Low Slope Roofing Systems
The University of Wisconsin Madison
Madison, Wisconsin – November 29-30, 2016

The codes

presented by

Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
Rosemont, Illinois

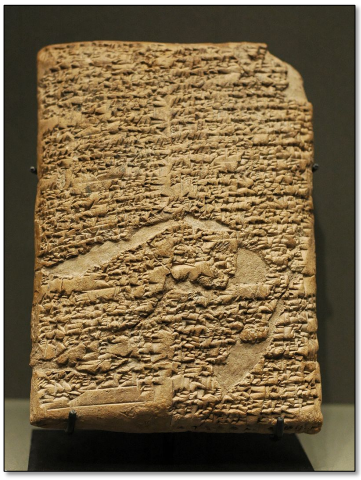
The purpose of the code

International Building Code, 2015

[A] 101.3 Intent. The purpose of this code is to establish the minimum requirements to provide a reasonable level of safety, public health and general welfare through structural strength, *means of egress* facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards attributed to the built environment and to provide a reasonable level of safety to fire fighters and emergency responders during emergency operations.

Code of Hammurabi

- Babylonian empire (1754 BC)
- 282 laws, scaled punishment
- "…an eye for an eye, a tooth for a tooth…"
- Specific provisions to construction and contracts



Legacy codes

Early 1900s up to 1999

- Building Officials and Code Administrators International (BOCA)
  - *The BOCA National Building Code*
- Southern Building Code Congress International (SBCCI)
  - *The Standard Building Code*
- International Conference of Building Officials
  - *Uniform Building Code*

International Code Council (ICC)

Beginning in 2000 and currently

ICC INTERNATIONAL CODE COUNCIL®

People Helping People Build a Safer World™

THE I-CODES

- ICC Performance Code (ICCPC)
- International Building Code (IBC)
- International Energy Conservation Code (IECC)
- International Existing Building Code (IEBC)
- International Fire Code (IFC)
- International Fuel Gas Code (IFGC)
- International Green Construction Code (IgCC)
- International Mechanical Code (IMC)
- International Plumbing Code (IPC)
- International Private Sewage Disposal Code (IPSDC)
- International Property Maintenance Code (IPMC)
- International Residential Code (IRC)
- International Swimming Pool and Spa Code (ISPSC)
- International Wildland-Urban Interface Code (IWUIC)
- International Zoning Code (IZC)

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I-code publication cycle

- 2000 edition
- 2003 edition
- 2006 edition
- 2009 edition
- 2012 edition
- 2015 edition
- 2018 edition (currently in final development)

Three-year code development and publication cycle

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Some background

Current code concept

- The I-codes are "model codes" developed by the International Code Council (ICC)
- Model codes serve as the technical basis for state or local code adoption
- The code provides the minimum legal requirements for building construction…and operation
- The code is enforced by the "authority having jurisdiction" (AHJ)
- The code can also provide a basis for construction claims-related litigation

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Code enforcement

- Code official
- Construction litigation

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Legal considerations

"In most states, a building code violation is considered to be evidence of negligence. In some situations, a building code violation may be considered *negligence per se…*"

--Stephen M. Phillips
Hendrick, Phillips, Salzman & Flatt

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Who is responsible?

- The building owner
- And, everyone else involved

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AIA General Conditions

AIA A201 – General Conditions of The Contract for Construction

Article 3 Contractor

3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statues, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by and made known to the Contractor as a request for information in such a form as the Architect may require.

AIA General Conditions

AIA A201 – General Conditions of The Contract for Construction

3.2.4 …If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay the costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages …for nonconformities of the Contract Documents to… codes…

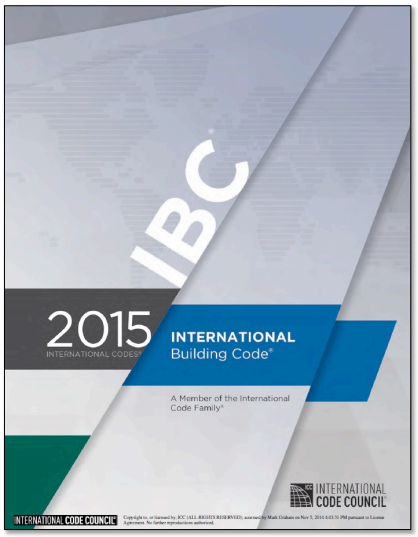
So, it pays to know...

or, it can cost you if you don't know.

Roofing-specific provisions

Discussed in this presentation

International Building Code, 2015 Edition



- Applicable to all buildings and structures, excepts those applicable to IRC 2015
- Roofing-related requirements:
  - Ch. 10-Means of egress
  - Ch. 12-Interior environment
  - Ch. 13-Energy efficiency
  - Ch. 15-Roof assemblies and rooftop structures
  - Ch. 16-Structural design
  - Ch. 20-Aluminum
  - Ch. 22-Steel
  - Ch. 24-Glass and glazing
  - Ch. 26-Plastic

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Significant roof requirements

International Building Code, 2015 Edition

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

Wind resistance

International Building Code, 2015 Edition
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.

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.

1504.3.1 Other roof systems. Built-up, modified bitumen, fully adhered or mechanically attached single-ply roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane roof coverings shall be tested in accordance with FM 4474, UL 580 or UL 1897.

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

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

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

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

Asphalt shingles installed over a roof deck complying with Section 1609.5.1 shall comply with the wind-resistance requirements of Section 1504.1.1.

1609.5.3 Rigid tile. Wind loads on rigid tile roof coverings shall be determined in accordance with the following equation:

$M_a = q_h C_L b L L_a [1.0 - G C_p]$ **(Equation 16-34)**

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SECTION 1603
CONSTRUCTION DOCUMENTS

1603.1 General. *Construction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.8 shall be indicated on the *construction documents*.

1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

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

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Fundamental premise

Wind resistance ≥ Design wind load

FM or UL rating ≥ ASCE 7

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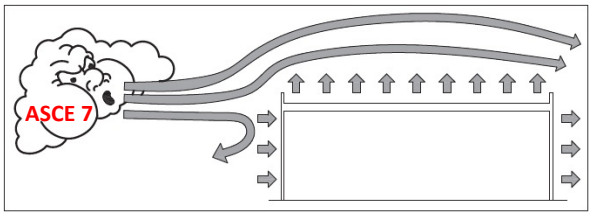
The fundamental concept



Wind creates pressures/forces
on building elements

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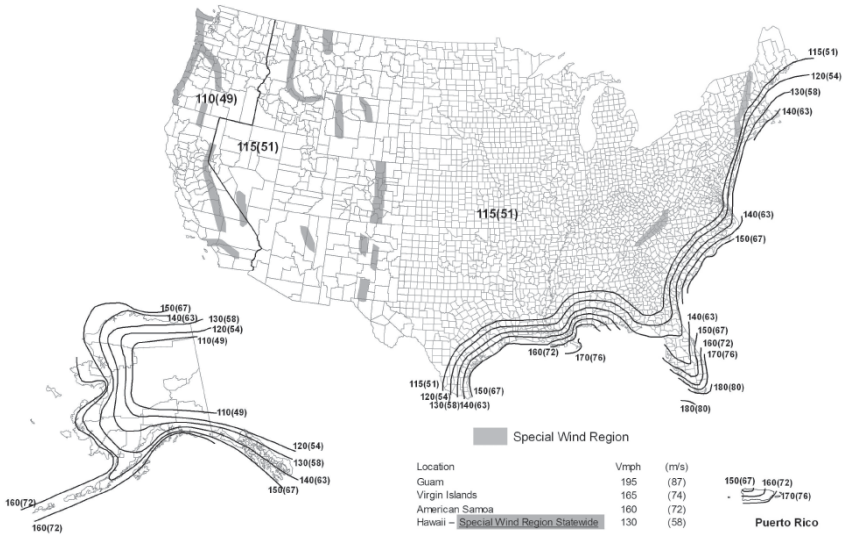
Basic wind speed

ASCE 7-10, Occupancy Category II Buildings



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Pressure coefficients (GC_p)

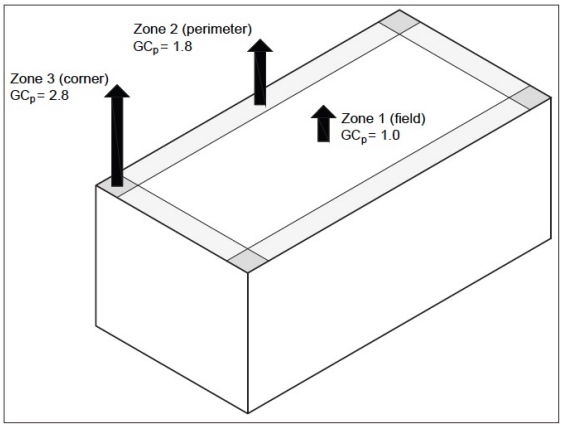

Illustration based upon ASCE 7-10, Fig. 30.4-2A ($\theta \leq 7°$); Effective wind area = 10 ft^2

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ASCE 7-10

Strength design method vs. Allowable stress method

- ASCE 7-10 is based upon the strength design method
  - Increased wind speeds on map
  - Load factor of 1.6
- ASCE 7-10 allows for conversion of allowable stress design (ASD) method:

  ASD value = Strength design value x 0.6
- ASCE 7-05 and previous editions were based upon the ASD method

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FM Loss Prevention Data Sheet 1-28

Wind Design (October 2016)

FM Global
Property Loss Prevention Data Sheets 1-28

Table 3. Roof Field Area (Zone 1) Uplift Design Pressure, p, for Exposure B, Flat or Gable Roof, Θ ≤ 7°
(For 60 ft (18 m) < h < 90 ft (27 m), limited to h/w ≤ 1); Enclosed Building

$p = 0.00256\ K_z\ K_{zt}\ K_d\ V^2\ I\ [(GC_p) - (GC_{pi})]$ in pounds per ft² (psf)

Enclosed Building; Roof Zone 1 (Field Area), Effective Wind Area 1 to 10 ft²;
$K_{zt} = 1.0$; $z = h$; $(GC_p) = -1.0$ for $h < 90$ ft and $(GC_p) = -1.4$ for $h \geq 90$ ft; $(GC_{pi}) = 0.18$

Mean Roof Height h (ft)	Basic Wind Speed, V, 3-sec gust, (mph)											
	≤ 85	90	100	110	120	130	140	145	150	160	170	185
	Roof Field Area Uplift Design Pressure, p, Exposure B (psf)											
0-15	15	17	21	25	30	35	41	43	47	53	60	71
30	15	17	21	25	30	35	41	43	47	53	60	71
60	18	20	25	31	36	43	49	53	57	65	73	86
89	20	23	28	34	41	48	55	60	64	72	82	97
90	27	31	38	46	55	64	74	80	86	97	110	130
100	28	32	39	47	56	66	77	82	88	100	113	134
200	34	39	48	58	69	80	93	100	107	122	138	163
300	39	43	53	65	77	91	105	112	121	137	155	183
400	42	47	58	70	84	98	114	122	131	149	168	199
500	45	50	62	75	89	105	121	130	139	158	179	212

3.2.6 Importance Factor 18
3.3 Wind Design Pressures for Roofs 18

Roof Design Negative Pressure Multipliers Zones 1, 2, 3 for Flat and Gabled Roofs
Apply multipliers to pressure values in Tables 3, 4, and 5, as appropriate.

Mean Roof Height, h	Roof Slope	Enclosed Building			Partially Enclosed Building[6]		
		Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
h ≤ 60 ft (18 m); and when h/w ≤ 1 for 60 < h < 90 ft (18 < h < 27.4 m)	Θ ≤ 7°	1.0	1.68	2.53	1.31	1.99	2.85
	7° < Θ ≤ 27°	0.92	1.59	2.36	1.23	1.91	2.67
	27° < Θ ≤ 45°	1.0	1.17	1.17	1.31	1.48	1.48

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FM Loss Prevention Data Sheet 1-29

Roof Deck Securement and Above-deck Components (April 2016)

FM Global
Property Loss Prevention Data Sheets 1-29
January 2016
Interim Revision April 2016
Page 1 of 49

FM Global testing has shown that fastener placement on the insulation board has a significant effect on the ultimate strength of the assembly. For example, research conducted with 4 × ft 4 ft × 1.5 in. (1.2 m × 1.2 m × 38 mm) polyisocyanurate insulation covered with a BUR showed a dramatic change in performance simply by rearranging the fasteners on the boards. For both tests, the fastening density was 1 fastener per 1.78 ft² (0.17 m²). Figures 6a and 6b show the fastener placement for each test.

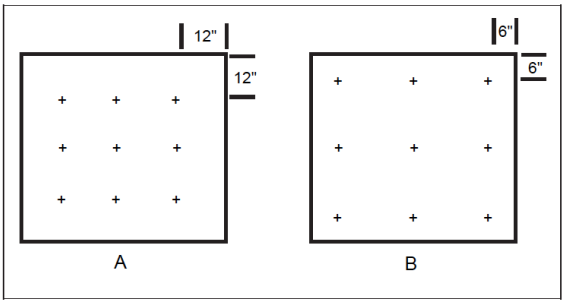

Fig. 6a/6b. 4 x 4 ft (1.2 x 1.2 m) insulation boards secured with nine fasteners per board.

The test of pattern 6a failed at 105 psf (5.0 kPa) by fracture of the insulation board. The test of pattern 6b failed at 160 psf (7.6 kPa) by screws pulling out of the deck.

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Comparing FM 1-28 to ASCE 7-05 and ASCE 7-10

Example: A manufacturing building located in New Orleans, LA. The building is an enclosed structure with a low-slope roof system and a roof height of 33 ft. The building is located in an area that is categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)		
		Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corner)
FM 1-28 (without SF)	v = 120	43	72	108
FM 1-28 (w/ 2.0 SF)		86	144	216
ASCE 7-05 (without SF)	v = 120	38	63	95
ASCE 7-05 (w/ 2.0 SF)		76	126	190
ASCE 7-10 Strength design	v_{ULT} = 150	59	99	148
ASCE 7-10 ASD (without SF)	v_{ASD} = 116	35	59	89
ASCE 7-10 ASD (w/ 2.0 SF)		71	118	178

Design wind load determination

www.roofwinddesigner.com

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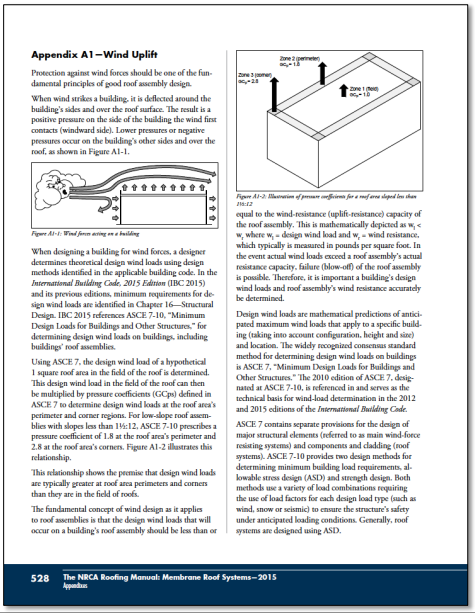
The NRCA Roofing Manual

2015 Manual (July 2016 update), Appendix A1-Wind uplift



Appendix A1—Wind Uplift

Protection against wind forces should be one of the fundamental principles of good roof assembly design.

When wind strikes a building, it is deflected around the building's sides and over the roof surface. The result is a positive pressure on the side of the building the wind first contacts (windward side). Lower pressures or negative pressures occur on the building's other sides and over the roof, as shown in Figure A1-1.

Figure A1-1: Wind forces acting on a building

When designing a building for wind forces, a designer determines theoretical design wind loads using design methods identified in the applicable building code. In the *International Building Code, 2015 Edition* (IBC 2015) and its previous editions, minimum requirements for design wind loads are identified in Chapter 16—Structural Design. IBC 2015 references ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures," for determining design wind loads on buildings, including buildings' roof assemblies.

Using ASCE 7, the design wind load of a hypothetical 1 square roof area in the field of the roof is determined. This design wind load in the field of the roof can then be multiplied by pressure coefficients (GCps) defined in ASCE 7 to determine design wind loads at the roof area's perimeter and corner regions. For low-slope roof assemblies with slopes less than 1½:12, ASCE 7-10 prescribes a pressure coefficient of 1.8 at the roof area's perimeter and 2.8 at the roof area's corners. Figure A1-2 illustrates this relationship.

This relationship shows the premise that design wind loads are typically greater at roof area perimeters and corners than they are in the field of roofs.

The fundamental concept of wind design as it applies to roof assemblies is that the design wind loads that will occur on a building's roof assembly should be less than or

Figure A1-2: Illustration of pressure coefficients for a roof area sloped less than 1½:12

equal to the wind-resistance (uplift-resistance) capacity of the roof assembly. This is mathematically depicted as $w_l < w_r$ where w_l = design wind load and w_r = wind resistance, which typically is measured in pounds per square foot. In the event actual wind loads exceed a roof assembly's actual resistance capacity, failure (blow-off) of the roof assembly is possible. Therefore, it is important a building's design wind loads and roof assembly's wind resistance accurately be determined.

Design wind loads are mathematical predictions of anticipated maximum wind loads that apply to a specific building (taking into account configuration, height and size) and location. The widely recognized consensus standard method for determining design wind loads on buildings is ASCE 7, "Minimum Design Loads for Buildings and Other Structures." The 2010 edition of ASCE 7, designated at ASCE 7-10, is referenced in and serves as the technical basis for wind-load determination in the 2012 and 2015 editions of the *International Building Code*.

ASCE 7 contains separate provisions for the design of major structural elements (referred to as main wind-force resisting systems) and components and cladding (roof systems). ASCE 7-10 provides two design methods for determining minimum building load requirements, allowable stress design (ASD) and strength design. Both methods use a variety of load combinations requiring the use of load factors for each design load type (such as wind, snow or seismic) to ensure the structure's safety under anticipated loading conditions. Generally, roof systems are designed using ASD.

Fire classification

International Building Code, 2015 Edition, Sec. 1505-Fire Classification

Roof assemblies shall be tested and listed:

- Class A: Severe fire-exposure

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

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

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

[Footnoted omitted for clarity]

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Look for listing or certification marks

Installation requirements

International Building Code, 2015 Edition, Sec. 1506-Materials

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

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Prescriptive requirements

International Building Code, 2015 Edition, Sec. 1507-Requirements for Roof Coverings

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

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Reroofing

International Building Code, 2015 Edition, Sec. 1511-Reroofing
IBC's previous editions: Sec. 1510-Reroofing

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

Exceptions:

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

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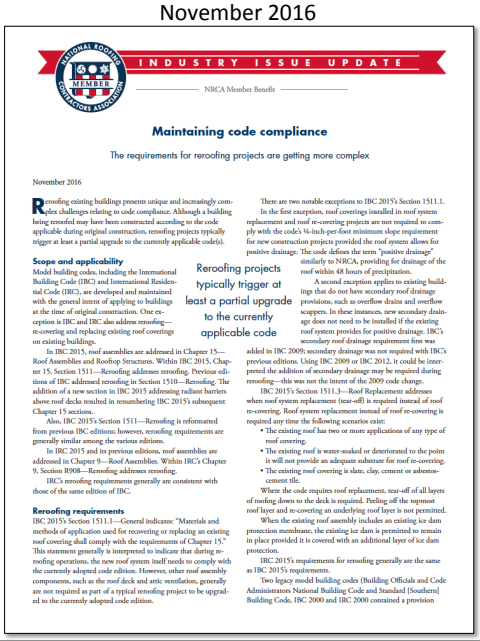
NRCA "Industry Issue Update"

November 2016



INDUSTRY ISSUE UPDATE

NRCA Member Benefit

Maintaining code compliance

The requirements for reroofing projects are getting more complex

November 2016

Reroofing existing buildings presents unique and increasingly complex challenges relating to code compliance. Although a building being reroofed may have been constructed according to the code applicable during original construction, reroofing projects typically trigger at least a partial upgrade to the currently applicable code(s).

Scope and applicability

Model building codes, including the International Building Code (IBC) and International Residential Code (IRC), are developed and maintained with the general intent of applying to buildings at the time of original construction. One exception is IBC and IRC also address reroofing—re-covering and replacing existing roof coverings on existing buildings.

Reroofing projects typically trigger at least a partial upgrade to the currently applicable code

In IBC 2015, roof assemblies are addressed in Chapter 15—Roof Assemblies and Rooftop Structures. Within IBC 2015, Chapter 15, Section 1511—Reroofing addresses reroofing. Previous editions of IBC addressed reroofing in Section 1510—Reroofing. The addition of a new section in IBC 2015 addressing radiant barriers above roof decks resulted in renumbering IBC 2015's subsequent Chapter 15 sections.

Also, IBC 2015's Section 1511—Reroofing is reformatted from previous IBC editions; however, reroofing requirements are generally similar among the various editions.

In IRC 2015 and its previous editions, roof assemblies are addressed in Chapter 9—Roof Assemblies. Within IRC's Chapter 9, Section R908—Reroofing addresses reroofing.

IRC's reroofing requirements generally are consistent with those of the same edition of IBC.

Reroofing requirements

IBC 2015's Section 1511.1—General indicates: "Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15." This statement generally is interpreted to indicate that during reroofing operations, the new roof system itself needs to comply with the currently adopted code edition. However, other roof assembly components, such as the roof deck and attic ventilation, generally are not required as part of a typical reroofing project to be upgraded to the currently adopted code edition.

There are two notable exceptions to IBC 2015's Section 1511.1.

In the first exception, roof coverings installed in roof system replacement and roof re-covering projects are not required to comply with the code's ¼-inch-per-foot minimum slope requirement for new construction projects provided the roof system allows for positive drainage. The code defines the term "positive drainage" similarly to NRCA, providing for drainage of the roof within 48 hours of precipitation.

A second exception applies to existing buildings that do not have secondary roof drainage provisions, such as overflow drains and overflow scuppers. In these instances, new secondary drainage does not need to be installed if the existing roof system provides for positive drainage. IBC's secondary roof drainage requirement first was added in IBC 2009; secondary drainage was not required with IBC's previous editions. Using IBC 2009 or IBC 2012, it could be interpreted the addition of secondary drainage may be required during reroofing—this was not the intent of the 2009 code change.

IBC 2015's Section 1511.3—Roof Replacement addresses when roof system replacement (tear-off) is required instead of roof re-covering. Roof system replacement instead of roof re-covering is required any time the following scenarios exist:

- The existing roof has two or more applications of any type of roof covering.
- The existing roof is water-soaked or deteriorated to the point it will not provide an adequate substrate for roof re-covering.
- The existing roof covering is slate, clay, cement or asbestos-cement tile.

Where the code requires roof replacement, tear-off of all layers of roofing down to the deck is required. Peeling off the topmost roof layer and re-covering an underlying roof layer is not permitted.

When the existing roof assembly includes an existing ice dam protection membrane, the existing ice dam is permitted to remain in place provided it is covered with an additional layer of ice dam protection.

IBC 2015's requirements for reroofing generally are the same as IBC 2015's requirements.

Two legacy model building codes (Building Officials and Code Administrators National Building Code and Standard [Southern] Building Code, IBC 2000 and IRC 2000 contained a provision

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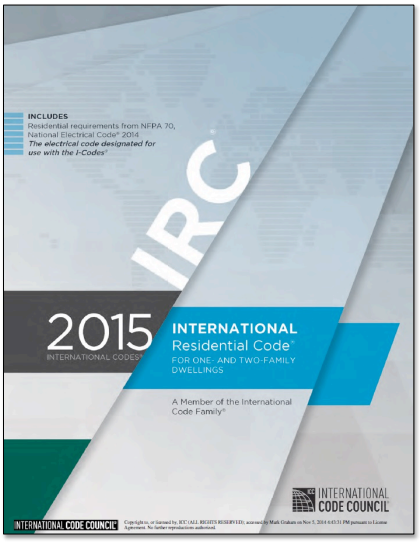
International Residential Code, 2015 Edition



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

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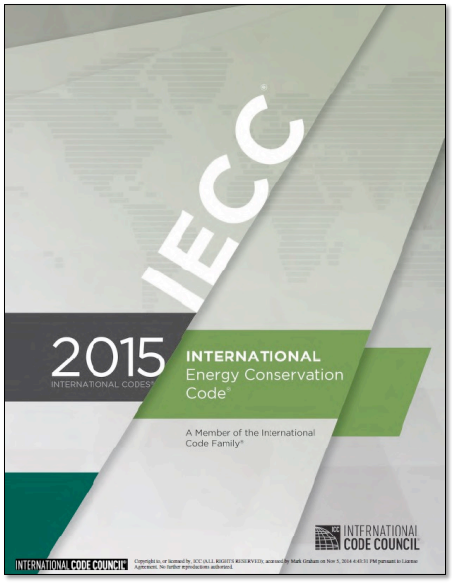
Ch. 9-Roof assemblies

International Residential Code, 2015 Edition

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



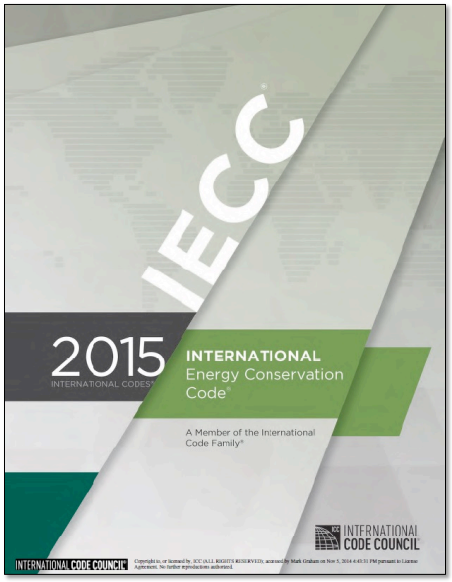
IECC 2015:

Commercial buildings:

- All except "Residential Buildings"

Residential buildings:

- One- and two-family dwellings, multiple single-family dwellings and Group R-2, R-3 and R-4 buildings three stories or less

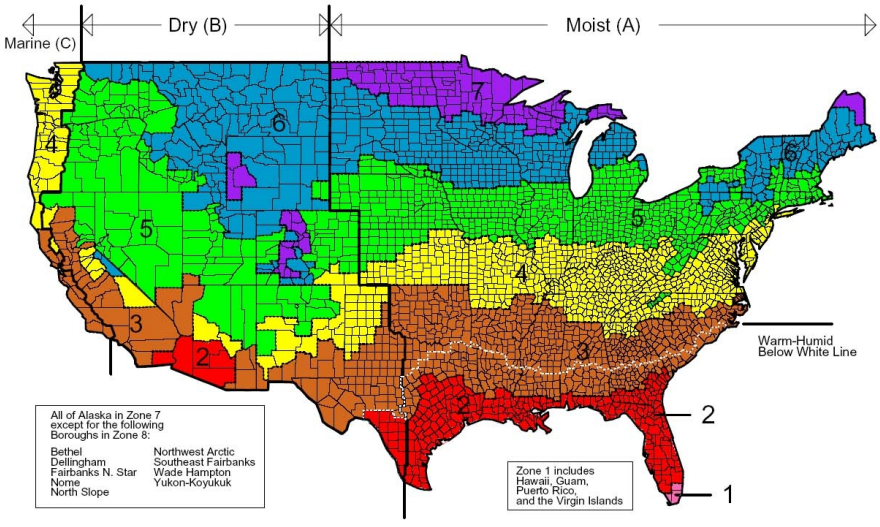


Roof requirements:

- R-value
- Roof reflectivity
- Air retarder

IECC 2015, Fig. C301.1-Climate zones

Fig. R301.1 (residential climate zones) is similar



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Minimum R-value

IECC 2015: Commercial Buildings (Insulation component R-value-based method)

Climate zone	Assembly description		
	Insulation entirely above deck	Metal buildings	Attic and other
1	R-20ci (all other) R-25ci (Group R)	R-19 + R-11 LS	R-38
2	R-25ci		
3			
4	R-30ci		R-38 (except Marine 4)
5			R-38 (all other) R-49 (Group R, Marine 4)
6		R-25 + R-11 LS	R-49
7	R-35ci	R-30 + R-11 LS	
8			

ci = Continuous insulation; LS = Liner system

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Comparison of IECC's various editions

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

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

* Applies to roof replacement projects
ci = continuous insulation

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Reflectivity

International Energy Conservation Code, 2015 Edition (Commercial)

C402.3 Roof solar reflectance and thermal emittance. Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: [Refer to earlier "Cool and Green Roofs" presentation]

TABLE C402.3
MINIMUM ROOF REFLECTANCE AND EMITTNCE OPTIONS

Three-year solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75
Three-year-aged solar reflectance index of 64

[Footnotes omitted for clarity]

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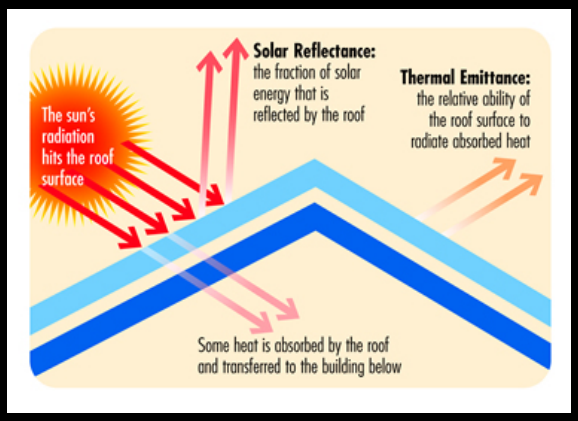

Courtesy of the Cool Roofs Rating Council

Definitions

Solar reflectance: The fraction of solar flux reflected by a surface expressed within the range of 0.00 and 1.00.

Thermal emittance: The ratio of radiant heat flux emitted by a surface to that emitted by a black body radiator at the same temperature expressed within a range of 0.00 to 1.00.

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Definitions – cont.

Solar reflectance index (SRI): The relative steady-state surface temperature of a surface with respect to the standard white (SRI = 100) and standard black (SRI = 0) under standard solar and ambient conditions.

--ASTM E 1980

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Air barrier

International Energy Conservation Code, 2015 Edition (Commercial), Sec. C402.5

"A continuous building envelope air barrier shall be provided throughout the building envelope…." (Except 2B)

Test methods:

- Whole building: Not greater than 0.40 cfm/ft^3
- Assembly: Not greater than 0.04 cfm/ft^3
- Material: Not greater than 0.004 cfm/ft^3
  - Deemed to comply: BUR, MB, adhered single ply and SPF

Air barrier not required in reroofing projects unless also recladding (IECC 2015 only: Sec. C502.4)

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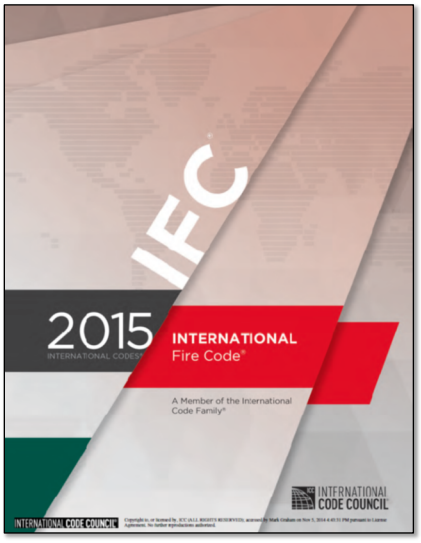
International Fire Code, 2015 Edition



Applicability:

- Structures, facilities and conditions
- Existing conditions and operations

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Roofing-related provisions

International Fire Code, 2015 Edition

- Sec. 303-Asphalt kettles
- Sec. 317-Rooftop gardens
- Sec. 605.11-Solar photovoltaic systems
- Sec. 905.3.8-Rooftop gardens
- Sec. 3317-Safeguarding roofing operations

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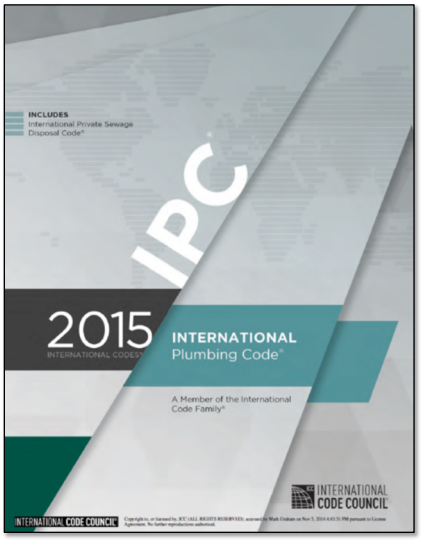
International Plumbing Code, 2015 Edition



- Applicable to all plumbing systems, except those applicable to IRC 2015
- Roofing-related requirements:
  - Ch. 11-Storm drainage

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Ch. 11-Storm drainage

Changes incorporated into IPC 2015

Sec. 1101.7-Roof drainage

- Design based upon maximum possible water depth; assume drains are blocked.
- [Sec. 1105.2-Roof drain flow rate] Based upon head of water above the roof drain.

Sec. 1103-Traps

- Leaders and storm drains connected to a building sewer system shall not be required to be trapped.

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Ch. 11-Storm drainage

Changes incorporated into IPC 2015

Sec. 1101.6-Size of conductors, leaders and storm drains

- Design roof drainage based on flow rate of roof drain, Table 1106.2-Storm drain pipe sizing (gpm) and Table 1106.3-Vertical leader sizing (gpm)
- Design gutters based upon flow rate from the roof surface, Table 1106.6-Horizontal gutter sizing (gpm) and Table 1106.3-Vertical leader sizing (gpm)

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How do you deal with alternatives to what is permitted by the Code…

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Alternative materials, design and methods of construction and equipment

- IBC 2015, Sec. 104.11
- IRC 2015, Sec. R104.11
- IECC 2015, Sec. C102.1 and Sec. R102.1
- IFC 2015, Sec. 104.9
- IPC 2015, Sec. 105.2

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***Professional Roofing*, June 2008**

Tech Today

Other options

Take advantage of alternative approval provisions in building codes

by Mark S. Graham

BUILDING CODES by their nature tend to be limiting—they limit designs, materials and construction methods to those specifically prescribed in codes and meeting codes' performance requirements. However, most codes contain provisions that allow building officials to approve alternatives that are not specifically permitted by the codes.

You should be aware of these alternative approval provisions because they apply to an increasing number of roofing products and roof systems.

Alternative approval

The 2006 edition of the International Building Code (IBC) includes the following statement regarding alternatives: "104.11 Alternative materials, design and methods of construction and equipment. The provisions of the code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work is, for the purpose intended, at least the equivalent of that prescribed in this code for quality, strength, effectiveness, fire resistance, durability and safety."

Evaluation reports

To assist in evaluating alternatives, building officials likely will request supporting data in the form of valid research reports from recognized sources.

ICC Evaluation Service (ICC-ES) Inc. issues research reports, commonly referred to as "evaluation reports," based on technical evaluations the company performs on building products, components and materials. Because ICC-ES is a subsidiary of the International Code Council, which publishes IBC, ICC-ES evaluation reports are considered by most building officials to be valid research reports when considering alternative approvals.

ICC-ES evaluation reports are available for hundreds of manufacturers' building components, products and systems, including many roofing products. These reports can be obtained from the individual manufacturers that have requested evaluations and on ICC-ES' Web site.

Roofing products

IBC's alternative approval provisions provide a viable means for you to gain a building official's approval of newly developed roofing products and roof systems and those not yet specifically permitted by IBC.

Roofing products that are not specifically permitted by IBC but have evaluation reports include synthetic steep-slope underlayments; fiber cements and synthetic shingles, shakes and slates; metal shingles; some specialty asphalt shingles; and hot, fluid-applied membrane roof systems.

IBC's alternative approval provisions also can be used to gain a building official's approval for roof system types the code does not completely address.

For example, vegetative green roof systems are described in the code; however, the code does not contain specific external fire- and wind-resistance classification information that is considered appropriate for vegetative green roof systems.

At this time, I am not aware of any manufacturer of vegetative green roof systems that has obtained a system-specific evaluation report. However, I hope manufacturers will pursue evaluation reports to help roofing professionals obtain building officials' approvals through the code's alternative approval provisions.

Additional information about building code requirements specific to roofing products and roof systems is provided in *The NRCA Building Codes Manual, Third Edition.*

Mark S. Graham is NRCA's associate executive director of technical services.

For links to ICC-ES' Web site and lists of ICC-ES acceptance criteria and evaluation reports, as well as a link to more information about *The NRCA Building Codes Manual, Third Edition*, log on to www.professionalroofing.net.

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July 2008 www.professionalroofing.net

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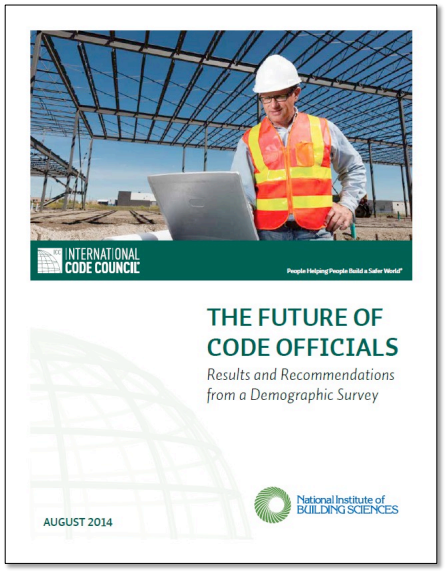
ICC/NIBS survey

www.ICCsafe.org



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A typical code official

- Between the ages of 55 and 64
- A jurisdiction employee (rather than third-party provider)
- Works in a one- to nine-person jurisdiction, less than 75,000 in population
- Earns between $50,000 and $75,000 (mean 2012 salary was $51,017 according to the U.S. Census Bureau)
- Has 26 to 35 years of experience in the building industry, but only five to 15 years as a code official
- Entered the code profession in their 30s; held one to three prior jobs; first job was as a tradesperson

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A typical code official - continued

- May possess a bachelor's degree (27 percent), or have no additional education beyond high school (25 percent)
- If they hold a bachelor's degree, it is probably in engineering, but it could be in management, accounting, finance, etc.
- Holds a professional license, certificate, certification or other credential
- Current role is as a inspector, plan reviewer or department manager; possibly all of these roles
- Expect to leave the profession in the next five to 15 years.

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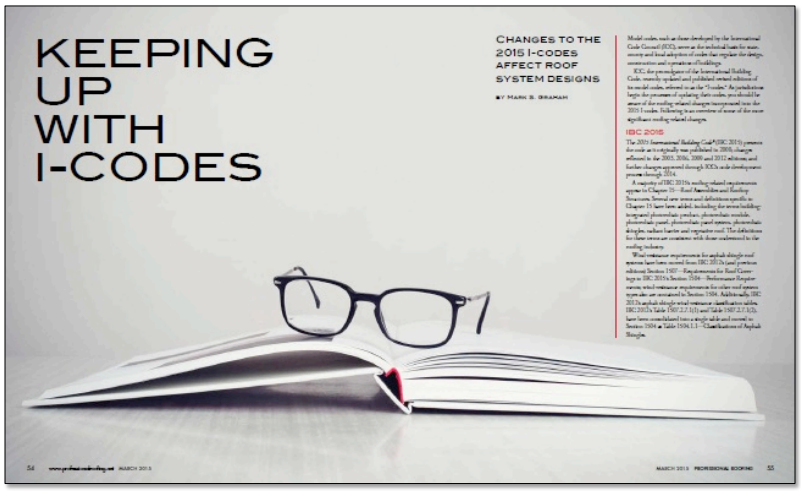
KEEPING UP WITH I-CODES

CHANGES TO THE 2015 I-CODES AFFECT ROOF SYSTEM DESIGNS

BY MARK S. GRAHAM

IBC 2015

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Code compliance is becoming increasingly challenging and presents significant liability risks

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Consider joining ICC…

Membership categories:

- Corporate member: $400 (complete collection)
- Building safety professional member: $150 (1 code)

http://www.iccsafe.org

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Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association
10255 West Higgins Road, 600
Rosemont, Illinois 60018-5607

(847) 299-9070
mgraham@nrca.net
www.nrca.net

Twitter: @MarkGrahamNRCA
Personal website: www.MarkGrahamNRCA.com

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