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Standard Test Method for Wind-Resistance of Asphalt Shingles (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 test method covers the procedure for evaluating the wind resistance of asphalt shingles that results from the shingle's rigidity (with or without contribution from sealant) or mechanical interlocking (with or without contribution from sealant) or any combination thereof. The shingles 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.

~~1.2The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.~~

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 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.

4. Classes of Shingles

4.1 Shingles are of three classes:

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

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

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

5. Significance and Use

5.1 Most asphalt shingles 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 in the field; for example, temperature, time, roof slope, contamination by dirt and debris, and fasteners that are misaligned or under-driven. 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 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.

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[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 Prepared Roofings, Shingles and Siding Materials.~~

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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.

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 test velocity shall not vary more than ±5 mph as measured at a minimum of three evenly spaced locations across the orifice. 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.~~ , 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 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.

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.)~~[50-in.] wide by 1.68-m ~~(66-in.)~~[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~~[135 to ~~140°F).~~ 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~~[50 by 66 ~~in.)~~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 to duplicate panels, parallel to the short dimension of the panel, in the normal manner recommended by the manufacturer. Use roofing nails, properly positioned in accordance with the manufacturer's instructions, to fasten each shingle. Do not apply roofing cement to fasten down tabs unless required by the manufacturer's installation instructions. Do not apply pressure to the shingle tabs either during or after application.

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

7.4 Secure the shingles at the outer edge of each test panel by exposed nailing to simulate anchoring at the rake edges of a roof deck.

7.5 Control the temperature at 27 ± 8°C ~~(80~~[80 ± ~~15°F)~~15°F] and maintain the slope of the panel at 2:12 (17 %), or the lowest slope recommended in the product manufacturer's installation instructions, during application of the shingles.

8. Conditioning of Shingle Test Panels

8.1 Maintain the test panels at a slope of 2:12 (17 %), or the lowest slope recommended in the product manufacturer's installation instructions, and at a temperature of 27 ± 8°C ~~(80~~[80 ± ~~15°F)~~15°F] until beginning heat conditioning.

8.2 Place the test panels in the conditioning cell or room on a slope of 2:12 (17 %), or the lowest slope recommended in the product manufacturer's installation instructions, and maintain at a temperature of 57 to 60°C ~~(135~~[135 to ~~140°F)~~140°F] for a continuous period of 16 h.

8.3 After completion of the conditioning period, allow the test panels to come to room temperature 27 ± 8°C ~~(80~~[80 ± ~~15°F)~~15°F] while being maintained at a slope of 2:12 (17 %), or the lowest slope recommended in the product manufacturer's installation instructions.

8.4 Exercise care to avoid pressure on, or damage to, shingle tabs by any twisting or distortion of the test panels in handling.

9. Test Procedure

9.1 *Location of the Test Panel*—Install the panel on the test carriage and accurately adjust it in relation to the duct so that the exposed edge of the target course will be on the same level as the lower edge of the duct orifice at a horizontal distance of 178 ± 1 mm ~~(7~~[7 ± 1⁄16 ~~in.).~~in.]. The target course shall be the third course up from the bottom of the panel. The test slope shall be 2:12 (17 %) or the lowest slope recommended by the manufacturer for the product being tested.

9.1.1 Test a minimum of two panels for each product being tested.

9.1.2 Since the design of lock-type shingle makes it difficult to determine the most critical angle of wind direction, conduct the test at a minimum of three different angles using a separate panel for each test (head-on, with the bottom of the target course parallel to and 178 mm ~~(7 in.)~~[7 in.] away from the machine orifice; and with the panel rotated 30 and 60° from the head-on