Designation: D 545 – 99 (Reapproved 2005)

Standard Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types)[1]

This standard is issued under the fixed designation D 545; 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 These test methods cover the physical properties associated with preformed expansion joint fillers. The test methods include:

Property	Section
Asphalt content	7.5
Boiling in hydrochloric acid	7.4
Compression	7.2
Density	7.7
Expansion in boiling water	7.1
Extrusion	7.3
Recovery	7.2
Water absorption	7.6

1.2 The values stated in inch-pound are to be regarded as standard.

NOTE 1—Specific test methods are applicable only to certain types of joint fillers, as stated herein.

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 consult and 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 147 Methods of Testing Bituminous Mastics, Grouts, and Like Mixtures[3]

D 1037 Test Methods for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials

3. Significance and Use

3.1 The compression resistance perpendicular to the faces, the resistance to the extrusion during compression, and the ability to recover after release of the load are indicative of a joint filler's ability to fill continuously a concrete expansion joint and thereby prevent damage that might otherwise occur during thermal expansion. The asphalt content is a measure of the fiber-type joint filler's durability and life expectancy. In the case of cork-type fillers, the resistance to water absorption and resistance to boiling hydrochloric acid are relative measures of durability and life expectancy.

4. Apparatus

4.1 *Balance*, for weighing joint fillers capable of weighing test specimens within 0.01 g.

4.2 *Mechanical Convection Oven*, capable of maintaining 220 ± 5.0°F [104 ± 3°C].

4.3 *Desiccator*, of sufficient size to accommodate the test specimens.

4.4 *Vernier Caliper*, for measuring length and width of specimens with accuracy within ±0.01 in. [0.25 mm].

4.5 *Dial Micrometer*, or other measuring device, graduated to read in 0.001-in. [0.02-mm] units.

4.6 *Extrusion Mold*—Three-sided steel mold to confine lateral movement of specimens under compression to one side only. Interior dimensions shall be 4 by 4 in. [102 by 102 mm] with permissible variations in length and width of ±0.015 in. [0.38 mm]. Mold sides shall be of such height as to extend at least 0.5 in. [13 mm] above the test specimens. A typical mold can be made from a steel base ½ by 4 by 4 ± 0.015 in. [13 by 102 by 102 ± 0.3 mm] and three bolted steel side plates ¼ in. [6.35 mm] thick, extending approximately 1½ in. [38 mm] above the base plate, thus forming a three-sided open-top box.

4.7 *Template*—One steel template 4 by 4 in. [102 by 102 mm], machined from ½-in. [6.4-mm] steel plate to fit the extrusion mold. The template shall fit the mold within – 0.005 in. [0.13 mm] in length and width.

4.8 *Metal Plate*, 4½ by 4½ in. ± 0.1 in. [114 by 114 ± 2.5 mm] with parallel faces machined from ½-in. [6.4-mm] steel plate.

4.9 *Compression Tester*, either hydraulic- or screw-type equipment with sufficient opening between upper- and lower-bearing surfaces to permit the use of verifying apparatus. The load applied to the test specimen shall be indicated with an accuracy of ±1.0 %. The upper-bearing device shall be a

[1] These methods are under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and are the direct responsibility of Subcommittee D04.34 on Preformed Joint Fillers, Sealers, and Sealing Systems..

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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] Withdrawn.

spherically seated, hardened metal block firmly attached at the center of the upper head of the machine. The center of the sphere shall lie at the center of the surface of the block in contact with the specimen. The block shall be closely held in its spherical seat, but free to tilt in any direction. Load shall be applied without shock at 0.05 in. [1.3 mm] per minute.

4.10 *Extractor Apparatus*, similar to Fig. 1 of Methods D 147 with thermostatically controlled heating element.

5. Sampling

5.1 One representative sample approximately 2 ft ^{2}/1000 ft^2 of joint filler shall be obtained and properly packaged for safe transporting to the testing agency.

5.2 For self-expanding cork joint filler, a minimum of five 4½- by 4½-in. (114- by 114-mm) square specimens properly banded and plastic wrapped at point of manufacture shall be submitted for testing.

6. Preparation of Test Specimens

6.1 For the joint fillers made of cork, sponge rubber, bituminous cork, or fiber, cut five specimens 4 by 4 in. [102 by 102 mm]. Each specimen shall be freshly and squarely cut using a metal plate as a cutting template, as described in 4.7.

6.2 For self-expanding cork only, after boiling the specimens in water as described in 7.1.1, air dry in ambient air 24 h. Then cut specimens to the size described in 6.1.

6.3 Determine the thickness of each specimen to the nearest 0.001 in. [0.03 mm].

7. Procedures

7.1 *Expansion in Boiling Water*:

7.1.1 For self-expanding cork joint filler only, use five of the test specimens supplied by the manufacture as described in 5.2. Determine the thickness of each specimen to the nearest 0.001 in. [0.03 mm]. Immerse the specimens in boiling water for 1 h; remove and allow to cool to room temperature for 15 min. Measure the final thickness of each specimen to the nearest 0.001 in. Calculate the expansion as follows:

$$\text{Expansion, \%, of original thickness} = \frac{A}{B} \times 100 \quad (1)$$

where:

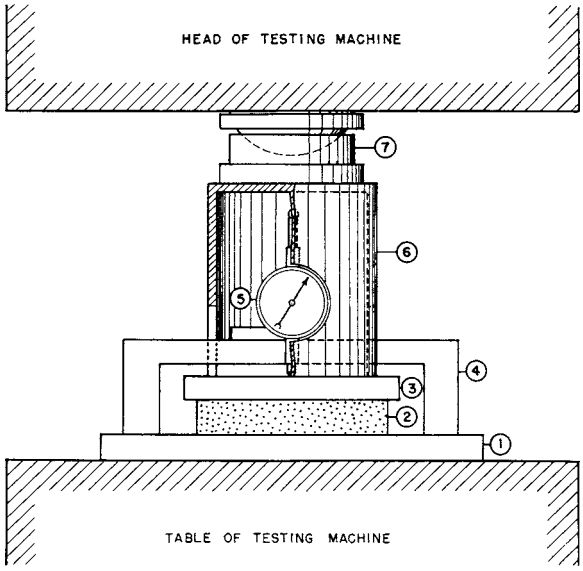
A = thickness in inches after boiling in water and
B = thickness in inches before boiling in water.

7.1.2 Prepare the test specimens for testing as described in 6.2.

7.2 *Recovery and Compression*:

7.2.1 *Test Specimen*—For these tests use one of the specimens prepared and described in 6.1 and 6.2. For the cork, sponge rubber, bituminous cork, and fiber joint fillers make these tests on material as received. If the cork filler fails to meet the specified requirements, make check tests on specimens that have been immersed in water for 24 h and then air-dried at ambient conditions for 24 h. Acceptance is based on the results of the check tests.

7.2.2 *Mounting*—Place the test specimen on a flat metal plate and center a 4- by 4½- by ½-in. [114- by 114- by 13-mm] metal plate, ground to have plane parallel faces, on the top surface of the specimen. Use a simple U-shaped bridge to support a dial gage or other suitable measuring device reading to the nearest 0.001 in. [0.03 mm] above the center of the specimen. Place a hollow metal load transfer cylinder with slots for inserting the U-shape bridge and an opening for reading the measuring device between the moving head of the testing machine and the plate covering the specimen. A typical mounting is shown in Fig. 1, but other suitable devices may be



1—Flat Metal Plate.
2—Specimen.
3—Metal Plate 4½ by 4½ by ½ in. (102 by 102 by 13 mm).
4—U-Shape Bridge.
5—Measuring Device.
6—Hollow Cylinder.
7—Spherical Bearing Block.

FIG. 1 Typical Mounting of the Specimen for Recovery and Compression Tests