General Application Specification - Epoxy Pavement Markings

A. EPOXY PAINT MATERIALS

1. Shipment of Materials

The material shall be shipped to the job site in containers that are substantial and shall be plainly marked with the manufacturer's name and address, the color of the material, date of manufacture and batch number.

2. Certification of Compliance

The material manufacturer shall furnish a notarized certification that the material complies with the provisions of this specification. It shall not be inferred that the provisions of a certification of compliance waives state inspection, sampling or testing.

3. Infrared Spectra

A copy of the infrared spectra of each component shall be supplied by the Contractor along with the certification papers.

4. Glass Beads

The Contractor shall furnish certifications which shall include or have attached specific results of tests performed for roundness, refractive index, flow characteristics and gradation. The certifications shall show the quantity and lot number.

B. EPOXY PAINT STRIPING MATERIALS

1. Formulation

The epoxy paint marking material shall consist of a 100% solid, two-part system formulated and designed to provide a simple volumetric mixing ratio of the two components (e.g., two volumes of Part A to one volume of Part B).

2. Composition

The Component A composition shall be within the following limits:

	WHITE	NON-LEAD YELLOW
Pigments		
Titanium Dioxide (ASTM D-476 Type V) (Exceeds Type I,II,III & IV)	18-25%	5-10 %
Organic Yellow		5-10%
Binder		
Epoxy Resin	75-82%	73-77%

3. Epoxide Number

The WPE of the epoxy resin (Component A) shall be 300 +/- 50 as determined by ASTM D-1652 Method B and 250 +/- 50 on a pigment free basis.

4. Amine Number

The amine number of the curing agent (Component B) shall be 475 +/- 50 as determined by ERF-25-68.

5. Toxicity

Upon heating to application temperature, the material shall not exude fumes which are toxic or injurious to persons or property.

6. Viscosity

Formulations of each component shall be such that the viscosity of both components shall coincide (within 10%) at a recommended spray temperature.

7. Track Free Time

The epoxy paint pavement marking material, when mixed in the proper ratio and applied at 15 mils +/- 0.5 mil wet film thickness at 75°F +/- 2°F and with the proper saturation of glass spheres, shall exhibit no tracking time of 10 minutes or less when tested according to ASTM D-711.

8. **Curing**

The epoxy paint materials shall be capable of fully curing under a constant surface temperature of 40°F or above.

9. **Color**

The initial color for white and lead-free yellow shall fall within the following color box coordinates before and after performing ASTM G-53.

	x	y	x	y	x	y	x	y
White	.355	.355	.305	.305	.285	.325	.335	.375
Yellow	.560	.440	.490	.510	.420	.440	.460	.400

Note: Daytime Chromaticity, 45/0 (0/45) geometry, CIE Illuminant D65 and 2 degree standard observer.

10. **Yellowness Index (ASTM E-313)**

- Cure 72 hours after sample preparation
- Take yellow index reading, XYZ C/2°, following 72 hour cure and preceding QUV
- Maximum index before QUV: 8
- Place sample in QUV for 72 hours
- Maximum index after QUV: 20

11. **Directional Reflectance (ASTM D-6628, replaces ASTM E-97)**

Directional Reflectance after QUV using XYZ Scale D65/2°.

White	**Yellow**
Minimum: 90	Minimum: 54

12. **Adhesion to Concrete**

The catalyzed epoxy paint pavement marking materials, when tested according to ASTM D-7234 (formerly ASTM D-4541), shall have such a higher degree of adhesion to the specified concrete (4,000 psi minimum) surface that there shall be a 100% concrete failure in the performance of this test. The prepared specimens shall be conditioned at room temperature (75°F +/- 2°F) for a minimum of 24 hours and a maximum of 72 hours prior to the performance of the indicated test.

13. **Hardness**

The epoxy paint pavement marking materials, when tested according to ASTM D-2240, shall have a Shore D Hardness greater than 80. Samples shall be allowed to cure at room temperature (75°F +/- 2°F) for a minimum of 24 hours and a maximum of 72 hours prior to performing the indicated test.

14. **Abrasion Resistance**

The epoxy paint pavement marking material, when tested according to ASTM D-4060 (formerly ASTM C-501) using a Taber Abrader, CS-17 wheels, at 1,000g for 1,000 cycles, shall not have more than 80 mg weight loss. The test shall be run on samples applied at 15 +/- mils to S-16 stainless steel plates, without glass spheres and cured at 75°F +/- 2°F for between 24 and 72 hours.

15. **Tensile Strength**

When tested according to ASTM D-638, the epoxy paint pavement marking materials shall have an average tensile strength of not less than 6,000 pounds per square inch. The Type IV Specimens shall be pulled at a rate of 1/4 inch per minute by a suitable dynamic testing machine. The samples shall be allowed to cure at room temperature (75°F +/- 2°F) for a minimum of 24 hours and a maximum of 72 hours prior to performing the indicated tests.

16. **Compressive Strength**

When tested according to ASTM D-695, the catalyzed epoxy paint pavement marking materials shall have an average compressive strength of not less than 12,000 pounds per square inch. The cast sample shall be conditioned at room temperature (75°F +/- 2°F) for a minimum of 72 hours before performing the indicated tests. The rate of compression of these samples shall be no more than 1/4 inch per minute.

C. GLASS BEADS

1. Glass Spheres

Spherical glass beads shall be used as reflective media in LS50. The glass spheres shall be colorless, clean, transparent and free of excessive air bubbles. The surface of the spheres shall not exhibit any scarring or scratching. The refractive index of the glass spheres shall be a minimum of 1.50 as determined by the liquid immersion method at 75°F/24°C. The silica content of the glass spheres shall be a minimum of 60% by weight.

2. Gradation of Glass Spheres

There shall be two gradation types used in the LS50 epoxy pavement marking material. The large glass spheres shall conform to the Type 4 gradation described in the Standard Specification for Construction of Roads and Bridges on Federal Projects FP-96, Section 718.19. The small glass spheres shall conform to the AASHTO M-247 Type 1 Specification.

D. APPLICATION

Equipment

Epoplex shall approve the equipment used for the application of LS50. The equipment shall be capable of spraying both white and yellow epoxy according to Epoplex's recommended proportions and be of sufficient size and stability with adequate hydraulic and air power supplies to produce lines of uniform dimensions. The equipment shall have a high-pressure air blast cleaning system capable of cleaning the pavement immediately prior to applying the markings.

The equipment shall be specifically designed to apply two-component liquid materials through airless static tube or impingement mixing guns in a continuous and/or skip-line pattern. The guns must accommodate plural component material systems with a volumetric ratio of two to one.

The equipment shall be mobile, truck mounted and self-contained. The equipment shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. Truck mounted application units shall be equipped with accessories to allow for the application of legends, symbols, crosswalks and other special markings.

The agency engineer and material manufacturer together may approve the use of a portable applicator in lieu of truck mounted accessories for the application of special markings provided such equipment can demonstrate satisfactory application of reflectorized markings in accordance with these specifications.

E. SURFACE PREPARATION

1. Temperature

LS50 epoxy must be applied only when atmospheric and surface temperatures are 40°F/5°C or higher.

2. Moisture

Pavement surfaces must be clean and dry prior to the application of LS50 epoxy.

3. Miscellaneous Debris

The pavement surface must be free of oil, grease, dirt and dust prior to the application of LS50 epoxy. A grinder or shot blaster is recommended for removal of such surface contaminants prior to material application.

4. New Portland Cement Concrete

The curing compounds must be completely removed from Portland cement surfaces prior to the application of LS50 epoxy. High pressure water-blasting, sandblasting and/or shot blasting are the recommended methods for removing curing compounds.

5. New Asphalt

After the application of new asphalt, interim markings should be put in place prior to striping with final markings. The asphalt surface must be free of excess asphalt emulsions and oils to ensure proper adhesion of the markings and to eliminate the chance of tracking the oils on to the freshly painted lines rendering them dirty and unreflective. It is Epoplex's recommendation to wait at least 14 days prior to applying final markings. Asphalt mixes with high oil levels may need an even longer interim period.

6. Chip and Slurry Seal Coated Surfaces

Slurry seal coats must be completely cured prior to the application of LS50 epoxy. Chip seal surfaces must be free of loose aggregate. A reasonable waiting period to allow vehicles to wear off loose aggregate is recommended.

7. **Removal of Existing Pavement Markings**

Existing pavement markings must be removed prior to the application of LS50 epoxy. The roadway surface should be water-blasted, sandblasted and/or shot blasted until a minimum of 80% of the pavement surface is exposed. Oil based paints and epoxies used as temporary markings must be removed prior to application of LS50 epoxy.

LS50 epoxy may be applied over latex water-based paint applied as a temporary marking, provided these markings were applied at a mil thickness of 10 mils or less. If these water-based paint markings were applied over Portland Cement prior to removal of the curing compound, these markings must be removed prior to application of LS50 epoxy.

F. APPLICATION

1. **Film Thickness**

The material film thickness shall vary depending on the condition and type of pavement surface being marked. The applied film thickness, calculated without drop-on glass spheres, shall conform to the following:

Surface Type LS50 Application Rate (1 inch = 1,000 mils)	
Smooth Asphalt or Concrete Surface	20 ± 2 mils
New Smooth Concrete Surface	20 ± 2 mils
New Grooved Concrete Surface	25 ± 2 mils
New Asphalt Surface (Standard Mix)	20 ± 2 mils
Open Grade Friction Course or Stone Matrix Asphalt (SMA)	25 ± 2 mils
Rough Asphalt or Concrete	22 ± 2 mils
Smooth Asphalt or Concrete After Removal of Existing Markings	22 ± 2 mils
Chip Seal	20 ± 2 mils
Slurry Seal	20 ± 2 mils

Applied markings shall have uniform mil thickness and glass bead distribution across the width of the line. The markings shall have crisp distinct edges and clean cutoff at the end of each line.

2. **Drop-On Glass Sphere Application**

Type 1 and Type 4 glass spheres, as described in sections C1 and C2 above, shall be applied to the LS50 epoxy in a double drop operation. Type 4 spheres shall be applied first from the bead dispenser directly behind the epoxy application gun followed immediately by the application of Type 1 beads from a second bead dispenser. The application rates of each of the glass spheres shall conform to the following:

3. **Protection of Newly Installed Markings**

All applied markings shall be protected from traffic and potential tracking while the LS50 epoxy cures. Markings may be saturated with glass spheres to help prevent tracking.

Mils of LS50 Applied	Application Rate of Glass Spheres
20 mils	10 lbs/gallon of Type 1 10 lbs/gallon of Type 4 (Total of 20 lbs per gallon)
22 mils	12 lbs/gallon of Type 1 12 lbs/gallon of Type 4 (Total of 24 lbs per gallon)
25 mils	15 lbs/gallon of Type 1 15 lbs/gallon of Type 4 (Total of 30 lbs per gallon)

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