Getting up to Code on Low-Slope Roof Edge Systems

ES-1 Standard Now a Legal Requirement

By John Hickman

The destructive force of several major hurricanes in Florida in 2004 and 2005, and Katrina and Rita's devastation of New Orleans and a portion of the Gulf Coast are poignant reminders of the importance of a strong, impermeable roofing system. And the roof edge is one of the more important components of a roofing system.

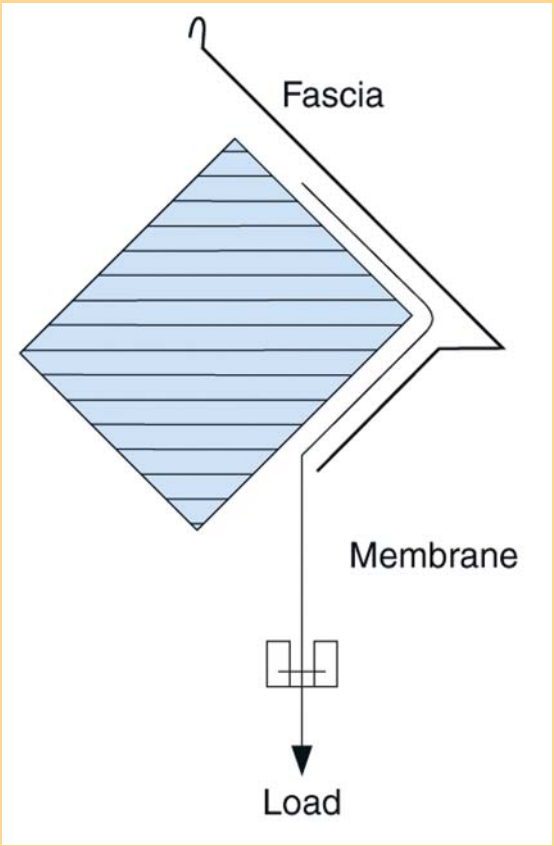
Recently, the Roofing Industry Committee on Weather Issues (RICOWI) released partial results from a study analyzing the 2004 Florida hurricanes. The report found that most of the damage to roofs was caused by failure at the perimeter, further confirming the importance of properly installed roof edge systems.

"Failure of roofing systems was because of system failure at the perimeter and punctures and tears from debris," said Dave Roodvoets, technical director for SPRI and head of this RICOWI study. "The membrane attachment to the deck cannot resist the loads created when the perimeter securement fails, and this leads to progressive loss of membrane coverage."

Another key finding from the study included discovery of cleat gauges that were less than those recommended by FM Global 1-49 and ANSI/SPRI ES-1. The committee also found that 95 percent of roof failures were caused by poor workmanship and substituted materials.

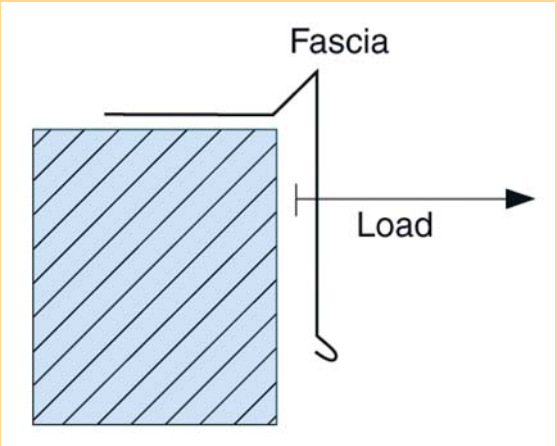
André Desjarlais, with Oak Ridge National Laboratory in Tennessee, was another member of the RICOWI study. "It's a fair statement to say membranes themselves were not the major cause of failure. There were a lot of perimeter attachment failures. If you can't hold the edge down, no matter what kind of roof you have, the whole thing is going to come down," he said.

Test Method RE-1



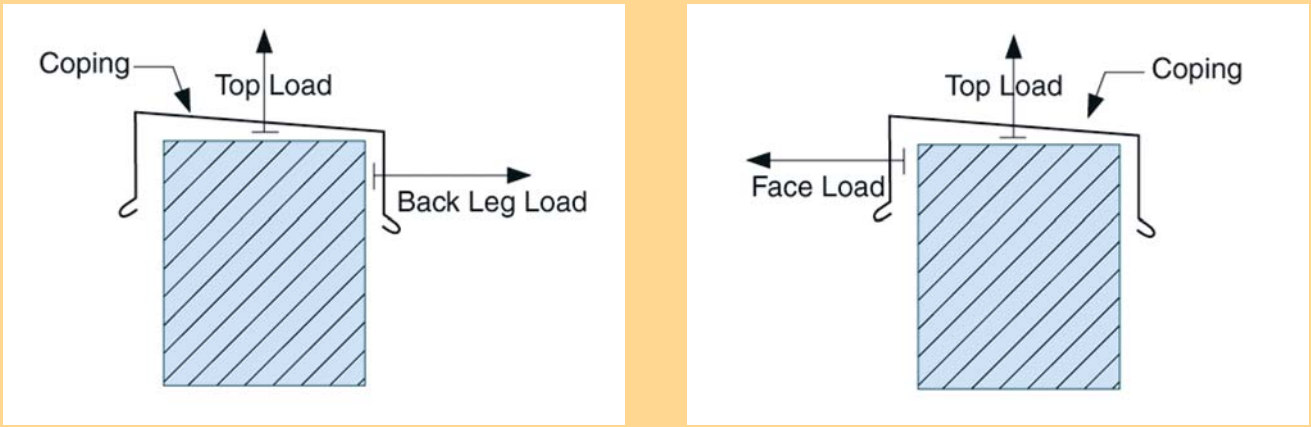
RE1 – Test for roof edge termination of ballasted or mechanically attached roofing membrane systems.

Test Method RE-2



RE2 – Pull-off test for edge flashings.

Test Method RE-3



RE-3 – Pull-off test for copings.

According to Factory Mutual data, almost 60 percent of roof failures begin at the edge[1]. This statistic emphasizes the critical nature of secure, safe roof edges in protecting the building envelope—and the potential pitfalls of edging that fails.

To aid architects, specifiers, and other roofing professionals in ensuring that a quality roof edge is specified and installed, the Single Ply Roofing Institute (SPRI), a roofing industry trade association, created an edge standard for low-slope roofs called "ES-1." ES-1 was accepted by the American National Standard Institute (ANSI) as a standard and has been adopted by the International Code Council and included in the 2003 International Building Code (IBC) as paragraph 1405 – "Edge Securement for Low-Slope Roofs." Numerous states and U.S. government departments have adopted the 2003 IBC; more details can be found at **www.iccsafe.org/government/adoption**.

Formally called "ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems," the ES-1 standard has existed for a number of years. With its inclusion in the 2003 IBC, ES-1 has now become law in many states and locales, including Florida. Additional states are scheduled to adopt the 2003 IBC through 2006, so specifying ANSI/SPRI ES-1 is no longer just a prudent idea—it has become a legal requirement as well.

The founding principle behind the development of ES-1 was to improve the longevity and safety of low-slope commercial roofs, protecting the building owner's investment by reducing the risk of edge—and hence roof—failure. Essentially, it provides formulas for calculating the wind load on edges for low-slope roofs and prescribes methodology for testing and evaluating the ability of edge systems to withstand those loads, thus ensuring wind resistance and long-term performance.

ES-1 takes into account all the important factors that go into a properly designed roof edge. These include wind speed, building height, roof edge regions, building exposure, importance factors, metal thickness, galvanic compatibility and resistance, rooftop appliances, nailer securement, membrane attachment, and fastener spacing.

There are three tests prescribed in ES-1, and these are based on the American Society of Civil Engineers' document ASCE-7/02, *Minimum Design Loads for Buildings and Other Structures*. Test method RE-1 measures how well the edge secures the perimeter on ballasted or mechanically-attached membranes. Method RE-2 is a pull-off test for metal edge flashing. It tests for wind load on the face dimension of the flashing system. RE-3 tests the strength of the metal coping cap to assure it meets or exceeds calculated design wind pressure. RE-3 tests wind load on both the face and top dimension and the top and back leg dimension.

Many pre-manufactured roof edge systems have been tested according to ANSI/SPRI ES-1 requirements. The National Roofing Contractors Association (NRCA) also has an approval listing based on these requirements. To ensure that you're up to code, be sure to write specifications requiring roof edge systems to meet ANSI/SPRI ES-1 standards for all low-slope construction and monitor the process to ensure that the specifications are followed.

To review the ANSI/SPRI ES-1 standard, now required as part of the 2003 International Building Code, visit **www.SPRI.org**.

[1] A study of 145 FM Global windstorm losses involving built-up roof (BUR) covers showed that 85 (59%) occurred because the perimeter failed. Source: FM Global Property Loss Prevention Data Sheet 1-49, "Perimeter Flashing."

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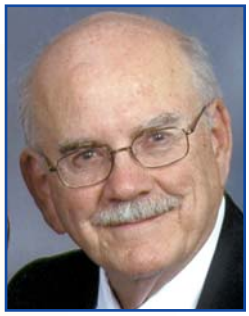

John Hickman is chairman of the board of the W.P. Hickman Company, in Asheville, North Carolina. He is the owner of several patents for roof edge design. John is chairman of the SPRI Roof Accessories Subcommittee and serves on the Edge Detail Subcommittee of the Roofing Industry Committee on Weather Issues (RICOWI). He has participated with RICOWI as an affiliate member since 1994 and has served on its board of directors. Hickman is a member of CSI, RCI, and NRCA. He holds bachelors and masters degrees in engineering from the University of Michigan.