's technical representative's qualifications, name and contact information.

(B) Surface Preparation:

The bridge deck shall be shot-blasted prior to overlay operations. The relief and texture of the prepared deck surface shall conform to International Concrete Repair Institute (ICRI) Surface Preparation Level 5-7 or ASTM E965 Pavement Macro-texture Depth of 1.0mm to 2.0mm (5/128 in to 10/128 in).

The contractor shall identify, as directed by the Engineer, remove and dispose of all existing unsound concrete, unsound patches and all asphalt concrete patches on the bridge deck. The Engineer shall approve all removal locations and limits.

Voids in the deck surface created by the removal of unsound concrete, unsound patches and all asphalt concrete patches that are less than or equal to one inch deep shall be filled with the same polymer epoxy comprising the overlay for the deck. Polymer epoxy used to fill these voids may be placed with the overlay, when approved by the Engineer. Voids deeper than one inch shall be filled with material conforming to "Patches" of this special provision. After the concrete patch has cured for not less than the minimum time required in these specifications, or as directed by the epoxy manufacturer, or as directed by the Engineer, the entire deck, including patched areas, shall receive the overlay.

Any areas of the prepared surface contaminated by oil or other materials detrimental to good bond as a result of the contractor's operations shall be removed to such depth as required to attain good bond at the discretion of the Engineer. Such cleaning or removal work shall be at no additional cost to the Department.

Exposed reinforcing steel shall be cleaned of rust and corrosive products including oil, dirt, concrete fragments, loose scale and other coating, of any character, which would destroy or reduce the bond with the overlay. Rust which may form on the reinforcing steel within seven

calendar days following unsound concrete removal and shot-blasting operations will not be cause for rejection or replacement of the steel. When acceptable reinforcing steel is exposed to the elements for more than seven calendar days prior to encasement in the overlay, adequate measures shall be taken by the contractor, as approved by the Engineer, to protect the steel from contamination or corrosion. Reinforcing steel contaminated as the result of the contractor's failure to provide adequate protection, as stipulated herein, shall be re-cleaned (including shot- or sandblasting if necessary) at no additional cost to the County and with no adjustment in contract time.

The final prepared surface of the deck shall be free from oil, grease, rust, and other foreign material and laitance that may reduce the bond of the overlay to the existing deck slab. These contaminants shall be removed by methods approved by the Engineer and the epoxy manufacturer, then followed by shot-blasting.

Brooms shall not be used to remove dust, loose material, foreign material and laitance.

If, after the final cleaning, the strip being overlaid becomes wet, the contractor shall flush the surface with high-pressure air prior to placement of the overlay. Overlay placement shall begin within 12 hours of completing the deck preparation for the portion of the deck to be overlaid. If overlay placement has not begun within 12 hours, the strip being overlaid shall be thoroughly cleaned to the satisfaction of the Engineer.

Traffic, other than the required construction equipment, shall not use any portion of the strip being overlaid and has undergone final preparation for placing of epoxy, unless approved the Engineer. Effort shall be made to prevent contamination of the prepared surface. The contractor shall protect the final prepared surface by placing a material, such as polyethylene film, on the deck surface used by equipment. The contractor will be required to clean the surface as described above if the deck surface becomes contaminated.

(C) Patches:

Patches, if needed, shall be completed prior to overlay construction as directed by the Engineer, and be paid for by Square Footage of work performed under Bridge Deck Concrete Surface Spall Repair pay item.

(D) Polymer Overlay (General):

The number of Epoxy or Epoxy Urethane layers and aggregate layers shall be per the manufacturer's recommendations. The overlay thickness shall be comprised of a minimum of two layers and the total application shall not be less than 7.5 gallons per 100 square feet. The first course shall have coverage not less than 2.5 gal/100 square feet. The second course shall have coverage not less than 5.0 gallons per 100 square feet.

(E) Placing Epoxy or Epoxy Urethane:

Epoxy and Epoxy Urethane shall be placed when the temperature of the bridge deck is within the recommended application temperature range specified by the manufacturer. Any artificial means to elevate the temperature of the bridge deck will not be permitted. Epoxy and Epoxy Urethane shall not be placed when the ambient temperature is forecasted to drop or rise outside the

Technical Specifications

manufacturer's specified application temperature range within an 8-hour period after application or if the epoxy or epoxy urethane's gel time is less than 10 minutes.

Visible moisture shall be identified by taping an 18"x18" plastic sheet to the deck for a minimum of two hours per ASTM D4263. The overlay operations shall not proceed if moisture appears on the bottom of the plastic sheet.

No visible moisture shall be present on the prepared deck surface at the time of or during the overlay application.

Epoxy or Epoxy Urethane shall not be placed until the Engineer has inspected the prepared deck surface and determined it to be acceptable for Epoxy or Epoxy Urethane placement.

Epoxy or Epoxy Urethane shall be applied per the manufacturer's recommendations.

(F) Placing Aggregate:

Aggregate shall be applied uniformly to the bridge deck using a self-propelled aggregate spreader per the manufacturer's requirements.

The first course shall have coverage of at least 10 pounds per square yard, but of sufficient quantity to completely cover the epoxy or epoxy urethane per the manufacturer's requirements.

The second course shall have coverage of at least 14 pounds per square yard, but of sufficient quantity to completely cover the epoxy or epoxy urethane per the manufacturer's requirements.

First course applications that do not receive enough aggregate prior to gel shall be removed and replaced at no additional cost to the Department.

Second course applications that are insufficiently covered with aggregate may be left in place, but additional applications per the manufacturer's recommendations shall be completed before opening to traffic at no additional cost to the Department.

All loose aggregate shall be removed by vacuuming or brooming after each course has cured.

(G) Curing:

Each course of overlay shall be cured until vacuuming or brooming can be performed without tearing or damaging the overlay surface.

Vehicles are not permitted on the finished overlay until the epoxy manufacturer's specified curing time is satisfied.

Overlays shall not be placed when weather conditions prevent the proper handling, placing and curing of the overlay.

(H) Determination of Delamination and the Sealing of Cracks and Joints:

The entire overlaid surface shall be sounded by use of chain drags or other mechanical devices after the requirements for curing have been satisfied to determine the existence of delamination in a manner approved by and in the presence of the Engineer. Unbonded areas shall be removed

and replaced with Polymer Epoxy Overlay by the contractor and at no additional cost to the Department.

The Engineer shall have sole discretion in determining the extent of cracking that requires repair. Cracks shall be repaired in accordance with the manufacturer's recommendations at no additional cost to the Department.

(I) Final Surface Texture:

The thickness of the polymer concrete overlay shall be 1/4 inch.

The surface texture of polymer concrete overlay surfaces shall not vary by more than 1/4 inch in three feet.

Areas showing deviations greater than those specified shall be corrected, at no additional cost to the Department, in accordance with the manufacturer's recommendations and shall be approved by the Engineer. All corrected areas shall be textured to match the finish of the surrounding deck surface.

The surface texture of polymer concrete overlay surfaces shall be uniform and shall have a skid resistance number greater than 33 as measured by ASTM E274 utilizing Standard Ribbed tire per ASTM E501 at 40 mph.

Traffic control, not shown in the plans, for performance of ASTM E274 testing, shall be provided at no additional cost to the Department. This test shall be performed immediately following overlay curing.

(J) Joint Sealant

Joint, as identified in construction plans and directed by engineer, shall be cleaned and sealed with Sikaflex-1A Joint Sealant or approved equal.

(K) Clean Abutment Strip Seal Expansion Joint

Clean all strip seal joints at locations identified in the construction plans or as directed by the Engineer. If required, replace the rubber strip seal with an approved in-kind material. The cost of the replacement material shall be excluded from the unit price for the "Clean Joint" pay item.

Method of Measurement:

Epoxy Chip Seal will be measured by the square foot. The bidding schedule quantities for Bridge Deck Concrete Surface Spall Repair is an allowance only. The quantity, upon which payment will be based, will be the actual quantity of Spall Repair required and completed in place, per the Bid Schedule unit price bid for the work. Contract shall use chain drags or other mechanical devices to determine the required location and quantity of necessary Spall Repair.

The bidding schedule quantities for Replace Rubber Strip Seal is an allowance only. The quantity, upon which payment will be based, will be the actual quantity of strip seal replacement required and completed in place, per the Bid Schedule unit price bid for the work.

Basis of Payment:

The accepted quantities for this work, measured as provided above, will be paid for at the contract unit price per square foot, which shall be full compensation for the item, complete and in-place as defined and described above including removal of patches to concrete deck, repair of concrete deck as needed, providing a finished deck surface that does not pond and drains into the bridge deck drains, if needed.

Pay Item:

Pay Unit:

Epoxy Chip Seal

Square Feet (SF)

Bridge Deck Concrete Surface Spall Repair

Square Feet (SF)

Prepare Concrete Deck by Shot Blasting

Square Feet (SF)

Clean Abutment Strip Seal Expansion Joint

Linear Feet (LF)

Replace Rubber Strip Seal

Linear Feet (LF)