



Standard Test Method for Saybolt Viscosity¹

This standard is issued under the fixed designation D 88; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers the empirical procedures for determining the Saybolt Universal or Saybolt Furol viscosities of petroleum products at specified temperatures between 21 and 99°C (70 and 210°F). A special procedure for waxy products is indicated.

NOTE 1—Test Methods D 445 and D 2170 are preferred for the determination of kinematic viscosity. They require smaller samples and less time, and provide greater accuracy. Kinematic viscosities may be converted to Saybolt viscosities by use of the tables in Practice D 2161. It is recommended that viscosity indexes be calculated from kinematic rather than Saybolt viscosities.

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

- D 93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
- D 117 Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Oils of Petroleum Origin
- D 140 Practice for Sampling Bituminous Materials
- D 244 Test Methods and Practices for Emulsified Asphalts
- D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
- D 2161 Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity
- D 2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products
- D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products
- E 1 Specification for ASTM Liquid-in-Glass Thermometers
- E 11 Specification for Wire Cloth and Sieves for Testing Purposes
- E 102 Test Method for Saybolt Furol Viscosity of Bituminous Materials at High Temperatures

3. Terminology

3.1 Definitions:

3.1.1 *Furol*—an acronym of “Fuel and road oils.”

3.1.2 *Saybolt Furol viscosity*—the corrected efflux time in seconds of 60 mL of sample flowing through a calibrated Furol orifice under specified conditions. The viscosity value is reported in Saybolt Furol seconds, abbreviated SFS, at a specified temperature.

3.1.3 *Saybolt Universal viscosity*—the corrected efflux time in seconds of 60 mL of sample flowing through a calibrated Universal orifice under specified conditions. The viscosity value is reported in Saybolt Universal seconds, abbreviated SUS, at a specified temperature.

¹ This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.05 on Solvent-Bearing Bituminous Compounds for Roofing and Waterproofing.

Current edition approved Nov. 1, 2005/2007. Published November 2005/2007. Originally approved in 1921. In 1923, combined with former Methods D 47. Last previous edition approved in 1999/2005 as ~~D88-94(1999)~~-D 88 – 94 (2005).

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.

4. Summary of Test Method

4.1 The efflux time in seconds of 60 mL of sample, flowing through a calibrated orifice, is measured under carefully controlled conditions. This time is corrected by an orifice factor and reported as the viscosity of the sample at that temperature.

5. Significance and Use

5.1 This test method is useful in characterizing certain petroleum products, as one element in establishing uniformity of shipments and sources of supply.

5.2 See Guide D 117 for applicability to mineral oils used as electrical insulating oils.

5.3 The Saybolt Furol viscosity is approximately one tenth the Saybolt Universal viscosity, and is recommended for characterization of petroleum products such as fuel oils and other residual materials having Saybolt Universal viscosities greater than 1000 s.

5.4 Determination of the Saybolt Furol viscosity of bituminous materials at higher temperatures is covered by Test Method E 102.

6. Apparatus

6.1 Saybolt Viscometer and Bath, as shown in Fig. 1 and described in Annex A1.

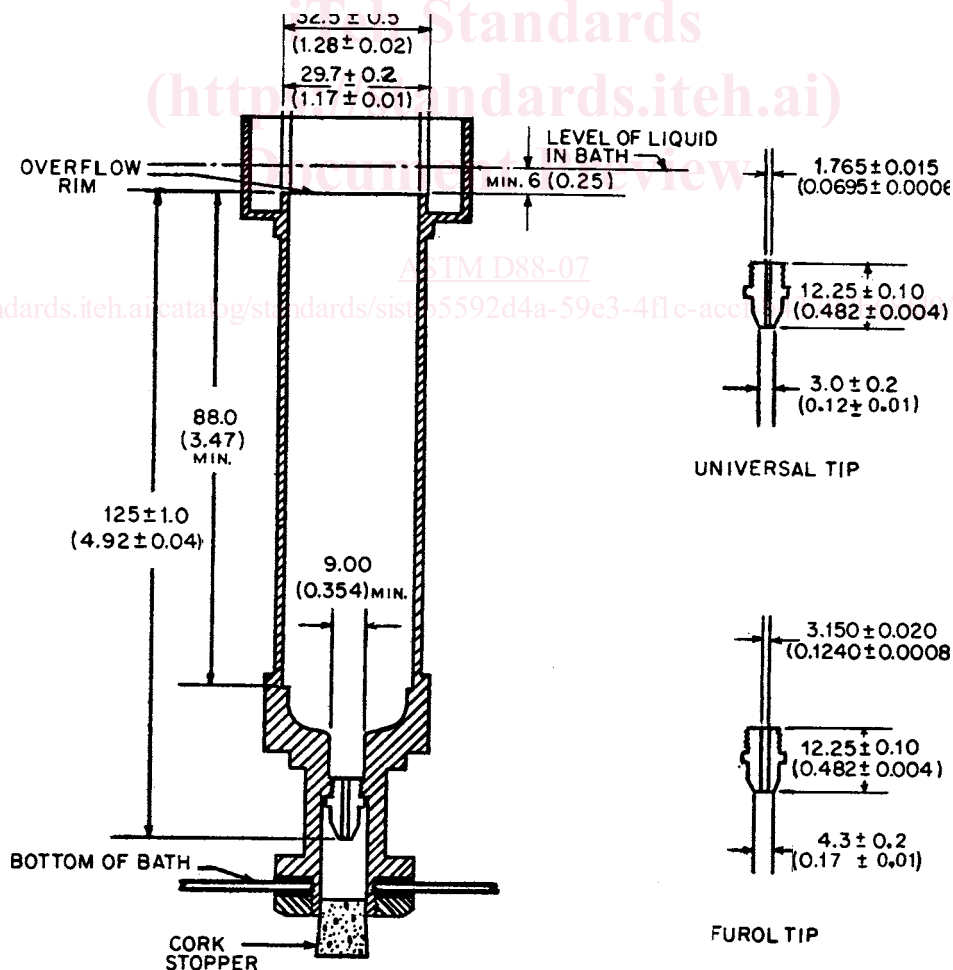
6.2 Withdrawal Tube, as shown in Fig. 2.

6.3 Thermometer Support, as shown in Fig. 3.

6.4 Saybolt Viscosity Thermometers, as listed in Table 1, for reading the temperature of the sample. Each thermometer shall conform to the requirements listed in Specification E 1 for that ASTM Thermometer Number.

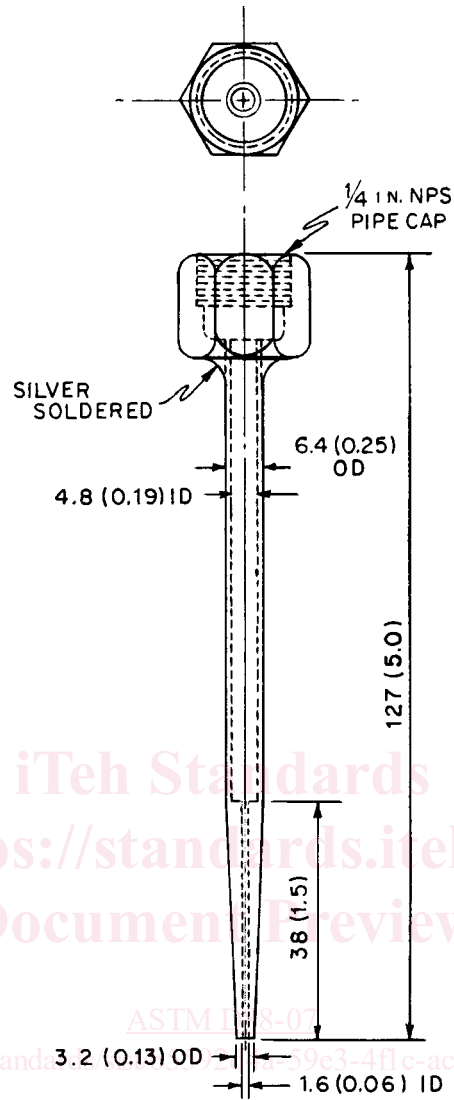
6.5 Bath Thermometers—Saybolt Viscosity thermometers, or any other temperature-indicating means of equivalent accuracy.

6.6 Filter Funnel, as shown in Fig. 4, equipped with interchangeable 150-µm (No. 100) and 75-µm (No. 200) wire-cloth inserts meeting the requirements of Specification E 11 with respect to the wire cloth.

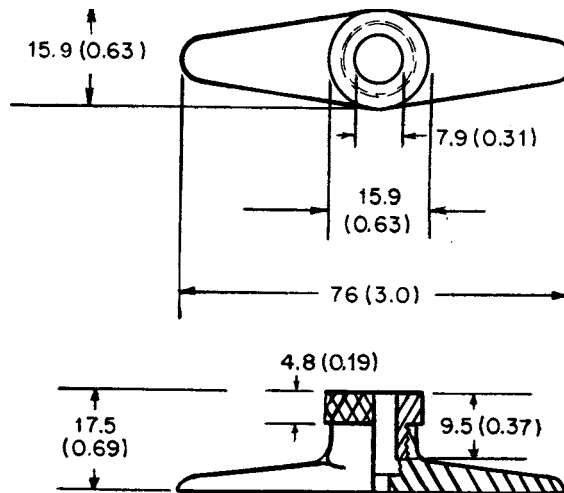


NOTE 1—All dimensions are in millimetres (inches).

FIG. 1 Saybolt Viscometer with Universal and Furol Orifice



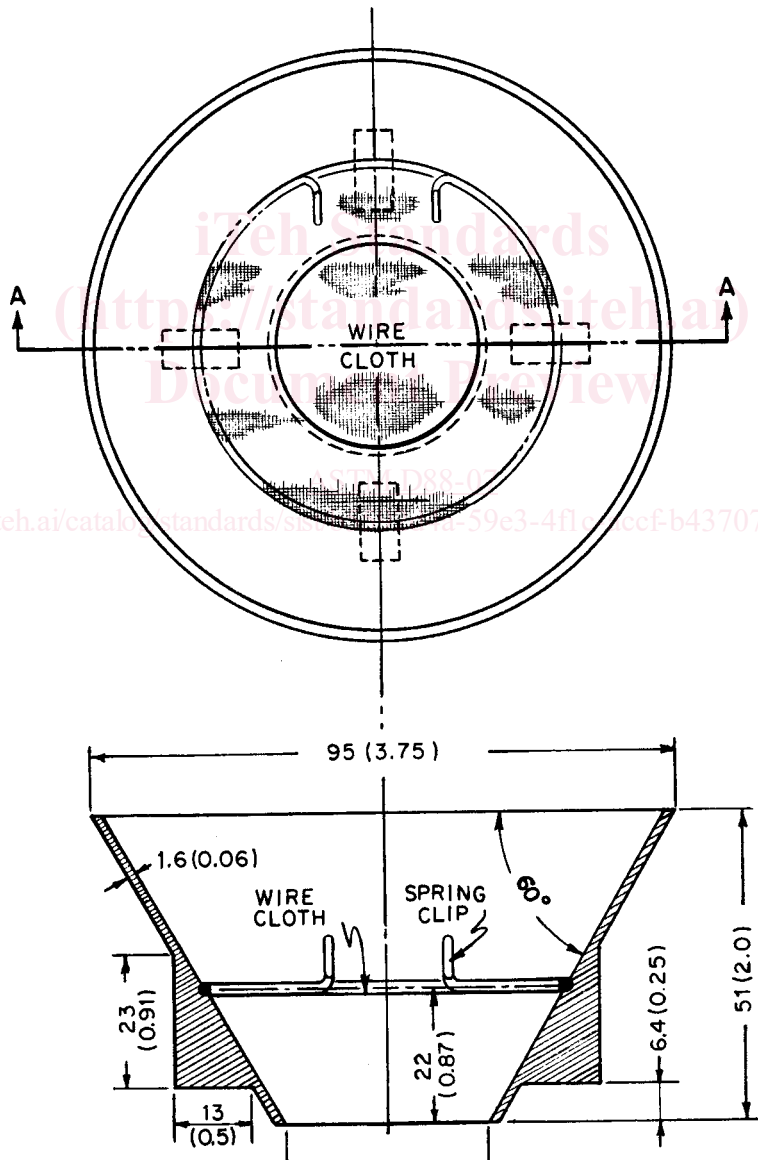
NOTE 1—All dimensions are in millimetres (inches).
 FIG. 2 Withdrawal Tube for Use with Saybolt Viscometer



NOTE 1—All dimensions are in millimetres (inches).
 FIG. 3 Thermometer Support

TABLE 1 ASTM Saybolt Viscosity Thermometers

Standard Test Temperature °C (°F)	ASTM Thermometer No.	Thermometer	
		Range° C (°F)	Subdivisions, ° C (°F)
21.1 (70)	17C (17F)	19 to 27 (66 to 80)	0.1 (0.2)
25.0 (77)	17C (17F)	19 to 27 (66 to 80)	0.1 (0.2)
37.8 (100)	18C (18F)	34 to 42 (94 to 108)	0.1 (0.2)
50.0 (122)	19C (19F)	49 to 57 (120 to 134)	0.1 (0.2)
54.4 (130)	19C (19F)	49 to 57 (120 to 134)	0.1 (0.2)
60.0 (140)	20C (20F)	57 to 65 (134 to 148)	0.1 (0.2)
82.2 (180)	21C (21F)	79 to 87 (174 to 188)	0.1 (0.2)
98.9 (210)	22C (22F)	95 to 103 (204 to 218)	0.1 (0.2)



NOTE 1—All dimensions are in millimetres (inches).
FIG. 4 Filter Funnel for Use with Saybolt Viscometer