

Concerns with impact testing

Testing may not replicate products' hail-resistance performance

by Mark S. Graham

IN MANY U.S. REGIONS, the ability of roofing products to resist hail damage is an important performance consideration. Currently, two test methods—UL 2218 and FM 4473—are frequently used to assess products' impact resistances. However, limitations in these test methods may preclude the tests from accurately measuring products' hail-resistance performance.

UL 2218

UL 2218, "Standard for Impact Resistance of Prepared Roof Covering Materials," provides for impact-resistance data for the evaluation of prepared roof covering products. Examples of prepared roof covering products include asphalt, wood, tile, fiber-cement, plastic and metal shingles.

With this standard's test method, a 3-by 3-foot specimen of newly manufactured (nonweathered) roof covering is subjected to impacts from steel balls of varying sizes dropped from specific heights at standard laboratory conditions. The masses of the steel balls combined with the drop heights are said to represent hail's kinetic energy.

A specimen is said to have passed the test when it withstands two coincident drops from a steel ball of a specified size at each of six locations selected based on examination for vulnerability. The exposed and back surfaces and underneath layers of the roof covering should show no evidence of tearing, fracturing, cracking, splitting, rupturing, crazing or opening.

Cosmetic damage in and of itself should not be determined to be a failure of the test.

Products passing UL 2218 are eligible to be classified by Underwriters Laboratories (UL) Inc. UL has four levels of impact-resistance classifications, with Class 1 being the lowest classified level and Class 4 being the highest.

FM 4473

FM 4473, "Specification Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls," provides for testing, procedures for evaluating and classification of new rigid roofing materials. For the purposes of this test method, rigid roofing materials include clay and concrete tile and slate.

With this test method, pre-molded ice balls of defined sizes are launched onto a 3-by 3-foot specimen of newly manufactured material at temperatures maintained between 60 F and 90 F. The masses and propelled velocities of the ice balls are said to represent hail's kinetic energy.

A product passes the test when it shows no visual evidence of cracking or breaking after two coincident impacts at two or more locations.

Passing products are eligible to be classified by FM Approvals as Class 1, 2, 3 or 4, with Class 1 being the lowest level of impact resistance and Class 4 being the highest.

Concerns

Although UL 2218 and FM 4473 provide means for testing and classifying the impact resistances of certain roofing products, they are not necessarily true indicators of products' hail resistances.

And though UL 2218 uses steel balls and FM 4473 uses ice balls to replicate hail and these are reportedly propelled with kinetic energies consistent with actual hail, I have not seen actual data that makes this correlation.

Also, the impact-resistance testing is done on new, unweathered products at standard room temperatures. Hail rarely impacts brand-new roofs or at steady, moderate exposure temperatures. In fact, hail typically occurs during rapidly decreasing temperatures, oftentimes accompanied by cooling rains, resulting in large thermal stresses on roof surfaces at the time of impact.

Exposing roofing products to the elements during extended time periods is known to significantly decrease most roofing products' hail resistances.

For these reasons, I caution you against representing specific roofing products as being "hail-tested" or "hail-resistant." Representing a product as being impact-tested to a specific test method and bearing a specific classification is more accurate and prudent. 

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