



Designation: D 6084 – 04

Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer¹

This standard is issued under the fixed designation D 6084; 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 the elastic recovery of a bituminous material measured by the recoverable strain determined after severing an elongated briquet specimen of the material of the form described in 4.1. The specimens are pulled to a specified distance at a specified speed and at a specified temperature. Unless otherwise specified, the test shall be made at a temperature of $25 \pm 0.5^\circ\text{C}$ ($77 \pm 0.9^\circ\text{F}$) and with a speed of $5 \text{ cm/min} \pm 5\%$.

1.2 The values stated in SI units are to be regarded as the standard. Values in parentheses in inch-pound units are provided for informational purposes 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

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

D 5 Test Method for Penetration of Bituminous Materials

D 113 Test Method for Ductility of Bituminous Materials

E 1 Specification for ASTM Liquid-in-Glass Thermometers

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

E 77 Test Method for Inspection and Verification of Thermometers

E 220 Test Method for Calibration of Thermocouples By Comparison Techniques

E 644 Test Methods for Testing Industrial Resistance Thermometers

3. Significance and Use

3.1 This test method is useful in confirming that a material has been added to the asphalt to provide a significant elastomeric characteristic. It does not necessarily identify the type or amount of material added.

4. Apparatus

4.1 *Mold*³—The mold shall be similar in design to that shown in Fig. 1. The mold shall be made of brass, $10.0 \pm 0.1 \text{ mm}$ 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. (See Note 1.)

4.2 *Water Bath for Conditioning Specimen*—Maintain the water bath at the specified test temperature, varying not more than 0.1°C (0.18°F) from this temperature. The volume of water shall be not less than 10 L, and the specimen immersed to a depth of not less than 10 cm and supported on a perforated shelf not less than 5 cm from the bottom of the bath.

4.3 *Testing Machine*—For elongating the briquet of bituminous material, any apparatus may be used that 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 variation of $\pm 5\%$ 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 $\pm 0.5^\circ\text{C}$ (0.9°F) of the test temperature. The testing machine shall incorporate a means by which the elongation can be measured in centimetres. (See Note 2.)

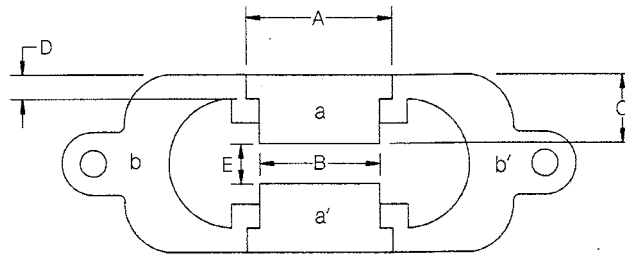
4.4 *Thermometer*—A thermometer having a range shown as follows, conforming to the requirements in accordance with Specification E 1, and calibrated in accordance with Test Method E 77. (See Note 3.) An equivalent thermometric device

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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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 sole source of supply of the apparatus known to the committee at this time is Humboldt Manufacturing Company, 7300 W. Agatite Ave., Chicago, IL 60656. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee³, which you may attend.



Spacer	
A	36.0 ± 0.5 mm
B	30 ± 0.1 mm
C	17 ± 0.1 mm
D	6 ± 0.1 mm
E	10 ± 0.1 mm

NOTE 1—Dimensions for *b* and *b'* can be found in Test Method D 113.

FIG. 1 Mold for Elastic Recovery Test Specimen

that has been calibrated in accordance with Test Method E 220 or Test Methods E 644 may be used.

Temperature Range	ASTM Thermometer No.
-8 to 32°C	63C
18 to 89°F	63F

4.5 *Scissors*—Any type of conventional scissors capable of cutting the bituminous material at the test temperature.

4.6 *Oven*—An oven capable of maintaining 135 ± 5°C (275 ± 10°F).

4.7 *Sieves*—300-µm (No. 50) and 850-µm (No. 20) sieves, 76 mm in diameter, in accordance with Specification E 11.

NOTE 1—Clips for the mold are the same as specified in Fig. 1 of Test Method D 113.

NOTE 2—The testing machine may be the same as specified in Test Method D 113.

NOTE 3—In those cases where the elastic recovery specimens are conditioned in the standard penetration bath at 25°C (77°F), the thermometer as prescribed for Test Method D 5 may be substituted in place of those shown.

5. Sample Preparation

5.1 *Asphalt Emulsion Residue*—If the sample is a residual product from the emulsion distillation test at 260°C (500°F) or a polymer-modified asphalt emulsion residual product from a distillation at lower temperatures, stir the contents in the still and immediately pour portions of the residue into suitable molds for making the required tests. If it is suspected there is foreign matter in the residue, pour the material through a 300-µm (No. 50) sieve that has been preheated at 135 ± 5°C (275 ± 10°F) prior to pouring into the test molds. (See Note 4.)

5.2 *Ambient Sample*—If the sample is an asphalt cement or a polymer-modified asphalt cement, carefully heat the sample in a covered container to prevent local overheating until it has become sufficiently fluid to pour. Use an oven set at 135 ± 5°C (275 ± 10°F) for sample heating. Strain the melted sample through a 300-µm (No. 50) sieve that has been preheated at 135 ± 5°C (275 ± 10°F). (See Note 5.)

NOTE 4—In the case of higher viscosity emulsion residues or residues from lower temperature distillations that will not pass a 300-µm (No. 50) sieve, an 850-µm (No. 20) sieve may be used.

NOTE 5—In those cases where the samples are not sufficiently fluid to

pour at 135°C (275°F), higher temperatures may be used. In the case of higher viscosity materials that will not pass a 300-µm (No. 50) sieve, an 850-µm (No. 20) sieve may be used.

6. Procedure

6.1 Assemble the mold on the brass plate. Thoroughly coat the surface of the plate and the interior surfaces of the sides of the mold, *a* and *a'*, with a thin layer of a mixture of glycerin and dextrin, talc, or kaolin (china clay) to prevent the test material from sticking. Other release agents may be used, provided results obtained are comparable to those obtained when using one of the above. The plate upon which the mold shall be placed shall be perfectly flat and level so that the bottom surface of the mold will be in contact throughout. After sample preparation as described in Section 5, thoroughly stir the sample and pour into the mold. In filling the mold, take care not to disarrange the pieces of the mold, thus distorting the shape. In filling, take care to pour and place material in a stream back and forth from end to end until the mold is more than level full. Allow the filled mold to cool to room temperature for 35 ± 5 min. Then place in the water bath at the test temperature for 30 ± 5 min. Remove the test specimens from the water bath and immediately trim the excess material with a hot putty knife or spatula to make the molds just level full. (See Note 6.)

6.2 *Keeping Specimens at Standard Temperature*—Place the trimmed specimen and mold in the water bath at the specified test temperature for 90 ± 5 min prior to testing. Remove the specimen from the plate by a shearing action between specimen and plate, avoiding any bending of the test specimen. Remove the side pieces *a* and *a'* being careful not to distort or fracture the specimen. Attach the specimen to the testing machine and immediately test the specimen.

6.3 *Testing, Procedure A*—Attach the rings at each end of the clips to the pins or hooks in the testing machine and pull the two clips apart at a uniform speed to an elongation of 10 ± 0.25 cm unless otherwise specified. Stop the elongation and immediately cut the test specimen into two halves at the midpoint using the scissors. Allow the specimen to remain in the testing machine in an undisturbed condition at the specified temperature for a period of 60 min. After the 60-min time