

FOG SEAL SURFACE TREATMENT

**\*\*From Randolph-Roxbury ER STP 0187(11)**

xx. DESCRIPTION. This work shall consist of furnishing and applying a fog seal surface treatment on an approved surface in accordance with the Contract Documents and as directed by the Engineer.

xx. MATERIALS. Materials shall meet the following requirements:

(a) Emulsified Asphalt.

- (1) General. Emulsified asphalt shall be produced by diluting (1:1) a Cationic Asphalt Emulsion Grade CSS-1h with a suitable emulsifier solution and thoroughly mixing into a homogeneous liquid.

All additives for emulsified asphalts shall be approved prior to their use.

Water may be checked for compatibility with the emulsion by mixing a small amount of the emulsion in a can (approximately 1 liter). The materials are mixed for 2 to 3 minutes with a stirrer and the resulting mixture is poured through a pre-wetted 150 µm sieve. If more than 1% by weight of material is retained on the sieve, the water is not compatible and clogging in spray jets may result.

Incompatible water may be treated with 0.5 to 1.0% of a compatible emulsifier solution (the emulsion manufacturer can provide advice regarding compatible solutions). The emulsifier solution should be added to the water tanker and circulated for 10 to 15 minutes via pump before adding to the emulsion. If a water treatment is used, the compatibility test should be repeated using the treated water to ensure compatibility.

Emulsified asphalt shall be homogeneous. It shall show no separation of asphalt at the time of use and shall be used within 30 calendar days after delivery from the manufacturer/supplier.

Diluted asphalt emulsion shall not be stored longer than 24 hours.

Emulsified asphalt shall not be allowed to freeze.

- (2) Properties. Emulsified asphalt shall conform to the requirements of Table 900-1 below, and/or AASHTO M 140 or AASHTO M 208, as appropriate. Emulsified asphalt shall be tested in accordance with AASHTO T 59.

TABLE 900-1  
 ASPHALT EMULSION FOR FOG SEAL

Material Designation Grade CSS-1h	900-1	
	Minimum	Maximum
Test Requirements (for diluted material)		
Sieve Test, %	-	0.10
Residue by Distillation, %	28	40
Oil Distillate, Volume of Total Emulsion, %	-	2
Test on residue from Distillation: Penetration, 25°C (77 °F), 100g, 5s	40	90
Spraying Temperature, °C (°F)	24-54 (75-130)	

- (3) Certification. A Type D Certification shall be furnished in accordance with Subsection 700.02.
- (4) Sampling of material from the distributor shall be random and as determined by the Engineer.
- (5) Verification. For the purpose of verifying materials used on the project the Engineer may require that all deliveries made of the emulsion to be used as Fog Seal, be evidenced by fully completed delivery records that accurately reflect the quantity and material delivered.

xx. WEATHER LIMITATIONS. Bituminous material shall be applied only when the following conditions prevail:

- (a) The ambient air temperature is at least 10°C (50°F) in the shade and rising, and the pavement surface temperature is at least 15°C (59°F).
- (b) The road surface is sufficiently dry.
- (c) Weather conditions or other conditions are favorable and are expected to remain so for the performance of satisfactory work.

Bituminous material shall not be applied between September 1st and June 1st.

xx. EQUIPMENT. The equipment used by the Contractor shall include transporting equipment, a bituminous distributor, and equipment for heating bituminous material.

- (a) Distributor. The distributor shall be so designed, equipped, maintained, and operated that bituminous material at even heat may be applied uniformly on variable widths of surfaces up to 4.9 m (16 feet) at the specified rate for the item being placed. Distributor equipment shall include suitable hand spray nozzle and hose, a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit

for the pump and full circulation spray bars adjustable laterally and vertically.

Distributors may be required to apply a 4.9 m (16 feet) wide strip at one time.

The mass (weight) of the loaded distributor shall not exceed the legal load limit.

Each pressure distributor shall be equipped with a squeegee and pouring pot, and labor shall be furnished to use the tools.

Each pressure distributor shall be equipped with a measuring stick.

Traveling or stationary plants or other equipment of proven performance may be used by the Contractor instead of the specified equipment if approved.

- (b) Transporting Equipment. Tanks for motor transport trucks shall be made of either steel or aluminum with a minimum capacity of 5.5 m<sup>3</sup> (1500 gallons), insulated, equipped with baffle plates to prevent surging, and equipped with the necessary units in order to heat the bituminous content in accordance with these specifications. Heating of motor transport truck tanks by distributors to bring the material to the proper temperature will not be permitted. The Contractor shall furnish the necessary heating units for the motor transport trucks and the operators for the heating units.

xx. PREPARATION OF SURFACES. All surfaces to be treated shall be patched, cleaned of loose or objectionable material, and free of irregularities to provide a reasonably smooth and uniform surface.

xx. APPLICATION OF BITUMINOUS MATERIALS. The application rates of bituminous materials shall be as directed by the Engineer.

The application shall be made in accordance with the widths and dimensions detailed in the Plans and shall have a uniform appearance acceptable to the Engineer across the width of the treatment area.

- (a) Emulsified Asphalt. Emulsified asphalt shall be applied between the temperature ranges specified in Table 900-1 by pressure distributors or other methods approved by the Engineer.

The emulsified asphalt shall be applied at the rate of 0.5 to 0.9 L/m<sup>2</sup> (0.1 to 0.2 gallons per square yard) as directed by the Engineer.

Application rates may be checked in accordance with the following:

**CHECKING APPLICATION RATES**

**Binder - Method A (Recommended for Calibration)**

- The weight of a 0.84 m<sup>2</sup> (1yd<sup>2</sup>) carpet, pan or, non-woven geotextile material is recorded and placed on the road surface.
- The distributor applies emulsion over the carpet, pan, or geotextile material.
- The weight of the carpet and emulsion, pan and emulsion, or geotextile material and emulsion is recorded.
- The weight of the carpet, pan, or geotextile material without emulsion is subtracted from the weight of the carpet, pan, or geotextile material with emulsion.
- The weights applied to the area of carpet (i.e., kg/m<sup>2</sup> or lb/yd<sup>2</sup>) must be converted to the units of the control mechanism, which is l/m<sup>2</sup> or gal/yd<sup>2</sup>, through knowledge of the specific gravity of the emulsion. If the distributor is not spraying the binder at the correct application rate, adjustments must be made to the controls and the process described above repeated until the correct application rate is achieved. Although this is the responsibility of the contractor, the inspector should verify that the distributor is spraying the binder at the correct application rate.

## BINDER CONSIDERATIONS

### CHECKING APPLICATION RATES

#### Example – Checking Fog Seal Application Rate (Method A)

- Given:  
Applying a Fog Seal with a 1:1 diluted emulsion.  
Tight surface texture.  
Recommended application rate of 0.15 – 0.5 l/m<sup>2</sup> ( 0.03 – 0.11 gal/yd<sup>2</sup> )  
(see Table 1).  
Specific gravity of Emulsion (G<sub>E</sub>) = 1.010.  
Unit Weight of Water (γ<sub>W</sub>) = 1 g/cm<sup>3</sup> or 1000 kg/ m<sup>3</sup> (62.4 lb/ft<sup>3</sup>).  
Conversion Factor (C<sub>f</sub>) = 1000 l/m<sup>3</sup> ( 7.5 gal/ft<sup>3</sup>).

#### Find the actual application rate (W<sub>A</sub>).

- Measure the weight of a 1 m<sup>2</sup> ( 1 yd<sup>2</sup> ) carpet (W<sub>C</sub>).  
(W<sub>C</sub>) = 1.8144 kg ( 4.0 lb )
- Measure the weight of 1 m<sup>2</sup> ( 1 yd<sup>2</sup> ) carpet and applied emulsion (W<sub>C+E</sub>).  
(W<sub>C+E</sub>) = 2.1944 kg (4.7 lb)
- Calculate the weight of emulsion covering the 1 m<sup>2</sup> ( 1 yd<sup>2</sup> ) carpet (W<sub>E</sub>).  
(W<sub>E</sub>) = (W<sub>C+E</sub> - W<sub>C</sub>)  
(W<sub>E</sub>) = ( 2.1944 kg - 1.8144 kg ) (4.7 lb - 4.0 lb)  
(W<sub>E</sub>) = 0.38kg ( 0.7 lb )
- The application rate is the weight of emulsion applied per unit area (W<sub>A</sub>).

$$(W_A) = \left( \frac{W_E}{1m^2} \right) \text{ or } \left( \frac{W_E}{1yd^2} \right)$$

$$(W_A) = \left( \frac{0.38kg}{1m^2} \right) \text{ or } \left( \frac{0.7lb}{1yd^2} \right)$$

$$(W_A) = 0.38 \frac{kg}{m^2} \text{ or } 0.7 \frac{lb}{yd^2}$$

#### Convert this application rate to gal/yd<sup>2</sup>.

- Calculate the unit weight of the emulsion (γ<sub>E</sub>) by multiplying the specific gravity of the emulsion (G<sub>E</sub>) by the unit weight of water (γ<sub>W</sub>).

$$(\gamma_E) = (G_E \times \gamma_W)$$

$$(\gamma_E) = \left( 1.010 \times 1000 \frac{kg}{m^3} \right) \text{ or } \left( 1.010 \times 62.4 \frac{lb}{ft^3} \right)$$

$$(\gamma_E) = 1010.0 \frac{kg}{m^3} \text{ or } 63.024 \frac{lb}{ft^3}$$

## BINDER CONSIDERATIONS

CHECKING APPLICATION RATES

### Example – Checking Fog Seal Application Rate (Method A) (continued)

- Convert the unit weight of the emulsion ( $\gamma_E$ ) to kg/l ( lb/gal ) ( $\gamma_{Ekg}$ ) by dividing ( $\gamma_E$ ) by ( $C_{f1}$ ).

$$(\gamma_{Ekg}) = \left( \frac{\gamma_E}{C_{f1}} \right)$$

$$(\gamma_{Ekg}) = \left( \frac{1010.0 \frac{kg}{m^3}}{1000 \frac{l}{m^3}} \right) \text{ or } \left( \frac{63.024 \frac{lb}{ft^3}}{7.5 \frac{gal}{ft^3}} \right)$$

$$(\gamma_{Ekg}) = 1.01 \frac{kg}{l} \text{ or } 8.4 \frac{lb}{gal}$$

- Convert ( $W_A$ ) in kg/m<sup>2</sup> ( lb/yd<sup>2</sup> ) to ( $W_{A'}$ ) in l/ m<sup>2</sup>( gal/yd<sup>2</sup> ) by dividing ( $W_A$ ) by ( $\gamma_{Ekg}$ ).

$$(W_{A'}) = \left( \frac{W_A}{\gamma_{Ekg}} \right)$$

$$(W_{A'}) = \left( \frac{0.38 \frac{kg}{m^2}}{1.01 \frac{kg}{l}} \right) \text{ or } \left( \frac{0.7 \frac{lb}{yd^2}}{8.4 \frac{lb}{gal}} \right)$$

$$(W_{A'}) = 0.3763 \frac{l}{m^2} \text{ or } 0.08 \frac{gal}{yd^2}$$

Check this value against the recommended application rates given in Table 1. For the given surface condition and dilution rate this application rate is acceptable.

- xx. TRAFFIC CONTROL. Flaggers shall be used in accordance with Section 630.

Signs informing the traveling public that bituminous surface treatment operations are underway shall be erected at each end of the section under construction that day. The signs shall be designed, worded, and erected in a manner approved by the Engineer. The signs shall be removed at the end of each day's work unless the condition of the road, as determined by the Engineer, requires otherwise.

All traffic shall be kept off the bituminous material for a minimum of two hours until the curing is complete and until the

fog seal surface treatment will not "pick up" under traffic, or as directed by the Engineer.

On projects where it is necessary to maintain traffic, the traffic shall be controlled by using a pilot car traveling at a low speed.

- xx. MAINTENANCE. The Contractor shall maintain the treated surfaces until the Contract is completed and the work accepted. Holes or irregularities shall be repaired by filling with material acceptable to the Engineer.
- xx. PROTECTION OF STRUCTURES AND TREES. The Contractor shall use care in applying bituminous material. Surfaces of adjacent structures and trees shall be protected from being spattered with the material.
- xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Fog Seal Surface Treatment) to be measured for payment will be the number of kilograms [hundredweight (CWT)] used in the complete and accepted work.
- xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Fog Seal Surface Treatment) will be paid for at the Contract unit price per kilogram [hundredweight (CWT)]. Payment shall be full compensation for furnishing, transporting, and placing the material specified and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for all necessary traffic control will be made under Contract item 641.10.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.635 Special Provision (Fog Seal Surface Treatment)	Kilogram
900.683 Special Provision (Fog Seal Surface Treatment)	CWT