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Standard Test Method for Determining the Viscosity of Emulsified Asphalts Using a Rotational Paddle Viscometer[1]

This standard is issued under the fixed designation D7226; 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.

~~ε[1] NOTE—Added research report information to Section 9 editorially in September 2010.~~

1. Scope

1.1 This test method uses a paddle rotational viscometer to measure the apparent viscosity of emulsified asphalt with viscosities between 30 and 1500 mPa·s (centipoises) at 50°C (122°F). It is applicable to all emulsified asphalt described in Specifications D977 and D2397.

1.2 The values given in SI units are to be considered 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]

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

D140 Practice for Sampling Bituminous Materials ~~D244 Test Methods and Practices for Emulsified Asphalts~~

D977 Specification for Emulsified Asphalt

D2397 Specification for Cationic Emulsified Asphalt

D7496 Test Method for Viscosity of Emulsified Asphalt by Saybolt Furol Viscometer

E1 Specification for ASTM Liquid-in-Glass Thermometers

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 *Definition:*

3.1.1 *viscosity*, *n*—ratio of shear stress to shear rate.

3.1.1.1 *Discussion*—The SI unit of viscosity is the Pascal second (Pa·s). The centimetre gram second (cgs) unit of viscosity is the poise (dynes/cm ^{2}) and is equivalent to 0.1 Pa·s. One centipoise (cP) is one millipascal second (mPa·s).

4. Summary of Test Method

4.1 The paddle rotational viscometer for this test method is used to measure the apparent viscosity of emulsified asphalt at 50°C (122°F) between 30 and 1500 mPa·s (cP). A microprocessor circuitry system functioning in tandem with a temperature probe and equipped with internal electronic sensors detects and analyzes the preset temperature. A paddle is immersed in the emulsified asphalt sample and is rotated at 100 RPM.[3] The apparent viscosity of the sample is obtained within 5 min and read from the electronic display or optional printer.

5. Significance and Use

~~5.1 This test method is useful to measure the apparent viscosity of emulsified asphalt at a temperature of 50°C (122°F) or another agreed-upon temperature.~~

5.1 The viscosity of emulsified asphalts characterizes their flow properties and affects their utility at 50°C (122°F) or at other

[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.

[3] Emulsions are sensitive to RPM, therefore, the manufacturer has preset the instrument to run at 100 RPM.

temperatures. An emulsified asphalt sprayability and workability is directly related to their viscosity for many applications types. The material must be thin enough to be sprayed yet thick enough such that it will not flow from the crown or grade of the road. For mixing grade emulsified asphalts the viscosity will affect its workability and resulting film thickness on the aggregate. This test method is useful to measure the apparent viscosity of emulsified asphalt at a temperature of 50°C (122°F) or another agreed-upon temperature.[4] The preset temperature and rotational speed at 100 RPM allow for an automated and consistent determination of an emulsified asphalt ~~apparent~~ viscosity within ~~5 min.~~ a short time.

6. Apparatus

6.1 The paddle viscometer test system consists of a paddle, temperature probe, sample cup, the sample cup cover, a means for controlling the sample temperature to 50 ± 0.1°C (122 ± 0.18°F), and readout system to display viscosity. The dimensions of the sample cup and paddle are shown in Figs. 1-3.

6.2 *Thermometer*—ASTM No. 19F or 19C for tests at 50°C conforming to the requirements of Specification E1~~—~~. Other thermometric devices of equal accuracy may be used. Measuring devices including liquid-in-glass thermometers, thermistors, thermocouples, or platinum resistance thermometers that provide equivalent accuracy and precision, that cover the temperature range for thermometers 19C and 19F may be used.

6.3 *Sieve*—An 850-µm sieve or a 20-mesh strainer of wire cloth, framed or unframed, conforming to Specification E11 is used.

6.4 *Oven/Water Bath*~~—An oven/water bath capable of maintaining the required testing temperature within the limit specified in 3.1 of Test Method D244 is used.~~ —An oven/water bath capable of maintaining the required testing temperature within the limit of +/- 3°C.

7. Hazards

7.1 **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 – http://www.epa.gov/mercury/faq.htm - for additional information. Users should be aware that selling mercury and/or mercury containing products into your state may be prohibited by state law.

[4] No accurate predictable conversion from mPa seconds to Saybolt Furol Seconds (SFS) is available at this time. However, an empirical correlation between SFS and mPa seconds can be obtained by performing the respective viscosity measurements on the appropriate equipment.

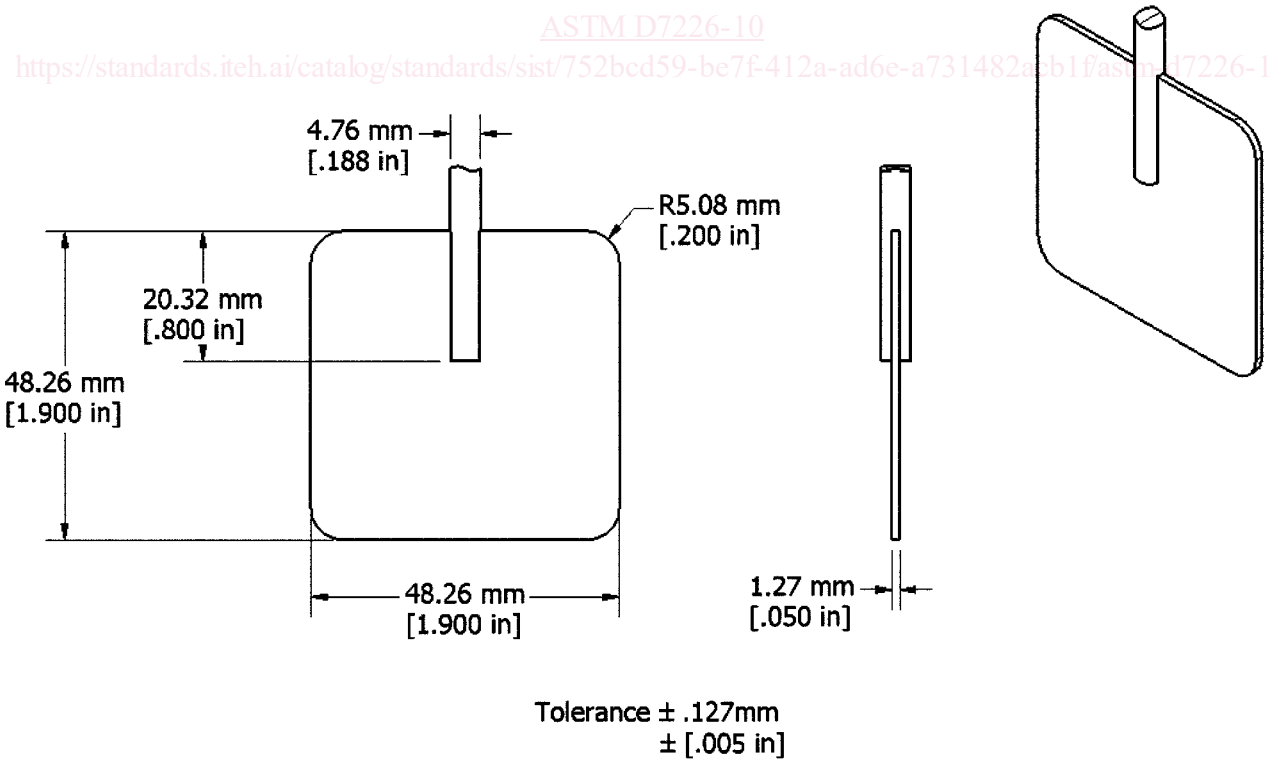

FIG. 1 Paddle Dimensions, mm (in.)