

# **SEALING PAVEMENT CRACKS WITH HIGH MOLECULAR WEIGHT METHACRYLATES**

## **1. SCOPE**

This specification covers the materials, techniques, and workmanship requirements for sealing portland cement concrete (PCC) pavement with high molecular weight methacrylates (HMWM).

### **1.1 Area to be Treated**

The entire length of all readily observable cracks shall be treated with high molecular weight methacrylate monomer (HMWM). Typically monomer may flow out up to six inches on either side of the crack and pond on the surface until broomed or squeegeed up.

## **2. DEFINITION OF TERMS**

### **2.1 HMWM Monomer**

A synthesized methacrylate monomer characterized by high molecular weight, low viscosity and low volatility.

### **2.2 Polymer System**

The system composed of the monomer and its curing additives. When properly mixed together a solid polymer is formed.

### **2.3 Curing System**

Chemical additives that are intended to be combined with the monomer in specific proportions to form a polymer system. It normally consists of a peroxide initiator and a cobalt promoter.

### **2.4 Initiator**

A peroxide additive which is added by the contractor at the time of pavement sealing. It is necessary to begin the polymerization process which causes the liquid monomer to become a solid plastic. It may be considered a hazardous material which can cause fires or chemical burns when improperly stored or handled.

## 2.5 Promoter

An additive used to accelerate the polymerization or curing process. In this case it is necessary to insure good tack-free surfaces of the polymerized HMWM. Be absolutely certain to keep it away from the peroxide initiator except as properly mixed into the monomer.

## 2.6 Polymerization

A chemical reaction in which the molecules of the monomer are linked together to form the polymer which in this case becomes a solid plastic seal or joint adhesive.

## 3. MATERIALS

### 3.1 HMWM Monomer

The monomer used for treating the concrete shall be a low viscosity, low fuming, high molecular weight methacrylate resin conforming to the following:

#### 3.3.1 Physical Properties

<i>Viscosity</i>	>39 cps	ASTM D 2393
<i>Density</i>	8.2-8.8 lb/gal	ASTM D 2849
<i>Flash Point</i>	Above 200 °F (93 °C)	ASTM D 3278
<i>Tg (DSC midpoint)</i>	Above 140 °F (60 °C)	ASTM D 3418
<i>Stability</i>	Must pass 96 °C/16-hour exposure with gelling	
<i>Order</i>	Low	
<i>Shelf Life</i>	1 year @ 70 °F (21 °C)	

#### 3.1.2 Performance Properties

<i>Cure Speed</i>		
<i>Bulk cure</i>	< 3 hours at 75 °F	
<i>Surface cure</i>	< 8 hous at 75 °F	
<i>(laboratory conditions)</i>		
<i>Waterproofing</i>	≥ 90% (24 hour test)	
<i>Crack healing</i>	≥ 75% (flexural strength regained from repaired broken beam)	
<i>Gel Time (thin-film bulk)</i>	< 2 hours @ 50 °F (10 °C)	
	< 40 minutes at 95 °F (35 °C)	
<i>Tack Free Time, hours</i>	< 8 hours at 70.5 °F (21 °C)	
<i>(2 gram sample in weighing dish, 70 °F, 50% relative humidity)</i>		
<i>Slant Shear Bond Strength</i>	<1500 psi	ASTM C 882
	Failure in concrete, wet or dry	

The high molecular weight methacrylate to be used shall contain no wax additives.

#### **4. MIXING OF HMWM MONOMER**

##### **4.1 Formulator's Mixing Instructions**

The formulator of the monomer shall furnish the mixing instruction which shall include the proportions of the cure system components by weight and volume to 1 gallon of the monomer and the order of addition of each component. The cure system components shall be identified by their generic classifications and shall include a cobalt drier and peroxide of the grade and proportions specified by the monomer formulator. The mixing proportions shall not be changed from the formulator's mixing instructions unless approved by the Engineer.

#### **5. APPLICATION EQUIPMENT**

##### **5.1 Equipment for Distributing Polymer**

The equipment for applying the HMWM polymer system to the pavement surface shall be of the contractor's choice but following guidelines of the monomer supplier and approval of the Engineer.

#### **6. SURFACE PREPARATION**

##### **6.1 Power Brooming**

Surface preparation shall consist of power sweeping the entire deck blowing out debris from cracks with compressed air such that all traces of dirt, dust, sand, gravel or other debris are thoroughly removed. All debris shall be collected and properly disposed of by the contractor. In some cases debris may have required high pressure water blasting first, and then after the required 7 days of drying the cracks must be blown clean with compressed air prior to the monomer treatment.

##### **6.2 Repairing Spalls and Drain Holes**

Immediately prior to application of the monomer, the contractor shall repair all of the spalls contiguous to the cracks to be treated, and precautions shall be taken such that the monomer will not be discharged into existing drains. Suitably sized rubber plugs or other similar devices shall be used and shall be subject to the approval of the Engineer.

#### **7. APPLICATION OF THE POLYMER**

Monomer shall not be applied after a rain until at least 7 days of no precipitation have followed. The monomer shall not be applied if the weather conditions are unsuitable, such as, rain predicted within 6 hours or ambient temperatures below 55 °F. The monomer may not be applied to wet or damp concrete. Suitable application conditions shall be at the sole discretion of the Engineer.

After the application the cracks shall be inspected to insure that the polymer system has uniformly filled the entire length of all cracks and that there is no buildup or puddling of the polymer system in low areas of the pavement. If buildup or puddling is observed in low area, brooms or squeegees shall be used to uniformly distribute the polymer system in the areas. Small areas that were underfilled (dry surface or voids at the surface of the crack after application) shall be retreated with the polymer. Any touch-up of areas like those described shall be performed within 15 minutes following the application and before the sand is spread over the surface.

The monomer shall not be allowed to flow into expansive joints. Areas within two feet of the expansion joints shall receive the monomer treatment by with care to insure there is no leakage of monomer into the joint. Immediately after application of the polymer system to the surface the amount of foot and vehicular traffic on the treated surface shall be kept to the minimum necessary to redistribute the polymer system from low areas and to spread the sand.

## **8. SAFETY AND HEALTH PRECAUTIONS**

### **8.1 General Precautions**

The materials used in the HMWM polymer systems and solvents used for cleanup do not ordinarily present a serious health hazard. Materials may be handled safely if adequate precautionary measures, such as the following, are observed:

- a. Handle only in well ventilated areas.
- b. Prevent skin contact.
- c. Wear protective clothing and goggles.

**WARNING:** Goggles must be worn to protect eyes for persons doing the blending and mixing operations.

- d. Wear rubber boots. The monomer will dissolve gum soled shoes.

### **8.2 Personal Precautions**

Wear neoprene or other suitable impervious gloves whenever the possibility of skin contact occurs when mixing and placing the materials. If clothing is contaminated with the material, the clothing should be removed to prevent continuous skin contact with the materials. Wear full face shields or goggles during the blending and mixing operations. Restrict blending and mixing operations to open areas or, if in buildings, near a well ventilated hood system. Use disposable paper or plastic coverings in the work area where drips or contamination may be expected.

### **8.3 First Aid**

Provide necessities for prompt treatment of accidental skin or eye contact.

a. Eyes

First aid procedures in case of accidental eye contamination consist of immediate and continued washing of the eye for at least 15 minutes with copious quantities of running water, and referral to a physician if there is any question of serious eye involvement.

b. Skin

Clean all skin areas thoroughly with soap and water following accidental skin contact. If soap and water do not remove all the material, acetone may be used as a solvent; however, the use of acetone must be kept to a minimum.

## **9. PURCHASING, STORAGE AND ACCEPTANCE OF MATERIALS**

### **9.1. Purchasing**

The HMWM monomer and cure system must meet the requirements of the Specification for HMWM monomer.

### **9.2 Delivery**

The monomer shall be delivered to the job site in original manufacturer's unopened containers. The containers shall be clearly marked showing the manufacturer's name, the product, quantity, date of manufacture, lot number, drum serial number, expiration data and safety precautions.

### **9.3. Storage**

The materials shall be stored inside at temperatures between 40° and 90 °F. The peroxide initiator must be stored in a separate location of the storage building.

### **9.4 Acceptance**

The Engineer shall have the option of accepting the HMWM monomer by a Certificate of Compliance from the manufacturer, or by having the materials tested by a laboratory for compliance to the specification. When submitting a sample to the laboratory a one gallon sample of the monomer, along with an appropriate amount of the catalysts shall be sent to the laboratory. The formulators name, batch or lot number, date of production, type and class as designated by the material specification, shall be included along with the samples.

## 10. METHOD OF PAYMENT

Payment for work under this section shall be made on the following basis:

Item	Unit
Methacrylate Polymer (cure system included)	Per Gallon

### 10.1 Measuring Quantities of Polymer

When the catalyst is added to the monomer, one gallon of monomer will yield approximately 1.061 gallons of polymer. The quantify of polymer for payment shall be made by multiplying the gallons of monomer actually incorporated into the structure as determined by the containers of monomer delivered to the site and used as directed by the engineer times 1.061. Such Price and payment shall be full compensation for all materials, equipment, labor and incidentals to complete the work.

## 11. MANUFACTURERS OF HIGH MOLECULAR WEIGHT METHACRYLATES

Product name:

Address:

Product Name:

Address:

Product name:

Address: