



Designation: D36 – 06

## Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)<sup>1</sup>

This standard is issued under the fixed designation D36; 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 ( $\epsilon$ ) 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 determination of the softening point of bitumen in the range from 30 to 157°C (86 to 315°F) using the ring-and-ball apparatus immersed in distilled water (30 to 80°C), USP glycerin (above 80 to 157°C), or ethylene glycol (30 to 110°C).

1.2 The values stated in SI units are to be regarded as the 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 and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**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

**D140** Practice for Sampling Bituminous Materials

**D3461** Test Method for Softening Point of Asphalt and Pitch (Mettler Cup-and-Ball Method)

**E1** Specification for ASTM Liquid-in-Glass Thermometers

### 3. Summary of Test Method

3.1 Two horizontal disks of bitumen, cast in shouldered brass rings, are heated at a controlled rate in a liquid bath while each supports a steel ball. The softening point is reported as the

mean of the temperatures at which the two disks soften enough to allow each ball, enveloped in bitumen, to fall a distance of 25 mm (1.0 in.).

### 4. Significance and Use

4.1 Bitumens are viscoelastic materials without sharply defined melting points; they gradually become softer and less viscous as the temperature rises. For this reason, softening points must be determined by an arbitrary and closely defined method if results are to be reproducible.

4.2 The softening point is useful in the classification of bitumens, as one element in establishing the uniformity of shipments or sources of supply, and is indicative of the tendency of the material to flow at elevated temperatures encountered in service.

### 5. Apparatus

5.1 *Rings*—Two square-shouldered brass rings conforming to the dimensions shown in Fig. 1(a).

5.2 *Pouring Plate*—A flat, smooth, brass plate approximately 50 by 75 mm (2 by 3 in.).

5.3 *Balls*—Two steel balls, 9.5 mm ( $\frac{3}{8}$  in.) in diameter, each having a mass of  $3.50 \pm 0.05$  g.

5.4 *Ball-Centering Guides*—Two brass guides for centering the steel balls, one for each ring, conforming to the general shape and dimensions shown in Fig. 1 (b).

5.5 *Bath*—A glass vessel, capable of being heated, not less than 85 mm in inside diameter and not less than 120 mm in depth from the bottom of the flare.

NOTE 1—An 800-mL, low-form Griffin beaker of heat-resistant glass meets this requirement.

5.6 *Ring Holder and Assembly*—A brass holder designed to support the two rings in a horizontal position, conforming to the shape and dimensions shown in Fig. 1 (c), supported in the assembly illustrated in Fig. 1 (d). The bottom of the shouldered rings in the ring holder shall be 25 mm (1.0 in.) above the upper surface of the bottom plate, and the lower surface of the bottom plate shall be  $16 \pm 3$  mm ( $\frac{5}{8} \pm \frac{1}{8}$  in.) from the bottom of the bath.

5.7 *Thermometers:*

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.03 on Surfacing and Bituminous Materials for Membrane Waterproofing and Built-up Roofing.

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<sup>2</sup> 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.

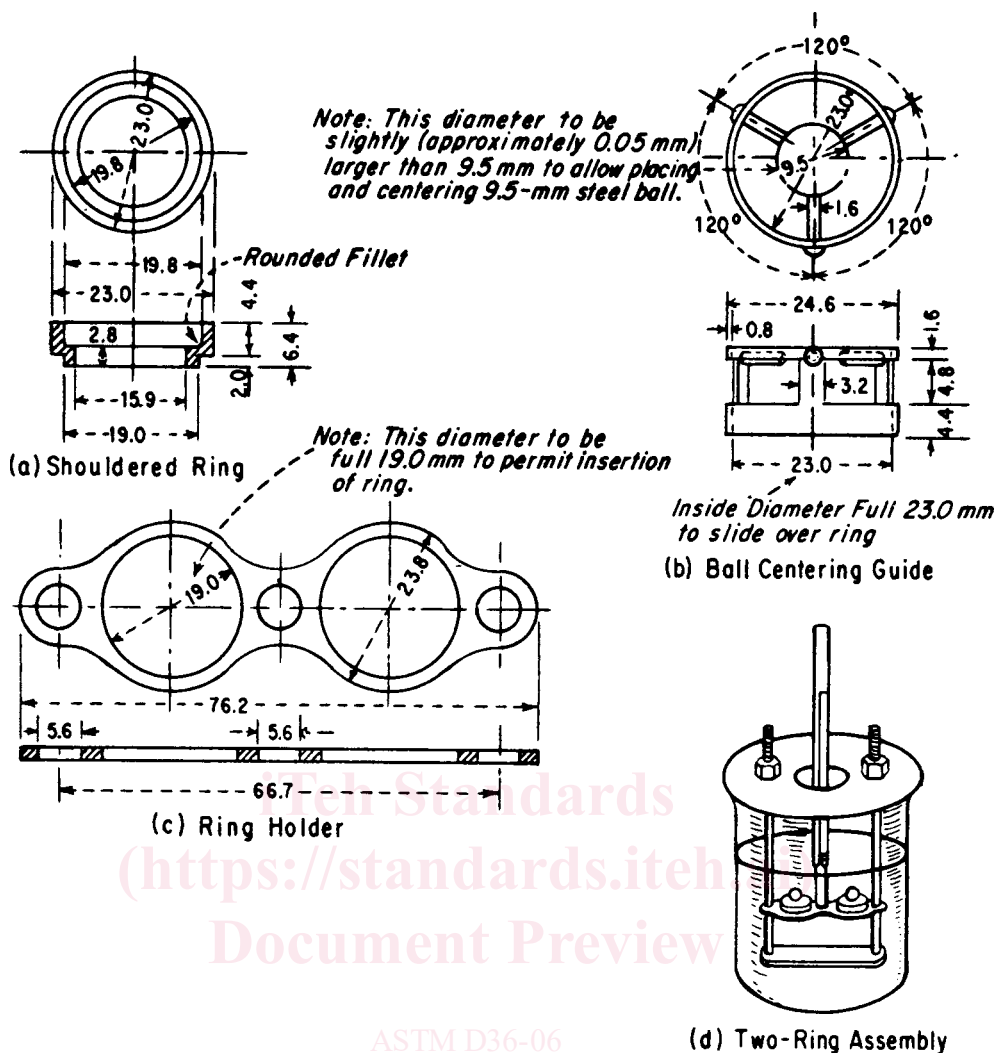


FIG. 1 Shouldered Ring, Ball-Centering Guide, Ring Holder, and Assembly of Apparatus Showing Two Rings

NOTE 1—All dimensions are in millimetres.

5.7.1 An ASTM Low Softening Point Thermometer, having a range from  $-2$  to  $+80^{\circ}\text{C}$  or  $30$  to  $180^{\circ}\text{F}$ , and conforming to the requirements for Thermometer 15C or 15F as prescribed in Specification E1. As an alternative, any other thermometric device used shall be at least: (1) of equal accuracy to that of the thermometer specified in Specification E1, (2) capable of indicating temperature to within  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ ), and (3) stable to within  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ ) for the duration of the exposure.

5.7.2 An ASTM High Softening Point Thermometer, having a range from  $30$  to  $200^{\circ}\text{C}$  or  $85$  to  $392^{\circ}\text{F}$ , and conforming to the requirements for Thermometer 16C or 16F as prescribed in Specification E1. As an alternative, any other thermometric device used shall be at least: (1) of equal accuracy to that of the thermometer specified in Specification E1, (2) capable of indicating temperature to within  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ ), and (3) stable to within  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ ) for the duration of the exposure.

5.7.3 The appropriate thermometer shall be suspended in the assembly as shown in Fig. 1 (d) so that the bottom of the bulb is level with the bottom of the rings and within 13 mm (0.5 in.) of the rings, but not touching them or the ring holder.

Substitution of other thermometers shall not be permitted. As an alternative, any other thermometric device used shall be at least: (1) of equal accuracy to that of the thermometer specified in Specification E1, (2) capable of indicating temperature to within  $0.5^{\circ}\text{C}$  ( $1.0^{\circ}\text{F}$ ), and (3) stable to within  $0.5^{\circ}\text{C}$  ( $1.0^{\circ}\text{F}$ ) for the duration of the exposure.

## 6. Reagents and Materials

### 6.1 Bath Liquids:

#### 6.1.1 Freshly Boiled Distilled Water.

NOTE 2—The use of freshly boiled distilled water is essential to avoid trapping air bubbles on the surface of the specimen which may affect the results.

6.1.2 *USP Glycerin* (**Warning**—Glycerin has a flash point of  $160^{\circ}\text{C}$  ( $320^{\circ}\text{F}$ ) in accordance with Test Method D92.), or

6.1.3 *Ethylene Glycol*, with a boiling point between  $195$  and  $197^{\circ}\text{C}$  ( $383$  and  $387^{\circ}\text{F}$ ). (**Warning**—Ethylene glycol is toxic when taken internally or inhaled as a vapor. Avoid prolonged or repeated skin contact and inhalation of vapors. Its flash point is