Standard Method of Test for

Emulsified Asphalts

AASHTO Designation: T 59-16
Release: Group 3 (August 2016)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Standard Method of Test for

Emulsified Asphalts

AASHTO Designation: T 59-16
Release: Group 3 (August 2016)

AASHTO

1. SCOPE

1.1. These test methods, given under the headings titled Composition, Consistency, Stability, Examination of Residue, Identification Tests, Coating Tests on Emulsified Asphalts, and Density of Emulsified Asphalts, cover the examination of Emulsified Asphalt composed principally of a semisolid or liquid asphalt base, water, and an emulsifying agent. The methods cover the following tests:

Test or Procedure	Section(s)
Calibration, Standardization, and Check	3
Sample Conditioning	4
Composition:	
Water Content	5
Residue and Oil Distillate by Distillation	6
Emulsified Asphalt Residue by Evaporation	7
Particle Charge of Cationic Emulsified Asphalts	8
Consistency:	
Viscosity (Saybolt Furol)	9
Stability:	
Demulsibility	10
Settlement	11
Cement Mixing	12
Sieve Test	13
Coating Test	14
Miscibility with Water	15
Freezing Test	16
Coating Ability and Water Resistance	17
Storage Stability of Emulsified Asphalt	18
Examination of Residue	19 to 26
Identification Tests:	
Identification Test for Cationic Rapid-Setting (CRS) Emulsified Asphalts	27
Identification Test for Cationic Slow-Setting (CSS) Emulsified Asphalts	28
Coating Tests on Emulsified Asphalts:	
Field Coating Test	29
Emulsified Asphalt/Job Aggregate Coating Test	30
Density of Emulsified Asphalts:	
Test to Determine Mass per Liter (Gallon)	31

1.2. The values stated in SI units are to be regarded as the standard. The values stated in parentheses are provided for information only.

1.3. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 85, Portland Cement
- M 140, Emulsified Asphalt
- M 208, Cationic Emulsified Asphalt
- M 231, Weighing Devices Used in the Testing of Materials
- M 316, Polymer-Modified Cationic Emulsified Asphalt
- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- R 61, Establishing Requirements for Equipment Calibrations, Standardizations, and Checks
- R 66, Sampling Bituminous Materials
- T 44, Solubility of Bituminous Materials
- T 49, Penetration of Bituminous Materials
- T 50, Float Test for Bituminous Materials
- T 51, Ductility of Asphalt Materials
- T 98, Fineness of Portland Cement by the Turbidimeter
- T 111, Mineral Matter or Ash in Asphalt Materials
- T 153, Fineness of Hydraulic Cement by Air Permeability
- T 228, Specific Gravity of Semi-Solid Asphalt Materials

2.2. *ASTM Standards*:

- C778, Standard Specification for Standard Sand
- D86, Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure
- D128, Standard Test Methods for Analysis of Lubricating Grease
- D3289, Standard Test Method for Density of Semi-Solid and Solid Bituminous Materials (Nickel Crucible Method)
- E1, Standard Specification for ASTM Liquid-in-Glass Thermometers
- E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
- E77, Standard Test Method for Inspection and Verification of Thermometers
- E145, Standard Specification for Gravity-Convection and Forced-Ventilation Ovens
- E563, Standard Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature
- E644, Standard Test Methods for Testing Industrial Resistance Thermometers
- E1137/E1137M, Standard Specification for Industrial Platinum Resistance Thermometers
- E2251, Standard Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

3. CALIBRATION, STANDARDIZATION, AND CHECK

3.1. Unless otherwise specified, follow the requirements and intervals for equipment calibration, standardizations, and checks in R 18.

3.2. Follow the procedures for performing equipment calibration, standardization, and checks found in R 61.

4. SAMPLE CONDITIONING FOR TESTING

4.1. *Scope*:

4.1.1. This practice describes how to prepare the emulsified asphalt samples for testing.

4.2. *Significance and Use*:

4.2.1. Before performing the tests listed in this standard, the test samples must be conditioned to ensure that the emulsified asphalt is in its optimal state for determining its true properties. Failure to condition the test samples according to the requirements of this standard will result in a nonconforming test situation.

4.3. *Apparatus*:

4.3.1. A thermometer meeting the requirements of ASTM E1, E1137, or E2251 of a suitable range (see Table 1) having a maximum scale error of 1.0°C (2.0°F). The thermometer must be standardized in accordance with one of the methods in ASTM E77 or ASTM E644.

Table 1—Conditioning Temperatures and Suitable Ranges for Thermometers

Initial Sample Temperature	Required Viscosity Temperature	Conditioning Temperature Adjustment	Maximum Bath or Oven Temperature	Minimum Thermometer Temperature Range
Below 21°C (70°F)	25°C(77°F)	Bring sample to at least 21°C (70°F)	74°C (165°F), if used	19 to 27°C (66 to 80°F)
Above 25°C (77°F)	25°C(77°F)	Cool sample to appropriate test temperature identified in the test section of this standard	n/a	19 to 27°C (66 to 80°F)
Below 50°C(122°F)	50°C(122°F)	Bring sample to at least 50°C (122°F)	74°C (165°F)	49 to 57°C (120 to 134°F) or 19 to 27°C (66 to 80°F)
Above 50°C(122°F)	50°C(122°F)	Cool sample to appropriate test temperature identified in the test section of this standard	n/a	49 to 57°C (120 to 134°F)

4.3.2. *Water Bath or Oven*–A vessel for heating or maintaining the temperature of the samples.

4.3.3. *Stirring Rod*—A glass or metal rod for stirring the sample. Alternatively, a non-mercury thermometer may be used as the stirring rod.

4.4. *Procedure*:

4.4.1. Condition the sample to the appropriate temperature in Table 1 based on the initial temperature and the viscosity temperature of the sample as noted.

4.4.2. Stir the sample before testing.

Note 1—Stirring prematurely can damage the emulsion and possibly alter test results. Some higher viscosity emulsions may require periodic stirring after reaching 21°C (70°F).

Note 2—The container may be vented to relieve pressure.

COMPOSITION

5. WATER CONTENT

5.1. *Scope*:

5.1.1. This test method covers the procedure for determining the water content of emulsified asphalt by reflux distillation using a water trap.

5.2. *Significance and Use*:

5.2.1. This test method measures the amount of water present in the emulsified asphalt, as distinguished from either asphalt material or petroleum solvent.

5.3. *Apparatus and Materials*:

5.3.1. *Metal Distillation Pot*—The metal distillation pot [Figure 1(a)] shall be a vertical cylindrical vessel, preferably made of copper, having a faced flange at the top to which the head is tightly attached by means of a clamp. The head shall be made of metal, preferably brass or copper, and shall be provided with a tubulation 25.4 mm (1 in.) in inside diameter.

5.3.2. *Glass Distillation Pot*—The glass distillation pot [Figure 1(b)] shall be a short-neck, round-bottom flask, made of well-annealed glass, and having an approximate capacity of 500 mL.

5.3.3. *Heat Source*—The heat source used with the metal distillation pot shall be a ring gas burner of 100-mm (4-in.) inside diameter or an electric mantle heater. The heat source for the glass distillation pot shall be either an ordinary gas burner or electric heater.

5.3.4. *Condenser*—The condenser shall be a water-cooled, reflux glass-tube type, having a jacket not less than 400 mm ($15\frac{3}{4}$ in.) in length, with an inner tube 9.5 to 12.7 mm ($\frac{3}{8}$ to $\frac{1}{2}$ in.) in outside diameter. The end of the condenser shall be ground to an angle of 30 degrees ±5 degrees from the vertical axis of the condenser.

5.3.5. *Trap*—The trap shall be made of annealed glass constructed in accordance with Figure 1(c) and graduated in 0.10-mL divisions from 0 to 2 mL and in 0.20-mL divisions from 2 to 25 mL.

5.3.6. *Solvent*—Xylol or other petroleum distillate conforming to the following distillation requirements: 98 percent distills between 120 and 250°C (248 and 482°F). This distillation shall be conducted in accordance with ASTM D86.

5.3.7. *Balance*—Conforming to the requirements of M 231, Class G 2.

5.4. *Sample*:

5.4.1. Obtain a representative sample of the material as specified in R 66.

Note 3—The difficulties in obtaining representative samples for this determination are unusually great, so the importance of proper sampling cannot be too strongly emphasized.