

ALBERTA INFRASTRUCTURE AND TRANSPORTATION

TECHNICAL STANDARDS BRANCH

B405-JULY 00

SPECIFICATION FOR POLYMER RESINS USED IN POLYMER OVERLAYS

1.0 INTRODUCTION

This Specification is for the supply of polymer resin used in Non-Skid Polymer Overlays (Section 15).

The polymer, when applied on a concrete deck and seeded with an approved aggregate (B392), shall create a durable polymer-aggregate composite that exhibits thermal compatibility, waterproofing ability, and skid resistance. The polymer shall be UV resistant (BT007), flexible, have good bond to concrete and polymer to polymer, and meet the physical properties for polymer listed below. Table 1 summarizes all the requirements for the physical properties of the polymer resin.

1.1 Related Documents

The following documents are to be used in conjunction with B405, Specification for the Supply of Polymer Resins used in Polymer Overlays.

B392	Specification for Seed Aggregates used in Polymer Membrane and Overlays
BT007	Test Procedure for Ultraviolet Resistance of Polymer Resins used in Bridge Deck Wearing Surfaces.
BT008	Test Procedure for Finger Printing Sealers using Infrared Spectrography and Gas Chromatographic Separation

2.0 QUALIFYING TESTS

The Supplier/Manufacturer shall engage an independent, CSA certified laboratory for the purpose of sampling, testing, and completing the qualifying tests at his own expense.

2.1 Samples and Mixing

The sample of product submitted to the testing lab shall be large enough to allow all the samples for the required tests to be cast from the same batch. The polymer resin shall be mixed in accordance with the manufacturer's instruction. The manufacturer's product data sheet and safety data sheet shall also be submitted along with the sample.

2.2 Spectrographic and Chromatographic Analysis

For each component, the polymer resin shall be subjected to an infrared spectrographic analysis test (a graph of frequency versus amplitude) and a gas chromatographic analysis test (a graph of separation versus time) shall be plotted for all components and submitted to the Department for review.

2.3 Solids Content

The solid content of the mixed polymer resin shall be tested in accordance with ASTM D2369, at 60°C for 2 hours, "Standard Test Method for Volatile Content of Coatings". The solids content shall not be less than 98%.

2.5 Density

The density of each component shall be determined in accordance with ASTM D1475 "Standard Test Method for Density of Liquid Coatings, Inks, and Related Products".

2.5 Bond Strength

The bond strength to concrete when tested in accordance with ASTM C882, •Bond Strength of Epoxy-Resin Systems used with Concrete by Slant Shear• shall not be less than 10 MPa at an age of 7 days.

The interlayer bond strength to polymer when tested in accordance with ASTM C882, •Bond Strength of Epoxy-Resin Systems used with Concrete by Slant Shear• at an age of 2 days shall not be less than 7.0 MPa.

2.6 Tensile Strength

The tensile strength when tested in accordance with ASTM D638, •Tensile Properties of Plastics• shall be within the specified range of 10 MPa to 17 MPa at an age of 7 days.

The tensile strength after 365 days of UV exposure when tested in accordance with ASTM D638 •Tensile Properties of Plastics• shall have an equivalent tensile strength at 7 days, ∇ 3 MPa.

2.7 Tensile Elongation

The tensile elongation when tested in accordance with ASTM D638, •Tensile Properties of Plastics• shall not be less than 30% at an age of 7 days.

The tensile elongation after 365 days of UV exposure when tested in accordance with ASTM D638, •Tensile Properties of Plastics•, shall not be less than 20%.

2.8 Modulus Elasticity and Unit Weight

The modulus of elasticity (secant) of the mixed polymer resin when tested in accordance with ASTM C-109, •Test Method for Compressive Strength of Hydraulic Cement Mortars•, shall not be greater than 900 MPa. The samples shall be tested at a loading rate of 0.5 MPa ∇ 0.05 MPa per second. The unit weight shall be recorded prior to testing and a plot of the stress-strain curve shall be included with the report.

2.9 Compressive Strength and Unit Weight

The compressive strength of the polymer mortar, when tested in accordance with ASTM C109, •Test Method for Compressive Strength of Hydraulic Cement Mortars•, shall not be less than 40.0 MPa at an age of 7 days. The unit weight of the samples shall be recorded prior to testing. The samples shall be tested at a loading rate of 0.5 MPa ∇ 0.05 MPa per second, cubes cast with 1 volume of polymer to 2.5 volumes of Indag # 8 aggregate.

2.10 Thermal Compatibility

The thermal compatibility of the polymer mortar when tested in accordance with ASTM C884, •Thermal Compatibility between Concrete and an Epoxy-Resin Overlay•, shall not fail after 10 cycles of -21°C to 60°C.

2.11 Absorption

The polymer mortar when tested in accordance with ASTM C642, •Specific Gravity, Absorption, and Voids in Hardened Concrete•, shall be less than 1.25%.

3.0 EVALUATION OF POLYMER RESIN

To further evaluate the product, the Supplier/Manufacturer shall provide a list of projects where the material has been in service for at least 5 years, and shall include performance data, traffic volumes, and the clients' names and phone numbers.

The polymer resin shall meet or exceed all qualifying tests, and shall perform adequately in the field. The Department will continue to evaluate performance over a two-to five-year period. Approval of the polymer resin will be conditional only; unsatisfactory performance, whether short term or long term, shall be grounds for withdrawal of the approval.

4.0 ADDITIONAL REQUIREMENTS

4.1 Quality Control

The Supplier/Manufacturer shall be responsible for quality control of the product. He shall sample and test the polymer resin as necessary during production to ensure that all polymer resin conforms to these specifications, and is consistent with the sample of material that was tested and approved. When requested by the Department, the manufacturer shall submit the quality control test data within 30 days. Any change in the product will require a re-test at the Supplier•s/ Manufacturer's expense.

4.2 Labelling

The following information shall be labelled on the outside of each container for each component.

- (a) Dangerous Goods Warning
- (b) Product Name
- (c) Manufacturer
- (d) Batch and/or Lot Number
- (e) Date Material Manufactured
- (f) Shelf Life
- (g) Volume of Material
- (h) Mix Ratio

5.0 RIGHT TO REJECT

The Department reserves the right to run laboratory tests, reject materials, and withdraw the approval of the product should it not meet the requirements of the specification.

The material shall meet or exceed all qualifying tests, and shall perform adequately in the field. Unsatisfactory performance, whether short term or long term, shall be grounds for withdrawal of the approval.

6.0 LABORATORY TEST REPORT

The report prepared by the testing laboratory shall include all the results of the qualifying tests, product data sheet and safety data sheet.

The test results shall be submitted by the Supplier/Manufacturer to:

Alberta Infrastructure and Transportation
Technical Standards Branch
2nd Floor, Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta T6B 2X3
Attention: Clarence Wong, Materials Engineer
Telephone: (780)415-1029 FAX: (780)422-5426

TABLE 1

PHYSICAL REQUIREMENTS OF POLYMER			
Material	Physical Property	Required Value	Test Method
Polymer	Solids Content	minimum 98% solids	ASTM D2369 at 60°C for 2 hours
Polymer	Specific Gravity of Each Component		ASTM D1475
Polymer	Infrared Spectrography and Gas Chromatographic Separation		BT008
Polymer	Bond Strength to Concrete @ 7 days	10.0 MPa (minimum)	ASTM C882 Non-sandblasted surface.
	Interlayer Bond Strength to Polymer @ 2 days. Tested @ 23°C	7.0 MPa (minimum)	
Polymer	Tensile Strength @ 7 days	10.0 - 17.0 MPa	ASTM D638 Speed 4-6 mm/min. Sample type M-1. Use 10 x 10 mm sample.
	Tensile Strength after 365 days UV exposure	Equivalent of tensile strength @ 7 days ∇ 3 MPa	
Polymer	Tensile Elongation @ 7 days	30.0% (minimum)	ASTM D638 Speed 4-6 mm/min Use 10 x 10 mm sample.
	Tensile Elongation after 365 days UV exposure	20% (minimum)	
Polymer	Modulus of Elasticity @ 7 days (Secant)	900 MPa (maximum)	ASTM C109 (Modified) 50 x 50 mm cubes.
Polymer Mortar	Compressive Strength @ 7 days	40.0 MPa (minimum)	ASTM C109 (Modified) 50 x 50 mm cubes
Polymer Mortar	Thermal Compatibility @ 7 days	10 cycles of -21°C to 60°C (minimum)	ASTM C884 6 mm depth.
Polymer Mortar	Absorption Volume of Permeable Voids @ 7 days	1.25% (maximum)	ASTM C642 50 x 50 mm cubes oven dry @ 60°C for 48 hours.

- (1) Polymer shall be mixed in accordance with the Manufacturer's instructions.
- (2) All polymer mortar samples shall consist of 1 volume of polymer to 2.5 volumes of Indag #8 aggregate.
- (3) All tests will be carried out using the most recent test method.
- (4) UV test to be carried out in accordance with Alberta Infrastructure and Transportation BT007, Test Procedure for Ultraviolet Resistance of Polymer Resins used in Bridge Deck Wearing Surfaces.
- (5) Infrared Spectrography and Gas Chromatographic Separation to be carried out in accordance with Alberta Infrastructure and Transportation BT008, Test Method for Finger Printing Sealers using Infrared Spectrography and Gas Chromatographic Separation.