

EPOXY CONCRETE OVERLAY SYSTEM:

4-21-09

SPI

DESCRIPTION

This work shall consist of furnishing and applying a two-coat epoxy overlay system over the concrete bridge deck in accordance with the contract documents.

MATERIALS

Epoxy, Type 2 shall conform to the requirements of Article 1081-1 of the *Standard Specifications*.

Aggregate shall be angular grained silica sand or basalt having less than 0.2% moisture, and free of dirt, clay, asphalt and other foreign or organic materials. The silica sand and basalt shall have a Mohs' scale hardness of no less than seven. Unless otherwise approved, silica sand and basalt shall conform to the following gradation:

Percent by Weight of Material Passing

No. 4 Sieve	No. 8 Sieve	No. 16 Sieve	No. 30 Sieve
100	30-75	Max. 5	Max. 1

Construction Methods**A. Surface Preparation**

Clean bridge deck prior to applying the two coat epoxy overlay system, in accordance with the manufacturer's recommendations and the following.

Clean the entire deck surface by shot blasting and other means to remove asphaltic material, oils, dirt, rubber, curing compounds, paint carbonation, laitance, weak surface mortar and other potentially detrimental materials that may interfere with the bonding or curing of the overlay. Acceptable cleaning is usually recognized by a significant change in the color of the concrete and mortar, and the beginning exposure of coarse aggregate particles. Mortar, that is sound and soundly bonded to the coarse aggregate, shall have open pores due to cleaning to be considered adequate for bond. Areas of asphalt larger than one inch in diameter, or smaller areas spaced less than six inches apart, shall be removed. Traffic paint lines shall be considered clean when the concrete has exposed aggregate showing through the paint stripe. A vacuum cleaner shall be used to remove all dust and other loose material. Brooms will not be permitted.

Epoxy concrete overlay shall not be placed on hydraulic cement concrete that is less than 28 days old. Patching and cleaning operations shall be inspected and approved prior to placing each layer of the overlay. Any contamination of the deck or intermediate courses, after initial cleaning, shall be removed. Both courses shall be applied within 24 hours following the final cleaning and prior to opening the area to traffic.

The deck shall be completely dry at the time of application of the epoxy concrete overlay.

B. Equipment

For mechanical applications, equipment shall consist of no less than an epoxy distribution system, fine aggregate spreader, application squeegee and vacuum trucks. The distribution system or distributor shall accurately blend the epoxy resin and hardening agent, and shall uniformly and accurately apply the epoxy materials at the specified rate to the bridge deck in such a manner as to cover 100% of the work area. The fine aggregate spreader shall be propelled in such a manner as to uniformly and accurately apply the aggregate to cover 100% of the epoxy material. The vacuum truck shall be self-propelled.

For hand applications, equipment shall consist of calibrated containers, a paddle type mixer, squeegees, rollers and brooms that are suitable for mixing the epoxy and applying the epoxy and aggregate.

C. Application

Handling and mixing of the epoxy resin and hardening agent shall be performed in a safe manner to achieve the desired result in accordance with the manufacturer's recommendations as approved and as directed by the Engineer. Epoxy concrete overlay materials shall not be placed when weather or surface conditions are such that the material cannot be properly handled, placed, spread and cured within the specified requirements of traffic control.

The epoxy overlay shall be applied in two separate courses in accordance with the following rate of application, and the total of the two applications shall not be less than 7.5 gals. per 100 sq. ft.

Course	Rate Gal./100 Sq. Ft.	Aggregate Lbs./Sq. Yd*
1	No less than 2.5	10+
2	No less than 5.0	14+

*Application of aggregate shall be of sufficient quantity to completely cover the epoxy.

After the epoxy mixture has been prepared for the epoxy concrete overlay, it shall be immediately and uniformly applied to the surface of the bridge deck with a squeegee or paint roller. The temperature of the bridge deck surface and all epoxy and aggregate components shall be 70°F or above at the time of application. Epoxy shall not be applied if the air temperature is expected to drop below 55°F within 8 hours after application, or the gel time is less than 10 minutes. The dry aggregate shall be applied in such a manner as to cover the epoxy mixture completely within 5 minutes. First course applications that do not

receive enough sand prior to gel shall be removed and replaced. A second course insufficiently sanded may be left in place, but will require additional applications before opening to traffic. Each course of epoxy concrete overlay shall be cured until vacuuming or brooming can be performed without tearing or damaging the surface. Traffic or equipment shall not be permitted on the overlay surface during the curing period. After the course one curing period, all loose aggregate shall be removed by vacuuming or brooming and the next overlay course applied to completion. The minimum curing periods shall be as follows:

Course: Average temperature of deck, epoxy and aggregate components in °F

	60-64	65-69	70-74	75-79	80-84	85+
1	4 hrs.	3 hrs.	2.5 hrs.	2 hrs.	1.5 hrs.	1 hr.
2	6.5 hrs.*	5 hrs.	4 hrs.	3 hrs.	3 hrs.	3 hrs.

*Course 2 shall be cured for 8 hrs. if the air temperature drops below 60°F during the curing period.

The Contractor shall plan and prosecute the work to provide the curing periods as specified herein, or other longer minimum curing periods as prescribed by the manufacturer prior to opening to public or construction traffic, unless otherwise permitted. Course one applications shall not be opened to traffic.

Do not apply epoxy concrete overlay courses over modular or metal expansion joints.

In the event the Contractor's operation damages or mars the epoxy concrete overlay, the Contractor shall remove the damaged areas by saw-cutting in rectangular sections to the top of the concrete deck surface and replacing the various courses in accordance with this Specification at no additional cost to the Department.

MEASUREMENT AND PAYMENT

Placement of Epoxy will be measured and paid for in square feet, which price shall be full compensation for deck preparation, furnishing and placing the two coat overlay system, including saw-cutting joints and all tools, labor, materials, maintenance and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Placement of Epoxy	Square Foot

CONCRETE DECK REPAIR USING ELASTOMERIC CONCRETE:

(4-23-09)

SPI

Description

This work consists of concrete deck repair as designated by the Engineer. The Contractor shall begin work within 60 days of notification.

Materials

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy, and kiln-dried aggregate. Have the manufacturer supply it as a unit.

Use one of the following products:

Ceva Crete by Chase Construction Products, 401 New Karner Road, Albany, NY 12205.

E-Crete #57 by Chase Construction Products, 401 New Karner Road, Albany, NY 12205

Ply-Krete HS by Polyset, Company, P.O. Box 111, Mechanicville, NY 12118

Wabocrete Elastomeric Concrete by Watson Bowman Acme Corporation, 95 Pineview Drive, Amherst, NY 14120 716-691-7566

Or approved equal.

Construction Methods

All areas of concrete deck repairs shall be made with elastomeric concrete. The Engineer will determine the areas where Class I, Class II and Class III deck repair shall be performed. These areas shall be saw cut and material shall be applied according to the material specifications.

Do not place elastomeric concrete if the ambient air temperature is below 45°F (7°C). Prepare and apply a primer, as per manufacturer's recommendations, to all vertical concrete faces, all steel components to be in contact with elastomeric concrete, and to areas specified by the manufacturer. Align the angles with the joint opening.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete while the primer is still tacky and within 2 hours after applying the primer. Properly consolidate the elastomeric concrete around the steel and anchors.

Tarps shall be utilized under the mixing areas, and the bridge deck joint shall be taped off to protect the bridge deck from spills during elastomeric concrete installation.

Class I Deck Repair: Remove all loose, unsound deck concrete to a depth of 1/2 inch (13 mm), remove and dispose concrete, and thoroughly clean the surface. In areas where reinforcing steel

is located in the 1/2 inch (13 mm) depth to be scarified, use another method with the Engineer's approval.

Class II Deck Repair (Partial Depth): Remove by chipping with hand tools all loose, unsound and contaminated deck concrete and in areas where reinforcing steel is exposed, by scarifying to an average depth of approximately one-half the deck thickness, but no less than 3/4 inch (19 mm) below the top mat of steel. Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface.

When chipping, be careful not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft²/ft (0.2 m²/m) length of bridge without overhang support is permitted unless the Engineer directs otherwise. For concrete areas greater than 0.60 ft²/ft (0.2 m²/m) length of bridge, approval of the overhang support is required.

Refill areas where concrete was removed with elastomeric concrete.

Class III Deck Repair (Full Depth): Remove full depth all loose, unsound and contaminated deck concrete. Thoroughly clean the routed out area and dispose of concrete removed. Clean, repair, or replace reinforcing bars and fill the areas from which unsound concrete has been removed with elastomeric concrete up to the bottom of the proposed concrete overlay.

Clean or replace reinforcing bars and place elastomeric concrete.

For areas of less than 3 ft² (0.3 m²), suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges.

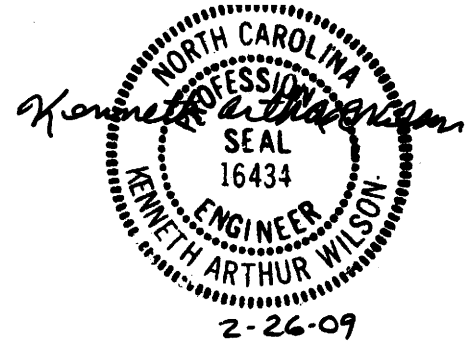
Submit for approval detailed plans for Class III deck repair. Detail how waste and debris is kept from falling below. When Class III repairs adjacent to the rail are necessary, support the rail in a manner approved by the Engineer.

Measurement and Payment

Class I, Class II and Class III deck repair will be measured in square yards for the appropriate areas so prepared. The entire cost for concrete deck repair using elastomeric concrete including, but not limited to, materials, labor, maintenance, equipment, tools, and incidentals will be included in the unit price per square yard for *Concrete Deck Repair (Class _____) using Elastomeric Concrete*. Also the Contractor shall clean up built up material out from under the guardrail for 100' on the approach and trailing end of the bridge, as directed by the Engineer as part of the work of Concrete Deck Repair using Elastomeric Concrete.

Payments will be made under:

Pay Item	Pay Unit
Concrete Deck Repair (Class _____) using Elastomeric Concrete	Square Yard



ELASTOMERIC CONCRETE FOR JOINT REPAIR (10-12-01)

DESCRIPTION

Contractor shall repair damaged concrete adjacent to expansion joints with elastomeric concrete or use the elastomeric concrete in the blocked out areas on both sides of the bridge deck joints as directed by the Engineer.

Contractor shall submit falsework plans for approval. Falsework plans shall take into account expansion of the bridgedeck due to changes in temperature.

Do not place elastomeric concrete if the ambient air temperature is below 45°F (7°C). Prepare and apply a primer, as per manufacturer's recommendations, to all vertical concrete faces, all steel components to be in contact with elastomeric concrete, and to areas specified by the manufacturer. Align the angles with the joint opening.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete while the primer is still tacky and within 2 hours after applying the primer. Properly consolidate the elastomeric concrete around the steel and anchors.

Tarps are to be utilized under the mixing areas, and the bridge deck joint shall be taped off to protect the bridge deck from spills during elastomeric concrete installation.

MATERIALS

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy, and kiln-dried aggregate. Have the manufacturer supply it as a unit.

Provide materials that comply with the following minimum requirements at 14 days.

CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Bond Strength to Concrete, psi (MPa)	ASTM D638 (D638M)	450 (3.1)
Brittleness by Impact, ft-lb (kg-m)	Ball Drop	7 (0.97)
Compressive Strength, psi (MPa)	ASTM D695 (D695M)	2800 (19.3)
BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi (MPa)	ASTM D638 (D638M)	800 (5.5)

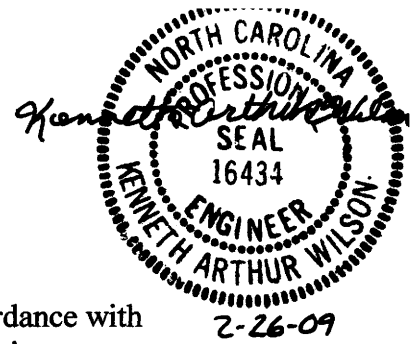
Ultimate Elongation	ASTM D638 (D638M)	150%
Tear Resistance, lb/in (kN/m)	ASTM D624	90 (15.7)

In addition to the requirements above, use elastomeric concrete that also resists water, chemical, UV, and ozone exposure and withstands extreme temperature (freeze-thaw) changes.

Furnish a manufacturer's certification verifying that the materials satisfy the above requirements. Provide samples of elastomeric concrete to the Engineer, if requested, to independently verify conformance with the above requirements.

BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete **that is used in joint repair**. The contract unit price bid for "Evazote Expansion Joint Replacement" will be full compensation for furnishing and placing the Elastomeric Concrete used in joint repair.



EVAZOTE EXPANSION JOINT REPLACEMENT

Contractor shall remove the existing expansion joint, clean the area in accordance with the manufacturer's recommendations, and place the evazote expansion joint in accordance with the manufacturer's recommendations. Contractor shall have a manufacturer's representative present during the installation of the first evazote expansion joint of the project. The expansion joint shall be replaced with the materials stated in this contract.

All materials shall be delivered unopened in their original containers bearing the manufacturer's label, date of manufacture, batch number, trade name brand, and quantity. Sufficient material to perform the entire expansion joint shall be "on hand" prior to removing the existing expansion joint. Stored materials may be inspected prior to their use and shall meet the requirements of these provisions. Each shipment of repair material shall be accompanied by Material Safety Data Sheets (MSDS) and a certificate of compliance certifying that the materials conform to the requirements of these provisions.

Evazote Joint Seal Specifications

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a low-density closed cell, cross-linked ethylene vinyl acetate polyethylene copolymer nitrogen blown material for the seal. Use seals manufactured with grooves 1/8" (3 mm) ± wide by 1/8" (3 mm) ± deep and spaced between 1/4 (6 mm) and 1/2 inch (13 mm) apart along the bond surface running the length of the joint. Use seals sized so that the depth of the seal meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4 inch (6 mm). Splice the seal using the heat welding method by placing the joint material ends against a Teflon heating iron of 350°F (177°C) for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled. Use material that resists weathering and ultraviolet rays. Provide a seal that has a working range of 30% tension and 60% compression and is watertight along its entire length including the ends. Have the top of the evazote seal clearly shop marked. Inspect the evazote seals upon receipt to ensure that the marks are clearly visible upon installation.

Provide seals that meet the requirements given below:

TEST	TEST METHOD	REQUIREMENT
Elongation at break	ASTM D3575	210 ± 15%
Tensile strength, psi (kPa)	ASTM D3575	110 ± 15 (755 ± 100)
Compression Recovery (% of original width)	AASHTO T42 50% compr. for 22 hr. @ 73°F (23°C) 1/2 hr. recovery	87 ± 3
Weather/Deterioration	AASHTO T42 Accelerated Weathering	No deterioration for 10 years min.
Compression/Deflection	@ 50% deflection of original width @ 50% deflection of original width	10 psi (69 kPa) min. 60 psi (414 kPa) max.
Tear Strength, psi (kPa)	ASTM D624	16 ± 3 (110 ± 20)
Density	ASTM D545	2.8 to 3.4
Water Absorption (% vol/vol)	ASTM D3575 Total immersion for 3 months	3

Adhesives

Use a two component, 100% solid, modified epoxy adhesive with the seal that meets the requirements of ASTM C881, Type 1, Grade 3, Class B & C and has the following physical properties:

Tensile strength 3500 psi (24.1 MPa) min.

Compressive strength 7000 psi (48.3 MPa) min.

Shore D Hardness 75 psi (0.5 MPa) min.

Water Absorption 0.25% by weight

Use an adhesive that is workable to 40°F (4°C). When installing in temperatures below 40°F (4°C) or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint material.

Joint Preparation

After removal of existing joint, area must be sand-blasted immediately prior to installation of the new joint. Blasting medium shall be a non-silica product. Blasting medium shall be swept up and removed from the project. Traffic shall be protected from blasting operations. Joint shall be re-cleaned (and re-blasted if necessary), if joint installation is delayed and joint is determined to be unsuitable due to dirt, oils, etc.

Exact size of joint seals to be used where joints have been repaired with Elastomeric Concrete shall be determined after the Elastomeric Concrete work is completed.

Seal Installation

Do not install the joint seal if the ambient air temperature is below 45°F (7°C).

Begin installation at the low end of the joint after applying the mixed epoxy to the sides of both the joint material and both sides of the joint, making certain to completely fill the grooves with epoxy. With gloved hands, compress the material and with the help of a blunt probe, push it down into the joint until it is recessed approximately 1/4 inch (6 mm) below the surface. Do not push the seal at an angle that would stretch the material. Once work on a joint begins, do not stop until it is completed. Clean the excess epoxy off the surface of the joint material quickly and thoroughly. Do not use solvents to remove excess epoxy. Remove excess epoxy in accordance with the joint manufacturer's recommendations.

The entire cost for the Evazote expansion joint replacement including but not limited to labor, maintenance, equipment, tools, and incidentals will be included in the unit prices for Evazote expansion joint replacement .

Payments shall be made under:

Evazote Expansion Joint Replacement. Linear Feet