



Standard Test Method for Ductility of Asphalt Materials¹

This standard is issued under the fixed designation D113; 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 describes the procedure for determining the ductility of an asphalt material measured by the distance to which it will elongate before breaking when two ends of a briquet specimen of the material, of the form described in 4.1, are pulled apart at a specified speed and at a specified temperature. Unless otherwise specified, the test shall be made at a temperature of 25 ± 0.5 °C [77 ± 0.9 °F] and with a speed of 5 cm/min \pm 5.0 %. At other temperatures the speed should be specified.

1.2 Because of the large number of methods for obtaining test samples, it is impractical to discuss specific products in this test method. Refer to individual product specifications for guidance in obtaining a test sample.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 The values stated in 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 each other. Combining values from the two systems may result in nonconformance with the standard. Bath and mold dimensions are given in SI units only, as the equipment is not available in inch-pound units.

1.5 **Warning**—Mercury has been designated by the United States Environmental Protection Agency 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 Safety Data Sheet (SDS) for details and the EPA's website (<http://www.epa.gov/mercury/faq.htm>) for additional information. Users should be

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.

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aware that selling mercury or mercury-containing products, or both, in your state may be prohibited by state law.

1.6 *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.*

1.7 *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

- C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- D5/D5M Test Method for Penetration of Bituminous Materials
- D402/D402M Test Method for Distillation of Cutback Asphalt
- D1754/D1754M Test Method for Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)
- D2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)
- D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- D6934 Test Method for Residue by Evaporation of Emulsified Asphalt
- D6997 Test Method for Distillation of Emulsified Asphalt
- D7403 Test Method for Determination of Residue of Emulsified Asphalt by Low-Temperature Vacuum Distillation
- D7497 Practice for Recovering Residue from Emulsified Asphalt Using Low Temperature Evaporative Technique
- E1 Specification for ASTM Liquid-in-Glass Thermometers
- E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

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.

- E77 Test Method for Inspection and Verification of Thermometers
- E220 Test Method for Calibration of Thermocouples By Comparison Techniques
- E644 Test Methods for Testing Industrial Resistance Thermometers
- E1137/E1137M Specification for Industrial Platinum Resistance Thermometers
- E2251 Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

means of evaluating and controlling some of those factors.

4. Apparatus

4.1 *Mold*—The mold shall be similar in design to that shown in Fig. 1. The mold shall be made of brass, 10.0 ± 0.1 mm thick, the ends *b* and *b'* being known as clips, and the parts *a* and *a'* as sides of the mold, with a brass base plate that is larger than the assembled mold. The dimensions of the assembled mold shall be as shown in Fig. 1 with the permissible variations indicated.

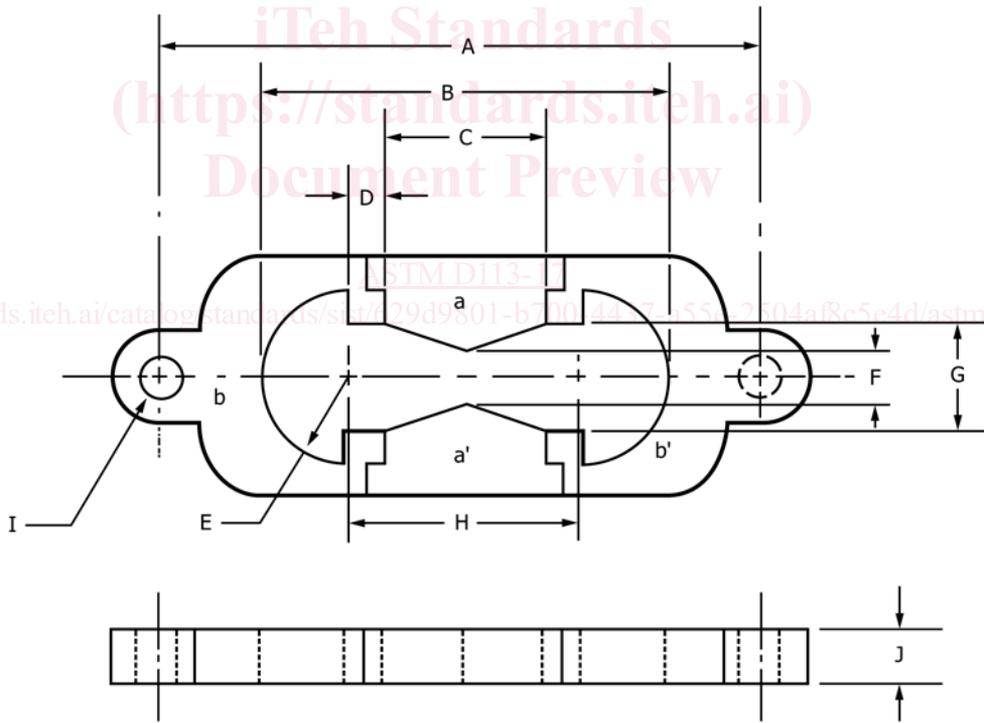
4.2 *Water Bath for Conditioning Specimens*—A water bath capable of maintaining the specified test temperature, varying not more than $0.5 \text{ }^\circ\text{C}$ [$0.9 \text{ }^\circ\text{F}$] from this temperature. The specimen shall be immersed to a depth of not less than 2.5 cm.

4.3 *Testing Machine*—For pulling the briquet of asphalt material apart, any apparatus may be used which is so constructed that the specimen will be continuously immersed in water, while the two clips are pulled apart at a uniform speed, as specified, without undue vibration. A $\pm 5 \%$ variation of test speed is permissible. The water in the tank of the testing machine shall cover the specimen both above and below it by at least 2.5 cm and shall be maintained within $\pm 0.5 \text{ }^\circ\text{C}$

3. Significance and Use

3.1 This test method provides one measure of tensile properties of asphalt materials and may be used to measure ductility for specification requirements.

NOTE 1—The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or some similar acceptable guideline provides a



- A – Distance between centers, 111.5 to 113.5 mm.
- B – Total length of briquet, 74.5 to 75.5 mm.
- C – Distance between clips, 29.7 to 30.3 mm.
- D – Shoulder, 6.8 to 7.2 mm.
- E – Radius, 15.75 to 16.25 mm.
- F – Width at minimum cross section, 9.9 to 10.1 mm.
- G – Width at mouth of clip, 19.8 to 20.2 mm.
- H – Distance between centers of radii, 42.9 to 43.1 mm.
- I – Hole diameter, 6.5 to 6.7 mm.
- J – Thickness, 9.9 to 10.1 mm.

FIG. 1 Mold for Ductility Test Specimen