Paraguard Roof Perimeter Systems ANSI/SPRI ES-1 Test Reports UL® Classified Products

Introduction to ES-1

The ANSI/SPRI ES-1 Roof Edge Standard is a reference for those who design, specify, or install edge materials used with low slope roofs. This standard focuses primarily on design for wind resistance. It is intended for use with specifications and requirements of specific roofing materials and edge systems used in the roofing assembly, excluding gutters.

This guide has been revised in accordance with the ASCE 7-02 document titled "Minimum Design Loads for Buildings and Other Structures" to provide a relatively simple calculation method for the determination of the wind uplift pressures on components and cladding for any building.

Wind Speed

Basic wind speed values used in the design calculations are 3-second maximum peak gust speeds in miles per hour measured at 33 feet above ground for Exposure Factor C associated with an annual probability of 0.02 (50-year return). These values are taken from the ASCE 7-02 document.

Wind Maps

The wind maps included at the end of this paper are provided courtesy of SPRI's "Wind Design Standard for Edge Systems Used with Low Slope Roofs". The maps are an element of the ANSI/ASCE 7-02 Document, "Minimum Design Loads for Buildings and Other Structures", an American National Standards Institute Standard, copyrighted in 2002 by the American Society of Civil Engineers.

General Design Considerations

The general design considerations contained in ANSI / SPRI ES-1 call for the roof edge construction to have sufficient strength to withstand the design wind load. When designing the roof edge system factors such as design wind speed, building exposure, building height, roof perimeter and corner regions, edge conditions, galvanic compatibility, and shape or flatness of fascias should be considered.

Importance of Roof Edge

Roof edge systems serve aesthetic as well as performance functions for a building. Aesthetically, they provide an attractive finish and are sometimes a key feature of the exterior of a building. Of course, no matter how aesthetically pleasing, a roof edge system must act primarily as an effective mechanical termination and transition between the roof and other building components such as parapet walls, vertical walls, corners, soffits, edge nailers, fascia boards, etc.

A high performance roof edge system provides many benefits. It acts as a water seal at the edge. When it is also the means by which the membrane is attached to the building at the edge, it must exhibit sufficient holding power to prevent the membrane from pulling out at the edge under design wind conditions. Furthermore, the edge device assembly itself must not come loose in a design wind. A loose edge assembly not only endangers surrounding property and people, but it also allows the roof system to be vulnerable to blow-off, starting at the edge.

Design Options (from Section 6.0 ANSI/SPRI ES-1 2003)

Load resistance of the edge detail is divided into two considerations. The first is the resistance of the edge to outward and upward forces that tend to blow or peel the edge system off the substrate. The second is the ability of the edge to resist the pull of the roofing inwardly.

International Building Code Requirements

2003 IBC – 1504.5 Edge securement for low-slope roofs.

Low-slope membrane roof systems metal edge securement, except gutters, installed in accordance with Section 1507, shall be designed in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609 (ACSE 7-02 Basic Wind Map).

2006 IBC – 1504.5 Edge securement for low-slope roofs.

Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609.

Roof System Importance

(RICOWI Report after investigating roof failures following Hurricanes Charley & Ivan)

"Failure of roofing systems was because of system failure at the perimeter, and punctures and tears from debris." David Roodvoets, SPRI Director said. "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 (peeling of the membrane from the deck)."

Roof Edge Design Pressure

To calculate the minimum required roof edge design pressure you may use the formula in Section 7.1 of the ANSI/SPRI ES-1 Roof Edge Standard or you may use the Wind Design Calculator at www.wph.com.

Code Compliance – Third Party Verification

The Siplast Paraguard Roof Perimeter System has received the Underwriters Laboratories Inc.® (UL) Classification for roof edge systems, following a complete review of the company's design and manufacturing practices.

The UL program incorporates the ANSI/SPRI ES-1 roof edge system testing protocols as required by the 2003 International Building Code. Companies receiving classification are authorized to apply the UL marks to those roof edge system products that: 1.) have been found to comply with ES-1 requirements and; 2.) are subject to UL's ongoing audit program requirements.

Most Paraguard products, including both coping and fascia systems, were tested and received the UL Classification. These products include Paraguard Coping, Paraguard Raised Edge, and Proform gravel stop. Complete systems manufactured and supplied by Siplast, including fasteners, were tested. In addition, a UL engineer will return to the facility where Siplast Paraguard and Proform are fabricated periodically to ensure that this process continues to produce ES-1 compliant edge systems.

The new UL category will be included in the voluminous UL Roof Directory, which includes testing for impact, wind resistance, and fire. It is also located on their Web site, www.ul.com.

Certificate of Compliance

Upon request, Siplast will provide a "Certificate of Compliance" that the Product(s) specified have been tested in accordance with the protocols of the ANSI/SPRI ES-1 Roof Edge Standard, and that when installed as required by our provided instructions will withstand the design pressures calculated using ES-1 for the listed project as prescribed by Section 1504.5 of the International Building Code.

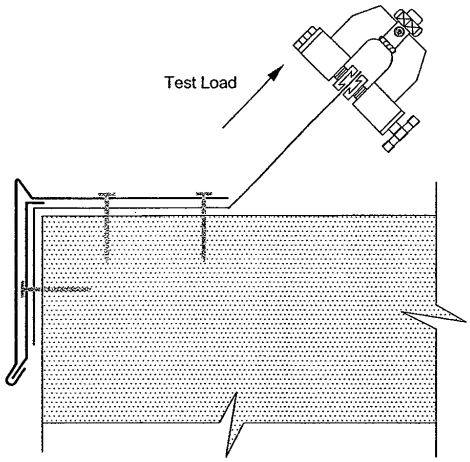
SPRI Test Methods

SPRI Test RE-1 for Roof Edge Termination of ballasted or chemically attached roofing membrane systems. Must meet 100 lbs/ft minimum resistance. SPRI Test RE-2 for edge flashings with 4" or less horizontal exposure. SPRI Test RE-3 for copings where the exposed horizontal flange exceeds 4". Edge Flashings tested using Methods RE-2 and RE-3 must meet the minimum roof edge design pressures as calculated using the ES-1 Design Standard Formula.

ANSI / SPRI ES-1 Test Methods

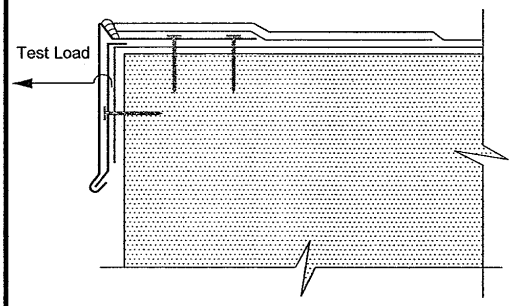
The following test methods are taken from *SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems*. Graphics shown are recreations of the originals taken from the test method section of the ES-1 Standard. All other content within this section contains actual excerpts from the test method protocol.

TEST METHOD RE-1 ROOF EDGE TERMINATION (Ballasted or mechanically attached)



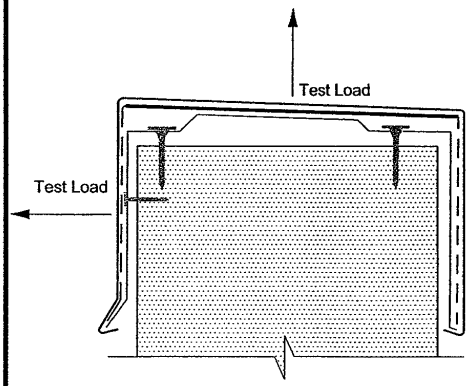
A minimum 12 inch (300 mm) wide mock-up of the edge device system shall be constructed and mounted on the base of a tensile testing device so the membrane is pulled at a 45 degree angle to the roof deck to simulate a billowing membrane. For devices in which fasteners are part of the membrane securement, at least two such fasteners shall be included in a balanced sample. However, no more fasteners shall be installed than would be typically installed in field conditions.

TEST METHOD RE-2 ROOF EDGE TERMINATION (4 inch or less horizontal exposure)



Pull test for edge flashings: All parts of the test specimen shall be full size in width and all other dimensions, using the same materials, details, and methods of construction and anchoring devices (such as clips or cleats) as used on the actual building. Sample length shall be the average length designed for field use on the project with a minimum of 8 feet (2.4 m). When the longest length designed for the project is less than 8 feet (2.4 m) the longest design length shall be used. When anchoring the means at the ends of the edge flashing are normally used to restrain other additional lengths of edge flashing, then the anchoring means shall be modified so that only that percentage that might restrain rotational movement in the test specimen is used.

TEST METHOD RE-3 COPING (Exposed horizontal flange exceeding 4 inches)



Pull test for copings: All parts of the test specimen shall be in full size in width and all other dimensions, using the same materials, details, and methods of construction and anchoring devices (such as clips or cleats) as used on the actual building. Sample length shall be the average length desired for field use on the project with a minimum of 8 feet (2.4 m). When the longest length designed for the project is less than 8 feet (2.4 m) the longest design length shall be used. When the anchoring means at the ends of the edge flashing are normally used to restrain other additional lengths of edge flashing, then the anchoring means shall be modified so that only that percentage that might restrain rotational movement in the test specimen is used.

ANSI/SPRI ES-1 Test Report for
Paraguard Raised Edge

RE-2 Test Method
UL Classification Rating: 164 psf
Maximum Size: 10”
Cover Material: .050” aluminum
Description: 050” aluminum fascia with 24-gauge galvanized steel spring clip in 10’-0” lengths. Installed with 1.5” galvanized ring shank nails.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)									
Building Height	85	90	100	110	120	130	140	150	160	170
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>50-60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>60-70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>70-80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>80-90	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>90-100	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>100-120	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>120-140	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>140-160	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>160-180	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>180-200	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>200-250	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>250-300	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>300-350	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>350-400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>400-450	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>450-500	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

ANSI/SPRI ES-1 Test Report for
Paraguard Raised Edge

RE-2 Test Method
UL Classification Rating: 144 psf
Maximum Size: 10”
Cover Material: 24 gauge galvanized steel
Description: 24-gauge galvanized steel fascia with galvanized steel water dam in 10’-0” lengths. Installed with 1.5” galvanized ring shank nails.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)									
Building Height	85	90	100	110	120	130	140	150	160	170
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>50-60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>60-70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>70-80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>80-90	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>90-100	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>100-120	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>120-140	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>140-160	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>160-180	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>180-200	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>200-250	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>250-300	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>300-350	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>350-400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>400-450	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>450-500	Y	Y	Y	Y	Y	Y	Y	Y	Y	N

ANSI/SPRI ES-1 Test Report for
Proform Gravel Stop

RE-2 Test Method
UL Classification Rating: 159 psf
Maximum Size: 10”
Cover Material: .050” aluminum
Description: 050” aluminum fascia with galvanized steel anchor clip in 10’-0” lengths. Installed with 1.5” galvanized ring shank nails.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)									
Building Height	85	90	100	110	120	130	140	150	160	170
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>50-60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>60-70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>70-80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>80-90	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>90-100	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>100-120	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>120-140	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>140-160	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>160-180	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>180-200	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>200-250	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>250-300	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>300-350	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>350-400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>400-450	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>450-500	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

ANSI/SPRI ES-1 Test Report for
Proform Gravel Stop

RE-2 Test Method
UL Classification Rating: 135 psf
Maximum Size: 10”
Cover Material: 24 gauge galvanized steel
Description: 24-gauge galvanized steel fascia with galvanized steel anchor clip in 10’-0” lengths. Installed with 1.5” galvanized ring shank nails.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)									
Building Height	85	90	100	110	120	130	140	150	160	170
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>50-60	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>60-70	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>70-80	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>80-90	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>90-100	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>100-120	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>120-140	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>140-160	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>160-180	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>180-200	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>200-250	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>250-300	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>300-350	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>350-400	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>400-450	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>450-500	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

ANSI/SPRI ES-1 Test Report for Paraguard Coping

RE-3 Test Method
UL Classification Rating: 80 psf Outward, 170 psf Upward
Maximum Size: 16” wall with 6” face leg and 4” back leg
Cover Material: .050” aluminum
Description: 050” aluminum coping cap with16 gauge galvanized steel cleat 12” wide installed 5’0” o.c.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)									
Building Height	85	90	100	110	120	130	140	150	160	170
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	N	N
>50-60	Y	Y	Y	Y	Y	Y	Y	Y	N	N
>60-70	Y	Y	Y	Y	Y	Y	N	N	N	N
>70-80	Y	Y	Y	Y	Y	Y	N	N	N	N
>80-90	Y	Y	Y	Y	Y	Y	N	N	N	N
>90-100	Y	Y	Y	Y	Y	Y	N	N	N	N
>100-120	Y	Y	Y	Y	Y	Y	N	N	N	N
>120-140	Y	Y	Y	Y	Y	N	N	N	N	N
>140-160	Y	Y	Y	Y	Y	N	N	N	N	N
>160-180	Y	Y	Y	Y	Y	N	N	N	N	N
>180-200	Y	Y	Y	Y	Y	N	N	N	N	N
>200-250	Y	Y	Y	Y	Y	N	N	N	N	N
>250-300	Y	Y	Y	Y	N	N	N	N	N	N
>300-350	Y	Y	Y	Y	N	N	N	N	N	N
>350-400	Y	Y	Y	Y	N	N	N	N	N	N
>400-450	Y	Y	Y	Y	N	N	N	N	N	N
>450-500	Y	Y	Y	Y	N	N	N	N	N	N

ANSI/SPRI ES-1 Test Report for Paraguard Coping

RE-3 Test Method
UL Classification Rating: 95 psf Upward, 148 psf Outward
Maximum Size: 16” wall with 6” face leg and 4” back leg
Cover Material: 24 gauge galvanized steel
Description: 24 gauge galvanized steel coping cap with 16 gauge galvanized steel cleat 12” wide installed 5’0” o.c.

Pass/Fail Ratings based on Importance Factor Categories III & IV (education, medical, rescue, detention, and other essential or critical facilities) and a ground roughness Exposure D (flat unobstructed areas such as coastal).

	Maximum Wind Speeds (MPH)								
Building Height	85	90	100	110	120	130	140	150	160
0-15	Y	Y	Y	Y	Y	Y	Y	Y	Y
>15-20	Y	Y	Y	Y	Y	Y	Y	Y	Y
>20-30	Y	Y	Y	Y	Y	Y	Y	Y	N
>30-40	Y	Y	Y	Y	Y	Y	Y	Y	N
>40-50	Y	Y	Y	Y	Y	Y	Y	Y	N
>50-60	Y	Y	Y	Y	Y	Y	Y	N	N
>60-70	Y	Y	Y	Y	Y	N	N	N	N
>70-80	Y	Y	Y	Y	Y	N	N	N	N
>80-90	Y	Y	Y	Y	Y	N	N	N	N
>90-100	Y	Y	Y	Y	Y	N	N	N	N
>100-120	Y	Y	Y	Y	Y	N	N	N	N
>120-140	Y	Y	Y	Y	Y	N	N	N	N
>140-160	Y	Y	Y	Y	N	N	N	N	N
>160-180	Y	Y	Y	Y	N	N	N	N	N
>180-200	Y	Y	Y	Y	N	N	N	N	N
>200-250	Y	Y	Y	Y	N	N	N	N	N
>250-300	Y	Y	Y	Y	N	N	N	N	N
>300-350	Y	Y	Y	Y	N	N	N	N	N
>350-400	Y	Y	Y	N	N	N	N	N	N
>400-450	Y	Y	Y	N	N	N	N	N	N
>450-500	Y	Y	Y	N	N	N	N	N	N

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