

ITEM 67

BITUMINOUS MATERIALS

67.01-Asphalt Cement

Asphalt cement shall conform to the requirements of AASHTO MP-1 for PG 64-22. When asphalt cement PG 70-22 or PG 76-22 is specified, the asphalt cement shall conform to AASHTO MP-1. Modification of the asphalt shall be accomplished by properly blending styrene butadiene (SB), styrene butadiene styrene (SBS) or styrene butadiene rubber (SBR) to a PG 64-22 base asphalt.

In addition to the above requirements, the PG 70-22 and PG 76-22 shall meet the following:

	<u>PG 70-22</u>	<u>PG 76-22</u>
Ring & Ball Softening Point, degrees C (degrees F), minimum	53 (128)	57 (135)
Elastic Recovery by means of Ductilometer, % minimum	40	58
Screen Test	No lumps retained	

Test Procedures

Elastic Recovery by means of a Ductilometer

Condition the ductilometer and samples to be tested at the temperature prescribed for that material. Prepare the brass plate, mold, and briquet specimen in accordance with ASTM D 113, "Ductility of Bituminous Materials". Keep the specimen at the specified test temperature for 85- 90 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm. The rate of pull shall be 5 cm/min. unless otherwise stated. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in its elongated position for 5 minutes. At this time, clip the sample approximately in half by means of scissors or other suitable cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation in cm.

Calculation - Calculate percent recovery by the following formula:

$$\% \text{ Recovery} = ((20 - X)/20) \times 100$$

X = observed elongation after rejoining the sample, cm

Screen Test

The procedure shall be to pour a 1000 gram sample heated to 135 degrees C (275 degrees F) through a 2.0 millimeter (No. 10) sieve. There shall be no lumps or particles retained on the sieve.

Viscometer Test

In addition to the above, a rotational viscometer, meeting ASTM D4402 requirements with a thermostatically controlled cell will be required at all hot mix asphalt mix plants using modified liquid asphalt products. A minimum of one test per day shall be run on samples taken from the contractor's storage tank or from a sampling port after the material is in-line blended if the grade of the material is being changed at the hot-mix plant. Viscosity values shall be in the range from 650-3000 cP for PG 70-22, and, 1000 to 3000 cP for PG 76-22 at 275 degrees F.

Materials Certification

A certification shall be furnished to the Engineer on each project stating that the asphalt cement furnished meets the Department's specification. A complete series of tests shall be conducted biweekly on a sample from the storage tanks and after material is added to the storage tanks.

Where blending or modification occurs after the material has left the storage tanks. A complete series of tests shall be conducted on a sample taken on the first day's production and biweekly thereafter for each grade being produced. Brookfield viscosity and DSR original tests shall be performed daily at the point of blending or modification. The DSR value G^*/\sin_{θ} shall be ≥ 1.0 kPa at the high PG grade temperature (ie. 70 degrees C for PG 70-22).

In addition, the producer shall provide a temperature-viscosity curve with a recommended mixing temperature range. In order to develop a temperature-viscosity curve, it may be necessary to run the viscosity test at a higher temperature. This temperature would be dependent on the softening point of the modified asphalt cement.

If a SBR modifier is used, the SBR shall be pre-blended with the asphalt cement or added by means of an "in-line" motionless mixer. The "in-line" mixer shall be a Komax Model No. 30715A, Ross LPD Motionless mixer, Koch Static Mixer or other approved equal. The "in-line" motionless mixing unit shall provide a homogeneity value of 0.15 or less. The mixing unit shall be equipped with a port(s) for obtaining representative samples of the blended material in accordance with AASHTO T 40. The mixer shall be oil jacketed. The mixer shall have a minimum diameter of 13 millimeters (1/2 inch) larger than the asphalt supply line onto which it is installed. The manufacturer shall document to the Engineer that the above specifications will be obtained with the mixer furnished.

67.02-Cut-Back Asphalts. Cut-back asphalts shall conform to the requirements of AASHTO M 81 or M 82, for the type and grade specified.

67.03-Emulsified Asphalts. These specifications cover two kinds of emulsified asphalt, anionic and cationic.

The manufacturer shall furnish samples of base asphalt used in the manufacture of the asphalt emulsion, as directed by the Engineer.

All emulsified asphalts shall be homogeneous, and shall adhere firmly to the surface of the mineral aggregate. Failure of the emulsified asphalt to perform satisfactorily on the job shall be deemed cause for rejection, notwithstanding its ability to pass laboratory tests.

A. Anionic Emulsified Asphalts.

In general, anionic emulsified asphalts shall conform to all the requirements of AASHTO M 140, for the type and grade specified.

In addition to the classes provided for in AASHTO M 140, a special mixing material (AE-3) or a special priming material (AEP) may be specified. These special materials shall conform to the following requirements:

Type	Special Mixing		Special Prime		Special Tack	
	AE-3		AE-P		TST-1P	
Grade	Min.	Max.	Min.	Max.	Min.	Max.
Test Requirements:						
Viscosity, Saybolt-Furol, 25° C (77° F), Sec.	10	50		10	75	
Viscosity, Saybolt-Furol, 50° C (122° F), Sec.	50+	& Pumpable				
Settlement, 5 days, % 24 Hours		5		5		5 1.0
Sieve Test		.10		.10		
Stone Coating (% coated)	90					
Distillation to 260° C (500° F)						
Distillate, % by weight		30		55		
Oil portion of distillate, % by vol.		6		12		
Distillation to 205°C (400°F)						
Distillate, % by weight					55	60
Tests on residue from distillation						
(a) Float Test, 60° C (140° F), Sec.	200		20			
(b) Ductility, 25° C (77° F), cm	40					
(c) Ductility, 4°C					10	35
(d) Soluble in Trichloroethylene %	97.5		97.5			
(e) Ash, by ignition, %		2				
Demulsibility (.02 Normal/35mL)						+5
Elastic recovery@10°C(50°F)						25+
Pen					75	150

The test requirement for settlement may be waived when the emulsified asphalt (special tack coat excepted) is used in less than five days' time; or the Engineer may require that the settlement test be run from the time the sample is received until it is used, if the elapsed time is less than five days.

The AE-3 shall be of such stability that it will remain constant and uniform while being mixed with dry or approximately dry aggregate, and shall thoroughly and uniformly coat the entire surface of each fragment while being manipulated and incorporated into the work. The emulsified asphalt after being incorporated into the work shall show no signs of re-emulsifying.

These special materials shall be tested in accordance with AASHTO T 59, with the following modification and additions:

1. Stone coating test: AASHTO T 59, except that the mixture of stone and emulsified asphalt shall be mixed vigorously for five minutes and then immediately drenched with approximately twice its own volume of tap water at room temperature.
2. Float Test: AASHTO T 50, except
 - (a) Delete Section 3.2 and substitute Section 8.7 of AASHTO T 59 for preparation of test specimen.
3. Solubility in Trichloroethylene: AASHTO T 44.

B. Cationic Emulsified Asphalts.

Cationic emulsified asphalts shall conform to the requirements of AASHTO M 208, for the type and grade specified.

In addition to the classes provided in AASHTO M 208, a special priming material may be specified which is designated CAE-P. This material shall meet the requirements listed for AE-P except as follows:

- (1) The Float Test shall be deleted.
- (2) Penetration Test (25 degrees C ,77 degrees F) shall be a minimum of 300.
- (3) The particle charge shall be positive.

When approved by the Engineer, cationic emulsions may be substituted for anionic emulsions.

C. Emulsified Asphalts for Slurry Seal.

The emulsified asphalt for a Slow-Set Emulsified Asphalt Slurry Seal shall be Type CSS-1h meeting the requirements specified herein. The emulsified asphalt for a Quick-Set Emulsified Asphalt Slurry Seal and a Quick-Traffic Emulsified Asphalt Slurry Seal shall be Type CQS-1h meeting the requirements for Type CSS-1h with the following exceptions:

Residue, %	MIN. 60
Cement mixing test, %	(waived)

Unless otherwise specified on the Plans, a Quick-Set Emulsified Asphalt Slurry Seal shall be used.

The water shall meet the requirements of Subsection 918.01 of the TDOT Standard Specifications.

The latex modifier, when specified, shall be an unvulcanized styrene-butadiene rubber in liquid latex form. The cationic latex modifier shall conform to the following requirements:

Tests	Cationic Latex Modifier
Styrene/Butadiene Ratio, %	24/76 ± 1.5
Solids Content, %	60 Min.
ph	6.2 Max.

Kilograms per Liter (lbs. per gallon):

Wet Basis @ 25° C	0.95 (7.9) Min.
Dry Basis @ 25° C	0.55 (4.5) Min.

The manufacturer of the latex shall provide written certification of the results of the above noted tests.

Latex modified CSS-1h shall meet the requirements of AASHTO M-208 modified as follows:

Residue Requirements

Penetration @ 25° C	30 Min.
Ductility @ 25° C	150 +
@ 4° C	100 +
Softening Point, Ring and Ball, degrees C	54 +

The latex shall be combined with the asphalt emulsion at the emulsion mill to produce a homogeneous mixture.

The latex modified emulsion upon standing undisturbed for a period of 24 hours shall show no color striations, but shall be a uniform color throughout.

The latex modified asphalt emulsion shall meet the requirements of the Stretch Test which will be conducted as follows:

Pour onto a liter (quart) friction can lid or similar container, enough of the emulsion to cover the surface to a depth of 1.5 to 3 millimeters (1/16 to 1/8-inch). Immediately, while the emulsion is still brown, embed with thumb pressure several stones or chips approximately 13 millimeters (1/2- inch) in size (10 to 16 millimeters, 3/8-inch to 5/8-inch) into the binder. Put the lid, or similar container containing the emulsion and aggregate into a 38 degrees C (100 degree F) oven and allow to cure for a minimum of eight hours. After the curing period, remove the lid and allow it to cool for one hour. Upon lifting a stone or chip from the binder, the asphaltic material must adhere to the aggregate and must elongate for a minimum distance of 75 millimeters (three inches) without loss of adhesion and without breaking.

D. Emulsified Asphalts for Micro-Surface.

The latex or polymer modifier and other emulsifiers shall be milled into the asphalt cement and shall show no separation after mixing. The latex or polymer modified emulsified asphalt shall have a minimum softening point (Ring and Ball) of 57 degrees C (135 degrees F) when tested in accordance with AASHTO T 53.

The blended asphalt mixture when combined with aggregate and mineral filler shall have the following characteristics:

1. Be capable of filling up to 13 millimeters (1/2 inch) wheel ruts in one pass.
2. Be capable of field regulation of the setting time.
3. Be suitable for nighttime placement.

The latex or polymer modified emulsified asphalt shall be accepted by certification from the manufacturer.

67.04-Asphalt for Underseals. Asphalt for underseals shall conform to the requirements of AASHTO M 238.

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