Wind resistance of asphalt shingles

by **Mark S. Graham**

Asphalt shingle roof system performance during high-wind conditions has come under increased scrutiny during recent years. Following the relatively poor performance of asphalt shingles during a number of high-wind events, including Hurricane Andrew in Florida in 1992 and Hurricane Bertha in South Carolina in 1996, building insurers, code officials and roofing professionals have taken a renewed interest in asphalt shingle roof system wind resistance.



ASTM D 3161/UL 997

Currently, asphalt shingle roof system wind resistance is tested in accordance with two similar, recognized standards: the American Society for Testing and Materials (ASTM) Standard D 3161, "Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method)" or Underwriters Laboratories Inc. (UL) 997, "Standard for Wind Resistance of Prepared Roof Covering Materials."

For both these test method standards, asphalt shingle test panels that measure 50 inches (1.3 m) wide by 66 inches (1.7 m) long are subjected to sustained fan-induced wind speeds of 60 mph (27 m/s) for two hours. A test panel assembly is considered to have passed the test when the full shingle tabs are restrained from lifting or the locking ears (e.g., interlocking shingles) are not torn loose or disengaged during the test.

Building codes

The model building codes (i.e., *Uniform Building Code, Standard Building Code [SBC]* and *The BOCA* [Building Officials and Code Administrators International Inc.] *National Building Code [BNBC]*) historically have addressed wind resistance of asphalt shingle roof systems with prescriptive, rather than performance-based, requirements. This language dictates, for example, that asphalt strip shingles be secured to a roof deck with a minimum of four fasteners per strip shingle. For certain high-wind situations, several model building codes require the use of six fasteners for asphalt strip shingle installation.

Although the model building codes typically have allowed asphalt shingle roof systems to be installed according to these prescriptive fastening requirements, most other roof systems are required to be performance-tested to withstand specific wind uplift pressures. These uplift pressures are based, in part, on code-prescribed design wind speeds of 80 to 110 mph (36 to 49 m/s) for the continental United States.

BNBC's 1999 edition includes significant revisions impacting the wind resistance requirements for asphalt shingle roof systems. Specifically, the provision allowing the prescriptive fastening requirements (e.g., four fasteners per strip shingle) to satisfy the wind uplift requirements has been removed.

Asphalt shingle roof systems now must be designed to resist basic wind speeds (i.e., 80 to 110 mph [36 to 49 m/s]) adjusted for building height above grade, building exposure, wind-gust effect and wind-importance factor (i.e., a classification of a building's relative hazard risk) as prescribed by the code. Similarly, the Southern Building Code Congress International Inc. included a change in *SBC*'s 1999 edition.

As a result of these code changes, existing wind test results for asphalt shingles based on ASTM D 3161 or UL 997 are deficient in satisfying the intent of the building codes' wind uplift resistance provisions.

Roofing professionals should realize there currently is little or no scientific correlation between using four or six fasteners to attach asphalt shingles and satisfying the codes' prescribed wind speeds or wind uplift pressure requirements.

Further research

Several asphalt shingle manufacturers, along with the Asphalt Roofing Manufacturers Association, are conducting research to determine and test the wind resistances of asphalt shingle roof systems for the purpose of compliance with building code requirements.

The initial phase of this research work is complete, and a second phase, intended to address specific shingle products, currently is under way. (For more information, readers should refer to "Symposium offers technical information," March issue, page 60.) The researchers indicate they intend to complete the research and have the necessary documentation available to submit to building code officials by early 2000.

Cause for concern

Until further research is completed and accepted by building code officials in jurisdictions that adopt *BNBC 1999* or *SBC 1999*, roofing professionals should realize they probably will not be able to install asphalt shingles and comply with building codes' intent. Because noncompliance with a building code has specific legal implications, including potential liability for related failure, this issue is of particular concern to the roofing industry.

Roofing professionals are urged to encourage asphalt shingle manufacturers and suppliers to supply asphalt shingle products and installation instructions to comply with the building codes' intent. Also, roofing professionals should attempt to have asphalt shingle manufacturers and suppliers share their potential code-related liability. One way to accomplish this is to include hold-harmless language in purchase orders or contracts in which roofing professionals specify or purchase asphalt shingle products. PR

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