

**KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, EDITION 2007**

Create a new section in DIVISION 1700:

POLYMER RESINS FOR POLYMER CONCRETE OVERLAY SYSTEMS

1.0 DESCRIPTION

This specification covers polymer resins for use in Multi-Layer Polymer Concrete Overlay and Slurry Polymer Concrete Overlay for Portland cement concrete bridge decks.

The following types of systems are covered by this specification:

- Type III Epoxy Resin for Multi-Layer Polymer Concrete Overlay,
- Epoxy Resin for Slurry Polymer Concrete Overlay,
- Methyl Methacrylate Resin for Slurry Polymer Concrete Overlay,
- Polyester Resin for Multi-Layer Polymer Concrete Overlay with High Molecular Weight Methacrylate (HMWM) Primer, and
- Polyester Resin for Slurry Polymer Concrete Overlay with HMWM Primer.

2.0 REQUIREMENTS

a. Epoxy Materials.

(1) Multi-Layer Polymer Concrete Overlay. Provide a system that complies with the requirements of AASHTO M 235 (ASTM C 881), Type III, Grade 1 or 2, with 100 percent solids, and is a thermosetting, moisture-insensitive epoxy resin. With the exceptions in **TABLE 1.0**:

TABLE 1.0: TYPE III EPOXY RESIN FOR MULTI-LAYER POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000 - 2500 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C 579 with 2X2 inch cubes using 2.75 parts ASTM C778, 20-30 mesh sand to one part of mixed polymer resin binder by volume.

(2) Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 2.0**.

TABLE 2.0: EPOXY RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000 - 2500 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	1000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

b. Methyl Methacrylate Materials. Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 3.0**.

TABLE 3.0: METHYL METHACRYLATE RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1100-1300 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	100-200 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

c. Polyester Materials.

(1) Multi-Layer Polymer Concrete Overlay. Provide a system that complies with **TABLE 4.0**.

TABLE 4.0: POLYESTER RESIN FOR MULTI-LAYER POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	1000-2000 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	10-25 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation (neat), 7 days	ASTM D 638, Type 1	30-80 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

(2) Slurry Polymer Concrete Overlay. Provide a system that complies with **TABLE 5.0**.

TABLE 5.0: POLYESTER RESIN FOR SLURRY POLYMER CONCRETE OVERLAY		
Property	Test Method	Requirements
Viscosity	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	75-200 cps
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	15-45 minutes
Compressive Strength, 3 hr.	ASTM C 579, Method B*	1000 psi, min.
Compressive Strength, 24 hr.	ASTM C 579, Method B*	5000 psi, min.
Tensile Strength, 7 days	ASTM D 638, Type 1	2000-5000 psi
Elongation, 7 days	ASTM D 638, Type 1	100-200 percent
Chloride Ion Penetration	AASHTO T 277	100 coulombs, max.

*Perform ASTM C579 with 2X2 inch cubes using aggregate supplied by the manufacturer.

(3) High Molecular Weight Methacrylate (HMWM) Primer. Provide a HMWM primer as part of a system of polyester materials that complies with **TABLE 6.0**.

TABLE 6.0: HMWM PRIMER WITH POLYESTER RESINS		
Property	Test Method	Requirements
Viscosity, max	ASTM D 2196, Brookfield RVT, Spindle No. 3 at 20 RPM	50 cps, minimum
Gel Time	ASTM C 881, para. 11.2.1 modified, 75 ml sample	10-150 minutes
Specific Gravity	ASTM D 2849	0.90 – 1.10
Elongation, 7 days	ASTM D 638, Type 1	100-200 percent
Flash Point	ASTM D 3278	180°F, minimum

3.0 TEST METHODS

Test the systems as specified in **subsection 2.0** with the following modifications:

a. Precondition, cure and test all material at 75±2° F.

b. Perform ASTM C 579 using only plastic inserts.

4.0 PREQUALIFICATION

a. All systems intended for use under this specification must be prequalified prior to use. Manufacturers desiring to supply material for KDOT jobs must submit a written request to the Bureau Chief of Construction and Materials, with the following information for each system:

(1) Name, address and telephone number of the manufacturer. Include the name of the preferred contact person.

(2) Brand name of the system.

(3) Type of material.

(4) Information regarding recommended usage and application instructions. If HMWM primer is required for the system, include primer information regarding recommended usage and application instructions.

(5) Material Safety Data Sheets.

(6) One copy of a certified test report prepared by a laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National Institute of Standards Technology or other approved reference laboratory, showing test results complying with **subsection 2.0**. Include evidence that the laboratory is inspected regularly.

Test results from the AASHTO National Transportation Product Evaluation Program (NTPEP) for the identical system, including primer when applicable, are acceptable in lieu of a test report from an approved reference laboratory.

(7) Include a Fourier Transform Infrared Spectrophotometry (FTIR) spectrum in transmittance mode and a bulk sample of each liquid component tested. All liquid components will be “fingerprinted” using infrared spectroscopy for use in screening future verification samples to verify that materials submitted for use are of an identical formulation as originally approved. All data will be maintained as confidential and used only for QA/QC purposes.

b. In addition to the written request described above, prequalification is also dependent upon two years of satisfactory performance in the field. Proof of performance on non-KDOT projects in Kansas may be submitted to show satisfactory performance history in Kansas.

c. The information, test reports and field performance will be reviewed by the Bureau Chief of Construction and Materials. The manufacturer will be advised as to whether or not the product is prequalified.

d. The Bureau of Construction and Materials will maintain a list of prequalified Polymer Concrete Overlay systems. Systems will remain prequalified as long as the formulation and manufacturing processes remain unchanged, and field experience indicates that the system functions appropriately. Changes in formulation or manufacturing processes will require new prequalification testing. Failure of the system to function appropriately in the field will be cause for removal of the product from prequalified status. Products removed from prequalified status will be considered for requalification if the manufacturer can provide evidence the cause of failure has been positively identified, and necessary formulation changes and quality control measures have been implemented to eliminate the cause. Complete prequalification testing may be required for systems that have been removed from prequalified status.

e. Verification samples will be taken in the field and forwarded to the Materials and Research Center for testing. Failure of such samples to comply with the specification requirements may be cause for removal of the system from prequalified status.

5.0 BASIS OF ACCEPTANCE

Prequalification as specified in **subsection 4.0**.

Receipt and approval of a Type C certification as specified in **DIVISION 2600**.

Observation at the project to verify performance.