



LS90

## General Application Specification - Polyurea Pavement Markings

### A. GENERAL

This specification describes the material requirements and application procedures for Epoplex LS90 polyurea liquid pavement marking system. LS90 is designed for use as a durable pavement marking on asphalt and concrete roadways.

### B. POLYUREA STRIPING MATERIAL

#### 1. Formulation

LS90 polyurea pavement marking shall consist of a 100% solids, two-part system formulated and designed to provide a simple volumetric ratio of two components (2 parts Amine to 1 part Isocyanate). No volatile or polluting solvents will be allowed.

#### 2. 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	.493	.473	.518	.464	.486	.428	.469	.452

#### 3. Toxicity

Upon heating to application temperature, the material shall not exude fumes which are toxic or injurious to persons or property. Both white and yellow formulations shall be lead and heavy metal free.

#### 4. Track Free Time

The polyurea pavement marking material, when mixed in the proper ratio and applied at 15 +/- 0.5 mils wet film thickness at 75°F +/- 2°F and with the proper saturation of glass spheres, shall exhibit no tracking time of 7 to 10 minutes when tested according to ASTM D-711.

#### 5. Daylight Reflectance

The daylight directional reflectance of cured LS90 (without glass beads) shall not be less than 80% (White) and 50% (Yellow) relative to magnesium oxide when tested using a color spectrophotometer with a 45 circumferential/0 geometry, illuminant C, and 2 observer angle. The color instrument shall measure the visible spectrum from 380 to 720nm with a wavelength measurement interval and special bandpass of 10nm. The color of the Yellow polyurea shall exhibit a close visual match to Color Number 33538 of Federal Standard 595a.

#### 6. Weathering Resistance

When mixed in the proper ratio and applied at 20 +/- 2 mils wet film thickness to an aluminum alloy panel and allowed to cure for 72 hours at room temperature, LS90 shall be subjected to accelerated weathering for 75 hours. The accelerated weathering shall be conducted using the light and water apparatus (fluorescent UV-condensation type) testing in accordance with ASTM G-53. The test shall be conducted using a cycle consisting of 4 hours UV exposure at 122°F/50°C and 4 hours of condensation at 104°F/40°C. At the end of the exposure period, LS90 shall show no substantial change in color or gloss. When tested according to ASTM E-313 the Yellowness Index of White LS90 shall not exceed 5 before and after 1,000 hours of QUV exposure.

## **7. Adhesion**

Cured polyurea pavement marking material, when tested according to ASTM D-7234 (formerly ASTM D-4541), shall have such a higher degree of adhesion to the specified concrete (3,500 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°) for a minimum of 24 hours and a maximum of 72 hours prior to the performing the indicated tests.

## **8. Hardness**

When tested according to ASTM D-2240, the polyurea pavement marking material shall have a Shore D Hardness greater than 75. 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.

## **9. Abrasion Resistance**

The polyurea pavement marking material, when tested according to ASTM D-4060 (formerly ASTM C-501) using a Taber Abrader, CS-17 wheels, at 1,000 gm for 1,000 cycles, shall not have more than 60 mg weight loss. The test shall be run on samples applied at 15 +/- 0.5 mils to S-16 stainless steel plates without glass spheres, and cured at 75° F +/- 2° F for a minimum of 72 hours.

## **10. Tensile Strength**

When tested according to ASTM D-638, the tensile strength of LS90 shall be greater than 3,500 psi.

## **C. GLASS BEADS**

### **1. Glass Spheres**

Spherical glass beads shall be used as reflective media in LS90. 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 LS90 polyurea 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 ASHTO M-247 Type 1 Specification.

## **D. APPLICATION**

### **1. Equipment**

Epoplex shall approve the equipment used for the application of LS90. The equipment shall be capable of spraying both white and yellow polyurea 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 that such equipment can demonstrate satisfactory application of reflectorized markings in accordance with these specifications.

## E. SURFACE PREPARATION

### 1. Temperature

LS90 polyurea must be applied only when atmospheric and surface temperatures are 32°F/5°C or higher.

### 2. Moisture

Pavement surfaces must be clean and dry prior to the application of LS90 polyurea.

### 3. Miscellaneous Debris

The pavement surface must be free of oil, grease, dirt and dust prior to the application of LS90 polyurea. 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 LS90 polyurea. High pressure water blasting, sandblasting and/or shot blasting are the recommended methods for removing curing compounds.

### 5. New Asphalt

LS90 polyurea can be applied directly to new asphalt surfaces as soon as the asphalt has cooled and can support the weight of application equipment. The asphalt surface must be free of excess asphalt emulsions and oils to ensure proper adhesion of the markings.

### 6. Chip and Slurry Seal Coated Surfaces

Slurry seal coats must be completely cured prior to the application of LS90 polyurea. 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 LS90 polyurea. 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 LS90 polyurea.

LS90 polyurea 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 LS90 polyurea.

## 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	LS90 Polyurea 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 a 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 LS90 polyurea in a double drop operation. Type 4 spheres shall be applied first from the bead dispenser directly behind the polyurea 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:

Mils of LS90 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)

## 3. Protection of Newly Installed Markings

All applied markings shall be protected from traffic and potential tracking while the LS90 polyurea cures. Markings may be saturated with glass spheres to help prevent tracking.

### IMPORTANT:

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