

ASPHALT REJUVENATION SPECIFICATION.

(REV 11-3-16)

ASPHALT REJUVENATION

335-1 Description.

The work specified in this section shall consist of furnishing all labor, material, and equipment necessary to perform all operations for the application of an asphalt rejuvenating agent to asphaltic concrete surface courses.

The rejuvenation of surface courses shall be by spray application of a maltene based cationic rejuvenating agent composed of petroleum oils and resins emulsified with water. All work shall be in accordance with the specifications, the applicable drawings, and subject to the terms and conditions of this contract.

335-2 Materials.

The asphalt rejuvenating agent shall be an emulsion composed of a petroleum resin oil base uniformly emulsified with water. Each bidder must submit a bid with a certified statement from the asphalt rejuvenator manufacturer showing that the asphalt rejuvenating emulsion conforms to the required physical and chemical requirements.

	Test Methods		Requirements	
	ASTM	AASHTO	Min	Max
Tests on Emulsion				
Viscosity @ 25°C, SFS	D-244	T-59	15	40
Residue, % W ¹	D-244(Mod.)	T-59(Mod)	60	65
Miscibility Test ²	D-244(Mod.)	T-59(Mod)	No Coagulation	
Sieve Test, % W ³	D-244(Mod.)	T-59(Mod)		0.1
Particle Charge Test	D-244	T-59	Positive	
Percent Light Transmittance ⁴				30
Tests on Residue from Distillation:				
Flash Point, COC, °C	D-92	T-48	196	
Viscosity @ 60°C, cSt	D-445	-	100	200
Asphaltenes, % w	D-2006-70	-		1.00
Maltene Dist. Ratio ⁵	D-2006-70	-	0.3	0.6
PC/S Ratio ⁵	D-2006-70	-	0.5	
Saturated Hydrocarbons,S ⁵	D-2006-70	-	21	28

1. ASTM D-244 Modified Evaporation Test for percent of residue is made by heating 50 gram sample to 149°C (300°F) until foaming ceases, then cool immediately and calculate results.

2. Test procedure identical with ASTM D-244-60 except that .02 Normal Calcium Chloride solution shall be used in place of distilled water.

3. Test procedure identical with ASTM D-244 except that distilled water shall be used in place of two percent sodium oleate solution.

4. Procedure for Determining Percent Light Transmittance on Asphalt Rejuvenating Agent:

a. Scope: This procedure covers the determination of percent light transmittance of the asphalt rejuvenating agent.

b. Apparatus:

1. Container may be glass, plastic or metal having a capacity of 6,000 ml.
2. Graduated cylinder, 1,000 ml, or greater
3. Light transmittance measuring apparatus, such as Bausch and Lomb or Lumberton spectrophotometer
4. Graduated pipette having 1 ml capacity to 0.01 ml accuracy
5. Suction bulb for use with pipette
6. Test tubes compatible with spectrophotometer, 3/4" X 6, Bausch and Lomb, Catalog No. 33-17- 81, (B&L)

c. Calibration of spectrophotometer:

1. Calibrate spectrophotometer as follows:
 - a. Set wavelength at 580 mu,
 - b. Allow spectrophotometer to warm-up thirty minutes,
 - c. Zero percent light transmittance (%LT) scale,
 - d. Rinse test tube three times with tap water and fill to top of circle marking on B&L test tube or approximately 2/3 full,
 - e. Place tube in spectrophotometer and set %LT scale at 100, and,
 - f. repeat steps (c) and (e) two times or until no further adjustments are necessary.

d. Procedure:

1. Shake, stir or otherwise thoroughly mix emulsion to be tested. Place sample of emulsion in beaker and allow to stand one minute.
2. Place 2,000 ml tap water in container.
3. Suck 1.00 ml emulsion into pipette using suction bulb. Wipe off outside of pipette.
4. Using suction bulb, blow emulsion into container.
5. Rinse pipette by sucking in diluted emulsion solution and blowing out.
6. Clean pipette with soap or solvent and water. Rinse with acetone.
7. Stir diluted emulsion thoroughly.
8. Rinse out tube to be used with the diluted emulsion three times and fill to top of circle.
9. Calibrate spectrophotometer.
10. Place diluted emulsion sample tube in spectrophotometer, cover and read %LT to nearest tenth.
11. Repeat steps 9 and 10 until three identical consecutive readings are achieved.
12. The elapsed time between addition of emulsion to dilution of water and final %LT reading should not exceed 5 minutes.

5. Chemical Composition by ASTM Method D-2006-70:

$$\frac{PC + A_1}{S + A_2}$$

PC = Polar Compounds, A₁ = First Acidaffins
A₂ = Second Acidaffins, S = Saturated Hydrocarbons

The rejuvenating agent shall have a record of satisfactory service as an asphalt rejuvenating agent and in depth sealer. Satisfactory service shall be based on the capability of the material to decrease the viscosity of the asphalt binder and provide an in-depth seal.

The bidder must submit with his bid the manufacturer's certification that the material proposed for use is in compliance with the specification requirements. The bidder must submit with his bid previous use documentation and test data conclusively demonstrating that; the rejuvenating agent has been used successfully and that the asphalt rejuvenating agent has been proven to perform, as heretofore required, through field testing as to the required change in asphalt binder viscosity. Testing data shall be submitted indicating such product performance on a sufficient number of projects to insure product consistency and reasonable life expectancy.

335-3 Material Performance:

The asphalt rejuvenating agent shall have the capability to penetrate the asphalt pavement surface. The asphalt rejuvenating agent shall be absorbed and incorporated into the asphalt binder. Verification that said incorporation of the asphalt rejuvenating agent into the asphalt binder has been effected shall be by analysis of the chemical properties the asphalt binder. The viscosity shall be reduced by a minimum of 25% for a pavement two years or less in age, and reduced by a minimum of 40% for a pavement greater than two years in age as determined by dynamic shear rheometer (DSR) method for asphalt testing in accord with AASHTO T315-05. This analysis shall apply to extracted asphalt binder, taken from cores extracted fifteen to thirty days following application, in the upper 3/8 inch of pavement. In addition, the treated areas shall be sealed in-depth to the intrusion of air and water.

The Engineer will require that untreated and treated core samples, a minimum of six inches in diameter, be removed by the Contractor at locations indicated by the Engineer. The treated core sample shall be taken in the same lane in close proximity to each untreated sample. A minimum of one untreated and treated core sample shall be taken for each pavement group or one per 50,000 square yards of treated pavement in each pavement group.

335-4 Equipment:

335-4.1 Distributor: The distributor for spreading the emulsion shall be self-propelled, and shall have pneumatic tires. The distributor shall be designed and equipped to distribute the asphalt rejuvenating agent uniformly on variable widths of surface at readily determined and controlled rates from 0.04 to 0.5 gallons per square yard of surface, and with an allowable variation from any specified rate not to exceed 5% of the specified rate.

Distributor equipment shall include full circulation spray bars, pump tachometer, volume measuring device and a hand hose attachment suitable for application of the emulsion manually to cover areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the emulsion within the tank.

The rate of application shall be controlled by an onboard computer control system designed to uniformly and consistently control the selected application rate in gallons per square yard regardless of the forward speed of the distributor truck.

A check of distributor equipment as well as application rate accuracy and uniformity of distribution shall be made when directed by the Engineer.

335-4.2 Sand Truck: The truck used for sanding shall be equipped with a spreader that allows the sand to be uniformly distributed onto the pavement. The spreader shall be able to apply 1/2 pound to 3 pounds of sand per square yard in a single pass. The spreader shall be adjustable so as not to broadcast sand onto driveways or to lawns.

The sand to be used shall be manufactured sand free flowing, without any leaves, dirt, stones, etc. Any wet sand shall be rejected from the job site.

Any equipment that is not maintained in full working order, or is proven inadequate to obtain the results prescribed, shall be repaired or replaced at the direction of the Engineer.

335-4.3 Calibration:

Distributor- Prior to construction, calibrate the distributor in accordance with ASTM D2995-99 in the presence of the Engineer. The distributor shall be moving forward at the proper application speed at the time the spray bar is opened. If at any time a nozzle becomes clogged or not spraying a proper pattern, the operation shall be immediately halted until repairs are made.

Sand Spreader- Prior to construction, calibrate the spreader in accordance with ASTM D5624-02, in the presence of the Engineer. The allowable deviation in the amount of manufactured sand spread on each of the rubber mats shall not exceed plus or minus 1 pound per square yard in the transverse direction, or plus or minus 1 pound per square yard in the longitudinal direction, from the design application rate.

335-5 Construction:

335-5.1 Layout: The Contractor will be responsible for the lay out of the roadway and project planning and sequencing to meet traffic control requirements prior to paving.

335-5.2 Weather and Seasonal limitations: The asphalt-rejuvenating agent shall not be applied to a wet surface or when rain is occurring or the threat of rain is present immediately before placement. The surface treatment shall not be applied when the temperature is less than 40° in the shade. When applying emulsions, the temperature of the surface shall be a minimum of 59°F, and no more than 140°F.

If unexpected rain occurs prior to material penetration and sanding, the agent shall be reapplied at no cost to the county. Further, the contractor's traffic control and project monitoring shall continue until the application has penetrated, area has been sanded and the resultant surface is not slippery or dangerous to vehicular travel.

335-5.3 Preparation of Surface: The contractor will be responsible for blowing or sweeping the road immediately ahead of the application operation to make sure the road is free of standing water, dirt, loose aggregate and other debris. The surface shall be clean and dry prior to the application.

335-5.4 Application of asphalt rejuvenating emulsion: The asphalt-rejuvenating agent shall be applied by a distributor truck at the temperature recommended by the manufacturer and at the pressure required for the proper distribution. The emulsion shall be so applied that uniform distribution is obtained at all points of the areas to be treated. Distribution shall be commenced with a running start to insure full rate of spread over the entire area to be treated. Areas inadvertently missed shall receive additional treatment as may be required by hand sprayer application.

335-5.4.1 Material Placement: Application of asphalt rejuvenating agent shall be on one-half width of the pavement at a time. When the second half of the surface is treated, the distributor nozzle nearest the center of the road shall overlap the previous application by at least

one-half the width of the nozzle spray. In any event the centerline construction joint of the pavement shall be treated in both application passes of the distributor truck.

Before spreading, the asphalt rejuvenating agent shall be blended with water at the rate of two parts rejuvenating agent to one part water, by volume or as specified by the manufacturer. The combined mixture of asphalt rejuvenating agent and water shall be spread at the rate of 0.04 to 0.10 gallons per square yard, or as approved by the Engineer following field testing.

Where more than one application is to be made, succeeding applications shall be made as soon as penetration of the preceding application has been completed and the Engineer grants approval for additional applications. Grades or super elevations of surfaces that may cause excessive runoff, in the opinion of the Engineer, shall have the required amounts applied in two or more applications as directed. After the street has been treated, the area within one foot of the curb line on both sides of the road, when directed shall receive an additional uniformly applied treatment of the asphalt rejuvenating emulsion as directed by the engineer.

The Contractor shall furnish a quality inspection report showing the source, manufacturer, and the date shipped, for each load of asphalt rejuvenating agent. When directed by the Engineer, the Contractor shall take representative samples of material for testing.

335-5.4.2 Test Strip for Application Rate: Prior to start of the project, the contractor shall perform test strip applications as directed by the engineer. Test strips shall be performed for each pavement group of similar age and type within the project area.

The test strips shall be applied at a minimum width of 6 feet and for a length of 50 feet. A total of three test strips shall be applied at application rates of 0.04, 0.08 and 0.10 gallons per square yard, respectively. The time, in minutes, for essentially complete absorption of the asphalt rejuvenating emulsion shall be recorded for each test strip. The optimal rate to be used in a given area shall be that rate essentially absorbed within 30 minutes.

In the event that all three of the standard test rates are absorbed completely within the 30 minute timeframe, then the Contractor and the Engineer shall agree on a fourth test strip application rate.

Upon completion of the test strips for each pavement group, the Engineer will determine the final application rate to be applied to each pavement group.

335-5.4.3 Sanding/Blotting: After the rejuvenating emulsion has penetrated, and when recommended by the Contractor and approved by the Engineer, a coating of dry manufacture sand shall be applied to the surface in sufficient amount to protect the traveling public as required.

All manufactured sand used during the treatment must be removed no later than 24 hours after treatment of a roadway. This shall be accomplished by a combination of hand and mechanical sweeping. All turnouts, cul-de-sacs, etc. must be cleaned of any material to the satisfaction of the Engineer. Street sweeping will be included in the price bid per square yard for asphalt rejuvenating emulsion.

If, after manufactured sand is swept and in the opinion of the Engineer a hazardous condition exists on the roadway, the contractor must apply additional manufactured sand and sweep same no later than 24 hours following reapplication. No additional compensation will be allowed for reapplication and removal of materials.

335-5.4.4 Handling of Asphalt Rejuvenating Agent: Contents in tank cars or storage tanks shall be circulated at least 45 minutes before withdrawing any material for application. When loading the distributor, the asphalt rejuvenating agent concentrate shall be

loaded first and then the required amount of water shall be added. The water shall be added into the distributor with enough force to cause agitation and thorough mixing of the two materials. To prevent foaming, the discharge end of the water hose or pipe shall be kept below the surface of the material in the distributor that shall be used as a spreader. The distributor truck will be cleaned of all of its asphalt materials, and washed out to the extent that no discoloration of the emulsion may be perceptible. Cleanliness of the spreading equipment shall be subject to the approval and satisfaction of the Engineer.

335-5.4.5 Street Sweeping: The Contractor shall be responsible for sweeping and cleaning of the streets after treatment. All sand used during the treatment must be removed no later than 48 hours after treatment of the street. This shall be accomplished by a combination of hand and mechanical sweeping. All turnouts, cul-de-sacs, etc. must be cleaned of any material to the satisfaction of the Engineer.

If, after sand is swept and in the opinion of the Engineer a hazardous condition exists on the roadway, the contractor must apply additional sand and sweep same no later than 24 hours following reapplication. No additional compensation will be allowed for reapplication and removal of sand.

335-5.4.6 Resident Notification: The contractor shall distribute by hand, a typed notice to all residences and businesses on the street to be treated. The notice will be delivered no more than 24 hours prior to the treatment of the road. The notice will have a local phone number that residents may call to ask questions. The notice shall be of the door hanger type, which secures to the door handle of each dwelling. Unsecured notices will not be allowed. The contractor shall also place the notice on the windshield of any parked cars on the street. Hand distribution of this notice will be considered incidental to the contract.

335-5.6 Traffic Control.

The Contractor shall furnish all necessary traffic control, barricades, signs and flagmen, to ensure the safety of the traveling public and to all working personnel. Traffic shall not travel on fresh Asphalt Rejuvenator until penetration, in the opinion of the Engineer, has become complete and the area is suitable for traffic. The Contractor shall submit an M.O.T plan indicating all facets of traffic control for the project area. The MOT plan must be approved in writing by the Engineer prior to commencing any work. All traffic control shall be in accordance with the FDOT Roadway Design Standards, most current edition and TP-102. M.O.T. and associated devices shall be checked daily and periodically throughout the project for compliance; and where adjustments or corrections are needed, prompt revisions shall be made.

335-5.7 Method of Measurement.

Asphalt rejuvenating emulsion at the Contract bid unit prices of measure is compensation in full for all costs of furnishing and applying the material as specified, including cleaning the existing pavement, stationing, purchase of aggregate, delivery of aggregate, all labor, equipment, and materials necessary for the placement of the asphalt rejuvenating emulsion, sweeping of any loose material after construction and other requirements as specified. Traffic control for maintaining traffic for constructing asphalt rejuvenating emulsion, removal and repair of test cores shall be considered incidental to the work unless specified elsewhere in the plans or proposal.

Payment for removal of untreated and treated cores shall be paid for as each at the unit price bid for Test Core Removal.

Payment for laboratory analysis of untreated and/or treated test cores shall be paid for as each at the unit price bid for Test Core Laboratory Analysis.

335-8 Basis of Payment.

Payment will be made under:

Asphalt Rejuvenating Emulsion	Per Square Yard
Test Core Removal	Each
Test Core Laboratory Analysis- Viscosity	Each