



# SPRI Develops Ten ANSI-Approved Standards

BY MIKE ENNIS, RRC

Roof consultants are in a unique—and often challenging—position on the building team. Not only must they be familiar with every low- and steep-sloped roofing system known to man, they also need to address code requirements; sources of moisture not related to the roof; and a plethora of cladding, masonry, and sealant issues.

Add to this the rapid growth of vegetative roofs, building-integrated photovoltaic (BIPV) systems, and sustainable roof designs, and many roof consultants are on a stressful road to information overload.

Fortunately, industry associations are helping RCI and its members with roofing research and standards-writing efforts geared toward enhancing current roof design knowledge and best practices.

SPRI, the association representing sheet membrane and component suppliers to the commercial roofing industry, is working harder than ever to develop meaningful standards that will benefit roof consultants and other design professionals.

As an accredited American National Standards Institute (ANSI) canvasser, SPRI has the unique ability to help RCI and other organizations develop standards for acceptance into the building codes. Over the past several years, SPRI has developed ten ANSI-

approved standards, two of which have been adopted by the International Building Code (IBC) and one of which has been proposed for code.

Among SPRI's most important accomplishments in 2010 was the release of several key standards for vegetative roofing. The association also announced the results of an Oak Ridge National Laboratory study on vegetative roofs. It showed that these roof systems can reduce heating and cooling costs and save as much energy as light-colored, reflective roof membranes.

For an updated list of ANSI/SPRI standards, technical reports, and guidelines in downloadable PDF format, visit [spri.org](http://spri.org).

## PERIMETER FAILURE OF ROOF SYSTEMS

While vegetative roofs, sustainability, and cool roofing remain hot topics, the traditional role of roofs as one of the primary waterproofing systems for buildings remains the key focus for roof consultants.

The ANSI/SPRI ES-1 standard addresses roof edge securement to help prevent it from becoming a potential weak spot in low-slope roofing performance. FM Global's Phil Smith has often been quoted as saying that "the integrity of the perimeter flashing is a critical first line of defense against roof failure."

In 1992, Hurricane Andrew became the

third Category 5 hurricane to make landfall in U.S. history, and it caused \$26.5 billion in damage—mostly in southern Florida. It was also estimated that 75% of all building losses were due to roof failure.

A study of 145 FM Global built-up roofs showed that 85 failed due to system failure at the roof perimeter. Simply put, the membrane attachment to the deck could not withstand the loads created when these perimeter systems failed during the hurricane.

SPRI knew that more recent posthurricane investigations by the Roofing Industry Committee on Weather Issues (RICOWI) consistently showed that, in many cases, damage to a low-slope roof system during high-wind events begins when the edge of the assembly becomes disengaged from the building. Once this occurs, components of the roof system (membrane, insulation, etc.) are exposed. Damage then propagates across the entire roof by peeling of the membrane, insulation, or a combination of the two.

For this reason, SPRI's landmark ES-1 standard, *Wind Design Standard for Edge Systems Used With Low-Slope Roofing Systems*, was developed in 1998. It is currently referenced in Section 1504.5 of the 2003, 2006, 2009, and 2012 IBC. The standard provides roof consultants and others

with information for calculating wind loads on metal roof edge systems and prescribes the test methods to be used to ensure that the supplied edge system is capable of resisting that load. There are three tests that make up the ES-1 standard—RE-1, RE-2, and RE-3 (see *Photo 1*).

A version of this key standard—SPRI/FM 4435/ES-1—was revised and reapproved by ANSI in October 2011. It combines SPRI and FM Global requirements and provides basic requirements for wind load resistance testing and design for roof edge securement, flashing systems, and nailers.

The document also provides minimum fascia thicknesses for satisfactory “flatness” and

designs to minimize corrosion. It is intended to be used with manufacturers’ specifications and requirements of specific roofing materials and edge systems used in roof assemblies, excluding gutters.

Basically, the latest draft to ES-1 combines the performance requirements included in the current version of ES-1 and has been expanded to include requirements addressed in FM 4435, *Approval Standard for Roof Perimeter Flashing*.

For state-by-state adoption of ES-1 in the IBC, roof consultants can visit [icc-safe.org/gr/pages/adoptions.aspx](http://icc-safe.org/gr/pages/adoptions.aspx).

SPRI is also revising another important standard on wind loads for reapproval as an American National Standard. The revision will update ANSI/SPRI RP-4, *Wind Design Standards for Ballasted Single-Ply Roofing Systems* to comply with the current American Society of Civil Engineers (ASCE) document.

ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures*, was significantly revised last year. These revisions will affect every roofing professional who uses ASCE for determining wind loads on structures. Some of the revisions include new wind speed maps using a 700-plus-year



*Photo 1 – As part of the ES-1 testing protocol, RE-3 tests upward and outward simultaneous pull of horizontal and vertical flanges of a parapet coping cap. (Courtesy of W.P. Hickman, Arden, NC.)*

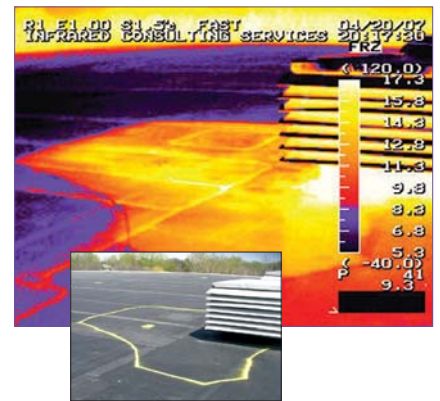
return; reinstating Exposure Category D for hurricane-prone coastlines, as well as “simplified” procedures for determining wind pressures for buildings of all heights.

Ballasted roof systems, in particular, are a cost-effective and energy-efficient method for low-slope roof assemblies. Concerns with these types of systems have been roof assemblies not remaining in place and loose gravel becoming a component of wind-borne debris during high-wind events. RP-4 is a design standard that has been specifically developed to address these critical issues. It is based on hundreds of wind tunnel tests, field exposure tests, and decades of experience.

SPRI is also starting the revision process on ANSI/SPRI WD-1, *Wind Design Standard Practices for Roofing Assemblies*. The standard has been proposed for inclusion in Section 1504.3 of the 2015 IBC. It provides a two-part methodology for the designing of wind uplift resistance of non-ballasted built-up, modified-bitumen, and single-ply roofing system assemblies installed over any type of roof deck.

“WD-1 is based on ASCE 7,” says SPRI task force chairman Joe Malpezzi. “So, in order to keep WD-1 current, it is being

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# SPRI TASK FORCE PREPARES PROTOCOL FOR NUCLEAR MOISTURE TESTING

COMMITTEE READIES RCI MANUAL OF PRACTICE DOCUMENT FOR ANSI CANVASSING PROCESS

By Michael Russo

A 20-year-old protocol on nuclear-based moisture testing is getting a facelift in preparation for ANSI canvassing, courtesy of a new SPRI committee.

The protocol, "Detection and Location of Latent Moisture of Building Roofing Systems by Nuclear Radioisotopic Thermalization," can be found in Appendix E of the *RCI Manual of Practice*.

The document contains information on proper handling of nuclear-based moisture survey equipment in the field, gathering of data, as well as calculating and analyzing of survey results.

"Interest in the initiative was shown within SPRI, and now we have a well-rounded task force of about one dozen members," says task force chairman David Hawn, FRCI, RRC, CEM. Hawn is also president of Dedicated Roof and Hydro-Solutions LLC, Centreville, VA, and a past president of RCI. "The members of the committee are engaged and active in working toward development of a consensus-based standard," says Hawn.

Vegetative roofs and other systems that have overburden requirements are becoming more common, and the testing of these systems prior to overburden installation makes sense, says Hawn. However, the only consensus-based standard available to code bodies right now is ASTM C1153 for infrared testing of roof assemblies for moisture and substrate condition. Nuclear-based moisture testing uses a different technology than infrared and is more appropriate for testing ballasted and vegetative roofs.

"We realized there was a shortcoming in the RCI protocol not being consensus-based," says Hawn. "Nuclear-based technology is relatively simple and hasn't changed much over the years. But there are a fair amount of language changes from the RCI protocol that need to be made."

Currently, the task force is modifying the RCI protocol to better fit the format and vernacular of a true ANSI standard. Once the task force agrees on the changes, the document will go to the SPRI board of directors for approval. Once approved, balloting by an established canvass body composed of producers, users, and

general-interest members will take place.

"Although roof consultants use the protocol more than anyone else, this document will be a benefit to more than just RCI members," says Hawn. "The fact is that manufacturers' materials and roofing contractors' installations are being judged on a daily basis using nuclear testing," continues Hawn. "So anything that can standardize this process and make it more consistent will work toward the good of the entire industry."

While the actual use of nuclear-based equipment is simple (just place the device on the roof, push a button, and jot down a number), the interpretation of the results is more complex. "It's pretty hard to use a nuclear-measuring device incorrectly up on the roof," agrees Hawn. "What's important is what you do with those readings afterward."

RCI's first protocol for nuclear-based moisture testing

was written in the mid-1980s and updated just prior to the release of its *Manual of Practice*. In addition to nuclear and infrared testing, capacitance moisture surveys continue to be used. However, there is neither an RCI protocol nor consensus standard planned for capacitance technology as of this writing.

Infrared equipment has become less bulky and less expensive over the years, and some

cameras offer additional features not available before the advent of digital photography. The price of nuclear-based equipment is similar to infrared on a first-cost basis. However, nuclear equipment is more expensive to maintain due to the required leak testing, reporting procedures, and licensing requirements that must be maintained annually—whether the equipment is used or not. Operators also need to be licensed and undergo radiation safety training. While considered a valuable tool for roofing use, it is used more often in soil and roadway testing.

"Nuclear moisture testing is a useful technology," says Hawn. "We have a robust committee at work on it, and there continues to be a substantial amount of interest within the SPRI membership in our efforts."

Michael Russo has reported on the roofing industry for more than 30 years. He can be reached at [mikerusso1983@zoominternet.net](mailto:mikerusso1983@zoominternet.net).



Figure 1 – A technician works with a Troxler nuclear moisture gauge (courtesy of Infra-red Analyzers).

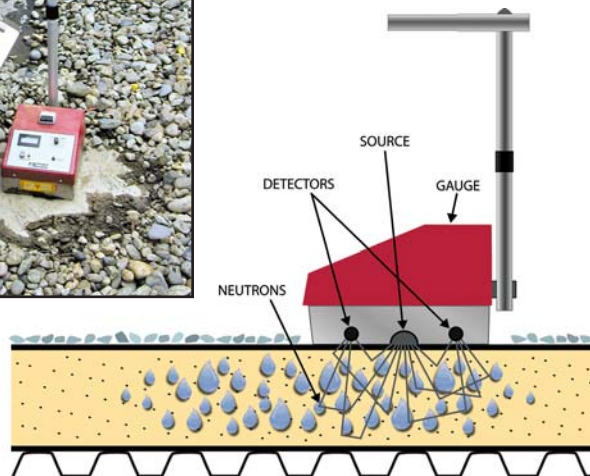


Figure 2 – This rendering depicts the operation of a nuclear moisture gauge in schematic form (courtesy of Infra-red Analyzers).

updated to reflect the changes from ASCE 7-05 to ASCE 7-10.”

#### OTHER SPRI CODES AND STANDARDS

ANSI approved the first of three standards for vegetative roofs developed by SPRI in cooperation with Green Roofs for Healthy Cities (GRHC).

ANSI/SPRI VF-1, *External Fire Design Standard for Vegetative Roofs*, was approved on January 29, 2010, after a final round of revising and rebaloting.

The ANSI/SPRI VF-1 fire design standard includes fire-control designs to limit the spread of flame if a vegetative roof system were to catch fire. The standard uses barriers of



*Photo 2 – This gravel stop is being tested according to the ANSI/SPRI ES-1 standard using the RE-2 test for fascia systems.*



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# SPRI's RECENT ACCOMPLISHMENTS

Here is a list of SPRI's latest accomplishments in the areas of codes, standards, and application guidelines for the roofing industry:

- ANSI/SPRI VF-1, *External Fire Design Standard for Vegetative Roofs*
- ANSI/SPRI RP-14 2010, *Wind Design Standard for Vegetative Roofing Systems*
- SPRI/FM 4435-ES-1 2010, *Wind Design Standard for Edge Systems Used With Low-Slope Roofing Systems*
- ANSI/SPRI IA-1 2010, *Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives Over Various Substrates*
- ANSI/GRHC-SPRI VR-1, *Procedure for Investigating Resistance to Root Penetration on Vegetative Roofs*
- ANSI/SPRI GD-1, *Design Standard for Gutter Systems Used With Low-Slope Roofs*
- Technical Report, *Thermal Performance of Vegetative Roof Systems*
- Field study and technical report, *Evaluation of Metal Fasteners Corroded From Contact With Preservative-Treated Wood*
- *Application Guidelines for a Modified-Bitumen Roofing System*
- *Application Guidelines for Fasteners Used With Flexible Membrane Roofing Systems*
- *Modified-Bitumen Cold-Weather Recommendations*

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nonvegetative zones to contain a potential fire.

A second vegetative roof standard was approved by ANSI on June 3, 2010. ANSI/SPRI RP-14 2010, *Wind Design Standard for Vegetative Roofing Systems*, provides design guidelines associated with wind uplift and stone scour and defines items such as setbacks from the edges of roofs in areas with high winds, use of wind erosion mats, and edging details. There is also a discussion of the various types of materials and their behavior under varying wind conditions.

SPRI's Sid Teachey led the successful development of a third vegetative roofing document—a root penetration standard for vegetative roof systems. ANSI/GRHC-SPRI VR-1, *Procedure for Investigating Resistance to Root Penetration on Vegetative Roofs*, was approved by ANSI in March 2011.

The roofing industry also has a performance standard for retrofit drains—ANSI/SPRI RD-1 2009—that references installation in existing drain plumbing on existing roofs. This standard was also successfully rebalotted and reapproved by ANSI.

Last summer, SPRI announced that another key standard—this one addressing

insulation adhesives—was also reaffirmed by ANSI.

ANSI/SPRI IA-1 2010, *Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives Over Various Substrates*, was developed to provide a uniform field testing procedure for determining the suitability of using an insulation adhesive for insulation or cover board attachment to a substrate. The uplift data obtained provide the roof system manufacturer, adhesive manufacturer, and design professional with pull resistance values that will assist in verifying the suitability of the intended design. The standard was first approved as an American National Standard in 2005.

Another standard approved by ANSI in October 2010 is the ANSI/SPRI GD-1, *Design Standard for Gutter Systems Used With Low-Slope Roofs*. The standard specifies structural design for gutters used with low-slope roofing. However, the standard does not address water removal or the water-carrying capability of the gutter, as other building codes already address these issues. Also, there is little to address in terms of wind resistance of gutters in the code, so SPRI will propose that GD-1 be included in the IBC.


ANSI/SPRI FX-1, *Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners*, was reapproved by ANSI on August 19, 2011. SPRI developed this standard for measuring the pull-out resistance of roofing fasteners in field conditions. Specifically, it is used to obtain data used by roof consultants and other professionals to calculate the proper density and placement of fasteners used in membrane roofing systems. The standard can also be used by roofing installers and inspectors as a quality control test to ensure that sufficient pull-out performance is achieved.

In the meantime, SPRI members will



Photo 3 – A metal roof edge system is being tested using a method based on the SPRI/FM 4435/ES-1 standard.

continue to identify areas within the industry that will benefit from the collective efforts of the association. Whether it is the development of standards, performing technical research, providing input to industry

codes, or developing industry education programs, SPRI's focus is to provide unbiased information that will enhance the community of knowledge and to help advance the industry as a whole. 

#### Mike Ennis

Mike Ennis joined SPRI in 1993. He has chaired a variety of SPRI committees and task forces and served as president from 2004-2006. He was named technical director of SPRI in 2007. For more information about SPRI, its members, and its activities, visit SPRI's Web site at [www.spri.org](http://www.spri.org) or contact the association at [info@spri.org](mailto:info@spri.org).



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