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**LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SPECIFICATIONS**

POLYMER MODIFIED ASPHALTIC MATERIALS

DESCRIPTION:

These specifications cover polymer modified asphaltic materials for road maintenance.

GENERAL REQUIREMENTS:

Polymer modified asphalt shall be prepared by the refining of petroleum. It shall be uniform in character, free from water, and shall not foam when heated to 350°. Asphalt shall be from an approved source on Qualified Products List No. 41.

Storage tanks, piping, retorts, booster tanks, distributors and other equipment used in delivering, storing or handling asphaltic materials shall be kept clean and in good operating condition and shall be operated in such manner as to avoid contamination of the contents with foreign materials.

Test methods shall be the latest in effect in addition to the ones included in this specification. Final test results for polymer modified asphaltic materials will be applied to the proper table herein for conformance to specifications. Any deviation from the specifications will result in a payment adjustment as specified. If test results are such that a price adjustment would result from more than 1 test value, the payment adjustment for the greatest reduction shall apply.

The adjustment in pay for polymer modified asphaltic materials shall be applied only to samples taken at the point of delivery. Samples taken at the refinery shall conform to specification requirements; if the refinery sample fails to meet these requirements, the material will be rejected and shall not be shipped.

SAMPLING:

Sampling will be in accordance with the Materials Sampling Manual.

**TABLE 1
POLYMER MODIFIED ASPHALT CEMENTS¹**

PROPERTY APPLICABLE TO ASPHALTIC CONCRETE	AASHTO TEST METHOD	PAC-40HG			PAC-30		
		Specification	Deviation		Specification	Deviation	
		100	95	90 or Remove	100	95	90 or Remove
Penetration @ 25° C, 100 g., 5 sec.	T 49	50-75 ⁷	---	44- 81+	50+ ⁸	---	44-
Viscosity ² , @ 60° C, Poise	T 202 ⁹	4,000+	---	3,400-	3,000+	---	2,400-
Viscosity @ 135° C, cSt	T 201 ⁹	2,000-	2,001-2,050	2,051+	2,000-	2,001- 2,050	2,051+
Flash Point, ° C	T 48	232+	---	230-	232+	---	230-
Solubility ³ , %	T 44	99.0+	---	---	99.0+	---	---
Separation of Polymer ⁴ 163° C, 48 hours difference in R & B from top to bottom sample, ° F	---	4-	---	---	4-	---	---
Force Ductility ⁵ (f ₂ /f ₁ , 4° C, 5 cm/min., 30 cm elongation)	---	0.30+	---	0.29-	---	---	---
Force Ductility ⁵ , 4° C, 5 cm/min., 30 cm elongation, lb	---	---	---	---	0.50+	---	0.49-
Test for Residue from Thin Film Oven Test Penetration Retention, %	T 49	50+	---	49-	50+	---	49-
Elastic Recovery ⁶ , 25° C, 10 cm elongation, %	---	60+	---	59-	40+	---	39-

- ¹ The following specifications shall define either Polymer Modified Asphalt Cement materials preblended or the sampled base asphalt cement plus additive combined at the plant site.
- ² The absolute viscosity shall be run in a Modified Koppers vacuum capillary viscometer. Report the viscosity at a shear rate of 1 reciprocal second.
- ³ Not all polymers are soluble in the specified solvents. If the polymer modified asphalt digested in the solvent will not pass the filter media, a sample of the base asphalt used in making the polymer modified asphalt should be tested for solubility. If the solubility of the base asphalt is at least 99.0%, the material shall be considered as passing.
- ⁴ Separation of Polymer Test - See following test method. To be used for preblended modified asphalt cement materials or batched and stored materials. This test will be for informational purposes only.
- ⁵ For Force Ductility Test, see following test method for PAC-40HG. For PAC-30, the Force Ductility test shall conform to ASTM P-226-92.
- ⁶ For Elastic Recovery Test - See the following test method.
- ⁷ For samples obtained at the point of delivery, the penetration requirement shall be 45-80.
- ⁸ For samples obtained at the point of delivery, the penetration requirement shall be 45+.
- ⁹ ASTM D 4957 may be used to determine viscosity.

**TABLE 2
ANIONIC EMULSIFIED POLYMER MODIFIED ASPHALT**

PROPERTY	TEST METHOD	SS-1P		
		SPECIFICATION	DEVIATION	
		100	80	50 or Remove
Viscosity, Saybolt 25° C, SSF	AASHTO T 59	20-100	10-19 101-150	9- 151+
Storage Stability, 24 Hour, %	AASHTO T 59	1.0-	---	---
Sieve Test, retained on the No. 20, %	AASHTO T 59	0.1-	---	---
Residue by Distillation ¹ , 250° C	ASTM D 244	57+	---	56-
TESTS ON RESIDUE FROM DISTILLATION TEST:				
Penetration, 25° C, 100g, 5s	AASHTO T 49	100-200	88-99 201-212	87- 213+
Solubility, %	AASHTO T 44	97.5+	---	---
Force Ductility ² f ₂ /f ₁ , 4° C, 5 cm/min	---	0.15+	---	0.14-
Elastic Recovery ³ , 10° C, 20 cm elongation 60 min, %	---	30+	---	29-

¹ ASTM D 244 Residue by Distillation is modified to include a maximum of 204° C to be held for a period of 15 minutes.

² For Force Ductility test see the following test method.

³ For Elastic Recovery test see the following test method.

**TABLE 3
ANIONIC EMULSIFIED LATEX MODIFIED ASPHALT**

PROPERTY	TEST METHOD	SS-1L		
		SPECIFICATION	DEVIATION	
		100	80	50 or Remove
Viscosity, Saybolt 25° C, SSF	AASHTO T 59	20-100	10-19 101-150	9- 151+
Storage Stability, 24Hour, %	AASHTO T 59	1.0-	---	---
Sieve Test, retained on the No. 20, %	AASHTO T 59	0.1-	---	---
Residue by Distillation ¹ , 204° C, %	ASTM D 244	57+	---	56-
TESTS ON RESIDUE FROM DISTILLATION TEST:				
Penetration, 25° C, 100g, 5s	AASHTO T 49	100-200	88-99 201-212	87- 213+
Ductility, 5 cm/min., 4° C	AASHTO T 51	50+	41-49	40-
Elastic Recovery ² , 10° C, 20 cm elongation 60 min, %	---	50+	---	49-
Softening Point, Ring & Ball, ° C	AASHTO T 53	50.0+	45.1- 49.9	45.0-

- ¹ ASTM D244, Residue by Distillation, Section 12, is modified as follows: The temperature on the lower thermometer shall be brought slowly to $204 \pm 5^\circ \text{C}$ and maintained at this point for 15 minutes. Generally, the distillation should be complete at this point and must be accomplished within a maximum of 60 minutes.
- ² For Elastic Recovery test see the following test method.

SEPARATION OF POLYMER TEST

1. Scope

1.1 The separation of polymer from asphalt cement during hot storage is evaluated by comparing the ring and ball softening points of top and bottom samples taken from a conditioned sealed tube of polymer modified asphalt. The conditioning consists of placing a sealed tube of polymer modified asphalt in a vertical position in a 325°F oven for a 2 day period.

2. Referenced Documents

2.1 AASHTO T 53 Softening Point of Asphalt (Bitumen) and Tar in Ethylene Glycol (Ring-and-Ball).

2.2 ASTM E 11 Specifications for Wire Cloth Sieves for Testing Purposes.

3. Apparatus

3.1 Aluminum Tubes - The tubes are used to hold the test sample during the conditioning. The cylinders are defined as 1 inch diameter by 5 1/2 inches length blind aluminum tubes.

3.2 Oven - An oven capable of maintaining $325 \pm 10^\circ \text{F}$.

3.3 Freezer - A freezer capable of maintaining $20 \pm 10^\circ \text{F}$.

3.4 Rack - A rack capable of holding the aluminum tubes in a vertical position in an oven or in the freezer

3.5 Shears (or spatula and hammer) - The shears (or spatula and hammer) shall be rigid and sharp to allow cutting of the tube containing the polymer modified asphalt when it is at low temperature.

4. Procedure

4.1 Place the empty tube, sealed end down, in the rack.

4.2 Carefully heat the sample until sufficiently fluid to pour. Care should be taken to avoid localized overheating. Strain the melted sample through a No. 50 sieve conforming to ASTM E 11. After a thorough stirring, pour 50.0 g into the vertically held tube. Fold the excess tube over two times and crimp the seal.

4.3 Place the rack containing the sealed tubes in a $325 \pm 10^\circ \text{F}$ oven. Allow the tubes to stand undisturbed in the oven for a period of 48 ± 1 hour. At the end of the heating period, remove the rack from the oven and immediately place in the freezer, at $20 \pm 10^\circ \text{F}$ taking care to keep the tubes in a vertical position at all times. Leave the tubes in the freezer for a minimum of 4 hours to completely solidify the sample.

4.4 Upon removing the tube from the freezer, place the tube on a flat surface. With the shears (or spatula and hammer), cut the tube into three equal length portions. Place the top and bottom portions into separate marked beakers. Place the beakers in a $325 \pm 10^\circ \text{F}$ oven until sufficient fluid to remove the pieces of aluminum tube.

4.5 After a thorough stirring, pour the top and bottom samples into the appropriately marked rings of the ring and ball softening point test. Prepare the rings and apparatus as described in AASHTO T 53.

4.6 The top and bottom sample from the same tube should be run at the same time on the softening point test.

5. Report

5.1 Record the softening point of the top and bottom portions of the sample. Duplicate separation tests should be run.

FORCE DUCTILITY TEST

The force ductility test follows procedures as specified in ASTM D 113 - "Ductility of Bituminous Materials" with the following conditions and modifications:

(a) Temperature - 4°C

(b) Rate of Travel - 5 cm/min.

- (c) The standard V-shaped sides for the specimen mold shall be replaced by straight-sided inserts of the same length, so that the specimen will contain a section 1 cm x 1 cm x 3 cm.
- (d) A calibrated force adapter is placed on one end of the specimen mold, so that the tensile force can be determined at any point during the elongation.

The force ductility is defined as the force at 30 cm elongation (f_2) divided by the maximum force at the initial peak (f_1). Report the force ductility to the nearest hundredth (0.01).

ELASTIC RECOVERY

1. Ductilometer Temperature:

Polymerized Asphalt Cement	25° C
Emulsified Polymer or Latex Modified Asphalt	10° C

2. Procedure: 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". The standard V-shaped sides for the specimen mold shall be replaced by straight-sided inserts of the same length, so that the specimen will contain a section 1 cm x 1 cm x 3 cm. With the specimen at the specified test temperature, place the specimen in the ductilometer and immediately elongate the specimen to 10 cm for Polymer Modified Asphalt Cement or 20 cm for Emulsified Polymer or Latex Modified Asphalt. The rate of pull shall be 5 cm/min, unless otherwise stated. For Polymer Modified Asphalt Cement, clip the sample approximately in half with scissors or other suitable cutting device immediately after reaching the 10 cm elongation. For Emulsified Polymer or Latex Modified Asphalt, allow the sample to remain in its elongated position for 5 ± 0.25 minutes after reaching the 20 cm elongation, then clip the sample approximately in half with scissors or other suitable cutting device. Let the severed sample remain in the ductilometer in an undisturbed condition for 1 hour. At the end of this time period, carefully move the traveling carriage back to a position where the severed ends of the specimen touch. Observe and record the elongation of the specimen with severed ends just touching each other.

3. Calculation: Calculate percent recover by the following formulas:

For Polymer Modified Asphalt Cement

$$\% \text{ Recovery} = \frac{10 - a}{10} \times 100$$

Where:

a = observed elongation after rejoining of sample, cm.

For Emulsified Polymer or Latex Modified Asphalt

$$\% \text{ Recovery} = \frac{20 - a}{20} \times 100$$

Where:

a = observed elongation after rejoining of sample, cm.