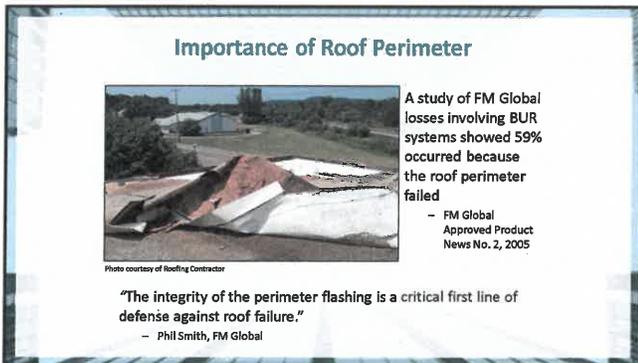




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Key Findings from RICOWI Research
 Published in October 2005 Issue of RCI



Photo courtesy of RICOWI

- Failure of roofing systems was because of system failure at the perimeter...
- The membrane attachment to the deck cannot resist the loads created when the perimeter securement fails...

4

SPRI Edge Standards Evolution

- 1998 **ANSI/SPRI ES-1**
 - Design and testing of low-slope perimeter edge metal, excluding gutters
- 2010 **ANSI/SPRI GD-1**
 - Design and testing of low slope gutters
- 2011 **ANSI/SPRI/FM 4435/ES-1**
 - Revision of ANSI/SPRI ES-1 incorporating components of FM 4435

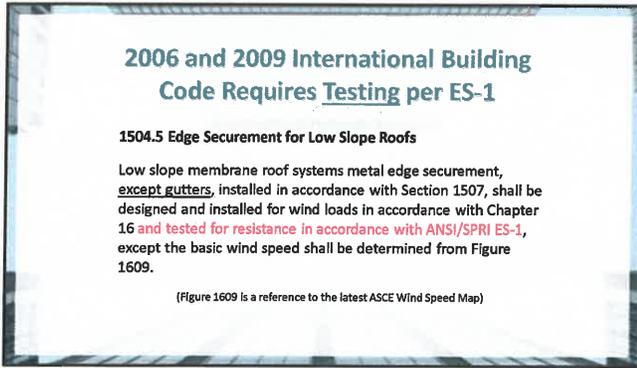
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SPRI Edge Standards Evolution

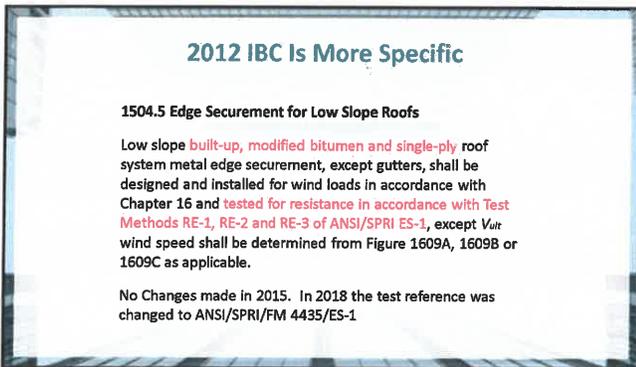
- 2016* **ANSI/SPRI GT-1**
 - Test standard for gutters—low or steep slope
- 2017** **ANSI/SPRI/FM 4435/ES-1**
 - Test standard for low-slope perimeter edge metal, excluding gutters
- 2019*** **ANSI/SPRI ED-1**
 - Design standard for all low-slope perimeter edge metal including gutter, fascia, and coping

• ANSI/SPRI GT-1 was updated in 2022 with editorial changes.
 • ANSI/SPRI/FM 4435/ES-1 was updated in 2023 with minor changes.
 ***ANSI/SPRI ED-1 is currently being updated with minor revisions

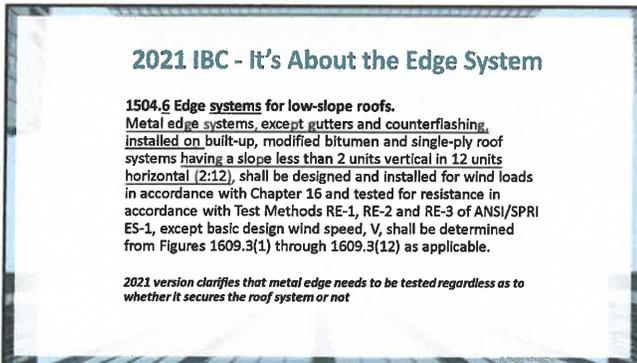
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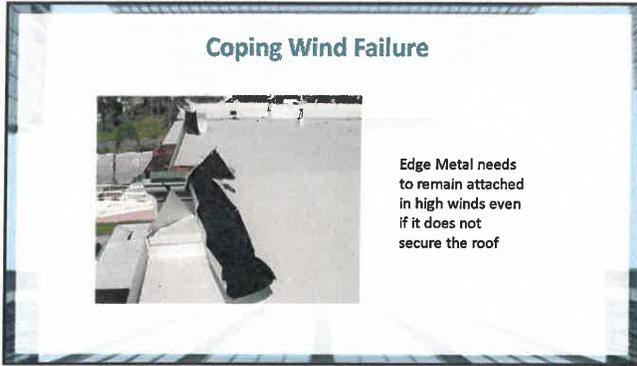
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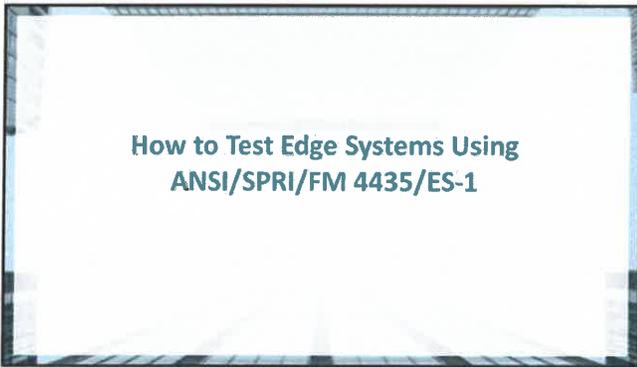
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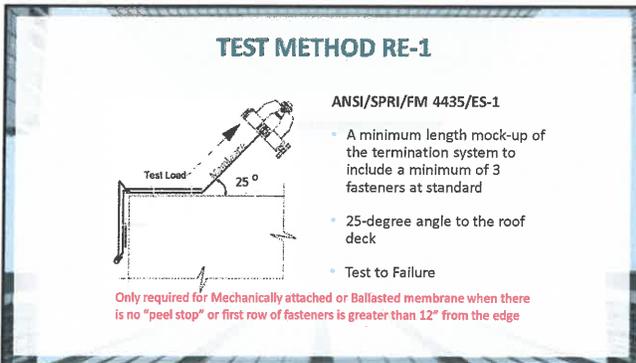
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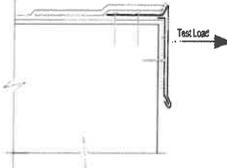
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TEST METHOD RE-2

ES-1 and 4435/ES-1



- All parts of the test specimen shall be full size in all dimensions
- Length as designed for field use (8' minimum)
- Cycled increasing loads until failure

13

ES-1 Test Protocols



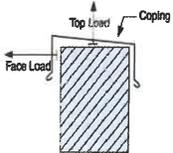
Photo courtesy of ARS International

- RE-2 tests the outward pull (negative pressure) on the vertical face of an edge device

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TEST METHOD RE-3

ES-1 and 4435/ES-1



- Bi-Directional test for coping caps - face and top loadings applied simultaneously
 - Ratio of load is 1.73 Vert. : 1.00 Horz.
- Cycled increasing loads until failure
- Repeated with loads on back and top

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ES-1 Test Protocols



- RE-3 tests upward and outward simultaneous pull on the horizontal top and vertical sides of a parapet coping cap

Photo courtesy of Hiciman Edge Systems

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IBC Code Language Prior to 2021

1503.3 Coping.
Parapet walls shall be properly coped with noncombustible*, weatherproof materials of a width not less than the thickness of the parapet wall.

*metal, stone, tile are noncombustible...what about single-ply?

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Coping Parapet Walls




Metal

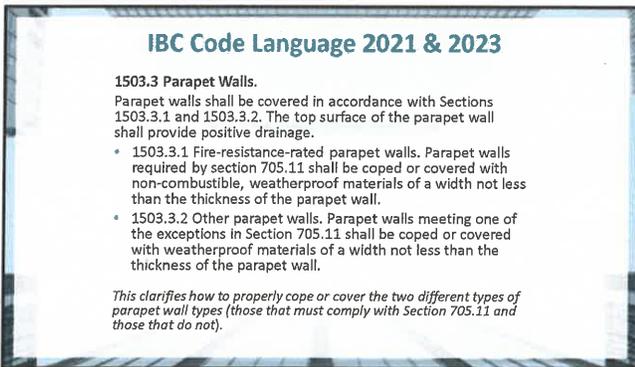

Stone


Tile

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21

Testing Some Gutters per ANSI/SPRI GT-1 is a requirement of 2021 IBC

1504.5.1 Gutter securement for low-slope roofs.

External gutters that are used to secure the edge of the roof membrane on low-slope (less than 2:12 slope) built-up, modified bitumen, and single ply roofs, shall be designed, constructed and installed to resist wind loads in accordance with Section 1609 and shall be tested in accordance with Test Methods G-1 and G-2 of SPRI GT-1

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Test G-1
- Tests Gutter's resistance to horizontal negative pressure

Photo Courtesy of Hickman Edge Systems and RICOWI

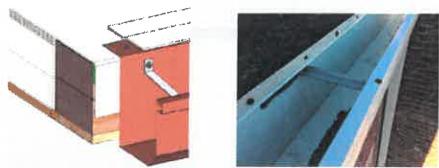
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Test G-2
- Tests gutter's resistance to vertical negative (or positive) pressure

Photo Courtesy of Hickman Edge Systems and RICOWI

24

"Gutters that are used to secure the perimeter edge of the roof membrane?"

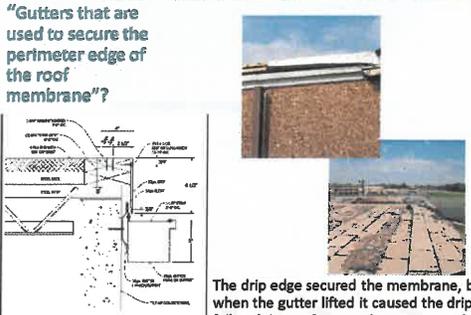


Gutter with a Roof Flange clearly secures the membrane; same as a drip edge or gravel stop.

Does the gutter secure the membrane or does the term bar? If the gutter lifts and pulls out the term bar the roof will no longer be secure.

25

"Gutters that are used to secure the perimeter edge of the roof membrane?"

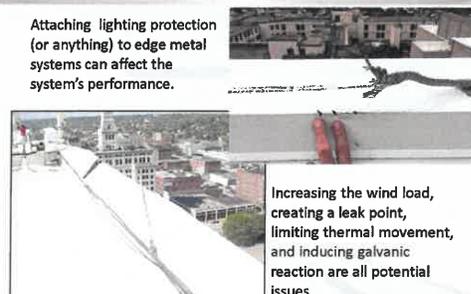


The drip edge secured the membrane, but when the gutter lifted it caused the drip edge to fail and the roof was no longer secured.

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Concern Addressed in IBC 2024

Attaching lighting protection (or anything) to edge metal systems can affect the system's performance.



Increasing the wind load, creating a leak point, limiting thermal movement, and inducing galvanic reaction are all potential issues

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IBC 2024 Lightning Protection

- **1511.7.6.1 Installation on metal edge systems or gutters.** Lightning protection system components attached to ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 tested metal edge systems or gutters shall be installed with compatible brackets, fasteners, or adhesives, in accordance with the metal edge systems or gutter manufacturer's installation instructions. When metal edge system or gutter manufacturer is unknown, installation shall be as directed by a registered design professional.
- **1511.7.6.2 Installation on roof coverings.** Lightning protection system components directly attached to or through the roof covering shall be installed in accordance with this chapter and the roof covering manufacturer's installation instructions. Flashing shall be installed in accordance with the roof assembly manufacturer's installation instructions and Sections 1503.2 and 1507 where the lightning protection system installation results in a penetration through the roof covering. When the roof covering manufacturer is unknown, installation shall be as directed by a registered design professional.

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Solutions Exist...More are Needed



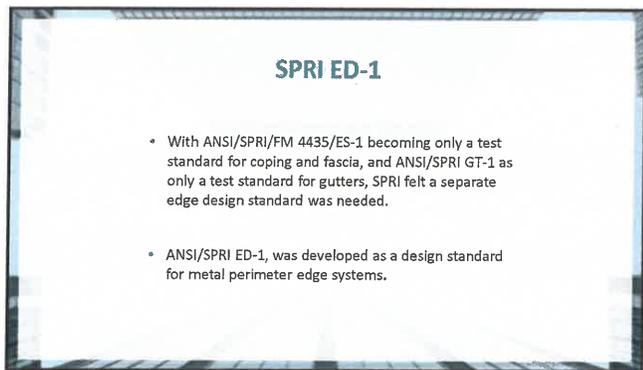
Membrane and Edge Metal manufacturers will need to provide solutions and installation instructions for mounting lightning protection on their systems

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ANSI/SPRI ED-1
Approved 3, 2019

Design Standard for Edge Systems Used with Low Slope Roofing Systems

30



31



32



33

Nailer Attachment

- For the edge metal to perform as tested the nailer must be properly secured.
- The ES-1 Standards do not include tests for nailers
- ANSI/SPRI ED-1 does provide guidance
- FM Data Sheet 1-49 is another good reference



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Conclusions

- Edge metal failure is a leading cause of roof failures
- 2006 and later versions of International Building Code require that edge metal, except gutters, be tested per ANSI/SPRI ES-1 or ANSI/SPRI/FM 4435/ES-1
- The 2021 and later versions of International Building Code require that gutters be tested per ANSI/SPRI GT-1.
- ED-1 has been developed as an Edge Design Standard to be used for all low-slope metal perimeter edge (Fascia, Coping, and Gutter)

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