



Fall Education Seminar

October 8, 2020

Code and technical issues update

presented by

Mark S. Graham

Vice President, Technical Services
National Roofing Contractors Association (NRCA)



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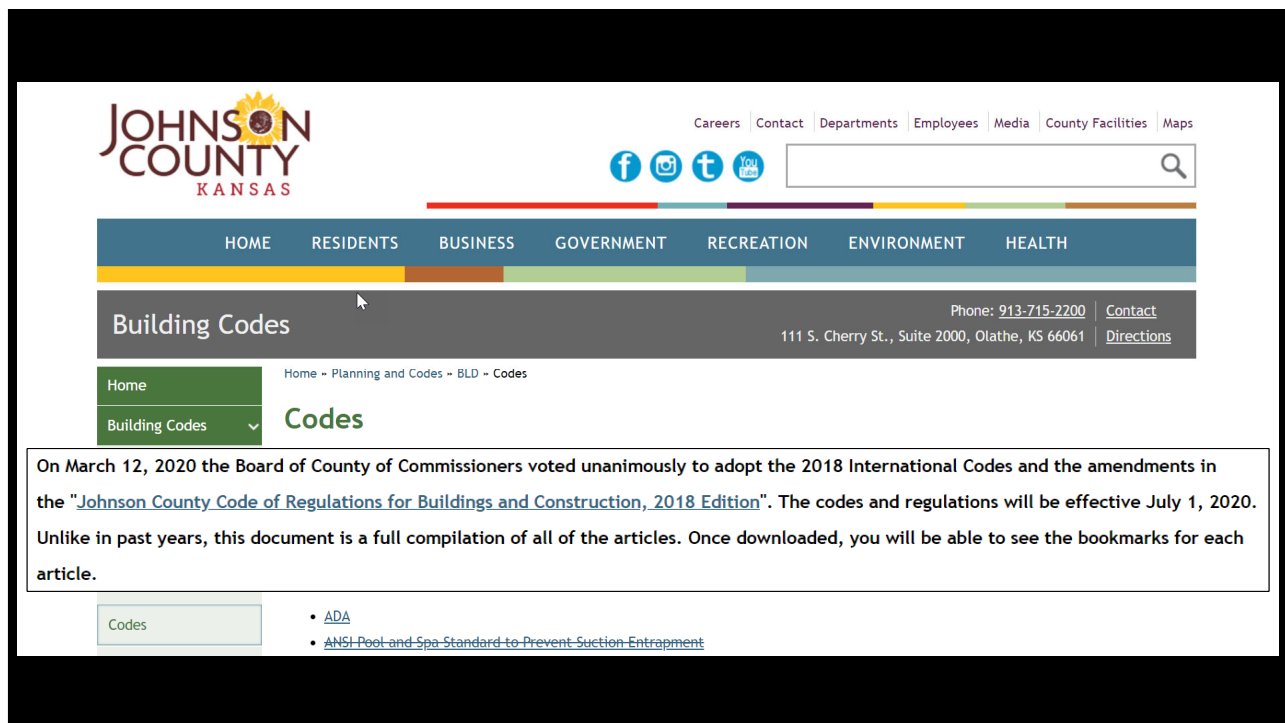
Topics

- Johnson County adoption of 2018 I-codes
- Roofing-related changes in 2018 I-codes
- FM VSH (hail)
- Synthetic underlayment
- Attic ventilation
- Questions... and other topics

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ORGANIZATION AND CONTENTS

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SECTIONS 1. ADOPTION
2. DEFINITIONS
3. DELETIONS
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5. AMENDMENTS

[Link](#)

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1. Walls 24 inches (610 mm) total length or shorter connecting offset braced

n) **Section R903.5 Hail exposure.** Add the following to Section R903.5: Hail exposure, as specified in Sections R903.5.1 and R903.5.2, shall be determined using Figure R903.5.

■ Minimum 1 hail day/20 years, Moderate Size (1.5 - 5.0 in.)
■ Minimum 1 hail day/20 years, Severe Size (2.0 - 5.0 in.)

Figure R903.5

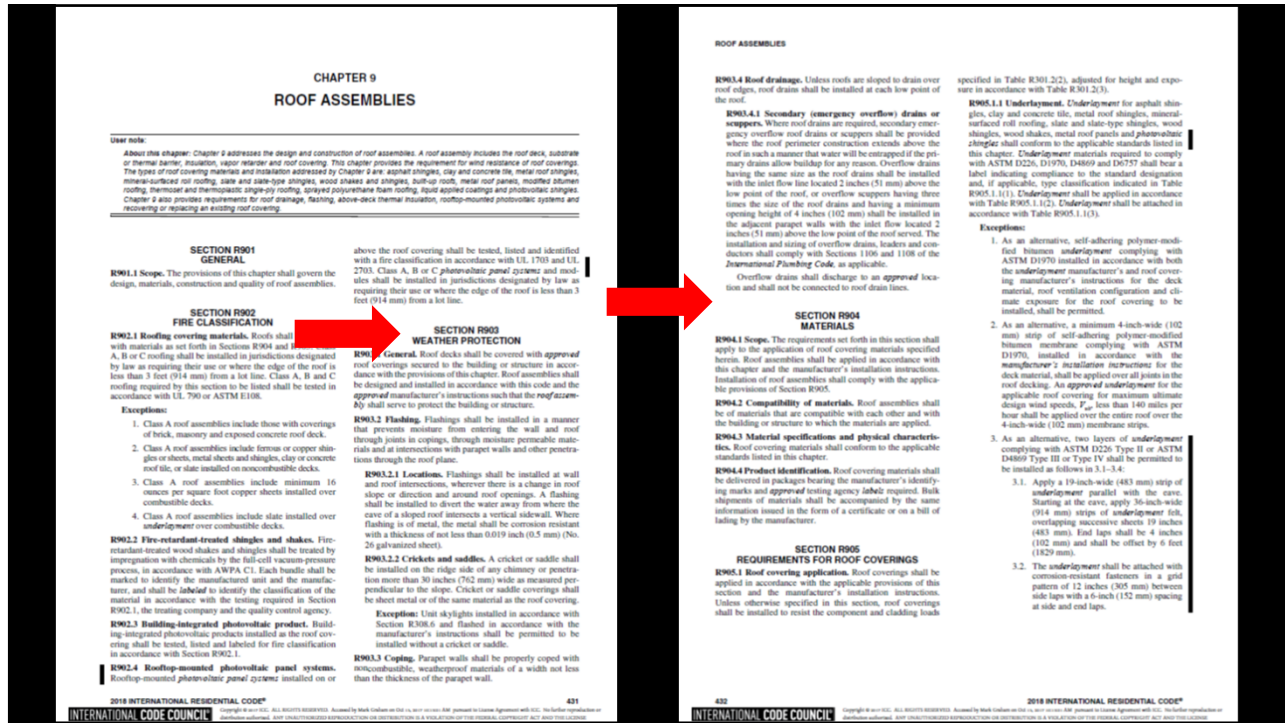
FIGURE R903.5
HAIL EXPOSURE MAP

o) **Section R903.5.1 Moderate hail exposure.** Add the following to Section R903.5.1: One or more hail days with hail diameters larger than 1.5 inches (38 mm) in a 20-year period.

p) **Section R903.5.2 Severe hail exposure.** Add the following to Section R903.5.2: One or more hail days with hail diameters equal to or larger than 2.0 inches (51 mm) in a 20-year period.

Article 3 - 5

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**JOHNSON COUNTY
KANSAS
Building Codes**

Johnson County Commercial Roofing/Re-roofing submittal requirements

- All submittals for commercial roofing or re-roofing shall meet following items. These requirements are in accordance with 2018 IBC, and 2018 IECC. See following items for submittals and inspection for roofing and re-roofing permit for commercial projects. We also perform site inspection during different stage of the project until approval by final inspection.
- All Submittals shall be reviewed, sealed, and signed by a design professional registered in state of Kansas. (Drawings, cut sheet, manufacture specifications, product listing, etc.)
- Description of the work and method of application for new roofing or, re-roofing shall be written clearly in detail for installation and inspection by the jurisdiction.
- Type of the construction and type of the occupancy and minimum roof covering fire classification in accordance with 2018 IBC chapter 15 shall be clarified and verified on the submittals.
- Foam plastic insulation used in roofing assembly shall meet 2018 IBC chapter 26. Also, Insulation R values shall meet 2018 IECC requirements.
- Fire resistance roof construction shall meet 2018 IBC Table 601. (Note: Roof assembly consists of roof deck and roof covering, as defined in 2018 IBC, Definition chapter 2.)

- Proposed roof covering assembly shall be listed and listing design # by UL, FM, or any other approved agency shall be part of the submittals.
- All individual membrane in the roof covering assembly shall be listed and approved individually, by any approved agency (UL, FM, etc.)
- Contractors may not create their own custom roof assembly using various individual component materials of their own choosing. Contractors may only submit full assemblies approved by UL, FM, or similar authorities for review and approval by a design professional registered in the State of KS. Final, sealed, submissions are then transmitted to the Johnson County Planning and Codes Office for final review and approval before roof construction begins.

Link

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JOHNSON COUNTY
Planning, Development & Codes
111 South Cherry Street Suite 2000
Olathe, KS 66061
Phone: (913) 715-2200 Fax: (913) 715-2299
Email: PlanningandCodes@jocogov.org
Website: https://jocogov.org/dept/planning-and-codes/bld/home
Customer Portal https://www.mygovernmentonline.org/

APPLICATION FOR ROOFING PERMIT

RESIDENTIAL COMMERCIAL

ROOFING CONTRACTOR HOMEOWNER (authorization required)

Company Name _____ License # _____
Licensee Name _____ License Class _____
Address _____
City, State, Zip _____ Telephone (____) _____
Email _____

ADOPTED CODES: THE NATIONAL ELECTRICAL CODE '2017, THE INTERNATIONAL PLUMBING CODE '2018, THE INTERNATIONAL RESIDENTIAL CODE '2018, THE INTERNATIONAL BUILDING CODE '2018, THE INTERNATIONAL ENERGY CONSERVATION CODE '2018, AND THE INTERNATIONAL MECHANICAL CODE '2018 HAVE BEEN ADOPTED. *****SEE IRC SECTION 907.3, ITEM 4, RE: FOR ONE LAYER ASPHALT SHINGLES ROOF COVERING IN MODERATE HAIL EXPOSURE AREA *****ICE BARRIERS ARE REQUIRED

PROPERTY OWNER INFORMATION	SITE ADDRESS
Name _____	Address _____ <input type="checkbox"/> SAME AS OWNER ADDRESS
Home Address _____	City, State, Zip _____
City, State, Zip _____	Township Name _____
Telephone (____) _____	Subdivision _____
Email _____	

Type of Material Used: _____

Type of Structure: _____ Roof Area: _____ (squares)

Valuation (Labor & Material): _____

Description of Work: _____

SIGNATURE OF LICENSEE OR PERMITEE OF COMPANY OR HOMEOWNER IF ACTING AS GENERAL: _____

JOHNSON COUNTY
Planning, Development & Codes
111 S Cherry St Suite 2000
Olathe, Ks 66061
Phone: (913) 715-2200 Fax: (913) 715-2299
Website: https://jocogov.org/dept/planning-and-codes/bld/home
Customer Portal https://www.mygovernmentonline.org/

Roofing Sub-Contractor Information

General Contractor/Builder _____ Phone # _____

Contact	Property Owner	Site Address	Phone #
Name _____	Name _____	Address _____	_____
Address _____	Address _____	City/ST/ZIP _____	_____
City/ST/ZIP _____	City/ST/ZIP _____	Township Name _____	_____
Telephone _____	Telephone _____	Subdivision _____	_____

Roofing Contractor

Company _____ License # _____
Licensee Name _____ License Class _____
Address _____ City/ST/ZIP _____
Phone _____ Email _____

Description of Work Commercial Residential

Note Current Codes: The National Electrical Code 2017, The International Plumbing Code 2018, The International Residential Code 2018, The International Building Code 2018, the International Energy Conservation Code 2018, and the International Mechanical Code 2018 have been adopted. SEE IRC SECTION 907.3, ITEM 4, RE: FOR ONE LAYER ASPHALT SHINGLES ROOF COVERING IN MODERATE HAIL EXPOSURE AREA. ICE BARRIERS ARE REQUIRED, effective 7/1/2020

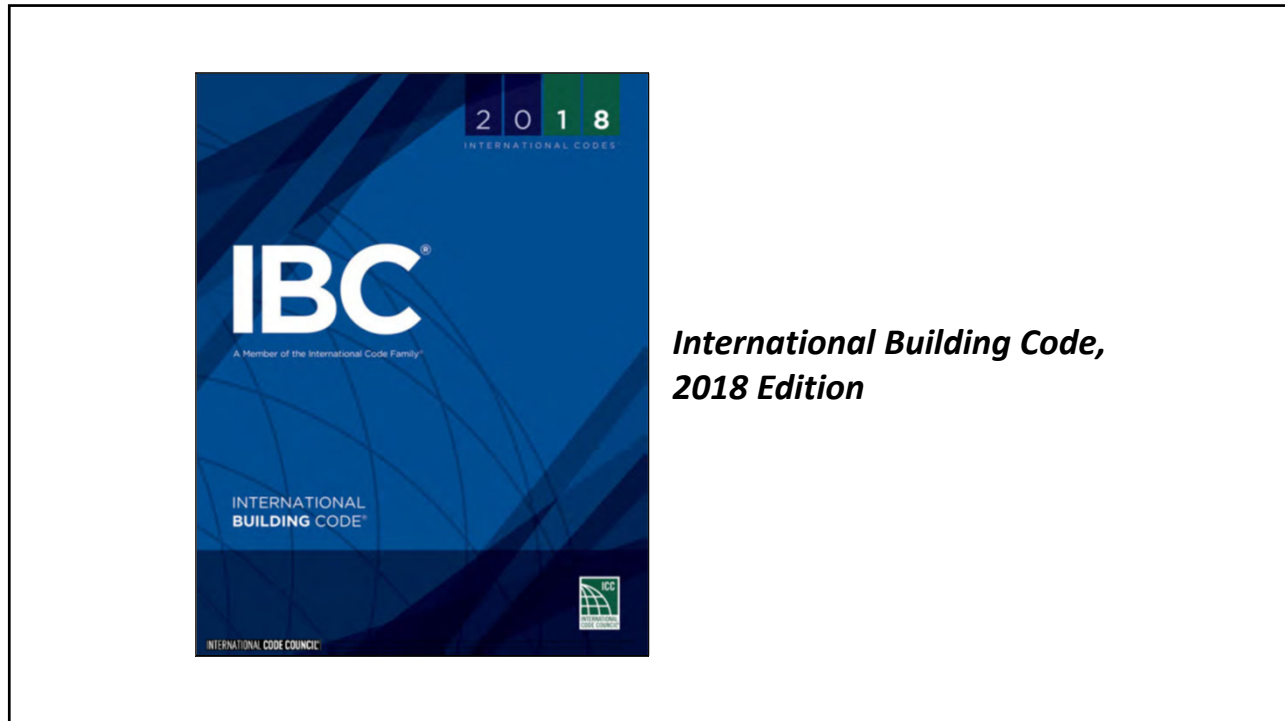
Valuation - Total Cost \$ _____

x _____
Signature required by Roofing Company listed. Signature only of a person authorized to pull permits, see Johnson County Contractor Licensing.

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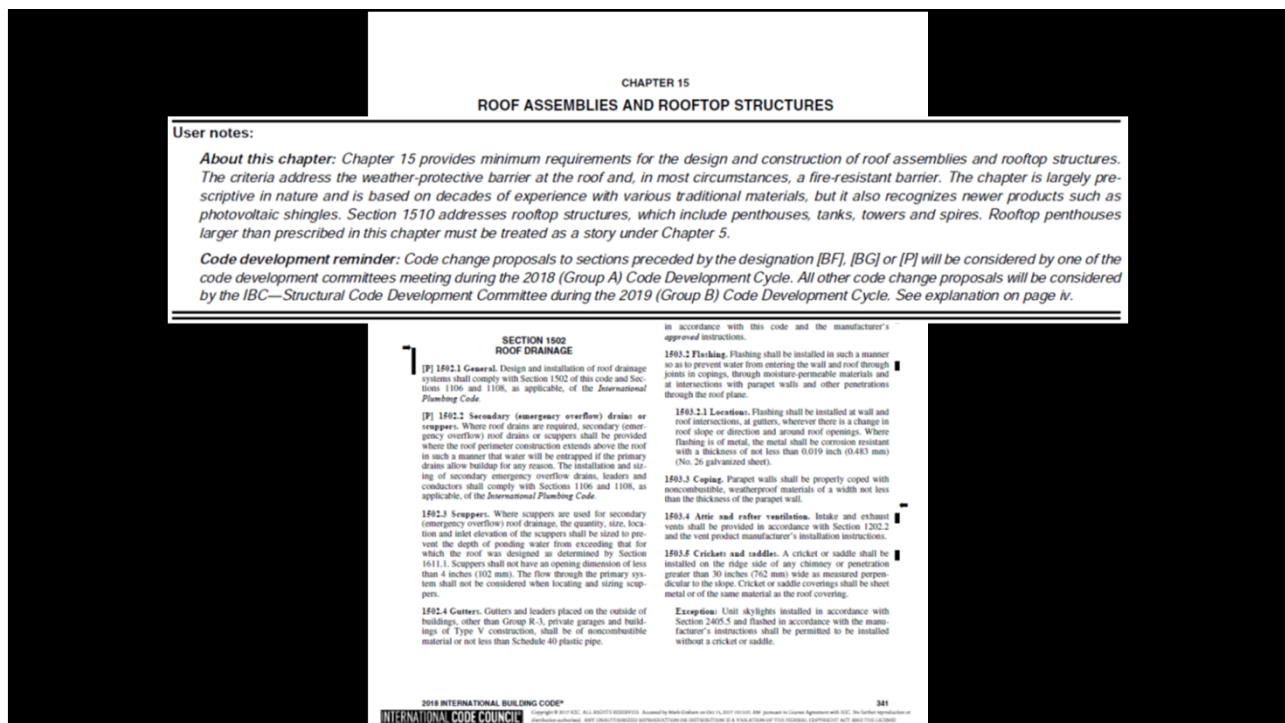


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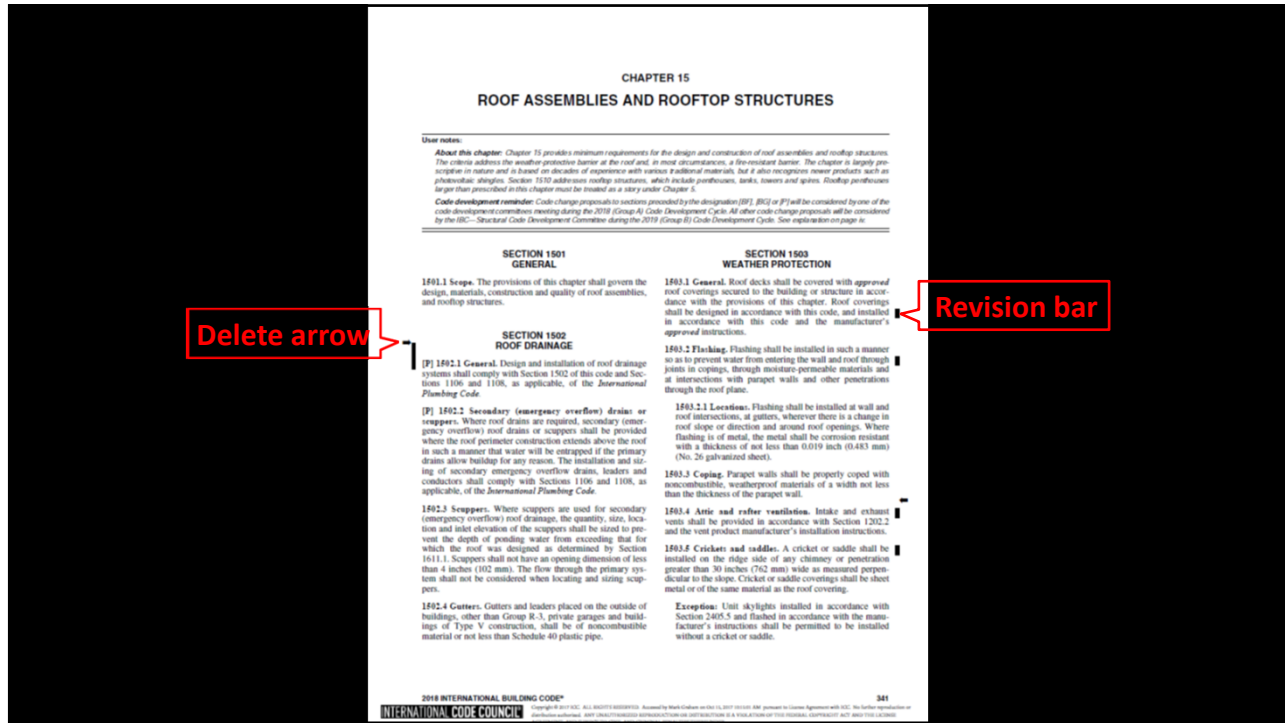


International Building Code, 2018 Edition

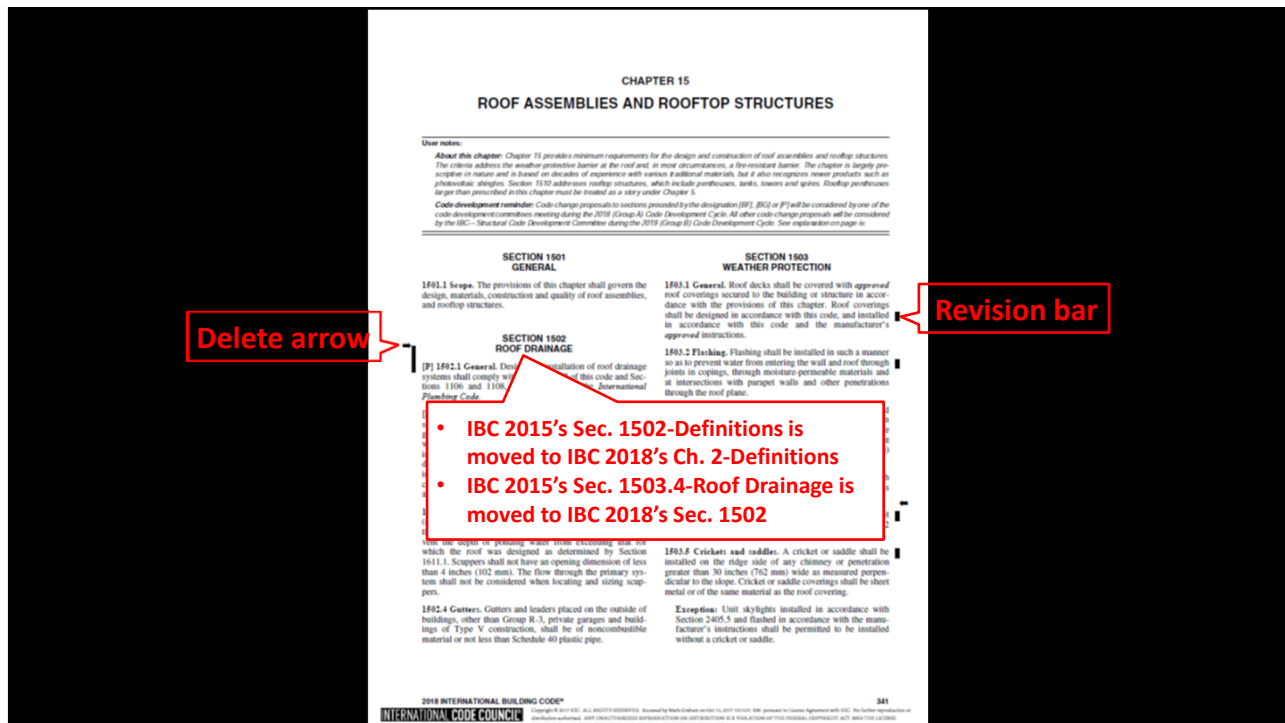
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**SECTION 1502
ROOF DRAINAGE**

[P] 1502.1 General. Design and installation of roof drainage systems shall comply with Section 1502 of this code and Sections 1106 and 1108, as applicable, of the *International Plumbing Code*.

[P] 1502.2 Secondary (emergency overflow) drains or scuppers. Where roof drains are required, secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason. The installation and sizing of secondary emergency overflow drains, leaders and conductors shall comply with Sections 1106 and 1108, as applicable, of the *International Plumbing Code*.

1502.3 Scuppers. Where scuppers are used for secondary (emergency overflow) roof drainage, the quantity, size, location and inlet elevation of the scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1611.1. Scuppers shall not have an opening dimension of less than 4 inches (102 mm). The flow through the primary system shall not be considered when locating and sizing scuppers.

1502.4 Gutters. Gutters and leaders placed on the outside of buildings, other than Group R-3, private garages and buildings of Type V construction, shall be of noncombustible material or not less than Schedule 40 plastic pipe.

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ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

**SECTION 1511
REROOFING**

1511.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement* or *roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide positive roof drainage.
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1503.4 for roofs that provide for positive roof drainage. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1503.4.

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ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1504 PERFORMANCE REQUIREMENTS

SECTION 1504 PERFORMANCE REQUIREMENTS

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

ASCE 7-16

1504.2 Wind resistance of clay and concrete tile. Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609.5.

1504.2.1 Testing. Testing of concrete and clay roof tiles shall be in accordance with Sections 1504.2.1.1 and 1504.2.1.2.

1504.2.1.1 Overturning resistance. Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with Chapter 15 and other SBCCI SSTD 11 or ASTM C1568.

1504.2.1.2 Wind tunnel testing. Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI SSTD 11 and Chapter 15.

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

ASCE 7-16's ASD method

1504.3.3 Metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580 or UL 1897. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table 1504.1.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.1.1.

1504.4 Ballasted low-slope roof systems. Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13 shall be designed in accordance with Section 1504.8 and

1504.4.1 Low-slope system metal designed and Chapter 16 and methods RE-1.

2018 INTERNATIONAL BUILDING CODE*

MAXIMUM BASIC WIND SPEED (mph)	CLASSIFICATION	CLASSIFICATION
110	D, G or H	A, D or F
116	D, G or H	A, D or F
129	G or H	A, D or F
142	G or H	F
155	G or H	F
168	H	F
181	H	F
194	H	F

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ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

SECTION 1504 PERFORMANCE REQUIREMENTS

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

1504.1.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table 1504.1.1.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.1.1.

1504.2 Wind resistance of clay and concrete tile. Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609.5.

1504.2.1 Testing. Testing of concrete and clay roof tiles shall be in accordance with Sections 1504.2.1.1 and 1504.2.1.2.

1504.2.1.1 Overturning resistance. Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with Chapter 15 and other SBCCI SSTD 11 or ASTM C1568.

1504.2.1.2 Wind tunnel testing. Where concrete and clay roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with SBCCI SSTD 11 and Chapter 15.

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

1504.3.1 Other roof systems. Metal roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

1504.3.2 Structural metal panel roof systems. Where the metal roof panel functions as the roof deck and roof covering and it provides both weather protection and support for loads, the structural metal panel roof system shall comply with this section. Structural standing-seam metal panel roof systems shall be tested in accordance with ASTM E1592 or FM 4474. Structural through-fastened metal panel roof systems shall be tested in accordance with ASTM E1592, FM 4474 or UL 580.

Exception:

1. Metal roofs constructed of cold-formed steel shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2210.1.
2. Metal roofs constructed of aluminum shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2002.1.

1504.3.3 Metal roof shingles. Metal roof shingles applied to a solid or closely fitted deck shall be tested in accordance with ASTM D3161, FM 4474, UL 580 or UL 1897. Metal roof shingles tested in accordance with ASTM D3161 shall meet the classification requirements of Table 1504.1.1 for the appropriate maximum basic wind speed and the metal shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table 1504.1.1.

1504.4 Ballasted low-slope roof systems. Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13 shall be designed in accordance with Section 1504.8 and

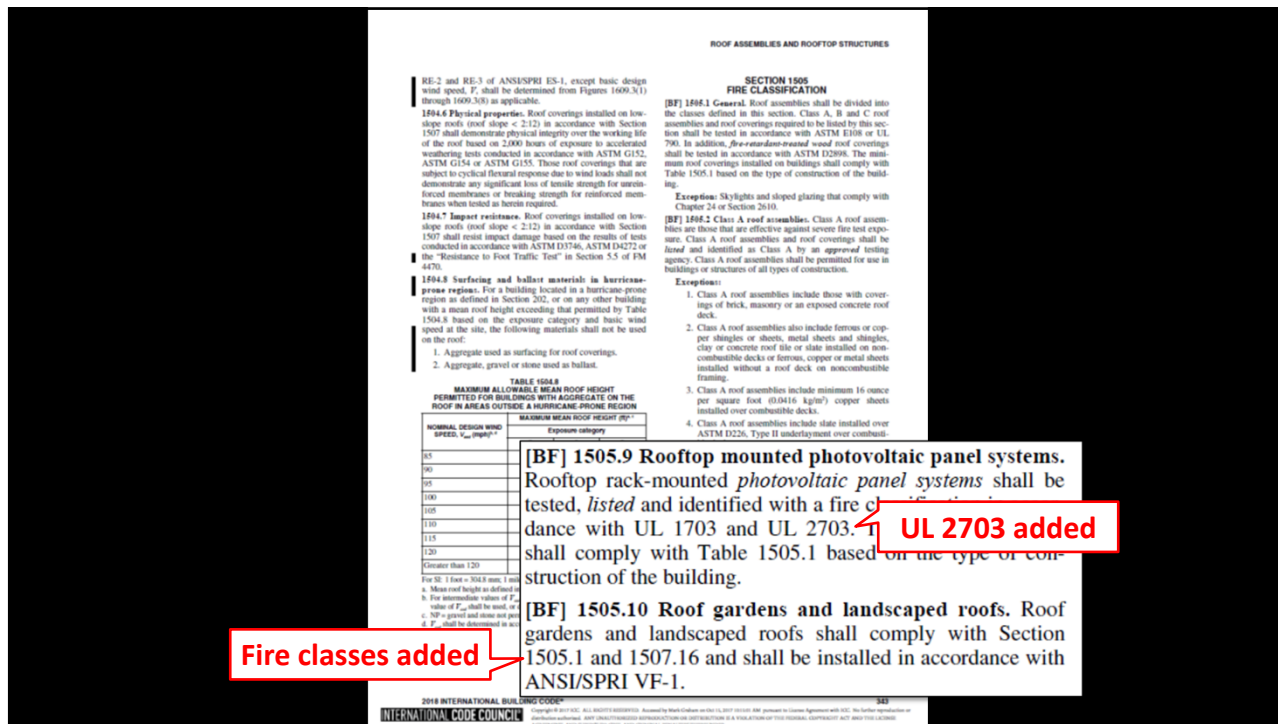
1504.4.1 Low-slope system metal designed and Chapter 16 and methods RE-1.

2018 INTERNATIONAL BUILDING CODE*

MAXIMUM BASIC WIND SPEED (mph)	CLASSIFICATION	CLASSIFICATION
110	D, G or H	A, D or F
116	D, G or H	A, D or F
129	G or H	A, D or F
142	G or H	F
155	G or H	F
168	H	F
181	H	F
194	H	F

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ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

TABLE 1507.1.1(1)
UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, V < 140 MPH	MAXIMUM BASIC DESIGN WIND SPEED, V ≥ 140 MPH
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757
Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing	ASTM D226 Type II ASTM D2626 Type I ASTM D6380 Class M mineral surfaced roll roofing
Metal panels	1507.4	Manufacturer's instructions	ASTM D226 Type II ASTM D4869 Type IV
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Slate shingles	1507.7	ASTM D226 Type II ASTM D4869 Type III or IV	ASTM D226 Type II ASTM D4869 Type IV
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Wood shakes	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type IV
Photovoltaic shingles	1507.17	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV ASTM D6757	ASTM D226 Type II ASTM D4869 Type IV ASTM D6757

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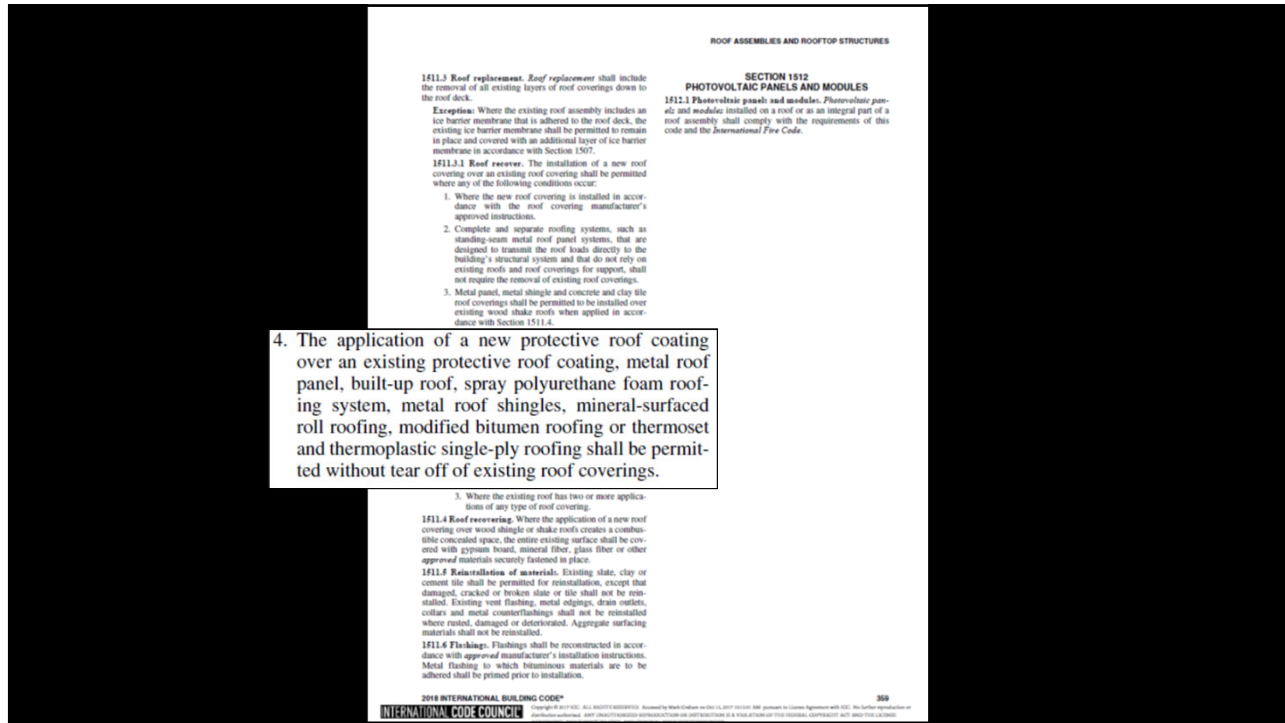
ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

TABLE 1507.1.1(2)
UNDERLAYMENT APPLICATION

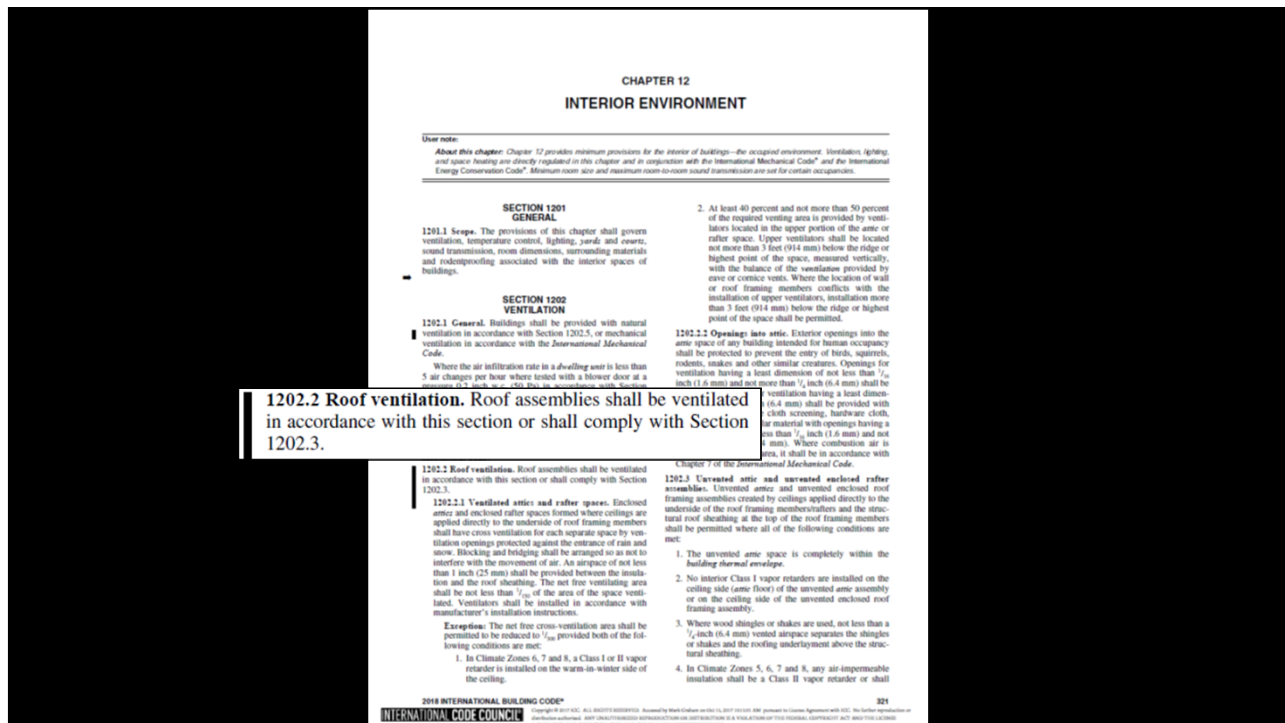
ROOF COVERING	SECTION	MAXIMUM BASIC DESIGN WIND SPEED, V < 140 MPH	MAXIMUM BASIC DESIGN WIND SPEED, V ≥ 140 MPH
Asphalt shingles	1507.2	For roof slopes from two units vertical in 12 units horizontal (2:12), up to four units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied as follows: Apply a 19-inch strip of underlayment felt parallel to and starting at the eaves. Starting at the eave, apply 36-inch-wide sheets of underlayment, overlapping successive sheets 19 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. For roof slopes of four units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be 4 inches and shall be offset by 6 feet.	Same as Maximum Basic Design Wind Speed, V < 140 mph except all laps shall be not less than 4 inches

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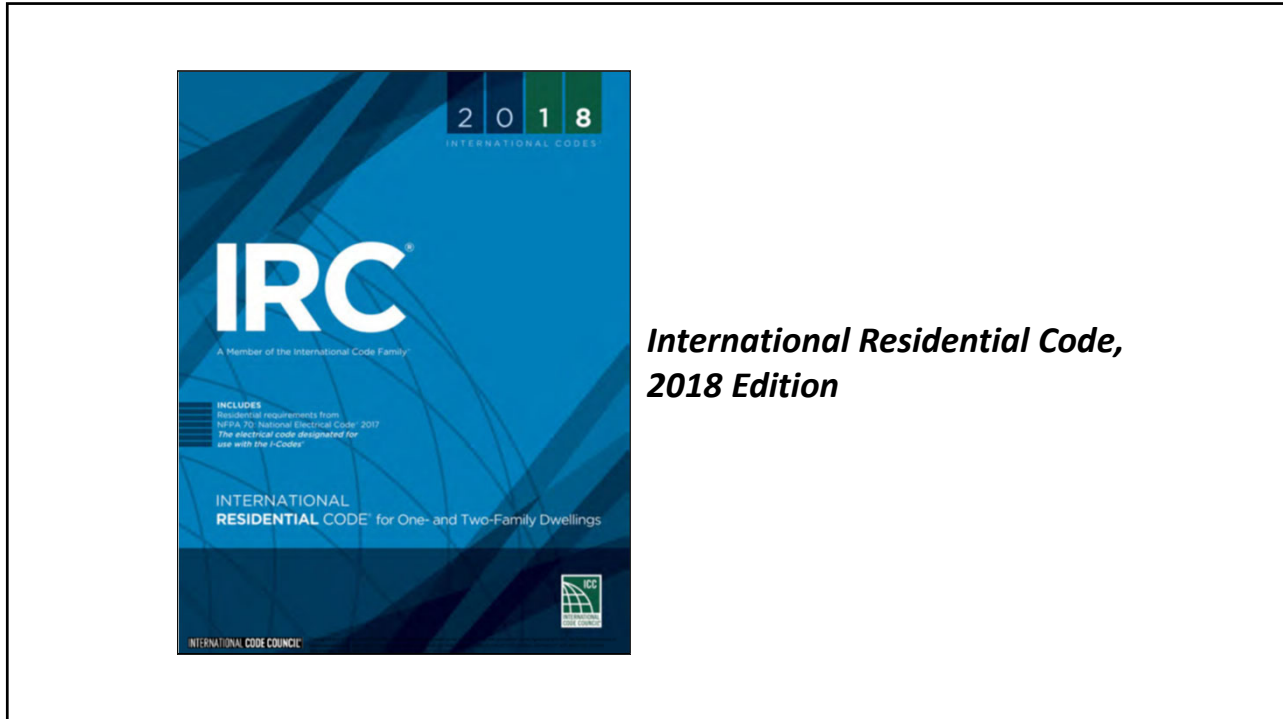
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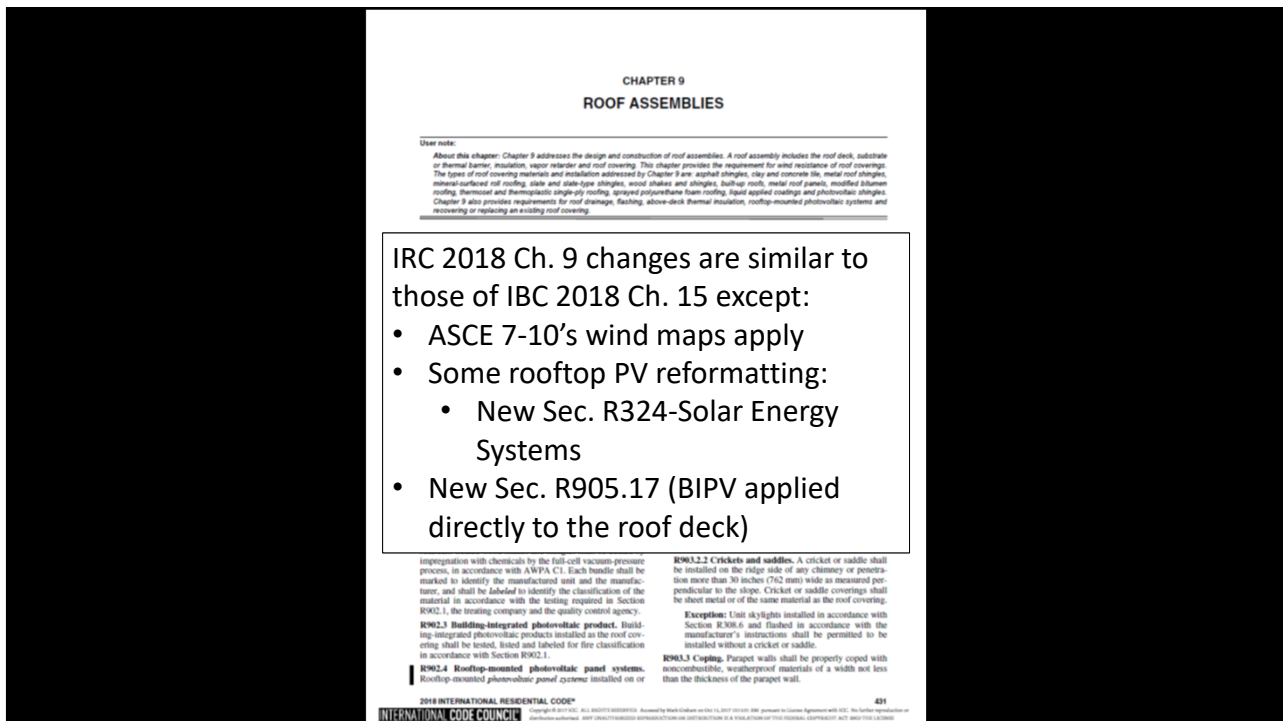


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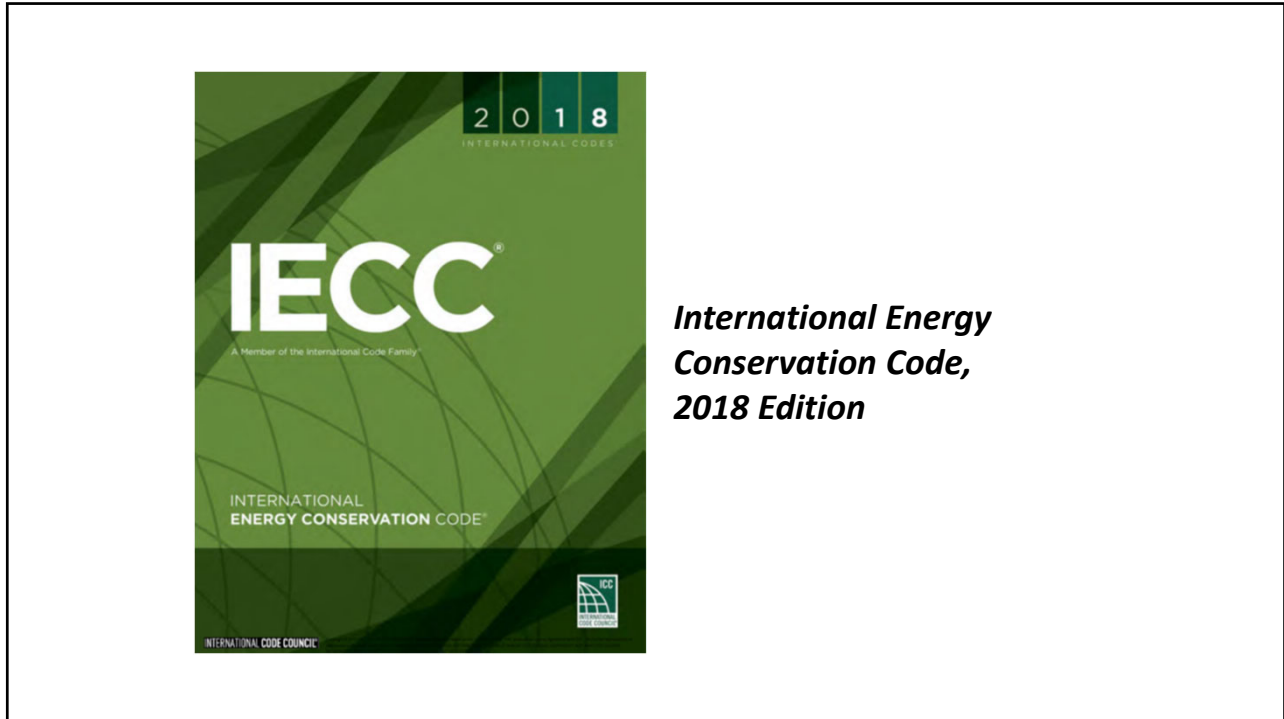


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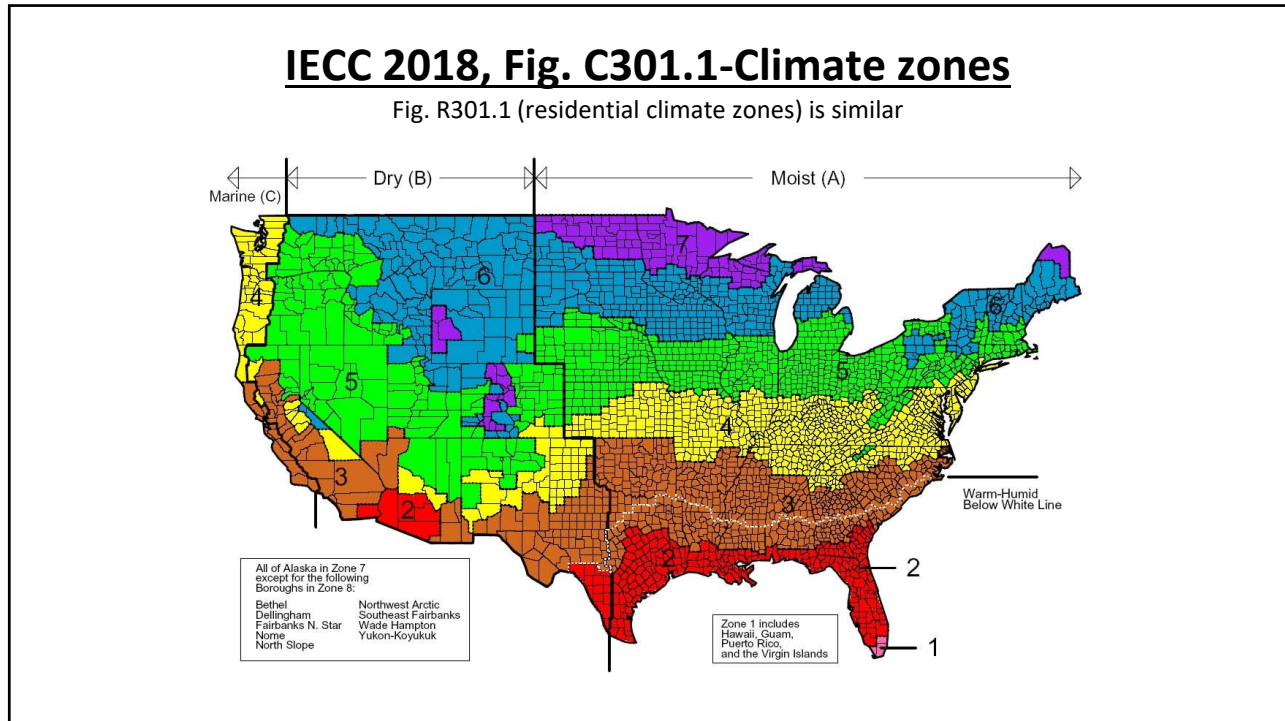


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IECC 2018's roofing-related requirements

- No substantive changes from IECC 2015
 - R-value
 - Roof reflectivity and emissivity
 - Air barriers
- ASHRAE 90.1-16 alternative
 - ASHRAE 90.1-12 referenced in IECC 2015

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COMMERCIAL ENERGY EFFICIENCY

TABLE C402.1.3 OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49
Walls, above grade																
Misc ^c	R-5.7d	R-5.7d	R-7.6d	R-7.6d	R-9.5d	R-9.5d	R-9.5d	R-11.4d	R-11.4d	R-13.3d	R-13.3d	R-15.2d	R-15.2d	R-15.2d	R-25d	R-25d
Metal building	R-11 + R-5d	R-11 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d
Metal framed	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d
Wood framed and other	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d	R-13 + R-5d
Below-grade wall	NR	NR	NR	NR	NR	NR	NR	R-7.5d	R-7.5d	R-7.5d	R-7.5d	R-7.5d	R-10d	R-10d	R-10d	R-12.5d
Floors																
Misc ^c	NR	NR	R-4.5d	R-4.5d	R-10d	R-10d	R-10d	R-10d	R-10d	R-10d	R-12.5d	R-12.5d	R-12.5d	R-15d	R-15d	R-15d
Unheated slab	NR	NR	NR	NR	NR	NR	NR	NR	NR	R-10 for 2" below	R-10 for 2" below	R-10 for 2" below	R-10 for 2" below	R-10 for 2" below	R-10 for 2" below	R-10 for 2" below
Heated slab ^d	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below	R-10 for 12" below
Overhead doors																
Overhang	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

ci = Continuous insulation, NR = No Requirement, LS = Laser System.

a. Assembly description can be found in ANSI/AIAA/ASHRAE/IESNA Appendix A.

b. When using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4.

c. R-5.7d is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having a maximum thermal conductivity of 0.44 (lb-in²/ft²·°F).

d. Where heated slabs are below grade, below-grade walls shall comply with the exterior insulation requirements for heated slabs.

e. "Mass floors" shall be in accordance with Section C402.2.3.

f. Steel floor joist systems shall be insulated to R-38.

g. "Mass walls" shall be in accordance with Section C402.2.2.

h. The first value is for perimeter insulation and the second value is for slab insulation. Perimeter insulation is not required to extend below the bottom of the slab.

i. Not applicable to garage doors. See Table C402.1.4.

C-33

2018 INTERNATIONAL ENERGY CONSERVATION CODE®

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Roofing-specific adaptation of Table C402.1.3

International Energy Conservation Code, 2018 Edition

Opaque Thermal Envelope Assembly Requirements			
Climate zone	Roof assembly configuration		
	Insulation entirely above deck	Metal buildings (with R-5 thermal blocks)	Attic and other
1	R-20ci	R-19 + R-11 LS	R-38
2	R-25ci		
3			
4			
5	R-30ci	R-25 + R-11 LS	R-49
6			
7	R-35ci	R-30 + R-11 LS	
8			

ci = Continuous insulation
 LS = Liner system (a continuous membrane installed below the purlins and uninterrupted by framing members; uncompressed, faced insulation rests on top of the membrane between the purlins)

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Comparison of IECC's various editions

Commercial Buildings (Insulation component R-value-based method)

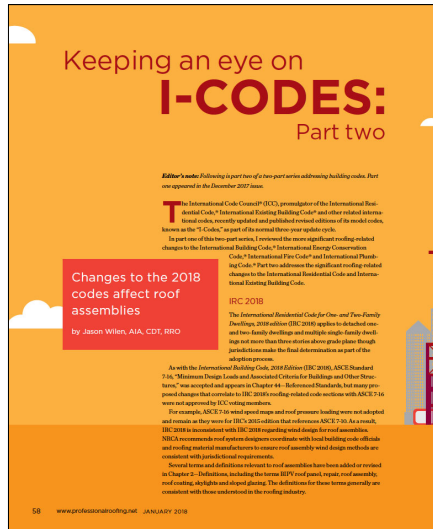
Climate Zone	IECC 2003	IECC 2006	IECC 2009	IECC 2012*	IECC 2015*	IECC 2018*
1	R-12 ci	R-15 ci	R-15 ci	R-20 ci	R-20 ci	R-20 ci
2	R-14 ci		R-20ci		R-25 ci	R-25 ci
3	R-10 ci					
4	R-12 ci	R-20 ci	R-25 ci	R-25 ci	R-30 ci	R-30 ci
5	R-15 ci					
6	R-11 ci	R-25 ci	R-25 ci	R-30 ci	R-35 ci	R-35 ci
7	R-15 ci					
8	R-15 ci	R-25 ci	R-25 ci	R-30 ci	R-35 ci	R-35 ci

* Applies to roof replacement projects
 ci = continuous insulation

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Professional Roofing, December 2017
[Link to access this article](#)



Professional Roofing, January 2018
[Link to access this article](#)

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FM Global

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Who is Factory Mutual?

- FM Approvals
 - A standards development organization (e.g., FM 4474)
 - A code-approved testing agency (e.g., 1-60, 1-90, etc.)
 - A subsidiary of FM Global
- FM Global
 - A mutually-owned insurance company (i.e., highly-protected risk)
 - Property Loss Prevention Data Sheets
 - Form X2688, “Checklist for Roofing System”

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CHECKLIST FOR ROOFING SYSTEM

FM Global OFFICE REVIEW
(Please leave blank for FM Global Office Review)

WIND:

Design Wind Speed: [] (mph)	Ground Terrain: <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D
Uplift Pressure in field: [] (psf)	Uplift Rating Required: []
Adequate Uplift Rating Provided: []	Adequate? <input type="checkbox"/> Yes <input type="checkbox"/> No

If standing seam, has collapse been reviewed? Yes No

COMMENTS: []

X2688 ENGINEERING (Rev., Oct 2016)

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February 26, 2020

Publication date... and implementation date

March 5, 2020

Roofing industry FM coalition meeting

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New FM Global Loss Prevention Data Sheets

February 26, 2020 – Accessible at www.fmglobaldatasheets.com

- FM 1-15, “Roof-Mounted Solar Photovoltaic Panels
- FM 1-28, “Wind Design”
- FM 1-29, “Roof Deck Securement and Above-deck Roof Components”
- FM 1-30, “Repair of Wind-damaged Single- and Multi-ply Roof Systems
- FM 1-31, “Roof Panel Systems”
- FM 1-34, “Hail Damage”
- FM 1-35, “Vegetative Roof Systems
- FM 1-49, “Perimeter Flashing”
- FM 1-52, “Field Verification of Roof Wind Uplift Resistance”

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FM Global Property Loss Prevention Data Sheets		1-28 October 2015 Interim Revision February 2020 Page 1 of 100
WIND DESIGN INSUREES OF FM GLOBAL SHOULD CONTACT THEIR LOCAL FM GLOBAL OFFICE BEFORE BEGINNING ANY ROOFING WORK.		
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 Interim Revision February 2020

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Wind Design **1-28**
 FM Global Property Loss Prevention Data Sheets Page 5

1.0 SCOPE

This data sheet provides general guidance to building designers regarding wind considerations with regard to property protection at highly protected buildings. This includes recommended wind pressures for common building shapes for the following:

Open buildings are not covered by this data sheet. However, a conservative approach for these roof pressures can be achieved by following the guidelines in this data sheet for enclosed buildings.

Only enclosed buildings are recommended for new construction; however, guidance is also provided for partially enclosed buildings because they may be encountered during renovations of existing structures.

Guidance in determining proper construction to resist the recommended loads in this document is included in other documents listed in Section 4.0.

Guidance related to other types of loads, such as snow, ice and rain, can be found in Data Sheet 1-54.

1.1 Changes

February 2020, Interim revision. Significant changes include the following:

A. Revised design wind guidance to reflect changes in pressure coefficients and zone dimensions in ASCE 7-16. In some cases, roof wind pressures have increased considerably based on an updated review of boundary layer wind tunnel (BLWT) test data. This document uses allowable strength design (ASD) for wind design guidance. More specific changes are noted below.

B. The basic design wind speed maps for the continental United States and Alaska remain unchanged. They are still based on ASCE 7-05. Optional design wind guidance for tornadoes is contained in Appendix D.

C. Instead of using wind isolines subject to interpolation, wind zones (polygons) are provided. For locations that fall anywhere within a given zone, the wind speed for that zone should be used without interpolation.

D. A separate 100-year MRI wind map is provided for each of the islands of Hawaii, instead of using one wind speed for all the islands. Also, because of the steep terrain on much of the islands, wind speeds on the map increase with elevation to reflect the topographic effect. So a determination of K_{zt} , which can be somewhat complicated, is not needed for Hawaii (assume 1.0).

E. Deleted wind pressure tables for walls and roofs. Roof pressures can be determined using Ratings Calculator in RoofNav. Also, pressure equations with various pressure coefficients are provided in Section 3.0 of this document.

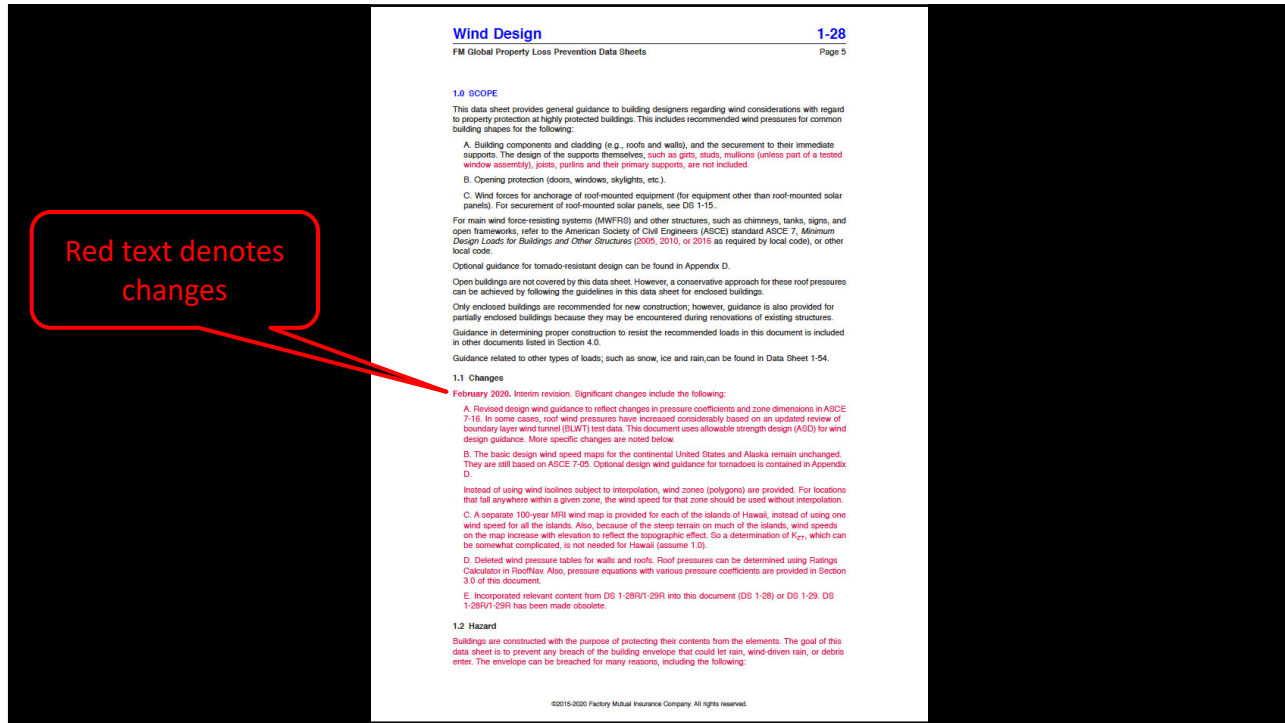
F. Incorporated relevant content from DS 1-28R1-29R into this document (DS 1-28) or DS 1-29. DS 1-28R1-29R has been made obsolete.

1.2 Hazard

Buildings are constructed with the purpose of protecting their contents from the elements. The goal of this data sheet is to prevent any breach of the building envelope that could let rain, wind-driven rain, or debris enter. The envelope can be breached for many reasons, including the following:

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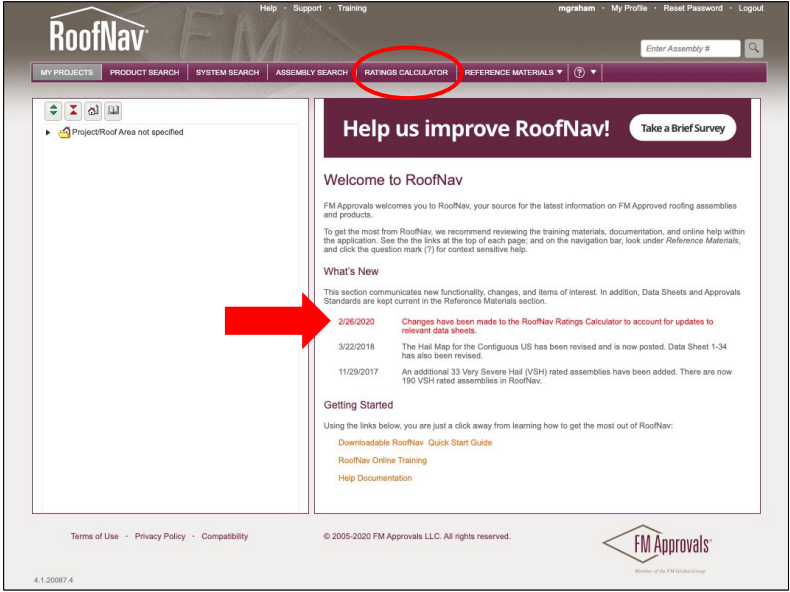
Significant changes in FM 1-28, Feb. 2020

- Wind load determination tables have been removed from FM 1-28; now use the ratings calculator in RoofNav

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FM Approvals' RoofNav

www.roofnav.com



The screenshot shows the RoofNav website interface. The navigation bar includes links for MY PROJECTS, PRODUCT SEARCH, SYSTEM SEARCH, ASSEMBLY SEARCH, RATINGS CALCULATOR (circled in red), and REFERENCE MATERIALS. A red arrow points to the 'What's New' section, which contains the following updates:

- 2/26/2020** Changes have been made to the RoofNav Ratings Calculator to account for updates to relevant data sheets.
- 3/22/2018** The Hill Map for the Contiguous US has been revised and is now posted. Data Sheet 1-34 has also been revised.
- 11/29/2017** An additional 33 Very Severe Hail (VSH) rated assemblies have been added. There are now 190 VSH rated assemblies in RoofNav.

Below the updates, there is a 'Getting Started' section with links for Downloadable RoofNav Quick Start Guide, RoofNav Online Training, and Help Documentation.

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Significant changes in FM 1-28, Feb. 2020

- Wind load determination tables have been removed from FM 1-28; now use the ratings calculator in RoofNav
- FM 1-28 now uses ASCE 7-16's pressure coefficients and zones
- FM 1-28 still uses ASCE 7-05's 100-year MRI maps
- FM 1-28 still uses the allowable strength design (ASD) method
- FM 1-28 uses (adds) an Importance Factor of 1.15

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What impacts do these changes have?

An example calculation using the Ratings Calculator:

Example: A low-rise office building (Risk Category II) is located in Chicago, IL. The building is an enclosed structure with a mean roof height of 60 ft. The building is located in an open terrain area that can be categorized as Exposure Category C.

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Calculate Wind Uplift

Roof Area Properties	Dimensions	1000 x 1000 ft (304.8 x 304.8 m)
	Height	60 ft (18.29 m)
	Slope	0.25 in 12 (1.2°)
	Min 3 ft (1 m) continuous parapet	N
Site Properties	Surface Roughness	C
	Wind Speed	90 mph
	In a Tropical Cyclone Prone region	N
	Enclosure Classification	Enclosed
Wind Pressures	Zone 1 Prime	24 psf (1.1 kPa)
	Zone 1	43 psf (2.1 kPa)
	Zone 2	57 psf (2.7 kPa)
	Zone 3	77 psf (3.7 kPa)
Wind Uplift Ratings	Zone 1 Prime	80 psf
	Zone 1	90 psf
	Zone 2	120 psf
	Zone 3	165 psf

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Comparing ASCE 7-05, FM 1-28, ASCE 7-10 and ASCE 7-16

Example: A low-rise office building (Risk Category II) is located in Chicago, IL. The building is an enclosed structure with a mean roof height of 60 ft. The building is located in an open terrain area that can be categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)			
		Zone 1' (Center)	Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corners)
ASCE 7-05	$V_{ASD} = 90$	--	24	40	58
FM 1-28 (old)	$V_{ASD} = 90$	--	27	46	69

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Comparing ASCE 7-05, FM 1-28, ASCE 7-10 and ASCE 7-16

Example: A low-rise office building (Risk Category II) is located in Chicago, IL. The building is an enclosed structure with a mean roof height of 60 ft. The building is located in an open terrain area that can be categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)			
		Zone 1' (Center)	Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corners)
ASCE 7-05	$V_{ASD} = 90$	--	24	40	58
FM 1-28 (old)	$V_{ASD} = 90$	--	27	46	69
FM 1-28 (new)	$V_{ASD} = 90$	24	43	57	77

A 59% increase

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Comparing ASCE 7-05, FM 1-28, ASCE 7-10 and ASCE 7-16

Example: A low-rise office building (Risk Category II) is located in Chicago, IL. The building is an enclosed structure with a mean roof height of 60 ft. The building is located in an open terrain area that can be categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)			
		Zone 1' (Center)	Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corners)
ASCE 7-05	$V_{ASD} = 90$	--	24	40	58
FM 1-28 (old)	$V_{ASD} = 90$	--	27	FM 1-60	69
FM 1-28 (new)	$V_{ASD} = 90$	24	43	FM 1-90	77
ASCE 7-10 Ult.	$V_{ULT} = 115$	--	39	65	97
ASCE 7-10 ASD	$V_{ASD} = 90$	--	23	39	58
ASCE 7-16 Ult.	$V_{ULT} = 105$	30	51	67	92
ASCE 7-16 ASD	$V_{ASD} = 90$	18	31	FM 1-75	55

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Calculate Wind Uplift

Dimensions		1000 x 1000 ft (304.8 x 304.8 m)
Roof Area Properties	Height	150 ft (45.72 m)
	Slope	0.25 in 12 (1.2°)
	Min 3 ft (1 m) continuous parapet	N
Surface Roughness		C
Site Properties	Wind Speed	90 mph
	In a Tropical Cyclone Prone region	N
	Enclosure Classification	Enclosed
Wind Pressures	Zone 1	44 psf (2.1 kPa)
	Zone 2	69 psf (3.3 kPa)
	Zone 3	94 psf (4.5 kPa)
Wind Uplift Ratings	Zone 1	90 psf
	Zone 2	150 psf
	Zone 3	195 psf

a = 10% of the lesser horizontal dimension, but not less than 3ft. (0.9m)

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Comparing ASCE 7-05, FM 1-28, ASCE 7-10 and ASCE 7-16

Example: A high-rise office building (Risk Category II) is located in Chicago, IL. The building is an enclosed structure with a mean roof height of 150 ft. The building is located in an open terrain area that can be categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)			
		Zone 1' (Center)	Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corners)
ASCE 7-05	$V_{ASD} = 90$	--	38	60	82
FM 1-28 (old)	$V_{ASD} = 90$	--	44	69	94
FM 1-28 (new)	$V_{ASD} = 90$	--	44	FM 1-90	94
ASCE 7-10 (Ult.)	$V_{ULT} = 115$	--	63	98	134
ASCE 7-10 ASD	$V_{ASD} = 90$	--	38	59	80
ASCE 7-16 Ult.	$V_{ULT} = 105$	--	52	82	112
ASCE 7-16 ASD	$V_{ASD} = 90$	--	31	49	67

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The values derived from FM 1-28 are not consistent with ASCE 7-16's ASD values (IBC 2018). Using FM 1-28 typically results in higher design wind loads.

Complying with the code is a minimum legal requirement.

- Where FM 1-28's values are lower, use of the code's required wind loads is recommended
- Where FM 1-28's values are higher, these may be a project-specific contract requirement

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RESEARCH+TECH



FM Global makes some changes

A new FM 1-28 introduces wind design complications for FM-insured buildings
by Mark S. Graham

22 www.professionalroofing.net APRIL 2020

[Link to article](#)

Professional Roofing

April 2020

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FM Global

Property Loss Prevention Data Sheets

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January 2016
Interim Revision February 2020
Page 1 of 50

ROOF DECK SECUREMENT AND ABOVE-DECK ROOF COMPONENTS

Note to Insurers of Factory Mutual Insurance Company: Contact the local FM Global office before beginning any roofing work.


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FM 1-29

February 2020

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Fall Education Seminar
Kansas Roofing Association

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Roof Deck Securement and Above-Deck Roof Components 1-29

FM Global Property Loss Prevention Data Sheets Page 3

1.0 SCOPE

This data sheet provides guidance on the following subjects:

A. Wind resistance, including:

1. The proper span and securement of steel roof decks to supporting members. This is appropriate information for the Structural Engineer of Record (SER).
2. The proper design and installation of above-deck roof components. This is appropriate information for the roofing professional.

B. Fire classification of roofs

Items covered include:

- roof covers
- insulation
- cover boards
- vapor retarders
- air barriers
- fasteners
- re-roof and re-cover assemblies

This data sheet is intended to be used in conjunction with RoofNav and Data Sheet 1-28, *Wind Design*. See the following data sheets for guidance on subjects that are not covered in this data sheet:

Data Sheet 1-15, *Roof Mounted Solar Photovoltaic Panels*

Data Sheet 1-42, *Maximum Foreseeable Loss Limiting Factors*, for guidance on roofs of buildings divided by MPZ fire walls

Data Sheet 1-31, *Panel Roof Systems*, for guidance on panel roofs, including lap seam, standing seam, and insulated metal panels

Data Sheet 1-33, *Self-securing Torch-Applied Roof Installations*

Data Sheet 1-34, *Hail Damage*

1.1 Changes

January 2020. Interim Revision. The following changes were made:

- A. Updated tables and examples throughout to reflect changes made to Data Sheet 1-28.
- B. Changed the terms used for roof areas from field, perimeter, and corner to Zone 1, Zone 2, and Zone 3, respectively.
- C. Added new interior roof Zone 1'.

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1-29 Roof Deck Securement and Above-Deck Roof Components

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Table 1E. 3 in. (75 mm) Deep, Type N Steel Deck with 8 in. (200 mm) Rib Spacing for Wind Ratings from 60 to 225 psf (2.9 to 10.8 kPa)

(NOTE: Use this table when the distance between ribs of roof cover fasteners is one-half the deck span or less. Green for indicates that deflection governs over bending stress.)

Yield Stress, psf	Deck Gauge	Ultimate Wind Rating per RoofNav (psf)											
		Maximum Span (ft)											
		60	75	90	105	120	135	150	165	180	195	210	225
30,000	22	13.29	11.88	10.89	10.04	9.40	8.88	8.40	8.01	7.67	7.37	7.10	6.86
	20	14.83	13.27	12.11	11.21	10.49	9.89	9.38	8.94	8.56	8.23	7.93	7.66
	18	17.39	15.56	14.20	13.15	12.30	11.60	11.00	10.49	10.04	9.65	9.30	8.98
40,000	22	20.45	18.29	16.69	15.49	14.49	13.63	12.83	12.33	11.80	11.34	10.93	10.56
	20	22.78	20.12	18.30	17.00	16.00	14.99	14.22	13.56	12.98	12.48	12.02	11.61
	18	25.79	22.51	20.62	18.98	17.60	16.49	15.54	14.84	14.26	13.74	13.25	12.80
45,000	22	24.62	21.87	20.00	18.50	17.30	16.30	15.40	14.70	14.10	13.50	13.00	12.50
	20	27.50	24.50	22.50	20.75	19.25	18.00	16.90	16.00	15.30	14.70	14.10	13.60
	18	30.75	27.50	25.25	23.25	21.50	20.00	18.75	17.75	16.90	16.20	15.60	15.00

2.2.3.4 Provide deck securement as required by RoofNav for the needed wind rating using one of the following methods:

- A. Performance-based approach: Where RoofNav assemblies are selected to account for the higher wind ratings needed in **Zone 2** and **Zone 3**, the entry for the RoofNav assembly will address the specific securement requirements.
- B. Prescriptive enhancement approach: Where a single RoofNav assembly is selected based on the needed **Zone 1** rating (assuming deck span is adequate for all areas as noted above), enhance deck securement in **Zone 2** and **Zone 3** as follows:
 1. **Zone 2:** Increase deck securement by a minimum of 50% compared to that required by RoofNav for the Zone 1 rating.
 2. **Zone 3:** Provide deck securement equivalent to at least 2 times that required by the RoofNav listing for Zone 1 and in accordance with Tables 2 or 3, where applicable.

In most cases, due to steel deck module spacing, it will be practical for both Zone 2 and Zone 3 to provide deck securement equivalent to 2 times that required by the RoofNav listing for Zone 1.

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Fall Education Seminar
Kansas Roofing Association

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Roof Deck Securement and Above-Deck Roof Components 1-29	
FM Global Property Loss Prevention Data Sheets Page 15	
Table 2. Steel Roof Deck, Zone 3 Enhancement Options for 6 in. (150 mm) Module (Rib Spacing), Common With 1 ½ in. (38 mm) Deep Deck	
Required Zone 1 Securement	Zone 3 Securement
5/8 in. welds @ 12 in. (300 mm)	5/8 in. welds or FM Approved deck fasteners @ 6 in. (150 mm)
5/8 in. welds @ 6 in. (150 mm)	Two 5/8 in. welds or two FM Approved deck fasteners @ 6 in. (150 mm)
3/4 in. welds @ 12 in. (300 mm)	¾ in. welds or FM Approved deck fasteners @ 6 in. (150 mm)
3/4 in. welds @ 6 in. (150 mm)	Two ¾ in. welds or two FM Approved deck fasteners @ 6 in. (150 mm)
One FM Approved deck fastener @ 12 in. (300 mm)	One FM Approved deck fastener with minimum ½ in. integral washer diameter or ¾ in. washer @ 6 in. (150 mm)
One FM Approved dek fasteners @ 6 in. (150 mm)	Two FM Approved deck fasteners with minimum ½ in. integral washer diameter or ¾ in. washers @ 6 in. (150 mm)
Two FM Approved deck fasteners @ 6 in. (150 mm)	Two FM Approved deck fastener with ¾ in. washer @ 6 in. (150 mm)
Table 3. Steel Roof Deck, Zone 3 Enhancement Options for 8 in. (200 mm) Module (Rib Spacing), Common with 3 in. (75 mm) Deep Deck	
Required Zone 1 Securement	Zone 3 Securement
5/8 in. welds @ 8 in. (200 mm)	Two 5/8 in. welds or two FM Approved deck fasteners @ 8 in. (200 mm)
¾ in. welds @ 8 in. (200 mm)	Two ¾ in. welds or two FM Approved deck fasteners @ 8 in. (200 mm)
One FM Approved deck fastener @ 8 in. (200 mm)	Two FM Approved deck fasteners with minimum 1/2 in. integral washer diameter or 3/4 in. washer @ 8 in. (200 mm)
Two 5/8 in. (16 mm) welds @ 8 in. (200 mm)	Two FM Approved deck fasteners with ¾ in. washers @ 8 in. (200 mm)

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FM Global
Property Loss Prevention Data Sheets **1-52**
February 2020
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FIELD VERIFICATION OF ROOF WIND UPLIFT RESISTANCE
FM Global clients must contact the local FM Global office before beginning uplift testing or any roofing work.

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FM 1-52
January 2016
Interim Revision February 2020

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Field Verification of Roof Wind Uplift Resistance 1-52
FM Global Property Loss Prevention Data Sheets Page 3

1.0 SCOPE
 This data sheet describes two methods of field testing above-deck roofing assemblies to determine if there is adequate wind resistance. It also provides alternative visual construction observation guidelines. Confirmation of acceptable wind uplift resistance on completed roof systems is critical in hurricane-prone regions. Field testing may also be used where interior construction is suspected (or known to be present) or where a partial blow-off has occurred. Field tests are not applicable to metal panel roofs (standing seam and through fastened), ballasted roofs, or mechanically fastened covers with fasteners spaced more than 2 ft (0.6 m) apart in either direction.

1.1 Changes

February 2020. This data sheet has been completely revised. The following significant changes were made:

- A. Reformatted the document to simplify implementation of testing. Moved procedures for field testing and visual construction observation (VCO) to appendices to facilitate their use.
- B. Renamed the “safety factor” for testing to “uplift testing” factor (Ω_{test}).
- C. Updated the roof zone nomenclature.
- D. Added testing parameters to accommodate a new interior roof zone (Zone 1’).**
- E. Moved supporting information from Section 2.0 to Section 3.0 (Table 3.1 Commentary).

- Wood deck
- Cementitious panel roof deck
- Structural concrete with a minimum ultimate compressive strength ($f'c$) of 2500 psi (17.4 MPa)
- Lightweight insulating concrete (LWIC) in which roof cover fasteners completely penetrate the LWIC and fully engage minimum 22 ga. (0.0295 in., 0.75 mm) steel form deck

Note: Verification of roof cover fastener spacing may be accomplished by visual identification or nondestructive examination (e.g., metal detection).

2.1.2 If uplift tests are performed, ensure testing requirements are included in the building contract, and roofing contracts/subcontracts when applicable, to determine that the wind uplift performance for the test areas meets the specifications in this data sheet.

2.1.3 Have testing witnessed by the owner's representative.

2.1.4 Record the results of uplift tests or visual construction observation (VCO) on FM Global Form 2688, *Checker for Roofing Systems*, which must be maintained on file and forwarded to the FM Global local servicing office. See Appendix C for a copy and suggested contract wording.

2.1.5 Have a roofing professional present to repair the test areas and return the roof area to a watertight condition should any of the tests fail.

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Fig. 2.3.12-1. Uplift test location example. Note: sections A1 with individual roof areas up to 60,000 ft² (5,600 m²) and no change in above-deck roofing assembly for Zones 1 and 1'.

Table 2.3.12-1. Minimum Number of Negative Pressure Tests

Roof Area (A) [ft² or m²]	Minimum Number of Individual Tests(per Roof Zone)			
	Zone 1'	Zone 1	Zone 2	Zone 3
A < 10,000 (930)	See Note 1.	1	1	1
10,000 (930) < A < 60,000 (5,600)		2	2	1
A > 60,000 (5,600) or multiple adjoining roof areas	See Note 1.			

1 See Sections 2.3.8 to 2.3.12 and Figure 2.3.12-1.

per Equation 2:

$$F_{req} [R] = U_s [psf] \times A_{substructure} [ft^2] + Weight_{substructure} [R]$$

$$F_{req} [kN] = U_s [kPa] \times A_{substructure} [m^2] + Weight_{substructure} [kN]$$

(Eq. 2)

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Table 2.2.5-2. Required Passing Uplift Test Pressures

Roof Zone	Velocity Pressure, v_z (psf)	Pressure Coeff. C_{pe} (psf)	Design Wind Pressure, p (psf)	Minimum FM Approved Rating ¹ (psf)	Uplift Testing Factor, U_{LF} (see 2.2.4)	Required Passing Uplift Test Pressure ² (psf)
3	25.8	-3.28	-100.3	-1,215	1.25	-125
2		-2.48	-79.8	-1,150	1.25	-82
1		-1.68	-59.8	-1,120	1.25	-79
1'		-1.08	-32.0	-1,751	1.25	-40

¹ Due to the lower end limit (1,400 and 10 psf increments for FM Approved roof assembly ratings, in some cases the rating of the installed roof assembly may be significantly higher than both the design wind pressure and required passing uplift test pressure. The threshold of this scenario is particularly true for zone 1'.
² The minimum FM Approved roof assembly rating is based upon a factor of safety of 2 over the design wind pressure. The required passing uplift test pressure is lower than the minimum FM Approved rating in all scenarios.

2.2.5 Except where otherwise noted, evaluation of uplift tests resulting in a passing designation is based on withstanding the required passing uplift test pressure (U) or equivalent for its respective roof zone for a period of 1 minute without experiencing any defined mode of failure.

2.2.7 To prevent water damage to insulation, promptly patch and make watertight all damaged/failed test areas.

2.2.8 Perform repairs in accordance with Data Sheets 1-30, Repair of Wind Damaged Single- and Multi-Ply Roof Systems; 1-28, Wind Design; and 1-29, Roof Deck Securement and Above-Deck Roof Components.

2.3 Negative Pressure Test

2.3.1 The negative pressure uplift test is generally preferable to the bonded uplift test. It is not to be used directly on porous surfaces because the test requires an airtight seal between the test apparatus and the roof covering.

2.3.2 Negative pressure uplift tests may be conducted on totally adhered built-up roofs (BUR), modified bitumen (mod bit), or single-ply membranes. This test can also be performed on mechanically attached base sheets, or mechanically attached/plate-bonded/induction-welded reinforced single-ply membranes if fasteners are spaced no more than 2 ft (0.6 m) on center in both orthogonal directions.

2.3.3 For the fastened base sheets or reinforced single-ply membranes described in Section 2.3.2, the negative pressure apparatus may be used provided a minimum of one fastener is tested at its full fastener-to-fastener span in both orthogonal directions.

2.3.4 Conduct negative pressure uplift tests in accordance with Appendix D, Negative Pressure Test Procedure.

2.3.5 Determine the minimum number of individual negative pressure tests per roof area (NOT per building) in accordance with Table 2.2.5-2.

2.3.10 Only two tests are required for every interior roof area (see Figure 2.3.12-1).

2.3.11 If a roof area includes Zone 1', **and** the construction of the above-deck roofing assembly **does** differ between Zone 1 and Zone 1', test Zone 1' using the appropriate Zone 1' test pressure.

2.3.12 If a roof area includes Zone 1 and Zone 1', **and** the construction of the above-deck roofing assembly **does not** differ between Zone 1 and Zone 1', testing of Zone 1 is sufficient.

FM Global intends these new guidelines to be effective as of February 26, 2020 (date of publication)

Some observations


- FM field engineers have been trained on 2/26/20 revisions
- Some FM field engineers are acting “empowered”:
 - Directing work
 - “Requiring” the use of specific materials
 - Stopping work
- FM is not a party in the Roofing Contractor’s contract
- Consider FM’s changes as a change to your Contract
 - Request a Change Order

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FM’s very severe hail (VSH) classifications

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RESEARCH+TECH



Understanding FM VSH

FM has implemented a new impact-resistance classification by Mark S. Graham

Commercial and industrial insuree FM Global and its code-approved testing agency subsidiary, FM Approvals, have implemented a Very Severe Hail (VSH) impact-resistance classification that could affect some of the work you do.


FM Global guidelines
 FM Global traditionally has recommended its insured building owners use moderate hail (MH) and severe hail (SH) classified roof systems for buildings located in areas FM Global considers to be susceptible to moderate or severe hail impacts. FM Loss Prevention Data Sheet 1-34 (FM 1-34), "Hail Damage," provides a map identifying these regions. In recent years, the U.S. insurance industry has experienced increases in losses from hail in terms of the number of claims reported and costs of those claims. A majority of the hail damage occurs in roof systems and other roofing components. In the latest version of FM 1-34, dated October 2014, FM Global has identified a new VSH region, encompassing Oklahoma, Kansas and some northern counties in Texas. FM 1-34 Table 1 identifies the specific northern Texas counties.

To access FM Global Data Sheets, including FM 1-34—"Hail Damage," go to www.professionalroofing.net.

22 www.professionalroofing.net DECEMBER 2017

Professional Roofing, December 2017
[Link to access this article](#)

RESEARCH+TECH



Designing for hail resistance

Did you know FM Global has updated its hail design guidance? by Mark S. Graham

In March, property and building loss insuree FM Global updated its Property Loss Prevention Data Sheet 1-34, "Hail Damage." (FM 1-34). If you work on buildings insured by FM Global, you should be aware of its latest hail resistance guidelines and the effects they may have on roof system selection and design.

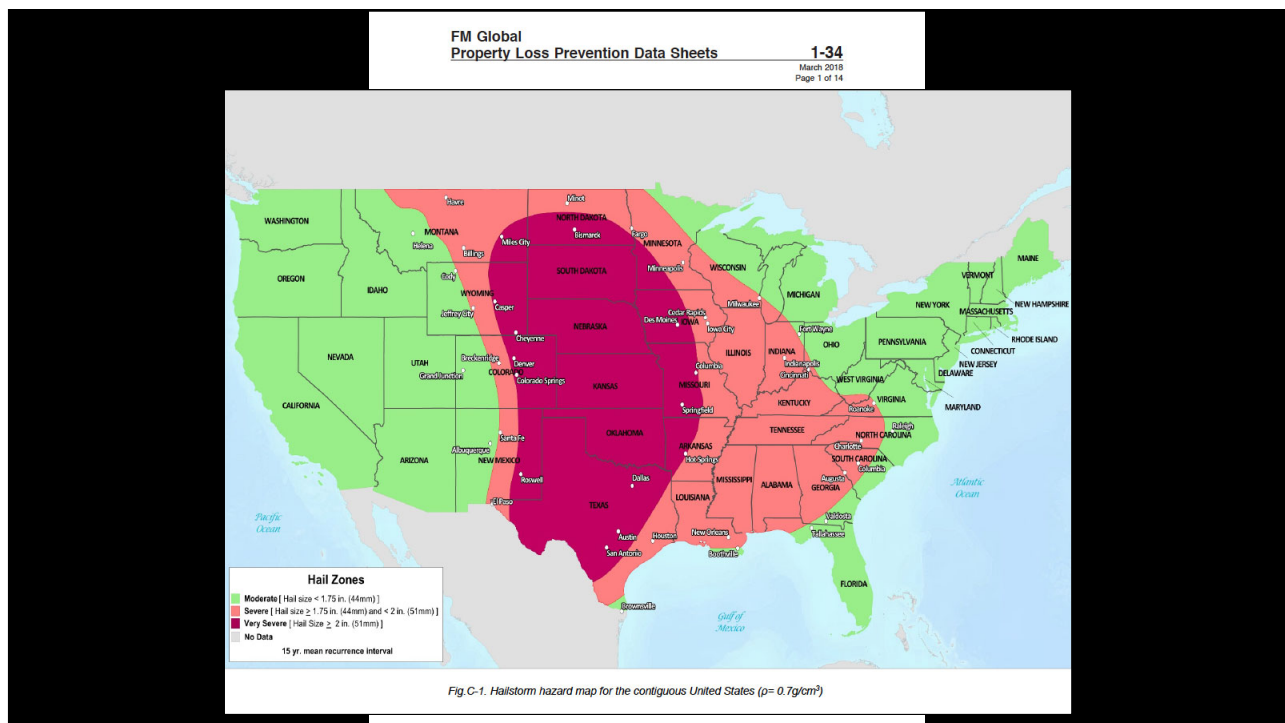
FM 1-34
 FM 1-34 provides loss prevention guidelines to minimize the potential for hail damage to buildings, roof-mounted equipment and other outdoor equipment. FM Global intends FM 1-34 and its other Property Loss Prevention Data Sheets to apply to the insured buildings. However, some designers use the Property Loss Prevention Data Sheets as design guidelines for buildings (and roof systems) other than those insured by FM Global.

FM Global contends hailstorms are a widespread hazard affecting many areas of the world that can severely damage buildings' roof systems, roofing HVAC units and skylights. Cooling towers and exposed glass and plastic components of outdoor equipment also can be

20 www.professionalroofing.net MAY 2018

Professional Roofing, May 2018
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Of the 981,181 roof assemblies in FM's RoofNav;
6,317 have a VSH classification

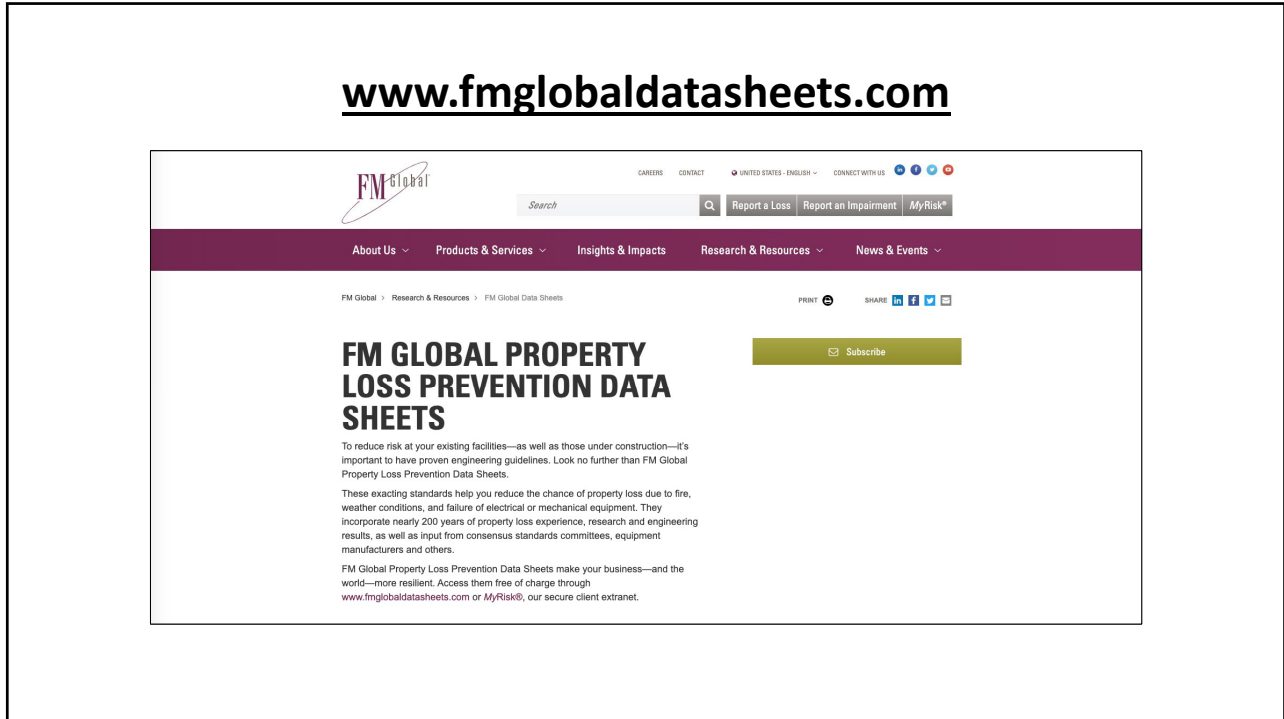
As of Oct. 7, 2020

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Some characteristics of a VSH roof system

- From FM Approvals' RoofNav:
 - BUR: 124
 - MB: 4,776
 - Single ply: 1,417 (adhered only)
- Only several manufacturers have a majority of the single ply VSH approvals
- Many single-ply systems require the use of wood sheathing as a coverboard


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Understanding underlayments

Roof system type	IBC 2015			IBC 2015		
	Section	$V_{w} < 120$ mph	$V_{w} \geq 120$ mph	Section	$V_{w} < 140$ mph	$V_{w} \geq 140$ mph
Asphalt shingles	1507.2	ASTM D226, Type I ASTM D4869, Type I ASTM D6757	ASTM D226, Type II ASTM D4869, Type IV ASTM D6757 ASTM D1970	R905.2	ASTM D226, Type I ASTM D4869, Type I, II, III or IV ASTM D6757	ASTM D226, Type IV ASTM D4869, Type IV ASTM D6757 ASTM D1970
Clay and concrete tile	1507.3	ASTM D226, Type II ASTM D2626 ASTM D6380, Class III	ASTM D226, Type II ASTM D2626 ASTM D6380, Class III ASTM D1970	R905.3	ASTM D226, Type II ASTM D2626, Type I ASTM D6380, Class III	ASTM D226, Type II ASTM D2626, Type I ASTM D6380, Class III ASTM D1970
Metal panels	1507.4	Not applicable	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.10	Manufacturer's instructions	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Metal shingles	1507.5	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.4	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Mineral-surfaced roll roofing	1507.6	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D1970	R905.5	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Slate shingles	1507.7	ASTM D226, Type II ASTM D4869, Type III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.6	ASTM D226, Type I ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Wood shingles	1507.8	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.7	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970
Wood shakes	1507.9	ASTM D226, Type I ASTM D4869	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970	R905.8	ASTM D226, Type I or II ASTM D4869, Type I, II, III or IV	ASTM D226, Type II ASTM D4869, Type IV ASTM D1970

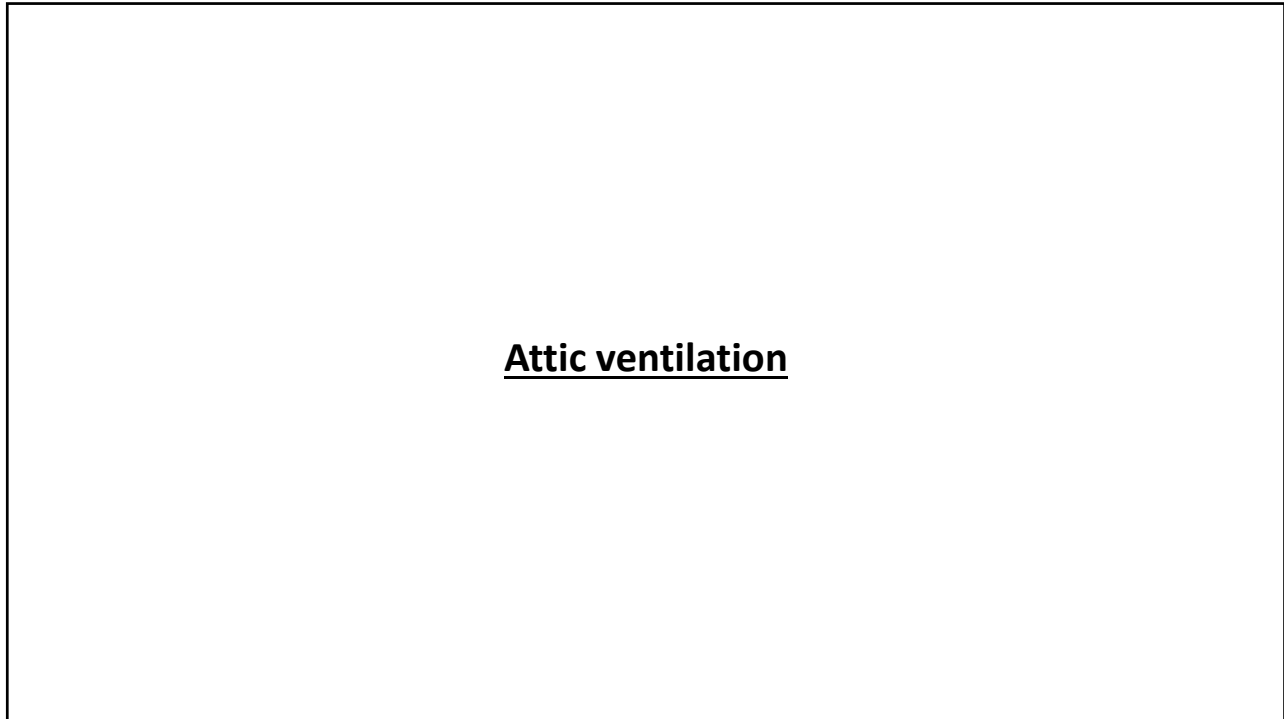
Professional Roofing,
December 2016

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NRCA synthetic underlayment testing

- Shed water
- Dimensional stability values vary greatly
 - Shrinkage and wrinkling concerns
- Some products are permeable, others non-permeable
 - Which should you use?

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Attic ventilation

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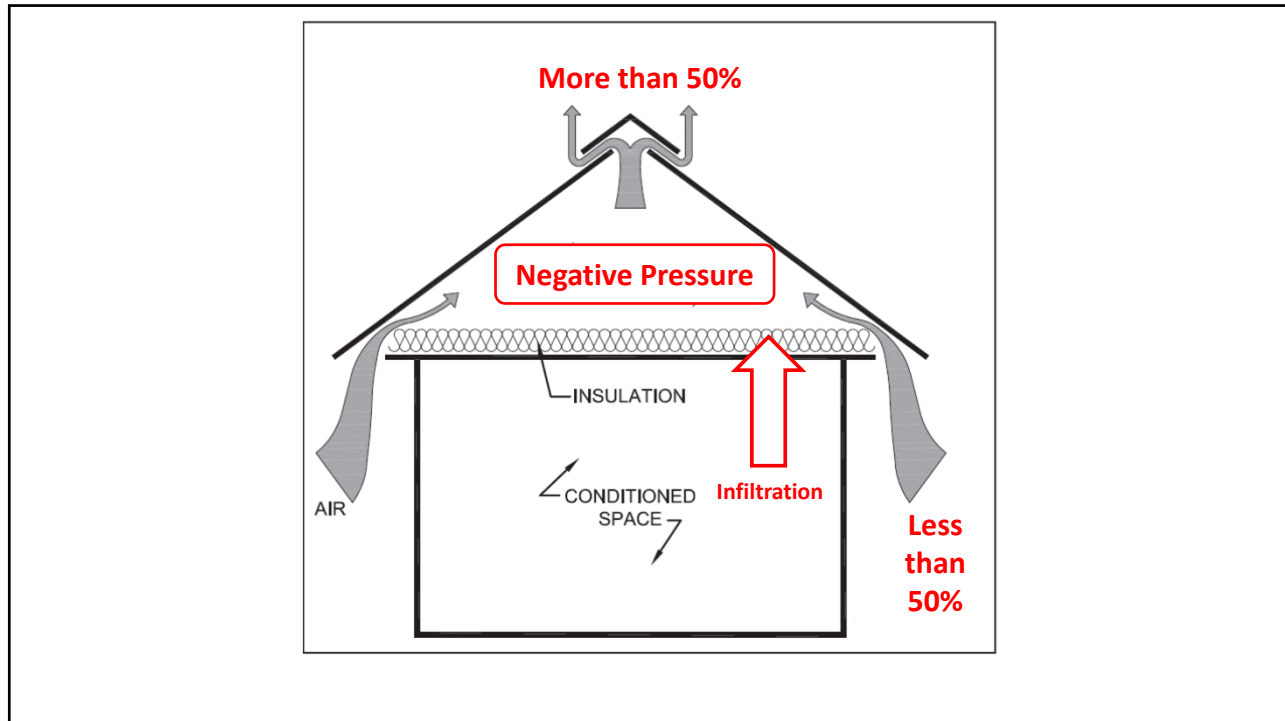
RESEARCH+TECH

Clearing the air
Considerations for attic ventilation
by Mark S. Graham

Professional Roofing
July 2018

Link

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Be careful not to install excess amounts of ridge vents.... It can have undesirable consequences

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Questions... and other topics

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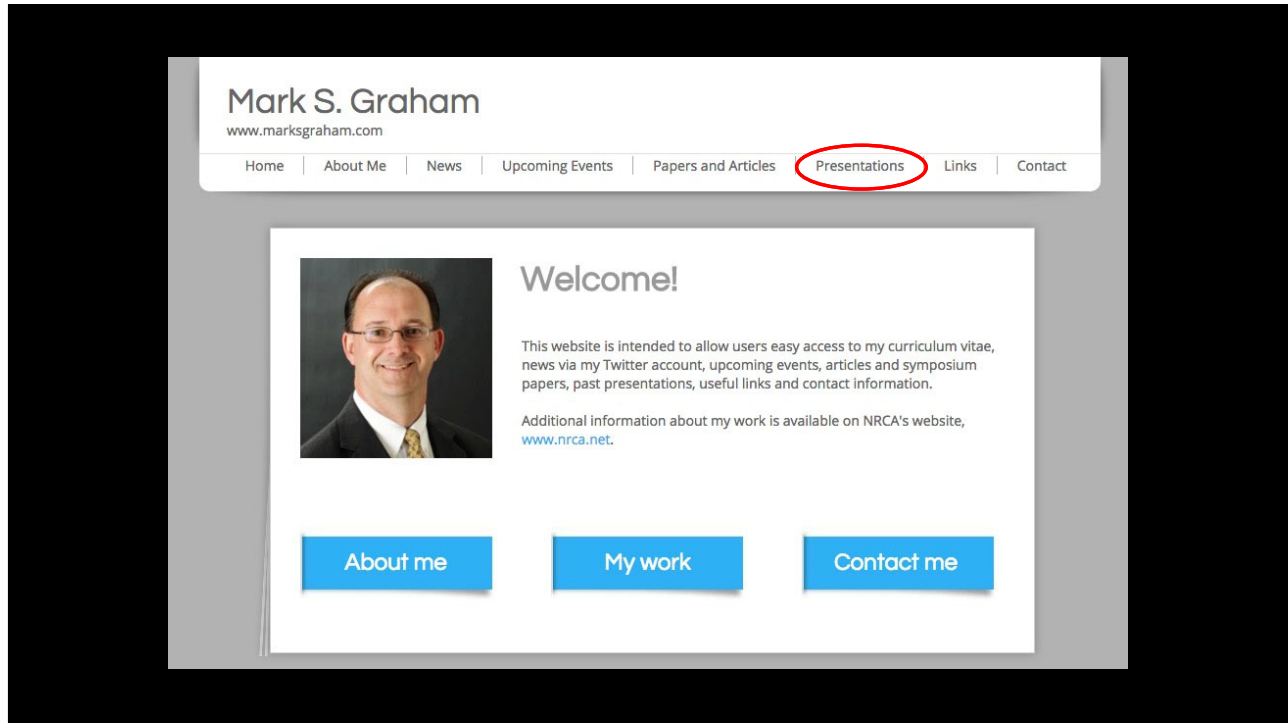
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