Roofing Issues: Decks to Dockets
September 18-21, 2019 – New York, NY

Code and technical issues update

presented by

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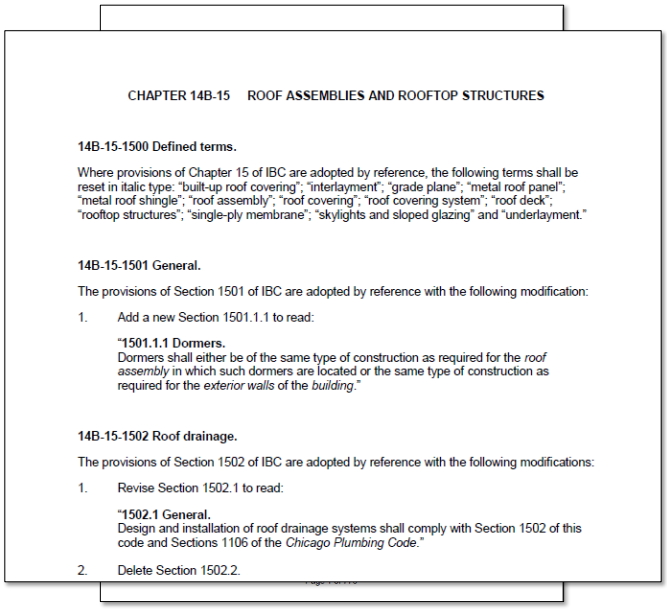
Topics

- I-codes
- Code adoption
- I-code provisions
  - Wind resistance
  - Fire resistance
  - Prescriptive requirements
  - Installation requirements
- Reroofing
- ANSI/SPRI ES-1
- Questions

Methods of model code adoption

- Simply adopt the I-codes (e.g., many local jurisdictions)
  - Refer to published I-codes in an adoption ordinance/legislation
- I-codes used as the basis for a code (e.g., some states)
  - Adoption entity publishes their own code based upon I-codes
  - Code format, chapters and section numbering likely remain similar I-codes
  - Some modifications to I-codes possible
- Jurisdiction development of their own code with an I-code basis (e.g., large cities)
  - Code format, chapters and numbering likely different from I-codes
  - Notable revisions to I-code provisions likely

Chicago Construction Codes



CHAPTER 14B-15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

14B-15-1500 Defined terms.

Where provisions of Chapter 15 of IBC are adopted by reference, the following terms shall be reset in italic type: "built-up roof covering"; "interlayment"; "grade plane"; "metal roof panel"; "metal roof shingle"; "roof assembly"; "roof covering"; "roof covering system"; "roof deck"; "rooftop structures"; "single-ply membrane"; "skylights and sloped glazing" and "underlayment."

14B-15-1501 General.

The provisions of Section 1501 of IBC are adopted by reference with the following modification:

1. Add a new Section 1501.1.1 to read:

   "**1501.1.1 Dormers.**
   Dormers shall either be of the same type of construction as required for the *roof assembly* in which such dormers are located or the same type of construction as required for the *exterior walls* of the *building*."

14B-15-1502 Roof drainage.

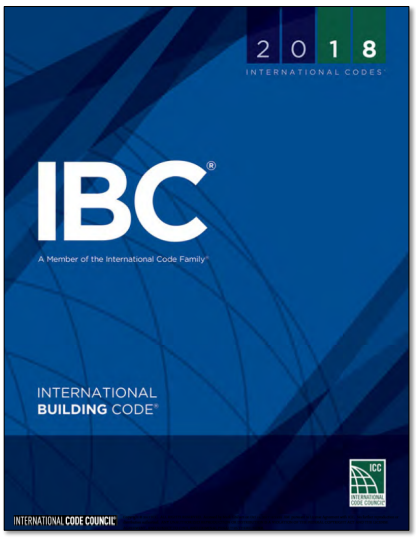
The provisions of Section 1502 of IBC are adopted by reference with the following modifications:

1. Revise Section 1502.1 to read:

   "**1502.1 General.**
   Design and installation of roof drainage systems shall comply with Section 1502 of this code and Sections 1106 of the *Chicago Plumbing Code*."

2. Delete Section 1502.2.

International Building Code, 2018 Edition



- Applicable to all buildings and structures, excepts those applicable to IRC 2018
- Roofing-related requirements:
  - Ch. 10-Means of egress
  - Ch. 12-Interior environment
  - Ch. 13-Energy efficiency
  - Ch. 15-Roof assemblies and rooftop structures
  - Ch. 16-Structural design
  - Ch. 20-Aluminum
  - Ch. 22-Steel
  - Ch. 24-Glass and glazing
  - Ch. 26-Plastic

Significant roof requirements

International Building Code, 2018 Edition

- Wind resistance
- Fire classification
- Installation requirements
- Prescriptive requirements
- Reroofing

Wind resistance

International Building Code, 2018 Edition

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.

1504.3 Wind resistance of nonballasted roofs. Roof coverings installed on roofs in accordance with Section 1507 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.5.2. The wind load on the roof covering shall be permitted to be determined using allowable stress design.

1504.3.1 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single-ply 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.

1609.5 Roof systems. Roof systems shall be designed and constructed in accordance with Sections 1609.5.1 through 1609.5.3, as applicable.

1609.5.1 Roof deck. The roof deck shall be designed to withstand the wind pressures determined in accordance with ASCE 7.

1609.5.2 Roof coverings. Roof coverings shall comply with Section 1609.5.1.

Exception: Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.5.1 are permitted to be designed in accordance with Section 1609.5.3.

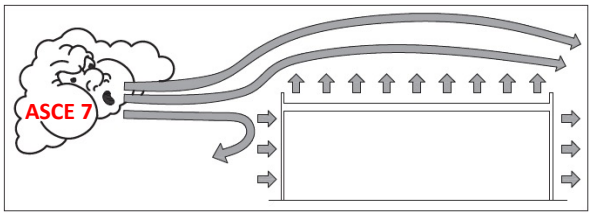
SECTION 1603
CONSTRUCTION DOCUMENTS

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*.

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. Basic design wind speed, V, miles per hour and allowable stress design wind speed, V_{asd}, as determined in accordance with Section 1609.3.1.
2. *Risk category.*
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures to be used for exterior component and cladding materials not specifically designed by the *registered design professional* responsible for the design of the structure, psf (kN/m^2).

The fundamental concept



Wind creates pressures/forces
on building elements

The fundamental concept – cont.

Wind resistance ≥ Design wind load

FM or UL

ASCE 7

Fire classification

International Building Code, 2018 Edition, Sec. 1505-Fire Classification

Roof assemblies shall be tested and listed:

- Class A: Severe fire-exposure

  Exceptions: Brick, masonry, exposed concrete deck; metal shingles or sheets, tile or slate on non-combustible decks; and copper or slate on non-combustible decks
- Class B: Moderate fire-test exposure
- Class C: Light fire-test exposure

TABLE 1505.1[a, b]
MINIMUM ROOF COVERING CLASSIFICATION FOR TYPES OF CONSTRUCTION

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	C[c]	B	C[c]	B	B	C[c]

[Footnoted omitted for clarity]

Look for listing or certification marks

Installation requirements

International Building Code, 2018 Edition, Sec. 1506-Materials

"…Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions...."

Prescriptive requirements

International Building Code, 2018 Edition, Sec. 1507-Requirements for Roof Coverings

- Deck
- Slope: ¼" per ft., ⅛" per ft. for coal tar BUR
- Material standards: Typically ASTM standards
- Installation

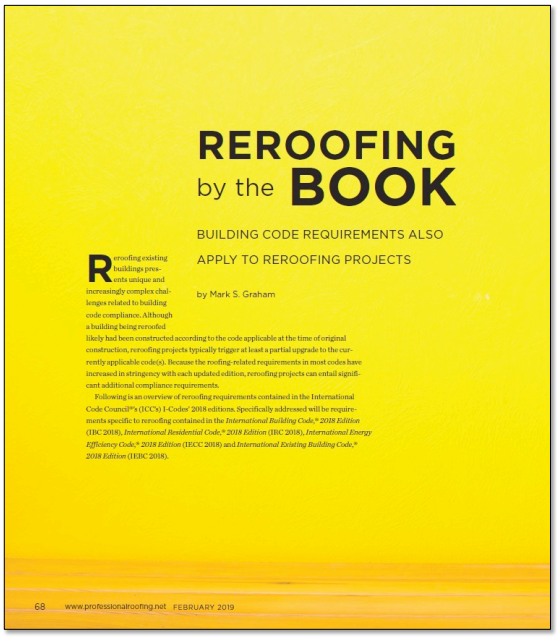
Reroofing

International Building Code, 2018 Edition, Sec. 1511-Reroofing

"…recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15...."

Exceptions:

- Roof slope: "positive drainage" instead of ¼"per ft.
- Secondary roof drains: Not required



Professional Roofing
February 2019

Link

International Residential Code, 2018 Edition

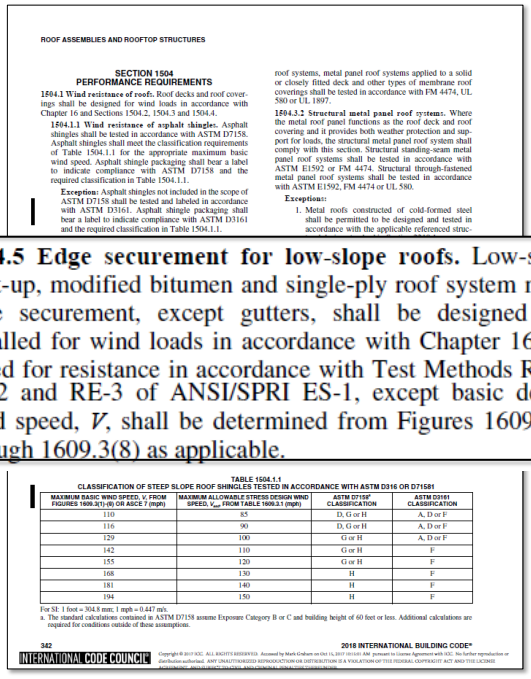
- Applicable to one- and two-family dwellings and townhouses no more than three stories in height
- Roofing-related requirements:
  - Ch. 8-Roof/ceiling construction
  - Ch. 9-Roof assemblies

Ch. 9-Roof assemblies

International Residential Code, 2018 Edition

- Ch. 9 closely mirrors IBC Ch. 15's requirements
- Except IRC only requires fire classified roof assemblies where:
  - Required by local ordinance
  - Roof edge is less than 3 ft. from the lot line

ANSI/SPRI ES-1



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.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 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 with ASTM E1592, FM 4474 or UL 580.

Exceptions:

1. Metal roofs constructed of cold-formed steel shall be permitted to be designed and tested in accordance with the applicable referenced struc-

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.

TABLE 1504.1.1
CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161 OR D7158[a]

MAXIMUM BASIC WIND SPEED, *V*, FROM FIGURES 1609.3(1)–(8) OR ASCE 7 (mph)	MAXIMUM ALLOWABLE STRESS DESIGN WIND SPEED, V_{asd}, FROM TABLE 1609.3.1 (mph)	ASTM D7158 CLASSIFICATION	ASTM D3161 CLASSIFICATION
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.

342 2018 INTERNATIONAL BUILDING CODE®

INTERNATIONAL CODE COUNCIL

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

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Suite 331
Waltham, MA 02452
www.spri.org

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.

Appendix B—Edge System Testing

RE-1 Test

Test Method for Dependently Terminated Roof Membrane Systems

Note: This test is only needed for mechanically attached or ballasted systems which do NOT contain a "peel stop" within 12 in. of the roof edge.

RE1.1 Determination of applied load

For mechanically attached roof membrane systems the load is determined based upon the distance (r) between the roof side of the edge system and the first row of fasteners parallel to the edge. The design membrane tension (G) shall be calculated using the formula below.

Note:

With r = Row Spacing =

1. Test is waived if r ≤ 12
2. For ballasted systems
3. Fully adhered systems consideration and thus

For Mechanically Attache

Design membrane t where

SF = Safety Factor

q_h = Field of roof p

GC_p = External pres choose either

r = Row spacing

When a SF =

Design memb

RE1.2 Apparatus

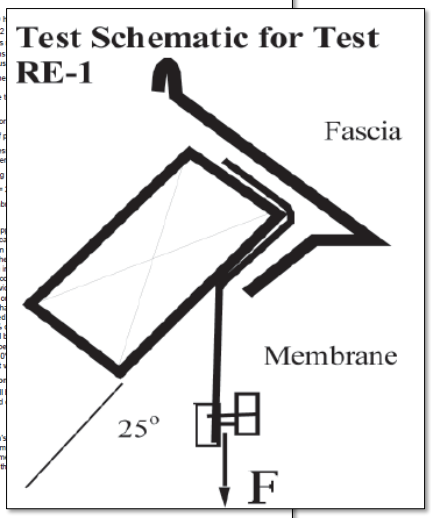
The description of the app nature. Any equipment ca the test procedure within shall be permitted. A sche this apparatus is shown i test apparatus shall be co the performance of indivi are unaffected by edge e the test sample. Load sh measured with calibrated accurate to within +/-3% values. Calibration shall b (minimum) and should be recorded at 5%, 25%, 50 expected maximum test

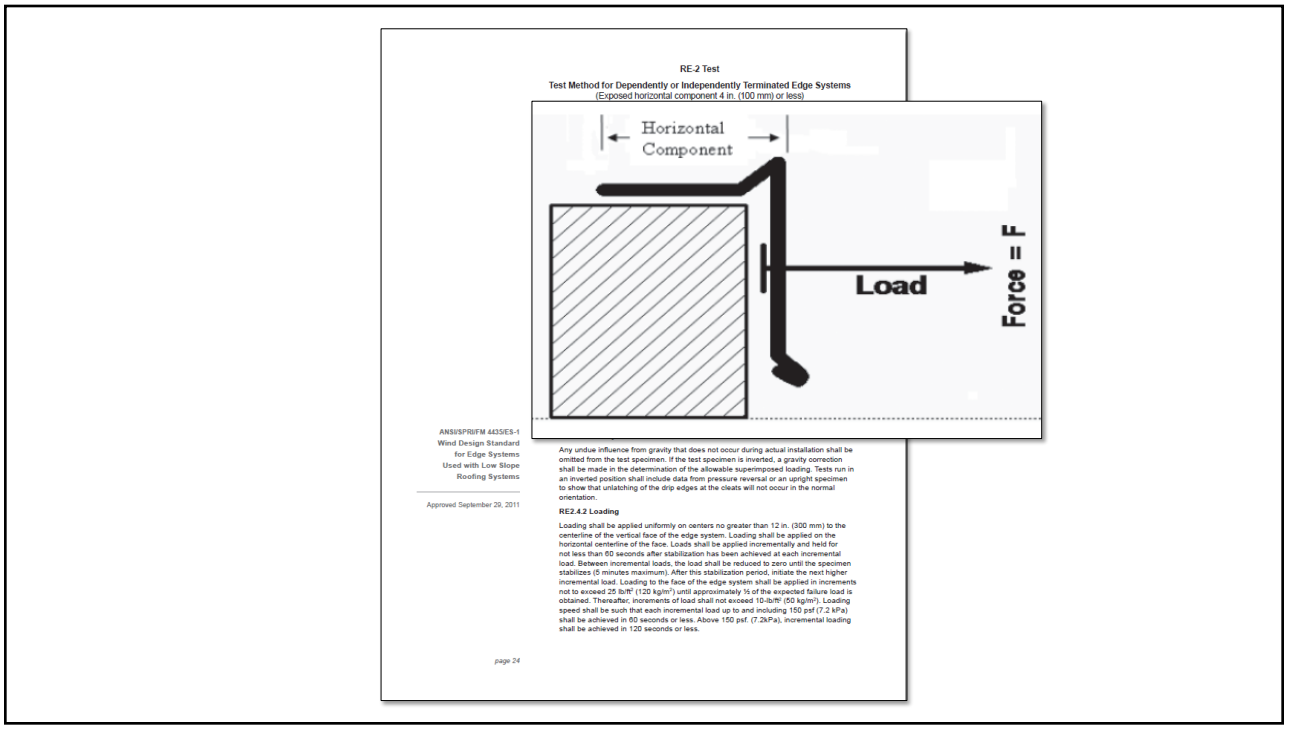
Re1.3 Safety Precaution

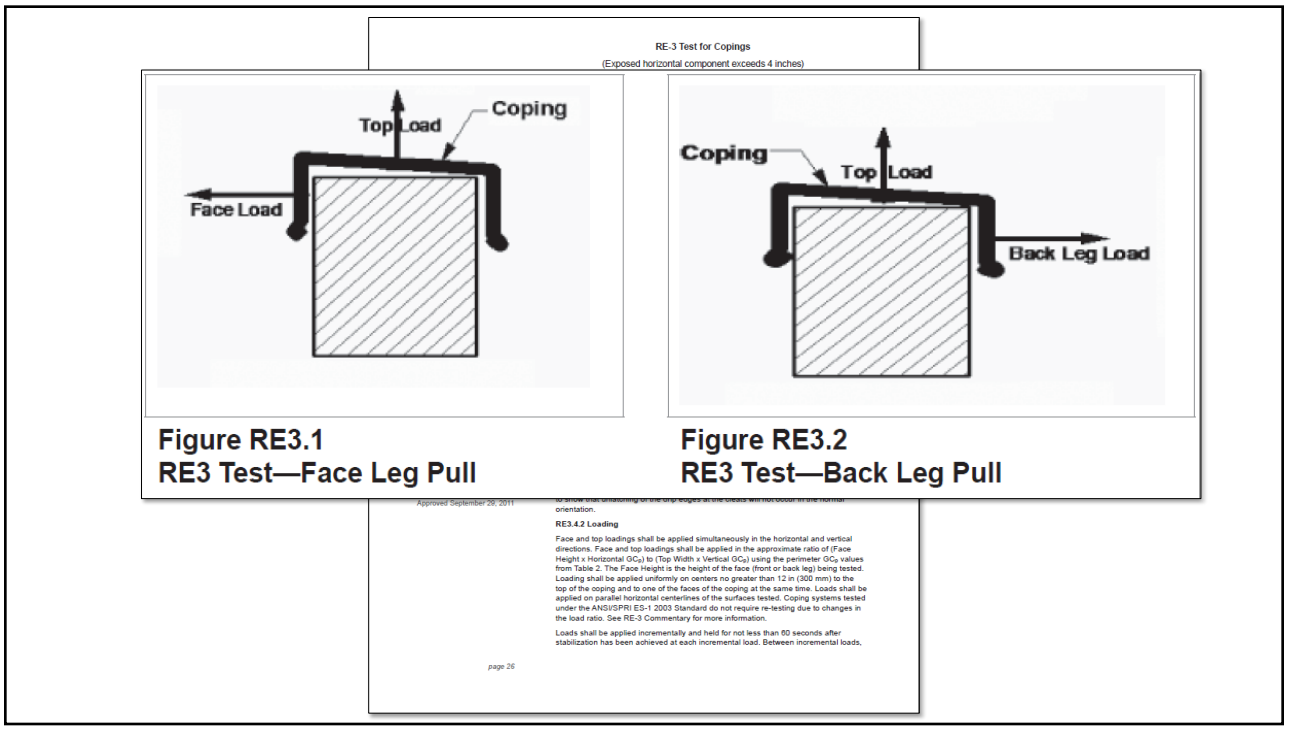
Proper precautions shall operating personnel and any failure.

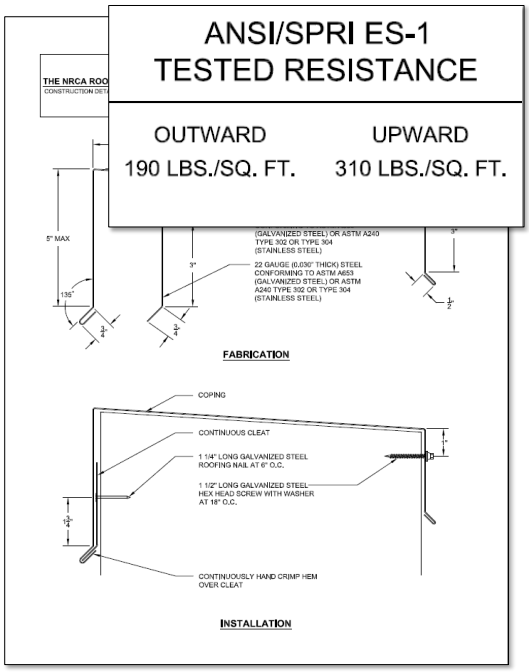
RE1.4 Test Method

To test the edge system's membrane force, uniform along the length of the m The minimum length of th




RE-2 Test
Test Method for Dependently or Independently Terminated Edge Systems
(Exposed horizontal component 4 in. (100 mm) or less)
Horizontal Component
Load
Force = F
ANSI/SPRI/FM 4435/ES-1
Wind Design Standard
for Edge Systems
Used with Low Slope
Roofing Systems
Approved September 29, 2011
Any undue influence from gravity that does not occur during actual installation shall be omitted from the test specimen. If the test specimen is inverted, a gravity correction shall be made in the determination of the allowable superimposed loading. Tests run in an inverted position shall include data from pressure reversal or an upright specimen to show that unlatching of the drip edges at the cleats will not occur in the normal orientation.
RE2.4.2 Loading
Loading shall be applied uniformly on centers no greater than 12 in. (300 mm) to the centerline of the vertical face of the edge system. Loading shall be applied on the horizontal centerline of the face. Loads shall be applied incrementally and held for not less than 60 seconds after stabilization has been achieved at each incremental load. Between incremental loads, the load shall be reduced to zero until the specimen stabilizes (5 minutes maximum). After this stabilization period, initiate the next higher incremental load. Loading to the face of the edge system shall be applied in increments not to exceed 25 lb/ft² (120 kg/m²) until approximately ½ of the expected failure load is obtained. Thereafter, increments of load shall not exceed 10-lb/ft² (50 kg/m²). Loading speed shall be such that each incremental load up to and including 150 psf (7.2 kPa) shall be achieved in 60 seconds or less. Above 150 psf. (7.2kPa), incremental loading shall be achieved in 120 seconds or less.
page 24


RE-3 Test for Copings
(Exposed horizontal component exceeds 4 inches)
Top Load
Coping
Face Load
Figure RE3.1
RE3 Test—Face Leg Pull
Coping
Top Load
Back Leg Load
Figure RE3.2
RE3 Test—Back Leg Pull
Approved September 29, 2011
orientation.
RE3.4.2 Loading
Face and top loadings shall be applied simultaneously in the horizontal and vertical directions. Face and top loadings shall be applied in the approximate ratio of (Face Height x Horizontal GCp) to (Top Width x Vertical GCp) using the perimeter GCp values from Table 2. The Face Height is the height of the face (front or back leg) being tested. Loading shall be applied uniformly on centers no greater than 12 in (300 mm) to the top of the coping and to one of the faces of the coping at the same time. Loads shall be applied on parallel horizontal centerlines of the surfaces tested. Coping systems tested under the ANSI/SPRI ES-1 2003 Standard do not require re-testing due to changes in the load ratio. See RE-3 Commentary for more information.
Loads shall be applied incrementally and held for not less than 60 seconds after stabilization has been achieved at each incremental load. Between incremental loads,
page 26



NRCA has in-place a certification program with UL for contractor's sheet metal shops to comply with ANSI/SPRI ES-1.
This certification allows contractors' sheet metal shops to fabricate and install their own sheet metal in compliance with ANSI/SPRI ES-1 and the IBC.

This certification is available to NRCA members as an add-on to your NRCA membership. For additional information contact NRCA's Technical Services section

Code issue summary

- Comply with the applicable code
  - Assign someone in your company to be responsible for code review/compliance assurance
  - Use ASTM designations, etc. in your material/product purchase orders
- Do not take on additional code code-compliance responsibilities
  - Roof system design
  - Wind load determination
- Know your local code official
- Ask for assistance

Questions and other technical topics…

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