



REPUBLIC OF THE PHILIPPINES  
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS  
OFFICE OF THE SECRETARY  
MANILA

097. 13 DPWH  
03. 20 - 2015

MAR 20 2015

DEPARTMENT ORDER )  
NO. 45 )  
Series of 2015 ) 03. 20 - 15

**SUBJECT: DPWH Standard Specification for  
Item 738 - Epoxy Resin Adhesives for  
Bonding Traffic Markers to Hardened  
Portland Cement and Asphalt  
Concrete Pavement**

In line with the continuing efforts to upgrade the construction technology thru the adoption of successful research studies, this Department has approved the DPWH Standard Specification for Item 738 - Epoxy Resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement and Asphalt Concrete Pavement subject to its specifications hereto attached.

This Order shall take effect immediately.

**ROGELIO L. SINGSON**  
Secretary

Department of Public Works and Highways  
Office of the Secretary



WIN5U01054

5.5.2 FET/JFS

## **DPWH STANDARD SPECIFICATION FOR**

### **Item 738 - EPOXY RESIN ADHESIVES FOR BONDING TRAFFIC MARKERS TO HARDENED PORTLAND CEMENT AND ASPHALT CONCRETE**

#### **738.1 Description**

This Item shall consist of furnishing all the materials needed for epoxy resin adhesives for bonding traffic markers to hardened Portland Cement and Asphalt Concrete, labor, tools, operations, and equipment required in undertaking the proper application as specified in the Plans, or as directed by the Engineer.

##### **738.1.1 Scope**

This Specification covers epoxy resin adhesives for bonding traffic markers to pavement surfaces.

This Standard may involve hazardous materials, operations, and equipment. This standard does not intend to address all of the safety concerns associated with its use. It is the responsibility of the users (Contractor and Implementing Office) to adopt and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

##### **738.1.2 Classifications**

**Type I** - Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence of traffic markers to the surface of the pavement.

**Type II** - Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

**Type III** - Rapid Setting, Low Viscosity, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers. It is more water-resistant than Type I and Type II.

**Type IV** - Standard Set Epoxy for Blade Deflecting - Type Plowable Markers.

#### **738.2 Material Requirements**

The material shall be furnished in two (2) separate components for combining in equal volumes immediately prior to use.

##### **738.2.1 Composition**

The chemical composition of the components for Type I and Type II epoxies shall conform to the requirements prescribed in Table 1 of AASHTO M 237.

The chemical composition of the components for Type III epoxy shall conform to the requirements prescribed in Table 2 of AASHTO M 237.

The components for Type IV shall conform to the requirements prescribed in Table 3 of AASHTO M 237.

Other epoxies meeting the physical requirements of Sections 738.2.2 and 738.2.3 for the type specified may be used with the approval of the Engineer.

**738.2.2 Physical Requirements – Individual Components**

**738.2.2.1** Requirements for components A and B are the same for all types except as noted.

**738.2.2.2 Viscosity**

Classification	Viscosity (Pa·s)	Viscosity (Pa·s)
	TE Helipath Spindle at 25± 1°C	TD Helipath at 25± 1°C
Type I	350 to 500	-
Type II	-	100 to 300
Type III	4 to 6	-

**738.2.2.3** For Types I and II, the shear ratio at 25°C shall have a value of two (2) minimum.

**738.2.2.4 Density, kilograms per cubic meter at 25°C:**

Classification	Component A	Component B
Type I	1402 to 1462	1402 to 1462
Type II	1270 to 1306	1354 to 1390
Type III	1797 to 1893	1929 to 1965
Type IV	1414 to 1438	1390 to 1414

**738.2.2.5** Percent air shall have a value of two (2) maximum.

**738.2.2.6** Infrared Curves – Components A and B shall match curves originally approved by the Engineer.

**738.2.2.7 Storage Stability:**

- a. The components A and B shall not change in viscosity and shear ratio by more than  $\pm 15$  percent when stored for 14 days in closed containers at  $47.0 \pm 1.8^\circ\text{C}$ . All measurements shall be made at  $25 \pm 1^\circ\text{C}$  using the same spindle and apparatus as in Section 738.2.2.2 – Viscosity.
- b. The adhesive shall meet all other requirements for twelve (12) months from date of manufacture. Any settling of the fillers shall be easily redispersible with a paddle.

**738.2.3 Physical Requirements for the Mixed Epoxy (Component A mixed with Component B) Types I, II, III, and IV.**

- a. Gel time for Types I, II, III, and IV shall be 6 to 10 minutes.
- b. Bond strength to concrete, maximum time, minutes to reach 1380 kPa. (See Table 738.01)

**Table 738.01 - Bond Strength to Concrete**

	Maximum Time, Minutes to Reach 1380 kPa		
	Type I	Type II, Type IV	Type III
at $25 \pm 1^\circ\text{C}$ , max	35	210	35
at $10 \pm 1^\circ\text{C}$ , max	45	-	45
at $-1 \pm 1^\circ\text{C}$ , max	85	-	85

- c. Slant shear strength (See Table 738.02)

**Table 738.02 - Slant Shear Strength**

	Type I	Type II, Type IV	Type III
24 h at $25 \pm 1^\circ\text{C}$ , kPa, min	6895	13790	6895
24 h at $25 \pm 1^\circ\text{C}$ , plus water soak, kPa, min	5516	10342	6895

- d. Tensile Adhesion and Cohesion are as follows:

For ceramic marker bottom, minimum requirement for Types I, II, III, and IV shall be 4830 kPa.

For ceramic marker bottom, including post cure, minimum requirement for Types I, II, III, and IV shall be 4830 kPa.

For reflective pavement marker, bottom, minimum requirement for Types I, II, III, and IV shall be 3450 kPa.

- e. Color – Color for all types shall be approximately that of Color 26132 to 26152 of Federal Standard No. 595.

#### **738.2.4 Certificate of Compliance**

The supplier shall furnish to the Contractor a Certificate of Compliance for Component A, Component B, and for the mixed epoxy. The certificate shall certify conformance to this Specification. Test results shall be maintained and available upon request.

#### **738.2.5 Test Methods**

Test for epoxy resins shall be in accordance with the methods specified in AASHTO M 237.

### **738.3 Construction Requirements**

#### **738.3.1 Surface Preparation**

Road surface shall be cleaned by sandblasting the area to which marker is to be bonded except for recessed or sawn installations. Sand shall be clean and dry.

When markers are to be placed over existing traffic paint stripes, all old paint and primer, if present, shall be removed.

When mixture is to be applied to old surfaces having heavy local deposits of oil, grease, and other adherent foreign materials, which will interfere with proper cleaning, these deposits shall be completely removed using any suitable means. Possible methods include solvents, such as trichloroethylene or xylene, heavy-duty detergents and/or mechanical means such as scraping. Where the concrete surface has deteriorated, it shall be cleaned down to sound material and patched, if necessary.

New concrete shall be aged at least 14 days before any adhesive is applied.

Sandblasting shall be accomplished in such a manner as to insure the removal of all laitance or any other substance that would prevent good adhesion of the epoxy. After sandblasting, the surface shall be swept, vacuumed, hosed or blown free of all dust and grit. The surface of the concrete shall be dry when the epoxy resin adhesive is applied.

#### **738.3.2 Adhesive Mixing and Metering**

Machine mixer and applicator shall be capable of accurately and uniformly proportioning Component A to Component B in a volume ratio of 1 to 1 within  $\pm 5$  percent by volume of each component (i.e., within range of 47.5 percent to 52.5 percent for each compound).

Mixing chamber shall produce the mixed adhesive with a uniform gray color with no visible evidence of streaks of either black or white on the surface or within the mixed adhesive.

Voids in a cured undisturbed sample 1.6 mm thick from the extrusion nozzle shall not exceed four percent (4%).

Periodic checks of the proportioning equipment shall be made to determine the actual volume ratio of A to B. This shall be done by placing containers before the mixing chamber and the actual volume of A and B measured.

The ambient temperature during application of Types II and IV epoxy shall be at least 10°C and preferably higher than 15.6°C. These adhesives harden relatively slow at 10°C but the hardening rate rapidly accelerates as temperature increases.

When markers are placed, all vehicular and foot traffic shall be prohibited in the area until the epoxy resin adhesive is hardened.

#### **738.4 Packaging and Marking**

Packaging – The two components of the epoxy resin system furnished under this Specification shall be supplied in separate containers that are non-reactive with the materials contained therein.

Marking – Each container of the two components shall be labelled with the name of the mixture, the component type, the name of the manufacturer, the lot or batch number, the date of packaging, and the quantity contained therein.

#### **738.5 Measurement and Payment**

Epoxy resin adhesives for bonding traffic markers to hardened Portland cement and asphalt concrete shall not be measured and paid for separately, but the cost thereof shall be considered as included in the contract unit price of the items where called for.

#### **References:**

1. DPWH Standard Specifications for Highways, Bridges and Airport, Volume II, 2013 Edition
2. American Society for Testing and Materials (ASTM)
3. American Association of State Highway and Transportation Officials (AASHTO)
4. Internet
  - a) <http://www.hiwaysafety.com/index.php/epoxy-binder-for-pavement-markers.html>  
Copyright © 2012 Myers & Sons Hi-Way Safety Inc. August 31, 2014
  - b) <http://forrestpaint.com/liquid-coatings/high-performance-epoxy-products/adhesive-systems/>  
FORREST Technical Coatings • 1011 McKinley Street, Eugene, OR 97402 • 800-537-7201 • 541-342-1821  
August 31, 2014
  - c) [www.epoxy-paint.net/Epoxy-Paste-Adhesive-Bonding-Traffic-Markers-Pavement.htm](http://www.epoxy-paint.net/Epoxy-Paste-Adhesive-Bonding-Traffic-Markers-Pavement.htm)  
August 31, 2014
  - d) [www.minifibers.com](http://www.minifibers.com)  
Mini Fibers, Inc., 2923 Boones Creek Road Johnson City, Tennessee 37615 – 4662  
September 7, 2014