Designation: D7051 – 05 (Reapproved 2020)

Standard Test Method for Cyclic Thermal Shock of SBS-Modified Bituminous Roofing Sheets with Factory-Applied Metal Surface[1]

This standard is issued under the fixed designation D7051; 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 measurement of movement due to cyclic thermal exposure of SBS (styrene-butadiene-styrene)-modified bituminous sheets with a factory-applied metal foil surface.

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

1.4 *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]

C552 Specification for Cellular Glass Thermal Insulation

D41/D41M Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

D312/D312M Specification for Asphalt Used in Roofing

D5147/D5147M Test Methods for Sampling and Testing Modified Bituminous Sheet Material

3. Summary of Test Method

3.1 This test consists of exposing two specimens of 2000 ± 5 by 90 ± 5 mm (78.7 ± 0.2 by 3.5 ± 0.2 in.) to cycles of temperature produced by infrared radiation. The variation in the specimen length dimension is measured in relation to the number of cycles and temperature variation. This test applies to metal foil surfaced SBS-modified bitumen roofing sheets.

4. Significance and Use

4.1 This test method is used to determine the dimensional changes and physical stability of the product upon exposure to specified cyclic thermal conditions. It is also useful in determining the integrity of the bond between the metal foil and the SBS-modified bituminous compound.

5. Apparatus

5.1 The apparatus and test assembly as shown in Figs. 1-4 consist of the following components.

5.2 A hollow metal, rigid support or base on which the test sample is mounted, hereafter referred to as the shock table. The base shall be 2110 ± 25 mm long by 280 ± 25 mm wide by 125 ± 13 mm tall (83 ± 1.0 in. long by 11 ± 1.0 in. wide by 5 ± 0.5 in. tall). The shock table shall have water inlet and outlet attachments mounted such that the support is always full of circulating water. This is done to avoid expansion or contraction of the shock table during the test.

NOTE 1—The support can be easily constructed by welding two pieces of wide channel iron together with the addition of end plates.

5.3 Mounting brackets for the measuring devices shall be attached to the shock table such that the measuring device is level with and facing the metal reference tabs attached to the foil surface of the specimens (see 6.4).

5.4 Linear transducers, or dial indicators, accurate to 10 µm (0.4 mil) shall be used to measure the change in distance between the adhered metal reference tab and the mounted indicator.

5.5 Six or more 250 W infrared heating lamps are mounted above the support equally spaced across the 2000 mm (79 in.) test length.

NOTE 2—The number of lamps is not critical as long as the temperature is accurate and consistent.

5.6 Sheet metal panels, or other suitable protection, shall be mounted on the sides and ends of the hollow support to reduce drafts and temperature fluctuations during the test. The panels should be easily removed to allow for daily observations of the test assembly.

[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.04 on Felts, Fabrics and Bituminous Sheet Materials.

Current edition approved Oct. 1, 2020. Published October 2020. Originally approved in 2005. Last previous edition approved in 2013 as D7051 – 05 (2013). DOI: 10.1520/D7051-05R20.

[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.

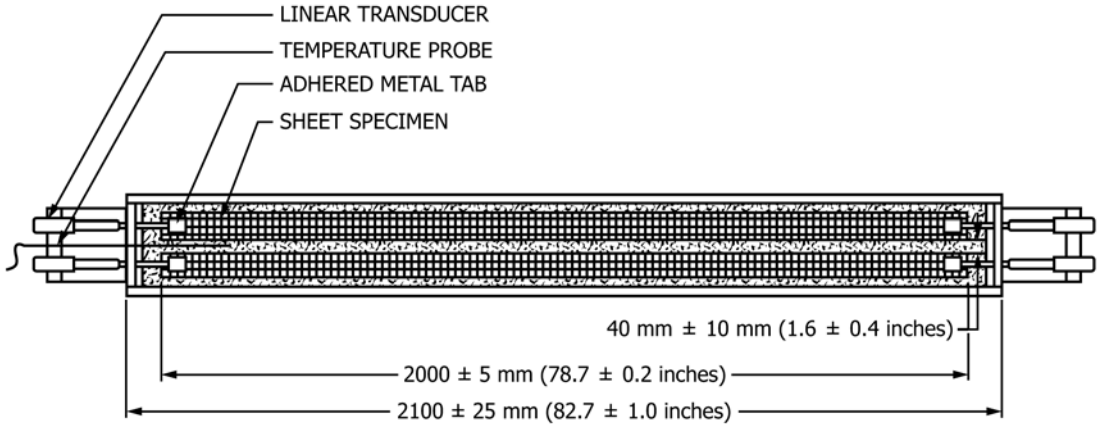

FIG. 1 Shock Table—Top View

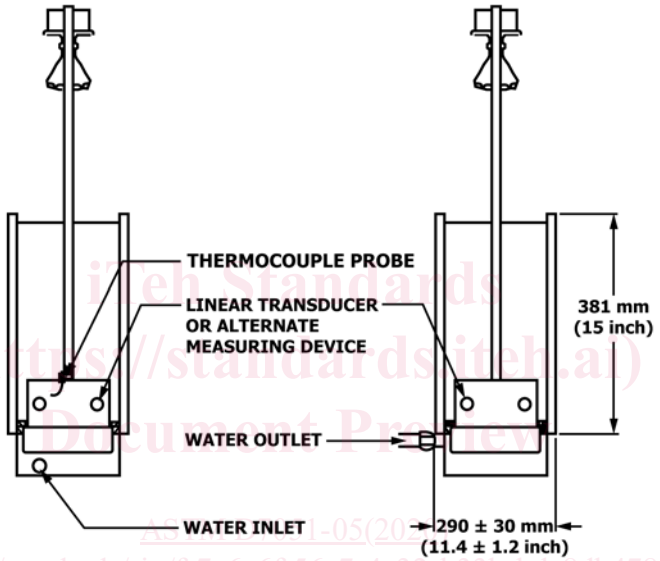

FIG. 2 Shock Table—End Views

5.7 A regulating system shall be used to maintain the timing of the heating and cooling cycles. Temperature may be maintained automatically or manually, but the temperature shall be measured using thermocouples.

6. Preparation of Apparatus

6.1 The top surface of the shock table shall be primed with Specification D41/D41M asphalt primer and allowed to dry. Specification C552 Type IV, board cellular glass thermal insulation 38 mm (1.5 in.) thick shall be cut to fit the shock table. The cellular glass insulation shall then be bonded to the primed metal base with Specification D312/D312M Type IV asphalt.

6.2 Place the thermocouples on the insulation surface and, with side shields in position, adjust the height of the infrared heating lamps until the test temperature is attained. This will serve as the initial lamp height. Remove the thermocouples.

6.3 Test specimens of the SBS metal foil surfaced SBS-modified bitumen sheets are bonded directly to the cellular glass insulation using a pour and roll method with a Specification D312/D312M Type IV asphalt applied at 218 ± 14 °C (425 ± 25 °F). The specimens are applied parallel to each other, and shall be separated by a distance of 40 ± 10 mm (1.6 ± 0.4 in.). If polyolefin film backing exists, it shall be carefully melted away and dusted with a parting agent before applying the specimens with asphalt.

6.4 Metal reference tabs, minimum 0.5 mm (28 ga) thick, shall be attached to the foil surface at both ends of each specimen, and shall be used as the reference points. The metal reference tabs shall be bent at a 90° angle, and shall be adhered using a two-component epoxy adhesive. See Figs. 1-3 for metal tab shape and placement.

6.5 After adhering the metal reference tabs, paint the foil surface of the specimens using flat black spray paint. The paint provides for consistent surface temperature regardless of the metal foil type. Avoid painting the index tabs.

7. Conditioning

7.1 Condition test specimens according to Test Methods D5147/D5147M.

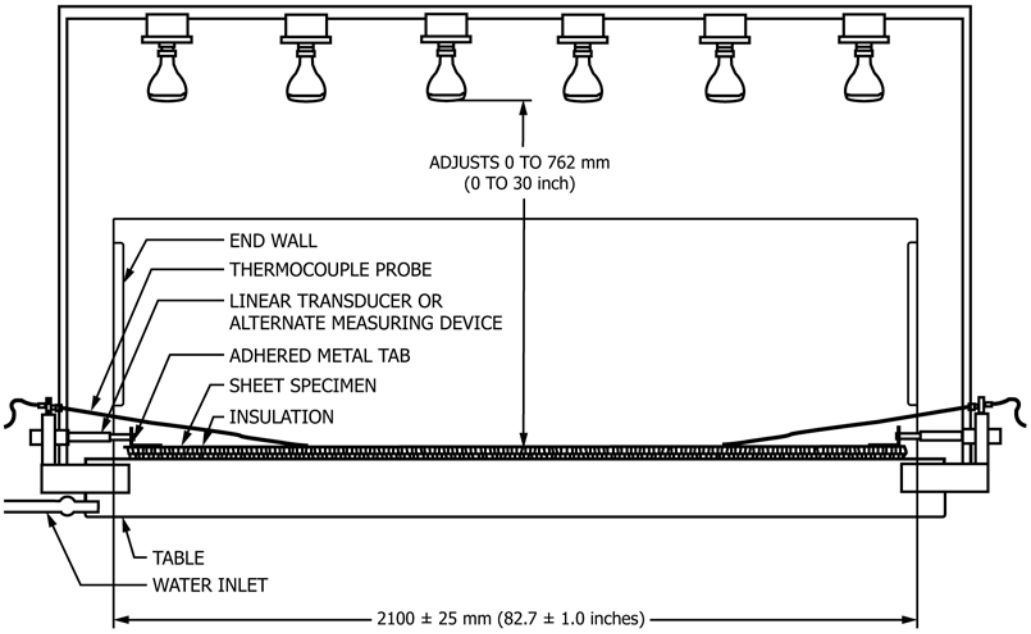

FIG. 3 Shock Table—Side View

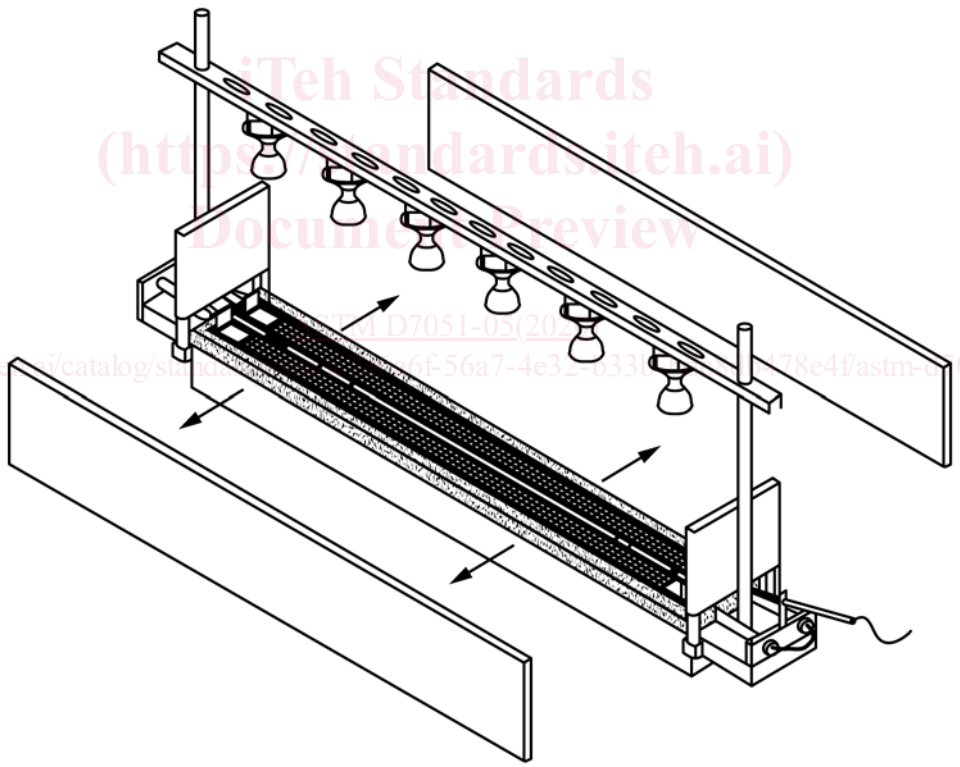

FIG. 4 Shock Table—ISO View

8. Procedure

8.1 Linear transducers or dial indicators shall be mounted to the metal base facing the metal reference tabs that are adhered to the test specimens. See Figs. 1-4. The change in dimensional movement shall be measured between these two reference points.

8.2 Position a minimum of two thermocouples on the surface of the specimens. The average temperature from the thermocouples shall be used to control the surface temperature of specimens at 73 ± 5 °C (163 ± 9 °F). Prior to the first heating cycle, measure and record the initial gap setting between the reference points and use this as the zero point.