



Standard Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens¹

This standard is issued under the fixed designation D5635/D5635M; 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 evaluation of the maximum dynamic puncture load that roofing membrane samples can withstand, without allowing the passage of water, when subjected to impact from a rigid object having a sharp edge.

1.2 This laboratory test can be conducted at any desired temperature using membrane samples manufactured in a factory or prepared in a laboratory.

1.3 Roof membrane specimens to which the test method is applicable include bituminous built-up, polymer-modified bitumens, vulcanized rubbers, non-vulcanized polymeric, and thermoplastic materials.

1.3.1 The applicability of this test method to these membrane specimens includes their use in vegetative roof systems.

1.4 This test method is not applicable to aggregate-surfaced membrane specimens; however, it is applicable to specimens having factory-applied granules.

1.5 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.

1.6 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

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.

C578 Specification for Rigid, Cellular Polystyrene Thermal Insulation

D1079 Terminology Relating to Roofing and Waterproofing

3. Terminology

3.1 Definitions:

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

4. Summary of Test Method

4.1 The roofing membrane test specimen, set on a thermal insulation substrate, is subjected to a predetermined dynamic impact load created by a rigid falling puncture head. The head falls through a quarter-circle trajectory from a vertical position to horizontal position under gravitational acceleration.

4.2 The puncture energy is increased from 5 to 50 J [119 to 1190 ft-pdl] in 2.5 J [59.4 ft-pdl] increments until puncture of the membrane specimen occurs or until the maximum energy is reached.

4.3 Puncture of the test specimen is assessed by visual examination and verified by conducting a watertightness test.

5. Principle of the Test Method

5.1 The energy at impact is equated to the potential energy of the raised puncture head as follows:

$$E = mgH \quad (1)$$

where:

m = mass of the puncture head (in kg or lbm),
 g = gravitational acceleration (in m/s^2 or ft/s^2), and
 H = height through which the puncture head falls (in metres or feet).

In this test method, the height is fixed at 0.51 m [1.67 ft]. With gravitational acceleration being equal to 9.8 m/s^2 [32 ft/s^2], the impact energy is, thus, equal to the following:

$$E = 5 \cdot m \quad (2)$$

where:

m = kg.

or

$$E = 53.4 \cdot m \quad (3)$$