

**ASPHALT EMULSION SEAL COAT**

Asphalt emulsion seal coat consist of applying asphaltic emulsion and screenings on the pavement where shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Asphalt emulsion seal coat consists of one of the following:

1. Polymer modified cationic rapid set emulsion (PMCRS-2h)
2. Polymer modified rejuvenating emulsion (PMRE)
3. Polymer modified rejuvenating emulsion with tire rubber (PMRE-TR)

**MATERIALS**

The asphalt emulsion applied for seal coat shall be \_\_\_\_\_.

The specified emulsion for chip seal shall conform to the following applicable requirements:

**Asphalt Emulsion**

PMCRS-2h emulsion shall conform with Caltrans Standard Specification Section 94 and to the following requirements when tested in conformance with the following methods:

<b>Polymer Modified Cationic Rapid-set Emulsion (PMCRS-2h)</b>		
<b>Tests on Emulsion</b>		
Specification Designation	Test Method	Requirement
Viscosity SSF @ 122°F (50°C)	AASHTO T 59	75 - 300 Seconds
Sieve, max.	AASHTO T 59	0.30 Percent
Settlement, 5 days, max.*	ASTM D 244	5 Percent
Demulsibility, min.	AASHTO T 59	40 percent
pH	ASTM E 70	2.0 - 5.0
Residue by Evaporation, min.	California TM 331	65 Percent
<b>Tests on Residue By Evaporation</b>		
Specification Designation	Test Method	Requirement
Penetration @ 77°F (25°C), 100g, 5s ,0.1mm	AASHTO T 49	40-90
Ductility @ 77°F (25°C), mm, min.	AASHTO T 51	400
Torsional Recovery, %, min.	California Test 332	18

PMRE shall conform to the following requirements when tested in conformance with the following methods:

<b>Polymer Modified Rejuvenating Emulsion (PMRE)</b>		
<b>Tests on Emulsion</b>		
Specification Designation	Test Method	Requirement
Viscosity SFs @ 122°F (50°C), sec.	AASHTO T 59	50 - 350
Sieve, %	AASHTO T 59	0.10 maximum
Settlement, 5 days, %*	ASTM D 244	5.0 maximum
pH	ASTM E 70	2.0 – 5.0
Oil Distillate, wt. %	ASTM T 59	0.5 maximum
Residue by Evaporation, wt. %	California TM 331	65 minimum
<b>Tests on Residue By Evaporation</b>		
Specification Designation	Test Method	Requirement
Penetration @ 39.2°F (4°C), 200g, 60s ,0.1mm	AASHTO T 49	40 minimum
Viscosity @ 140°F (60°C), P	ASTM D 2171	5000 maximum
Elastic Recovery <sup>(1,2)</sup> , 50°F (10°C), %	ASSHTO T 301	60 minimum
OR Torsional Recovery <sup>(1,3)</sup> , %	California TM 332	45 minimum
<b>Tests on Rejuvenating Agent</b>		
Specification Designation	Test Method	Requirement
Viscosity @ 140°F (60°C), cSt	ASTM D 2170	50 – 175
Flash Point, COC, °F	ASTM D 92	380 minimum
Saturates, wt. %	ASTM D 2007	30 maximum
Asphaltenes, wt. %	ASTM D 2007	1.0 maximum
<b>Tests on Rejuvenating Agent RTFO Residue</b>		
Specification Designation	Test Method	Requirement
Weight Change, wt. %	ASTM D 2872	6.5 maximum
Viscosity Ratio (RTFO/Original)	ASTM D 2170	3.0 maximum

<sup>(1)</sup> Choose either Elastic Recovery or Torsional Recovery as a test.

<sup>(2)</sup> Elastic Recovery @ 10°C (50°F): Hour glass sides, pull to 20cm, hold 5 minutes then cut, let sit 1 hour.

<sup>(3)</sup> Torsional recovery shall include the first 30 second.

<b>Polymer Modified Rejuvenating Emulsion with Tire Rubber (PMRE-TR)</b>		
<b>Tests on Emulsion</b>		
Specification Designation	Test Method	Requirement
Viscosity SSF @ 77°F (25°C)	AASHTO T 59	75 - 300 Seconds
pH	ASTM E 70	2.0 - 5.0
Residue by Evaporation, min.	California TM 331	65 Percent
<b>Tests on Residue By Evaporation</b>		
Specification Designation	Test Method	Requirement
Penetration @ 77°F (25°C), 100g, 5s, 0.1mm	AASHTO T 49	50-120
Elastic Recovery @ 77°F (25°C), mm, min.	AASHTO T 301	55 minimum
Dynamic Shear Rheometer, 70°C, 2mm gap, G*/sinδ	AASHTO T 315	1.00 minimum
<b>Test on Ground Tire Rubber</b>		
Specification Designation	Test Method	Requirement
Ground Tire Rubber Content, wt. %	calculation	8.0 minimum
Tire Rubber Gradation, passing	ASTM C 136	No. 20, 100 percent
		No. 30, 95 – 100 percent

### Screenings

Screenings for the asphalt emulsion \_\_\_\_\_ seal coat must comply with \_\_\_\_\_.

Screenings shall consist of sound, durable, crushed stone or crushed gravel. The material shall be free from vegetable matter and other deleterious substances. Screenings shall be 100% crushed particles as determined by California Test 205. The percentage composition by weight of the screenings shall conform to the specified gradation for the appropriate asphalt emulsion:

<b>PMCRS-2h Seal Coat Screenings Gradation</b>				
	Percentage passing			
Sieve sizes	Coarse 1/2" max	Medium 3/8" max	Medium fine 5/16" max	Fine 1/4" max
3/4"	100	--	--	--
1/2"	85-100	100	--	--
3/8"	0-30	85-100	100	100
No. 4	0-5	0-15	0-50	60-85
No. 8	--	0-5	0-15	0-25
No. 16	--	--	0-5	0-5
No. 30	--	--	0-3	0-3
No. 200	0-2	0-2	0-2	0-2

The cleanliness value determined California Test 227 must be 86 for PMCRS-2h seal coat screenings.

<b>PMRE and PMRE-TR Seal Coat Screenings Gradation</b>			
	Percentage passing		
Sieve sizes	Medium 3/8" max	Medium fine 5/16" max	Fine 1/4" max
3/4"	--	--	--
1/2"	100	--	--
3/8"	90-100	100	100
No. 4	5-20	35-55	60-80
No. 8	0-7	0-10	0-15
No. 16	0-5	0-5	0-5
No. 30	0-4	0-4	0-4
No. 200	0-3	0-3	0-3

The cleanliness value determined California Test 227 must be 80 for PMRE and PMRE-TR seal coat screenings.

## APPLICATION

Polymer modified asphaltic emulsion must be applied within the application rate ranges shown in the following table:

<b>Polymer Modified Asphaltic Emulsion Application Rates</b>	
Screenings	Application rate range(gallons per square yard)
Fine	0.15-0.30
Medium fine	0.25-0.35
Medium	0.25-0.40
Coarse	0.30-0.40

The Engineer determines the exact application rate.

At the time of application, the temperature of asphalt emulsion must be from 130 to 180 °F for PMCRS-2h and 110 to 180°F for PMRE.

Apply asphalt emulsion when the ambient air temperature is from 60 to 105 °F and the pavement surface temperature is at least 55 ° F.

Do not apply asphalt emulsion when weather forecasts predict the ambient air temperature will fall below 39 °F within 24 hours after application.

When tested under California Test 339, the application rate for polymer modified asphaltic emulsion must not vary from the average by more than:

1. 15 percent in the transverse direction
2. 10 percent in the longitudinal direction

The emulsion shall be applied with a distributor truck to the pavement surface capable of rate of 0.15 to 0.40 gallons per square yard.

## EQUIPMENT

Immediately following the emulsion, an application of screenings shall be spread evenly by a mechanical spreader.

The rate shall be adjusted up or down so that no bleed through occurs during rolling.

Pneumatic tire rolling shall follow immediately after the screenings is applied. The following equipment to be used for the chip seal shall be as follows:

- A. An asphalt distributor for application of the emulsion shall have a full circulation spray bar that is adjustable to at least sixteen (16) feet wide and capable of heating and circulating the emulsion simultaneously. It must have computerized rate control for adjusting and controlling the

application from the cab by .01 gallons per square yard increments. The distributor shall also be equipped with a volume measuring device and a thermometer for measuring the emulsion temperature in the tank.

- B. A self-propelled screenings spreader with front discharge that can evenly distribute screenings throughout the entire range of application rates specified for the project gradation. The spreader shall be equipped with computerized rate control.
- C. Two (2) pneumatic-tired rollers weighing at least five (5) tons each.
- D. Two (2) mechanically powered kick-brooms or mechanically powered pick up brooms equipped with vacuum type suction, for sweeping on city streets.
- E. A back pack blower for removing excess screenings during the sweeping operation.

The seal coat shall not be placed if either the pavement or the air temperature is below forty (40) degrees F and falling, but may be applied when both the air and pavement temperature is forty (40) degrees F or above and rising. The weather forecast should be for highs near sixty (60) degrees F and no rain forecast for the next twenty-four (24) hours after the seal coat has been applied. The mixture shall not be applied if high relative humidity prolongs the curing beyond a reasonable time.

Seal coat to be placed shall consist of an application of Polymer Modified Rejuvenating Emulsion and a single screening; and shall be applied and finished in conformance with these Special Provisions. The lane to be sealed shall be closed from the time the asphaltic emulsion is applied until the time the seal coat has set sufficiently to open traffic.

The Contractor shall take precautions such that no asphaltic emulsion or screenings are allowed to enter streams and waterways near the project during the course of the work.

Immediately before commencing the seal coat operations, all surface metal utility covers (including survey monuments) shall be protected by thoroughly covering the surface with an appropriate adhesive and paper or plastic. No adhesive material shall be permitted to cover, seal or fill the joint between the frame and cover of the structure. Covers are to be uncovered and cleaned of seal coat material by the end of the same work day.

For the purpose of this project, the construction zone is defined to include all stockpile staging areas and travel routes to/from streets where the seal coat is to be applied.

## **FINISHING**

Rollers shall be pneumatic-tired and a minimum of 2 rollers shall be used. Initial rolling shall begin immediately behind the chip spreader. The pneumatic tired-rollers shall carry a minimum loading of three thousand (3000) pounds. On each wheel an air pressure of one hundred (100) pounds per square inch is required.

All streets shall be power swept after placing the seal coat before the end of day. The sweepers shall be self-propelled vacuum or mechanical broom pickup, with water spray bars to reduce dust. If necessary, more than one type of sweeper may be used. Sidewinder sweepers or brooms that windrow material and do not remove it

shall not be used. A minimum of two (2) sweepers shall be used at all times. All areas shall be swept a second time or more if necessary in the same manner as the first sweeping. Completion of sweeping shall be evidenced by the absence of loose screenings in gutters or driveways. Special attention shall be required in sweeping from the driveways clear of loose chips. The contractor shall also be responsible for removal of all screenings from the sidewalks and other affected areas such as adjacent streets and truck route.

The Contractor shall exercise care to prevent oil from being deposited on concrete surfaces. The Contractor shall remove oil from the surfaces not designated to be seal coated.

#### **MEASUREMENT AND PAYMENT**

Seal coat will be measured and paid for by the square yard for the actual surface areas covered.

The contract price paid per square yard for seal coat shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in the furnishing and placing of the seal coat complete in place, including cleaning the surface, all as shown on the plans, as specified in these specifications and as directed by the Engineer.