



Designation: D5683/D5683M – 95 (Reapproved 2017)

Standard Test Method for Flexibility of Roofing and Waterproofing Materials and Membranes¹

This standard is issued under the fixed designation D5683/D5683M; 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 measures the flexibility of roofing or waterproofing sheet materials or membranes by bending the test material over a block containing arcs of specific radii at a standard temperature.

1.2 The values stated in either 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 the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *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

D1079 Terminology Relating to Roofing and Waterproofing

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology **D1079**.

4. Summary of Test Method

4.1 Bend the five specimens of roofing or waterproofing sheet materials or membrane, conditioned at 4.4°C [40°F], (see **Note 1**), over a block (see **Fig. 1**) designed to provide arcs of equal length with 6-mm [$\frac{1}{4}$ -in.], 13-mm [$\frac{1}{2}$ -in.], 19-mm

[$\frac{3}{4}$ -in.], and 25-mm [1-in.] radii, and the smallest radius is reported where cracking is not observed in any specimen.

NOTE 1—Other test temperatures may be used in addition to the tests required at 4.4°C [40°F], and refrigerated conditioning chambers may be used instead of the water bath specified. Follow procedures outlined in Section 8, if refrigerated chamber is utilized; however, the plastic bag may be omitted.

5. Significance and Use

5.1 This test method is designed to aid those interested in the engineering properties of roofing and waterproofing sheet materials and membranes.

5.2 This test method enables a researcher to measure the relative flexibility of roofing and waterproofing sheet materials and membranes under standard conditions in the laboratory.

5.3 The data obtained from this test method will not permit prediction of the service life of a membrane. Membrane flexibility is important during application, and changes in flexibility are believed to be linked to the performance of roofing and waterproofing membranes, but the actual link between test data and performance is unknown and is dependent on the materials and exposure.

6. Apparatus

6.1 *Water Bath*—A bath with the capacity of at least 10 L [2.5 gal] and capable of maintaining a temperature of 4.4 \pm 0.1°C [40 \pm 0.2°F].

6.2 *Polyethylene Bags*—A sealable plastic bag for conditioning each group of test specimens. Commercial 1-gal sealable polyethylene scrap or food storage bags can perform this function.

6.3 *Test Block*—The test block (see **Fig. 1**) may be made from any hard durable material that conforms to the dimensions shown in **Fig. 1**. It is designed to provide equal arc lengths for arcs with 6-mm [$\frac{1}{4}$ -in.], 13-mm [$\frac{1}{2}$ -in.], 19-mm [$\frac{3}{4}$ -in.], and 25-mm [1-in.] radii.

7. Sampling

7.1 This test method requires a total of one 152 by 305-mm [6 by 12-in.] sample from the sheet material or membrane.

¹ This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.20 on Roofing Membrane 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.

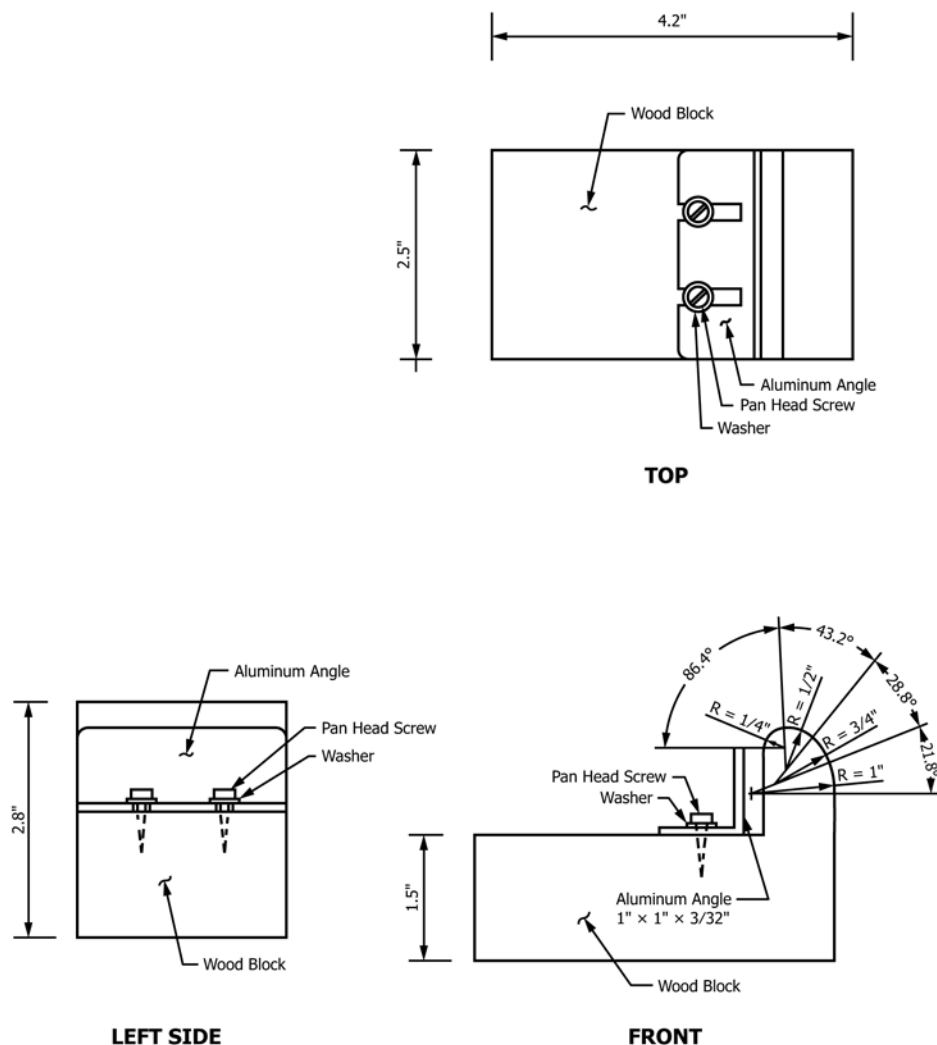


FIG. 1 Test Block

7.2 Cut five 25 by 152-mm [1 by 6-in.] specimens in the machine direction (the length) and five 1 by 6-in. specimens in the cross direction (the width) of each sample.

8. Procedure

8.1 Exclude as much air as possible and seal each group of five specimens in a plastic bag.

8.2 Condition the specimens in each plastic bag in a water bath at $4.4 \pm 0.1^\circ\text{C}$ [$40 \pm 0.2^\circ\text{F}$] for at least 1 h.

8.3 One at a time, remove the specimens from the conditioning medium. Quickly clamp a narrow end of the specimen to the test block (see Fig. 1) with thumb pressure on the sliding angle clamp, with the side most likely to crack (usually the side intended for exposure to the weather) of the sample upward. Bend the specimen over the test block with a smooth movement requiring 2 ± 1 s, and hold in place over the radius bend for 15 ± 1 s. Record the smallest radius where cracking is not evident to the unaided eye. For the purposes of this test method, any surface crack longer than 3 mm [$1/8$ in.] is considered failure at the radius where the crack appears (see Note 2).

NOTE 2—After initial testing, tested specimens may not be utilized for successive testing at lower or higher temperatures.

9. Report

9.1 Report the following information:

9.1.1 Complete specimen identification, orientation, and the smallest radius where none of the test specimens cracked. The report assumes testing at 4.4°C [40°F].

9.1.2 Report the results of testing at any additional temperature.

9.2 If none of the specimens cracked, report flexibility “less than 6-mm [$1/4$ -in.] radius”.

9.3 If any test specimens break at 25 mm [1 in.] or prior to testing, report “too brittle for test.”

10. Precision and Bias

10.1 *Precision:*

10.1.1 *Repeatability*—Duplicate values by the same operator shall not be considered suspect unless they differ by more than 6 mm [$1/4$ in.].

10.1.2 *Reproducibility*—The values reported by two laboratories, representing the arithmetic average of five determinations, shall not be considered suspect unless they differ by more than 13 mm [$\frac{1}{2}$ in.].

10.2 *Bias*—The flexibility measured by this test method has no bias, because the value is only determined by this test method.

11. Keywords

11.1 cracking resistance; flexibility; roofing membrane; waterproofing membrane

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