

## **Rejuvenating Fog Seal**

### **Sample Construction Specification Guideline**

This sample construction specification guideline is provided solely for informational purposes only and is not intended to replace suitable planning, design, or professional consultation after careful consideration of the facts and circumstances of the particular project. Consequently, Ergon Asphalt & Emulsions, Inc., its affiliates, and their respective agents, directors, officers, and employees shall have no liability for any claims, damages, losses, demands, suits, and/or judgments in any way arising out of or caused by: (i) any use of this sample construction specification guideline, or (ii) the accuracy or content of the information contained herein. This sample construction guideline is provided AS IS, without warranty, and is subject to change without notice. Any person using this sample construction specification guideline assumes all risk of use and is advised to engage appropriate professionals, formulate a comprehensive project plan, and adhere to all applicable instructions, warnings, and safety precautions.

### **1. Scope**

The scope of this sample construction specification guideline is limited and intended to provide general information regarding the design, component material specification, application, inspection, measurement, and payment of a Rejuvenating Fog Seal.

### **2. Description**

A Rejuvenating Fog Seal is a light application of an asphalt emulsion containing a rejuvenating agent used to extend the service life of a flexible pavement structure. A Rejuvenating Fog Seal is recommended on pavement in relatively good condition to prevent or correct distresses such as raveling, oxidation, and minor top-down cracking.

### **3. Materials**

#### **3.1 Asphalt Emulsion**

The asphalt emulsion shall contain asphalt, water, polymer, and a rejuvenating agent and shall not be diluted prior to application.

#### **3.2 Aggregate**

Aggregate is used only as a blotting agent in areas of excess emulsion application or as a means to protect a freshly placed seal in high-traffic areas or to facilitate early return to traffic.

## 4. Material Specification

### 4.1 Asphalt Emulsion

Asphalt emulsion delivered to the project shall be accompanied by a laboratory certification of analysis. The asphalt emulsion shall be designated CMS-1PF and shall meet the following requirements:

Property	Test Procedure	Specification	
	AASHTO	Min	Max
<b>Emulsion Properties</b>			
Viscosity, Saybolt-Furol, 77°F, seconds	T72	10	100
Sieve Test, %	T59	-	0.1
Storage Stability, 24 hours, %	T59	-	1
<b>Residue Properties From Distillation</b>			
Residue by Distillation, <sup>1</sup> 350°F, %	T59	30	-
Oil Distillate, %	T59	-	0.5
Penetration, 4°C, 200g weight, 60 seconds	T49	30	-
<b>Residue Properties From Low Temperature Evaporation</b>			
MSCR, 52°C, J <sub>nr</sub> , 3.2/kPa	T350	-	4.0
MSCR, 52°C, % Recovery, 0.1/kPa	T350	30	-
<b>Polymer Properties<sup>3</sup></b>			
Swelling in Rejuvenating Agent, % Max Weight Increase	ASTM D471 Modified <sup>2</sup>	-	40
Tensile Strength (psi)	ASTM D412A Modified <sup>2</sup>	800	-
<b>Rejuvenating Agent Properties<sup>3</sup></b>			
Flash Point, COC, °F	T48	380	-
Viscosity, 140°F, cSt	T201	50	300
Saturates, %	ASTM D4124	-	30
Asphaltenes, %	ASTM D4124	-	1.0
<b>Residue Properties From Rolling Thin-Film Oven Test</b>			
Mass Change, %	T240	-	6.5
Viscosity Ratio (Rolling Thin-Film Oven Test/Orig.)	T201	-	3

1. Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly to 350°F +/- 10°F. Maintain this temperature for 20 minutes. Complete the total distillation in 60 +/- 5 minutes.
2. Refer to Appendix A for Test Modifications.
3. The emulsion supplier shall receive quarterly Certificates of Analysis from both the polymer and rejuvenating agent manufacturers. The Certificate of Analysis will be provided to the agency upon request.

## **4.2 Recycling Agent**

The manufacturer of the rejuvenating agent, through the emulsion supplier and the contractor, shall submit to the agency test results certifying that the material meets the specifications listed in this document. The agency shall not accept test results dated more than 120 days from the date of the project start. At any time during the project, the agency may obtain, and have tested at agency expense, samples of the recycling agent being used in manufacturing of emulsion delivered to the project.

## **4.3 Latex Polymer**

The manufacturer of the latex polymer, through the emulsion supplier and the contractor, shall submit to the agency test results certifying that the material meets the specifications listed in this document. The agency shall not accept test results dated more than 120 days from the date of the project start. At any time during the project, the agency may obtain, and have tested at agency expense, samples of the latex polymer being used in manufacturing of emulsion delivered to the project.

## **4.4 Aggregate**

The aggregate shall be any suitable manufactured or natural sand with top-sized material of less than 0.25 inches (0.64 cm).

## **5. Equipment**

### **5.1 Asphalt Distributor**

The distributor shall be self-powered and capable of providing a uniform application rate of asphalt binder varying from 0.05-1.00 gal/yd<sup>2</sup> (0.23-4.5 L/m<sup>2</sup>) over a variable width up to 16 feet (4.88 m) in a single pass. Nozzles on the distributor bar shall be fully operational and of the size suggested by the manufacturer to apply the intended application rate. Coverage shall be full with no overlapping areas or bare spots. Multiple passes shall overlap by a maximum of four inches (10.2 cm), with the end nozzles applying 50% of the desired application rate of each pass. The distributor shall be self-powered and include computerized application controls and be capable of heating material to 160°F (71.1°C).

### **5.2 Broom**

Self-propelled, four-wheeled rotary mechanical brooms and/or vacuum brooms capable of operating in both forward and reverse are recommended. Brooms should be in good condition and meet applicable environmental standards.

## 6. Equipment Calibration

### 6.1 Asphalt Distributor

The distributor shall be calibrated by applying asphalt emulsion for a minimum 300-foot (91.4 m) continuous section. The amount of material distributed shall be within 5% of the intended application rate and shall be verified by use of the strapping stick as supplied by the equipment manufacturer. Neither a visual gauge indicating volume nor the computer readout shall be used as a calibration method. Application rate is measured in gal/yd<sup>2</sup> (L/m<sup>2</sup>).

## 7. Test Strip

Prior to the beginning of the project, the contractor may be required to perform a test strip in a suitable area such as a parking lot or staging area to assure the materials, contractor personnel, and equipment are suitable to produce a satisfactory Rejuvenating Fog Seal. The location for the test strip shall be approved by the owner. The test strip may be conducted as part of the calibration procedure and may be conducted as part of the project.

## 8. Weather

The Rejuvenating Fog Seal shall not be placed when rain is possible prior to curing of the product or when freezing conditions are expected within 24 hours of application. Both ambient temperature and roadway surface temperature shall be minimum 50°F (10°C) and rising before beginning application.

## 9. Traffic Control

Prior to start of the project, a traffic control plan shall be developed to address all aspects of traffic control, including without limitation, coordination with local officials and traffic control equipment and methods. The traffic control plan is intended to promote controlled traffic flow through the project in order to protect the safety of the contractor and owner personnel, the public, and the product. The traffic control plan shall remain in place until the product has sufficiently cured to withstand traffic without damage. Any damage to the newly applied Rejuvenating Fog Seal due to the premature release of traffic shall be repaired to the satisfaction of the owner at the contractor's expense.

## 10. Surface Preparation

### 10.1 General

Immediately prior to applying the Rejuvenating Fog Seal, the pavement surface shall be cleared of all loose material, silt spots, vegetation, and other objectionable material. If water is used, cracks shall be allowed to dry thoroughly before applying the Rejuvenating Fog Seal. Manholes, valve boxes, drop inlets, and other service entrances shall be protected from the Rejuvenating Fog Seal by a suitable method. Thermoplastic and other striping should be removed or protected prior to application of the Rejuvenating Fog Seal. The owner shall approve the surface preparation prior to application of the Rejuvenating Fog Seal.

## 10.2 Cracks

Cracks wider than 0.25 inches (0.64 cm) should be treated with an approved crack sealer after application of the Rejuvenating Fog Seal.

## 10.3 Patching

Prior to application, all failed pavement sections should be removed and patched using accepted best practices. The perimeter of excavated areas should be milled or saw cut to form a neat vertical face. Unstable areas of sub-grade should be backfilled with well-graded and compacted aggregate. Patching should be completed 30 days prior to application of the Rejuvenating Fog Seal. Patches may require an individual application of asphalt emulsion prior to the full-width application. Extensive, large areas or shallow patches should be considered for suitability prior to application of Rejuvenating Fog Seal, as the rejuvenator can soften some mixes.

## 11. Application

The asphalt emulsion shall be applied by means of a pressure distributor. Application shall be a uniform, continuous, full-coverage spread and under such pressure as to thoroughly coat the surface at the specified rate. The temperature of the asphalt emulsion during application shall be maintained from 100°F-160°F (37.8°C-71.1°C).

## 12. Material Storage and Handling

### 12.1 Asphalt Emulsion

Asphalt emulsion stored on the jobsite must be agitated and heated using the distributor prior to use. Stored emulsion shall be inspected by the contractor for suitability prior to use on the project. The contractor shall comply with all material handling, storage, and safety requirements outlined in any applicable SDS or other product label.

### 12.2 Aggregate

Aggregate intended for use on the project shall be maintained in such manner as to protect it from contamination by debris and excess moisture. Large or oversized particles shall be removed from the aggregate by screening or other acceptable method prior to use on the project.

## 13. Inspection

Assure all distributor operations are functional. The nozzles shall be clean and producing a consistent fan of material, providing full and complete coverage of material across the asphalt surface with no overlap or excessive material. Assure material is within required temperature range and the material is sufficiently cured prior to return of traffic. Assure traffic control measures are in place and are adequate to satisfy all safety and product requirements.

## 14. Measurement

The Rejuvenating Fog Seal shall be measured in square yards (square meters) of pavement covered.

## 15. Payment

Payment shall be in consideration of all materials, tools, labor, and other items as Rejuvenating Fog Seal shall be paid at either of the methods below as set forth in the bid documents:

- Square Yards (square meters) of project
- Gallons (Liters) of emulsion used

## APPENDIX A

### Test Modifications

*ASTM D471 Standard Test Method for Rubber Property – Effect of Liquids: Modifications for Polymer Testing, Resistance to Swelling*

1. Using a syringe, place 0.8 gm of latex into an 18 mm diameter DSR mold.
2. Allow the sample to dry at ambient lab conditions (air conditioned) on the bench for 72 hours. Sample should be easily removable from the mold.
3. Take the “button” out of the mold and place the sample into a forced air oven at 40°C (104°F) for 48 hours (on release paper). If at the end of the ambient dry, the sample sticks to the mold, place it into the oven and check it after 1-2 hours.
4. After 48 hours, cool and weigh the sample to the nearest 0.0001 gram and record the weight.
5. Put 1/2 inch of Rejuvenating Agent into a 3 oz penetration tin.
6. Place the “button” on the Rejuvenating Agent, and add another 1/2 inch of Rejuvenating Agent, so that the “button” is covered.
7. Put the cap on the penetration tin and place it into the 40°C oven for 48 hours.
8. Remove the “button” from the Rejuvenating Agent, blot surface of the “button” to remove excess Rejuvenating Agent, cool the “button” to room temperature, and weigh it.
9. Calculate weight gain of the “button,” express as %.

*ASTM D412A Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension: Modifications*

1. To prepare the polymer film, dilute the waterborne polymer to 40% Total Solids Content and pour 57 g into a Teflon or silicone release mold of dimensions 7” x 7” x 1/4.”
2. Allow to dry at 23°C (73°F) and 50% RH (controlled conditions) for 7-10 days total time, during which time the film should be flipped around once, preferably after 3 or 4 days. The film should be transparent in the end.

3. To drive out any residual water, place the film in an oven at 50°C for 30 minutes. Dried film thickness should be 25 mils +/- 5 mils. Discard films <20 mils.
4. Cut out dumbbell-shaped test specimens of dimension 75 mm total length, 25 mm mid-section (L), and 4 mm width of mid-section.
5. Grip in Instron machine with gap size 1 inch; use 8-inch/min cross-head speed.

### *ASTM D6937 Standard Test Method for Determining Density of Emulsified Asphalt: Modifications*

Replace "Emulsified Asphalt" with "Latex" in text of test method. The testing temperature used should be 25 +/- 3°C. The calculation in Section 7 should be as follows:

Calculation:

$$D = (W_f - W_t) * 0.1$$

$$S.G. = D / 8.337$$

Where:  $W_f$  = Weight of filled cup (g)

$W_t$  = Weight of empty cup (g)

### *ASTM E70 Standard Test Method for pH of Aqueous Solutions with the Glass Electrode: Modifications*

1. A pH meter with automatic temperature measurement should be used in the evaluation with a calomel cell assembly or combination electrode. Calibration should be made using the procedure with the pH meter, according to ASTM method, prior to testing the pH of the latex. In Section 9, the procedure for measuring pH of the latex should be as follows:
  - a. Place the electrode and probe into the dispersion that is to be measured and swirl the sample cup or beaker gently. (You may also use the probe in a stirring motion.)
  - b. Wait for the reading to stabilize (usually less than a minute) and read/record this value. Note the temperature if not utilizing an ATC probe.
  - c. Take the Electrode and ATC probes from the sample and rinse thoroughly with deionized water. Pat dry and place back into appropriate solution recommended by electrode manufacturer for storage.