Designation: D7496 – 11

Standard Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer[1]

This standard is issued under the fixed designation D7496; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method utilizes the Saybolt Furol viscometer to measure the consistency of emulsified asphalt. It is applicable to all the emulsified asphalts specified in Specifications D977 and D2397.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are 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 *ASTM Standards:*[2]

D88 Test Method for Saybolt Viscosity
D244 Test Methods and Practices for Emulsified Asphalts
D977 Specification for Emulsified Asphalt
D2397 Specification for Cationic Emulsified Asphalt
E1 Specification for ASTM Liquid-in-Glass Thermometers
E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Significance and Use

3.1 Viscosity has significance in the use of emulsified asphalt because it is a property which affects their utility. When used in application types of construction, the material must be thin enough to be uniformly applied through the spray bar of distributor, yet thick enough so that it will not flow from the crown or grade of the road. For mixing grade emulsions, the viscosity may affect mixibility and resulting thickness of film on the aggregate. The viscosity of many emulsions is affected by shear. Therefore, strict adherence to test procedure is necessary to achieve precision.

4. Sample Conditioning for Testing

4.1 All emulsified asphalts shall be properly stirred to achieve homogeneity before testing.

4.2 All emulsified asphalts with the viscosity testing requirements of 50°C shall be heated to 50 ± 3°C in the original sample container in a water bath or oven. The container should be vented to relieve pressure. After the sample reaches 50 ± 3°C, stir the sample to achieve homogeneity.

4.3 Emulsified asphalts with a viscosity testing requirements to 25°C should be mixed or stirred at 25 ± 3°C in the original sample container to achieve homogeneity.

NOTE 1—Emulsified asphalts with viscosity testing requirements of 25°C may be heated and stirred as specified in 4.2, if necessary. In the event the 4.2 method is used, the sample should be cooled to 25 ± 3°C before testing.

5. Apparatus

5.1 *Viscometer*—A Saybolt Furol viscometer conforming to the requirements specified in Test Method D88.

5.2 *Sieve*—A850-µm sieve or a 20-mesh strainer of wire cloth, framed or unframed. Refer to Specification E11.

5.3 *Thermometers*—ASTM No. 17C or 17F for tests at 25°C (77°F) and ASTM No. 19C or 19F for tests at 50°C (122°F), conforming to the requirements of Specification E1, or any other thermometric device of equal accuracy.

5.4 *Water Bath or Oven,* capable of maintaining the required testing temperature within the limits specified in Table 2 of Test Method D88.

5.5 *Receiving Flask,* as shown in Test Method D88.

6. Hazards

6.1 **Warning—**Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website

[1] This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.42 on Emulsified Asphalt Test.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

(www.epa.gov/mercury/faq.htm) for additional information. Users should be aware that selling mercury or mercury containing products (or both) into your state may be prohibited by state law.

7. Procedure

7.1 *Tests at 25°C (77°F)*—Clean and dry the viscometer and insert the stopper or cork. Follow either Procedure A or B below:

7.1.1 *Procedure A*—Pour approximately 100 mL of the emulsified asphalt into a 400 mL glass beaker. Immerse bottom of the beaker containing the emulsified asphalt approximately 50 mm (2 in.) below the level of a 25°C (77°F) water bath. Hold the beaker upright and stir the emulsified asphalt with a wide circular motion at a rate of 60 revolutions per minute with the thermometric device to obtain uniform temperature distribution. Avoid incorporation of bubbles. Pour the sample into the viscometer through the 850-µm sieve or 20-mesh strainer until it is above the overflow rim. Stir the emulsified asphalt in the viscometer with the thermometric device, avoiding bubble formation. Adjust the viscometer bath temperature until the emulsified asphalt temperature remains constant for 1 minute at 25 ± 0.1°C (77 ± 0.2°F). Withdraw the thermometric device. Quickly remove the excess emulsified asphalt from the gallery with a suction pipet or a vacuum hose. Determine the viscosity as described in Test Method D88. Report the results to the nearest full second.

7.1.2 *Procedure B*—Pour the sample of emulsified asphalt into an appropriately sized (approximately 120 mL) bottle. Place the sealed bottle into a water bath maintained at 25°C (77°F) for 30 minutes. Remove the bottle from the bath and mix the sample by inverting the bottle several times slowly enough to avoid bubble formation. Pour the sample into the viscometer through the 850-mm sieve or 20-mesh strainer until it is above the overflow rim. Stir the emulsified asphalt in the viscometer with the thermometric device, avoiding bubble formation. Adjust the viscometer bath temperature until the emulsified asphalt temperature remains constant for 1 minute at 25 ± 0.1°C (77 ± 0.2°F). Withdraw the thermometric device. Quickly remove the excess emulsified asphalt from the gallery with a suction pipet or a vacuum hose. Determine the viscosity as described in Test Method D88. Report the results to the nearest full second.

7.2 *Tests at 50°C (122°F)*—Clean and dry the viscometer and insert the stopper or cork. Follow either Procedure A or B below:

7.2.1 *Procedure A*—If the sample of emulsified asphalt is cooler than 50°C (122°F), heat the sample to 50 ± 3°C (122 ± 5°F) in a 71 ± 3°C (160 ± 5°F) water bath or oven. Stir the sample thoroughly without incorporating bubbles, and then pour approximately 100 mL into a 400-mL glass beaker. Immerse the bottom of the beaker containing the emulsified asphalt approximately 50 mm (2 in.) below the level of a 71 ± 3°C (160 ± 5°F) water bath. Hold the beaker upright and stir the emulsified asphalt with a wide circular motion at a rate of 60 revolutions per minute with the thermometric device to obtain uniform temperature distribution. Avoid incorporation of bubbles. Heat the emulsified asphalt in the water bath to 51.4 ± 0.3°C (124.5 ± 0.5°F). Immediately pour the emulsified asphalt through the 850-µm sieve or 20-mesh strainer into the viscometer until it is above the overflow rim. Stir the emulsified asphalt in the viscometer at 60 revolutions per minute with the thermometric device, avoiding bubble formation. Adjust the bath temperature until the emulsified asphalt temperature remains constant for 1 minute at 50 ± 0.1°C (122 ± 0.2°F). Withdraw the thermometric device. Quickly remove the excess emulsified asphalt from the gallery with a suction pipet or a vacuum hose. Determine the viscosity as described in Test Method D88. Report the results to the nearest full second.

7.2.2 *Procedure B*—Pour the sample of emulsified asphalt into an appropriately sized (approximately 120 mL) bottle. Place the sealed bottle into a water bath or oven maintained at 51.4 ± 0.3°C (124.5 ± 0.5°F) for 30 minutes. Remove the bottle from the bath or oven and mix the sample by inverting the bottle several times slowly enough to avoid bubble formation. Pour the sample into the viscometer through the 850-mm sieve or 20-mesh strainer until it is above the overflow rim. Stir the emulsified asphalt in the viscometer at 60 revolutions per minute with the thermometric device, avoiding bubble formation. Adjust the bath temperature until the emulsified asphalt temperature remains constant for 1 minute at 50 ± 0.1°C (122 ± 0.2°F). Withdraw the thermometric device. Quickly remove the excess emulsified asphalt from the gallery with a suction pipet or a vacuum hose. Determine the viscosity as described in Test Method D88. Report the results to the nearest full second.

NOTE 2—While the Saybolt Furol viscometer is not used for petroleum products and lubricants when the time of flow is less than 25 s, this instrument is satisfactory for testing emulsified asphalt when the time of flow is not less than 20 s.

8. Precision and Bias

8.1 The following criteria should be used for judging the acceptability of results (95 % probability).[3]

8.1.1 Duplicate results by the same operator should not be considered suspect unless they differ by more that the following amount:

Test Temperature °C (°F)	Viscosity s	Repeatability % of the mean
25 (77)	25 to 200	6.7
50 (122)	75 to 400	10.8

8.1.2 The results submitted by each of two laboratories should not be considered suspect unless they differ by more than the following amount:

Test Temperature °C (°F)	Viscosity s	Reproducibility % of the mean
25 (77)	25 to 200	22
50 (122)	75 to 400	88

9. Keywords

9.1 asphalt; emulsified asphalt; emulsion; furol; saybolt; viscosity

[3] Research Report RR:D04-1035 and RR:D04-1036 presents the results of the Interlaboratory Study used to establish the precision and bias statement for ASTM D7496, Standard Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer. The collaborative study included respectively 14 labs and 17 labs who used method D7496 to analyze the viscosity of several types of emulsified asphalt of varying viscosity levels, including three different standards. The research report presents summary method performance statistics as well as the measurement data used to calculate results for the study.