SECTION 623

CONCRETE BONDING COMPOUND, EPOXY MORTAR AND EPOXY POLYMER CONCRETE OVERLAY

SECTION 623.10 CONCRETE BONDING COMPOUND

623.10.1 Description. This work shall consist of preparing the surface, furnishing and applying the concrete bonding compound to be used to bond plastic concrete mortar to hardened concrete as shown on the plans or as directed by the engineer.

623.10.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Type II Epoxy	1039

623.10.3 Construction Requirements.

623.10.3.1 Surface Preparation. The surface of the hardened concrete to which the plastic concrete mortar is to be bonded shall be surface dry and thoroughly cleaned such that all loose and unsound concrete is removed prior to application of the bonding agent.

623.10.3.2 Application. The bonding agent shall be applied when both the air and surface temperature is within the manufacturer's written recommendations.

623.10.3.2.1 Components shall be mixed in accordance with manufacturer's written recommendations. The components may be warmed with indirect heat to a maximum temperature of 100 F (38 C) to reduce the viscosity. No solvents shall be added to the compound.

623.10.3.2.2 The mixed bonding agent shall be applied in such a manner as to thoroughly work the bonding compound into the hardened concrete surface. The thickness of the application shall be 20 to 25 mils (0.5 to 0.6 mm). If the concrete absorbs the bonding agent, additional coats shall be applied until the correct thickness is attained.

623.10.3.2.3 The plastic concrete mortar shall be placed while the bonding agent is still tacky. If there is a delay in placing the plastic concrete mortar and the bonding agent becomes tack free, another coat of bonding agent shall be applied.

623.10.4 Basis of Payment. No direct payment will be made for furnishing material, surface preparation or application.

SECTION 623.20 EPOXY MORTAR

623.20.1 Description. This work shall consist of preparing the surface, furnishing and applying epoxy mortar as shown on the plans.

623.20.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Type III Epoxy	1039
Sand for Mortar	1039

623.20.3 Construction Requirements.

623.20.3.1 Surface Preparation. The surfaces to which the epoxy mortar is to be applied shall be free of dust, water or any other material that may affect the adhesion.

623.20.3.2 Application. The epoxy mortar shall be prepared and placed when the weather is dry and the air temperature is in accordance with the manufacturer's written recommendations.

623.20.3.2.1 The contractor shall mix only the number of containers of material that can be placed in 20 to 40 minutes.

623.20.3.2.2 Epoxy shall be thoroughly mixed in accordance with the manufacturer's written recommendations. Mixing shall continue as permitted to ensure uniformity.

623.20.3.2.3 When the epoxy material has been thoroughly mixed, sand shall be added at the manufacturer's recommended rate while mixing continues. After the proper quantity of sand has been added, mixing shall continue until the mixture is uniform.

623.20.3.2.4 Areas to be patched or leveled shall be thoroughly primed with an application of neat epoxy. After the area is primed, the mortar shall be placed and struck off to grade. The surface shall have a rough finish equal to that of a Portland cement concrete deck.

623.20.3.2.5 The patched or leveled area shall be protected during the curing period to prevent damage. Material shall be cured in accordance with the manufacturer's written recommendations. Curing acceleration by direct flame application will not be permitted.

623.20.4 Basis of Payment. No direct payment will be made for furnishing material, surface preparation or application.

SECTION 623.30 EPOXY POLYMER CONCRETE OVERLAY.

623.30.1 Description. This work shall consist of furnishing and applying thin polymer concrete overlays in a prime coat, plus two courses on designated bridge structures as shown on the plans or as directed by the engineer.

623.30.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Epoxy Resin for Epoxy Polymer Concrete Overlay	1039
Aggregate for Epoxy Polymer Concrete Overlay	1039

623.30.3 Construction Requirements.

623.30.3.1 Manufacturer Representation. The overlay manufacturer's representative shall witness the entire testing phase of each field test. The manufacturer's representative shall verify that all operations are performed by acceptable practices.

623.30.3.2 Handling and Storage of Material. Handling and storage of material shall be in accordance with the manufacturer's written recommendations.

623.30.3.3 Field Test. Prior to the start of the overlay operation, a test area of the complete overlay system shall be placed on the bridge deck in a contractor proposed location that is approved by the engineer. When multiple bridges are included in a project, a test area will be required on each bridge. The contractor may utilize one-half of the bridge deck or an area equal to one day's placement operation, whichever is smaller, as a field test. The degree of cleaning used on the test area shall be the minimum used on the remainder of the structure. The surface for the test overlay shall be prepared in accordance with the test method prescribed in ACI 503R - Appendix A of the ACI Manual of Concrete Practice to establish an approved cleaning practice.

623.30.3.3.1 The approved cleaning practice shall remove all potentially detrimental material which may interfere with the bonding or curing of the overlay. Concrete shall be sound, with mortar soundly bonded to the coarse aggregate, with clean and open pores to be considered adequate for bond. Areas of asphalt that are larger than one inch (25 mm) shall be removed. Areas of asphalt that are smaller than one inch (25 mm), but are spaced less than 6 inches (150 mm) apart shall also be removed. Pavement marking will be considered clean when the concrete has exposed aggregate showing through at least 75 percent of the pavement marking.

623.30.3.3.2 In addition to the above requirements, the cleaning practice shall provide an adhesion strength test result greater than 250 psi (1.7 MPa) or a failure area into the base concrete that is greater than 50 percent of the test area. After the test area has cured for a minimum of 72 hours, adhesion shall be checked in accordance with ACI 503R. A test result will be the average of three tests on a sample area of the test patch. A minimum of three sample areas per test patch shall be tested. Successful test results will be required from each sample area.

623.30.3.3.3 If the test of a sample area fails to meet the above requirements due to a cohesive failure of the substrate concrete, the adhesive strength of the sample area will be considered acceptable.

623.30.3.3.4 Successful completion of the adhesion strength tests will be required before the full-scale overlay operation is to begin. All cleaning operations shall equal those used for the adhesion strength test areas, in both profile and cleanliness. If changes are made to the established cleaning practice, new adhesion strength testing shall be performed at the contractor's expense.

623.30.3.3.5 Test patches shall be installed with the same material, equipment, personnel, timing, sequence of operations and curing period that will be used for the installation of the overlay.

623.30.3.3.6 If the test fails, the contractor shall remove the material represented by the failed test patches and provide another test patch, at the contractor's expense, until satisfactory test results are obtained.

623.30.3.4 Surface Preparation. Before placement of the overlay, the entire deck surface shall be prepared by the cleaning practice established in the field adhesion strength tests in accordance with Sec 623.30.3.3.

623.30.3.4.1 If the engineer determines that the weather has changed significantly since the application of the field test patch, the contractor shall verify through adhesion strength tests that the practice is acceptable, at the contractor's expense.

623.30.3.4.2 No traffic of any kind shall be permitted on any portion of the deck which has been shot blasted or on the overlay without approval from the engineer. The time between surface preparation and application of the first course shall not exceed 24 hours.

623.30.3.4.3 All patching and cleaning operations shall be inspected and approved prior to placing the overlay.

623.30.3.4.4 If the deck or intermediate course is contaminated by foreign material or water after initial cleaning, the contamination and any detrimentally affected overlay material shall be removed. Both courses shall be applied prior to opening the area to traffic.

623.30.3.5 Equipment. The contractor's equipment shall be as recommended by the epoxy manufacturer.

623.30.3.6 Epoxy Mixture. Mixing of epoxy components shall be in accordance with the manufacturer's recommendations. When mineral fillers are specified, the mineral fillers shall be inert and non-settling or readily dispersible. Material showing a permanent increase in viscosity or the settling of pigments that cannot be readily dispersed with a paddle shall be replaced at the contractor's expense. At least 95 percent of the filler shall pass the No. 200 (75 µm) sieve.

623.30.3.7 Application. Application of epoxy shall be performed by the supplier or by a factory trained or licensed applicator with written approval from the manufacturer of the epoxy system.

623.30.3.7.1 The handling and mixing of epoxy shall be in accordance with the manufacturer's written recommendations. The overlay material shall not be placed when weather or surface conditions are such that the material cannot be properly handled, placed and cured within the specified requirements of traffic control, or when rain is forecasted within 24 hours of application.

623.30.3.7.2 The overlay shall consist of a thin prime coat and a two-course application of epoxy and aggregate. The first course shall be applied before the prime coat has gelled. The prime coat and first course shall not be placed as one application. Each of the two courses shall consist of a layer of epoxy covered with a layer of aggregate in sufficient quantity to completely cover the epoxy. The thickness of each course shall be approximately equal. The total thickness of the overlay shall be no less than 1/4 inch (7 mm).

623.30.3.7.3 The temperature of the bridge deck surface at the time of application shall be in accordance with the manufacturer’s recommendation.

623.30.3.7.4 Dry aggregate shall be applied in such a manner as to cover the epoxy mixture completely within 5 minutes of application. The dry aggregate shall be placed in a manner such that the level of the epoxy mixture is not disturbed.

623.30.3.7.5 The first course shall be swept to remove loose aggregate prior to the second course application. Sweeping shall be done without removing embedded aggregate. First course applications which do not receive enough aggregate prior to gelling shall be removed and replaced. A second course applied with insufficient aggregate may be left in place, but additional applications shall be placed at the contractor’s expense before opening to traffic.

623.30.3.7.6 The thickness of the overlay shall be verified to be at least 1/4-inch (7 mm), measured from the deck surface to the top of the resin. The contractor shall provide a minimum 1/2-inch (13 mm) diameter hole at a rate of at least one hole per 100 feet (30 m) of

traffic lane. Hole placement shall be at locations designated by the engineer. Thin areas shall be recoated and reverified at the contractor's expense.

623.30.3.7.7 When additional applications or recoating are required, the engineer may require additional adhesion strength tests by the contractor, at the contractor's expense, in accordance with ACI 503R to verify the contractor's procedure.

623.30.3.7.8 All adhesion strength test areas, thickness test holes or any debonded areas shall be repaired by filling with overlay material before final acceptance.

623.30.3.7.9 The epoxy concrete overlay shall be cured at least one hour, or until brooming or vacuuming can be performed without tearing or otherwise damaging the surface. No traffic or equipment shall be permitted on the overlay surface during the curing period.

623.30.3.7.10 After the curing period, all loose aggregate shall be removed by brooming or vacuuming and the next overlay course applied as specified in the contract documents.

623.30.3.7.11 The polymer mixture shall not be permitted to run into drains.

623.30.3.7.12 Unless otherwise specified, the epoxy concrete overlay courses shall be applied over the expansion joints and joint seals of the bridge deck. The expansion joints and joint seals shall be provided with a bond breaker. Prior to opening to traffic, the overlay shall be removed over each joint by removal of the bond breaker in accordance with the overlay manufacturer's recommendations.

623.30.3.7.13 Prior to opening a section to public or construction traffic, the overlay shall be allowed to cure in accordance with the manufacturer's recommendations. First course applications shall not be opened to traffic.

623.30.3.7.14 Damaged or debonded areas of an epoxy concrete overlay course shall be removed and repaired prior to acceptance. Repair shall consist of saw-cutting in rectangular sections to the top of the concrete deck surface and replacing the various courses in accordance with this specification at the contractor's expense.

623.30.4 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. Where required, the area of polymer concrete overlay will be measured and computed to the nearest square yard (m^2). This area will be measured longitudinally from end to end of bridge deck and transversely between the roadway face of curbs, excluding the area of the expansion device, if any. The revision or correction will be computed and added to or deducted from the contract quantity.

623.30.5 Basis of Payment. The accepted quantity of epoxy polymer concrete overlay will be paid for at the contract unit price.

SECTION 623.40 POLYMER CONCRETE.

623.40.1 Description. This work shall consist of furnishing and placing polymer concrete as shown on the plans or as directed by the engineer.

623.40.2 Manufacturer Representation. The manufacturer's representative shall be present at the start of surface preparations and polymer concrete installation for at least one day. The contractor shall furnish the manufacturer's recommendations to the engineer as to the acceptability of all aspects of the operation. The contractor shall contact the manufacturer's representative at least two weeks prior to installation.

623.40.3 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Polymer Concrete	1039

623.40.4 Construction Requirements.

623.40.4.1 Equipment. The contractor's equipment shall be in accordance with the manufacturer's recommendations.

623.40.4.2 Surface Preparation. Portland cement concrete shall be allowed to cure and dry for a minimum of seven dry days prior to installing the polymer concrete. Days with cold, wet or inclement weather which may be a detriment to curing of the Portland cement concrete will not count in this seven day minimum curing and drying time. The concrete surface shall be dry when placing the polymer concrete. The substrate shall be structurally sound and sandblasted to be free of all foreign matter, grease, dirt and laitance for all areas that will be in contact with the polymer concrete. Steel surfaces shall be cleaned in accordance with SSPC-SP 10 surface preparation requirements. After sandblasting is completed, the joint shall be cleaned of debris by using oil and water free compressed air at a minimum of 90 psi (620 kPa) or by vacuuming. These areas shall then be primed in accordance with the manufacturer's recommendations.

623.40.4.3 Placement. The polymer concrete shall be mixed, placed and cured in accordance with the manufacturer's recommendations and as shown on the plans. Before opening to traffic, the material shall be tack free and fully cured as determined by the engineer.

623.40.5 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. Where required, the volume of polymer concrete will be measured to the nearest 1.0 cubic feet (0.05 m^3) of accepted, in-place polymer concrete. The revision or correction will be computed and added to or deducted from the contract quantity.

623.40.6 Basis of Payment. The accepted quantity of polymer concrete will be paid for at the contract unit price.