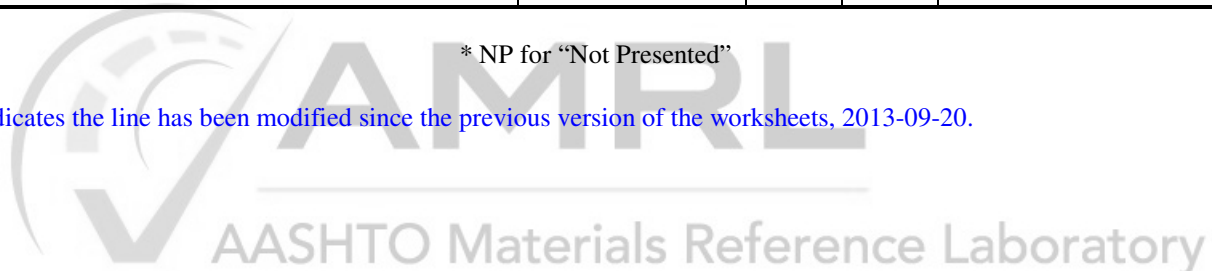


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* NP for "Not Presented"

❖ - Indicates the line has been modified since the previous version of the worksheets, 2013-09-20.



FREEZING OF EMULSIFIED ASPHALTS(T59) _____
(D6929) _____APPARATUS

Date: _____

1. Freezer capable of maintaining test temperature of $-18 \pm 5^{\circ}\text{C}$?
 2. Metal container with close fitting lid (*such as a 500-mL press-top can*)?
 3. Glass stirring rod?
-

PROCEDURE

1. Approximately 400g of emulsion poured into a clean metal container?
2. Closed metal container with emulsion placed in freezer for 12 to 18 consecutive hours?
3. Container removed from freezer and allowed to thaw by exposure to ambient temperature?
4. Freezing and thawing periods repeated an additional two times (*total of three cycles*)?
5. After third cycle, emulsion stirred?
6. Asphalt examined and reported as either *Homogeneous* or *Broken* based on whether or not stirring at room temperature brought any separated emulsion back into a homogeneous state?

COMMENTS:

SETTLEMENT AND STORAGE STABILITY

(T59) _____
(D6930) _____APPARATUS

Date: _____

1. Two 500 mL glass cylinders [*ASTM: Only one required*]?
 (a) 50 ± 5 mm O.D.?
 (b) AASHTO Only: 5 mL graduations?
 (c) Cork or glass stoppers [*ASTM: rubber stoppers are acceptable*]?
Note to Assessor: Cylinders equipped with side-arms are acceptable – AMRL
2. A glass tube pipette or siphon assembly capable of removing and delivering 55 mL of sample
[ASTM: 50 ml glass tube pipette]?
Note to Assessor: Not necessary if cylinder with side-arms is used
3. Four [*ASTM: Only two required*] 1000 mL glass, metal beakers or containers of similar dimensions?
4. Four [*ASTM: Only two required*] glass rods: 7 in. long x ¼ in. diameter
 for residue by evaporation determination?
5. Additional stir rods; glass or stainless steel, with rounded ends
 for stirring settlement and storage stability sample?
6. Oven: maintained at 325 ± 5°F (163 ± 3°C)?
7. Class G2 balance conforming to the requirements of M231?

PROCEDURE

1. Sample brought to room temperature (*Storage Stability: 70 to 80°F (21 to 27°C)*)
[ASTM: 22 to 28°C (72 to 83°F)]?
2. 500 mL representative sample placed in each of 2 cylinders [*ASTM: Number of cylinders optional*]?
3. Cylinders allowed to stand undisturbed at room temperature
 (*Storage Stability: 70 to 80°F (21 to 27°C)*) [*ASTM: 22 to 28°C (72 to 83°F)*]?
 (a) Cylinders sealed airtight?
 (b) 24 hours for storage stability?
 (c) 5 days for settlement?
4. Approximately 55 mL of emulsion pipetted or siphoned from the top of each cylinder
 (*drained if using cylinders with side arms*) without disturbing remainder of sample?
 (a) Each 55 ml portion thoroughly stirred?
 (b) 50.0 ± 0.1 g of each sample weighed into a separate beaker
 or container that has been previously weighed with a stirring rod?
5. Content of each beaker or container evaporated by procedure specified under
 Residue by Evaporation and percent residue calculated? (A = top)
6. Approximately next 390 mL siphoned (*or drained if using cylinders with side arms*) from each cylinder?
7. Thoroughly mix the remaining emulsion in the cylinders? ❖
8. 50.0 ± 0.1 g of each sample weighed into a separate beaker or container that
 has been previously weighed with a stirring rod?
9. Content of each beaker or container evaporated by procedure specified under
 Residue by Evaporation, and percent residue calculated? (B = bottom)
10. Storage stability or settlement for the cylinder calculated as follows:
 (a) Storage Stability, % (24 hrs) = B – A
 (b) Settlement, % (5 days) = B – A
11. Report the storage stability as the average of the two individual
 cylinder results? [*ASTM: Averaging Optional*]?

COMMENTS:

SIEVE TEST(T59) _____
(D6933) _____APPARATUS

Date: _____

1. 3 in. diameter, 850- μ m (No. 20) sieve?
2. Shallow metal pan or container to fit bottom of sieve?
3. Container suitable for 1 kg of emulsion?
4. *AASHTO: Solution of 2 percent sodium oleate dissolved in distilled water for testing anionic emulsions?*
5. *AASHTO: Distilled water for testing cationic emulsions?*
6. **ASTM: 1% solution of nonionic surfactant solution, (ethoxylated nonylphenol is recommended)**
(1 g of nonionic surfactant dissolved in distilled water and diluted to 100 mL)?
7. Desiccator equipped with desiccant?
8. Oven maintained at 220°F (105°C) [*AASHTO: 105 \pm 5°C (220 \pm 9°F)*]?
9. *AASHTO: Oven or hot water bath at 50 \pm 3°C (122 \pm 5°F) if it is necessary to heat the emulsified asphalt prior to testing?*
10. Balances
 - (a) Class G5 balance?
 - (Note to Assessors: More precise balances with capacity to weigh the emulsion sample are acceptable)
 - (b) Class G2 balance available? (For weighing the sieve and residue)
11. **Thermometers**
 - (a) **ASTM 17C thermometer for tests at 25 °C?**
 - (b) **ASTM 19C thermometer for tests at 50 °C?**
 - (c) **Or any other thermometric device of equal accuracy?**

PROCEDURE

1. Test Temperature
 - (a) Room temperature for samples whose viscosity is 100 s or less when tested at 77°F (25°C)?
 - (b) Test temperature at 122 \pm 5°F (50 \pm 3°C) for samples whose viscosity is greater than 100 s or whose viscosity is specified at 122°F (50°C)?
2. Sample stirred to achieve homogeneity?
3. Weight of 850- μ m (No. 20) sieve and pan determined (= A)?
4. 1 kg [**ASTM: 800-1000 g**] (1000 g) of emulsion weighed into suitable container [**ASTM: and mass determined (=C)**]?
5. Sieve cloth wet with appropriate liquid?
 - (a) *AASHTO: With 2 percent sodium oleate solution for anionic emulsions?*
 - (b) *AASHTO: With distilled water for cationic emulsions?*
 - (c) **ASTM: Nonionic surfactant solution for both anionic and cationic emulsions?**
6. Sample poured through sieve?
7. Residue on sieve [*AASHTO: and container*] washed with appropriate liquid until clear?
 - (a) With 2 percent sodium oleate solution for anionic emulsions?
 - (b) With distilled water for cationic emulsions?
 - (c) **ASTM: Distilled or deionized water for both anionic and cationic emulsions?**
8. **ASTM: Mass of empty container determined (=D)?**
9. Pan placed under sieve?
10. Pan and sieve heated for 2 hr. in 220°F (105°C) drying oven?
11. Pan and sieve cooled in a desiccator?
12. Weight of 850- μ m (No. 20) sieve, pan, and residue weighed (= B)?
13. *AAHSTO: Percentage sample retained on sieve calculated as: { (B - A) / 10 }?*
14. **ASTM: Percentage sample retained on the sieve calculated as: { (B - A / (C - D) * 100 }**

COMMENTS:

RESIDUE BY EVAPORATION(T59) _____
(D6934) _____APPARATUS

Date: _____

1. Beakers, low form, 1000 mL capacity, made of glass or metal (quantity as required for the test)?
2. Glass rods, flame polished ends, approximately 7 in. long x 1/4 in. in diameter (one rod per beaker)?
3. 300- μ m (No. 50) sieve (only required when the residue is to be further tested)?
4. Oven?
- (a) Thermostatically controlled?
- (b) Maintained at $325 \pm 5^\circ\text{F}$ ($163 \pm 3^\circ\text{C}$)?
5. Class G2 [ASTM: GP2] balance conforming to the requirements of M231?

PROCEDURE

1. Three beakers used if only the amount of residue is to be determined, four beakers if further testing is to be performed on the residue?
2. Each beaker and stirring rod weighed to 0.1 g?
3. 50 ± 0.1 g of thoroughly mixed emulsion weighed into each beaker?
4. Water initially evaporated from the beakers or containers by one of the following methods:
- (a) Heating in an oven at $325 \pm 5^\circ\text{F}$ ($163 \pm 3^\circ\text{C}$) for 2 hrs?
- (b) Heating on a hot plate?
- (c) Heating in a cold or warm oven and gradually bringing oven and sample up to a temperature of 325°F (163°C)?
5. Initial evaporation performed in a manner that prevents loss of asphalt from the beaker through foaming and splattering?
6. After initial evaporation, residue thoroughly stirred with pre-weighed glass rod?
7. Beakers, with rod and residue, replaced in oven at $325 \pm 5^\circ\text{F}$ ($163 \pm 3^\circ\text{C}$) for one hour?
8. Beakers, with rod and residue, allowed to cool to room temperature and weighed to 0.1 g?
9. Percent residue calculated for each beaker?
10. Percentage of residue by evaporation reported as the average of the results?
11. If further testing is to be performed on the material, are the following steps taken?
- (a) Beakers, with rod and residue, replaced in oven until residue sufficiently fluid to pour?
- (b) Residue poured through 300- μ m (No. 50) sieve into suitable containers or molds for further testing? ..

COMMENTS:

CEMENT MIXING(T59) _____
(D6935) _____APPARATUS

Date: _____

1. Sieves:
 - (a) A 180- μ m (No. 80) sieve?.....
 - (b) A 3 in. diameter 1.40-mm (No. 14) sieve?.....
 - (c) A shallow pan for 3 in. diameter sieve?
2. A graduated cylinder with 100 mL capacity?.....
3. Mixing bowl made of glass or metal, capacity approximately 500 mL?
4. Stirring rod made of steel, approximately ½ in. (13 mm) [*ASTM: approximately 10 mm*] diameter, with rounded ends?.....
5. Type III Portland Cement conforming to ASTM C150 (AASHTO M85)?.....
6. Class G2 [*ASTM: GP2*] balance?
7. Oven?
- (a) Thermostatically controlled?.....
 - (b) Maintained at 325 \pm 5°F (163 \pm 3°C)?.....
 - (c) *AASHTO: Conforming to ASTM E145, Type 1B*.....
8. ***ASTM: Thermometer: a thermometric device capable of measuring the temperature of the oven and the emulsified asphalt to the nearest 1 °C?***

PROCEDURE

1. Emulsion diluted to 55 percent residue?
- (a) Calculation of percent residue based on determination by:
 - (1) Distillation?
 - (2) Residue by Evaporation?
 - (b) Diluted with calculated amount of distilled [*ASTM: or deionized*] water?
 - (c) Calculation determined by %Water = 100 – [(55 / %Residue) x 100]
2. Cement sieved through 180- μ m (No. 80) sieve?.....
3. 50.0 \pm 0.1 g cement passing 180- μ m (No. 80) sieve weighed into mixing bowl?.....
4. Ingredients and apparatus brought to approximately 77°F (25°C) [AMRL: \pm 9°F (\pm 5°C)] before mixing?
5. 100 mL of diluted emulsion added to cement in mixing bowl?.....
6. Mixture immediately stirred with steel rod, in a circular motion at approximately 60 rpm for one minute?.....
7. After stirring 1 min., 150 mL distilled [*ASTM: or deionized*] water added?.....
8. Stirring continued for additional 3 min. period?
9. Tare weight of 1.40-mm (No. 14) sieve and shallow pan determined?
10. Mixture poured through 1.40-mm (No. 14) sieve?.....
11. Bowl rinsed over sieve with distilled [*ASTM: or deionized*] water until clean?.....
12. Sieve rinsed with distilled water poured from a height of approximately 150 mm (6 in.) until water is clear?.....
13. Sieve placed in shallow pan and heated at 325°F (163°C) in oven?
14. Heating and weighing repeated until successive weights differ by no more than 0.1 g?
15. Weight of material retained on sieve and in pan reported as the percentage of break in the cement mixing test?

COMMENTS:

DEMULSIBILITY(T59) _____
(D6936) _____APPARATUS

Date: _____

1. Three pieces [**ASTM: one**] of 1.40-mm (No. 14) wire cloth, unframed, approximately 5 in. square [**AMRL: sufficient to completely cover beaker**]?
2. **AASHTO: Three 600 mL capacity metal beakers?**.....
3. **ASTM: One metal beaker or other suitable metal container with a minimum 300 mL capacity?**
4. Three metal rods approximately 5/16 in. (7.9 mm) [**AMRL: $\pm 1/8$ in. (± 3.2 mm)**] diameter, with rounded ends?.....
ASTM: metal rod: approximately 10 mm diameter, with rounded ends?
5. 50 mL glass burette graduated in 0.1 mL intervals?.....
6. Demulsifying solutions for anionic emulsions (as appropriate to the material):
 - (a) CaCl_2 solution (1.11 g/L), prepared with distilled water?.....
 - (b) CaCl_2 solution (5.55 g/L), prepared with distilled water?.....
 - (c) Stored in an airtight container?
7. Demulsifying solutions for cationic emulsions:
 - (a) Dioctyl sodium sulfosuccinate solution (8g/L), in distilled water?
 - (1) Stored in a dark glass [**ASTM: or impermeable plastic**] airtight container [**AASHTO: in a cool dark location**] and less than 90 days old?.....
8. Class G2 [**ASTM: GP2**] balance conforming to the requirements of M231?.....
9. Oven capable of maintaining $163 \pm 3^\circ\text{C}$ ($325 \pm 5^\circ\text{F}$)?
10. **AASHTO: Timer graduated in 0.1 s and accurate within 0.1 percent when tested over a 15 minute interval?** ...

PROCEDURE

1. Percent residue by distillation determined?.....
2. Three assemblies consisting of a beaker, a stirring rod, and a wire cloth weighed [**ASTM: only one assembly required**]?
3. 100.0 ± 0.1 g of sample weighed into each of three assemblies?.....
4. Weighed samples [**AASHTO: and reagent**] brought to $77.0 \pm 1.0^\circ\text{F}$ ($25.0 \pm 0.5^\circ\text{C}$) [**ASTM: $25 \pm 1.0^\circ\text{C}$**]?.....
5. **ASTM: Material kept covered during conditioning to avoid evaporation?**.....
6. Reagent added from burette over approximately 2 minute period [**AMRL: ± 10 s**]?
- (a) 35 mL CaCl_2 solution (1.11 g/L) for anionic (*Rapid Set*) emulsions?.....
- (b) 50 mL CaCl_2 sol (5.55g/L) for anionic (*Medium Set or Mixing – Type*) emulsions?.....
- (c) 35 mL dioctyl sodium sulfosuccinate solution (8g/L) for cationic RS emulsions?
- Note: This test is designed for rapid-setting and medium-setting emulsions, no provision is given for slow-setting type emulsions.
7. Contents of beaker stirred continuously and vigorously during addition of reagent?.....
8. Lumps kneaded against side of beaker?
9. Kneading continued for 2 minutes after addition of reagent?.....
10. Mixture decanted onto wire cloth?
11. Beaker and rod rinsed over wire cloth with distilled water?
12. Lumps kneaded and beaker, rod, and wire cloth rinsed until water runs clear?
13. Wire cloth enclosing asphalt placed in beaker with rod?
14. Assemblies placed in 325°F (163°C) oven?.....
(Note to Assessors: **AASHTO: Preliminary heating at lower temperatures to prevent spattering is permissible** [**ASTM: Pre-drying sample is not acceptable**])
15. Samples dried to constant mass until change is less than 0.1 g?.....
16. Demulsibility calculated as $(M_{\text{der}}/M_{\text{dir}}) \times 100$?

where: M_{der} = average weight of demulsibility residues from the 3 tests [**ASTM: weight from single test**]
 M_{dir} = weight of residue by distillation in 100 g of sample

COMMENTS:

DETERMINING DENSITY OF EMULSIFIED ASPHALTS
(Weight Per Gallon)

(T59) _____
 (D6937) _____

APPARATUS

Date: _____

1. Density cup:
 - (a) Stainless steel?
 - (b) Standard volume (83.2 mL)?
 - (c) Appropriate cap?
2. Class G1 [*ASTM: GPI*] balance?
3. Constant temperature water bath at $25 \pm 0.5^\circ\text{C}$?

PROCEDURE

1. Emulsions with a viscosity requirement of 50°C heated to $50 \pm 3^\circ\text{C}$ in a water bath or oven with the sample vented to relieve pressure, then stirred to achieve homogeneity?
2. Emulsions with a viscosity requirement of 25°C mixed or stirred at $25 \pm 3^\circ\text{C}$ in the original sample container to achieve homogeneity?
Note: Emulsions specified at 25°C may be heated following the 50°C procedure for stirring as appropriate to the material.
3. Emulsion stirred and placed in a $25 \pm 0.5^\circ\text{C}$ water bath for approximately 1 hour?
4. Measure and cap tared on balance and brought to approximately 25°C ?
5. Emulsion removed from water bath and stirred, avoiding trapping air in the sample?
6. If necessary, strained through a No. 20 (850- μm) sieve to remove any skin or film?
7. Emulsion poured into measure at temperature filling it completely?
8. Cap placed tightly onto measure and excess emulsion wiped clean from all surfaces with a clean, dry rag or paper? ❖
9. Carefully cleaned measure, cap, and sample weighed to nearest 0.01 g?
10. Density of emulsion calculated as follows:

where: $W = (G) (11.98);$
 W is the unit density (g/L) of the emulsion and G is the mass (g) of emulsion in the measure
Note: Alternative calculations exist for different units, please verify with the laboratory if they are using a different method.

COMMENTS:

RESIDUE BY DISTILLATION(T59) _____
(D6997) _____APPARATUS

Date: _____

1. Still and Burner Assembly:

- (a) Still:
- (1) *AASHTO: Made of aluminum alloy?*..... _____
- (2) *ASTM: Made of aluminum alloy or iron?*..... _____
- (3) Approximately 240 mm (9 1/2 in.) by 95 mm (3 3/4 in.) [AMRL: ± 5 mm] inner diameter? ... _____
- (b) Still head:
- (1) *AASHTO: Made of aluminum alloy?*..... _____
- (2) *ASTM: Made of aluminum alloy or iron?*..... _____
- (3) One 1 inch hole for connecting tube? _____
- (4) Two 1/2 in. holes for thermometers? _____
- (c) Clamp for still head? _____
- (d) Seal for still, either of the following:
Note for ASTM: this is only required if further analysis of the oil and water distillate is required.
- (1) Joint ground to a tight fit?..... _____
- (2) Gasket made of asbestos or oiled paper [ASTM: any material provided that it withstands maximum temperature reached during distillation]?..... _____
- (e) Burner for still:
- (1) Approximately 4 3/4 in. inner diameter ring burner?..... _____
- (2) Ports on inner periphery?..... _____

2. Connecting Apparatus:

- (a) Glass connecting tube, approximately 12 mm outer diameter:..... _____
- (b) Bunsen burner for connecting tube (*wing tip optional*) [ASTM: entire burner assembly optional] _____
- (c) Metal flame shield?..... _____
- (d) Suitable adapter between condenser and graduate? _____

3. Condenser:

- (a) One of the following:
- (1) West or Liebig type glass condenser?..... _____
- (2) Metal-jacketed condenser? _____
- (3) ASTM: Other condensers with wetted length of 400 to 550 mm?..... _____
- (b) Adapter end to accommodate cork connection?..... _____

4. Receiver:

- (a) 100 mL graduated cylinder?..... _____
- (b) Graduation intervals of 1.0 mL? _____

5. Thermometers:

- (a) *AASHTO: Two ASTM 7C or 7F thermometers* _____
- (b) *ASTM: At least one ASTM 7C or 7F thermometer or other device of equal accuracy?* _____
- (c) Corks for thermometers?..... _____

6. Miscellaneous

- (a) 8 oz. container or suitable molds?..... _____
- (b) A 300- μ m (No. 50) sieve?..... _____
- (c) Class G2 [ASTM: GP2] balance?..... _____
ASTM: Balance capable of weighing 3500 g to ± 0.1 g? _____
- (d) *ASTM: Silicone or foil wrapped cork stoppers for still head?*..... _____
- (e) *ASTM: Heat resistant rubber tubing of adequate size to secure glass to glass joint of connecting tube and condenser?* _____

COMMENTS:

RESIDUE BY DISTILLATION(T59) _____
(D6997) _____PROCEDURE

Date: _____

1. ASTM: Sample conditioned at the viscosity testing temperature $\pm 3^{\circ}\text{C}$ unless freshly obtained from a storage tank? Samples from a storage tank are exempt from the temperature conditioning requirement.
2. ASTM: Samples stirred to ensure homogeneity prior to testing?
3. Still with lid; clamp; thermometers; and gasket (if used) weighed to 0.1 g?
4. 200.0 ± 0.1 g [ASTM: ± 1.0 g] representative sample weighed into still assembly?
5. One thermometer positioned approximately 1/4 in. from bottom of still?
6. Other thermometer positioned approx. 6 1/2 in. [AMRL: *thermometer not immersed*] from bottom?
7. **ASTM: (second thermometer is not required) Is hole in still head sealed if no second thermometer used? ...**
8. Ring burner placed around still about 6 in. from bottom?
- Note:** the positioning of the ring burner is flexible depending on the behavior of the material. Starting the burner higher or lower or lowering the burner progressively during testing are both acceptable provided that the other requirements of the test are met.
9. Ring burner lit: Time: (.....)
10. Connecting tube heated by Bunsen burner to prevent condensation [★ASTM: optional]?
11. Ring burner moved to bottom of still when lower thermometer is approximately 420°F (215°C)
12. Temperature of lower thermometer increased to $500 \pm 10^{\circ}\text{F}$ ($260 \pm 5^{\circ}\text{C}$)?
13. Temperature maintained at $500 \pm 10^{\circ}\text{F}$ ($260 \pm 5^{\circ}\text{C}$) for 15 minutes?
14. Ring burner shut off: Time: (.....)
15. Elapsed time from the application of the first heat to shutting off the ring burner is 60 ± 15 minutes?
16. Hot still assembly containing residue immediately weighed to 0.1 g?
17. Residue stirred [ASTM: or agitated by swirling]?
18. Suitable portions immediately poured into an 8 oz. tin or suitable molds using a 300- μm (No. 50) sieve if foreign matter is present?
19. Volume of oil distillate, if present, recorded to nearest 1/2-mL?
20. Volume percentage of oil distillate calculated & reported?
21. Thermal buoyancy correction of 1.5 g added to gross still weight?
22. Percentage residue by distillation calculated and reported to the nearest 0.1%?

COMMENTS:

EVALUATING AGGREGATE COATING USING EMULSIFIED ASPHALTS(T59) _____
(D6998) _____APPARATUS

Date: _____

1. Sieves:
 - (a) 3/4 in. (19.0-mm)
 - (b) 1/4 in. (6.3-mm)
2. Steel spatula, or equivalent, having a blade approximately 200-mm in length?
3. Round bottom iron dish or kitchen saucepan or similar, approximately 1 L capacity?
4. Supply of washed and dried reference stone?.....
 - (a) All passing a 3/4 in. (19.0-mm) sieve and not more than 5% passing the 1/4 in. (6.3-mm) sieve?
5. Class G2 [ASTM: GP2] balance with a capacity of at least 1000 g?

PROCEDURE

1. Emulsion conditioned in the original container [ASTM: *in a sample container*] to the same temperature required for viscosity testing $\pm 3^{\circ}\text{C}$?
2. 465.0 ± 0.1 g [ASTM: 465.0 ± 1.0 g] of stone weighed into metal pan?
3. 35.0 ± 0.1 g of emulsion added to the stone in the pan and mixed vigorously with spatula for 3 minutes?
Note: ASTM allows an equivalent ratio of 93% stone to 7% emulsified asphalt to be used. Larger or smaller total masses are acceptable.
4. Reported Information:
 - (a) Any appreciable separation of asphaltic base from the water of the emulsified asphalt?
 - (b) Is stone thoroughly coated with the emulsified asphalt?

COMMENTS:

PARTICLE CHARGE(T59) _____
(D7402) _____APPARATUS

Date: _____

1. 12-Volt dc current source, milliammeter, and a variable resistor?
2. Electrodes: two 1 in. x 4 in. stainless steel plates?
 - (a) Held rigidly parallel, 1/2 in. apart?
3. 250 mL capacity beaker?.....
4. Insulator
 - (a) polytetrafluoroethylene resin square rod?
 - (1) virgin electrical grade?
 - (2) 1/2 in. [ASTM: 12.5 ± 0.5 mm] thick?
 - or (b) AASHTO: insulator made from other suitable material?
5. Glass rod, 4 in. long and 1/4 in thick or other device capable of suspending the electrode assembly in emulsion?
- or Apparatus capable of manual height adjustment to suspend electrode assembly?
6. Water bath at temperature of $160 \pm 5^\circ\text{F}$ ($71 \pm 3^\circ\text{C}$)?
7. ASTM 19F or 19C thermometer or equivalent thermometric device?
8. AASHTO: Timer graduated in 0.1 s and accurate within 0.1 percent when tested over a 15 minute interval? ..

PROCEDURE (ASTM: Method A)

1. AASHTO: Emulsion heated to $122 \pm 5^\circ\text{F}$ ($50 \pm 3^\circ\text{C}$) in a $160 \pm 5^\circ\text{F}$ ($71 \pm 3^\circ\text{C}$) water bath, while stirring thoroughly?.....
2. ASTM: Emulsion either stirred at $25 \pm 3^\circ\text{C}$ or heated to $50 \pm 3^\circ\text{C}$ in a water bath or oven and stirred, in the original container, based on the temperature used for viscosity testing?.....
3. Emulsion poured into 250 mL beaker inserting glass rod between the two electrodes with ends of glass rod on the two opposite top edges of beaker?
4. Sufficient emulsion poured into beaker to allow electrodes to be immersed 1 in (25 mm)?
5. Clean dry electrodes connected to current source and inserted approximately 1 in. [AMRL: 3/4 to 1 1/2] into the emulsion?.....
6. Current adjusted to at least 8 mA (if a higher current is used, it should be noted on the report) and timing started?
7. After 30 minutes or at 2 mA, whichever occurs first, electrodes disconnected and gently washed with a smooth, thin stream of distilled water?
8. Electrodes examined for deposit of asphalt and polarity reported?.....
Note: Asphalt on cathode (negative electrode) for cationic emulsion, Asphalt on anode (positive electrode) for anionic emulsions

ELECTRODE CLEANING PROCEDURE

1. New electrodes and electrodes being reused cleaned in the following sequence?.....
 - (a) Wash with distilled water
 - (b) Wash with suitable asphalt solvent.....
 - (c) Wash with isopropyl or ethyl alcohol
 - (d) Wash with distilled water

Note to Assessors: Deviations from the specified electrode cleaning procedure will be marked as permanent observations.

COMMENTS:

SAYBOLT FUROL VISCOSITY(T59, T72) _____
(D7496, D88) _____APPARATUS

Date: _____

VISCOSITY TUBES

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Correction 1% or less (0.990 to 1.010) for referee testing? | | | | | | |
| Month and year of calibration reported (3 year interval) | | | | | | |
| Tube has furol tip? | | | | | | |
| Tube corrosion resistant? | | | | | | |
| Inner surface smooth & clean? | | | | | | |
| Good cork? | | | | | | |
| Bottom of tube 10 – 13 cm from flasks graduated mark? | | | | | | |

| No. | Manufacturer | Timers | | | 0.1 sec. graduations? | Accurate to 0.1% in 60 min.? (3.6 seconds in 60 min.) |
|-----|--------------|----------|--------|--------|--------------------------|---|
| | | Electric | Spring | Quartz | | |
| 1 | | | | | | |
| 2 | | | | | | |

1. **Testing Bath**

- (a) Viscometer and bath in draft-free location? _____
- (b) Bath must be capable of being filled to at least 6 mm (1/4 in.) above overflow rim of viscometer? _____
- (c) Bath has stirrer? _____
- (d) Bath has thermostatic temperature control? _____
- (1) Control regulating the temperature of the bath so that it does not fluctuate by more than $\pm 0.05^{\circ}\text{F}$ ($\pm 0.03^{\circ}\text{C}$)? _____

2. **Thermometers**

- (a) ASTM 17F or 17C for tests at 77°F (25°C)? _____
- (b) ASTM 19F or 19C for tests at 122°F (50°C)? _____
- (c) **ASTM: Or any other device of equal accuracy?** _____

3. **Water Baths**

- (a) Temperature within range of $77.0 \pm 0.2^{\circ}\text{F}$ ($25.00 \pm 0.10^{\circ}\text{C}$) for 25°C testing? _____
- (b) AASHTO and ASTM A: Temperature within range of $160 \pm 5^{\circ}\text{F}$ ($71 \pm 3^{\circ}\text{C}$) for 50°C testing? _____
- (c) ASTM B: Temperature within range of $51.4 \pm 0.3^{\circ}\text{C}$ ($124.5 \pm 0.5^{\circ}\text{F}$) _____

4. **Miscellaneous**

- (a) Withdrawal device? _____
- (b) Thermometer support? _____
- (c) Proper receiving flasks? _____
- (d) 850- μm (No. 20) sieve or a 20-mesh strainer of wire cloth (framed or unframed)? _____
- (e) 4 oz. bottle with stopper for tests at 77°F (25°C)? _____
- (f) 400 mL beaker for tests at 122°F (50°C)? _____

COMMENTS:

SAYBOLT FUROL VISCOSITY

(T59, T72) _____

PROCEDURE FOR TESTS AT 77 °F (25 °C)

Date: _____

1. Viscometer bath thermostat adjusted to maintain the bath at a temperature of 77.0 ± 0.2 °F (25.0 ± 0.1 °C)?..... _____
2. Sample thoroughly stirred, without incorporating bubbles? _____
3. 100 to 110 mL of sample poured into 4 oz. (118 mL) bottle? _____
4. Closed bottle placed for 30 minutes in a water bath maintained at 77.0 ± 0.2 °F (25.0 ± 0.1 °C)?..... _____
5. Bottle slowly inverted several times to mix sample? _____
6. Sample poured into viscometer through No. 20 (850- μ m) sieve? _____
 - (a) Small portion allowed to flow through outlet to waste? _____
 - (b) Tube corked and viscometer filled until liquid begins to overflow the overflow rim? _____
7. Viscosity determined without any further disturbance of sample (without clearing gallery or stirring)? _____
 - (a) Cork snapped from tube and timer started at same instant? _____
 - (b) Flask located so stream just touches neck of flask?..... _____
 - (c) Timer stopped when bottom of meniscus reaches grad. mark? _____
8. Time of flow exceeds at least 20 seconds? _____
9. Calculation: Viscosity = Efflux Time X Calibration Factor of Viscometer Used _____

PROCEDURE FOR TESTS AT 122 °F (50 °C)

1. Emulsion sample heated in the original container to 122 ± 5 °F (50 ± 3 °C) in a 160 ± 5 °F (71 ± 3 °C) water bath or oven? _____
2. Sample thoroughly stirred without incorporating bubbles? _____
3. Approximately 100 mL of sample poured into 400 mL beaker? _____
4. Beaker immersed approximately 2 inches in water bath at 160 ± 5 °F (71 ± 3 °C) and sample heated until temperature is usable for the test but not greater than 53 °C)? _____
5. Cleaned and dried viscometer pre-corked? _____
6. Sample poured into viscometer through No. 20 (850- μ m) sieve above overflow rim of viscometer? _____
 - (a) Sample stirred at approximately 60 rpm with thermometer and avoiding air bubbles?..... _____
 - (b) Temperature of emulsion adjusted until it remains constant for one minute at 122.0 ± 0.1 °F (50.00 ± 0.05 °C)? _____
 - (c) Temperature of viscosity bath within ± 0.35 °F (± 0.20 °C) of sample temperature at start of test? _____
7. Viscosity determined after thermometer withdrawn from viscometer tube? _____
 - (a) Excess emulsion quickly removed from the gallery? _____
 - (b) Cork snapped from tube and timer started at same instant? _____
 - (c) Flask located so stream just touches neck of flask?..... _____
 - (d) Timer stopped when bottom of meniscus reaches grad. mark? _____
8. Time of flow exceeds at least 20 seconds? _____
9. Calculation: Viscosity = Efflux Time X Calibration Factor of Viscometer Used _____

COMMENTS:

SAYBOLT FUROL VISCOSITY

(D7496, D88) _____

PROCEDURE FOR TESTS AT 77 °F (25 °C)

Date: _____

1. *Viscometer clean, dry, and stoppered or corked?*
2. *Material prepared according to either Procedure A or Procedure B?*
 - (a) *Procedure A (using an open beaker)*
 - (1) *Approximately 100 mL of emulsion poured into a 400 mL glass beaker?*
 - (2) *Bottom of the beaker immersed 50 mm below the level of a 25°C (77°F) water bath?*
 - (3) *Beaker held upright and stirred with a thermometer at approximately 60 revolutions/min?*
 - (4) *Incorporation of air bubbles avoided?*
 - (b) *Procedure B (using a sealed bottle)*
 - (1) *Sample poured into an approximately 120 mL bottle?*
 - (2) *Sealed bottle placed into a water bath maintained at 25°C (77°F) for 30 minutes?*
 - (3) *Bottle removed from the bath and mixed by inverting the bottle several times?*
 - (4) *Bubble formation avoided?*
3. *Sample poured into the viscometer through an 850-µm sieve or 20-mesh strainer?*
4. *Filled above the overflow rim?*
5. *Emulsified asphalt stirred with the thermometer?*
6. *Bubble formation avoided?*
7. *Viscometer bath temperature adjusted until the emulsion temperature remains constant for 1 minute at 25 ± 0.1°C (77 ± 0.2°F)?*
8. *Thermometer withdrawn and excess asphalt removed from the gallery by suction?*
9. *Cork snapped from the tube and timer started at the same instant?*
10. *Flask located so that the stream just touches the neck of the flask?*
11. *Timer stopped when the bottom of the meniscus touches the graduation mark?*
12. *Time of flow exceeds 20 seconds?*

PROCEDURE FOR TESTS AT 122 °F (50 °C)

1. *Viscometer clean, dry, and stoppered or corked?*
2. *Sample prepared according to either Procedure A or Procedure B?*
 - (a) *Procedure A*
 - (1) *If the sample is cooler than 50°C (122°F), heated to 50 ± 3°C (122 ± 5°F) in a 71 ± 3°C (160 ± 5°F) water bath or oven?*
 - (2) *Sample stirred without incorporating bubbles?*
 - (3) *Approximately 100 mL poured into a 400 mL glass beaker?*
 - (4) *Bottom of the beaker immersed approximately 50 mm (2 in.) below the level of a 71 ± 3°C (160 ± 5°F) water bath?*
 - (5) *Beaker held upright and stirred with the thermometer at 60 revolutions/minute?*
 - (6) *Sample heated to 51.4 ± 0.3°C (124.5 ± 0.5°F)?*
 - (b) *Procedure B*
 - (1) *Sample poured into an approximately 120 mL bottle and sealed?*
 - (2) *Sealed bottle placed in a water bath at 51.4 ± 0.3°C (124.5 ± 0.5°F) for 30 minutes?*
 - (3) *Sample mixed by slowly inverting the bottle several times, avoiding bubbles?*
3. *Sample poured into the viscometer through an 850-µm sieve or 20-mesh strainer?*
4. *Filled above the overflow rim?*
5. *Emulsion stirred at approximately 60 revolutions/min. until the sample reached 50 ± 0.1°C (122 ± 0.2°F)?*
6. *Thermometer withdrawn and excess emulsion removed from the gallery by suction?*
7. *Cork snapped from the tube and timer started at the same instant?*
8. *Flask located so that the stream just touches the neck of the flask?*
9. *Time stopped when the bottom of the meniscus touches the graduation mark?*
10. *Time of flow exceeds 20 seconds?*

COMMENTS:

SWEEP TEST OF BITUMINOUS EMULSION SURFACE TREATMENT SAMPLES

(D7000) _____

APPARATUS

Date: _____

Mixer. Capable of abrasion at a rate of 0.83 gyrations/sec (50 gyr/min) [AMRL: ± 2 gyr/min]?..... _____Quick-clamp Mounting Base:

1. Level support for clamping sample in place?..... _____
2. Does not move during abrasion test?..... _____

Pan. Capable of holding sample on mixer and dislodged aggregate?..... _____Oven:

1. Constant temperature, force draft?..... _____
2. Shelves placed at least 120 mm apart and 100mm away from top and floor?..... _____
3. Minimum inside dimensions of 460 x 460 x 460 mm (18 x 18 x 18 in)?..... _____

Balance:

1. Must be capable of weighing 800g or more to within ± 0.1 g?..... _____
2. Has a platform length and width of 240 mm (9.5 in.)?..... _____

Brush Holder:

1. Removable?..... _____
2. Free floating movement of 19 ± 1 mm?..... _____
 - (a) Brush head length 128mm?..... _____
 - (b) Overall trim 25.4 mm [AMRL: ± 2 mm]?..... _____
3. Total weight of brush head and attached weight shall be 1500 ± 15 g?..... _____
(Note: The collar and nylon strip are not included in the weight)

Nylon Strip Brush:

1. Shall conform to following specifications?..... _____
 - (a) Brush head height 19 mm [AMRL: ± 5 mm]?..... _____
 - (b) Overall length 127 ± 1 mm?..... _____
 - (c) Crimped black nylon as fill material?..... _____
Note: If bristles can be pulled out of brush w/ minimal pressure than brush is in poor condition.
 - (d) Fill diameter approximately 0.254 mm [AMRL: ± 0.05 mm] (Note: check fiber diameter w/ calipers)?..... _____
 - (e) Weight 35 ± 2 g?..... _____

Strike-off Template:

1. Flat, stainless steel metal plate?..... _____
2. Shall include a 280 ± 3 mm diameter cut out with flush edge?..... _____
Note: 16 gage U.S. Standard plate and sheet metal will suffice.
Alternative gages may be necessary for various emulsion masses and aggregate types

Strike-off Rod:

1. Made of 17 to 20 mm diameter electrical conduit [AMRL: metal or plastic]?..... _____
2. Length of 750 ± 100 mm?..... _____

Sweep Test Compactor:

1. Suitable design?..... _____
2. Mass of 7500 ± 500 g?..... _____

COMMENTS (D7000):

(D7000)

SWEEP TEST OF BITUMINOUS EMULSION SURFACE TREATMENT SAMPLES

(D7000) _____

SAMPLE PREPARATION

Date: _____

Emulsion:

1. Equilibrated to a temperature of 60°C?

Aggregate:

1. Representative sample obtained?
2. Dried to constant weight (sample should not be washed) [AMRL: at 110 ± 5°C]?
3. 100% of material passes 9.5 mm (3/8 in) and <1% passing the 4.75 (No. 4) sieve?
4. The amount of aggregate to be used calculated from the following equation:

Note: A pre-calculated table with known masses and corresponding bulk specific gravities may be used to interpolate the correct weight.

$$Y = \frac{A(202.1X - 15.8)}{100} + \frac{B(146.4X - 4.7)}{100}$$

Where:

A = % of aggregate from 9.5 to 6.3 mm

B = % of aggregate from 6.3 to 4.75 mm

X = bulk specific gravity

Y = amount of aggregate needed for test, g

Asphalt felt disks:

1. Disks must be made of 30 lb asphalt felt paper and free of breaks, cracks, and tears?
- (a) Cut into 300 ± 10 mm diameter disks?
- (b) Placed in a 50°C oven for 24 to 72 hours to flatten?
- (c) Stored flat and at room temperature for a minimum of 3 days?

Test Specimen Preparation:

1. Weigh the asphalt felt disk to the nearest 0.1 g?
2. Felt disk placed on a flat surface and manipulated until flat?
3. Disk not used if edges curl, bubble, or the disk contained foreign matter?
4. Aggregate weighed and the mass recorded to the nearest 1 g?
5. Strike off template placed over felt disk?
6. 83 ± 5 g of emulsion at 60°C poured along top arc of the disk (*Assessor: start timer, see Step 12*)?
7. Excess emulsion removed with strike-off rod using a gentle side-to-side motion?
8. Excess emulsion struck off within a 3 ± 1 s [AMRL: < 10 s finding is an *observation*] period without stopping motion?
9. Pre-weighted aggregate (See table 1) immediately applied using a back and forth motion?
10. Aggregate compacted using three -½ cycles in one direction and three - ½ cycles in the perpendicular direction? ❖
11. Sample weighed (*Assessor: stop timer*) and placed in oven?
12. Time from beginning of sample production to weighing not longer than 4 minutes?

COMMENTS (D7000):

(D7000)

**SWEEP TEST OF BITUMINOUS EMULSION SURFACE
TREATMENT SAMPLES**

(D7000) _____

SAMPLE PREPARATION (Continued)

Date: _____

Conditioning:

1. Conditioning based on road parameters and field performance?..... _____
Note: *Conditioning times may vary greatly pending on emulsion type.*
2. Time and temperature shall be within 10% of desired value and relative humidity within 25%? _____
3. Sample removed from the oven (*Assessor: start timer, see Procedure Step 1*)? _____
4. After conditioning sample turned vertically and loose aggregate removed by gentle brushing with fingers? _____
5. Specimen weighed to the nearest 0.1 g and recorded? _____

PROCEDURE

1. The time from removing sample from oven to being placed in test apparatus not longer than 2 minutes? _____
2. Attach specimen and leave in clamping device for 180 ± 30 s (3 min. ± 30 s)?..... _____
3. Brush secured into brush head and weight attached to mixer during equilibration?..... _____
4. At end of equilibration time, brush head is put into contact with sample? _____
5. Mixer turned onto setting #1, 0.83 gyrations/sec (50 gyrations/min) [AMRL: ± 2 gyrations/min] for 60 s? _____
6. Sample is removed from device, held vertically, and loose aggregate brushed away with fingers? _____
7. Abraded sample weighed to nearest 0.1 g and recorded as final specimen weight? _____

CALCULATION

$$\% \text{ Mass Loss} = (A-B)/(A-C) \times 100 \times 1.33$$

A = initial weight

B = final weight, and

C = asphalt sample disk weight..... _____

COMMENTS (D7000):

(D7000)