Designation: D7226 – 13 (Reapproved 2023)

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.

1. Scope

1.1 This test method utilizes the rotational paddle viscometer to measure the viscosity of emulsified asphalt. It is applicable to all the emulsified asphalts described in Specifications D977 and D2397/D2397M.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D140/D140M Practice for Sampling Asphalt Materials

D977 Specification for Emulsified Asphalt

D2397/D2397M Specification for Cationic Emulsified Asphalt

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 *Definitions:*

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).[3]

4. Summary of Test Method

4.1 The rotational paddle viscometer method is used to measure the apparent viscosity of emulsified asphalt at 50 °C, 25 °C, or other agreed-upon temperatures. 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 r/min. The apparent viscosity of the sample is obtained and read from the electronic display or an optional printer.

5. Significance and Use

5.1 The viscosity of emulsified asphalts characterizes their flow properties and affects their utility at 50 °C or at other temperatures. The sprayability and workability of an emulsified asphalt are directly related to its viscosity for many applications. 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, 25 °C, or another agreed-upon temperature. The preset temperature and rotational speed at 100 r/min allow for an automated and consistent determination of an emulsified asphalt viscosity within a short time.

6. Apparatus

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

6.2 *Thermometer*—Any thermometric device can be used to monitor the temperature of the sample being conditioned for testing.

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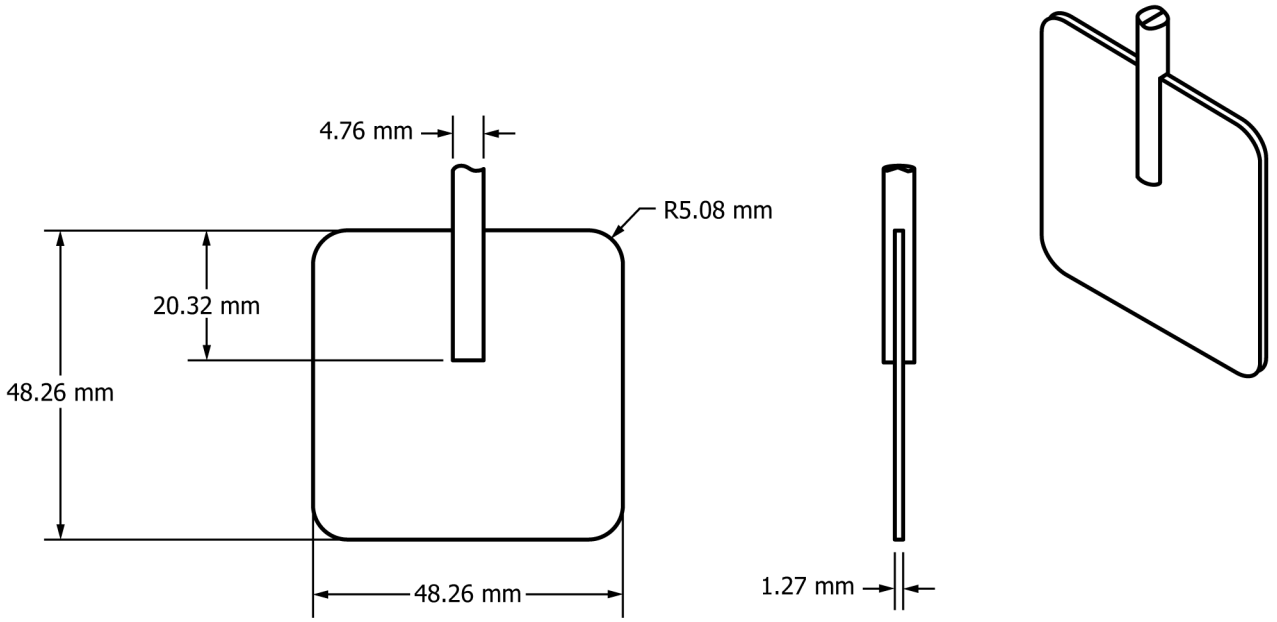
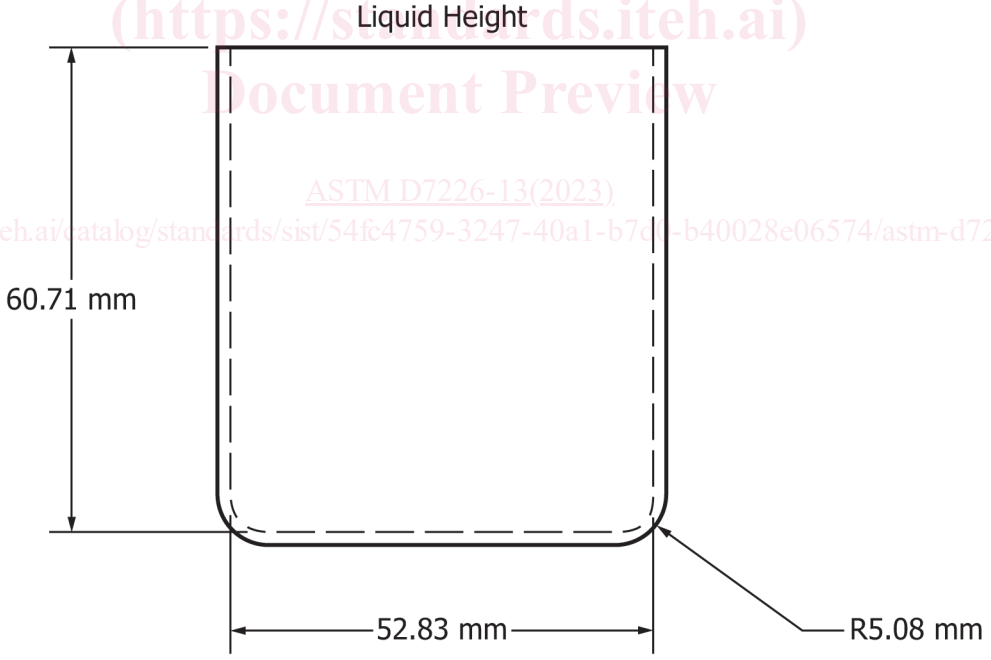
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] 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).



Tolerance ± .127 mm

FIG. 1 Paddle Dimensions



Tolerance ± .127 mm

FIG. 2 Sample Cup Dimensions

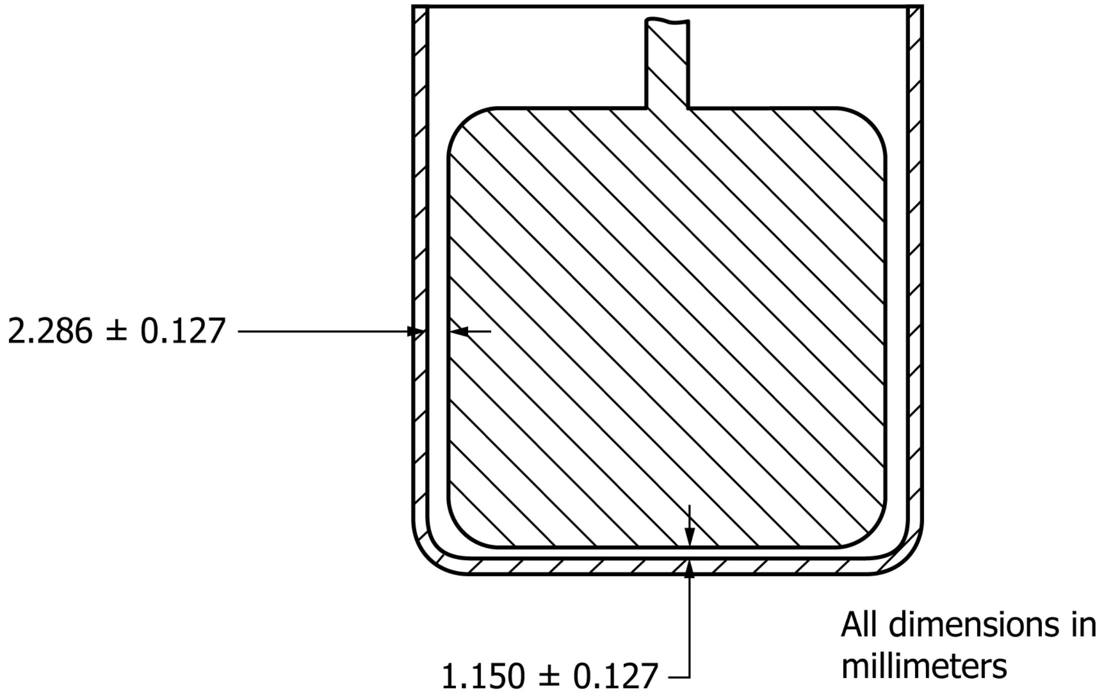


FIG. 3 Paddle and Sample Cup

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 of ±3 °C.

7. Hazards

7.1 **Warning—**Mercury has been designated by the 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 the 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 in your state may be prohibited by state law.

8. Calibration and Standardization

8.1 Calibrate the rotational paddle viscometer at periodic intervals or as required by measuring the viscosity at 25 °C of an appropriate standard following the procedure in Section 9.

8.2 If the measured viscosity standard differs from the certified value by more than 11 %, calculate a correction factor, *F*, for the viscometer as follows:

$$F = \eta_s / \eta$$

where:

η_s = certified viscosity of the standard at the test temperature, and

η = measured viscosity at 25 °C.

8.3 Calibrate the rotational paddle viscometer in the same manner as above, using a viscosity standard for 50 °C.

9. Procedure

9.1 Obtain a representative sample of the material for testing using standard procedures as specified in Practice D140/D140M.

9.2 Turn on the viscometer power and set to the test temperature and attach the paddle to the viscometer. Allow the instrument to warm up for a minimum of 30 min.

9.3 Emulsified asphalts with a viscosity testing requirement of 50 °C shall be heated to 50 ± 3 °C in the original sample container in a water bath or oven as described herein. If the sample temperature is greater or less than 50 °C then it should be conditioned to the required test temperature. Pour the sample into a clean sample cup through the 850 µm sieve or 20 mesh strainer to the fill line of the viscometer sample cup.

9.4 Emulsified asphalts with a viscosity testing temperature requirement of 25 °C should be conditioned at 25 ± 3 °C in the original sample container to achieve homogeneity. Pour the sample into the sample cup after passing through an 850 µm or 20 mesh sieve.