

Shingle specification

Care must be taken when specifying asphalt shingles for wind resistance

by Mark S. Graham

Properly specifying the wind resistances of asphalt shingles can be more complex than most designers may realize. Further complicating the situation, many building codes currently do not implement asphalt shingles' wind-resistance test methods consistent with how test methods are written.

Wind resistance

Wind resistances of asphalt shingles are tested and classified using two test methods: ASTM D3161 and ASTM D7158.

ASTM D3161, "Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method)," is a fan-induced wind method. The current edition was published in 2016 (ASTM D3161-16).

According to ASTM D3161, asphalt shingles are classified as Class A if they pass at a test velocity of 60 mph, Class D if they

pass at a test velocity of 90 mph or Class F if they pass at a test velocity of 110 mph.

ASTM D3161 specifically indicates the results and classifications derived from the test method do not directly correlate to wind speed experiences in service, and no accommodation is made in the test method for building height, building exposure category or building importance factor. It generally is recognized these factors can notably affect wind loads on steep-slope roof assemblies.

ASTM D7158, "Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method),"

was developed based on research conducted for the Asphalt Roofing Manufacturers Association during the late-1990s, and it first became an ASTM International test method in 2005. The current edition is ASTM D7158-11.

According to ASTM D7158, asphalt shingles are classified as Class D if they pass at a basic wind speed of 90 mph, Class G if they pass at a basic wind speed of 120 mph or Class H if they pass at a basic wind speed of 150 mph.

ASTM D7158 specifically indicates the calculations that support its classifications use standard building environmental factors, including the three-second wind-gust exposure from ASCE 7-02, "Minimum Design Loads for Buildings and Other Structures," an assumption of installation of use category I or II buildings 60 feet tall or less, and ground roughness B or C. For buildings greater than 60 feet tall, of use categories III or IV, or in ground roughness D, additional calculations are necessary. Designers should consult specific asphalt shingle manufacturers for the coefficient values to complete the necessary calculations.

Code requirements

Although the 2012 and 2015 editions of the International Building Code (IBC) permit using either ASTM D3161 or ASTM D7158 for determining asphalt shingles' wind resistances, both editions base their wind maps and load determination methods on ASCE 7-10. ASCE 7-10's wind speed maps are ultimate design wind speeds having 300-, 700- or 1,700-year recurrence intervals. This creates a conflict because ASTM D3161 and ASTM D7158 use basic wind speeds based upon ASCE 7-02's 50- and 100-year return.

ASCE 7-10's ultimate design wind speeds are somewhat higher than ASCE 7-02's basic wind speeds.

IBC 2012 and IBC 2015 include tables for converting ASCE 7-10's ultimate design wind speeds (designated as V_{ult}) to nominal design wind speeds (designated as V_{asd}). Use of the conversions in these tables permits ASTM D3161's and ASTM D7158's classifications to be used with ASCE 7-10's ultimate design wind speed maps.

Closing thoughts

Asphalt shingle roof system designers should be aware of the differences between ASTM D3161 and ASTM D7158 and the limitations of the resulting classifications from each test method. Designers also should take into account the necessary conversion of ASCE 7-10's ultimate design wind speeds used in IBC 2012 and IBC 2015 to nominal design wind speeds when specifying appropriate wind-resistance classifications for asphalt shingle roof systems.

Additional information about properly specifying asphalt shingle roof systems is contained in the Asphalt Shingle Roof Systems Section of *The NRCA Roofing Manual: Steep-slope Roof Systems—2013*.

ASTM International is balloting a revision to ASTM D7158 that would convert the standard's classifications from basic wind speeds to ultimate design wind speeds, such as those used in ASCE 7-10. If the ballot is approved, the updated edition of ASTM D7158 likely would first be incorporated into IBC 2018. 🌐🔗

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