Tuesday, May 7

	Ocean	Rhode Island	Patriot
8:00 AM	Codes & Standards 8:00 - 9:00 Collins		
8:15 AM			
8:30 AM			
8:45 AM			
9:00 AM	Code Development 9:00 - 10:00 Collins	TDP-1 (Peel Test) 9:00 - 9:45 Childs	
9:15 AM			
9:30 AM			Resiliency 9:30 - 10:15 Ibanez
9:45 AM			
10:00 AM		RD-1 10:00 - 10:45 Donovan	
10:15 AM	DORA™ Listing 10:15 - 11:00 Collins		
10:30 AM			
10:45 AM		ADT-1 Griswold/Eschhofen 10:45-11:30	
11:00 AM	DORA™ Fire 11:00 - 11:45 Collins		VR-1 Partners 11:00-11:30 Kiriazes
11:15 AM			
11:30 AM		Education 11:30 - 12:00 Chamberlain	
11:45 AM			
12:00 PM	Lunch & Member Services Presentation Dan Boardman, FM Approvals Preview of the updated ROOF Nav Click here to view the BETA site.		
12:15 PM			
12:30 PM			
12:45 PM			
1:00 PM	DORA™ Edge 1:00 - 1:45 LeClare		
1:15 PM		RP-14 1:15 - 2:00 Mader	
1:30 PM			PRO Guide 1:30 - 2:00 Collins
1:45 PM			
2:00 PM	PVC Environmental 2:00 - 3:00 Stanley	Standards Template Library 2:00 - 2:30 Mader	WD-1 Update 2:00 - 2:30 Chamberlain/Scheerer
2:15 PM			
2:30 PM		Internal Pressure 2:30 - 3:15 Mader	Digital Content & Communications 2:30 - 3:15 Montoya
2:45 PM			
3:00 PM			
3:15 PM	Technical Committee 3:15-4:15 Childs		
3:30 PM			
3:45 PM			
4:00 PM			

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SPRI
Codes & Standards
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
8:00 a.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Review objectives of Task Force

IV. Reports and Updates
   a.) Industry Association Report
   b.) Industry Initiatives Report
   c.) Code updates
   d.) Standards upates

V. Unfinished Business
   a.) Puget Sound update
   b.) PVB Materials Research

VI. New Business

VII. Adjournment

Task Force Objective:
- Chadwick Collins, SPRI

The objectives of the Codes & Standards Task Force (CSTF) are to provide timely and pertinent information on codes & standards that may affect the sale and use of sheet membrane roofing systems and the components used in those systems. The CSTF will respond promptly to issues relating to codes & standards based on the consensus of the SPRI membership. As of January 2014, the Cool Roof Codes update will be provided in the CSTF meeting.

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SPRI
Code Development
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
9:00 a.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Review Code Development Task Force Objectives

IV. ICC Code Development Process Update (Review of Proposals and Strategy for 2027 edition)

V. IAPMO/UPC

VI. 2024/2027 IECC Update

VII. ASHRAE update (90.1 and 189.1)

VIII. Florida Code Development update

IX. Code Trends

X. Adjournment

Task Force Objective:
– Amanda Hickman, SPRI
start date 10/2010 budget: $0

The objective of the Code Development Task Force is to develop and advocate for safe, technically correct, and easily enforced code language while also promoting the goals of the SPRI's membership.

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SPRI
DORA™ Listing Service
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
10:15 a.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Reports & Updates
  a.) Steering Committee Updates
    i. Education/Outreach (Collins and Wise)
    ii. Scope Check
  b.) DORA Database Report & Updates (Wise)
  c.) Edge Securement Task Force Update (LeClare)
  d.) Fire Classification Task Force Update

IV. Unfinished Business
  a.) Contractor outreach
  b.) Maine update

V. New Business

VI. Adjournment

Task Force Objective:
– Chadwick Collins, SPRI

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Return to Schedule

SPRI
DORA™ Fire Classification
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
11:00 a.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Reports & Updates
Review of January dicussion

IV. New Business
Discussion of options to recommend to the Steering Committee

V. Adjournment

Task Force Objective:
– Chadwick Collins, SPRI
start date 10/2023 *budget: $0*

The objective of this Task Force is to determine how to best add fire classifications to the DORA® Listing program.

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Return to Schedule

SPRI
DORA Edge Securement
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
1:00 p.m.

AGENDA

I. Call to Order — B. LeClare

II. Roll call and reading of SPRI antitrust statement

III. Review of Objective Statement

a.) The Board has created this task force to meet the objective; discussion of whether that objective is appropriate is outside the scope of the task force.
b.) The determination of which companies can participate in DORA is outside the scope of this task force.

IV. Roof Assembly Term
a.) Does it include edge metal?
b.) If not is there a broader term that includes roof assembly and edge metal?

V. How to handle sub-listing type programs
a.) Can guidelines written for Roof Assemblies incorporate Roof Edge?
b.) Should it be broadened to incorporate other tested roof products or systems

VI. How to document, describe and charge for field roll formed products
a.) Does a product from each roll former need to be tested?
b.) Is testing applicable to all roll formers using dies sets equal to those used to produce the tested product.

VII. Adjournment

Task Force Objective:
– Bob LeClare, ATLAS International, Inc.
start date 06/2023 objectives approved 11/09/2022 budget: $0

The objective of this Task Force is to add edge securement requirements to the DORA® Listing program.

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SPRI
PVC Environmental
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:00 p.m.

AGENDA

I.	Call to Order	S. Stanley
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review the most recent version of the white paper	
IV.	Finalize the version with possible small edits	
V.	Adjournment	

Task Force Objective:
– Shawn Stanley, IB Roof Systems
start date 07/2022 objectives approved 10/19/2022 budget: $20,000

The approved objectives of this Task Force are:

- To collaborate with interested industry parties to remove flexible PVC roofing membranes from the Red List.
- Educate Living Building Challenge and LEED to acknowledge and differentiate flexible PVC roofing materials from other PVC uses types and categories.
- Explore alternate offsets or trade-offs to resolve Red List exceptions.
- Combat possible regulations on a national level that are biased against flexible PVC roofing membranes.

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SPRI
TDP-1 Tear Drop Peel
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
9:00 a.m.

AGENDA

I.	Call to Order	S. Childs
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review Pre-Canvas List (attached)	
IV.	Review TDP-1 Standard Draft (attached)	
V.	Adjournment	

Task Force Objective:
– Stephen Childs, GAF *start date 10/2023* *budget: $0*

Develop an industry recognized standard that outlines a procedure to evaluate and compare the interactions of membranes, substrates, and membrane adhesives when used to adhere the membrane to the substrate material.

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TDP Canvass Group

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Voter Name	Answer
Chadwick Collins	General Interest
David Roodvoets	General Interest
Todd Burroughs	General Interest
Michael Giangiacomo	Other Producer
Mike Darsch	Other Producer
Stephanie Kiriazes	Other Producer
Stephen Childs	Other Producer
Christopher Mader	Producer
Al Janni	Producer
Nick Eschhofen	Producer
Steven Moskowitz	Producer
Brian Chamberlain	Producer
Colin Griswold	Producer
Tim McQuillen	Producer
Stan Choiniere	User
David Hawn	User
David Alves*	User
Flonja Shyti	
Linda King	
Chris Meyer	
Mike Ennis	
Luis Cadena	
Andrew Reynolds	
Joel King	
Zach Priest	

*added 10/10/2023 - FM invited to participate

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ANSI/SPRI/FM TDP-1 2024

Test Standard for Comparative Adhesion Strengths of Waterproofing Membranes, Membrane Adhesives, and Board Stock Materials Used with Low Slope Roofing Systems

Table of Contents

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1.0 Introduction

1.1 Scope

This standard provides basic requirements and procedures for determining the *maximum failure load* of *waterproofing membranes*, membrane adhesives, and *board stock materials* when tested for adhesion strength in peel. See Appendix A - Commentary C1.1 for additional information.

1.2 Reference Document

1.2.1 ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

1.2.2 <dead load heat shear std holder>

~~1.2.1~~1.2.3 ISO 813:2019 Rubber, vulcanized or thermoplastic - determination of adhesion to a rigid substrate 90-degree peel method

1.3 Significance and Use

1.3.1 Roof assemblies are tested for wind uplift resistance in accordance with various standards, such as *ANSI/FM 4474*, Florida Building Code TAS 114, UL 1897, or CSA A123.21. Each assembly is made up of various components. The test procedure in this standard is useful in qualifying components or component combinations to reduce the dependence on large scale roof assembly testing. See Appendix A - Commentary C1.3.1 for additional information.

1.3.2 This test procedure is used to determine the *maximum failure load* of *waterproofing membranes and board stock* materials when secured with a *membrane adhesive* and exposed to a linear load perpendicular to the plane in which the waterproofing membrane is installed on the board stock material.

2.0 General Information

2.1 Definitions

All words defined within this section are italicized throughout the standard.

2.1.1 ANSI

American National Standards Institute

2.1.2 Board Stock

A rigid ~~board~~ panel upon which a *waterproofing membrane* is secured to, ex: insulation board, cover board, thermal barrier, etc.

2.1.3 Maximum Failure Load

The peak load value observed when the test specimen is no longer able to resist the application of additional load.

2.1.4 Membrane Adhesive

A component used within a roof assembly to bond the waterproofing membrane to the top surface of the *board stock* material.

Commented [CC1]: Reel will provide ASTM number and title

Commented [CC2]: or substrate - comment was to have definition include CDX/similar as well

Commented [CC3]: Conversation: is "maximum" necessary here?

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2.1.5 Standard Laboratory Conditions
The room or enclosure where the materials are conditioned, and test specimens are prepared and tested shall be protected from the elements and maintained at a temperature of 73 ± 2°F (23 ± 1°C) and 50% relative humidity ± 2%.

2.1.6 Waterproofing Membrane
A flexible rolled sheet product secured to the top layer of *board stock* material using a *membrane adhesive* intended to prevent water ingress to the structure.

2.2 Apparatus

2.2.1 A tensile test machine that applies load with a constant rate of speed and can measure the applied load. The equipment shall be calibrated within 12 months of the date of testing, in accordance with a standard that is traceable to a nationally recognized source. The load cell shall be of appropriate load capacity to ensure accurate results. See Appendix A - Commentary C2.2.1 for additional information.

2.2.2 Pinch wheel rollers or clamping device compatible with the tensile test machine used to attach the free ends of the *waterproofing membrane* to the cross head of the tensile testing machine.

2.3 Test Specimen Sourcing

2.3.1 All specimen components shall be provided by the program sponsor or component supplier and tested as received.

2.3.2 All test specimens shall be preconditioned and prepared for testing in *standard laboratory conditions.*

3.0 TDP-1 Procedure

3.1 Personal Protective Equipment - Adequate personal protective equipment shall be available and in use during specimen setup and testing such as eye protection, cut resistant gloves, etc.

3.2 Test Specimen Setup

3.2.1 The *waterproofing membrane* shall be cut to 2 in. (50.8 mm) wide by a minimum of 20 in. (508 mm) long strips. See Appendix A - Commentary C3.2.1 for additional information.

3.2.2 *Board stock* material should be cut to a minimum size of 4 in. x 8 in (101.6 mm x 203.2 mm).

3.2.3 The waterproofing membrane shall be installed using the membrane adhesive to the top surface of the *board stock* being evaluated following the membrane adhesive manufacturers installation guidelines. The waterproofing membrane shall be installed such that the center 2 in. x 6 in. section of the waterproofing membrane is centered on the board stock material leaving a minimum of a 7 in. (177.8 mm) free end on either side of the adhered center section that will be

Return to Schedule

used to attach the test sample to the crosshead. See Appendix A - Commentary C3.2.1.3 for additional information.

3.2.4 The test specimen shall be installed, centered under the crosshead and secured in the tensile test machine in preparation for a load to be applied perpendicular to the plane of the board stock materials top surface on which the *waterproofing membrane* is adhered.

3.2.5 Statically secure the *board stock* material and move the crosshead holding the *waterproofing membrane* loose ends. See Appendix A - Commentary C3.2.3.2 for additional information.

Commented [CC4]: Edit to clarify that one end of the sample is statically secured and the other end is moving. Clarify that the board is secured in the bottom securement with the tabs in the top securement

3.2.6 Information on test specimen sampling size is provided in Commentary. See Appendix A - Commentary C3.2.4 for additional information.

3.3 Test Method

3.3.1 Testing shall be conducted in *standard laboratory conditions*.

3.3.2 Load is applied perpendicular to the plane of the board stock materials top surface on which the *waterproofing membrane* is adhered at a speed of 2.0 in./min (50.8 mm/min).

Commented [CC5]: Need confirmation that this is the only speed needed in the standard.

3.3.3 The *maximum failure load* and mode of failure shall be recorded for each test specimen. See Appendix A - Commentary C3.3.3 for additional information.

4.0 Reporting – Test reports shall include the following:

4.1 Name and address of the manufacturer or supplier of each test specimen component.

4.2 Name or other identification marks of each test specimen component, including any relevant listing and labeling marks.

4.3 Description of each test specimen component.

4.4 Conditioning of the test specimens, environmental data during the test (temperature, RH, etc.).

4.5 Identification of the laboratory technician.

4.6 Identification of the test equipment and instruments used, including open area dimensions of the *waterproofing membrane* holding device.

4.7 Calibration date of the tensile test machine.

4.8 Any deviations from the test method.

4.9 *Maximum Failure Load* of each test specimen.

4.10 Mode of failure of each test specimen and images representative of each mode of failure.

4.11 Statistics. See Appendix A - Commentary C4.11 for additional information.

5.0 Precision and Bias – There is not enough data available to establish precision and bias.

Commented [CC6]: Revise - current indicates that a P&B would be done once sufficient data is available

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Appendix A – Commentary

This Commentary is not a part of this standard. It consists of explanatory and supplementary material designed to assist users in complying with the requirements. It is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements or to provide other clarifications. It therefore has not been processed in accordance with *ANSI* Essential Requirements and may contain material that has not been subjected to public review or a consensus process. Thus, it does not contain requirements necessary for conformance with the standard.

The sections of the Commentary are numbered to correspond to the sections of the standard to which they refer. Since it is not necessary to have supplementary material for every section in the standard itself, there may be gaps in the numbering in the Commentary.

C1.1 Scope

This standard provides basic requirements and procedures for testing *waterproofing membrane* pull over resistance. *Stress plates* may be exposed to symmetrical or asymmetrical loading schemes depending on the application and proposed roofing system. An asymmetrically loaded *stress plate* would be found in a traditional inseam or lap fastened system with a one sided weld. A symmetrically loaded plate would be found in systems where the *waterproofing membrane* is field fastened or where a double sided weld is used with an inseam or lap fastened system. This test procedure can be used for induction welded system membrane and plate disengagement as well as base sheet rupture evaluations.

C1.3.1 Significance and Use

This standard is intended to be a basis of practical comparative testing for roof system components that are within the scope of this standard. Acceptable applications include, but aren't limited to:

1) Determination of the comparative performance of component combinations - Prior to full scale roof assembly testing, it is reasonable to perform small scale testing in accordance with this standard to determine the most critical or lowest performing component combination(s). Using the most critical component combination(s) in full-scale roof assembly testing would allow the inclusion of the component combination(s) tested in accordance with this standard to be included in the full-scale assembly listings or approvals.
2) Inclusion of alternate components into existing roof assembly listings or approvals - Should a manufacturer desire to change a component, or include an alternate component, it is reasonable to perform comparative small-scale testing in accordance with this standard to determine if the proposed components perform as well or better than the existing components.

When comparing one data set to another to determine the most critical components, it is important to be sure those data sets were generated using the same testing conditions, apparatus, and test specimen setup.

C2.2.1 Load Cell

Ensure the load cell is appropriate for the expected or discovered loads. In some cases, load cells have a recommended load range that differs from the stated maximum load capacity due to non-linearity near zero or near maximum load.

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SPRI
RD-1
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
10:00 a.m.

AGENDA

I.	Call to Order	L. Donovan
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review edits in redline document (attached)	
IV.	Review tables and figures in commentary	
V.	Timeline	
VI.	Adjournment	

Task Force Objective:
– Liam Donovan, OMG Roofing Products

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ANSI/SPRI RD-1 2019 2024

Performance Standard for Retrofit Roof Drains

Approved July 25, 2019

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www.spri.org.

Disclaimer
This standard is for use by architects, engineers, consultants, roofing contractors and owners of low slope roofing systems. This standard specifically does not address existing building drainage capacity or overflow drainage requirements and should not be used for those purposes. It is intended to provide data and guidance necessary to understand the implementation and use of retrofit roof drainage elements. Do not assume all existing buildings have code compliant drainage. SPRI, IT'S MEMBERS AND EMPLOYEES DO NOT WARRANT THAT THIS STANDARD IS PROPER AND APPLICABLE UNDER ALL CONDITIONS.

Table of Contents

1 Introduction

This standard is a reference for those that design, specify, or install *retrofit roof drains* which are designed for installation in existing drain plumbing on existing roofs. This standard does not include consideration of all roof storm water drainage code requirements for specific building sites. Design is dictated by local code requirements. As such, this standard shall be used in conjunction with local code and the installation instructions from the manufacturer of the specific *retrofit roof drain*.

2 Definitions

For the purposes of this Document, the following definitions apply:

2.1 Available Inlet Area

The combined area of all the openings in the *strainer*.

2.2 Drain Body

The basic drain, consisting of the *drain flange* and interconnected *drain stem*. There may be a sump between the flange and the stem.

2.3 Drain Flange

The part of the *drain body* that extends horizontally, in the plane of the roof. It is used for attachment of the drain to the roof deck and for clamping and sealing the roof membrane flashing plies to the drain.

2.4 Drain Flashing

The watertight connection(s) between the *retrofit roof drain* and the existing roofing system.

2.4.1 Clamping Ring

A component of the *retrofit roof drain* that creates a mechanical compression seal with the membrane flashing plies by clamping the membrane flashing plies between the *clamping ring* and the *drain flange*.

2.4.2 Heat Welding

A method for creating a watertight seal between the electric heat-welded membrane flashing plies and the *drain flange*.

2.4.3 Backflow Seal

The part of the *retrofit roof drain* that creates a watertight mechanical compression seal between the *drain stem* and the existing plumbing

2.5 Drain Stem

A part of the drain that is inserted through the existing roof drain bowl for connection to the existing roof drain plumbing. The *backflow seal* is integral to the stem.

2.6 Effective Drain Diameter

The least cross-sectional flow area between the *drain body* and the outlet of the *drain stem* expressed as a diameter.

2.7 Retrofit Roof Drain

A factory fabricated drain, installed within an existing roof drain on an existing roof. *Retrofit roof drains* are installed from the roof surface and are provisional with a horizontal flashing flange for adhering membrane flashing materials, and coupling to provide a mechanical backflow compression seal to the existing plumbing. A *retrofit roof drain* is designed so that it may be installed without removing the existing roof *drain body* and plumbing.

2.8 Strainer

A component of the drain which minimizes amount of debris that enters the drain.

3 General Design Considerations

3.1 The drain manufacturer's installation instructions shall reference the information required for proper installation of the roof *drain body*, *backflow seal*, and *strainer* and shall include at least the following:

3.1.1 A requirement that all *retrofit roof drain* installations shall meet the requirements of this standard and the requirements of the local authorities having jurisdiction. Where local codes conflict with this standard, local codes shall have priority.

3.1.2 A description of the *drain body*, *backflow seal* and *strainer* and the equipment needed for proper assembly and installation.

3.1.3 Information regarding proper storage and handling of the *retrofit roof drain* materials prior to and during installation.

3.1.4 Description of all limitations, special installation instructions and design criteria associated with the performance of the *retrofit roof drain*.

3.2 The *retrofit roof drain* size shall be the proper size to be compatible with the existing drain. It shall provide adequate performance based on the more stringent flow requirements of either, the governing building code, or the flow requirements as noted in Section 8. See Table 1 in the Commentary of this Standard.

3.3 Roofing Watertight Seal

The bond between the roof membrane and the *drain flange* shall provide a watertight seal using a manufacturer's approved water block adhesive and *clamping ring*, with bolts evenly cinched to membrane or by *heat welding* to the roofing membrane.

3.4 Backflow Seal

The *backflow seal* shall extend below the top of the existing drain and be long enough to create a watertight connection with the properly prepared and cleaned interconnecting portion of the existing drain system.

4 Materials

Retrofit roof drains shall be constructed of polymeric or metal materials or any combination of metals and polymeric materials that ~~have been judged to~~ perform satisfactorily in the rooftop environment. ~~Manufacturers~~Roof system manufacturers shall be contacted to determine membrane system compatibility.

5 Testing

Retrofit roof drain manufacturers shall test samples that are representative of standard production per the RF-1 test specified in this section.

5.1 Leakage

Drain bodies with *backflow seals* shall withstand a continuous test pressure ~~under the equivalent of a 10-foot head of water or~~ of 4.33 lbf./in.^{2} (30 kPa) above the elevation of the *backflow seals* without any visible leakage after 24 hours. Laboratory test method RF-1 shall be used to test the *backflow seals*.

Test RF-1

Setup

Insert a representative *retrofit roof drain* into a vertical plumbing pipe large enough to receive the *retrofit roof drain* stem and the *backflow seals*. Seal the existing plumbing pipe below the *drain stem*-to-plumbing pipe juncture. Affix a vertical pipe at least 10 ft. long (3.05 m), but of any convenient diameter that can be sealed to the *drain body* so that water can flow through the pipe and into the seal between the plumbing and the backflow gasket.

Method

~~Fill the pipe with water to a height of 10 ft. (3.05 m) above the *backflow seal*. The test shall be conducted for a minimum of 24 hours -0/+1 hour during which the 10-foot head of water shall be maintained.~~Employee a test method that achieves the required pressure of 4.33 lbf./in.^{2} (30 kPa) above the elevation of the *backflow seals* without any visible leakage after 24 hours.

Test Results

The drain shall be acceptable if there is no visible leakage at the *backflow seal*.

6 Strainers

Strainers extending above the surface of the roof, shall extend not less than 4 in. (100 mm) above the surface of the roof immediately adjacent to the roof drain. To facilitate normal flow of water, dome shaped *strainers* shall have an available inlet area, above roof level, of not less than one and one-half times the inside cross-sectional area of the drain diameter.

7 Installation

The *retrofit roof drain* shall be installed in compliance with the drain manufacturer's instructions. The roof cover tie-in shall be completed in compliance with the roof cover manufacturer's instructions.

8 Flow requirements

Flow capacity calculations shall be based on the *effective drain diameter*. There shall be a sufficient drainage to accommodate a one-hour rainfall rate base on a 100-year return period or the local code, whichever number is greater. Local code requirements for overflow requirements shall be confirmed with a local building code representative. Consult Commentary Figure 1 or local weather stations for local statistics.

Where separate roof sections are drained independently, flow calculations shall be performed on each section. Each section shall have at least one drain. Drain capacities shall be determined from the applicable plumbing code. See Commentary Table 1. Pipe diameter shall be the inside diameter of the retrofitted *drain stem*, not the original drain diameter.

Commentary

This Commentary consists of explanatory and supplementary material designed to help designers, roofing contractors and local building authorities in applying the requirements of the preceding Standard. It is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements.

This Standard addresses the design of retrofit primary drains. Note that local codes may also require a secondary or overflow drain and this secondary drain may be required to have greater flow capacity than the primary drain

Test setup example

Fill a pipe with water to a height of 10 ft. (3.05m) above the backflow seal. The test shall be conducted for a minimum of 24 hours -0/+1 hour during which the10-foot head of water shall be maintained.

Flow requirements

Flow capabilities are addressed in the Standard. There should be sufficient total cross-section area of drains to drain the entire roof area. Drain rates in Table 1 can be approximated using the following formula:

$$A = 464 \times D^{2.66} \div r$$

A = area drained (ft.^{2})
D = drain diameter (in.)
r = rainfall rate (in./hr.)

The International Code Council/International Plumbing Code Formula (ICC/IPC) (Q = 0.0104 x A x i) will produce slightly different values.

Q = Volumetric Flow Rate (gal./min.)
A = Roof Area (ft.^{2})
i = Rainfall rate (in./hr.)

Existing drain capacities frequently exceed requirements. When more drain capacity is needed, consult with the *retrofit roof drain* manufacturer for a compatible solution.

Alternative Drain Specification Method

Table 2 may be used to check to see if sufficient drains exist on the retrofit roof. Pipe diameter is that of the retrofitted drain, not the original drain diameter.

Table 1

Roof Areas (ft.^{2}) Drained vs. Drain Diameter and Rainfall Rates

Rainfall in./hr.	Drain Diameter (in.)					
	2	3	4	5	6	8
.8	3,670	10,780	23,170	41,950	68,130	146,440
1.0	2,930	8,620	18,540	33,560	54,500	117,150
1.2	2,440	7,190	15,450	27,960	45,420	97,620
1.4	2,090	6,160	13,240	23,970	38,930	83,680
1.6	1,830	5,390	11,580	20,970	34,060	73,220
1.8	1,630	4,790	10,300	18,640	30,280	65,080
2.0	1,470	4,310	9,270	16,780	27,250	58,570
2.5	1,170	3,450	7,410	13,420	21,800	46,860
3.0	980	2,870	6,180	11,190	18,170	39,050
3.5	840	2,460	5,300	9,590	15,570	33,470
4.0	730	2,160	4,630	8,390	13,630	29,290
4.5	650	1,920	4,120	7,460	12,110	26,030
5.0	590	1,720	3,710	6,710	10,900	23,430

Drainage areas in Table 1: Vertical façades (walls), that can shed wind-driven rain onto roof sections, should be accounted for when determining effective roof areas. Tributary vertical façade areas are generally considered to be 50% effective—that is, the tributary wall area is reduced by 50% to determine the equivalent effective tributary roof area which is then added to the roof section drainage area to determine the total effective roof drainage area.

Table 1 may be interpolated for intermediate effective pipe diameters and rainfall rates. Drainage areas assume roof conditions will allow sufficient water flow to the drain.

Table 2

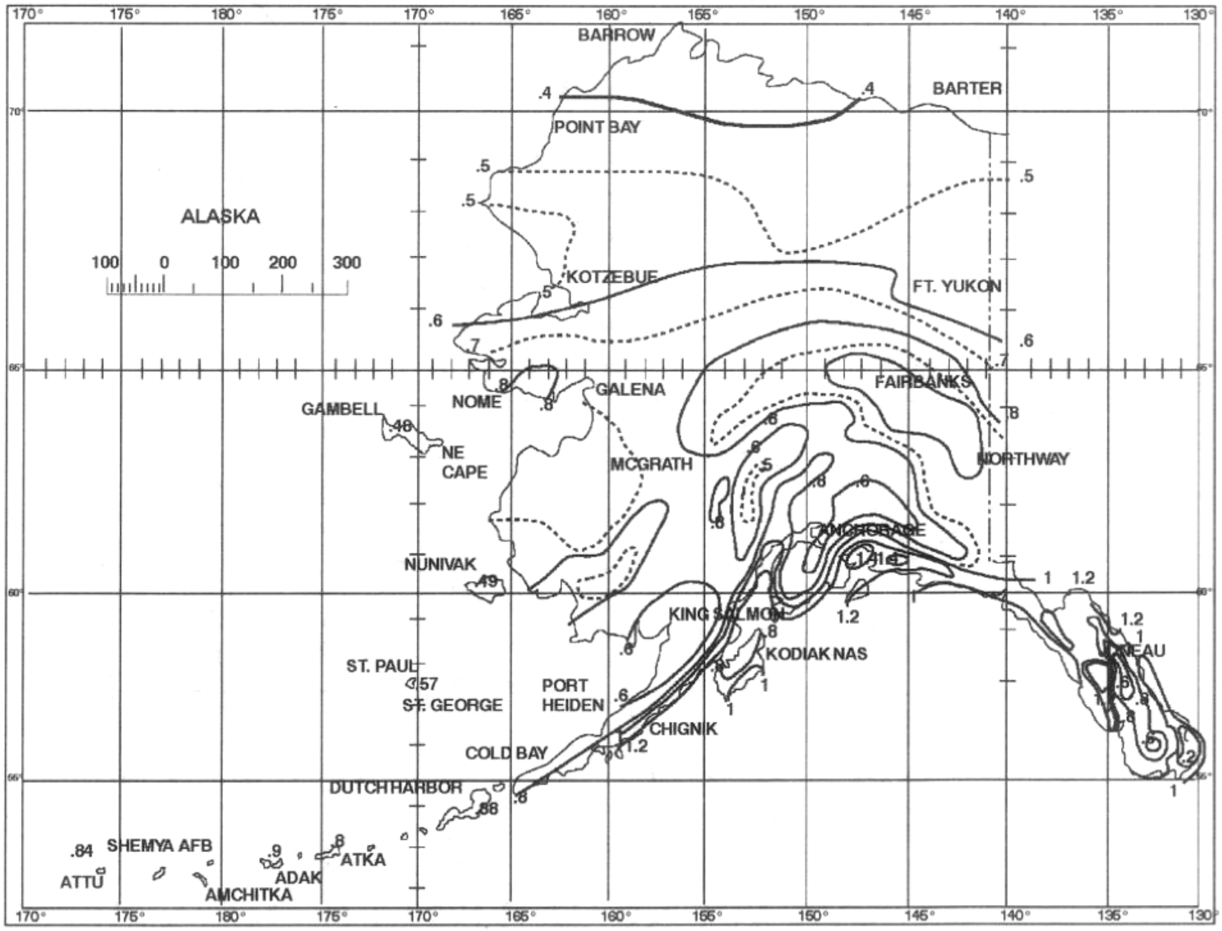
Minimum Number of Drains per Thousand Squares (100,000 ft.²)

Rainfall in./hr.	Drain Diameter (in.)					
	2	3	4	5	6	8
0.8	28	10	5	3	2	1
1.0	35	12	6	3	2	1
1.2	41	14	7	4	3	2
1.4	48	17	8	5	3	2
1.6	55	19	9	5	3	2
1.8	62	21	10	6	4	2
2.0	69	24	11	6	4	2
2.5	86	29	14	8	5	3
3.0	103	35	17	9	6	3
3.5	120	41	19	11	7	3
4.0	137	47	22	12	8	4
4.5	154	53	25	14	9	4
5.0	171	58	27	15	10	5

Drain sizing tables should be used with care. Roof design may not be capable of conducting rain from a very large area (ex: 40,000 ft.²), to a single drain even if the drain could handle the water flow.

One-Hour 100-year Return Rainfall Rates[1]

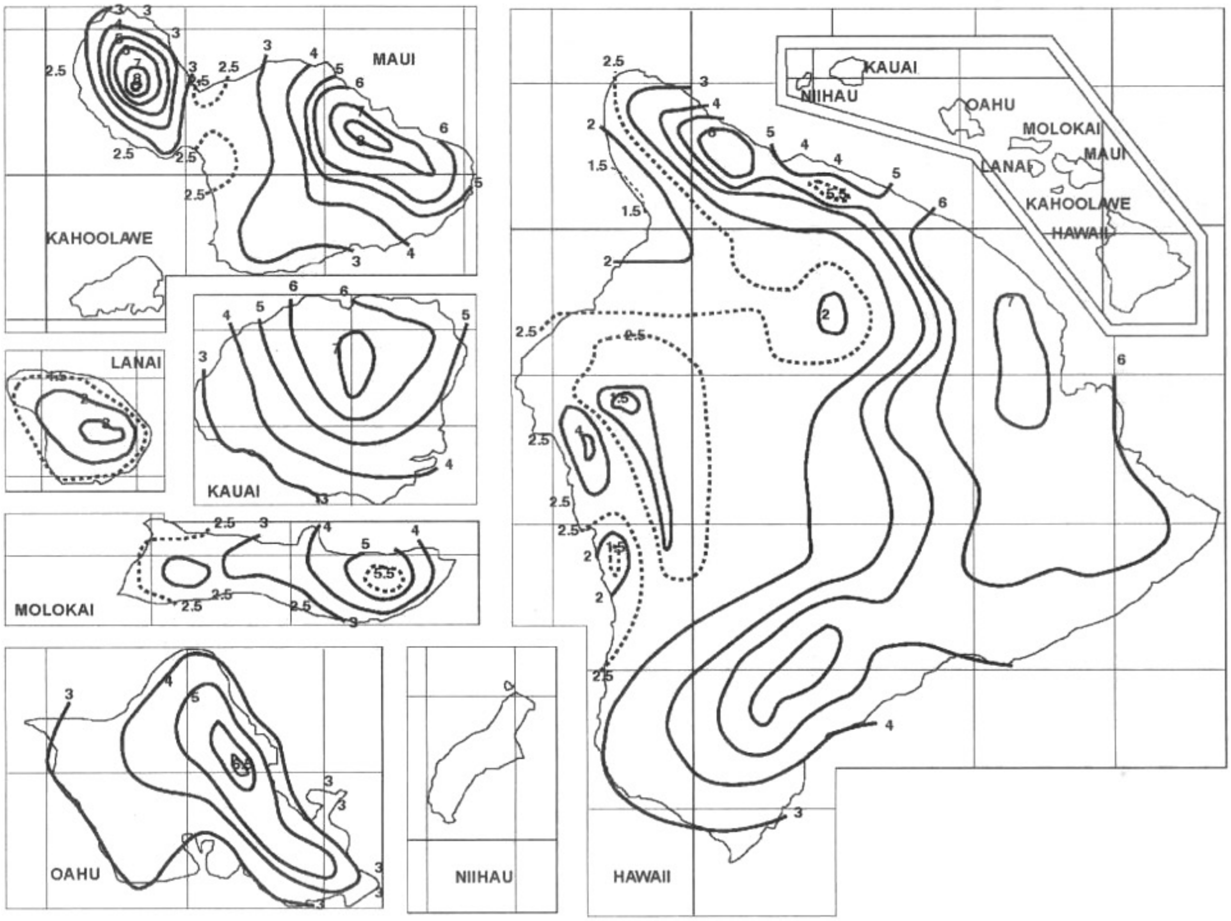
Figure 1b: For Alaska



1. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

One-Hour 100-year Return Rainfall Rates[2]

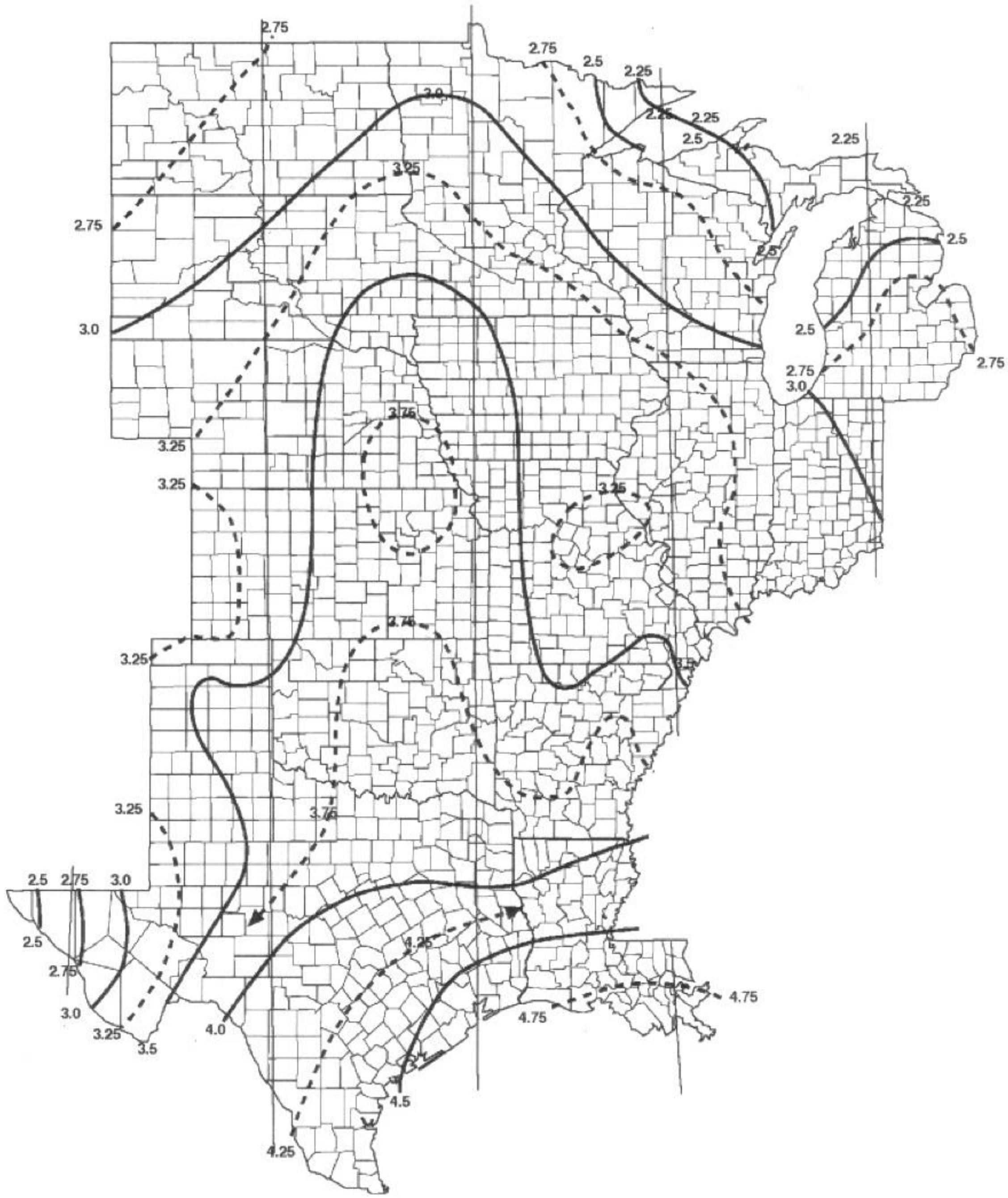
Figure 1c: For Hawaii



2. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

One-Hour 100-year Return Rainfall Rates[3]

Figure 1d: For Central U.S.



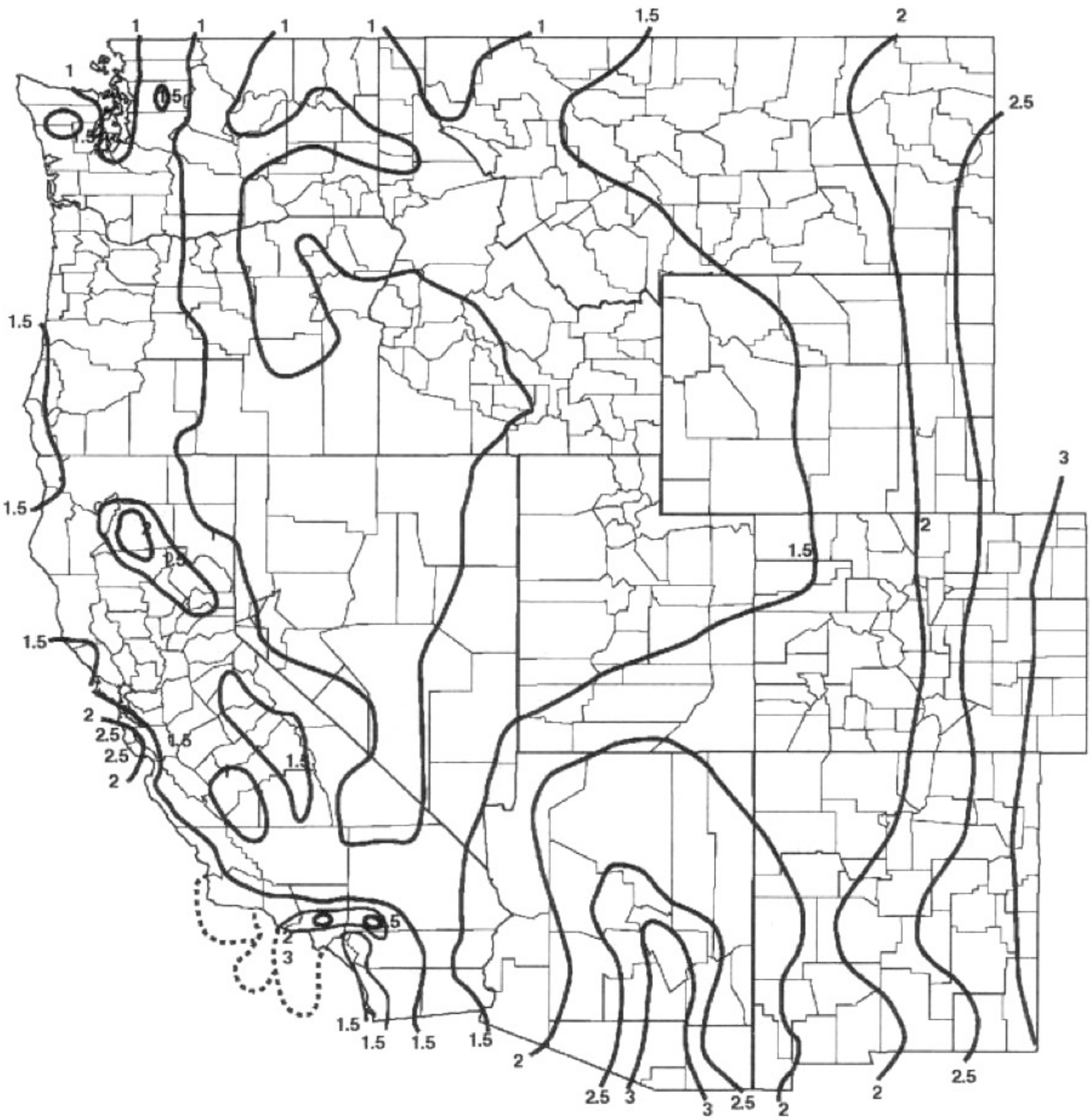
4. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

One-Hour 100-year Return Rainfall Rates[4]
Figure 1e: For Eastern U.S.

3. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

One-Hour 100-year Return Rainfall Rates[5]

Figure 1f: For Western U.S.



5. Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington D.C.

Ballot Name:	Approval of BSR_SPRI RD-1 20xx Performance Standard for Retrofit Drains Ballot 1
Ballot URL:	https://standards.spri.org/higherlogic/ws/groups/938a6b79-de08-495d-8317-4140401e5f87/ballots/ballot?id=122
Ballot Status:	Ballot has closed.
Total Votes:	10

Vote Summary

Option	Count	Percent
Affirmative	10	100%
Negative w/comment	0	0%
Abstain	0	

Company Name	Voter Name	Vote	Interest Categories	Voting Role	Email Address
Atlas Roofing Corporation	Moskowitz, Steve	Affirmative	Other Producer	Member	smoskowitz@atlasroofing.com
Benchmark, Inc.	Reynolds, Andrew	Affirmative	User	Member	AReynolds@benchmark-inc.com
Carlisle Construction Materials Incorporated	Malpezzi, Joseph	Affirmative	Other Producer	Member	Joe.Malpezzi@carlisleccm.com
Dedicated Roof & Hydro-Solutions, LLC	Hawn, David	Affirmative	User	Member	drhawn@drhroofsolutions.com
Ennis Associates	Ennis, Michael	Affirmative	General Interest	Member	csennis@mac.com
OMG Roofing Products	Childs, Stephen	Affirmative	Producer	Group Chair	schilds@olyfast.com
RCI, Inc.	Edwards, Wanda	Affirmative	General Interest	Member	we@wandaedwardsconsulting.com
Sika Sarnafil Inc.	Darsch, Mike	Affirmative	Other Producer	Member	darsch.michael@us.sika.com
StanCConsulting	Choiniere, Stan	Affirmative	User	Member	stancconsult@comcast.net
Trufast, LLC	Alexander, Brian	Affirmative	Producer	Member	balexander@trufast.com
Tech Roofing Services	Narkawicz, Joe	Did not vote	User	Member	jnarko@gmail.com

Producer	2
Other Producer	3
User	4
General Interest	2
	11

Return to Schedule

SPRI
ADT-1
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
10:45 a.m.

AGENDA

I. Call to Order — N. Eschhofen and C. Griswold

II. Roll Call & sign in

III. Reading of SPRI Antitrust Statement

IV. Review negatives collected from the ballot results (attached)

V. Discuss SPRI response

VI. Adjournment

Task Force Objective:
– Nick Eschhofen, TruFast, Colin Griswold, OMG
start date 04/2023   budget: $0

This Task Force will develop a consensus standard /for a 6x6 adhesive delamination tests.

465 Waverley Oaks Road, Suite 421 – Waltham, MA 02452
t. 781.647.7026   f. 781.647-7222   e. info@spri.org

turn to Schedule

Voter Name	Voter Role	Answer	Section	Comment
Stan Choiniere	Official Voter	Affirmative		
David Roodvoets	Official Voter	Affirmative		
Todd Burroughs	Official Voter	Affirmative		
Michael Giangiacomo	Official Voter	Affirmative		
Al Janni	Official Voter	Affirmative		
David Alves	Official Voter	Affirmative		
Christopher Mader	Official Voter	Affirmative		
David Hawn	Official Voter	Affirmative		
Colin Griswold	Official Voter	Affirmative		
Mike Darsch	Official Voter	Affirmative		
Brian Chamberlain	Official Voter	Affirmative		
Stephen Childs	Official Voter	Affirmative		
Nick Eschhofen	Official Voter	Affirmative		
Steven Moskowitz	Official Voter	Negative w/ Comment	C3.1.1	Currently this is written as follows: Adhesive is applied as a single or multiple bead/ribbon, or in full coverage. When using this standard to evaluate and compare adhesive/substrate combinations, it is imperative the Adhesive coverage is consistent between samples. For approval purposes, the approval body having jurisdiction shall determine the required coverage. For research purposes, full coverage can reduce sample-to-sample variation and can yield more repeatable results. I recommend removing “For research purposes” from the last sentence of C3.1.1. The reason for this negative being that the sentence as written can be misleading given full coverage can reduce sample-to-sample variation and can yield more repeatable results in all cases, not just for research purposes.

turn to Schedule

Steven Moskowitz	Official Voter	Negative w/ Comment	2.1.5 Roof Assembly	For consistency with other SPR[illegible]ndards, I recommend we change “weatherproofing” to “waterproofing” Examples follow: ANSI/SPRI/FM MPO-1 2.1.8 Waterproofing Membrane A flexible rolled sheet product secured to the roof intended to prevent water ingress to the structure. Waterproofing membrane materials can be tested for pull over resistance in combination with the fastener or fastening system. ANSI/SPRI ED-1 1.2 Definitions Membrane: a flexible or semi-flexible roof covering or waterproofing whose primary function is to exclude water
Flonja Shyti	Official Voter	Negative w/ Comment	C3.1.1	For the adhesive a minimum of two beads should be applied. Two beads should give more repeatable data. Is there data that shows there is no difference between one and two beads?
Flonja Shyti	Official Voter	Negative w/ Comment	C1.2	It should be component/adhesive combination instead of component combination.
Flonja Shyti	Official Voter	Negative w/ Comment	4	Add a section on statistical accuracy of the data. "4.9 Determine the statistical accuracy of the data. To have statistical validity, a minimum of 5 specimens shall be tested to calculate the average and standard deviation. Additional specimens shall be tested to maintain the standard deviation less than 10% of its average."
Flonja Shyti	Official Voter	Negative w/ Comment	3.3.4	Specify how many specimens will need to be tested.
Tim McQuillen	Official Voter			
Linda King	Administrator			
Chadwick Collins	Official Voter			
Stephanie Kiriazes	Official Voter			

Return to Schedule

SPRI
Education
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
11:30 a.m.

AGENDA

I.	Call to Order	B. Chamberlain
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review revised WD-1 Slides for SPRI Wind Education	
IV.	Discuss Wind Seminar	
V.	Ideas and Thoughts	
VI.	Adjournment	

Task Force Objective:
– Brian Chamberlain, Carlisle Construction Materials
start date 01/2021 budget: $0

The objective of this Task Force is to develop and conduct training programs for code officials, designers, installers and other interested parties. When appropriate, the Task Force will join with other industry organizations to expand the educational content.

Return to Schedule

SPRI
RP-14 Revision
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
1:15 p.m.

SINGLE PLY ROOFING INDUSTRY

AGENDA

I. Call to Order — C. Mader

II. Roll Call & Reading of SPRI Antitrust Statement

III. Review Response sent to Negative ballot (attached)

IV. Update on Recirculation ballot results to date

V. Adjournment

Task Force Objective:
-Chris Mader, Blueridge Fiberboard
start date 04/2023

The ANSI/SPRI RP-14, *Wind Design Standard for Vegetative Roofing Systems,* will be edited to remove information no longer relevant to the standard, and canvassed for re-approval as an American National Standard.

Return to Schedule

From: Christopher R. Mader
To: mgraham@nrca.net
Cc: SPRI
Subject: Fw: RP-14 ballot submission
Date: Friday, January 19, 2024 5:26:09 PM

Hi Mark!

Thank you for the thorough and thoughtful feedback on this. I'm always amazed (in a good way, I swear!) by your attention to detail as you go through these documents. It takes a lot of patience and diligence.

1) We agree. We are updating the maps to the ASCE 7-22, and will clean up the Sec 2.5 references
2) We agree. "adhered" is best
3) We agree. Revising accordingly
4) We agree. We're deleting the entire paragraph as it is not functional any longer.
5) We agree. We're deleting the entire paragraph as the wind uplift test standards are not relevant to the vegetative roofing system testing/design practices. It does pertain to the roofing system underneath, but is outside the scope of this standard.
6) We are updating the maps to 7-22 and recommending the use of those wind speeds instead of 7-16, but the vegetative assembly wind design recommendations within this standard are based on the Kind and Wardlaw study regarding ballast and scour. ASCE 7-22 design practices would not apply. For this, we find this singular comment non-persuasive.

I agree regarding the redlines. The issue we ran into in this case was the size of the file. I couldn't get it to share via e-mail. We ended up moving it through google drive/google docs, and I think we lost the redlines in the process. In the future, I'll send it to our specbuilder admin via a thumb drive or something so that we don't lose that feature.

Best Regards,

Christopher R. Mader
Code and Certification Manager | Blue Ridge Fiberboard, Inc.
Mobile: 224-325-1080 | Office: 434-797-1321| Toll Free: 800-375-0289
Email: CMader@blueridgefiberboard.com | Web: http://www.blueridgefiberboard.com

Return to Schedule

From: SPRI <info@spri.org>
Sent: Tuesday, January 2, 2024 4:24 PM
To: Christopher R. Mader
Subject: FW: RP-14 ballot submission

External Sender - From: (SPRI <info@spri.org>)
This message came from outside your organization.

Comment:
1) Sec. 2.5. References to I-C, I-A, I-B and I-C do not properly correlate to the basic wind speed maps on pages 24-39. The maps only indicate the "I" designation and not the letter designations. Also, in 2.5.1 for Risk Category I, it appears the reference is to a Risk Category III map.
2) Sec. 4.1 indicates "fully adhered", as does C3.8. Sec. 1 indicates "adhered". This should be made consistent; "adhered" is preferred.
3) Sec. 7.0 regarding scour greater than 50 sq. ft., a statement should be added indicating the update to the next system design level should apply where the scour occurs at or below the design wind speeds. Also, some of the maintenance text from C7.0's second paragraph should be added here.
4) Sec. C2.5, the statement "...fastest mile plus 20 mph..." should no longer be used; it is not accurate. Also, see comment on ASCE 7 version below.
5) Sec. C4.0, last paragraph, suggest revising "Both testing facilities... information." to "Contact the membrane manufacturer..."
6) Overall comment on design methodology and ASCE 7 version: The wind maps (pages 24-39) appear to be from ASCE 7-16. The roof zone dimensions used in Sec. 2.6 and Figure 1 (pages 20-21) appear to be from ASCE 7-10 or previous. The ASCE 7 version used in RP-14 needs to be consistently implemented and clearly indicated to users. Also, if SPRI intends for RP-14 to remain in the IBC, RP-14 should be updated to the most recent version of ACE 7.

Additional comment not a part of negative: It would be helpful if future ballots clearly delineated changes from the previous version. Use of strikeout and underline test to denote revisions is suggested.

From: Mark Graham <mgraham@nrca.net>
Sent: Tuesday, January 2, 2024 4:21 PM
To: SPRI <info@spri.org>
Subject: RE: RP-14 ballot submission

Return to Schedule

SPRI
Standards Template Library
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:00 p.m.

AGENDA

I. Call to Order C. Mader

II. Roll Call & Reading of SPRI Antitrust Statement

III. Review typical units list (attached)

IV. Review Significant Figures procedures and decide on conversion factors

V. Discuss on-going work and future work, if appropriate

VI. Adjournment

Task Force Objective:
–Chris Mader, Blue Ridge Fiberboard
start date 01/2023

The Standards Template Library Task Force objective is to update and modify the SPRI 'Glossary of Terms', using existing SPRI standards and documents, and create template documents, with the goal of creating consistency across SPRI standards, and making the standard development process more efficient.

Return to Schedule

Standard / Date	#	Unit (US)	#	Unit (Metric)
ED-1 2019	0.016	in	0.4	mm
ED-1 2019	0.022	in	0.6	mm
ED-1 2019	0.023	in	0.6	mm
ED-1 2019	0.027	in	0.7	mm
ED-1 2019	0.028	in	0.7	mm
ED-1 2019	0.029	in	0.7	mm
ED-1 2019	0.032	in	0.82	mm
ED-1 2019	0.034	in	0.9	mm
ED-1 2019	0.04	in	1	mm
ED-1 2019	0.05	in	1.3	mm
ED-1 2019	0.063	in	1.6	mm
VR-1 2018	0.07	oz	2	g
GT-1 2022	0.125	in	3	mm
VR-1 2018	0.2	in	5	mm
IA-1 2022	0.3716	m²	12.21	KPA
GT-1 2022	0.5	in	12	mm
ED-1 2019	0.5	in	13	mm
WD-1 2020	0.75	in	19	mm
VR-1 2018	0.79	in	20	mm
RP-14 2022	1	ft	0.3	m
RP-14 2022	1	mph	0.45	m/sec
ES-1 2022	1	lbf/ft²	4.88	kgf/m²
ED-1 2019	1	in	25	mm
VF-1 2023	1.18	in	30	mm
WD-1 2020	1.25	in	32	mm
ED-1 2019	1.5	in	38	mm
ES-1 2022	1.73	lbf/ft²	8.45	kgf/m²
RP-14 2022	2	ft	0.6	m
ED-1 2019	2	ft	0.61	m
BPT-1 2021	2	in	50	mm
MPO-1 2023	2	in	50.8	mm
BPT-1 2021	2	in	51	mm
WD-1 2020	2	ft	60	cm
VF-1 2023	3	ft	0.9	m
ED-1 2019	3	ft	0.91	m
NT-1 2017	3	ft	1	m
VR-1 2018	3	in	75	mm
WD-1 2020	3	ft	90	cm
VF-1 2023	3.15	in	80	mm
IA-1 2022	4	ft²	0.37	m²
RP-14 2022	4	ft	1.2	m
ED-1 2019	4	ft	1.22	m
RD-1 2019	4	in	100	mm
RP-14 2022	4	in	102	mm
RD-1 2019	4.33	lbf	30	kPa
NT-1 2017	5	ft	1.5	m
ED-1 2019	5	ft	1.52	m
GT-1 2022	5	lbs/lf	7.4	kg/m
WD-1 2020	5.3	ft	1.6	m
RP-14 2022	6	in	0.15	m
VF-1 2023	6	ft	1.8	m
ED-1 2019	6	ft	1.83	m
NT-1 2017	6	ft	2	m
WD-1 2020	6	in	15	cm

Standard / Date	#	Unit (US)	#	Unit (Metric)
VF-1 2023	6	in	152	mm
MPO-1 2023	6	in	152.4	mm
WD-1 2020	7	in	18	cm
GT-1 2022	8	ft	2.4	m
ED-1 2019	8	in	203	mm
RP-14 2022	8.5	ft	2.6	m
RP-14 2022	8.5	ft	2.9	m
IA-1 2022	10	lbs	0.0445	kN
ED-1 2019	10	ft	3	m
RD-1 2019	10	ft	3.05	m
ES-1 2022	10	lbf/ft²	49	kgf/m²
VR-1 2018	10	in	250	mm
ED-1 2019	10	in	254	mm
RP-14 2022	10	psf	479	N/m²
WD-1 2020	11.5	ft	3.5	m
GT-1 2022	12	ft	2.4	m
RP-14 2022	12	ft	3.6	m
GT-1 2022	12	ft	3.7	m
WD-1 2020	12	in	30.5	cm
GT-1 2022	12	in	300	mm
MPO-1 2023	12	in	304.8	mm
BPT-1 2021	12	in	305	mm
WD-1 2020	12.7	psf	0.6	kPa
VF-1 2023	13	ft	4	m
VF-1 2023	13	lbs	171	kg
VR-1 2018	13	in	330	mm
RP-14 2022	13	psf	622	N/m²
IA-1 2022	15	lbf	0.0667	kN
RP-14 2022	15	ft	4.6	m
GT-1 2022	15	lbs/lf	22.3	kg/m
RP-14 2022	16	ft	5	m
VR-1 2018	16	in	405	mm
ED-1 2019	16	in	610	mm
VR-1 2018	17.5	in	445	mm
WD-1 2020	18	in	46	cm
BPT-1 2021	18	in	457	mm
MPO-1 2023	18	in	457.2	mm
RP-14 2022	18	psf	862	N/m²
RP-14 2022	20	ft	6	m
RP-14 2022	20	mph	9	m/sec
WD-1 2020	21.1	psf	1	kPa
RP-14 2022	22	psf	1053	N/m²
WD-1 2020	22.1	psf	1.1	kPa
VR-1 2018	23	gal	88	L
RP-14 2022	24	ft	7.3	m
ED-1 2019	24	in	610	mm
ES-1 2022	25	lbf/ft²	122	kgf/m²
VF-1 2023	25	lbs	122	kg
WD-1 2020	25.6	psf	1.2	kPa
VR-1 2018	27.5	in	700	mm
WD-1 2020	29.1	psf	1.4	kPa
IA-1 2022	30	lbf	0.1334	kN
ED-1 2019	30	Psf	1.4	kPa
ED-1 2019	30	Psf	1.44	Kpa

Return to Schedule

Standard / Date	#	Unit (US)	#	Unit (Metric)
WD-1 2020	30	psf	1.5	kPa
RP-14 2022	30	ft	9	m
RP-14 2022	30	ft	9.1	m
FX-1 2021	32	°F	0	°C
VR-1 2018	32	in	800	mm
VR-1 2018	32	in	810	mm
RP-14 2022	33	ft	10	m
ES-1 2022	36	in	915	mm
WD-1 2020	37.5	psf	1.8	kPa
WD-1 2020	38.6	psf	1.8	kPa
WD-1 2020	39.7	psf	1.9	kPa
RP-14 2022	40	ft	12	m
VF-1 2023	40	lbs	195	kg
ED-1 2019	41	Psf	2	Kpa
WD-1 2020	42.9	psf	2.1	kPa
ED-1 2019	45	Psf	2.15	Kpa
ED-1 2019	45	Psf	2.2	kPa
WD-1 2020	48.5	psf	2.3	kPa
RP-14 2022	50	ft²	4.6	m²
ED-1 2019	51	Psf	2.4	Kpa
ED-1 2019	52.5	Psf	2.2	kPa
IA-1 2022	60	lbf	0.2669	kN
ED-1 2019	60	Psf	2.87	Kpa
WD-1 2020	60	psf	2.9	kPa
RP-14 2022	60	ft	18	m
GT-1 2022	60	lbs/lf	89.2	kg/m
ED-1 2019	61	Psf	2.9	Kpa
WD-1 2020	62.3	psf	3	kPa
WD-1 2020	64.6	psf	3.1	kPa
ED-1 2019	67.5	Psf	3.23	Kpa
RP-14 2022	70	ft	21.3	m
ED-1 2019	71	Psf	3.4	Kpa
ED-1 2019	75	Psf	3.59	Kpa
ED-1 2019	75	Psf	3.6	Kpa
RP-14 2022	75	ft	23	m
ED-1 2019	82	Psf	3.9	Kpa
ED-1 2019	82.5	Psf	3.95	Kpa
WD-1 2020	90	psf	4.3	kPa
ED-1 2019	90	Psf	4.31	Kpa
RP-14 2022	90	mph	40	m/sec
ED-1 2019	92	Psf	4.4	Kpa
ED-1 2019	94	Psf	4.5	Kpa
ED-1 2019	94	Psf	4.51	kPa
ED-1 2019	94	lb/ft	140	kg/m
ES-1 2022	96	in	2438	mm
ED-1 2019	97.5	Psf	4.67	Kpa
ED-1 2019	100	°F	37.8	°C
VF-1 2023	100	lbs	488	kg
ED-1 2019	101	Psf	4.83	Kpa
ED-1 2019	101	lb/ft	150	kg/m
ED-1 2019	102	Psf	4.9	Kpa
WD-1 2020	103.8	psf	5	kPa
ED-1 2019	105	Psf	5.06	Kpa

Standard / Date	#	Unit (US)	#	Unit (Metric)
NT-1 2017	110	°F	43	°C
RP-14 2022	110	mph	49	m/sec
ED-1 2019	112	Psf	5.4	Kpa
ED-1 2019	112.5	Psf	5.39	Kpa
ED-1 2019	113	Psf	5.4	Kpa
ED-1 2019	118	Psf	5.6	Kpa
ED-1 2019	118	Psf	5.64	kPa
ED-1 2019	118	lb/ft	175	kg/m
IA-1 2022	120	lbf	0.5338	kN
ED-1 2019	120	Psf	5.75	Kpa
ED-1 2019	122	Psf	5.9	Kpa
VF-1 2023	125	ft	38.1	m
ED-1 2019	126	lb/ft	187	kg/m
ED-1 2019	126	Psf	1330	Kpa
ED-1 2019	127.5	Psf	6.1	Kpa
ED-1 2019	127.5	Psf	6.11	Kpa
ED-1 2019	128	Psf	6.1	Kpa
ED-1 2019	131	Psf	6.3	Kpa
ED-1 2019	133	Psf	6.3	Kpa
RP-14 2022	140	mph	63	m/sec
ED-1 2019	141	Psf	6.77	kPa
ED-1 2019	141	Psf	6.8	Kpa
ED-1 2019	141	lb/ft	210	kg/m
ED-1 2019	143	Psf	6.8	Kpa
ED-1 2019	150	Psf	7.2	Kpa
VF-1 2023	150	lbs	45.7	m
RP-14 2022	150	ft	46	m
RP-14 2022	150	mph	67	m/sec
ES-1 2022	150	lbf/ft²	732	kgf/m²
ED-1 2019	151	Psf	7.24	Kpa
ED-1 2019	151	lb/ft	225	kg/m
ED-1 2019	153	Psf	7.3	Kpa
RP-14 2022	160	mph	72	m/sec
ED-1 2019	161	Psf	7.7	Kpa
ED-1 2019	163	Psf	7.8	Kpa
ED-1 2019	165	Psf	7.89	kPa
ED-1 2019	165	Psf	7.9	Kpa
RP-14 2022	165	mph	74	m/sec
ED-1 2019	165	lb/ft	245	kg/m
ED-1 2019	169	Psf	8.1	Kpa
RP-14 2022	170	mph	76	m/sec
ED-1 2019	173	Psf	8.3	Kpa
RP-14 2022	175	mph	78	m/sec
ED-1 2019	176	Psf	8.45	Kpa
ED-1 2019	176	lb/ft	262	kg/m
ED-1 2019	177	lb/ft	263	kg/m
ED-1 2019	179	lb/ft	2130	kg/m
RP-14 2022	180	mph	80	m/sec
ED-1 2019	188	Psf	9	Kpa
ED-1 2019	188	Psf	9.02	kPa
ED-1 2019	188	lb/ft	280	kg/m
ED-1 2019	189	lb/ft	281	kg/m
ED-1 2019	193	Psf	9.2	Kpa
RP-14 2022	195	mph	87	m/sec
ED-1 2019	202	Psf	9.65	Kpa

Return to Schedule

Standard / Date	#	Unit (US)	#	Unit (Metric)
ED-1 2019	202	lb/ft	300	kg/m
ED-1 2019	206	Psf	9.9	Kpa
RP-14 2022	210	mph	94	m/sec
ED-1 2019	212	Psf	10.1	Kpa
ED-1 2019	212	Psf	10.2	kPa
ED-1 2019	212	lb/ft	315	kg/m
NT-1 2017	220	°F	104.4	°C
ED-1 2019	224	lb/ft	333	kg/m
ED-1 2019	225	Psf	10.8	Kpa
ED-1 2019	225	Psf	10.8	Kpa
ED-1 2019	227	lb/ft	337	kg/m
ED-1 2019	227	Psf	1775	Kpa
ED-1 2019	236	Psf	11.3	Kpa
ED-1 2019	236	lb/ft	350	kg/m
ED-1 2019	239	lb/ft	356	kg/m
ED-1 2019	244	Psf	11.7	Kpa
ED-1 2019	247	lb/ft	368	kg/m
ED-1 2019	252	lb/ft	375	kg/m
ED-1 2019	252	Psf	1997	Kpa
ED-1 2019	256	lb/ft	394	kg/m
ED-1 2019	257	Psf	12.3	Kpa
ED-1 2019	259	Psf	12.4	Kpa
ED-1 2019	263	Psf	12.6	Kpa
ED-1 2019	277	Psf	13.3	Kpa
ED-1 2019	278	lb/ft	415	kg/m
ED-1 2019	281	Psf	13.5	Kpa
ED-1 2019	283	Psf	13.5	Kpa
ED-1 2019	283	lb/ft	421	kg/m
ED-1 2019	289	Psf	13.8	Kpa
ED-1 2019	294	lb/ft	438	kg/m
ED-1 2019	298	lb/ft	443	kg/m
ED-1 2019	300	Psf	14.4	Kpa
ED-1 2019	302	Psf	14.5	Kpa
ED-1 2019	302	lb/ft	450	kg/m
ED-1 2019	306	Psf	14.7	kPa
ED-1 2019	315	lb/ft	469	kg/m
ED-1 2019	319	Psf	15.3	Kpa
ED-1 2019	321	Psf	15.4	Kpa
ED-1 2019	328	Psf	15.7	Kpa
ED-1 2019	330	Psf	15.8	Kpa
ED-1 2019	330	lb/ft	491	kg/m
ED-1 2019	336	lb/ft	498	kg/m
ED-1 2019	353	Psf	16.9	kPa
ED-1 2019	353	lb/ft	525	kg/m
ED-1 2019	353	lb/ft	526	kg/m
ED-1 2019	358	lb/ft	533	kg/m
ED-1 2019	377	Psf	18	kPa
ED-1 2019	378	Psf	18.1	Kpa
ED-1 2019	378	lb/ft	562	kg/m
ED-1 2019	385	Psf	18.4	Kpa
ED-1 2019	390	lb/ft	581	kg/m
ED-1 2019	400	Psf	19.2	Kpa
ED-1 2019	403	Psf	19.3	Kpa
ED-1 2019	412	lb/ft	613	kg/m
ED-1 2019	417	Psf	20	Kpa

Standard / Date	#	Unit (US)	#	Unit (Metric)
ED-1 2019	417	lb/ft	621	kg/m
ED-1 2019	418	lb/ft	622	kg/m
ED-1 2019	424	lb/ft	631	kg/m
ED-1 2019	428	Psf	20.5	Kpa
ED-1 2019	441	lb/ft	656	kg/m
ED-1 2019	446	lb/ft	664	kg/m
ED-1 2019	447	lb/ft	664	kg/m
ED-1 2019	449	Psf	21.5	Kpa
ED-1 2019	454	lb/ft	675	kg/m
ED-1 2019	477	lb/ft	710	kg/m
ED-1 2019	482	Psf	23.1	Kpa
ED-1 2019	495	lb/ft	736	kg/m
ED-1 2019	502	lb/ft	747	kg/m
ED-1 2019	514	Psf	24.6	Kpa
ED-1 2019	529	lb/ft	787	kg/m
ED-1 2019	537	lb/ft	799	kg/m
ED-1 2019	537	lb/ft	2130	kg/m
ED-1 2019	546	Psf	26.1	Kpa
ED-1 2019	559	lb/ft	830	kg/m
ED-1 2019	559	lb/ft	830	kg/m
ED-1 2019	586	lb/ft	873	kg/m
ED-1 2019	596	lb/ft	887	kg/m
RP-14 2022	600	ft	183	m
ED-1 2019	626	lb/ft	932	kg/m
ED-1 2019	656	lb/ft	976	kg/m
ED-1 2019	670	lb/ft	997	kg/m
ED-1 2019	698	lb/ft	1037	kg/m
ED-1 2019	716	lb/ft	1066	kg/m
ED-1 2019	716	lb/ft	1109	kg/m
ED-1 2019	725	lb/ft	1078	kg/m
ED-1 2019	745	lb/ft	1109	kg/m
ED-1 2019	752	lb/ft	1121	kg/m
ED-1 2019	775	lb/ft	1152	kg/m
ED-1 2019	782	lb/ft	1163	kg/m
ED-1 2019	804	lb/ft	10.9	kg/m
ED-1 2019	835	lb/ft	1243	kg/m
ED-1 2019	836	lb/ft	1245	kg/m
ED-1 2019	836	lb/ft	1245	kg/m
ED-1 2019	836	lb/ft	1245	kg/m
ED-1 2019	893	lb/ft	1329	kg/m
ED-1 2019	894	lb/ft	1330	kg/m
ED-1 2019	954	lb/ft	710	kg/m
ED-1 2019	954	lb/ft	1419	kg/m
ED-1 2019	975	lb/ft	1452	kg/m
ED-1 2019	984	lb/ft	1412	kg/m
ED-1 2019	984	lb/ft	1464	kg/m
ED-1 2019	1004	lb/ft	1494	kg/m
ED-1 2019	1013	lb/ft	1509	kg/m
IA-1 2022	1030	lbs	4.581	kN
ED-1 2019	1042	lb/ft	1552	kg/m
ED-1 2019	1073	lb/ft	799	kg/m
ED-1 2019	1073	lb/ft	1073	kg/m
ED-1 2019	1073	lb/ft	1597	kg/m
ED-1 2019	1088	lb/ft	1620	kg/m
ED-1 2019	1116	lb/ft	1661	kg/m

Return to Schedule

Standard / Date	#	Unit (US)	#	Unit (Metric)
ED-1 2019	1163	lb/ft	1731	kg/m
ED-1 2019	1171	lb/ft	1742	kg/m
ED-1 2019	1193	lb/ft	1066	kg/m
ED-1 2019	1193	lb/ft	1775	kg/m
ED-1 2019	1251	lb/ft	1863	kg/m
ED-1 2019	1255	lb/ft	1869	kg/m
ED-1 2019	1312	lb/ft	1951	kg/m
ED-1 2019	1339	lb/ft	1993	kg/m
ED-1 2019	1342	lb/ft	1198	kg/m
ED-1 2019	1342	lb/ft	1997	kg/m
ED-1 2019	1395	lb/ft	2075	kg/m
ED-1 2019	1424	lb/ft	2118	kg/m
ED-1 2019	1431	lb/ft	1419	kg/m
ED-1 2019	1431	lb/ft	1597	kg/m
ED-1 2019	1431	lb/ft	2130	kg/m
ED-1 2019	1451	lb/ft	2159	kg/m
ED-1 2019	1490	lb/ft	2218	kg/m
ED-1 2019	1506	lb/ft	2242	kg/m
ED-1 2019	1521	lb/ft	2263	kg/m
ED-1 2019	1550	lb/ft	2307	kg/m
ED-1 2019	1562	lb/ft	2325	kg/m
ED-1 2019	1610	lb/ft	1597	kg/m
ED-1 2019	1640	lb/ft	2440	kg/m
ED-1 2019	1669	lb/ft	2484	kg/m
ED-1 2019	1674	lb/ft	2491	kg/m
ED-1 2019	1785	lb/ft	2656	kg/m
ED-1 2019	1789	lb/ft	2661	kg/m
ED-1 2019	1813	lb/ft	2698	kg/m
ED-1 2019	1896	lb/ft	2823	kg/m
ED-1 2019	1907	lb/ft	2839	kg/m
ED-1 2019	1937	lb/ft	2884	kg/m
ED-1 2019	1953	lb/ft	2907	kg/m
ED-1 2019	1968	lb/ft	2928	kg/m
ED-1 2019	2027	lb/ft	3016	kg/m
ED-1 2019	2087	lb/ft	3106	kg/m
ED-1 2019	2093	lb/ft	3114	kg/m
ED-1 2019	2146	lb/ft	2661	kg/m
ED-1 2019	2176	lb/ft	3238	kg/m
ED-1 2019	2231	lb/ft	3220	kg/m
ED-1 2019	2236	lb/ft	3328	kg/m
ED-1 2019	2326	lb/ft	3460	kg/m
ED-1 2019	2343	lb/ft	3487	kg/m
ED-1 2019	2371	lb/ft	3528	kg/m
ED-1 2019	2384	lb/ft	3548	kg/m
ED-1 2019	2504	lb/ft	3725	kg/m
ED-1 2019	2511	lb/ft	3735	kg/m
ED-1 2019	2534	lb/ft	3770	kg/m
ED-1 2019	2678	lb/ft	3985	kg/m
ED-1 2019	2683	lb/ft	3992	kg/m
ED-1 2019	2846	lb/ft	4235	kg/m
ED-1 2019	2861	lb/ft	4258	kg/m
ED-1 2019	3043	lb/ft	4525	kg/m
RP-14 2022	5000	ft	1,524	m
VF-1 2023	15625	ft^2	1451.6	m^2

Standard / Date	#	Unit (US)	#	Unit (Metric)
IA-1 2022	50,000	ft^2	4,650	m^2
VR-1 2018	104 ± 5	°F	40	°C
VR-1 2018	122 ± 5	°F	50	°C
FX-1 2021	2 ± 1	in	50 ± 25	mm
IA-1 2022	23/32	in	18.2	mm
VR-1 2018	45 ± 5	°F	7	°C
VR-1 2018	5.9 ± 0.39	in	150 ± 10	mm
VR-1 2018	60 ± 5	°F	15	°C
VR-1 2018	70 ± 5	°F	21	°C
BPT-1 2021	73± 4	°F	23 ± 2	°C
VR-1 2018	75 ± 5	°F	24	°C
VR-1 2018	77 ± 5	°F	25	°C

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SPRI
Internal Pressure
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:30 p.m.

AGENDA

I.	Call to Order	C. Mader
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Discuss latest revision to Internal Pressure white paper	
IV.	Discuss next steps (further revisions, vote to move to technical committee, etc. as appropriate	
IV.	Adjournment	

Return to Schedule

SPRI
Resiliency
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:00 p.m.

AGENDA

I. Call to Order — M. Ibanez

II. Roll Call & Reading of SPRI Antitrust Statement

III. Recap Survey Question results, sent out to all members - When is a roof not resilient? (attached)

IV. Review the Board's directive for this Task Force

V. Discuss and further develop a Position Paper continuing from the Sept. 15, 2023, Revision to Initial Statement.

VI. Adjournment

Task Force Objective:
– Mario Ibanez, Seaman Corporation
start date 07/2023 *budget: $0*

The objective of this Task Force is to develop a position paper on the definition of resilience as it relates to low slope single ply roofing systems to provide guidance to the roofing industry.

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Resiliency Standard Task Group

Meeting V

May 7th, 2024, 9:30 AM

Call To Order

Return to Schedule

Please Read

Here is the Anti-trust Statement.

SPRI Antitrust Statement: SPRI complies with antitrust laws and requires participants in its programs to comply with antitrust laws. Discussions which could affect competitive pricing decisions or other competitive factors are forbidden. There may be no discussions of pricing policies or future prices, production capacity, profit margins or other factors which may tend to influence prices. In discussing technical issues, care should be taken to avoid discussing potential or planned competitive activities. Members and participants should be familiar with the SPRI Antitrust Policy and act in conformity with it.

The website sign-in sheet can be accessed from the QR codes that will be in the meeting rooms.

Return to Schedule

When is a roof not resilient?

https://www.spri.org/when-is-a-roof-not-resilient/

Recap online survey replies.

	Ranked
☐ When it does not perform to its intended use…………….	First (3 of 4)
☐ When it does not last its intended service life…………….	Second (3 of 4)
☐ When it fails………………………………………………………………	Fourth
☐ When it is defective…………………………………………………	Fourth
☐ When improperly installed……………………………………….	Fifth
☐ Does not perform to warranty promises………………………	Fifth

☐ Other An attribute of a system, which provides an indication of its ability to adapt effectively to climate severity and recovering from disturbances.

- Listed in order of rank, no questions were ranked 6th
- Personal note: If so designed, then it is expected and if it does not perform, then it is a failure. If it performs beyond its design intent , then it is resilient.

Return to Schedule

SPRI Board of Directors, Directive

January 12th, 2024, Meeting Minutes

The objective of this Task Force is to develop a position paper on the definition of resilience as it relates to low slope single ply roofing systems to provide guidance to the roofing industry.

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ASTM E:3341-23a

In creating this position paper, we will seek to use as a guide the principals outlined in ASTM E3341-23a

- "1.2 Resilience is defined by four general principals: planning and preparation, adaption, withstanding and limiting impacts, and recovery of operations and function. This guide covers the fundamentals for each of the general principles."
- "4.3....Advancing resilience requires addressing all principles of resilience for applicable events and stressors during the design process and life of the system."
- "4.9 This guide, in covering general principles, is intended to be a basis for the creation of more specific documents on more specific topics"

A few excerpts of the E3341 Standard that describes the framework the position paper on resilience.

Return to Schedule

ASTM E:3341-23a

- This position paper development will follow, the Standard Principles of Resilience ASTM Designation: 3341 – 23A.
- Determining the Goals and Boundaries of the System
  - Planning and Preparation
  - Adaptation
  - Withstanding and Limiting Impacts
  - Recovery

The colors are to help in tracking the rearranging of the most recently accepted statement last revevised Sept 15 2023

Return to Schedule

Review most recent progress.

A revised version from Jim Kirby—Sept 15 2023

- Resiliency (noun), as it relates to low-slope roofing systems, is defined as: the capability/ability to absorb and continue to perform after adverse climatic conditions occur, including but not limited to rain, wind, hail, fire, chemical contamination, and/or unanticipated climatic phenomena, or any otherwise disruptive event above what the commonly intended purpose is or above what is reasonably expected to withstand, as defined by code minimums.
- Definition commentary:
- A resilient roof system will continue to protect human life and well-being, protect and maintain building contents, and allow a reasonable (?) level of uninterrupted use of a building or facility with little or no repairs to the roof system (i.e., the roof does not fail or need replacement). Roof system resilience anticipates a level of adverse climatic conditions exceeding minimum code requirements and is provided by designing and planning a roof system, including proper maintenance during operational use, that to have capabilities above current code requirements.

Color coded to help track how it will be rearranged n the following slide.

Return to Schedule

Rearrange to follow Standard Guide for General principals of Resilience E3341-23a

- Planning and Preparation:
Roof system resilience anticipates a level of adverse climatic conditions exceeding minimum code requirements and is provided by designing and planning a roof system, including proper maintenance during operational use, that to have capabilities above current code requirements.

- Adaption:
Resiliency (noun), as it relates to low-slope roofing systems, is defined as: the capability/ability to absorb and continue to perform after adverse climatic conditions occur, including but not limited to rain, wind, hail, fire, chemical contamination, and/or unanticipated climatic phenomena, or any otherwise disruptive event above what the commonly intended purpose is or above what is reasonably expected to withstand, as defined by code minimums.

- Withstanding and Limiting Impacts:
A resilient roof system will continue to protect human life and well-being, protect and maintain building contents, and allow a reasonable (?) level of uninterrupted use of a building or facility

- Recovery:
with little or no repairs to the roof system (i.e., the roof does not fail or need replacement).

These will be the four sections of the position paper to be expanded upon.

Return to Schedule

SPRI
VR-1 Partners
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
11:00 a.m.

AGENDA

I.	Call to Order	S. Kiriazes
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Updates on potentional contacts from universities	
IV.	Vice chair needed	
V.	Adjournment	

Task Force Objective:
Stephanie Kiriazes, Holcim
start date 10/2022 objectives approved 01/15/23 budget: $0

This SPRI/ANSI VR-1 Procedure for Investigating Resistance to Root or Rhizome Penetration on Vegetative Roofs standard will be reviewed, edited if necessary, and canvassed for re-approval as an American National Standard. This review is required every 5 years per ANSI Essential Requirements.

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Return to Schedule

SPRI
PRO Guide
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
1:30 p.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Reports & Updates Unfinished Business
  a.) Review Tracking Document and Updates

IV. Unfinished Business
  a.) Technical Director Review & Proposed Actions
  b.) PCR Revision Update
  c.) Standards Revision Update
  i.) VR-1
  ii.) ED-1
  iii.) RD-1
  iv.) WD-1

V. New Business

VI. Adjournment

Task Force Objective:
– Chadwick Collins, SPRI
start date 07/2023 *objective approved 07/2023* *budget: $0*

This Task Force will review, and update as needed the reference documents on the SPRI website. A sub-task force will review the thermoplastic detail documents and determine if they should be updated.

Return to Schedule

SPRI
WD-1 Revision
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:00 p.m.

AGENDA

I. Call to Order — D. Scheerer

II. Roll Call & Reading of SPRI Antitrust Statement

III. Expected timeline for completion

IV. Proposed revisions by the task force co-chairs (Currently approved version attached)

V. Solicitation for other proposed revisions

VI. General discussion

VII. Discuss scheduling of intermediate virtual meeting(s) to review draft prior to fall SPRI meeting

VIII. Adjournment

Task Force Objective:
– Dan Scheerer, SFS
start date 4/2024 *budget: $0*

The ANSI/SPRI Wind Design Standard Practice for Roofing Assemblies will be reviewed, revised if necessary, and recanvassed for approval as an ANSI standard.

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ANSI/SPRI WD-1

Wind Design Standard Practice for Roofing Assemblies

Approved January 6, 2020

465 Waverley Oaks Road

Suite 421
Waltham, MA 02452

www.spri.org.

Disclaimer
This standard is for use by architects, engineers, consultants, roofing contractors and owners of low slope roofing systems. This standard specifically does not address existing building drainage capacity or overflow drainage requirements and should not be used for those purposes. It is intended to provide data and guidance necessary to understand the implementation and use of retrofit roof drainage elements. Do not assume all existing buildings have code compliant drainage. SPRI, IT'S MEMBERS AND EMPLOYEES DO NOT WARRANT THAT THIS STANDARD IS PROPER AND APPLICABLE UNDER ALL CONDITIONS.

Table of Contents

1 Introduction

This Wind Design Standard Practice provides general building design considerations as well as a methodology for selecting an appropriate roofing system assembly to meet the building's calculated rooftop design wind uplift pressures. This document is appropriate for non-ballasted Built-Up, Modified Bitumen, and Single-Ply roofing system assemblies installed over any type of roof deck. (Refer to the Related Reference Documents on page 16, item 2, for the single-ply ballasted roofing system design standard reference).

This Standard Practice has been written specifically for use in North America, but it is also suitable for use by other countries utilizing the project prescribed jurisdictional wind design and wind uplift testing standards.

A Commentary section is provided at the end of this document to offer explanatory and supplementary information designed to assist users in complying with this Standard Practice. The commentary is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements, or to provide other clarification.

This Wind Design Standard Practice shall be used in conjunction with the published installation instructions of the manufacturer or supplier of the specified roofing system assembly. This Standard Practice is applicable to new roofing projects, reroofing projects (removing the existing materials and replacing with new materials) and recovering projects (covering over the existing roofing materials with new materials).

This document does not address the wind uplift design of the structural deck.

2 Methodology

2.1 Rooftop wind uplift design pressures (design loads)

The design wind uplift pressures shall be calculated by the designer of record for the field, perimeter and corner areas of the roof in accordance with the ASCE 7 Standard as referenced in the local building code. There are three or four design areas depending on the ASCE 7 issuance year referenced. The areas are; 1' (interior field), 1 (field), 2 (perimeter) and 3 (corner). Calculated design loads that are Ultimate Load values shall be converted to Allowable Loads when using this Standard Practice. The following equation shall be used to make this conversion:

$$\mathbf{L_d = \text{Ultimate Load (psf or kPa)} \times 0.6}$$

2.2 Determine the Tested Wind Uplift Load Capacity of the roofing system

The Tested Wind Uplift Load Capacity of a roofing system assembly shall be determined by testing in accordance with ANSI/FM 4474, UL 580, UL 1897 or CAN/ULC A123. Tested Uplift Load Capacity values are available from the roofing system assembly supplier through independent laboratory testing reports or evaluation reports, and from website listings that are developed and maintained by various independent testing/evaluation entities and laboratories.

2.3 Determine the Factored Tested Load Capacity

The Factored Tested Load Capacity **(L_t)** is determined by dividing the Tested Wind Uplift Load Capacity by a safety factor as specified by the designer of record. Refer to Commentary C to read a discussion on choosing a safety factor.

$$\mathbf{L_t = \text{Tested Wind Uplift Load Capacity / safety factor}}$$

2.4 Verify suitability of a roofing system assembly for a particular building

In order for a roofing system assembly to be considered for use, the Factored Tested Load Capacity (**L_t**) of that assembly must be greater than or equal to the calculated Wind Uplift Design Load (**L_d**) for the field area of the roof. This load comparison is to be made with zone 1 and not the zone 1' area that has been included for the first time in ASCE 7-16. If **L_t** is less than **L_d** for the zone 1 area, the roofing system assembly shall not be used on that particular building.

When **L_t** is greater than or equal to **L_d** for the zone 1 area, the roofing system assembly, as tested, is suitable for use in the field zone 1 area of the roof. (The zone 1' area is addressed in Section 2.4.1). In order to determine the appropriate assembly layout for the perimeter and corner areas of the roof, compare **L_t** to **L_d** for the perimeter and corner areas. When **L_t** meets or exceeds **L_d** for either of these areas, the roofing system assembly, as tested, is suitable for use in those respective areas.

When **L_t** is less than **L_d** for the perimeter and/or corner areas, one of the rational analysis methods described in Sections 2.5 and 2.6 of this document shall be used for enhancing the roofing system assembly in those areas.

2.4.1 Field Zone 1' Area

When the ASCE 7-16 Standard is used to determine design wind uplift pressures, a zone 1' will be identified for certain building configurations. When the 1' zone exists there are two options, one of which must be chosen, for selecting a roofing system assembly for that area. $\mathbf{L_d}$ for zone 1' will always be less than $\mathbf{L_d}$ for zone 1. Therefore, one option is to use the roofing system assembly chosen for zone 1 in the zone 1' area. The second option is to choose a different roofing system assembly in which $\mathbf{L_t}$ for that assembly meets or exceeds $\mathbf{L_d}$ for the zone 1' area.

2.5 Rational Analysis Method—Adhered Membrane Roofing System Assemblies

2.5.1 Rational Analysis Criteria

This adhered membrane roofing system assembly rational analysis method shall only be used when *all* of the following criteria are met:

1. The Tested Wind Uplift Load Capacity (without consideration of any safety factor) must be greater than or equal to the calculated corner area wind uplift design load; and
2. The adhered membrane roofing system assembly utilizes either mechanical fasteners or ribbons/beads of an adhesive for insulation/substrate attachment; and
3. When mechanically fastened base or anchor sheets are utilized, the tested attachment pattern must be uniform or repeating such that the number of fasteners utilized per a specified square foot area can be determined.

This rational analysis method shall not be used for adhered roofing system assemblies when the insulation/substrate layer(s) is (are) attached using 100% coverage of any adhesive or hot asphalt. Adhesives applied in ribbons/beads spaced 4 in. or less on center are considered to constitute 100% coverage.

2.5.1.1 Rational Analysis Method—Adhered Membrane with Mechanically Attached Insulation/Substrates

For insulation/substrates attached with mechanical fasteners, the increased number of fasteners ($\mathbf{F_n}$) needed to meet the calculated design wind uplift load(s) shall be determined using the following equation: $\mathbf{F_n = (F_t \times L_d) / L_t}$

Where: $\mathbf{F_n}$ is the number of fasteners needed to meet the calculated design load.

$\mathbf{F_t}$ is the number of fasteners used to achieve the tested load capacity.

$\mathbf{L_d}$ is the calculated design load for the perimeter or corner area of a roof, psf (kPa).

$\mathbf{L_t}$ is the Factored Tested Load Capacity, psf (kPa).

Refer to Commentary A for a practical example of rational analysis for an adhered roofing system assembly utilizing mechanically attached insulation/substrate.

2.5.1.2 Rational Analysis Method—Adhered Membrane with Ribbon/Bead Adhesive Attached Insulation/Substrates

For insulation/substrates attached with ribbons/beads of an adhesive, the reduced ribbon/bead spacing ($\mathbf{R_n}$) needed to meet the calculated design wind uplift load(s) shall be determined using the following equation:
$\mathbf{R_n = R_t / (L_d / L_t)}$

Where: $\mathbf{R_n}$ is the ribbon/bead spacing needed to meet the calculated design load, inches (cm).

$\mathbf{R_t}$ is the ribbon/bead spacing used to achieve the tested load capacity, inches (cm).

$\mathbf{L_d}$ is the calculated design load for the perimeter or corner area of a roof, psf (kPa).

$\mathbf{L_t}$ is the Factored Tested Load Capacity, psf (kPa).

Note: When ribbon/bead-attached insulation/substrate is applied directly to a fluted steel deck, the ribbon/bead spacing will be dictated by the center-to-center spacing of the top (high) flutes of the steel deck. The rationalized ribbon/bead spacing shall be rounded down (when necessary) to coincide with a top (high) flute spacing. If the rationalized ribbon/bead spacing is less than the center-to-center spacing of the top (high) flutes of a steel deck, ribbon/bead attachment of the insulation in that area shall not be acceptable.

Refer to Commentary A for a practical example of rational analysis for an adhered roofing system assembly utilizing ribbon/bead-attached insulation/substrate.

Cautionary Note: The $\mathbf{F_n}$ and $\mathbf{R_n}$ equations shall only be used to increase the number of fasteners or decrease the spacing of ribbons/beads of adhesive needed in the perimeter and corner areas. These equations shall not be used to rationalize backwards and reduce the number of fasteners or increase the spacing of ribbons/beads of adhesive used in the field of the roof.

2.6 Rational Analysis Method — Mechanically Fastened Membrane Roofing System Assemblies

For mechanically fastened membrane roofing system assemblies, the influence area per fastener for the tested assembly ($\mathbf{IA_t}$) shall be determined by multiplying the row spacing by the fastener spacing (along the row). For spot attached systems, multiply the distance between the attachment locations in each direction (2 ft. × 2 ft. [60 cm × 60 cm], 2 ft. × 3 ft. [60 cm × 90 cm], etc.). This gives the number of square feet (square centimeters) of membrane held in place by one fastener. The influence area needed to meet the calculated design wind uplift load(s) shall be determined using the following equation:

$$\mathbf{IA_n = (L_t \times IA_t) / L_d}$$

Where: $\mathbf{IA_n}$ is the area of membrane needed to be held in place by one fastener to meet the design load, ft^2 (cm^2).

$\mathbf{IA_t}$ is the area of membrane held in place by one fastener for the tested assembly, ft^2 (cm^2).

$\mathbf{L_d}$ is the calculated design wind uplift load for the perimeter or corner area of a roof, psf (kPa).

$\mathbf{L_t}$ is the Factored Tested Load Capacity, psf (kPa).

The fastener row spacing or the spot attachment grid spacing of the roofing system assembly being considered shall be reduced so the ft^2 (cm^2) area of membrane held in place by each fastener does not exceed $\mathbf{IA_n}$. For linearly-attached assemblies, the fastener spacing (along the row) shall be the same as was tested.

Refer to Commentary A for practical examples of rational analysis for membrane attachment on mechanically fastened membrane roofing system assemblies.

Cautionary Note: For mechanically fastened membrane roofing system assemblies with linear (row) attachment, only the spacing between fastener rows shall be reduced to meet $\mathbf{IA_n}$. This rational analysis method shall not be used to reduce the spacing between fasteners along the row (12 in. to 6 in. [30.5 cm to 15 cm], for example) in place of reducing the spacing between fastener rows. In addition, this rational analysis method shall not be used to rationalize backwards and increase the spacing between fasteners along the row (12 in. to 18 in. [30.5 cm to 46 cm], for example) or increase the spacing between fastener rows (8 ft. to 10 ft. [2.4 m to 3.0 m], for example).

Commentary Section

This Commentary is not a part of this standard. It consists of explanatory and supplementary material designed to assist users in complying with the requirements. It is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements or to provide other clarifications. It therefore has not been processed in accordance with ANSI Essential Requirements and may contain material that has not been subjected to public review or a consensus process. Thus, it does not contain requirements necessary for conformance with the standard.

The sections of the Commentary are numbered to correspond to the sections of the standard to which they refer. Since it is not necessary to have supplementary material for every section in the standard itself, there may be gaps in the numbering in the Commentary.

Commentary A

Practical Examples
Roofing System Assembly Selection

Example Building #1—Ultimate Design Uplift Loads

A building with a fluted steel deck has the following calculated ultimate design wind uplift loads determined by using the ASCE 7-16 Standard. The ultimate design loads need to be converted to allowable design loads. A safety factor of 2.0 is being used along with the allowable design loads for this example.

Calculated Ultimate Design Loads

- Interior field area (zone 1’) = -21.1 psf (-1.0 kPa)
- Field area (zone 1) = -36.8 psf (-1.8 kPa)
- Perimeter area (zone 2) = -48.5 psf (-2.3 kPa)
- Corner area (zone 3) = -103.8 psf (-5.0 kPa)

Convert Ultimate Design Loads to Allowable Design Loads using the equation:
$\mathbf{L_d}$ = Ultimate Load (psf or kPa) × 0.6

Converted Allowable Design Loads ($\mathbf{L_d}$)

- Interior field area (zone 1') = -12.7 psf (-0.6 kPa)
- Field area (zone 1) = 22.1 psf (-1.1 kPa)
- Perimeter area (zone 2) = -29.1 psf (-1.4 kPa)
- Corner area (zone 3) = -62.3 psf (-3.0 kPa)

Task
Evaluate the potential use of an adhered roofing system assembly for this building using the methodology outlined in Section 2 of this Standard Practice.

Adhered Membrane Assembly

The recognized listing for the adhered membrane roofing system assembly being considered for this building was tested to a maximum Wind Uplift Load Capacity of -60 psf (-2.9 kPa). The 4 ft. × 8 ft. (1.2 m × 2.4 m) insulation boards were attached using 8 fasteners ($\mathbf{F_t}$) per board.

Determine the Factored Tested Load Capacity ($\mathbf{L_t}$)

Apply the 2.0 safety factor to the -60 psf (-2.9 kPa) Tested Wind Uplift Load Capacity to determine the Factored Tested Load Capacity ($\mathbf{L_t}$):

$\mathbf{L_t}$ = 60 psf / 2.0 = **-30.0 psf**

or

$\mathbf{L_t}$ = -2.9 kPa / 2.0 = **-1.5 kPa**

Verify Roofing System Suitability

In order to determine if this adhered membrane roofing system assembly is suitable for use, compare the Factored Tested Load Capacity (**L_t**) to the calculated field area (zone 1) wind uplift design load. Since **L_t** (-30 psf or -1.5 kPa) exceeds the design load for zone 1 (-22.1 psf or -1.1 kPa), the roofing system assembly, as tested, is suitable for use in the field area of the roof (both zone 1 and zone 1').

Perimeter & Corner Layout Evaluation

L_t (-30 psf, -1.5 kPa) exceeds the calculated wind uplift design load for the perimeter (-29.1 psf, -1.4 kPa) area of the roof, but **L_t** is less than the corner area design load (-39.7 psf, -1.9 kPa). Consequently, the as-tested assembly is suitable for use in the perimeter area but not in the corner area. To determine if rational analysis is acceptable for defining the assembly layout for the corner area, check the requirements of Section 2.5.1 of this document.

1. Tested Wind Uplift Load Capacity is greater than the calculated corner area design load X
2. Roofing system assembly utilizes mechanical fasteners for insulation attachment √

Since **L_t** is less than the corner area design load, rational analysis is not permissible for the corner area. An alternate roofing system assembly with an **L_t** greater than the corner area design load will need to be selected for use in the corner area. However, as an option, this alternate roofing system assembly could be used over the entire roof.

Ultimate Wind Uplift Design Load Notes

The use of ultimate wind uplift design loads (without conversion to allowable design loads) is possible with this document if required by the designer of record. The methodology outlined in Section 2 of this document will still be applicable.

When calculating wind uplift design loads utilizing either ultimate wind speed maps (as contained in ASCE 7-16) or using a safety factor of 1.0 with allowable loads, rational analysis for the perimeter and corner areas for adhered membrane roofing system assemblies will not be possible. The reason is that the 1.0 safety factor is contained in the Rational Analysis rule: *"The Tested Wind Uplift Load Capacity (without consideration of any safety factor) must be greater than or equal to the calculated corner area wind uplift design load".* In this instance multiple assemblies can be used in the field, perimeter and corner areas (to meet the specific zone uplift pressures) or one assembly (that meets the corner design load) can used across the entire roof. This "lesson learned" applies only to adhered membrane roofing system assemblies. The Rational Analysis rules are different for mechanically fastened membrane roofing system assemblies.

Example Building #2 – Allowable Design Uplift Loads
(Used for the following 4 examples)

A building with a fluted steel deck has the following calculated allowable design wind uplift loads determined by using the ASCE Standard (pre 7-16 edition, therefore no 1' zone). A safety factor of 2.0 is being used along with the allowable design loads for this example.

Calculated design wind uplift loads:

- Field area = -25.6 psf (-1.2 kPa)
- Perimeter area = -42.9 psf (-2.1 kPa)
- Corner area = -64.6 psf (-3.1 kPa)

Note: The ASCE 7-10 and earlier Standards do not include a zone 1' area.

Task

Evaluate the potential use of four roofing system assemblies for this building using the methodology outlined in Section 2 of this Standard Practice. The roofing system assemblies to be evaluated are as follows:

Assembly 1—Adhered membrane over insulation attached with mechanical fasteners.

Assembly 2—Adhered membrane over insulation attached with ribbons/beads of a cold adhesive.

Assembly 3—Linearly-attached mechanically fastened membrane.

Assembly 4—Induction-Welded (grid-attached) mechanically fastened membrane.

Example Building # 2—Assembly 1
Adhered Membrane over Insulation Attached with Mechanical Fasteners

The recognized listing for the second adhered membrane roofing system assembly being considered for this building was tested to a maximum Wind Uplift Load Capacity of -90 psf (-4.3 kPa). The 4 ft. × 8 ft. (1.2 m × 2.4 m) insulation boards were attached using 16 fasteners (**F_t**) per board.

Determine the Factored Tested Load Capacity (L_t)

Apply the 2.0 safety factor to the -90 psf (-4.3 kPa) Tested Wind Uplift Load Capacity to determine the Factored Tested Load Capacity (**L_t**):

L_t = -90 psf / 2.0 = **-45.0 psf**

or

L_t = -4.3 kPa / 2.0 = **-2.2 kPa**

Verify Roofing System Suitability

In order to determine if this adhered membrane roofing system assembly is suitable for use, compare the Factored Tested Load Capacity (**L_t**) to the calculated field area wind uplift design load. Since **L_t** (-45 psf or -2.2 kPa) exceeds the design load for the field of the roof (-25.6 psf or -1.2 kPa), the roofing system assembly, as tested, is suitable for use in the field area of the roof.

Perimeter & Corner Layout Evaluation

L_t (-45 psf, -2.2 kPa) exceeds the calculated wind uplift design load for the perimeter (-42.9 psf, -2.1 kPa) area of the roof, but **L_t** is less than the corner area design load (-64.6 psf, -3.1 kPa). Consequently, the as-tested assembly is suitable for use in the perimeter area but not in the corner area. To determine if rational analysis is acceptable for defining the assembly layout for the corner area, check the requirements of Section 2.5.1 of this document.

1. Tested Wind Uplift Load Capacity is greater than the calculated corner area design load √
2. Roofing system assembly utilizes mechanical fasteners for insulation attachment √

Since the requirements of Section 2.5.1 are met, rational analysis is permissible. Note: If the Tested Wind Uplift Load Capacity was less than the corner design load, rational analysis would not be permissible. A higher rated roofing system assembly would need to be selected for use in the corner area, or for the entire roof.

Rational Analysis–Corner Area

To determine the number of fasteners (**F_n**) needed per insulation board for the corner areas of the roof, use the equation **$F_n = (F_t \times L_d) / L_t$**

Where: **F_n** is the number of fasteners per board needed to meet the calculated design load.

F_t is the number of fasteners per board used to achieve the tested load capacity.

L_d is the calculated design wind uplift load for the corner area of the roof, psf (kPa).

L_t is the Factored Tested Load Capacity, psf (kPa).

Corner Area

F_n = (16 fasteners × -64.6 psf) / -45 psf) = **23 fasteners per board**

or

F_n = (16 fasteners × -3.1 kPa) / -2.2 kPa) = **23 fasteners per board**

The final layout for this adhered membrane assembly scenario is to use 16 fasteners per 4 ft. × 8 ft. (1.2 m × 2.4 m) insulation board in the field and perimeter areas and 23 fasteners per board in the corner areas. The extra 7 fasteners added to the corner areas shall be evenly distributed (as best as possible) around the tested fastener layout pattern.

Example Building 2—Assembly 2
Adhered Membrane over Insulation Attached with Ribbons/Beads of a Cold Adhesive

An Evaluation Report listing for an adhered membrane roofing assembly identifies the Factored Tested Load Capacity (**L_t**) as being -37.5 psf (-1.8 kPa). The listing also indicates that testing was conducted using 4 ft. × 4 ft. (1.2 m × 1.2 m) insulation boards attached using ribbons/beads of adhesive spaced 12 in. (30.5 cm) on center (**R_t**). A safety factor of 2.0 was identified in the Evaluation Report as being used for determining **L_t**.

Determine the Tested Wind Uplift Load Capacity

Multiply the -37.5 psf (-1.8 kPa) Factored Tested Load Capacity (**L_t**) by the 2.0 safety factor to obtain the Tested Wind Uplift Load Capacity:

Tested Wind Uplift Load Capacity = 37.5 psf × 2.0 = **-75 psf**

or

Tested Wind Uplift Load Capacity = -1.8 kPa × 2.0= **-3.6 kPa**

Verify Roofing System Suitability

In order to determine if this adhered membrane roofing system assembly is suitable for use, compare the Factored Tested Load Capacity (**L_t**) to the calculated field area wind uplift design load. Since **L_t** (-37.5 psf or -1.8 kPa) exceeds the design load for the field of the roof (-25.6 psf or -1.2 kPa), the roofing system assembly, as tested, is suitable for use in the field area of the roof.

Perimeter & Corner Layout Evaluation

L_t (-37.5 psf or -1.8 kPa) is less than both the perimeter (-42.9 psf or -2.1 kPa) and corner (-64.6 psf or -3.1 kPa) area design loads. Consequently, the as-tested assembly is not suitable for use in the perimeter or corner areas. To determine if rational analysis is acceptable for defining the assembly layout for these areas, check the requirements of Section 2.5.1.2 of this document.

1. Tested Wind Uplift Load Capacity is greater than the calculated corner area design load √
2. Roofing system assembly utilizes mechanical fasteners for insulation attachment √

Since the requirements of Section 2.5.1 are met, rational analysis is permissible.

Note: If the Tested Wind Uplift Load Capacity was less than the corner design load, rational analysis would not be permissible. A higher rated roofing system assembly would need to be selected for use in the corner area, or for the entire roof.

Rational Analysis

To determine the reduced ribbon/bead spacing (**R_n**) for the perimeter and corner areas of the roof, use the equation **$R_n = R_t / (L_d / L_t)$**

Where: **R_n** is the ribbon/bead spacing needed to meet the design load, inches (cm).

R_t is the ribbon/bead spacing used to achieve the tested load capacity, inches (cm).

L_d is the calculated design wind uplift load for the perimeter/corner areas of the roof, psf (kPa).

L_t is the Factored Tested Load Capacity, psf (kPa).

Perimeter Area

R_n = 12 in./(-42.9 psf / -37.5 psf) = **10.5 in.** maximum on center spacing for ribbons/beads

or

R_n = 30.5 cm / (-2.1 kPa / -1.8 kPa) = **27 cm** maximum on center spacing for ribbons/beads

Corner Area

R_n = 12 in. / (-64.6 psf / -37.5 psf) = **7.0 in.** maximum on center spacing for ribbons/beads

or

R_n = 30.5 cm / (-3.1 kPa / -1.8 kPa) = **18 cm** maximum on center spacing for ribbons/beads

Since the steel deck flutes are spaced 6 in. (15 cm) on center, the perimeter and corner ribbons/bead spacing must be rounded down to 6 in. (15 cm) on center. Therefore, the final layout for this assembly scenario is to use ribbons/beads of adhesive spaced 12 in. (30.5 cm) on center for insulation attachment in the field of the roof and ribbons/

beads of adhesive spaced 6 in. (15 cm) on center for insulation attachment in the perimeter and corner areas. Note: If the deck had a smooth (non-fluted) top surface such as concrete, cementitious wood fiber, wood, etc., or if the adhesive was being used to attach multiple layers of insulation, the final layout for this assembly would be to use ribbons/beads of adhesive spaced a maximum of 12 in. (30.5 cm) on center in the field of the roof, 10.5 in. (27 cm) on center in the perimeter area and 7.0 in. (18 cm) on center in the corner areas.

Example Building 2—Assembly 3
Mechanically-Fastened Membrane Linearly-Attached Assembly

The recognized listing for this linearly-attached mechanically fastened roofing assembly being considered for this building was tested to a maximum Wind Uplift Load Capacity of -60 psf (-2.9 kPa). The assembly utilizes an 11.5 ft. (3.5 m) fastener row spacing with fasteners spaced 12 in. (30.5 cm/0.3 m) on center along the row.

Determine the Factored Tested Load Capacity (L_t)

Apply the 2.0 safety factor to the -60 psf (-2.9 kPa) Tested Wind Uplift Load Capacity to determine the Factored Tested Load Capacity (L_t):

L_t = -60 psf / 2.0 = **-30 psf**

or

L_t = -2.9 kPa / 2.0 = **-1.4 kPa**

Verify Roofing System Suitability

In order to determine if this mechanically fastened membrane roofing system assembly is suitable for use, compare the Factored Tested Load Capacity (L_t) to the calculated field area wind uplift design load. Since L_t (-30 psf or -1.4 kPa) exceeds the design load for the field of the roof (-25.6 psf or -1.2 kPa), the roofing system assembly, as tested, is suitable for use in the field area of the roof.

Perimeter & Corner Layout Evaluation

L_t (-30 psf or -1.4 kPa) is less than both the perimeter (-42.9 psf or -2.1 kPa) and corner (-64.6 psf or -3.1 kPa) area design loads. Consequently, the as-tested assembly is not suitable for use in the perimeter or corner areas. Use the rational analysis method referenced in Section 2.6 to determine the assembly layout for these two areas.

Rational Analysis

To determine the appropriate perimeter and corner row spacing, first calculate the influence area per fastener (IA_n) using the equation $IA_n = (L_t \times IA_t) / L_d$

Where: IA_n is the maximum area of membrane to be held in place by one fastener to meet the design load, ft^2 (m^2).

IA_t is the area of membrane held in place by one fastener for the tested assembly, ft^2 (m^2).

L_d is the calculated design load for the perimeter/corner area of the roof, psf (kPa).

L_t is the factored tested load capacity, psf (kPa).

IA_t = fastener row spacing times the fastener spacing along the row

IA_t = 11.5 ft. × 1.0 ft. = **11.5 ft² per fastener**

or

A_t = 3.5 m × 0.3 m = **1.1 m² per fastener**

Perimeter Area

IA_n = (-30 psf × 11.5 ft²) / -42.9 psf = **8.0 ft² maximum per fastener**

or

IA_n = (-1.4 kPa × 1.1 m²) / -2.1 kPa = **0.7 m² maximum per fastener**

Corner Area

IA_n = (-30 psf × 11.5 ft²) / -64.6 psf = **5.3 ft² maximum per fastener**

or

IA_n = (-1.4 kPa × 1.1 m²) / -3.1 kPa = **0.5 m² maximum per fastener**

The row spacing for the perimeter and corner areas shall be determined by dividing **IA_n** by the tested fastener spacing, as follows:

Perimeter Area

8.0 ft.^{2}/1.0 ft. = **8.0 ft. row spacing**

or

0.7 m^2/0.3 m = **2.4 m row spacing**

Corner Area

5.3 ft.^{2}/1.0 ft. = **5.3 ft. row spacing**

or

0.5 m^2/0.3 m = 1.6 m row spacing

There are two possible final layouts for this assembly scenario. The first possible layout is to use a maximum fastener row spacing of 11.5 ft. (3.5 m) in the field of the roof, maximum 8.0 ft. (2.4 m) in the perimeter areas and maximum 5.3 ft. (1.6 m) in the corner areas, all with fasteners spaced 12 in. (30.5 cm) on center along the row. The second possible layout is to use a maximum fastener row spacing of 11.5 ft. (3.5 m) in the field of the roof and a maximum 8.0 ft. (2.4 m) in the perimeter and corner areas. In this second layout however, the perimeter rows must extend into the corners from both directions, creating a cross-hatched fastening pattern.

Example Building # 2—Assembly 4
Induction-Welded (Grid-Attached) Membrane

The recognized listing for the induction-welded (grid-attached) roofing assembly being considered for this building was tested to a maximum Wind Uplift Load Capacity of -75 psf (-3.6 kPa) using a 2 ft. × 3 ft. (0.6 m × 0.9 m) grid membrane fastener spacing pattern. This grid pattern results in the use of 6 membrane fasteners per 4 ft. × 8 ft. (1.2 m × 2.4 m) insulation board.

Determine the Factored Tested Load Capacity (L_t)

Apply the 2.0 safety factor to the -75 psf (-3.6 kPa) Tested Wind Uplift Load Capacity to determine the Factored Tested Load Capacity (L_t):

L_t = -75 psf / 2.0 = **-37.5 psf**

or

L_t = -3.6 kPa / 2.0 = **-1.8 kPa**

Verify Roofing System Suitability

In order to determine if this mechanically fastened membrane roofing system assembly is suitable for use, compare the Factored Tested Load Capacity (L_t) to the calculated field area wind uplift design load. Since L_t (-37.5 psf or -1.8 kPa) exceeds the design load for the field of the roof (-25.6 psf or -1.2 kPa), the roofing system assembly, as tested, is suitable for use in the field area of the roof.

Perimeter & Corner Layout Evaluation

L_t (-37.5 psf or -1.8 kPa) is less than both the perimeter (-42.9 psf or -2.1 kPa) and corner (-64.6 psf or -3.1 kPa) area design loads. Consequently, the as-tested assembly is not suitable for use in the perimeter or corner areas. Use the rational analysis method referenced in Section 2.6 to determine the assembly layout for these two areas.

Rational Analysis

To determine the number of membrane fasteners (F_n) needed per insulation board for the perimeter and corner areas of the roof, use the equation $F_n = (F_t \times L_d) / L_t$.

Where: F_n is the number of fasteners per board needed to meet the calculated design load.

F_t is the number of fasteners per board used to achieve the tested load capacity.

L_d is the calculated design wind uplift load for the perimeter/corner area of the roof, psf (kPa).

L_t is the Factored Tested Load Capacity, psf (kPa).

Perimeter Area

F_n = (6 fasteners × -42.9 psf)/-37.5 psf = **7 fasteners per board**

or

F_n = (6 fasteners × -2.1 kPa) / -1.8 kPa = **7 fasteners per board**

Corner Area

F_n = (6 fasteners × -64.6 psf)/-37.5 psf = **11 fasteners per board**

or

F_n = (6 fasteners × -3.1 kPa) / -1.8 kPa = **11 fasteners per board**

The final layout for this assembly scenario is to use a minimum of 6 membrane fasteners per 4 ft. × 8 ft. (1.2 m × 2.4 m) insulation board in the field of the roof, 7 fasteners per board in the perimeter area and 11 fasteners per board in the corner areas. However, consideration should be given to using 8 membrane fasteners in the perimeter area and 12 in the corner areas. The extra fasteners will retain a grid-type pattern which will facilitate locating the fasteners after the membrane is installed, particularly if a membrane welding operation is involved. Retaining a grid-type pattern will also improve the finished appearance of the roof.

Commentary B

General Considerations

The following design and installation recommendations should be considered before starting a roofing project:

1. Consult with an engineer to ensure the roof deck is adequately secured to resist the wind uplift forces that will be imposed upon it by the installed roofing system assembly.
2. Conduct fastener pullout tests, where appropriate, to ensure the selected fastener/deck combination will provide adequate wind uplift resistance to the forces that will be imposed upon it by the installed roofing system assembly. This is particularly important for steel roof decks and for recover (covering over an existing roofing system assembly) applications. Pullout testing should be conducted in accordance with the ANSI/SPRI FX-1 Standard.
3. Mechanical fasteners used for insulation or membrane securement shall penetrate through the top flange of a steel deck.
4. Rows of mechanical fasteners, spaced greater than 3 ft. (0.9 m) apart, shall be installed perpendicular to the steel deck ribs to avoid overloading a single rib.
5. Ensure that all mechanical fasteners have the proper penetration into the roof deck. Typical fastener penetrations include: 3/4 in. (19 mm) for steel, 1 in. (25 mm) for wood and 1-1/4 in. (32 mm) for structural concrete. Consult with the roofing system supplier and the product listing for verification.
6. Install an edging or coping detail, where appropriate, that will meet the requirements of the SPRI/FM 4435/ES-1 Standard.
7. The use of the Rational Analysis Methods described in Sections 3.5 and 3.6 of this document may be affected by the test table size used to determine the tested wind uplift load capacity of a particular roofing system assembly. It is general industry practice that the following criteria be followed:
    a. **For adhered membrane roofing system assemblies:** The Tested Wind Uplift Load Capacity of the proposed adhered roofing system assembly should have been determined utilizing a test chamber of sufficient size to allow side-by-side positioning of a minimum of three full-size insulation/coverboard/substrate boards/panels on the test frame.
    b. **For linearly-attached mechanically fastened roofing system assemblies:** The tested wind uplift load capacity of the proposed linearly-attached (rows) mechanically fastened roofing system assembly should have been determined utilizing a test chamber of sufficient size such that the tested row spacing did not exceed one half of the table length. The minimum frame width should have been 8 ft. (2.4 m).
    c. **For spot-attached mechanically fastened roofing system assemblies:** The tested wind uplift load capacity of the proposed spot-attached mechanically fastened roofing system assembly should have been determined utilizing a test chamber of sufficient size to allow positioning of a minimum of nine attachment locations on the test frame. The minimum frame width should have been 8 ft. (2.4 m).

Commentary C

Safety Factor Discussion

A safety factor is not required by either the International Building Code or the ASCE 7 Standard but its use has historically been a common practice within the roofing industry. Determination for the need of a safety factor is the responsibility of the designer of record but typical values range between 1.0 and 2.0. Consideration should be given to using a safety factor of less than 2.0 when Ultimate Design Loads are used without conversion to Allowable Design Loads. Ultimate Design Load calculations have factors of safety inherently included in the wind speed maps making them more conservative than Allowable Design Load values and lessening the need for additional safety factors.

Some wind uplift website listings and most testing reports do not reference a safety factor as they simply identify the maximum Tested Wind Uplift Load Capacity that a particular roofing assembly is capable of resisting. Wind Uplift Load Capacity values available from evaluation reports, publications and some other websites may include a safety factor, which means that the listed wind uplift resistance value is actually the Factored Tested Load Capacity (**L_t**). In this instance the Tested Uplift Load Capacity is determined by multiplying **L_t** by the specified safety factor. When a safety factor of 1.0 is utilized, **L_t**=Tested Wind Uplift Load Capacity

Various methods exist for applying safety factors and include the following:

a. Allowable Design Load results multiply by safety factor:

   Factored Design Load Capacity (L_d) = Wind Uplift Design Pressures × safety factor

b. Tested Load Capacity divided by safety factor:

   Factored Tested Load Capacity (L_t) = Tested Wind Uplift Load Capacity / safety factor

Related Reference Documents

Design Standards

1. ASCE 7 Minimum Design Loads for Buildings and Other Structures (available at www.asce.org)
2. ANSI/SPRI RP-4, Wind Design Standard for Ballasted Single-Ply Roofing Systems (available at www.spri.org)
3. ANSI/SPRI RP-14, Wind Design Standard for Vegetative Roofing Systems (available at www.spri.org)
4. ANSI/SPRI/FM 4435/ES-1, Wind Design Standard For Edge Systems Used with Low Slope Roofing Systems (available at www.spri.org)
5. ANSI/SPRI GD-1, Structural Design Standard for Gutter Systems Used with Low-Slope Roofs (available at www.spri.org)

North American Testing Standards

1. ANSI/FM 4474, American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures (available at www.fmglobal.com)
2. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners (available at www.spri.org)
3. ANSI/SPRI IA-1, Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates (available at www.spri.org)
4. UL 580, Standard for Tests for Uplift Resistance of Roof Assemblies (available at www.ul.com)
5. UL 1897, Standard for Uplift Tests for Roof Covering Systems (available at www.ul.com)
6. CSA Standard A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems (available at www.ShopCSA.ca)

Informational Data Sheets & Guidelines

1. Application Guidelines for Modified Bitumen, Thermoplastic and Thermoset Roofing Systems (available at www.spri.org)
2. Modified Bitumen, Thermoplastic and Thermoset Details (available at www.spri.org)
3. FM Global Loss Prevention Data Sheets 1-28, 1-29 and 1-49 (available at www.roofnav.com)
4. Wind Design Standard Practice for Roofing Assemblies

Return to Schedule

SPRI
Digital Content & Communications
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
2:30 p.m.

AGENDA

I.	Call to Order	R. Montoya
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Blog Update and Review	
	a. Google Analytics Review	M. Jones
	b. Quarterly Vlog- Where are we?	C. Collins
IV.	Blogger Updates Q1 2024	
V.	Update blog list and additions	
VI.	Website update – summer meeting discussion	
VII.	Adjournment	

Task Force Objective:
– Rick Montoya, Acme Cone Company

The objective for this task force is to build SPRI's digital presence through the regular posting of blogs to the SPRI website, post and share digital content through LinkedIn and Facebook, soliciting blog content.

Return to Schedule

SPRI
Technical Committee
Crowne Plaza at the Crossings
Warwick, RI
May 7, 2024
3:30 p.m.

AGENDA

I.	Call to Order	S. Childs
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Minutes: Vote on approval of the minutes of the January 2024 meeting (attached)	
IV.	Review of Completed Objectives	
V.	Task Force Reports	
	a. ADT-1	Eschhofen/Griswold
	b. Code Development	C. Collins
	c. Codes & Standards	C. Collins
	d. Digital Content	R. Montoya
	e. DORA™ Edge Securement	B. LeClare
	f. DORA™ Fire Classification	C. Collins
	g. DORA™ Listing Service	C. Collins
	h. Education	B. Chamberlain
	i. Internal Positive Pressure	Childs/Mader
	j. PRO Guide Updates (https://www.spri.org/pro-guide-updates/)	C. Collins
	k. PVC Environmental	S. Stanley
	l. RD-1 Standard Update	L. Donovan
	m. Resiliency	M. Ibanez
	n. RP-14 Revision	C. Mader
	o. Standards Library and Template	C. Mader
	p. TDP-1 (Peel Test Procedure)	S. Childs
	q. VR-1 Partners	S. Kiriazes
	r. WD-1 Update	Chamberlain/Scheerer
	s. Standards date review	C. Collins
VI.	Unfinished Business	
VII.	New Business	
VIII.	Adjournment	