Concerns with field uplift testing

by Mark S. Graham

NRCA recently learned of at least one insurance carrier and several consultants who are beginning to mandate field testing of newly installed low-slope membrane roof systems in hurricane-prone regions in an attempt to verify in-place wind-uplift resistances. I briefly will review the recognized field test methods, explain their limitations and share NRCA's opinion of this type of quality-assurance testing.

ASTM E907/FM 1-52

There are two recognized field test methods for determining uplift resistances of membrane roof systems: ASTM E907, "Standard Test Method for Field Testing Uplift Resistance of Adhered Membrane Roofing Systems," and FM Global Property Loss Prevention Data Sheet 1-52, "Field Uplift Testing."

Both test methods are largely similar and provide for affixing a 5- by 5-foot dome-shaped chamber to the top side of a roof surface and applying a defined negative pressure to the roof surface inside the dome using a vacuum. During the tests, membrane surface deflection is measured and visually monitored to determine whether the membrane passes or fails.

One significant difference between ASTM E907 and FM 1-52 is the tests' pass/fail criteria. For ASTM E907, a roof system specimen is considered to have failed when the roof system has deflected upward 25 mm (about 1 inch). Using FM 1-52, a specimen is considered to have failed when it deflects more than ¼ of an inch.

Also, the scope of ASTM E907 limits its applicability to adhered membrane roof systems. FM 1-52 includes instructions for testing adhered built-up, adhered single-ply and mechanically attached single-ply membrane roof systems. For testing mechanically attached single-ply membrane roof systems, FM 1-52 allows for an effective test area to be limited to one mechanical fastener at its full fastener-to-fastener span (tributary area).

ASTM E907 and FM 1-52 require a minimum of two tests per roof area. For roof areas of 50 squares to 100 squares, ASTM E907 requires four tests. For roof areas larger than 100 squares, ASTM E907 requires and FM 1-52 recommends an additional test for each additional 100 squares of roof area or portion.

Test results' variability

The reliability of the results derived from ASTM E907 and FM 1-52 is of concern, especially when the tests are used for quality-assurance purposes. For example, a note in ASTM E907 indicates: "Deflection due to negative pressure potentially will vary at different locations because of varying stiffness of the roof system assembly."

In my experience with this test, I have found problems with test chamber placement relative to insulation board joints and fasteners, and lap seams in the membrane can affect the test results. Also, issues such as physical movement of the test operator and any witnesses on the roof surface while the test is conducted, an exterior door of the building opening or closing, or the building's mechanical systems cycling on or off while a test is being conducted significantly can affect the test results. These variances can change passing test results to failures.

Also, test chamber size and number of tests are not representative of a roof area. One test, two tests or four tests—which analyze a total of only 25 square feet, 50 square feet or 100 square feet, respectively, of roof area—are not statistically representative of 100 squares. And it is absurd for FM Global to think the results for one fastener in a mechanically attached single-ply system represent up to 100 squares.

NRCA's viewpoint

Based on its concerns with these test methods and reliability of their results, NRCA believes the use of ASTM E907 or FM 1-52 is inappropriate for quality-assurance purposes. Furthermore, NRCA cautions roofing professionals about using these test methods or entering into contracts that require performance assessment using these test methods.

NRCA maintains the best, most reliable means of assessing the quality of a newly installed roof system is through continuous observation of the application by a knowledgeable roofing professional at the time of installation. This viewpoint is shared by the Asphalt Roofing Manufacturers Association and SPRI.

Quality Control Guidelines for the Application of Built-up Roofing, *Quality Control Guidelines for the Application of Polymer-modified Bitumen Roofing* and *Quality Control Guidelines for the Application of Thermoset Single-ply Roof Membranes* contain detailed guidelines for quality control and quality-assurance assessment of new roof applications. They can be purchased at shop.nrca.net.

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