Midwest Roofing Contractors Association

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Overland Park, Kansas

Compliance with ES-1 perimeter edge requirements

presented by

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association (NRCA)

NRCA

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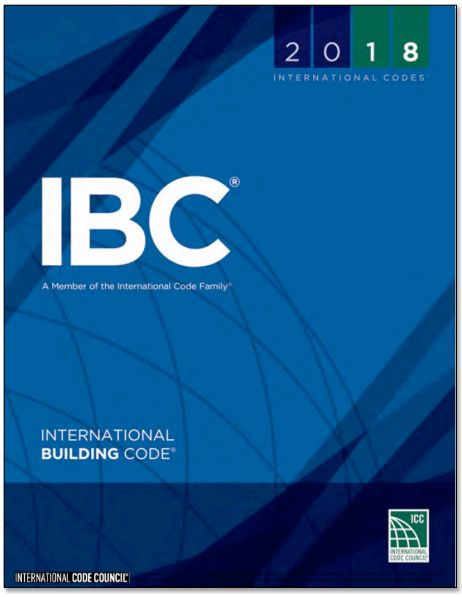

International Building Code, 2018 Edition

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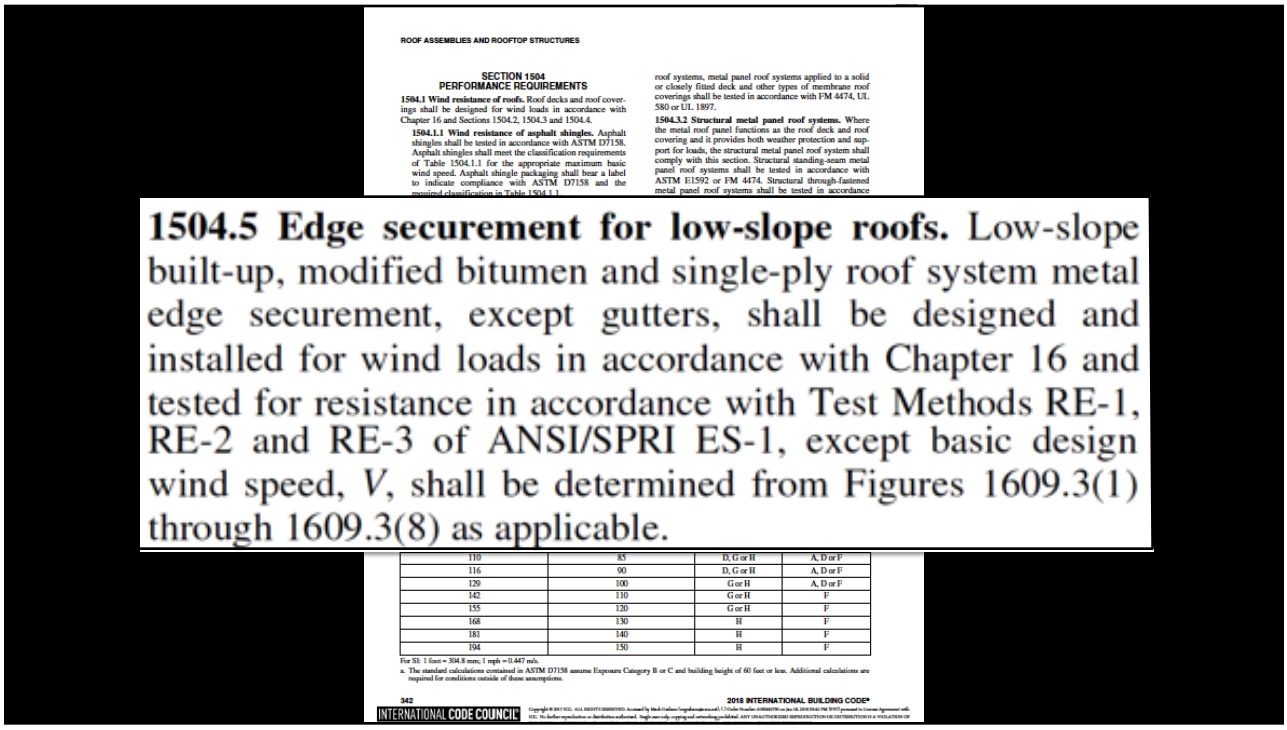

ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1504
PERFORMANCE REQUIREMENTS

1504.1 Wind resistance of roofs. Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

1504.1.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table 1504.1.1 for the appropriate maximum basic wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table 1504.1.1.

roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

1504.3.2 Structural metal panel roof systems. Where the metal roof panel functions as the roof deck and roof covering and it provides both weather protection and support for loads, the structural metal panel roof system shall comply with this section. Structural standing-seam metal panel roof systems shall be tested in accordance with ASTM E1592 or FM 4474. Structural through-fastened metal panel roof systems shall be tested in accordance

1504.5 Edge securement for low-slope roofs. Low-slope built-up, modified bitumen and single-ply 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 Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, except basic design wind speed, *V*, shall be determined from Figures 1609.3(1) through 1609.3(8) as applicable.

110	85	D, G or H	A, D or F
116	90	D, G or H	A, D or F
129	100	G or H	A, D or F
142	110	G or H	F
155	120	G or H	F
168	130	H	F
181	140	H	F
194	150	H	F

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

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Design wind loads

The Designer is required by the Code to include the design wind loads in the Construction Documents.

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Design wind load pressures

International Building Code, 2018 Edition

SECTION 1603

CONSTRUCTION DOCUMENTS

1603.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents.*

[continued…]

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1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force resisting system of the structure:

1. Ultimate design wind speed, V_{ult}, *(3-second gust),* miles per hour (km/hr) and nominal design wind speed, V_{asd}, as determined in accordance with Section 1609.3.1.
2. *Risk category.*
3. Wind exposure. Where more than one wind exposure is utilized, the wind exposure and applicable wind direction shall be indicated.
4. The applicable internal pressure coefficient.
5. Components and cladding. The design wind pressures in terms of psf (kN/m^2) to be used for the design of exterior component and cladding materials not specifically designed by the *registered design professional.*

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4. The applicable internal pressure coefficient.
5. Components and cladding. The design wind pressures in terms of psf (kN/m^2) to be used for the design of exterior component and cladding materials not specifically designed by the *registered design professional.*

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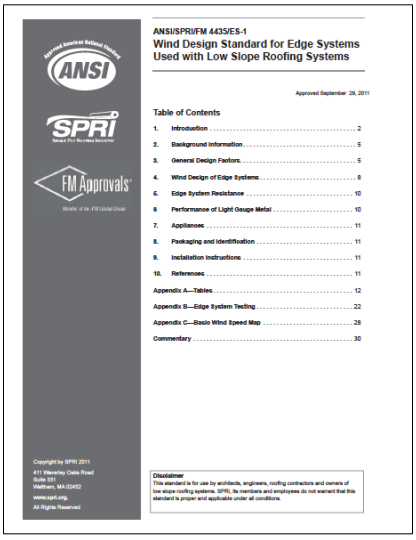
ANSI/SPRI/FM 4435/ES-1, 2011 Edition


ANSI/SPRI/FM 4435/ES-1
Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

Approved September 29, 2011

Table of Contents

Disclaimer
This standard is for use by architects, engineers, roofing contractors and owners of low slope roofing systems. SPRI, its members and employees do not warrant that this standard is proper and applicable under all conditions.

- Design wind loads
- Tested resistance:
  - RE-1
  - RE-2
  - RE-3
- Prescriptive requirements
- Appendixes
- Commentary

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Tested resistance

ANSI/SPRI FM 4435/ES-1, 2011 Edition

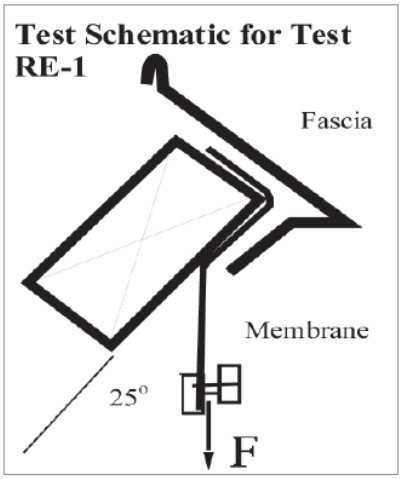

Figure RE1.1

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Tested resistance

ANSI/SPRI FM 4435/ES-1, 2011 Edition

Fascia Blow-Off Test Set Schematic

(Force at Failure x Face Area = Blowoff Resistnace)

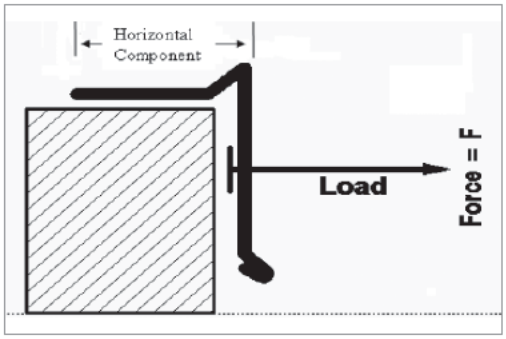

Figure RE2.1

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Tested resistance

ANSI/SPRI FM 4435/ES-1, 2011 Edition

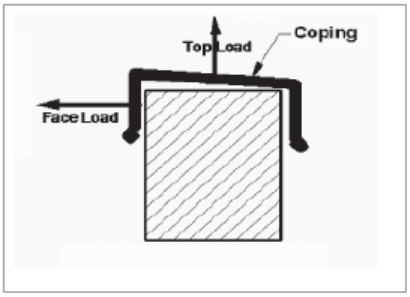

Figure RE3.1
RE3 Test—Face Leg Pull

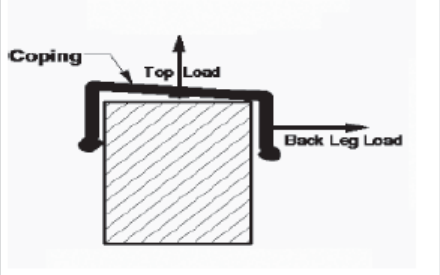

Figure RE3.2
RE3 Test—Back Leg Pull

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NRCA's shop-fabricated edge metal testing

www.nrca.net

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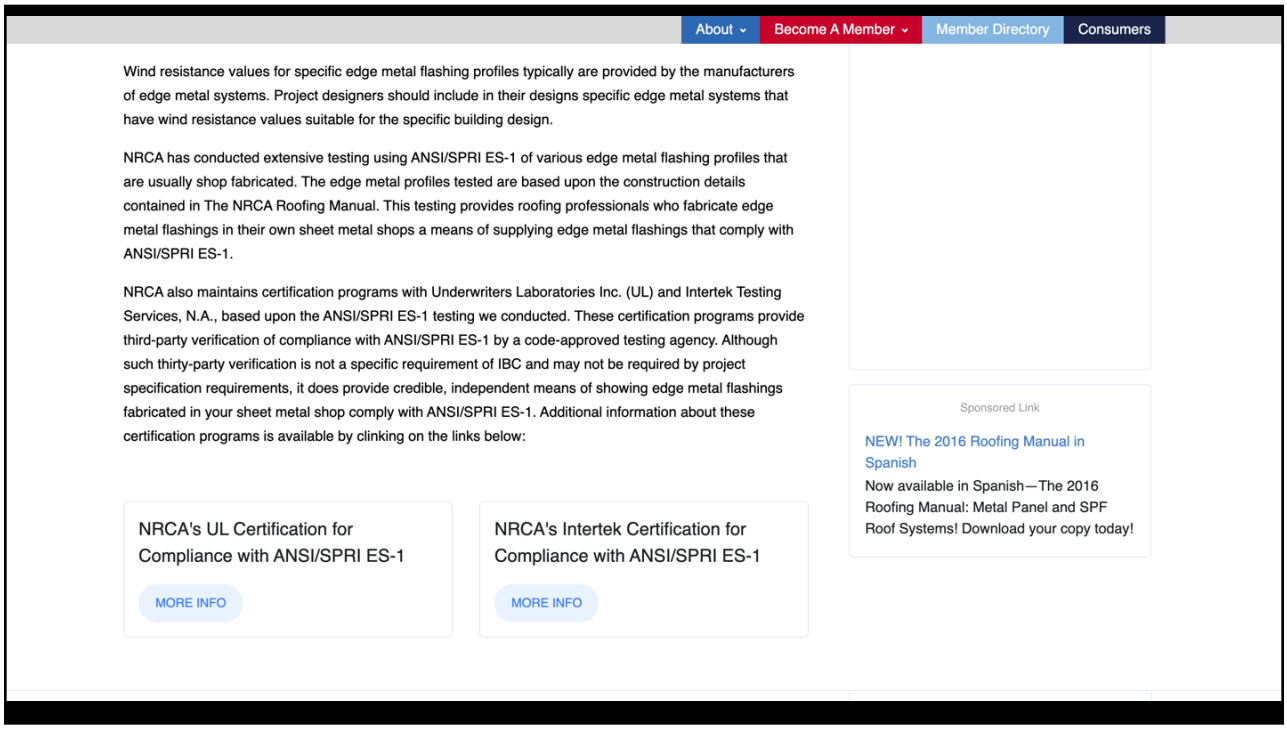
About
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Consumers
Wind resistance values for specific edge metal flashing profiles typically are provided by the manufacturers of edge metal systems. Project designers should include in their designs specific edge metal systems that have wind resistance values suitable for the specific building design.
NRCA has conducted extensive testing using ANSI/SPRI ES-1 of various edge metal flashing profiles that are usually shop fabricated. The edge metal profiles tested are based upon the construction details contained in The NRCA Roofing Manual. This testing provides roofing professionals who fabricate edge metal flashings in their own sheet metal shops a means of supplying edge metal flashings that comply with ANSI/SPRI ES-1.
NRCA also maintains certification programs with Underwriters Laboratories Inc. (UL) and Intertek Testing Services, N.A., based upon the ANSI/SPRI ES-1 testing we conducted. These certification programs provide third-party verification of compliance with ANSI/SPRI ES-1 by a code-approved testing agency. Although such thirty-party verification is not a specific requirement of IBC and may not be required by project specification requirements, it does provide credible, independent means of showing edge metal flashings fabricated in your sheet metal shop comply with ANSI/SPRI ES-1. Additional information about these certification programs is available by clinking on the links below:
NRCA's UL Certification for Compliance with ANSI/SPRI ES-1
MORE INFO
NRCA's Intertek Certification for Compliance with ANSI/SPRI ES-1
MORE INFO
Sponsored Link
NEW! The 2016 Roofing Manual in Spanish
Now available in Spanish—The 2016 Roofing Manual: Metal Panel and SPF Roof Systems! Download your copy today!

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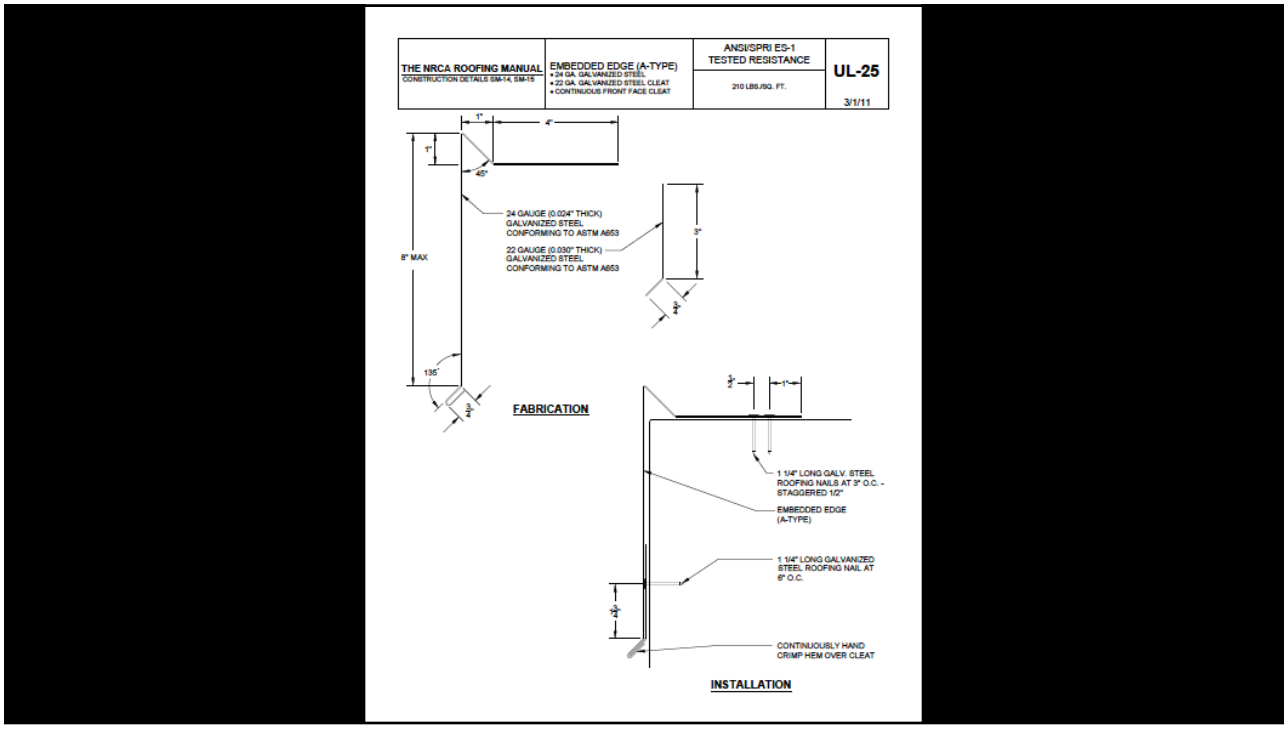
THE NRCA ROOFING MANUAL
CONSTRUCTION DETAILS SM-14, SM-15
EMBEDDED EDGE (A-TYPE)
• 24 GA. GALVANIZED STEEL
• 22 GA. GALVANIZED STEEL CLEAT
• CONTINUOUS FRONT FACE CLEAT
ANSI/SPRI ES-1 TESTED RESISTANCE
210 LBS./SQ. FT.
UL-25
3/1/11
24 GAUGE (0.024" THICK) GALVANIZED STEEL CONFORMING TO ASTM A653
22 GAUGE (0.030" THICK) GALVANIZED STEEL CONFORMING TO ASTM A653
8" MAX
FABRICATION
1 1/4" LONG GALV. STEEL ROOFING NAILS AT 3" O.C. - STAGGERED 1/2"
EMBEDDED EDGE (A-TYPE)
1 1/4" LONG GALVANIZED STEEL ROOFING NAIL AT 6" O.C.
CONTINUOUSLY HAND CRIMP HEM OVER CLEAT
INSTALLATION

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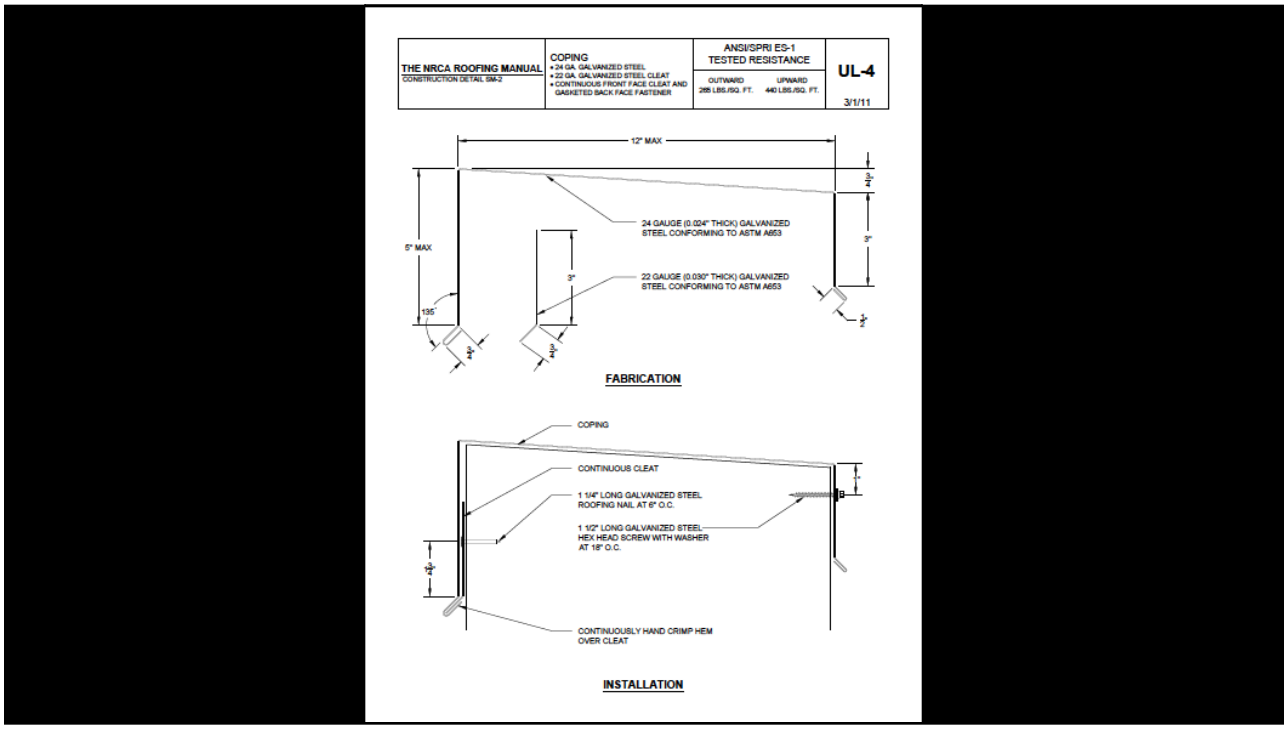

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NRCA's shop-fabricated edge metal testing

- NRCA has third-party certifications:
  - UL
  - Intertek Testing Services, N.A.
- Contractors included in NRCA's third-party certification program are listed on NRCA's website: www.nrca.net
- If interested, contact me for more information.

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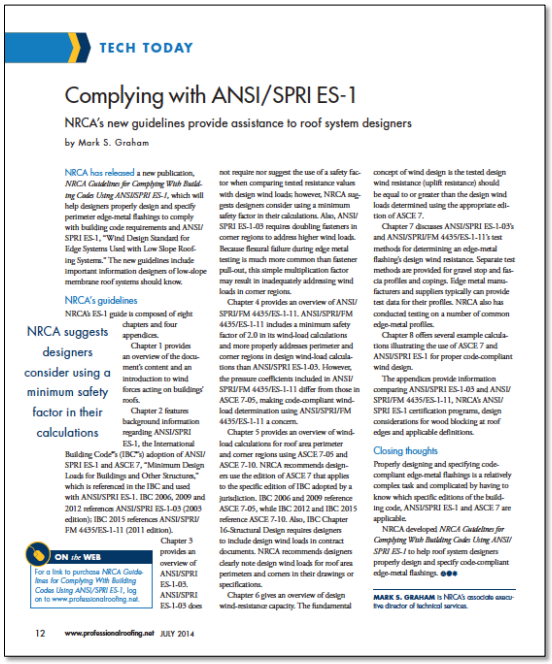

TECH TODAY

Complying with ANSI/SPRI ES-1

NRCA's new guidelines provide assistance to roof system designers

by Mark S. Graham

NRCA has released a new publication, *NRCA Guidelines for Complying With Building Codes Using ANSI/SPRI ES-1*, which will help designers properly design and specify perimeter edge-metal flashings to comply with building code requirements and ANSI/SPRI ES-1, "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems." The new guidelines include important information designers of low-slope membrane roof systems should know.

NRCA's guidelines

NRCA's ES-1 guide is composed of eight chapters and four appendices.

NRCA suggests designers consider using a minimum safety factor in their calculations

Chapter 1 provides an overview of the document's content and an introduction to wind forces acting on buildings' roofs.

Chapter 2 features background information regarding ANSI/SPRI ES-1, the International Building Code®'s (IBC®'s) adoption of ANSI/SPRI ES-1 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures," which is referenced in the IBC and used with ANSI/SPRI ES-1. IBC 2006, 2009 and 2012 references ANSI/SPRI ES-1-03 (2003 edition); IBC 2015 references ANSI/SPRI/FM 4435/ES-1-11 (2011 edition).

ON the WEB

For a link to purchase *NRCA Guidelines for Complying With Building Codes Using ANSI/SPRI ES-1*, log on to www.professionalroofing.net.

Chapter 3 provides an overview of ANSI/SPRI ES-1-03. ANSI/SPRI ES-1-03 does not require nor suggest the use of a safety factor when comparing tested resistance values with design wind loads; however, NRCA suggests designers consider using a minimum safety factor in their calculations. Also, ANSI/SPRI ES-1-03 requires doubling fasteners in corner regions to address higher wind loads. Because flexural failure during edge metal testing is much more common than fastener pull-out, this simple multiplication factor may result in inadequately addressing wind loads in corner regions.

Chapter 4 provides an overview of ANSI/SPRI/FM 4435/ES-1-11. ANSI/SPRI/FM 4435/ES-1-11 includes a minimum safety factor of 2.0 in its wind-load calculations and more properly addresses perimeter and corner regions in design wind-load calculations than ANSI/SPRI ES-1-03. However, the pressure coefficients included in ANSI/SPRI/FM 4435/ES-1-11 differ from those in ASCE 7-05, making code-compliant wind-load determination using ANSI/SPRI/FM 4435/ES-1-11 a concern.

Chapter 5 provides an overview of wind-load calculations for roof area perimeter and corner regions using ASCE 7-05 and ASCE 7-10. NRCA recommends designers use the edition of ASCE 7 that applies to the specific edition of IBC adopted by a jurisdiction. IBC 2006 and 2009 reference ASCE 7-05, while IBC 2012 and IBC 2015 reference ASCE 7-10. Also, IBC Chapter 16-Structural Design requires designers to include design wind loads in contract documents. NRCA recommends designers clearly note design wind loads for roof area perimeters and corners in their drawings or specifications.

Chapter 6 gives an overview of design wind-resistance capacity. The fundamental concept of wind design is the tested design wind resistance (uplift resistance) should be equal to or greater than the design wind loads determined using the appropriate edition of ASCE 7.

Chapter 7 discusses ANSI/SPRI ES-1-03's and ANSI/SPRI/FM 4435/ES-1-11's test methods for determining an edge-metal flashing's design wind resistance. Separate test methods are provided for gravel stop and fascia profiles and copings. Edge metal manufacturers and suppliers typically can provide test data for their profiles. NRCA also has conducted testing on a number of common edge-metal profiles.

Chapter 8 offers several example calculations illustrating the use of ASCE 7 and ANSI/SPRI ES-1 for proper code-compliant wind design.

The appendices provide information comparing ANSI/SPRI ES-1-03 and ANSI/SPRI/FM 4435/ES-1-11, NRCA's ANSI/SPRI ES-1 certification programs, design considerations for wood blocking at roof edges and applicable definitions.

Closing thoughts

Properly designing and specifying code-compliant edge-metal flashings is a relatively complex task and complicated by having to know which specific editions of the building code, ANSI/SPRI ES-1 and ASCE 7 are applicable.

NRCA developed *NRCA Guidelines for Complying With Building Codes Using ANSI/SPRI ES-1* to help roof system designers properly design and specify code-compliant edge-metal flashings. ◆◆◆

MARK S. GRAHAM is NRCA's associate executive director of technical services.

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July 2014

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So what's next…?

Gutter testing – ANSI/SPRI GT-1

Will likely be included in/required by IBC 2021

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