



Designation: D2170/D2170M – 10

Designation: 319/84 (89)

Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens)¹

This standard is issued under the fixed designation D2170/D2170M; 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 covers procedures for the determination of kinematic viscosity of liquid asphalts (bitumens), road oils and distillation residues of liquid asphalts (bitumens) all at 60°C [140°F] and of asphalt cements at 135°C [275°F] (**Note 1**) in the range from 6 to 100 000 mm²/s [cSt].

1.2 Results of this test method can be used to calculate viscosity when the density of the test material at the test temperature is known or can be determined. See **Annex A1** for the method of calculation.

NOTE 1—This test method is suitable for use at other temperatures and at lower kinematic viscosities, but the precision is based on determinations on liquid asphalts and road oils at 60°C [140°F] and on asphalt cements at 135°C [275°F] only in the viscosity range from 30 to 6000 mm²/s [cSt].

1.3 **Warning**—Mercury has been designated by United States Environmental Protection Agency (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, mercury containing products, or both, in your state may be prohibited by state law.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *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
- D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester
- D341 Practice for Viscosity-Temperature Charts for Liquid Petroleum Products
- D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
- D446 Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers
- D2162 Practice for Basic Calibration of Master Viscometers and Viscosity Oil Standards
- D2493 Standard Viscosity-Temperature Chart for Asphalts
- E1 Specification for ASTM Liquid-in-Glass Thermometers
- E77 Test Method for Inspection and Verification of Thermometers

3. Terminology

3.1 Definitions:

3.1.1 *density*—the mass per unit volume of liquid. The SI unit of density is 1 kg/m³. The cgs unit of density is 1 g/cm³.

3.1.2 *kinematic viscosity*—the ratio of the viscosity to the density of a liquid. It is a measure of the resistance to flow of a liquid under gravity. The SI unit of kinematic viscosity is m²/s; for practical use, a submultiple (mm²/s) is more convenient. The cgs unit of kinematic viscosity is 1 cm²/s and is called a stoke (symbol St). The centistoke (1 cSt = 10⁻² St) is 1 mm²/s and is often used.

3.1.3 *Newtonian liquid*—a liquid in which the rate of shear is proportional to the shearing stress. The constant ratio of the

¹ This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.44 on Rheological Tests. In the IP this test method is under the jurisdiction of the Standardization Committee.

Current edition approved June 1, 2010. Published August 2010. Originally approved in 1963. Last previous edition approved in 2007 as D2170 – 07. DOI: 10.1520/D2170-10.

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.