Wednesday, October 16

	Kannapolis			
10:00 AM	Roofing 101			
11:00 AM	Wind Design Seminar			
12:30 PM	**Lunch Break (Concord I)**			
1:30 PM	Wind Design Seminar			
5:00 PM	Reception			
6:00 PM				

Thursday, October 17

	Kannapolis	Kitty Hawk	Piedmont	Harrisburg
8:00 AM	SPRI Antitrust Primer			
8:15 AM	Codes & Standards 8:15 - 9:15 Collins			
8:30 AM				
8:45 AM				
9:00 AM				
9:15 AM	Code Development 9:15 - 10:15 Hickman	TDP-1 (Peel Test) 9:15 - 10:00 Childs		Exclusive Event for SPRI Members in Marketing 9:15 - 10:45
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		South Coast AQMD Monitoring 10:15 - 11:15 Walnut	
10:30 AM				
10:45 AM		Adhesive peel test w/o substrate 10:45 - 11:30		
11:00 AM				
11:15 AM	DORA™ Fire 11:15 - 12:00 Collins			
11:30 AM			Education 11:30 - 11:45, Chamberlain	
11:45 AM				
12:00 PM	**Lunch Concord I**			
12:15 PM				
12:30 PM				
12:45 PM				
1:00 PM	DORA™ Edge 1:00 - 1:45 LeClare	WD-1 Update 1:00 - 1:30 Chamberlain/Scheerer	Cover Board 1:00 - 1:30 Barber	
1:15 PM				
1:30 PM		RP-14 1:30 - 2:00 Mader	PRO Guide 1:30 - 2:00 Collins	
1:45 PM				
2:00 PM	Promotion/Digital Content 2: 00 - 3:00 Montoya	Standards Template Library 2:00 - 2:30 Mader	Recycling Percentage 2:00 - 2:30 Collins	
2:15 PM				
2:30 PM				
2:45 PM		ED-1 Canvass 2:45-3:15 LeClare		
3:00 PM				
3:15 PM	Technical Committee 3:15-4:15 Childs			
3:30 PM				
3:45 PM				
4:00 PM				
4:15 PM				
4:30 PM				
4:45 AM	Dinner at the Speedway Club, Charlotte Motor Speedway			

Return to Schedule

SPRI
Codes & Standards
Embassy Suites by Hilton
Concord, NC
October 17, 2024
8:15 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	
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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Return to Schedule

SPRI
Code Development
Embassy Suites by Hilton
Concord, NC
October 17, 2024
9:15 a.m.

AGENDA

I.	Call to Order	A. Hickman
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review Code Development Task Force Objectives	
IV.	ICC Code Development Process Update	
V.	Review of ICC Code Change Proposals and Strategy for 2027 edition	
VI.	IAPMO/UPC	
VII.	NFPA 5000, 780 / LPS	
VIII.	2024/2027 IECC Update	
IX.	ASHRAE update (90.1 and 189.1)	
X.	Florida Code Development update	
XI.	Code Trends	
XII.	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.

Return to Schedule

SPRI
DORA™ Listing Service
Embassy Suites by Hilton
Concord, NC
October 17, 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

V. New Business

VI. Adjournment

Task Force Objective:
– *Chadwick Collins, SPRI*

Develop 1-, 3- and 5-year objectives for the DORA platform in support of the SPRI Strategic Plan.

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Return to Schedule

SPRI
DORA™ Fire Classification
Embassy Suites by Hilton
Concord, NC
October 17, 2024
11:15 a.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Reports & Updates
Review of July discussion

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.

Return to Schedule

SPRI
DORA Edge Securement
Embassy Suites by Hilton
Concord, NC
October 17, 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	
IV.	Review draft of "Engineered Components Guidelines (for DORA)"	
V.	Other business	
VI.	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.

Return to Schedule

SPRI
Digital Content & Communications
Embassy Suites by Hilton
Concord, NC
October 17, 2024
2:00 p.m.

AGENDA

I.	Call to Order	R. Montoya
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Marketing & Membership Discussion	M. Jones
IV.	Blog Update and Review	
	a. Recap of Articles and Press Releases	M. Jones
	b. Articles in the pipeline	M. Jones
	c. New content suggestions & brainstorm	Group
V.	Vlog – Where are we? (see attached)	C. Collins & R. Montoya
VI.	Google Analytics	M. Jones
VII.	New Chair Search – Beginning January 2025	R. Montoya
VIII.	New Business	
IX.	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

Title	Posted	Writer
SPRI Wind Design Seminar	9/20/2024	Sam Everett
Roofing Day	6/10/2024	Michelle Jones
Meet SPRI President, Scott Carpenter	4/18/2024	Michelle Jones
Moisture Bulletin	2/22/2024	Sam Everett
GT-1	2/9/2024	Michelle Jones
Brad Van Dam Reflects on Time as President	1/5/2024	Michelle Jones
Making Roofing Santa Safe	12/21/2023	Chadwick & Brad
Wind Design Seminar: Unlocking the Secrets of Building Resilience	9/25/2023	Michelle Jones
MPO Standard	9/7/2023	Michelle Jones
EPDs	7/31/2023	Sam Everett
VF-1	6/23/2023	Michelle Jones
A conversation with Chadwick Collins	5/24/2023	Sam Everett
Protecting the Roof From Human Impact	3/6/2023	Brian Randall
NRCC Announces New Governance Model for Harmonized Construction of Code Development System	2/23/2023	Michelle Jones
SPRI 2023 Annual Business Conference: "Push It Up!"	2/1/2023	Michelle Jones
Single Ply Industry Resilience and Future Sustainability	1/4/2023	Sam Everett
Why Cover Boards are Important for Protecting Insulation in Low Slope Roofing	12/29/2022	Warren Barber
What About the Roof? Minimize Property Loss and Life Safety Concerns With Proper Rooftop Equipment Attachment	12/5/2022	Michelle Jones
Lightning Protection Systems	11/17/2022	Sam Everett
Three Ways Specifiers Are Using DORA	4/20/2022	Michelle Jones
Roof Drainage Assessment Using 3D Laser Scanning	7/29/2021	Josiah Lau, & Mike Sex
ENERGY STAR Phaseout for Roofing	7/16/2021	Adam Burzynski
Report from Roofing Day in Washington: Experience of an NRCA Roofing Day Virgin	4/13/2021	Randy Ober
Use Coverboard to Hear That Pin Drop	10/13/2020	Brian G. Randall
Your Search Just Got Easier – Learn More About DORA®	8/20/2020	Brian Buckle
Hail No, It'll Never Happen Here!	5/12/2020	Warren Barber
The Top 10 Reasons to Use Coverboard	2/5/2020	Warren Barber
The Importance of Nailers in Low Slope Roofing Systems	12/16/2019	Brad Van Dam
Introduction to Hot-Air Welding	9/20/2019	Dave Nordentoft
Popularity Increases for Induction Welded Single Ply Roof Systems	9/16/2019	Scott Carpenter
Randy Ober to join SPRI as Technical Director	7/22/2019	SPRI
Polyurethane Adhesives	5/15/2019	SPRI
SPRI Elects New Directors and Honors Members for Service	2/25/2019	SPRI
How Serious Should We Be About Adhering to Wind Protection Standards?	2/25/2019	SPRI
DORA® Now Included in MasterSpec	2/5/2019	SPRI
Bituminous Roofing 101	1/15/2019	SPRI
Single-Ply Roofing 101	1/9/2019	SPRI
EPDM Yesterday and Today	12/7/2018	SPRI
RCI Foundation Funds SPRI Research	9/28/2018	SPRI
RICOWI Releases Roofing Investigation Report on Hurricane Irma	9/25/2018	SPRI
SPRI July 2018 Meetings – A packed schedule and a packed room	7/23/2018	SPRI
SPRI's Position: ES-1 Tested Products	5/21/2018	SPRI
SPRI April Technical Task Force Meetings – Progressing the roofing industry with a dog friendly atmosphere	5/11/2018	SPRI
DORA – Your Search Just Got Easier	5/9/2018	SPRI
Air Barriers and Vapor Retarders	4/2/2018	SPRI
SPRI Participates: EduCode, Ricowi, RCI	3/22/2018	SPRI
SPRI Updates and Improves Roof Edge Standards	3/9/2018	SPRI
February 2018 SPRI Annual Meeting Election Results	2/20/2018	SPRI
Low Slope Roofing and ES-1 Testing FAQs	10/27/2017	SPRI
The Value of Industry Associations for Roofing Contractors	6/20/2017	SPRI
Join Us in Welcoming Amanda Hickman of The Hickman Group (THG) to the SPRI Team	5/20/2017	SPRI
3 Steps to Roofing Safety	4/20/2017	SPRI

Return to Schedule

SPRI
TDP-1 Tear Drop Peel
Embassy Suites by Hilton
Concord, NC
October 17, 2024
9:15 a.m.

AGENDA

I.	Call to Order	S. Childs
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review of language regarding suitable substrate vs. board stock	
IV.	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.

Return to Schedule

SPRI
RD-1
Embassy Suites by Hilton
Concord, NC
October 17, 2024
10:00 a.m.

AGENDA

I.	Call to Order	L. Donovan
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review Review final edits to the document	
IV.	Review added figures to the commentary section	
V.	Timeline	
VI.	Adjournment	

Task Force Objective:
– *Liam Donovan, OMG Roofing Products*

The ANSI/SPRI RD-1 Performance Standard for Retrofit Drains will be reviewed, revised if necessary, and recanvassed as an ANSI standard.

Return to Schedule

SPRI
Adhesive Peel Test w/o Substrate
Embassy Suites by Hilton
Concord, NC
October 17, 2024
10:45 a.m.

AGENDA

I.	Call to Order	TBD
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Drafting of Task Force Objectives	
IV.	Select Task Force Chair	
V.	Action Items	
VI.	Adjournment	

Task Force Objective:
TBD

Return to Schedule

SPRI
WD-1 Revision
Embassy Suites by Hilton
Concord, NC
October 17, 2024
1:00 p.m.

AGENDA

I.	Call to Order	D. Scheerer
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review WD-1 most current draft and comments from pre-canvass and canvass (to-date)	
IV.	Open discussion	
V.	Next steps	
VI.	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.

Return to Schedule

SPRI
RP-14 Revision
Embassy Suites by Hilton
Concord, NC
October 17, 2024
1:30 p.m.

AGENDA

I. Call to Order — C. Mader

II. Roll Call & Reading of SPRI Antitrust Statement

III. Task Force Chair to provide update

IV. Brian Chamberlain and his team updated the Figure 2 to reflect the 0.6h proposal, pending task force approval to move forward with the proposed resolution.

V. Vote on resolution and re-ballot

VI. 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

SPRI
Standards Template Library
Embassy Suites by Hilton
Concord, NC
October 17, 2024
2:00 p.m.

AGENDA

I. Call to Order C. Mader

II. Roll Call & Reading of SPRI Antitrust Statement

III. Discuss the revision to the existing Testing Standard Template document as it pertains to standard laboratory conditions

IV. 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

SPRI
ED-1 Canvass
Embassy Suites by Hilton
Concord, NC
October 17, 2024
2:45 p.m.

AGENDA

I. Call to Order — B. LeClare

II. Roll call and reading of SPRI antitrust statement

III. Task Force Objective

IV. Canvass List (see attached previous canvass list)

V. Any needed changes or additions? (see attached current standard)
  a.) Attachement to edge conditions other than wood blocking
  b.) GD-1 reference
  c.) ASCE 7 latest version
  d.) Tables and maps
  e.) Other

VI. Adjournment

Task Force Objective:
– Bob LeClare, ATLAS International, Inc.
start date 07/2023 budget: $0

Return to Schedule

2019 ED-1 Canvass List with Vote

Abstain	1

Company Name	Voter Name	Vote	Interest Categories
Technical Roof Services, Inc.	Dregger, Philip	Abstain	User
Benchmark, Inc.	Evans, Jeff	Affirmative	General Interest
Dedicated Roof & Hydro-Solutions, LLC	Hawn, David	Affirmative	General Interest
National Research Council of Canada	Baskaran, Bas	Affirmative	General Interest
StanCConsulting	Choiniere, Stan	Affirmative	General Interest
National Roofing Contractors Association	Wilen, Jason - Graham, Mark	Affirmative	General Interest
Carlisle Construction Materials Incorporat	Malpezzi, Joseph	Affirmative	Other Producer
ATAS International Inc	LeClare, Bob	Affirmative	Producer
Firestone Building Products Co, LLC	Hubbard, Michael	Affirmative	Producer
OMG Roofing Products	Patel, Karan	Affirmative	Producer
Intertek	Holstein, Andy (no longer at intertek)	Affirmative	User
Michelsen Technologies	Michelsen, Ted	Affirmative	User
RCI, Inc.	Edwards, Wanda	Affirmative	User
Resso Engineering, LLC	Resso, Frank	Affirmative	User
Insulfoam LLC	Savoy, Tom	Did not vote	Other Producer
IMETCO	Arnold, Kevin	Did not vote	Producer
Metal-Era, Inc.	Van Dam, Brad	Did not vote	Producer
FM Approvals / FM Global	Smith, Phil	Did not vote	User
Morrison Hershfield Corporation	Raymond, Russell	Did not vote	User
TW Freeman Consultants	Freeman, T.W.	Did not vote	User

Return to Schedule

ANSI/SPRI ED-1 2019

Design Standard for Edge Systems Used with Low Slope Roofing Systems

Approved June 3, 2019

Approved American National Standard

ANSI

SPRI

SINGLE PLY ROOFING INDUSTRY

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www.spri.org.

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

Table of Contents

Approved June 3, 2019

1 Introduction

1.1 Scope

This Standard provides the basic requirements for wind load design for roof edge securement of roof edge systems, including gutters and nailers. It also provides information on material thicknesses that lead to satisfactory flatness, accommodating thermal movement, how to minimize corrosion, methods for testing roof edge systems, and other factors affecting roof edge performance. This Standard is intended for use by those that design, specify, and manufacturer roofing materials and roof edge systems used in the roofing industry. The membrane manufacturer shall be consulted for specific recommendations for making the roof watertight at the edge.

This Standard applies to low slope membrane roof systems, with low slope defined here as roofs having a slope ≤ 9.5 degrees (2:12). The design and installation information found in this document addresses copings, horizontal roof edges, and gutters as well as the following factors which shall be considered in designing a roof edge:

- Structural integrity of the substrate that anchors the edge (e.g. nailers)
- Wind resistance of the edge detail
- Material specifications

This Standard provides perimeter edge loads based upon the field of roof pressure for the building under consideration. The user is required to know, or be able to calculate using ASCE 7 *Minimum Design Loads for Buildings and Other Structures*[1] or other means, the field of roof pressure. The intent of this Standard is to provide condensed design information pertaining to the design of roof edge systems; the Authority Having Jurisdiction (AHJ) for the project under design shall dictate the method for determining perimeter edge load requirements. See Commentary.

1.2 Definitions

ANSI: American National Standards Institute

ASCE: American Society of Civil Engineers

Aluminum: a non-rusting, malleable *metal* sometimes used for *roof edge systems*.

Ballast: an anchoring material, such as aggregate or precast concrete pavers, which employs its mass and the force of gravity to hold (or assist in holding) single-ply roof *membranes* in place.

Cleat: a continuous *metal* strip, or angled piece, used to secure *metal* components.

Clip: a non-continuous *metal* component or angle piece used to secure two or more *metal* components together.

Cold rolled: the process of forming steel, *aluminum*, and *copper* into sheets, panels, or shapes on a series of rollers at room temperature.

Coping: the covering piece on top of a *parapet wall* exposed to the weather, usually made of *metal*, and sloped to carry off water.

Copper: a natural weathering *metal* used in *metal* roofing or flashings.

Deck: the uppermost structural component of the building immediately below the *roof system*. The *deck* must be capable of safely supporting the weight of the *roof system*, and the loads required by the governing building codes.

Design load: the total load on a structural system for the most severe combination of loads and forces which it is designed to sustain.

Design pressure: the *design load* on a structure due to pressure, either negative or positive, caused by wind.

Drip: the lower most portion of a *metal* flashing or other overhanging component, which projects away from the building with the intention preventing capillary action and controlling the direction of dripping water to help protect underlying building components.

Fascia: the vertical or steeply sloped roof or trim located at the perimeter of a building. Typically, it is a border for the *low-slope roof system*.

Fastener: any of a wide variety of mechanical securement devices and assemblies, including nails, screws, *cleats*, *clips* and bolts, which may be used to secure various edge components.

Field of Roof Pressure: the wind pressure (generally upwards) imparted on a central area of the roof.

Flatness: a three-dimensional geometric tolerance that controls how much a feature can deviate from a flat plane.

Galvanic series: a list of *metals* and alloys arranged according to their relative electrolytic potentials in a given environment.

Galvanize: to coat steel or iron with *zinc*.

Gravel stop: a flanged device, frequently metallic, designed to prevent loose aggregate from washing off the roof and to provide a continuous finish edge for the roofing *membrane*.

Gutter: a generally U-shaped channel for collecting water runoff from the roof and leading it to an *outlet*.

Gutter Bracket: a device that supports a *gutter* from underneath.

Gutter Strap: a device that helps support a *gutter* from the top.

Gutter System: a system consisting of *gutter*, *gutter straps*, *gutter brackets*, joints, *fasteners*, and roof flange.

Low-slope roof: a category of roofs that generally include weatherproof *membrane* types of *roof systems* installed on slopes at or less than 2:12 (9.5 degrees).

Membrane: a flexible or semi-flexible roof covering or waterproofing whose primary function is to exclude water.

Metal: any of a category of electropositive elements that usually have a shiny surface, are generally good conductors of heat and electricity, and can be melted or fused, hammered into thin sheets.

Nailer: a longitudinal member, typical wooden, to which a *roof edge system* may be fastened to the building. Such fastening can be direct or through *clips*, *cleats*, *gutter brackets*, or *gutter straps*.

NRCA: National Roofing Contractors Association

Outlet: an opening in a *gutter* that allows water discharge.

Parapet wall: the part of a perimeter wall that extends above the roof.

Roof Edge: the point of transition from a *low-slope roof* to a lower vertical or near vertical building element, including but not limited to walls, windows, *fascia* boards, and mansard roofs.

Roof Edge System: a component or system of components at the perimeter of the roof that typically is integrated in to the *roof system* for the purpose of flashing and securing the roof *membrane*.

Roof slope: the angle a roof surface makes with the horizontal, expressed as a ratio of the units of vertical rise to the units of horizontal length (sometimes referred to as run), the amount or degree of such deviation. If the slope is given in inches, slope may be expressed as a ratio of rise of run, such as 2:12, or as an angle.

Roof system: a system of interacting roof components, generally consisting of a *membrane*, roof insulation and edge materials (not including the roof *deck*) designed to weatherproof and, sometimes, to improve the building's thermal resistance.

Safety Factor: a multiplier to design calculations selected to cover uncertainties in the calculation results and to address normally anticipated variances in, and deterioration/aging of, materials.

Soffit: the exposed undersurface of any exterior overhanging section of a roof eave.

SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Incorporated.

Substrate: the upper surface of the roof *deck*, insulation, or other roofing structure upon which a roofing *membrane* or other component of the roofing system is placed or to which it is attached.

Thermal expansion: the increase in the dimension or volume of a body due to temperature variations.

Wind load: force exerted by the wind on a roof or any component of a roof.

Wind uplift: wind that is deflected at *roof edges*, roof peaks or obstructions can cause a drop in air pressure immediately above the roof surface. The resultant force is transmitted to the roof surface and is called *wind uplift*.

Zinc: A bluish-white, lustrous metallic element which is used to form a wide variety of alloys including brass, bronze, in galvanizing iron and other *metals*, for roofing and *gutters* and other various components.

2 Background Information

2.1 Wind Related Roofing Damage

No area of the country is exempt from wind related roofing damage. A study of 145 FM Global losses involving built-up roof (BUR) systems showed 85 losses (59 percent) occurred because the roof perimeter failed[2]. The Roofing Industry Committee on Weather Issues (RICOWI) has issued several reports summarizing their findings regarding roof damage after significant wind events. The committee found "many examples of damage appeared to originate at failed edge details"[3]. RICOWI notes that their "studies reinforced the need for secure *roof edges*, and codes that require secure roof edging need to be enforced"[4].

Findings from a two-year study of in-situ *roof edge systems* conducted by the National Research Council of Canada (NRCC), *Wind Uplift Standard for Roof Edge Systems and Technologies (REST) Project*[5], are reported by Baskaran et al, (2017), Development of Wind Loaded Criteria for Commercial *Roof Edge Metals* in the journal of Architectural Engr, ASCE found that actual *wind load* measurements correlated very closely with the wind *design loads* outlined in this standard. However, when local code requires other *design loads*, they shall be used. See Commentary.

3 General Design Factors

3.1 Roof Slope

Roof Slope is accounted for in the pressure coefficient factors used in this document. Only *roof slopes* ≤ 9.5° (2:12) are addressed by this document.

3.2 Roof Edge Conditions

Roof edges composed of *low-slope roofs* terminating into a *parapet wall* or a lower vertical element of the building are addressed in this document.

3.3 Field of Roof Pressure

The *field of roof pressures* (q_{fz}) used in this document are in pounds per square foot (psf) and kilopascals (KPa). Calculation of the *field of roof pressure* for the building under design is outside of the scope of this document, and shall be calculated using ASCE 7 *Minimum Design Loads for Buildings and Other Structures*[1] or other means.

3.4 Building Height

The building height shall be measured from the ground to the eave of the roof section. Specific topographic features, such as hills, shall be considered as per ASCE 7 when calculating building height.

3.5 Roof Edge Regions

Wind forces near building corner regions are of greater intensity than in the perimeter regions between corners. These regions are defined as follows:

3.5.1 Corner Region

Corner region is determined by building height and width. The method of determining the size of the corner region varies based upon which version of ASCE 7 is used. Reference Code and the Authority Having Jurisdiction (AHJ) for the required version of ASCE 7 to be used, and calculate the corner region accordingly. See Commentary.

3.5.2 Perimeter Region

The perimeter is the section of *roof edge* between building corner regions as defined in Section 3.5.1 (above). The edge condition includes the *roof edge system* and the *nailer* or other *substrate* to which the *roof edge system* is attached.

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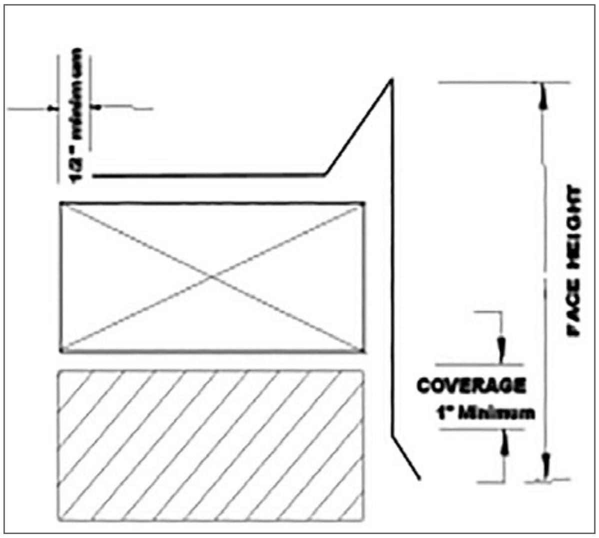

Figure 1: Face Height and Coverage

3.5.3 Face Height and Coverage

Coverage is the location of the lowest vertical point of the *roof edge system* or any extension of it, exclusive of any *drip* or other protrusion. The coverage shall extend a minimum of 1 in. (25 mm) below the bottom of the bottom *nailer*, or a minimum of 1 in. (25 mm) over the face of the wall when no *nailer* is present. The roof *membrane* shall not extend below the coverage (see Figure 1).

3.6 Importance Factor

Buildings shall have an Importance Factor included in the wind design calculations. When using ASCE 7-05 an importance factor multiplier is used. Table A1 (see Appendix A) defines these building classifications. The tables in this document all use a Risk category II importance factor of 1.0. When designing per ASCE 7-05 the loads listed in the tables shall be multiplied by the importance factor appropriate for the building under design. No adjustment is needed when designing per ASCE 7-10. See Commentary

3.7 Membrane Termination

Two types of **membrane** termination are industry accepted: dependently and independently terminated systems. See Commentary.

3.7.1 Dependently Terminated Systems

Ballasted Systems, ribbon adhered systems, or systems in which the mechanically attached roof cover is secured to the *substrate* at a distance greater than 12 in. (305 mm) from the outside edge of the *nailer* are considered dependently terminated by the *roof edge system*. See Commentary.

3.7.2 Independently Terminated Systems

Systems in which the roof cover is fully adhered to the *substrate* or a mechanically attached roof cover is secured to the *substrate* at a distance less than or equal to 12 in. (305 mm) from the outside edge of the *nailer* are considered independently terminated. See Commentary.

3.8 Nailer System Requirements

3.8.1 Nailer Secured Systems

Wood blocking or *nailers* used to attach *roof edge system* components shall be designed and installed to resist the design outward and upward loads determined for the *roof edge system* per Tables A6 and A7. See Commentary.

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Wood *nailers* shall have minimum thickness of 1.5 in. (38 mm). For *roof edge systems* used to secure the roofing (e.g., *gravel stops*), the *substrate* (e.g. *nailer*) shall extend at least ½ in (13 mm) beyond the back edge of the horizontal flange of the *roof edge system* (See Figure 1).

3.8.1.1 Nailer Attachment to Masonry

All anchor bolts shall be designed to resist the design *wind load* and shall be firmly attached to the masonry structure to provide a\load path. See Commentary.

3.8.1.2 Nailer Attachment to Lightweight Concrete and Gypsum

Anchors and anchor *substrates* shall be designed to resist the design *wind load*. Alternatively, all roof perimeter *nailers* shall be attached directly to building structural members to provide a continuous load path. See commentary.

3.8.1.3 Nailer Attachment to Steel Deck

All roof perimeter *nailers* attached to steel *decks* shall be designed to resist the design *wind loads*. The steel *decks* shall be attached to the structure to provide a continuous load path. See commentary.

3.8.2 Nailerless Systems

The direct attachment of *roof edge systems* to masonry or steel shall be designed to resist the design *wind loads*. See commentary.

3.8.3 Re-roofing

Edge *nailers* shall be in good condition with no rotted wood or splits. *Fasteners* shall be adequate to resist the design *wind load* and not be corroded or missing. See commentary.

3.9 Other Design Requirements

3.9.1 Local building codes

A local or state building code may have additional *wind load* provisions, which contain additional wind design requirements beyond those listed in this document.

3.9.2 Main Wind Force Resisting System

The project engineer of record shall provide the *roof edge system* manufacturer with additional design requirements of the *roof edge system* as a result of special or non-typical design considerations of the building's main wind force resisting system.

4 Wind Design of Edge Systems

4.1 General Information

The wind design of *roof edge systems* is comprised of two parts, the determination of the *roof edge wind loads* (Section 4.2), and the determination of the *roof edge system* resistance (Section 6). All materials for *roof edge* construction shall have sufficient strength (resistance) to withstand the design *wind load*.

4.2 Edge Pressure Wind Load Tables

Horizontal and vertical edge pressure values are given in Tables A2 (roof height (h) ≤ 60 ft.) and A3 (h > 60 ft.) for various *field of roof pressures*.

Membrane tension loads are given in Tables A4 (roof height (h) ≤ 60 ft.), and A5 (h > 60 ft.). See Commentary.

4.3 Nailer Securement Load Tables

The load values shown in Tables A6 (roof height (h) ≤ 60 ft.) and A7 (h > 60 ft.) are based on the load imparted to a *fastener* for a given *fastener* spacing. See Commentary.

5 Static Load Design for Gutters

5.1 Water Loads

If *gutter* outlets are blocked or clogged, the *gutter* will fill to capacity with water. The downward force per unit length of a filled *gutter* is equal to the density of water times the cross-sectional area of the portion of the *gutter* filled with water when the *gutter* is filled to capacity.

$F_s = S_f \times p_w \times A_w$

In which:

F_s = Downward static load per unit length of *gutter*

A_w = Cross-sectional area of the water when the *gutter* is filled to capacity

p_w = Density of water

S_f = Safety Factor = 1.67

The *gutter system* shall therefore be subjected to downward loads of

$F_w = 104 \times A_w$ with F_w in pounds per foot and A_w in ft.^{2}

5.2 Ice and Snow Loads

In regions where ground snow loads are greater than zero, the force of ice forming around the *gutter* shall be considered in the static load design. Static load on the *gutter* shall be the downward static load as defined in Section 5.1 above plus 2.0 times the ground snow load p_g with p_g = maximum of 20 lb./ft.^{2}

$F_s = S_f \times p_w \times A_w + 2.0 \times pf \times Aw$

In which p_f = Flat Roof Snow Load

In regions where $p_g < 20$ lb./ft.^{2}, then

$p_f = p_g$

In regions exceeding 20 lb./ft.^{2}

Ground snow load p_g shall be derived from Attachment I.

6 Edge System Resistance

Roof edge systems shall be tested in accordance with ANSI/SPRI/FM 4435/ES-1 and or ANSI/SPRI GT-1 as appropriate for the application.

6.1 Dependently Terminated Systems

Edge devices designed to act as *membrane* termination shall be tested according ANSI/SPRI/FM 4435/ES-1 Test RE-1.

6.2 Edge Flashing, Gravel Stops

Roof edge systems where the *expose*d horizontal component is 4 in. (102 mm) or less, shall be tested according to ANSI/SPRI/FM 4435/ES-1 Test RE-2. For *exposed* horizontal components greater than 4 in. (102 mm), ANSI/SPRI/FM 4435/ES-1 Test RE-3 is applicable.

6.3 Copings

Coping and other edge devices for which the *exposed* horizontal component exceeds 4 in. (102 mm) shall be tested according to ANSI/SPRI/FM 4435/ES-1Test RE-3.

6.4 Gutters

Gutters shall be tested in accordance with ANSI/SPRI GT-1 Tests G-1 for resistance to outward (horizontal) *wind loads*, G-2 for resistance to upward (vertical) *wind loads*, and G-3 for resistance to downward (vertical) static loads

6.5 Perimeter and Corner Regions

Roof edge systems installed within perimeter regions shall have been tested to meet perimeter *design loads*. Similarly, *roof edge systems* installed within corner regions shall have been tested to meet corner *design loads*.

7 Performance of Light Gauge Metal

7.1 Thermal Expansion

Roof edge systems shall be designed to allow for free thermal movement due to any differing rates of expansion/contraction between components of the *roof edge system*, and between the *roof edge system* and the *substrate* to which it is attached. *Roof edge system* elements, which are not allowed to expand/contract freely, can cause internal stresses and unwanted deflections (including face bowing) that may compromise both the appearance and performance of the *roof edge system*. Sections of the *roof edge system* should be designed to allow for the expected expansion/contraction of each section. Figure 2 shows the amount of expansion or contraction in 64ths of an inch that will occur to a 10-foot (3 m) section of *roof edge* or *roof edge system* due to a 100° F (37.8° C) temperature change.

7.1.1 Fastener Holes

When attaching materials with differing coefficients of expansion the *fastener* clearance holes shall be slotted or oversized to allow for differing amounts of *thermal expansion*.

7.1.2 Cleats and Clips

Engaging *roof edge system* components on *cleats* or *clips* will allow for thermal movement of the *roof edge system*; however, no linear edge component shall be tightly crimped or fastened to the *cleat* or *clip*

7.1.3 Joints

Joints where lineal sections of *roof edge system* components meet shall either be lapped to allow joining sections to move, or have a gap wide enough to allow for the expected thermal movement with a splice plate to prevent water infiltration where needed.

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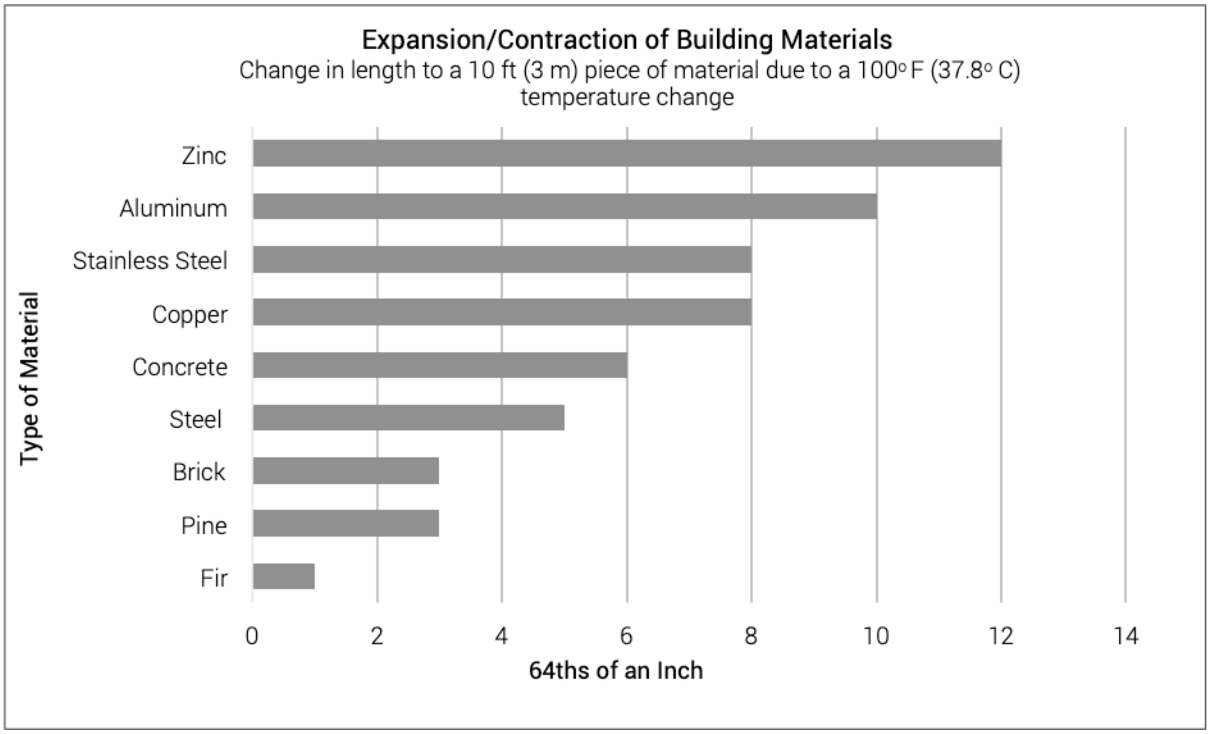
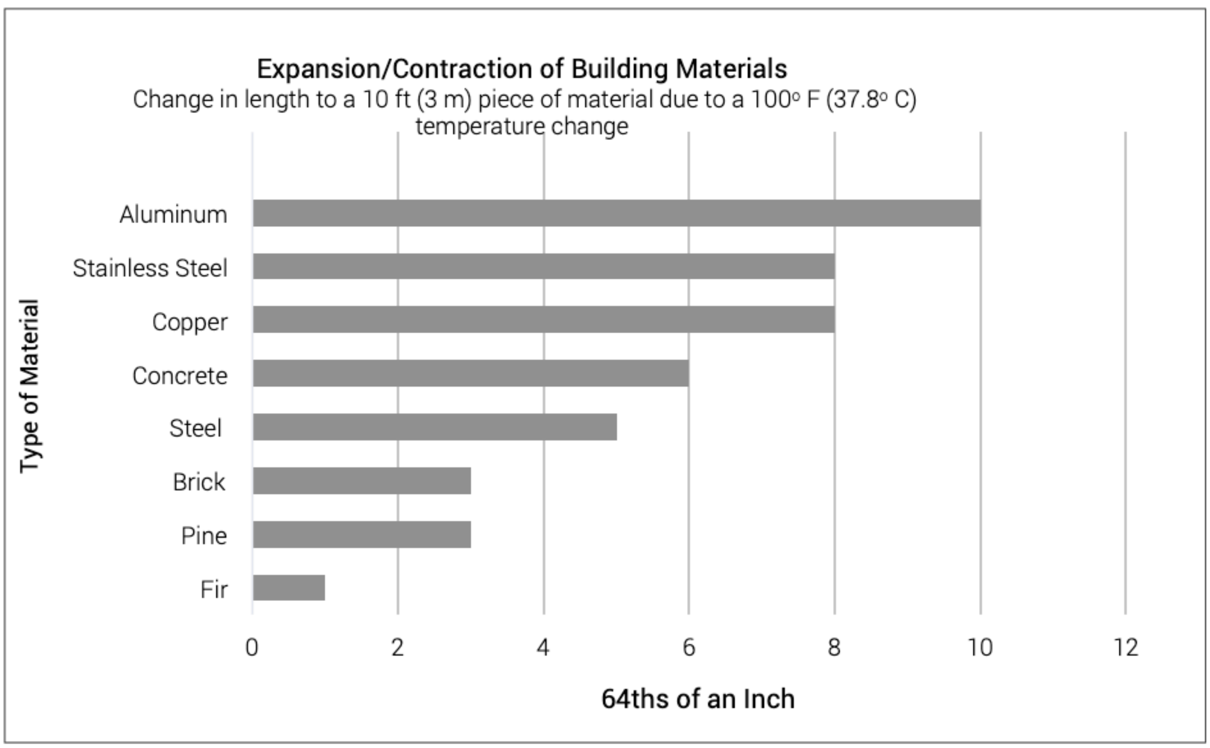
Figure 2





7.2 Metal Thickness

7.2.1 Flatness

Minimum gauges for *flatness* of exposed faces shall be determined from Figure 3. See Commentary.

Figure 3

Minimum Metal Thickness for Flatness

Exposed Face	Metallic Coated Steel or Zinc	Cold Rolled Copper	Aluminum Sheet	Stainless Steel
Up to 4 in. (to 102 mm)	24 ga. (0.028 in. 0.7 mm)	16 oz. (0.022 in. 0.6 mm)	0.032 in. (0.82 mm)	26 ga. (0.016 in. 0.4 mm)
> 4 in.–8 in. (> 102 mm–203 mm)	24 ga. (0.028 in. 0.7 mm)	16 oz. (0.022 in. 0.6 mm)	0.040 in. (1.0 mm)	26 ga. (0.016 in. 0.4 mm)
> 8 in.–10 in. (> 203 mm–254 mm)	22 ga. (0.034 in. 0.9 mm)	20 oz. (0.027 in. 0.7 mm)	0.050 in. (1.3 mm)	24 ga. (0.023 in. 0.6 mm)
> 10 in.–16 in. (> 254 mm–406 mm)	20 ga. (0.040 in. 1.0 mm)	20 oz. w/stiffening ribs	0.063 in. (1.6 mm)	22ga. (0.029 in. 0.7 mm)
> 16 in.–24 in. (> 406 mm–610 mm)	20 ga. (0.040 in. 1.0 mm)	20 oz. w/stiffening ribs	0.063 in. (1.6 mm)	22ga. (0.029 in. 0.7 mm)

7.2.2 Strength

Increasing material thickness typically increases the strength of a *metal* component. Because *cleats* are a critical component for restraining edge systems, it is generally recommended that *cleats* be one gauge heavier than the material engaged on the *cleat*. However, many other factors such as elasticity of the materials, *fastener* location, and others, greatly contribute to the strength or performance of an edge system. For that reason, edge system performance shall be tested per Section 6 above.

7.3 Galvanic Corrosion

Metal components of *roof edge systems* (face, *cleats*, *clips*, straps, brackets, and *fasteners*) shall be comprised of the same kind of *metal*, or shall be galvanically compatible *metal* pairs.

Fasteners shall be galvanically compatible with the other *roof edge system* components[6]. When used with *aluminum*, steel *fasteners* shall have a dielectric resistive coating. *Copper* shall not be used in combination with mill finish steel, *zinc* or *aluminum*. Only *copper*, stainless steel, or *copper*-alloy *fasteners* shall be used with *copper* components.

Pressure treated lumber, which is commonly used for wood blocking (*Nailers*), is frequently treated with a solution containing *copper*. When such pressure treated wood is used, the *roof edge system* shall be galvanically compatible with, or separated from, the treated wood, and *fasteners* installed into the wood shall be galvanically compatible with the treated wood.

Corrosion and strength should be considered in the choice of materials used for *metal roof edge systems*. Corrosive potential can be roughly predicted by knowing the placement of the two *metals* in the *galvanic series* [4, 5]. The farther apart the *metals* are in the *galvanic series*, the greater is this potential for corrosion. *Metals* adjacent to each other in the series have little potential for corrosion. In Figure 4, the *metals* low on the list are potentially corroded while those high on this list are protected. Basically, pairs of *metals* such as *aluminum* and *zinc* or *aluminum* and stainless steel will show no perceptible corrosion between them, because of their proximity to each other on the list. On the other hand, pairing *copper* and *zinc* or *aluminum* or steel must be avoided because *copper* is far from them in the *galvanic series* and the potential for corrosion is great.

Frequently, the corrosion rate of “sacrificed” *metals* will be low, even if there is a potential for corrosion.

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Thus, there will generally be little corrosion between *metals* that are close to each other on the list; however, when they are in contact, the higher of a pair will be protected by the lower even if no perceptible corrosion is taking place. For this reason, steel, being higher on the list than *zinc* will be protected by the *zinc*, which is "sacrificed" to save the steel. Fortunately, though there is a potential for corrosion between *zinc* and steel, under most conditions, the rate of corrosion is minuscule so that the *zinc* lasts many years while protecting the steel.

The immediate environment or "medium" of *metals* used in *roof edge systems* greatly affects the rate of galvanic corrosion[4, 5]; materials in a salt water spray environment will corrode faster than areas far from a salt water lagoon or ocean. In extremely corrosive environments such as salt-water environments, chemical plants or paper mills, corrosion resistant materials such as stainless steel shall be used. When plastic materials are used, corrosion is not usually a factor (although environmental deterioration must be considered). However, as with *metals* the strength of the materials must be considered.

7.4 Non-typical Building Environments

Metal to be used for highly acidic, caustic or other non-typical environments shall be designed and/or specified by the owner's representative or building's engineer of record.

7.5 Water Drainage

Roof Edge Systems shall be designed to prevent ponding water and infiltration of water into the *roof system*. The tops of *coping* shall be sloped to carry off water. The front lip of external *gutters* shall be a minimum of 1" lower than the back leg to allow water to flow over the front lip before infiltrating the *roof system* at the back in the event *gutter* drainage is blocked. *Gutter systems* shall have openings at the low points, or positive slope to outlets.

8 Appliances

Appliance attachments, such as air terminals (lightning rods), signs or antennae that penetrate the water seal, induce a galvanic reaction, restrain *thermal expansion* and contraction, or induce a *wind load* may compromise the effectiveness of the *roof edge system*. Appliances shall not be attached to the *roof edge system*, or shall be isolated to prevent the transfer of wind, thermal, or other forces which may compromise the performance of the *roof edge system*. Any attached appliances shall also be isolated to prevent galvanic reaction, see Section 7.3.

9 Packaging and Identification

Roof edge system components or packaging shall contain written documentation, which identifies the components, which have been tested in accordance with the ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 test standards. Documentation, in the form of a label, manufacturer's printed product literature or letter, shall be made available to the building owner or his/her representative.

Figure 4

Galvanic Corrosion Series Chart[6]

More Protected
Platinum
Gold
Graphite
Silver
316 Stainless steel (passive)
304 Stainless steel (passive)
Monel
Inconel (passive)
Nickel (passive)
70-30 cupro-nickel
Silicon bronze
Copper
Red brass
Admiralty bronze
Admiralty brass
Yellow brass
Hastelloy C (active)
Inconel (active)
Nickel (active)
Naval bronze
Muntz metal
Tin
Lead
316 Stainless steel (active)
304 Stainless steel (active)
400 Series stainless steels
50-50 lead-tin solder
13% Cr stainless steel (active)
Ni—resist
Cast iron
Wrought iron
Mild steel
Cadmium
Alclad
Aluminum
Aluminum 2024
Aluminum 3003
Aluminum 6053
Galvanized steel
Zinc
Magnesium alloys
Magnesium
More Corroded

10 Installation Instructions

Installation instructions shall be provided for all *roof edge systems* tested in accordance with the ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 test standards, and shall include as tested *fastener*, *cleat*, *clip*, strap, and bracket requirements.

11 References

1. *Minimum Design Loads for Buildings and Other Structures*, ASCE 7, American Society of Civil Engineers (ASCE), New York.
2. Factory Mutual Approved Product News Vol. 21, No. 2, 2005
3. Roofing Industry Committee on Weather Issues (RICOWI), *Hurricane Katrina Wind Investigation Report*, 2007, pp. xiv
4. Roofing Industry Committee on Weather Issues (RICOWI), *Hurricanes Charley and Ivan Wind Investigation Report*, 2006, pp.xxiv
5. *Wind Uplift Standard for Roof Edge Systems and Technologies (REST) Project*, National Research Council of Canada (NRCC), Presentation at REST Meeting 7, Ottawa, November 2015
6. *Procedure for Evaluation of Corrosion Resistance of Steel Fasteners,* SPRI, Needham MA, 1988.

Appendix A

Tables

Table A1—Importance Factors

Nature of Occupancy	Risk Category	Importance Factor	
		Non-Hurricane Prone Regions & Alaska. V = 85–100 mph	Hurricane Prone Regions. V > 100 mph
Buildings and other structures that represent a low hazard to human life in the event of failure including, but not limited to: ▶ Agricultural facilities ▶ Certain temporary facilities ▶ Minor storage facilities	I	0.87	0.77
All buildings and other structures except those listed in Categories I, III, and IV	II	1.00	1.00
Buildings and other structures that represent a substantial hazard to human life in the event of failure including, but not limited to: ▶ Buildings and other structures where more than 300 people congregate in one area ▶ Buildings and other structures with day care facilities with capacity greater than 150 ▶ Buildings and other structures with elementary school or secondary school facilities with capacity greater than 250 ▶ Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities ▶ Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities ▶ Jails and detention facilities ▶ Power generating stations and other public utility facilities not included in Category IV ▶ Buildings and other structures not included in Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing sufficient quantities of hazardous materials to be dangerous to the public if released.	III	1.15	1.15
Buildings and other structures designated as essential facilities including, but not limited to: ▶ Hospitals and other health care facilities having surgery or emergency treatment facilities ▶ Fire, rescue, ambulance, and police stations and emergency vehicle garages ▶ Designated earthquake, hurricane, or other emergency shelters ▶ Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response ▶ Power generating stations and other public utility facilities required in an emergency ▶ Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire-suppression material or equipment) required for operation of Category IV structures during an emergency ▶ Aviation control towers, air traffic control centers, and emergency aircraft hangars ▶ Water storage facilities and pump structures required to maintain water pressure for fire suppression ▶ Buildings and other structures having critical national defense functions ▶ Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing extremely hazardous materials where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction.	IV	1.15	1.15

From Table 1-1 and 6-1 of ASCE 7-05

ASCE 7-10 has separate maps that do not require use of an importance factor

Table A2
Horizontal and Vertical Edge Pressures
Enclosed Buildings[1]
h ≤ 60 ft.

Field of Roof Pressure q_{fz} Psf (KPa)	Horizontal Load psf (KPa)		Vertical Load psf (KPa)	
	Perimeter P_{hp}	Corner P_{hc}	Perimeter P_{vp}	Corner P_{vc}
30 (1.44)	58 (2.8)	73 (3.5)	101 (4.8)	152 (7.3)
37.5 (1.80)	73 (3.5)	91 (4.3)	126 (6.0)	190 (9.1)
45 (2.15)	87 (4.2)	109 (5.2)	151 (7.2)	228 (10.9)
52.5 (2.51)	102 (4.9)	127 (6.1)	176 (8.4)	266 (12.7)
60 (2.87)	116 (5.6)	145 (7.0)	202 (9.7)	304 (14.5)
67.5 (3.23)	131 (6.3)	163 (7.8)	227 (10.9)	342 (16.4)
75 (3.59)	146 (7.0)	182 (8.7)	252 (12.1)	380 (18.2)
82.5 (3.95)	160 (7.7)	200 (9.6)	277 (13.3)	417 (20.0)
90 (4.31)	175 (8.4)	218 (10.4)	302 (14.5)	455 (21.8)
97.5 (4.67)	189 (9.1)	236 (11.3)	328 (15.7)	493 (23.6)
X	1.94 × X	2.41 × X	3.36 × X	5.06 × X

Table Notes:

1. See Commentary 4.2 for open buildings or partially enclosed buildings.
2. Horizontal and vertical load values are calculated directly using *field of roof pressure* given in column 1.
3. Horizontal and vertical load values are calculated using External Pressure Coefficients (GC_p) of 0.97 horizontal perimeter, 1.21 horizontal corner, 1.68 vertical perimeter, and 2.53 vertical corner per ASCE 7-05 and ASCE 7-10.
4. Horizontal and vertical load values contain a *safety factor* of 2.0.

Table A3
Horizontal and Vertical Edge Pressures
Enclosed Buildings1
***h* > 60 ft.**

Field of Roof Pressure q_{fz} Psf (KPa)	Horizontal Load psf (KPa)		Vertical Load Psf (KPa)	
	Perimeter P_{hp}	Corner P_{hc}	Perimeter P_{vp}	Corner P_{vc}
30 (1.44)	41 (2.0)	75 (3.6)	94 (4.5)	128 (6.1)
37.5 (1.80)	51 (2.4)	94 (4.5)	118 (5.6)	161 (7.7)
45 (2.15)	61 (2.9)	113 (5.4)	141 (6.8)	193 (9.2)
52.5 (2.51)	71 (3.4)	131 (6.3)	165 (7.9)	225 (10.8)
60 (2.87)	82 (3.9)	150 (7.2)	188 (9.0)	257 (12.3)
67.5 (3.23)	92 (4.4)	169 (8.1)	212 (10.1)	289 (13.8)
75 (3.59)	102 (4.9)	188 (9.0)	236 (11.3)	321 (15.4)
82.5 (3.95)	112 (5.4)	206 (9.9)	259 (12.4)	353 (16.9)
90 (4.31)	122 (5.9)	225 (10.8)	283 (13.5)	385 (18.4)
97.5 (4.67)	133 (6.3)	244 (11.7)	306 (14.7)	417 (20.0)
105 (5.03)	143 (6.8)	263 (12.6)	330 (15.8)	449 (21.5)
112.5 (5.39)	153 (7.3)	281 (13.5)	353 (16.9)	482 (23.1)
120 (5.75)	163 (7.8)	300 (14.4)	377 (18.0)	514 (24.6)
127.5 (6.10)	173 (8.3)	319 (15.3)	400 (19.2)	546 (26.1)
X	1.36 × X	2.5 × X	3.14 × X	4.28 × X

Table Notes:

1. See Commentary 4.2 for open buildings or partially enclosed buildings.
2. Horizontal and vertical load values are calculated directly using *field of roof pressure* given in column 1.
3. Horizontal and vertical load values are calculated using External Pressure Coefficients (GC_p) of 0.68 horizontal perimeter, 1.25 horizontal corner, 1.57 vertical perimeter, and 2.14 vertical corner per ASCE 7-05 and ASCE 7-10.
4. Horizontal and vertical load values contain a *safety factor* of 2.0.

Table A4
RE-1 Loads - Dependently Terminated Systems
Enclosed Buildings[1]
h ≤ 60 ft.

Field of Roof Pressure q_{fz} psf (kPa)	Vertical Perimeter Pressure P_{vp} psf (kPa)	Membrane Tension lb./ft. (kg/m)				
		Distance to first row of fasteners ft.				
		1 < r ≤ 2 (0.3 < r ≤ 0.6)	2 < r ≤ 3 (0.6 < r ≤ 0.9)	3 < r ≤ 4 (0.9 < r ≤ 1.2)	4 < r ≤ 5 (1.2 < r ≤ 0.5)	5 < r ≤ 6* (1.5 < r ≤ 1.8)
q_{fz} ≤ 30.0 (q_{fz} ≤ 1.44)	101 (4.83)	239 (356)	358 (533)	477 (710)	596 (887)	716 (1066)
30.0 < q_{fz} ≤ 37.5 (1.44 < q_{fz} ≤ 1.8)	126 (6.03)	298 (443)	447 (664)	596 (887)	745 (1109)	894 (1330)
37.5 < q_{fz} ≤ 45.0 (1.8 < q_{fz} ≤ 2.15)	151 (7.24)	358 (533)	537 (799)	716 (1066)	894 (1330)	1073 (1597)
45.0 < q_{fz} ≤ 52.5 (2.15 < q_{fz} ≤ 2.51)	176 (8.45)	417 (621)	626 (932)	835 (1243)	1042 (1552)	1251 (1863)
52.5 < q_{fz} ≤ 60.0 (2.51 < q_{fz} ≤ 2.87)	202 (9.65)	477 (710)	716 (1066)	954 (1419)	1193 (1775)	1431 (2130)
60.0 < q_{fz} ≤ 67.5 (2.87 < q_{fz} ≤ 3.23)	227 (10.9)	537 (799)	804 (1198)	1073 (1597)	1342 (1997)	1610 (2395)
67.5 < q_{fz} ≤ 75.0 (3.23 < q_{fz} ≤ 3.59)	252 (12.1)	596 (887)	894 (1330)	1193 (1775)	1490 (2218)	1789 (2661)
75.0 < q_{fz} ≤ 82.5 (3.59 < q_{fz} ≤ 3.95)	277 (13.3)	656 (976)	984 (1464)	1312 (1951)	1640 (2440)	1968 (2928)
82.5 < q_{fz} ≤ 90.0 (3.95 < q_{fz} ≤ 4.31)	302 (14.5)	716 (1066)	1073 (1597)	1431 (2130)	1789 (2661)	2146 (3194)
90.0 < q_{fz} ≤ 97.5 (4.31 < q_{fz} ≤ 4.67)	328 (15.7)	775 (1152)	1163 (1731)	1550 (2307)	1937 (2884)	2326 (3460)
97.5 < q_{fz} ≤ 105.0 (4.67 < q_{fz} ≤ 5.03)	353 (16.9)	835 (1243)	1251 (1863)	1669 (2484)	2087 (3106)	2504 (3725)
105 < q_{fz} ≤ 112.5 (5.03 < q_{fz} ≤ 5.39)	378 (18.1)	894 (1330)	1342 (1997)	1789 (2661)	2236 (3328)	2683 (3992)
112.5 < q_{fz} ≤ 120 (5.39 < q_{fz} ≤ 5.75)	403 (19.3)	954 (1419)	1431 (2130)	1907 (2839)	2384 (3548)	2861 (4258)
120 < q_{fz} ≤ 127.5 (5.75 < q_{fz} ≤ 6.11)	428 (20.5)	1013 (1509)	1521 (2263)	2027 (3016)	2534 (3770)	3040 (4525)

Table Notes:

1. See Commentary 4.2 for open buildings or partially enclosed buildings.
2. * 5 < r < 6 column to be used for ballasted systems.
3. See Commentary for the calculations used to determine entries in this table.

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Table A5
RE-1 Loads—Dependently Terminated Systems
Enclosed Buildings[1]
h > 60 ft.

Field of Roof Pressure q_{fz} psf (kPa)	Vertical Perimeter Pressure P_{vp} psf (kPa)	Membrane Tension lb./ft. (kg/m)				
		Distance to first row of fasteners ft.				
		1 < r ≤ 2 (0.3 < r ≤ 0.6)	2 < r ≤ 3 (0.6 < r ≤ 0.9)	3 < r ≤ 4 (0.9 < r ≤ 1.2)	4 < r ≤ 5 (1.2 < r ≤ 0.5)	5 < r ≤ 6* (1.5 < r ≤ 1.8)
$q_{fz} \leq 30.0$ ($q_{fz} \leq 1.44$)	94 (4.51)	224 (333)	336 (498)	446 (664)	559 (830)	670 (997)
$30.0 < q_{fz} \leq 37.5$ ($1.44 < q_{fz} \leq 1.8$)	118 (5.64)	278 (415)	418 (622)	559 (830)	698 (1037)	836 (1245)
$37.5 < q_{fz} \leq 45.0$ ($1.8 < q_{fz} \leq 2.15$)	141 (6.77)	336 (498)	502 (747)	670 (997)	836 (1245)	1004 (1494)
$45.0 < q_{fz} \leq 52.5$ ($2.15 < q_{fz} \leq 2.51$)	165 (7.89)	390 (581)	586 (873)	782 (1163)	975 (1452)	1171 (1742)
$52.5 < q_{fz} \leq 60.0$ ($2.51 < q_{fz} \leq 2.87$)	188 (9.02)	446 (664)	670 (997)	893 (1329)	1116 (1661)	1339 (1993)
$60.0 < q_{fz} \leq 67.5$ ($2.87 < q_{fz} \leq 3.23$)	212 (10.2)	502 (747)	752 (1121)	1004 (1494)	1255 (1869)	1506 (2242)
$67.5 < q_{fz} \leq 75.0$ ($3.23 < q_{fz} \leq 3.59$)	236 (11.3)	559 (830)	836 (1245)	1116 (1661)	1395 (2075)	1674 (2491)
$75.0 < q_{fz} \leq 82.5$ ($3.59 < q_{fz} \leq 3.95$)	259 (12.4)	613 (914)	920 (1370)	1229 (1827)	1535 (2283)	1842 (2740)
$82.5 < q_{fz} \leq 90.0$ ($3.95 < q_{fz} \leq 4.31$)	283 (13.5)	670 (997)	1004 (1494)	1339 (1993)	1674 (2491)	2008 (2989)
$90.0 < q_{fz} \leq 97.5$ ($4.31 < q_{fz} \leq 4.67$)	306 (14.7)	725 (1078)	1088 (1620)	1451 (2159)	1813 (2698)	2176 (3238)
$97.5 < q_{fz} \leq 105.0$ ($4.67 < q_{fz} \leq 5.03$)	330 (15.8)	782 (1163)	1171 (1742)	1562 (2325)	1953 (2907)	2343 (3487)
$105 < q_{fz} \leq 112.5$ ($5.03 < q_{fz} \leq 5.39$)	353 (16.9)	836 (1245)	1255 (1869)	1674 (2491)	2093 (3114)	2511 (3735)
$112.5 < q_{fz} \leq 120$ ($5.39 < q_{fz} \leq 5.75$)	377 (18.0)	893 (1329)	1339 (1993)	1785 (2656)	2231 (3320)	2678 (3985)
$120 < q_{fz} \leq 127.5$ ($5.75 < q_{fz} \leq 6.11$)	400 (19.2)	948 (1412)	1424 (2118)	1896 (2823)	2371 (3528)	2846 (4235)

Table Notes:

1. See Commentary 4.2 for open buildings or partially enclosed buildings.
2. * 5 < r < 6 column to be used for ballasted systems.
3. See Commentary for the calculations used to determine entries in this table.

Table A6
Nailer Attachment- Fastener Loads
Enclosed Building
for *h* ≤ *60 ft.*

Field of Roof Pressure psf (kPa)	Fastener Spacing ft. (m)	Perimeter Fastener Load lb./ft. (kg/m)
30 (1.4)	2 (0.61)	101 (150)
30 (1.4)	3 (0.91)	151 (225)
30 (1.4)	4 (1.22)	202 (300)
30 (1.4)	5 (1.52)	252 (375)
30 (1.4)	6 (1.83)	302 (450)
37.5 (1.8)	2 (0.61)	126 (187)
37.5 (1.8)	3 (0.91)	189 (281)
37.5 (1.8)	4 (1.22)	252 (375)
37.5 (1.8)	5 (1.52)	315 (469)
37.5 (1.8)	6 (1.83)	378 (562)
45 (2.2)	2 (0.61)	151 (225)
45 (2.2)	3 (0.91)	227 (337)
45 (2.2)	4 (1.22)	302 (450)
45 (2.2)	5 (1.52)	378 (562)
45 (2.2)	6 (1.83)	454 (675)
52.5 (2.2)	2 (0.61)	176 (262)
52.5 (2.2)	3 (0.91)	265 (394)
52.5 (2.2)	4 (1.22)	353 (525)
52.5 (2.2)	5 (1.52)	441 (656)
52.5 (2.2)	6 (1.83)	529 (787)

Table Notes:

1. Loads are given in units of lb./ft. due to the variation in edge system widths. A *fastener* securing a *nailer* securing a 12-inch wide *coping* cap shall have a *fastener* load of 101 lb. for a 2-foot *fastener* spacing for a *field of roof pressure* of 30 psf. The same *fastener* shall have a load of 51 lb. for a 6 in. (½ ft.) wide *coping* cap (101 lb./ft. × 0.5 ft. = 51 lb.). Additional loads (field of roof *fasteners*, attachments) are excluded.
2. Values given above can be used as a design aid in lieu of *nailer* design calculations or *nailer* testing. See Section 3.9 for more information.
3. Perimeter *Fastener* Load values are based on Table A2 vertical loads with no *safety factor*.
4. *Fasteners* shall have a working load rating equal to the values shown in the table, with appropriate *safety factors* for the medium (masonry, steel, wood) to which the *nailer* is attached.
5. Loads are given for the perimeter region only. Multiply Perimeter Fastener Load values by 1.51 (Corner/Perimeter ratio from Table A2) to determine *fastener* loads within a corner region.
6. The *nailer* should be designed by the engineer of record to withstand bending, shear, or other stresses imparted by the *wind loads* and *fastener* resistance loads, as well as *fastener* pull through.

Table A7
Nailer Attachment- Fastener Loads
Enclosed Building
h > 60 ft.

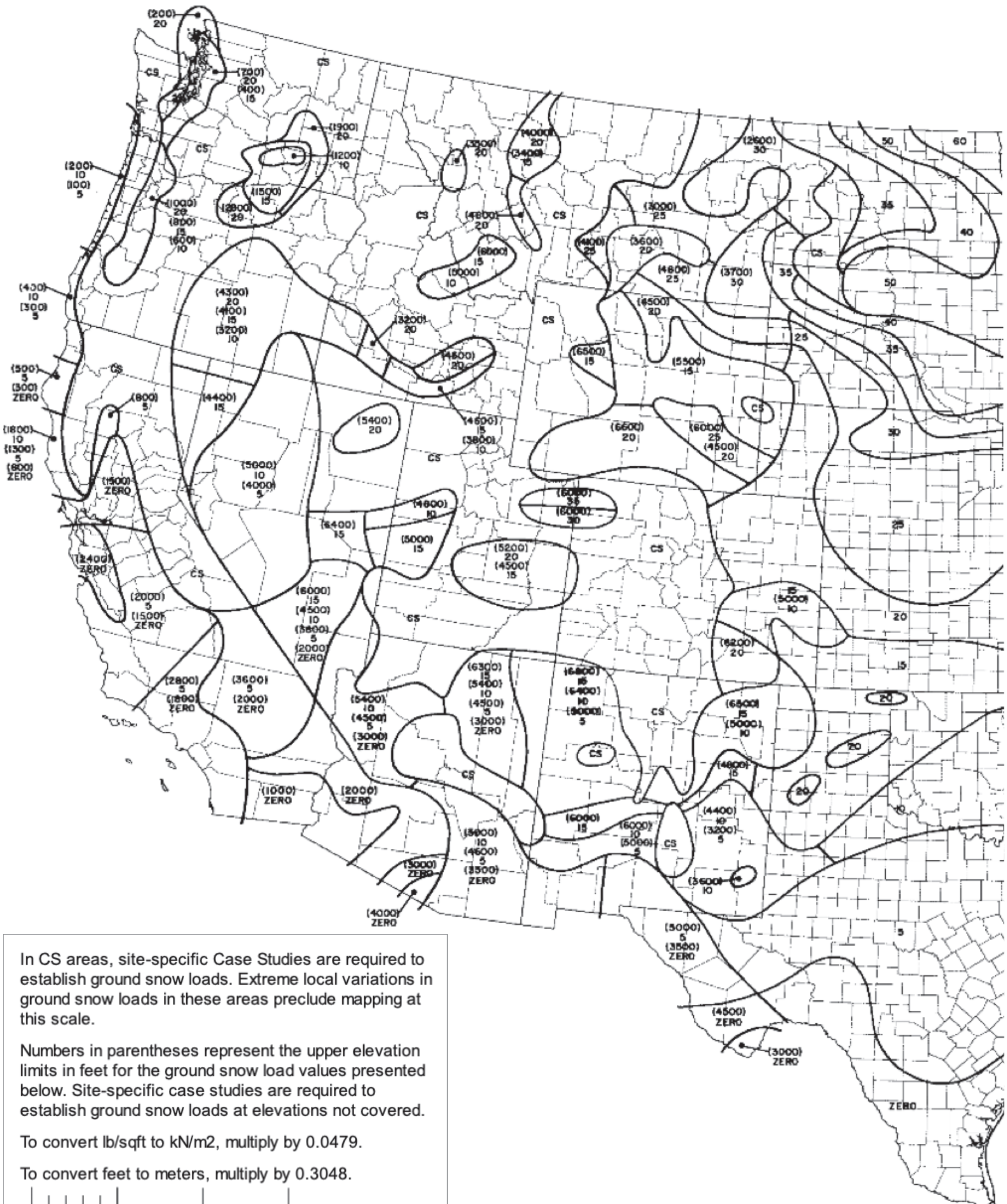
Field of Roof Pressure psf (kPa)	Fastener Spacing ft. (m)	Perimeter Fastener Load lb./ft. (kg/m)
30 (1.4)	2 (0.61)	94 (140)
30 (1.4)	3 (0.91)	141 (210)
30 (1.4)	4 (1.22)	188 (280)
30 (1.4)	5 (1.52)	236 (350)
30 (1.4)	6 (1.83)	283 (421)
37.5 (1.8)	2 (0.61)	118 (175)
37.5 (1.8)	3 (0.91)	177 (263)
37.5 (1.8)	4 (1.22)	236 (350)
37.5 (1.8)	5 (1.52)	294 (438)
37.5 (1.8)	6 (1.83)	353 (526)
45 (2.2)	2 (0.61)	141 (210)
45 (2.2)	3 (0.91)	212 (315)
45 (2.2)	4 (1.22)	283 (421)
45 (2.2)	5 (1.52)	353 (526)
45 (2.2)	6 (1.83)	424 (631)
52.5 (2.2)	2 (0.61)	165 (245)
52.5 (2.2)	3 (0.91)	247 (368)
52.5 (2.2)	4 (1.22)	330 (491)
52.5 (2.2)	5 (1.52)	412 (613)
52.5 (2.2)	6 (1.83)	495 (736)

Table Notes:

1. Loads are given in units of lb./ft. due to the variation in edge system widths. A *fastener* securing a *nailer* securing a 12-inch wide *coping* cap shall have a *fastener* load of 94 lb. for a 2-foot *fastener* spacing for a *field of roof pressure* of 30 psf. The same *fastener* shall have a load of 47 lb. for a 6 in. (½ ft.) wide *coping* cap (101 lb./ft. × 0.5 ft. = 47 lb.). Additional loads (field of roof *fasteners*, attachments) are excluded.
2. Values given above can be used as a design aid in lieu of *nailer* design calculations or *nailer* testing. See Section 3.9 for more information.
3. Perimeter *Fastener* Load values are based on Table A3 vertical loads with no *safety factor*.
4. *Fasteners* shall have a working load rating equal to the values shown in the table, with appropriate *safety factors* for the medium (masonry, steel, wood) to which the *nailer* is attached.
5. Loads are given for the perimeter region only. Multiply Perimeter Fastener Load values by 1.36 (Corner/Perimeter ratio from Table A3) to determine *fastener* loads within a corner region.
6. The *nailer* should be designed by the engineer of record to withstand bending, shear, or other stresses imparted by the *wind loads* and *fastener* resistance loads, as well as *fastener* pull through.

Appendix B
Attachments

Ground Snow Loads pounds/foot²
From ASCE 7-05 and ASCE 7-10



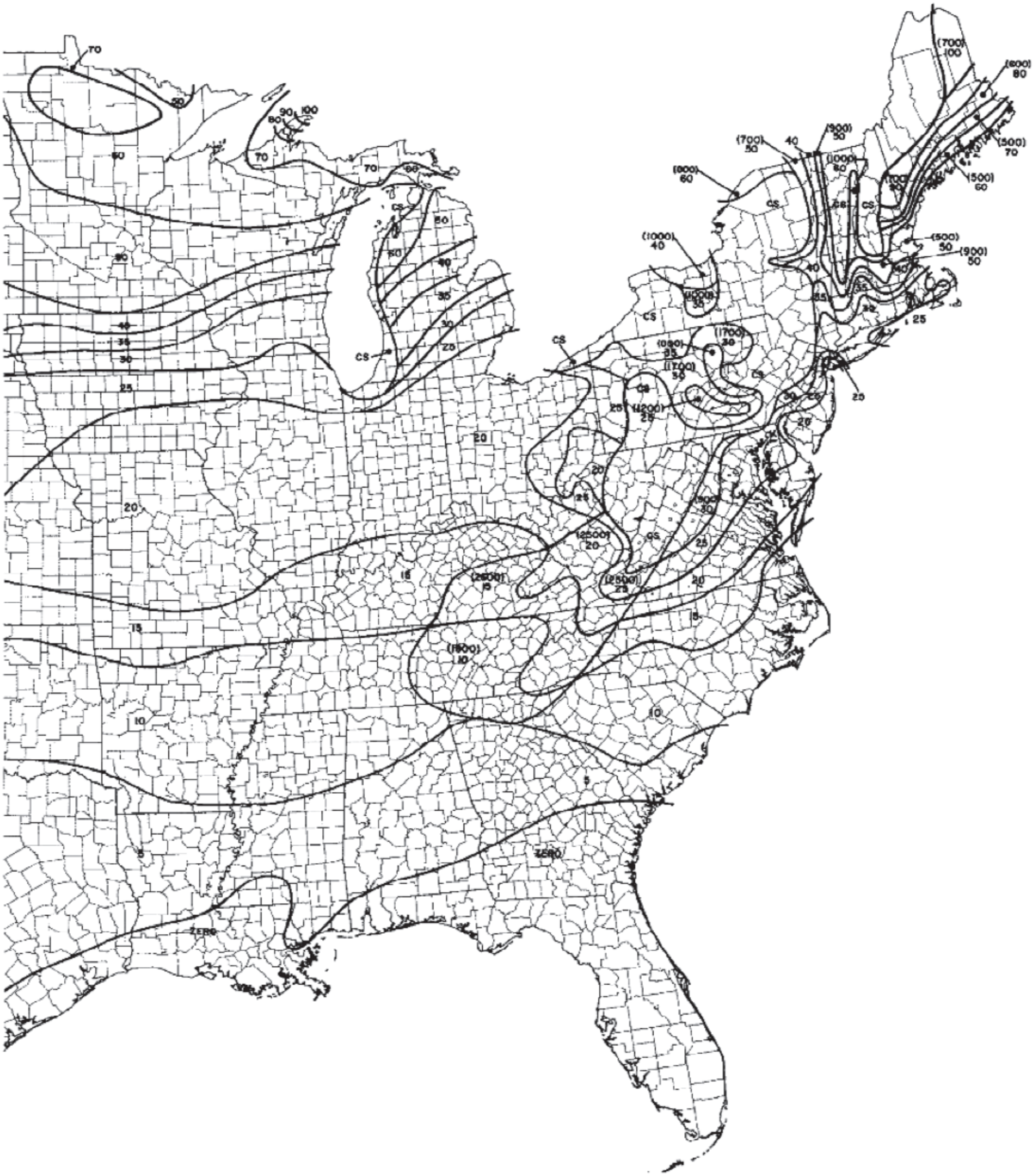
In CS areas, site-specific Case Studies are required to establish ground snow loads. Extreme local variations in ground snow loads in these areas preclude mapping at this scale.

Numbers in parentheses represent the upper elevation limits in feet for the ground snow load values presented below. Site-specific case studies are required to establish ground snow loads at elevations not covered.

To convert lb/sqft to kN/m2, multiply by 0.0479.

To convert feet to meters, multiply by 0.3048.

0 100 200 300 miles


70
60
50
40
35
30
25
20
15
10
5
ZERO
CS
(700)
100
(800)
80
(500)
70
(500)
60
(900)
50
(1000)
60
(700)
50
(800)
60
(1000)
40
(1700)
30
(1700)
30
(1200)
25
(2500)
20
(2600)
15
(2500)
25
(1900)
10

Appendix C
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.

This Commentary is intended to create an understanding of the requirements through brief explanations of the reasoning employed in arriving at these requirements.

The sections of this Commentary are numbered to correspond to sections of the Standard to which they refer. Since having supplementary material for every section of the Standard is not necessary, not all sections are referenced in this Commentary.

C1.1 Scope

This design Standard was developed for use with Built-Up (BUR), Single-Ply and Modified Bitumen roofing systems. While the Standard is intended as a reference for designers and roofing contractors, the design responsibility rests with the "designer of record."

The low slope value defined in this Standard comes from an industry accepted value of ≤ 9.5 degrees (2:12). The ASCE 7 document, used as a model for the development of this Standard, provides tables for GC_p for slopes less than or greater than 7 degrees (1.5:12) based on previous wind tunnel testing.

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

A high-performance *roof edge system* provides many benefits. It acts as a water seal at the edge. When it is the means by which the *membrane* is attached to the building at the edge, it should also exhibit sufficient holding power to prevent the *membrane* from pulling out at the edge under design wind conditions. Furthermore, the edge device assembly itself should not come loose in a design wind. A loose edge assembly not only endangers surrounding property or persons, but it also exposes the roofing to blow-off, starting at the edge. Good design practice requires consideration of *nailer*, *roof edge system* and *membrane* securement, and selection of materials and finishes to minimize corrosion, and *metal* gauges to assure strength and *flatness*.

It is recommended that the *roof edge* designer be familiar with the ASCE 7 document and its commentary.

C2.0 Background Information

The 1980s saw a dramatic increase in the popularity of single-ply *roof systems*. With this increase, *metal* edge termination systems began receiving additional attention. Throughout the 1980s into the early 1990s a variety of organizations developed edge termination recommendations and testing criteria. These standards however were not universal, and each was focused on the specific needs or purpose of that organization. This created a challenge for design professionals in selecting the appropriate *roof edge system*, which would perform to the needs of their project.

In 1995 the Single Ply Roofing Industry (SPRI) began the process of developing a consensus *roof edge* performance standard. The goal was to create a standard that would have real-world practicality and provide unified guidance to design professionals as well as those that fabricate and install *roof edge systems*.

In 1998 the American National Standards Institute (*ANSI*) approved what was to become the ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

Today, the central role that *roof edge systems* play in protecting against *wind uplift* is gaining increasing awareness due to renewed attention of significant wind events.

C3.5 Corner Region

The angle at which the walls meet to constitute a corner is undefined here and in ASCE 7. It has been suggested that an airflow separation effect begins to take effect when walls meet at 150°. Since most walls meet at angles more acute than this, the meeting angle is not a practical consideration for this Standard.

C3.6 Importance Factor

The Importance Factor, I, accounts for the degree of hazard to human life and damage to property. The Importance Factor, I, is used to modify the wind speed and, in effect, assign different levels of risk based upon intended use of the structure. The tables are incomplete in this document; ASCE 7-05 provides additional information, and exceptions. Category I Exposure gives a 25-year mean recurrence value while Categories III and IV give 100-year mean recurrence values. Other recurrence values can be found in the Commentary of ASCE 7-05. ASCE 7-10 has separate wind maps so multiplication by an importance factor is not required.

C3.7 Membrane Termination Systems

The roof edging may be the only restraint preventing a roof blow-off. Mechanically attached *membranes* may be attached only by the *roof edge system* at the building edge. In *ballasted* systems, *ballast* may be scoured away from the edge. *Ballasted* roofs should be designed to meet ANSI/SPRI RP-4 to prevent excessive scour.

Consideration should be given to sealing the edge against air infiltration. Air infiltration may affect the loads on the roofing and the perimeter edge detail by adding a positive pressure under the roofing, thus compounding the effect of negative pressure above the roofing.

BUR and most modified bitumen *membranes* are fully adhered to roof *deck* or insulation. When they are mechanically attached they should follow the rules for all mechanically attached systems.

C3.7.1 Dependently Terminated

Ballasted Systems or systems in which the mechanically attached roof cover is secured to the *substrate* at a distance greater than 12 in. (305 mm) from the outside edge of the *nailer* are considered dependently terminated by the *roof edge system*. Dependently Terminated systems are often called Edge Flashings or *Gravel Stops*: these products or designs complete the horizontal *deck* or *membrane* plane at its transition to a vertical wall drop, typically at a 90° angle.

Normally the roofing *membrane* is restrained at the edge by means of a mechanical gripping of the roofing between *metal* members or by a bond between the roofing and edging.

Termination devices against vertical walls inboard of the *roof edge* are not considered by this Standard.

C3.7.2 Independently Terminated

Systems in which the roof cover is fully adhered to the *substrate* or a mechanically attached roof cover is secured the *substrate* at a distance less than or equal to 12 in. (305 mm) from the outside edge of the *nailer* are considered independently terminated. For these systems Tables A4 and A5 are applicable.

Copings/Caps

Copings/Caps are independently terminated systems: These are systems that cover the tops of *parapet walls*, usually with the roofing *membrane* terminated under them. Tables A2 and A3 provide loads for these systems.

C3.8 Nailer System Requirements

Resistance to blow-off depends not only upon the attachment of the *roof edge system* to the edge of the building, but also upon the integrity of the *nailer* or other *substrate* to which the edge device is attached. It is important to consider the load path from the *nailer* to the foundation of the building to assure proper *wind load* protection. The design professional or authority having jurisdiction should determine if the load path is complete and the appropriate *safety factor* is applied.

C3.8.1 Nailer Secured Systems

It is recommended that *nailers* be preservative treated wood secured to structural components of the building by corrosion resistant[1,2] means sufficient to resist a vertical load of 200 lb./ft. (300 kg/m) or the *design load*, whichever is greater. For wood *nailers* wider than 6 in. (152 mm), bolts should be staggered to avoid splitting the wood. Each wood *nailer* member should have at least two *fasteners*. A *fastener* should be located approximately 4 in. (102 mm) but not less than 3 in. (76 mm) from each end of the wood.

Additional wood members, such as cant strips and stacked *nailers* should be fastened with corrosion resistant *fasteners* having sufficient pullout resistance prior to *roof edge system* failure. These *fasteners* should be staggered, spaced at a maximum 12 in. (305 mm) on centers, and should penetrate the wood sufficiently to achieve design pullout resistance. Spacing should be on maximum 6 in. (152 mm) centers in corner regions of the building. When re-roofing, the existing *nailer* should be exposed and inspected. If it has deteriorated, it should be replaced.

The following references are provided to assist in the design of wood *nailer* systems.

- The American Forest & Paper Association's (AF&PA's) "National Design Standard for Wood Construction (NDS)"
- The American Institute of Timber Construction's (AITC), "Design Manual"
- IBC Chapter 23
- FM 1-49 wood blocking and *nailers*, Sec. 2.2—Construction and Location
- Third party *fastener* test data.

C3.8.1.1 Masonry

When embedded in masonry, anchor bolts as defined above should be bent 90 degrees at the base or have heads designed to prevent rotation and slipping out. When hollow block masonry is used at the roofline, cores and voids in the top row of blocks should be filled with concrete having a minimum density of 140-lb./cu ft. (2,243 K/m3). When embedded in lightweight aggregate hollow block, bolts should be embedded minimum 12 in. (305 mm) into concrete fill. When heavy aggregate blocks are used, bolts should be embedded minimum 8 in. (203 mm).

C3.8.1.2 Light Weight Concrete and Gypsum Decks

Anchor all roof perimeter *nailers* using *fasteners* whose size and locations meet provisions in Section 3.9 of this Standard. It is recommended that the *fasteners* be attached directly to the structure if industry approved calculations verifying the anchor attachment strength, anchor *substrate* strength, and *substrate* attachment strength, are not available.

C3.8.1.3 Nailer Attached to Steel Deck

The steel *deck* shall be designed to withstand the design forces specified under Section 4.3 of the Standard. *Nailer* attachment should provide a minimum resistance of 200-bf/ft. (300 kg/m) vertical load.

C3.8.2 Nailerless Systems

When the *roof edge system* is attached directly to masonry or steel without the use of a *nailer*, its attachment configuration should be tested to resist wind loading, using tests specified in Section 4.3 of this Standard.

C3.8.3 Re-roofing

For *nailer* security when re-roofing, the contractor should check to ensure that the *nailer* or other *substrate* is in good condition and well secured to the building. Questionable members should be removed and replaced according to the above guidelines. Note that it is much more difficult to be sure that the load path (connection of roof members ultimately to the building foundation) is secure for an existing building than it is for new construction. The roofing contractor should notify the designer if unexpected conditions or deteriorated *substrate* materials are discovered during the re-roofing process. ANSI/SPRI/FX-1 can be used to verify the resistance of *fasteners* to pull out.

Return to Schedule

C4.2 Wind Load Determination

The *Roof Edge Design Pressure*, P, has been calculated based on a conservative form of the Components and Cladding "Velocity Pressure", q_z, found in Equations in ASCE 7-05 and ASCE 7-10

GC_{pi} = Internal Pressure coefficient for Enclosed Buildings, GC_{pi} = +/-0.18, use +0.18 for worst case pressure (See ASCE 7-05 Figure 6-5 for more information).

GC_p = External Pressure Coefficient. Choose GC_{pi}, perimeter, GC_p, corner, or GC_p, roof as seen in ASCE 7-05 Figures 6-11A, 6-11B, and 6-17.

GC_p, roof = -1.0 (h < 60 ft.) for the field of roof (from ASCE 7-05 Figure 6-11B)
= -1.4 (h > 60 ft.) for the field of roof (from ASCE 7-05 Figure 6-17).

P = Roof Edge Design Pressure = 2.0 × (GC_p) × (q_{fz}), where
2.0 = Design Factor (Safety Factor) for *roof edge systems*.

GC_p = External Pressure Coefficient (see Table C-A2). Horizontal GC_p values (used for comparison to RE-2 and RE-3 Test values) and vertical GC_p values (used for comparison to RE-3 Test values) are presented for building heights less than or equal to 60 ft., or greater than 60 ft.

ASCE 7-05 does not address the horizontal component of GC_p at the actual roof edge. Therefore, the horizontal value of GC_p shown in Table 2 of this ED-1 document was taken from the value of Zone 4 of Figure 6-11A for height ≤ 60 ft. 1). Values for the horizontal GC_p term, h ≤ 60 ft. have been reduced per ASCE 7-05 Figure 6-11A. Note: for walls 60 ft. high, the horizontal GC_p can be reduced by 10% for low slope roofs (< 10%).

Vertical GC_p values are considered for vertical forces on *roof edge systems* such as *coping* (or *fascia* systems with a horizontal exposure which exceeds 4 in. in length). Values for the vertical GC_p term were chosen based on Region 2 of Figure 6-11B and 6-17 of ASCE 7-05.

To produce a representative horizontal and vertical design force for various *roof edge systems*, an effective wind area of 10 ft.[2] was chosen for all GC_p terms (see Figure 6-11 and 6-17 of ASCE 7-05).

In this document, the GC_p term is multiplied by the *field of roof pressure* and not the velocity pressure. As such the values of GC_p shown in Table 2 were found by ensuring that the *roof edge design pressure*, P, has the same value as compared to ASCE 7-05 before a *safety factor* is applied:

Let Edge Pressure SPRI ED-1 document = Edge pressure ASCE 7-05 calculation (See ASCE 7-05 equations 6-15, 6-22, and 6-23 for calculation of the edge pressure via ASCE 7-05)

Thus, $q_{fz}\, GC_{pTable\ 2} = q_h(GC_p - GC_{pi})$

where q_h = velocity pressure evaluated at mean roof height
Knowing q_{fz} = field roof pressure
= $q_h \times (GC_{p,\ roof} - GC_{pi})$
per ASCE 7-05 equation 6-22

Thus

$q_h \times (GC_{p,\ roof} - GC_{pi})\, GC_{Table\ 2} = q_h(GC_p - GC_{pi})$

Solve for $GC_{pTable\ 2}$

$$GC_{pTable\ 2} = \frac{GC_p - GC_{pi}}{GC_{p,\ roof} - GC_{pi}} \quad \text{(Equation C4.4-1)}$$

Where values of GC_p, and GC_{pi} in the ratio above are taken directly from ASCE 7-05.

GC_p Calculation Example: for h < 60 ft. vertical perimeter pressure, determine GC_pTable 2 value:

$$\text{Table 2 } GC_{pTable\ 2} \text{ value} = \frac{-1.8 - 0.18)}{-1.0-(0.18)} = 1.678, \text{ round off to 1.68 and use negative sign.}$$

Thus $GC_{pTable\ 2}$ value = -1.68 (See Table 2). The negative sign is used since it is an outward pressure (consistent with ASCE 7-05).

In the ratio above:
-1.8 = Perimeter roof GC_p value from ASCE 7-05 Figure 6-11B (h < 60 ft.)
-1.0 = Field of roof GC_p ($GC_{p,\ roof}$, from ASCE 7-05 Figure 6-11B (h < 60 ft.)
0.18 = Internal Pressure Coefficient from ASCE 7-05 Figure 6-5 for an enclosed building. A positive value is used as it creates the worst-case loading (positive internal pressure).

All values shown in Table 2 are found similarly: the corner region, horizontal pressure, and roof height factors are determined from the appropriate ASCE 7-05 Figure. Upon choosing the correct GC_pTable 2 apply the *Safety Factor* and Importance Factor, as needed to Equation (1) of the SPRI ED-1 document.

Table C-A2
External Pressure Coefficient[1] (GC_p)
Partially Enclosed Building[2]

Type of Loading	Edge Location	Roof Height 60 ft. (18.3 m) or less z ≤ 60 ft. (18.3 m)	Roof Height over 60 ft. (18.3 m) z > 60 ft. (18.3 m)
Horizontal (acting outward from the building edge)	Perimeter	-0.952	-0.74
	Corner	-1.132	-1.21
Vertical (acting upward at the building edge)	Perimeter	-1.52	-1.46
	Corner	-2.16	-1.92

Table Notes:

1. Values of GC_p shown above differ from ASCE 7-05 and ASCE 7-10 values due to the incorporation of the internal pressure coefficient, GC_{pi}, and the application of GC_p to the *field of roof pressure*.
2. Per ASCE 7-05 values shown have taken into account a 10% reduction for roof slopes < 10 degrees. See ASCE 7-05 Figure 6-11A, Note 5 for more information.
3. The negative signs (–) in the External Pressure Coefficients represent vector directionality of the force acting away from the building, tending to pull materials upward or outward (horizontal) from the building.
4. Values in the table above were found by applying Equation C4-4-1 with $GC_{pi} = .55$
   See ASCE 7-05 Figure 6-6, Figure 6-11A, 6-11B, and Figure 6-17 for more information.

Open Buildings

Consult ASCE 7 to determine *roof edge* pressures for open buildings.

C4.3 Nailer Securement Load Tables

For mechanically attached or *ballasted* systems, which do NOT contain a "peel stop" within 12 in. (305 mm) of the *roof edge*, Tables A4 and A5 should be used. Values in Tables A4 and A5 were found by placing the *field of roof pressures* into Equation (1) using the vertical GC_p value for the perimeter region. However, Tables A4 and A5 do not address the horizontal loads given in Tables A2 and A3; therefore, additional engineering may be required to verify that the *nailer* attachment resists the total applied force for these specific systems.

C6.0 Edge System Resistance

Once the *design loads* have been determined, *roof edge systems* that have been tested to meet or exceed the *design loads* should be selected. International Building Code (IBC) requires that edge *metal* be tested per ANSI/SPRI ES-1 or ANSI/SPRI/FM 4435/ES-1; however, local codes and the AHJ ultimately dictate edge *metal* performance requirements.

The vertical face of an edge flashing (*gravel stop*) should be tested according to SPRI Test RE-2 and provide a strength that meets or exceeds the horizontal pressure found in Tables A2 (roof height (h) ≤ 60 ft.), and A3 (h > 60 ft.). The test should be applicable to systems with exposed horizontal components less than 4 in. (102 mm) as detailed in the RE-2 Test Method; otherwise Test RE-3 is applicable.

The vertical and horizontal faces of *copings* (and any *roof edge systems*) with a horizontal exposure which exceeds 4 in. (102 mm) in length should be tested according to Test RE-3 and provide a strength that meets or exceeds the horizontal and vertical pressures found in Tables A2 (roof height (h) > 60 ft.), and A3 (h > 60 ft.).

The edging, when used for securing dependently terminated roofing systems, should be tested according to Test RE-1 and provide a strength that meets or exceeds the *membrane* tension found in Tables A4 (roof height (h) ≤ 60 ft.), and A5 (h > 60 ft.).

C7.2 Metal Thickness

Increased *metal* thickness improves the *flatness* and reduces the “oil-can” effect of the *roof edge system*. Figure 3 was developed from NRCA, Factory Mutual, and *SMACNA* recommendations[3]. The table has been constructed to simplify its use over the Factory Mutual table and to extend the range of *fascia* widths beyond that given by *NRCA*. The required minimums do not address other important design factors such as fastening pattern and frequency, continuous *cleats* or intermittent *clips*, stiffening ribs or breaks in the edges. Tests RE-2 and RE-3 may determine that *metal* thickness need to be increased for higher *wind loads*.

C9.0 Packaging and Identification

Because IBC requires that *roof edge systems* be tested per ES-1, owners and code officials need documentation packaged with the *roof edge system* to identify that it has been tested. Follow-up programs are required for *roof edge systems* that are classified by FM, UL and other organizations.

C10.0 Installation Instructions

In order for the *roof edge system* to perform as tested it should be installed in the same manner as the tested *roof edge system*. Installation instructions are recommended to assure the proper *cleats*, *clips*, *fasteners* and other components are installed in the correct location and at the correct spacing.

Table A4 and A5 Commentary

The roof *membrane* termination (*roof edge system*, *nailer*, or other) is a key anchor point holding the *membrane* in place. During high-speed wind loading, the *roof system* can create extreme loads on the *roof edge system*.

Referring to Figure A4 for a mechanically attached system, the loading depends upon the distance, r, of the first row of *fasteners* to the edge termination. The overall shape of the *membrane* is based upon previous tests indicating that the *membrane* deformation can be well approximated by a 25-degree angle[7, 8]. Figure A5 shows a closer look at the *membrane* forces.

Figure A4—Mechanically Attached Roof Forces

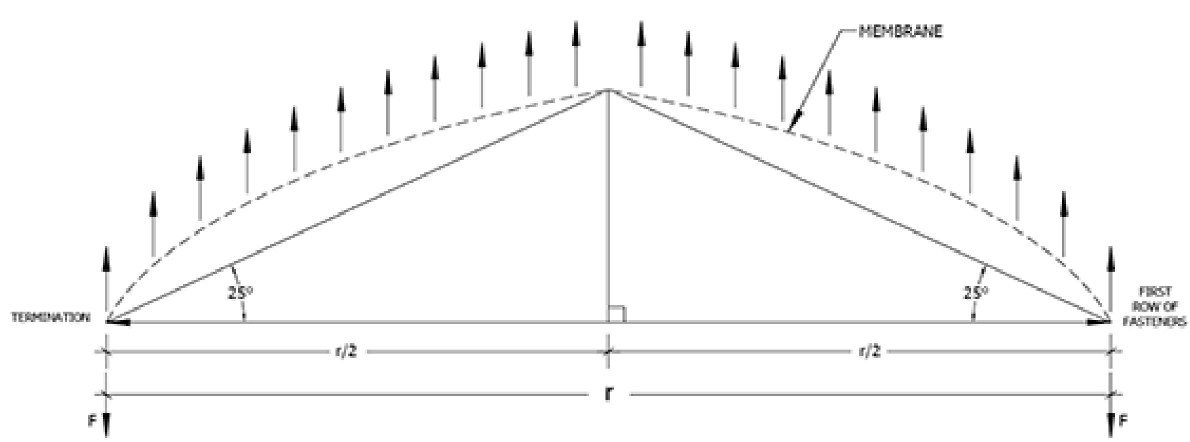
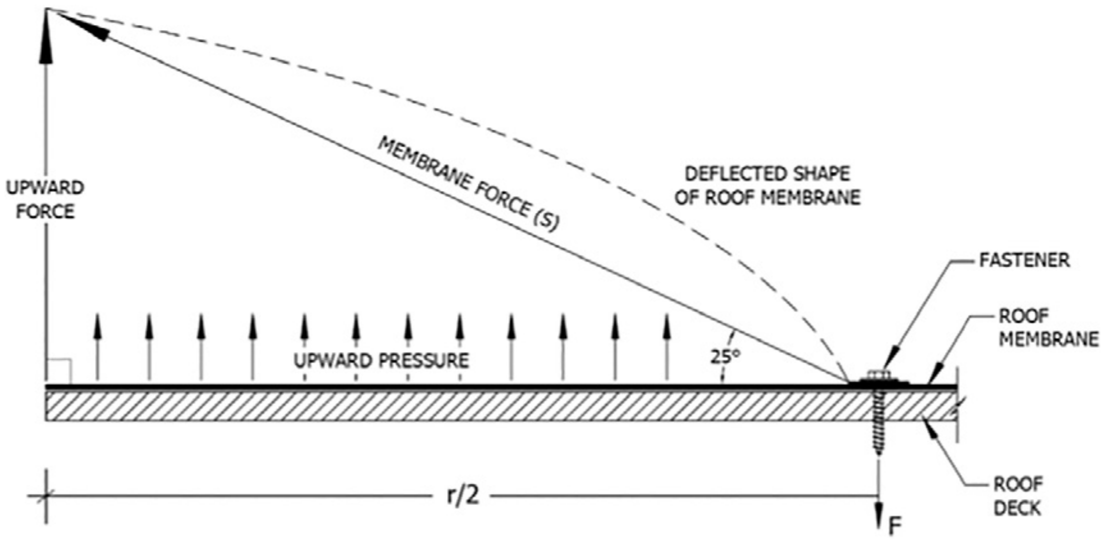


Figure A5—System of Forces, ½ of Membrane width between *Fasteners*



If an upward pressure (lb./ft.[2]) is applied to the *membrane*, then the upward force = upward pressure x r/2 for one half of the *membrane* width r (a single *fastener* will have a force, F, to resist this load). Assuming a 25° deflected shape, then the *membrane* force, S, can be found from the equations:

$$sin25° = \frac{UpwardForce}{S}$$

$$sin25° = \frac{Upwardpressure \times \frac{r}{2}}{S}$$

Thus,

$$S = \frac{Upwardpressure \times \frac{r}{2}}{sin25°}$$

If the edge region of the roof is considered, then the upward pressure (see Figure A5) equals either the vertical perimeter pressure, P_{vp}, or the vertical corner pressure, P_{vc}. Considering the perimeter region, the perimeter pressure can be found from Section 4.2 of this document:

P_{vp} =Perimeter Pressure = SF × q_{fz} × GC_p from Equation (1) for I=1.0

The design membrane tension, at the perimeter region, can be found from:

$$\text{Design membrane tension (S)} = SF \times q_{fz} \times GC_p \times \frac{\frac{r}{2}}{sin25°}$$

Where GC_p = External pressure coefficient (see Section 4.2), choose either perimeter region or corner.

The equation can be simplified noting:

sin (25º) = 0.42262

1/sin (25º) = 2.37, thus:

$$\text{Design membrane tension (S)} = SF \times 2.37 \times q_{fz} \times GC_p \times \frac{r}{2} \qquad \text{Equation (RE1-1)}$$

If SF = 2 is used, the equation becomes:

Design membrane tension (S) = $2.37 \times q_{fz} \times GC_p \times r$ Equation (RE1-2)

Example of Determining a Design Membrane Tension Force:

Given a 2-foot perimeter sheet, Class 135 (actual field pressure = 67.5 psf),
building height = 50 ft. (see Table A5):

S = Design membrane tension = $SF \times 2.37 \times q_{fz} \times GC_p \times \frac{r}{2}$
Using SF = 2, the equation becomes:
S = 2.37 × -1.68 × 67.5 psf × 2 ft. = -536 lb.

Values in Table A4 and A5 are found from the equations described above.

The precision and bias of this test measure has not been determined. In the absence of third party witness testing/verification, the ED-1 committee recommends round robin testing of standard, pre-manufactured *roof edge systems* to establish lab-to-lab variability of individual test results.

Fully Adhered Roof Systems

Fully adhered systems are assumed to apply no stress on the *roof edge system* under consideration, unless either the *metal* is loosened, or the *membrane* is in peel from the pressure differential between the exterior and interior of the system. Recent hurricane investigations have shown that both can occur.

1. *Standard C15-03 Wood for Commercial-Residential Construction*, Preservative Treatment, American Wood-Preservers Association, Granbury, TX, 1996.
2. Procedure for Evaluation of Corrosion Resistance of Steel *Fasteners*, SPRI, Needham MA, 1988.
3. *NRCA* Roofing and Waterproofing Manual, National Roofing Contractors Association, Rosemont, IL, 1996, and Loss Prevention Data Sheet 1-49, Factory Mutual Research Corporation, Norwood, MA. 1985 and Architectural Sheet Metal Manual *SMACNA*, Chantilly, VA 1993.
4. Corrosionsource.com ©2000 http://www.corrosionsource.com/handbook/galv_series.htm
5. http://www.corrosion-doctors.org/Definitions/galvanic-series.htm
6. *Handbook of Materials Selection for Engineering Applications*, G. T. Murray, CRC Press.
7. Allen, D.J., and Phalen, T.E., *Stress-Strain Characteristics for EPDM, CSPE, and PVC for the Development of Stresses in Membranes Utilized as Single-Ply Roof Systems*, 1991 International Symposium on Roofing Technology.
8. Garrigus, P.C. The Stress-Strain, Stress-Thickness and Stress-Width Characteristics of Non-Reinforced, Glass Reinforced and Polyester Reinforced PVC Roofing Membrane, Graduate Thesis, NU Student School of Engineering Technology, March 1991.

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SPRI
Resiliency
Embassy Suites by Hilton
Concord, NC
October 17, 2024
9:30 a.m.

AGENDA

I.	Call to Order	M. Ibanez
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Review Task Force Objective (see attached definition)	
IV.	Rubber and Analogy	
V.	SPRI Resiliency Task Force Position Paper DRAFT to Discuss (attached)	
VI.	Review previously agreed start point	
VII.	Continued development of a Position Paper, following the guidelines of ASTM E3341 – 23a	
VIII.	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.

- Planning and Preparation:

Roof system resilience anticipates a level of adverse climatic conditions exceeding minimum code requirements, including proper maintenance during operational use, that to have capabilities above current code requirements. It falls to the designer of record along with the building owner to select systems and components that will go beyond minimum building code requirements to increase system performance beyond that which was previously deemed to be sufficient to meet adverse conditions. System performance now goes well beyond keeping a building dry, it now extends to increased chemical exposure, stronger and more frequent wind events, hail and fire exposure due to an increased use of roof top surfaces ranging from photo voltaic arrays to broad range of recreational and environmental uses. The system will allow

- 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 serve as a reliable refuge for human life and well-being, as well as serving as a shelter for building contents and other assets, and allow for the ability to make temporary repairs in a reasonably short time period time, making it capable to provide an extended period of uninterrupted use of a building or facility, even though the level of performance may still require a more permanent repair or replacement.

- Recovery:

A resilient roof system has the ability to withstand detrimental effects of anticipated and unanticipated events with little or no repairs to the roof system (i.e., the roof does not fail or need replacement) or allows for the time of addressing other more pressing concerns, until resources can be aimed at the roof.

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SPRI Resiliency of Low Sloped Roofs – Position Paper Working DRAFT

Resiliency of Low-Sloped Roofing – Single Ply Roofing Institute (SPRI)

Introduction

The Single Ply Roofing Institute is an organization of shareholders that represent those engaged in the built environment with a focus on low-sloped type roofing materials and systems. SPRI, like many other organizations within the construction field believes it is necessary to discuss and develop a position on resiliency within the boundaries of low-sloped roofing.

Low-Sloped roofs are defined by Code as those structures with a roof slope of less than 2:12 and are the predominate type of building design in commercial, institutional and industrial buildings, however, are found in residential construction design as well. These roof types can offer various advantages related to constriction costs, product versatility and maintenance. Associated with this can be design challenges as low-sloped roof designs create greater exposure to UV, certain weather conditions and drainage of water from their surface. This paper is intended to highlight some of the factors that contribute to the resiliency of low-sloped materials/systems.

The Importance of Resiliency of Low-Sloped Roofs

Resiliency in roofing commonly refers to the ability of the roof to perform in, withstand and recover from adverse conditions, such as extreme weather, temperature fluctuations, and physical damage. For low-sloped roofs, resiliency is critical due to their unique exposure to various conditions, including standing water, UV radiation, and thermal cycling of its various material components. Enhancing the resiliency of low-sloped roofing systems enhances the longevity and safety of buildings, can reduce maintenance costs, and minimizes its environmental impact.

Factors that can Influence Resiliency

1. **Products/Materials:** Material choice or options can certainly have a significant impact on the durability and performance of any low-sloped roof. There are many product types to chose from, each offering unique properties and characteristic to the roof's design. All offer great resistance to protecting the building the variability of certain products maybe better suited for certain building designs.

a. **Thermoplastics/Thermosets**: This product category is popular among a wide variety of installers due to its ease of installation, versatility to a wide range of building conditions and light weight. Common uses are where greater flexibility, elongation and flexural design is desired.
b. **Modified Bitumen**: modified bitumen systems, commonly referred to as Polymer-Modified Bitumen (PMB) offer the desired redundancy of tradition BUR's and the factory-controlled conditions to make the sheet membrane. PMB can offer greater performance to physical damage as compared to other low-sloped roof types.

2. **Design Considerations**: The proper design, taking in all critical factors is a key factor in the resilient performance of any low-sloped roof. Some more obvious are below.
   a. **Drainage**: movement of surface water can be critical on the long-term performance of a roof system. The presence of ponding water is not only against Code but also good roofing practices. Ponding water in some regions can be more severe depending on the climactic conditions of the building.
   b. **Laps and adaptation**: The roofing system must have an ability to seamed well under what could be a wide variety of conditions. In addition, the materials/system must be able to conform to a potential wide variety of building conditions.
   c. **Secondary Materials**: The roofing system must be able to utilize a variety of secondary materials that may be chosen such as thermal insulation, coverboards and specialty flashing systems.
3. **Environmental Conditions**: Low-Sloped roofs are commonly exposure to more unique and harsh environmental conditions. The low angle at which these roofs are required to perform at creates more challenging conditions.
   a. **UV Exposure**: At a lesser slope the intensity of UV radiation is increased versus that of a steep-slope condition. These increased conditions, drive manufacturers of low-sloped system to design products to perform better and longer than comparable materials that might be used for a low-slope condition.
   b. **Thermal Impact**: Low-Sloped roof, having a lesser angle of exposure to sunlight and UV, create a greater and more harsh environment related to thermal changes from hot to cold. Increased thermal expansion and contraction conditions, make it important that low-sloped roof be resistant to the effects of thermal conditions.

   c. **Climate and Weather Events**: Depending on the location of the building, low-sloped roofs are expected to perform in some of the most severe climate conditions from heat, cold, rainy, wind and hail. As weather extremes become more commonplace, low-sloped roof are expected to perform in the harshest of conditions.

4. **Maintenance and Remediation**: Like so many other things in our lives, regular maintenance can be key to longevity. Similarly, when conditions may cause damage to a material, can it be quickly and effectively repaired to function as intended and continue to perform for its intended life cycle.
   a. **Roof-Top Observation**; It is important and recommended by product manufacturers to observe roof-top conditions twice annually and after any major storm event. Doing so can help the low-sloped roof perform to its maximum potential. Failing to keep awareness of the roof's condition can adversely impact the roof life cycle performance.
   b. **Cleaning/Housekeeping**: Keeping the roof free of debris that can block water outlets and cause further damage is important. Implementing periodic cleaning of any low-sloped roof can aide it its optimal performance. Keeping debris form hindering water drainage is important.
   c. **Repairs/Remediation**: It is important to know and under the best practice of how to make repairs to your low-sloped roof. This can include training of in-house staff or ensuring your have a qualified company under contract to simply reach out to and perform any duties needed. Ensuring the use of proper repair materials is crucial.

Conclusions

The resiliency of any low-sloped roofing system is truly influenced by a combination of items from material selection, design considerations, environmental factors, and maintenance practices. By having a good understanding and addressing these factors in any roof design, building owners and the designer of record can enhance the durability and performance of the low-sloped roof, ensuring it provides reliable protection and longevity.

As climate conditions become increasingly unpredictable, investing in resilient roofing systems is not only a matter of cost-effectiveness but also a critical component of sustainable building practices.

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SPRI
South Coast AQMD Monitoring
Embassy Suites by Hilton
Concord, NC
October 17, 2024
10:15 a.m.

AGENDA

I.	Call to Order	F. Walnut
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Task Force Objectives	
IV.	Update on SCAQMD's Rule 1171 - Solvent Cleaning Operations	
V.	Discussion on what SPRI should do	
VI.	Action Items and Assingments	
VII.	Adjournment	

Task Force Objective:
– Fred Walnut, Holcim Adhesives
start date 10/2024 budget: $0

This Task Force will develop a consensus on whether to send comments to SCAQMD on the proposed changes to Rule 1171 to prohibit PCBTF and TBAC in solvent cleaning operations.

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SPRI
Education
Embassy Suites by Hilton
Concord, NC
October 17, 2024
11:30 a.m.

AGENDA

I.	Call to Order	B. Chamberlain
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Discuss Wind Seminar	
IV.	Ideas and Thoughts	
V.	Adjournment	

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

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.

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SPRI
Cover Board
Embassy Suites by Hilton
Concord, NC
October 17, 2024
1:00 p.m.

AGENDA

I.	Call to Order	W. Barber
II.	Roll Call & Reading of SPRI Antitrust Statement	
III.	Approve Task Force objective	
IV.	SPRI Counsel review challenges a. External vs Environmental – clarify b. Single-ply vs low slope roof systems	
V.	Review SPRI definition of coverboards	
VI.	Adjournment	

Task Force Objective for approval:
Draft
"The objectives of the Coverboard Task Force are: to review the environmental factors that impact the long-term performance of all low-slope roof systems; and to provide educational content for SPRI members, code officials, designers, installers, owners and other interested parties. The overarching objective is to advocate for the advantages of coverboards in low-slope roof systems, i.e increase the roofing system performance and resilience. The Task Force will respond to issues involving the use of coverboards and provide updates to the SPRI Technical Committee."

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SPRI
PRO Guide
Embassy Suites by Hilton
Concord, NC
October 17, 2024
1:30 p.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Reports & Updates
Review Tracking Document and Updates

IV. Unfinished Business
- a.) Technical Director Review & Proposed Actions
- b.) PCR Revision Update
- c.) Standards Revision Update

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.

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SPRI
Recycling Percentage
Embassy Suites by Hilton
Concord, NC
October 17, 2024
2:00 p.m.

AGENDA

I. Call to Order — C. Collins

II. Roll Call & Reading of SPRI Antitrust Statement

III. Technical Director Report
Directions from the Board

IV. New Business

V. Old Business
   a. Chair(s)
   b. Drafting of Objective Statement
   c. Open Floor

VI. Adjournment

Task Force Objective:
– Chadwick Collins, SPRI

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SPRI
Technical Committee
Embassy Suites by Hilton
Concord, NC
October 17, 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 July 2024 meeting (attached)	
IV.	Task Force Reports	
	a. Adhesive Peel Test	?
	b. Code Development	C. Collins
	c. Codes & Standards	C. Collins
	d. Cover Board	C. Mader
	e. Digital Content	R. Montoya
	f. DORA™ Edge Securement	B. LeClare
	g. DORA™ Fire Classification	C. Collins
	h. DORA™ Listing Service	C. Collins
	i. ED-1 Canvass	B. LeClare
	j. Education	B. Chamberlain
	k. Internal Positive Pressure Vote on document approval (attached)	Childs/Mader
	l. PRO Guide Updates (https://www.spri.org/pro-guide-updates/)	C. Collins
	m. RD-1 Standard Update	L. Donovan
	n. Recycling Percentage	C. Collins
	o. Resiliency	M. Ibanez
	p. RP-14 Revision	C. Mader
	q. Standards Library and Template	C. Mader
	r. VOC Monitoring (SCAQMD)	F. Walnut
	s. TDP-1 (Peel Test Procedure)	S. Childs
	t. WD-1 Update	Chamberlain/Scheerer
	u. Standards date review	C. Collins
V.	Unfinished Business	
VI.	New Business	
VII.	Adjournment	

SPRI
Technical Committee
Crown Plaza at the Crossings
Warwick, RI
July 16, 2024

Minutes

Call to Order

Technical Committee Chair Stephen Childs called the meeting to order at 3:30 p.m. ET. The SPRI Antitrust Statement* was read.

Roll Call

Those present were:

Stephen Childs, GAF
Maury Alpert, Polyglass USA, Inc.
Warren Barber, National Gypsum
Bas Baskaran, NRCC
Kyle Boyce, Tremco, Inc.
Luis Cadena, NEMO | etc.
Scott Carpenter, Anchor Products
Brian Chamberlain, Carlisle Construction Materials
Eugenia Cho, NEMO | etc.
Stan Choiniere, StanCConsulting
Gareth Christopher, Siplast
Mike Darsch, Sika Sarnafil
Liam Donovan, OMG Roofing Products
Jamie Duvall, GAF
Joseph Fay, BASF
Tony Fuller, National Gypsum
MIchael Giangiacomo, Flex Membrane International Corp.
Frank Greco, IKO Industries
Colin Griswold, OMG Roofing Products
Matthew Hollingsworth, Georgia-Pacific Gypsum
George Howell, Martin Marietta
Bryson Hull, Tyelus Consulting
Lynsey Hull, Tyelus Consulting
Derrick Hutchinson, USG Corporation
Mario Ibanez, FiberTite
Al Janni, Duro-Last
Mark Keen, ICP Group
Shaun Kerschen, Atlas Roofing Corporation
Joel King, IB Roof Systems
James Kirby, Siplast
Stephanie Kiriazes, Holcim Building Envelope
Kaare Kurtzke, Johns Manville
Norbert Lash, H.B. Fuller Construction
Bob LeClare, ATAS International
Brandon Maag, Carlisle Construction Materials
Christopher Mader, Blue Ridge Fiberboard, Inc.
Yuddish Manna, Rockwool
Brian Martineau, IB Roof Systems
Matthew McGreal, National Gypsum
Walt McIntosh, Holcim Building Envelope
Chris Meyer, VaproShield
Margi Modi, SITURA Inc.
Jeff Moore, ICP Group
Steve Moskowitz, Atlas Roofing Corporation
Brian Ng, All Weather Insulated Panels
Hayden O'Brien, Canadian General Tower Limited
Jim Pieczynski, Blue Ridge Fiberboard, Inc.
Brian Randall, National Gypsum
Phil Redmon, National Gypsum
Bob Reel, H.B. Fuller Construction
Vincent Sandman, Holcim Adhesives
Dan Scheerer, SFS
Sally Schomp, Plastex Matting Inc.
Michelle Sluga, UL LLC
Justin Smith, Anchor Products
David Spaulding, ICP Group
Joel Stanley, Anchor Products
Shawn Stanley, IB Roof Systems

*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 that 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."

Steven Wadding, Polyglass U.S.A. Inc.
Frederick Walnut, Holcim Polymers Sealants
Dan Wise, Intertek
Hongchao Wu, H.B. Fuller Construction
Christopher Yanosko, Sika Sarnafil
Theodore Young, GAF

Staff present:
Chadwick Collins, SPRI Technical Director
Linda King, SPRI Managing Director
Carl Silverman, SPRI Legal Counsel

Guest present:
Sam Everett, SE Marketing LLC

Approval of Previous Meeting Minutes
On a motion duly made, the May 2024 Technical Committee meeting minutes were approved without objection as distributed.

Reports & Updates
ADT-1 Task Force Chairs Eschhofen and Griswold reported the following:

- One negative has been resolved; and
- The official response to the remaining negative has been developed to resolve it per procedure

Code Development Task Force –Technical Director Chadwick Collins reported on behalf of Chair Amanda™ Hickman the following:

- Reviewed the current status of the code development plan;
- Reviewed current ICC cycle process, current activity within cycle A, and planned activity for cycle B;
- Reviewed results from IAMPO hearings and follow-up actions from that;
- Reviewed recent activity at ASHRAE; and
- Announced the process for the 9th edition of the Florida Building Code. Codes & Standards Task Force Chair Chadwick Collins reported the following:
- Updated on CRRC activity, mainly the S100 update;
- Updated on SEIA standard development activity;
- Reviewed legislative activity, primarily related to environmental and recycling issues
- Reviewed the current status of standards of interest, both SPRI and external; and
- Informed SPRI Members of the NBI code overlay documents.

Cover Board Task Force Chair Chris Mader reported the following:

- Asked if there were SPRI Member Companies (at least 3) that would support the formation of a new Cover Board task force, with five affirming Members affirming: and
- Discussed the potential task force objectives with the intent of drafting the objective by or at the next Task Force-meeting.

DORA™ Edge Securement Task Force Chair Bob LeClare reported the following:

- Reviewed the use of the term “engineered components” as it impacts the approach to DORA™ incorporation; and
- The Task Force will review its draft documents concerning the DORA™ Steering Committee decision to change “listing” to “roof assembly/assemblies”

DORA™ Fire Classification Task Force Chair Chadwick Collins reported the following:

- Reviewed what Intertek presented as a possible path forward to incorporate fire classification data; and
- Will continue to develop a recommendation to make to the DORA™ Steering Committee.

DORA™ Listing Service Steering Committee Chair Chadwick Collins reported the following:

- Reviewed marketing activity for May and June
- Intertek provided an administrative update; and

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- Mr. Collins reported on the updated KPIs and a strategic plan update concerning database entry increase.

ED-1 Canvas Task Force chair Bob LeClare reported:

- Task Force has completed the initial steps in the review of the document in preparation for canvassing; and
- Task Force identified vital items that need to be updated since the last revision before canvassing.

Education Task Force Task Force Chair Brian Chamberlain reported the following:

- Discussed ideas to increase student attendance for the next event;
- Discussed developing an acronym key for attendees; and
- Discussed developing worksheets and a questionnaire to determine where the attendee's current knowledge level is before the event.

Internal Pressure Task Force Chair Chris Mader reported the following:

- No comments were received from the Task Force after the last distribution; and
- The goal is to have a document for the Technical Committee in October.

PRO Guide Updates Task Force Chair Chadwick Collins reported the following:

- The document tracking spreadsheet was reviewed;
- A summary of website data was presented; and
- A summary was presented of work currently being done with SPRI standards.

PVC Environmental Shawn Stanley reported the following:

- The SPRI Board has approved the white paper; and
- The Task Force discussed the next steps in publishing the white paper and its distribution.

RD-1 Standard Update Task Force Chair Liam Donovan reported that-there has been a review of the edits made since the May meeting.

Recycling Task Force Acting Chair Chadwick Collins reported the following:
After discussion, the Task Force moved, without objection, to present the Technical Committee with a request to the Board that SPRI authorize the collection of recycling data with shipment data for SPRI to better understand what data is available, which motion was approved by the Technical Committee (Chair Childs was authorized to bring this motion to the Board at its next meeting).

Resiliency Standard Task Force – Task Force Chair Mario Ibanez reported the following:

- Discussion continued to reach a definition of resiliency; and
- The Chair and Vice-chair will draft a position paper on this subject for consideration.

RP-14 Revision Task Force Chair Chris Mader reported the following:

- There were insufficient positive votes to overcome negative votes (P. Smith, M. Graham); and
- The Chair will contact the negative voters to explore paths to resolve those negatives.

Standards Library Task Force Chair Chris Mader reported the following:

- The development of a list of units and their metric equivalents mentioned in SPRI's library continues; and
- Work on a terminology document starting with a draft listing all terms defined in SPRI's document library continues (this may become its own task force).

TDP-1 Task Force Chair Stephen Childs reported the following:

- The discussion focused on language around sample size;
- The discussed continued with the need to have a parallel standard to cover a similar procedure; and

- The Task Force approved the current draft, without objection, for the draft to be presented to the Technical Committee for its recommendation to the Board.

VR-1 Revision –Task Force Chair Stephanie Kiriazes reported the following:

- A list of potential testing partners for consideration was discussed; and
- The Chair requested any contact information for direct contacts at universities for SPRI to partner with on the standard.

WD-1 Revision Task Force chair Dan Scheerer reported the following:

- The Task Force reviewed edits made since the last Task Force meeting; and
- The Task Force intends to meet in August to keep the timeline goal of being finished to align with the code work being done by the Code Development Task Force.

Standards Review

Chadwick Collins provided the following update:

- ED-1 – in process (see above);
- RD-1 – in process (see above);
- RP-14 – in process (see above);

VR-1 – in process (see above);

- WD-1 – in process (see above); and
- The standards with 2021 dates that will be on the docket for next year were identified.

New Business

- Mike Darsch asked if there was any interest in testing adhesives to a non-facer product to create a standard (to which four SPRI Member Companies expressed interest); and
- Dan Scheerer asked if there is more information about the marketing-focused session at the fall meeting available at this time? (following which Al Janni asked if there would be a meeting to discuss the logistics of that session?

Adjournment

There being no further business, the meeting adjourned at 4:05 p.m. ET.

Submitted: Chadwick Collins, SPRI Technical Director

These minutes have been reviewed by SPRI Legal Counsel.

The Impact of Building Pressurization on Commercial Roofing Systems

Proper building pressurization is not only crucial for managing indoor air quality, maintaining occupant comfort and wellbeing, and maximizing the building's energy efficiency, but also for managing the performance and life-expectancy of the commercial roofing system. Understanding how building pressure affects roofing is essential for ensuring long-term and efficient roofing performance.

Building Pressurization and How it Works

Building pressure refers to the difference in air pressure between the inside and outside of a commercial structure. Building pressurization can be intentionally designed as part of the building envelope or can be the unintentional result of environmental or design issues. In some cases, building designers intentionally design for slight positive or negative pressure to achieve a desired internal environment. Cleanrooms, for example, can be designed with either positive or negative pressure, depending on the applications. Cleanrooms with high positive pressure inside are designed to keep air and contaminants from migrating to the inside.

In a positive pressure environment, fresh air is forced or brought into the structure with fans or mechanical means, and allowed to exit the building through louvers, doors, windows, or vents. Since the pressure outside is greater than the pressure inside the building, air is 'pushed out,' through openings (i.e., windows, doors, vents,) as well as through cracks in the envelope. This prevents outside air or particles from coming into the building and potentially impacting occupants, products, or processes. In short, positively pressured buildings 'push' air out of the structure to prevent outside contaminants from coming in.

The opposite is true in a negative pressure environment, where the inside pressure is greater than the outside pressure. In this scenario, fans or mechanical equipment are used to evacuate air from the building that is coming in through doors, windows, vents, or louvers. This process to exhaust air from the building or from specific areas of the building to remove odors, chemicals, dust, etc., creates a vacuum within the structure that essentially 'pulls' air into the structure through openings in the building envelope to equalize the pressure.

It's important to note that many commercial buildings require both positive and negative pressure areas to address various processes and applications and must have mechanical systems designed specifically for the application. However, it is also possible that the building envelope is not designed for the building pressures it experiences in service.

There are three primary elements that impact the pressure differential in buildings: the stack effect, wind, and mechanical pressurization.

Stack Effect

The stack effect occurs when large volumes of air are moving through the building envelope due to a significant temperature difference between the inside and outside. When interior mechanical systems such as heating, ventilation, or air-conditioning, alter the density of the air inside a building compared to the outside air, that differential creates upward air movement, like an unintended chimney, known as the 'stack effect.'. Typically, this occurs in high-rise buildings.

Warm air inside a building is less dense than the cooler air outside and rises within the structure. This creates a low-pressure area in the lower portion of the building, which draws in denser or 'heavier air' that effectively pushes the warmer air, up and out of the upper floors of the building, through leaks or cracks in the envelope such as at the deck to wall joints, and penetrations through the roof.

The opposite happens during warmer months, as the cooler conditioned air leaks out of the lower portion of the building, creating a low-pressure area on the upper flows, which draws warmer air from outside into the structure from the upper flows, thus filling the void from the lost cold air.

Buildings can have several different areas that act as chimneys and are affected by this type of air movement, including elevator shafts, stairwells, mechanical chases, garbage chutes, as well as space behind various types of cladding.

Addressing vertical air movement is primarily a design challenge. Owners and facility managers should work with a design professional to address this issue and ensure that stairwells, elevator shafts, and other floor openings are properly sealed to minimize air movement through the structure, and ultimately into the roofing assembly.

Moisture laden air can travel into the roofing assembly through deck-to-wall joints, gaps around penetrations into or through the roofing assembly, as well as through voids in the deck. Once in the assembly, the moist air can become trapped due to the impermeable roof membrane or cover. When this happens, condensation will occur, and at temperatures below freezing, ice can form in the assembly, which can drip back into the building often with detrimental effects to components within the roofing assembly, and/or on the inside of the structure. The higher the level of interior relative humidity and the greater the temperature differential between the interior and the exterior of the building, the more moisture will collect, and the bigger the problem. In addition, biological growth can occur, causing other issues and potentially even long-term health problems for the building occupants.

In addition, well-designed structures and roofing systems should incorporate vapor barriers, adequate insulation materials, and ventilation to regulate temperature differentials, reduce the strain on the roofing structure, and minimize the risk of developing moisture from condensation in the roofing assembly.

Wind

It may be obvious, but wind can be a significant contributor to pressures the building will experience in service. This includes both internal and external pressures, which are well known and understood by the design community and are generally not a major issue. Both types of pressure are included in building design practices when designing in accordance with model building codes and generally do not create many issues unless the building has very unique design characteristics.

Mechanical Pressurization

In general, controlling air-infiltration can be addressed by mechanical equipment such as HVAC and air handling units, calibrated to provide a larger quantity of incoming outside air than the amount of internal air being evacuated from the building. Improper or ineffective maintenance of mechanical equipment can also cause issues, in terms of air volume.

Pressurization Sources Not Accounted for in Basic Wind Design

Properly designed and installed HVAC systems are calibrated specifically for the building in which they operate. The past few years have reinforced that wherever groups of people spend time together in enclosed and dedicated spaces, airborne germs and particulate matter can spread diseases such as COVID-19. As a result, many building owners and facility managers have adjusted HVAC systems to increase internal air filtration and movement, in an attempt to remove 'dirty' air from the facility. This has resulted in an increase of building pressurization issues which have negatively impacted roofing system performance and longevity in some cases.

SPRI recommends building owners and facility managers work closely with qualified HVAC engineers to follow industry guidelines and best practices from reputable sources such as ASHRAE when adjusting HVAC systems looking to increase internal air turnover and filtration.

Designing for Building Pressurization

Commercial roof assemblies, which typically include the deck, insulation, coverboard and waterproofing layer, play an important role when it comes to internal building pressure. Unfortunately, all too often, roofing membrane manufacturers are called in after the fact to identify and address problems caused by improper ventilation and condensation in the assembly.

Vapor retarders used in the roofing assembly – particularly in cooler climates -- are designed to prevent condensation from occurring in the roofing assembly by controlling moisture migration into the roofing assembly by allowing for some vapor transmission through the membrane. Air barriers, by contrast, are typically used to stop air movement through the building envelope.

To be effective, the location of the vapor barrier within the roofing assembly is an important consideration. For most commercial applications, vapor barriers are typically installed under the roofing insulation, where it is 'warmer' than the outside air temperature and dewpoint.

Vapor barriers should also be installed in conjunction with air barriers in the walls to prevent air movement through the roof-to-wall transitions, membrane seams and laps, as well as roofing penetrations. This in turn, can help to regulate the indoor climate by preventing air and related moisture from transferring from the interior to the exterior of the building or from the exterior to the interior.

Exterior air barriers are available in several configurations including sheet membranes that are either mechanically attached, fully adhered, or self-adhered. They can also be liquid applied membranes, sheets of polyethylene, foil covered products, or bituminous in nature.

In addition, some roofing materials can manage moisture and air-infiltration better than others. It's always best to work with the roof system manufacturer and a qualified roof system designer to select the proper products and design the roof assembly that best meets the specific needs of the facility.
When addressing pressure issues and the roof assembly, it's particularly important that the system details, particularly at the air and vapor control layer, are handled properly and with care. Furthermore, it is imperative to ensure that the vapor barrier is properly sealed at all penetrations and openings to avoid creating an open pathway for moisture and air migration.

Air movement in any areas not detailed properly can result in poor roof performance and a shorter life expectancy.

Change is Inevitable

In a report published by Statista.com, the size of the commercial property remodeling market in the United States reached $51 billion in 2022. With this continued expansion of building re-use and adaptation it is important that building owners and facility managers recognize the potential impact that changing a building's use can have on the facility's internal air pressure and the roofing system. Buildings repurposed to include industrial processes for which they were not originally designed, such as processing food, distilling liquor and, housing industrial painting processes, etc., can increase internal building pressures and potentially change internal moisture conditions that impact internal air quality. All of which can negatively impact the performance of the roofing system.

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