

POLYMER MODIFIED REJUVINATING FOGSEAL

1. DESCRIPTION

This work shall consist of furnishing all materials, equipment, labor and preparation necessary for the application of a light coating of asphalt emulsion containing a rejuvenating agent to an existing or newly constructed asphalt pavement for the primary purpose of slowing the oxidation, raveling and other damage caused to unprotected asphalt pavements.

2. MATERIALS

- a) **Emulsion:** Rejuvenating asphalt emulsion, **CMS-1PF**, shall contain a polymer and conform to the following specifications. The emulsion shall be certified as meeting this specification from the manufacturer, and shall not be diluted prior to application.

Property	Test Procedure	Specification	
	(AASHTO)	(min)	(max)
Emulsion Properties			
Viscosity, Saybolt-Furol, @ 77°F, SFS	T59	10	100
Storage, 24 hour, %	T59		1
Oil Distillate, %	T59		0.5
Sieve Test, %	T59		0.1
Residue by Distillation ⁽¹⁾ @350°F, % Residue by Distillation, % by weight	T59	30	
Residue Properties From Distillation			
Penetration @ 4C, 200g weight, 60 sec Residue by Distillation, % by weight	T49	30	
Residue Properties From Low Temp Evaporation			
Dynamic Shear, G*/sin @ 64oC, kPa	T315	Report Only	
Polymer Properties			
Swelling in rejuvenating agent, % max weight increase: 48 hrs	ASTM D471 ⁽²⁾		40%
Tensile Strength (psi)	ASTM D412a ⁽³⁾	800	
Glass Transition Temperature (Tg) – Midpoint by DSC (°C)	ASTM D7426 ⁽⁴⁾	0	
Latex Density at 23°C (g/cm3)	ASTM D6937 ⁽⁵⁾	1.00	1.05
Latex pH	ASTM E70 ⁽⁶⁾	6.0	8.0

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Test on Rejuvenating Agent			
Flash Point, COC, °F	T48	380	
Viscosity, 140°F, CST	201	50	175
Saturate, % by wt	ASTM D2007		30
Asphaltenes	ASTM D2007		1.0
Test on Residue			
Weight Change, %			6.5
Viscosity Ratio			3

(1) Exception to AASHTO T59: Bring the temperature on the lower thermometer slowly to 350°F plus or minus 10°F. Maintain this temperature for 20 minutes. Complete the total distillation in 60 plus or minus 5 minutes.

(2) Polymer Testing, Resistance to Swelling: Using a syringe, place 0.8 gm of latex into a 18 mm diameter DSR mold. 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. 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. After 48 hours, cool and weigh the sample to the nearest 0.0001 gram and record the weight. Put ½ inch of Rejuvenating Agent into a 3 oz penetration tin. Place the “button” on the Rejuvenating Agent, and add another ½ inch Of Rejuvenating Agent, so that the “button” is covered. Put the cap on the penetration tin and place it into the 40°C oven for 48 hours. 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. Calculate weight gain of the “button”, express as a %.

(3) 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 ¼”. 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, preferable after 3 or 4 days. The film should be transparent in the end. To drive out any residual water, place the film in an oven at 50°C for 30 min. Dried film thickness should be 25 mil +/- 5 mils. Discard films <20mil. Cut out dumbbell-shaped test specimens of dimension 75 mm total length, 25 mm mid-section (L) and 4 mm width of mid-section. Grip in Instron machine with gap size 1 inch, use 8 inch/min cross-head speed.

(4) Use between 3 – 30 mg dry polymer. Instrument used is TA Q2000Differential Scanning Calorimeter (DSC). Heating rate is 20°C/min.

(5) 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:

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

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

Where: Wf = Weight of filled cup (g), Wt = Weight of empty cup (g)

⁽⁶⁾ 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:

- 1) 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.)
- 2) 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.
- 3) 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.

b) Material Certifications and Testing

- 1) The emulsion manufacturer, through the Contractor, shall submit to the Owner certified test results that the emulsion meets the specification. The polymer manufacturer and the rejuvenating agent manufacturer, through emulsion supplier and the Contractor, shall submit to the Owner certified test results on the polymer and the recycling agent that meets the required specifications. The Owner will not accept test results dated more than 90 days from the date of bid opening.
 - 2) Certifications and test results on the emulsion must be submitted to the Owner and approved by the Owner 5 days prior to supplying material.
 - 3) Prior to and during the project the Owner may require samples of the finished emulsion, rejuvenating agent and the polymer used in the emulsion to be submitted to the Owner designated laboratory for testing. All testing shall be at the Owner's expense.
- c) **Aggregate:** The aggregate material shall be a dry, clean, dust and dirt-free, sound, durable, angular shaped manufactured specialty sand, such as that used as an abrasive (i.e., trade name "Black Beauty"), with a Mohs hardness of 6 to 8. The Contractor shall submit manufacturer's technical data and a manufacturer's certification indicating that the specialty sand meets the requirements of the specification to the Engineer prior to start of construction. The sand must be approved for use by the Engineer and shall meet the following gradation limits.

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Aggregate Material Gradation	Percentage Retained Sieves
No. 8 (2.38 mm)	0
No. 16 (1.19 mm)	0-10
No. 20 (0.84 mm)	0-25
No. 30 (0.60 mm)	15-50
No. 40 (0.42 mm)	20-45
No. 50 (0.30 mm)	5-35
No. 70 (0.21 mm)	0-5
No. 200 (0.07 mm)	0-2

3. EQUIPMENT

- a) **Pressure distributor:** The emulsion shall be applied with a computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spreader bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour or seven hundred (700') feet per minute. Before use the equipment must be tested under pressure for leaks to ensure it is in good working order.

The distributor truck shall be equipped with a 12'foot minimum, spreader bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard. These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

A distributor truck shall be provided, if necessary, equipped to effectively heat and mix the material to the required temperature prior to application. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Care shall be taken not to overheat or over-mix the material.

The distributor shall be equipped to hand-spray the emulsion in areas identified either on the plans or by the Engineer, or not accessible to the distributor truck itself.

- b) **Aggregate spreader:** The asphalt distributor truck shall be equipped with an aggregate spreader mounted to the distributor truck that can apply sand to the emulsion in a single pass operation without driving through the wet emulsion. The aggregate spreader shall be equipped with a variable control system capable of uniformly distributing the sand at the specified rate at varying application widths and speeds. The sander shall have a minimum hopper capacity of at least 3,000 pounds of sand. Push-type hand sanders will be allowed for use around lights, signs and other obstructions.

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4. WEATHER LIMITATIONS

Place the fog seal when both the pavement and atmospheric temperature is 50°F and rising. Do not place fog seal if any of the following conditions exist:

- a) Impending weather conditions do not allow for proper curing, or if temperatures are forecasted below 32°F within 24 hours from the time of work.
- b) The existing pavement temperature is 140°F or above.
- c) The pavement surface is wet, or rain is forecasted within 24 hours of placement.

5. SURFACE PREPARATION

The Contractor shall clean the pavement surface prior to placement with a power broom or road sweeper. Clean any muddy or dirty areas by flushing with water. Allow surface to dry completely prior to applying asphalt emulsion.

6. APPLICATION OF ASPHALT EMULSION & AGGREGATE

The Contractor shall follow the construction methods as described. Target application rates for the emulsion shall be in the range of 0.06 to 0.15 gallons per square yard as established by the Engineer after spraying a test strip or strips with varying application rates in order to determine the optimum rate to achieve coating without runoff or delayed curing times. Target application rate for the aggregate shall be 0.5 pounds per square yard, also as established by the Engineer after spraying the test strip(s). Apply the asphalt emulsion at the target rate(s) established during the test strip. Maintain the asphalt emulsion temperature from 120° to 160°F during construction, including the start of each day. Reheat the asphalt emulsion at a rate of no more than 25° F per hour whenever the asphalt emulsion is allowed to cool below 110°F. If the target application rates are not the optimum application rates to achieve proper coating of the existing or newly constructed pavement surface, or if the break time is too long or too short, immediately notify the Engineer. Adjust and document the new application rate by stationing. Do not allow the asphalt emulsion to streak on the road surface. If the Engineer determines that streaking is occurring, cease operations until the Engineer is satisfied that streaking has been eliminated. Apply the asphalt emulsion to all exposed areas of asphalt surface as directed by the Engineer.

During the application of the fog seal, ensure there are no deficiencies in the fog seal, resulting from poor workmanship, flushing, tracking from equipment, surface patterns, and sweeping. Inspect workmanship for untreated areas, minimum overlap on longitudinal joints, and minimum overlap on construction joints.

Verify the following for daily acceptance:

- a) Fog seal edges are neat and uniform along the roadway lane, shoulder and curb lines.
- b) Fog seal has no surface patterns such as lean or heavy lines.
- c) Fog seal has no bleeding/flushing areas.
- d) Fog seal uniformly covers all portions of the asphalt surface
- e) Blotter sand is broadcast uniformly and at the proper rate.

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7. TRAFFIC CONTROL

Unless otherwise specified in the contract documents, maintain one-way traffic on two lane highways in accordance with Standard Drawing and as directed by the Engineer. Maintain traffic on multi-lane highways as specified by the contract documents. Lower volume roadways may be closed at the discretion of the Engineer. Traffic control shall be considered incidental to the performance of this item except for police details and flagger costs. The cost of flaggers and any police details, if required, will be paid or reimbursed by the Owner. The Owner will coordinate detail assignments which will be billed to the Contractor directly based on the hourly cost. The Contractor will not be reimbursed for police detail expenses incurred due to failure to cancel or cancelling without the required notice.

8. METHOD OF AWARD

To ensure contractor accountability, the Owner intends to award all items to a single contractor. Accordingly, contractors must bid on all items of work, and the low bidder will be the contractor whose total bid price is the lowest. The bid quantities are not guaranteed, and their primary purpose is for the determination of the low bidder.

9. MEASUREMENT AND PAYMENT

- a) The quantity to be measured for payment will be the number of square yards of Fog Seal completed.
- b) No additional compensation shall be made for additional work required to apply asphalt emulsion to areas outside the normal operating width of the distributor.

10. Asphalt Pricing and Price Adjustments

- a) **Asphalt Price Adjustments:** Contractor's bid prices below shall be based upon the current State DOT asphalt cement price index posted exactly two (2) weeks prior to the due date for receipt of bids ("Bid Index"). If the posted State DOT asphalt cement price index in place when the work is performed differs from the Bid Index, up or down, then Contractor's invoices shall include price adjustments for the asphaltic materials, and these adjustments shall be calculated based on the actual tons of liquid asphalt cement incorporated into the work.
- b) **Future Year Price Adjustments:** The Owner reserves itself the option to extend the use, terms, conditions and prices of this bid for an additional three (3) years after the first year in which the contract is awarded. Such extension will be subject to the Owner reviewing and approving the Contractor's annual request for a price adjustment based on and limited to the prior year's actual rate of inflation. If such price adjustment cannot be mutually agreed upon between the Owner and Contractor, Owner may choose to re-bid the work in lieu of extending this contract.