Designation: ~~D3161/D3161M – 12~~ D3161/D3161M – 13

Standard Test Method for Wind-Resistance of ~~Asphalt Shingles~~ Steep Slope Roofing Products (Fan-Induced Method)[1]

This standard is issued under the fixed designation D3161/D3161M; 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 ~~This~~This test method covers the procedure for evaluating the wind resistance of as~~phalt shingles m~~any discontinuous, air permeable, steep slope roofing products that results from the ~~shingle's rigidity (with~~product's rigidity, with or without contribution from ~~sealant) or mechanical interlocking (with~~sealant or other adhesive to help hold down the leading edge of the tabs, or mechanical interlocking, with or without contribution from ~~sealant) or~~ sealant or other adhesive to help hold down the leading edge of the tabs, or any combination thereof. The ~~shingles~~products are applied to a test panel in accordance with the manufacturer's instructions and tested at a 2:12 (17 %) slope, or at the lowest slope permitted by those instructions.

1.2 This method evaluates wind resistance using a fan-induced procedure, delivering a stream of air across the exposed surface of the test specimens. This method does not measure structural performance, and does not provide a measure of uplift resistance. Consequently, this method is not applicable to continuous, non-permeable roof systems or coverings (such as membranes or mechanically-seamed metal roof panels).

1.3 This test method is limited to steep slope roofing product applied with a maximum exposure of 410 mm (16 in.).

NOTE 1—This test method was formerly titled "Wind Resistance of Asphalt Shingles (Fan-Induced Method)" but was revised to acknowledge that the method is applicable to many other steep slope roofing products and has been used to evaluate the wind resistance of those products for many years by several testing and certification laboratories, Products that have been tested by this method, in addition to asphalt shingles, include polymer-based shingles, fiber-cement shingles, concrete tiles, clay tiles, metal shingles, and photovoltaic shingles. The terms steep slope roofing products, or product, are used throughout this standard to include all of these types of steep slope roofing products.

1.4 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.

1.5 *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]

D1079 Terminology Relating to Roofing and Waterproofing

3. Terminology

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

3.2 *Definitions:*

3.2.1 *seal*—as it relates to steep slope roofing products, is the bonding that results from the use of sealant.

3.2.2 *sealant*—as it relates to steep slope roofing products, is defined as factory-applied or field-applied material designed to help hold down the leading edge of the tabs.

[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.02 on Steep Roofing Products and Assemblies.

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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.

3.2.3 *sealed*—the condition of the products after they are subjected to the conditioning procedure described in 8.2.

3.2.4 *tab, n*—a discrete section of the exposed portion of a steep slope roofing product.

3.2.4.1 *Discussion*—

Typically, the exposed portion of an asphalt shingle consists of one or more tabs. Many other steep slope roofing products consist of a single tab per unit.

4. Classes of ~~Shingles~~ Steep Slope Roofing Products

4.1 ~~Shingles~~Products are of three classes:

4.1.1 *Class A*—Pass at a test velocity of 97 km/h [60 mph].

4.1.2 *Class D*—Pass at a test velocity of 145 km/h [90 mph].

4.1.3 *Class F*—Pass at a test velocity of 177 km/h [110 mph].

5. Significance and Use

5.1 Most ~~asphalt shingles~~ steep slope roofing products that have demonstrated wind resistance by this test have also performed well in use. Natural wind conditions differ with respect to intensity, duration, and turbulence; these conditions are beyond the means of this test to simulate. The results of this test do not directly correlate to wind speeds experienced in service, and no accommodation is made in this test method for building height, building exposure category, or building importance factor.

5.2 Many factors influence the wind resistance of ~~shingles~~ a steep slope roofing product in the field; for example, temperature, time, roof slope, contamination by dirt and debris, and ~~fasteners~~ fasteners, both appropriate and inappropriate, that are misaligned or ~~under-driven.~~ misplaces, or over- or under-driven, and sealant adhesion, if used and functioning. It is beyond the scope of this test method to address all of these influences. This test method is designed to evaluate the wind resistance of ~~asphalt shingles~~ products as described in the scope when representative samples are applied to test panels in accordance with the manufacturer's instructions and conditioned as specified before testing.

6. Apparatus

6.1 *Test Machine,* capable of delivering a horizontal stream of air through a rectangular opening 914 mm [36 in.] wide and 305 mm [12 in.] high at a velocity not less than 97 km/h [60 mph]. At a velocity of not less than 177 km/h [110 mph], it is permissible to add a duct section to the equipment to lower the height of the rectangular opening to 152 mm [6 in.]. The machine shall be equipped with an adjustable stand to receive a test panel and be adapted to setting the test panel at any desired slope, at any horizontal distance from the lower edge of the duct opening, and at various angles incident to the wind direction.

6.1.1 *Calibration*—As a minimum, at the start of each test day, and at the start of each new desired test velocity, the air velocity shall be calibrated. Obtain calibration measurements using a bare panel as described in 7.1, ~~but without shingles~~ or the test panel with the candidate ~~shingles~~product to be tested. With the panel positioned as described in 9.1, the velocity shall be measured using calibrated airflow measuring devices, such as pitot tubes or airflow anemometers. Velocity measurements shall be taken at a minimum of three evenly spaced locations across the duct orifice. The average measured velocity shall not vary more than ±5 mph from the target test velocity selected to achieve the desired class of ~~shingle.~~product.

6.2 *Timer,* capable of reading to the nearest minute.

6.3 *Mechanical Circulation Conditioning Cell or Room,* having forced circulation of air capable of receiving a 1.27-m [50-in.] wide by 1.68-m [66-in.] long, or larger test panel on a slope of 2:12 (17 %), or the lowest slope recommended in the product manufacturer's installation instructions, and of maintaining a uniform temperature of 57 to 60°C [135 to 140°F].

7. Test Samples

7.1 The test panels shall be of plywood, tightly matched sheathing boards, or other suitable decking material and not less than 1.27 by 1.68 m [50 by 66 in.] in size. They are to be of such rigidity that they will not twist or distort with normal handling, or vibrate from the wind velocity during the test.

7.2 Apply ~~shingles~~ the product to duplicate panels, parallel to the short dimension of the panel, in the normal manner recommended by the manufacturer. Use roofing nails, or other fasteners specified, or allowed, by the manufacturer, properly positioned in accordance with the manufacturer's instructions, to fasten ~~each shingle.~~ the product to the test panel. Do not apply ~~roofing cement~~ sealant or adhesive to fasten down tabs unless required by the manufacturer's installation instructions. Do not apply pressure to the ~~shingle tabs~~ product either during or after ~~application.~~ application unless required by the manufacturer's instructions.

7.3 Apply ~~lock-type shingles~~interlocking-type product to an additional two panels, parallel to the short dimension of the panel, in accordance with the manufacturer's instructions.