



Building code update

presented by

Mark S. Graham

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



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Prerequisites

- Intermediate- to advanced-level
- Some knowledge of code requirements
- General knowledge of 2012 I-codes
- Understand...I am the messenger

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Some background

- 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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International Code Council (ICC)



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 (ISPSA)
International Wildland-Urban Interface Code (IWUIC)
International Zoning Code (IZC)

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Publication cycle

- 2000 edition
 - 2003 edition
 - 2006 edition
 - 2009 edition
 - 2012 edition
 - 2015 edition
 - 2018 edition (currently in development)
- Three-year code development and publication cycle

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Roofing-specific provisions

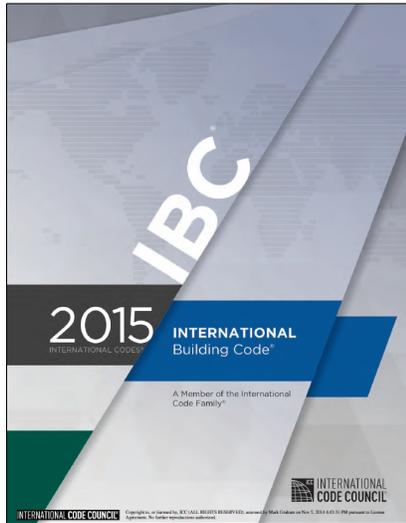
Discussed in this presentation



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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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Ch. 10 – Means of egress

Sec. 1015.6-Mechanical equipment, systems and devices

- *Guards* have been required for components where services is required within 10 ft. of roof edge or where elevated walkways are raised above 30 inches
- Exception now added for permanent fall arrest/restraint anchors
- Devices shall be reevaluated for possible replacement when the entire roof covering is replaced

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Ch. 12-Interior environment

Sec. 1203.2-Ventilation required

- 1:150 rule with 1:300 exception
- 1:300 exception reworded and more consistent with IRC
- Unvented attic and unvented enclosed rafter provisions add in Sec. 1203.3-Unvented attics and unvented enclosed rafter assemblies

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Ch. 13-Energy efficiency

Sec. 1301.1.1-Criteria

- Reference to the International Energy Conservation Code (IECC)
- Reference to IECC 2015 added

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1502-Definitions

- References to chapter-specific definitions in Ch. 2-Definitions
- New terms and definitions added:
 - Building-integrated photovoltaic (BIPV) product
 - Photovoltaic module
 - Photovoltaic panel
 - Photovoltaic panel system
 - Photovoltaic shingles
 - Radiant barrier

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1504.1-Wind resistance of roofs

- Wind resistance requirements for asphalt shingles relocated from Sec. 1507 to Sec. 1504.1.1
- Asphalt shingle wind resistance classification tables combined into Table 1504.1.1-Classification of asphalt shingles

[Continued...]

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1504.1-Wind resistance of roofs

- Wind resistance of structural metal panel roof systems is now subdivided:
 - Thru-fastened: FM 4474, UL 580 or ASTM E1592
 - Standing seam: ASTM E1592 or UL 580
- Aluminum panels now allowed to be designed (testing not required) using the Aluminum Association's *Aluminum Design Manual*

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1505-Fire classification

- Slate over ASTM D226, Type II underlayment on combustible decks now Class A without testing
- BIPV products now need to be *listed and labeled* for fire classification

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1507-Requirements for roof coverings

- New requirements for PV shingles added in Sec. 1507.17-Photovoltaic shingles
 - Deck requirements
 - Slope
 - Underlayment
 - Fasteners/attachment
 - Material standards (UL 1703)
 - Wind resistance (ASTM D3161)

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1505-Roof insulation

- FM 4450 removed, NFPA 276 added
- ASTM C1278 (fiber-reinforced gypsum board) added
- ASTM C1177 (glass-faced gypsum board) added

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Ch. 15-Roof assemblies and rooftop structures

Sec. 1509-Radiant barriers installed above deck

- New section and requirements
 - FM 4450 or UL 1256 testing
 - Comply with ASTM C1313

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Ch. 15-Roof assemblies and rooftop structures

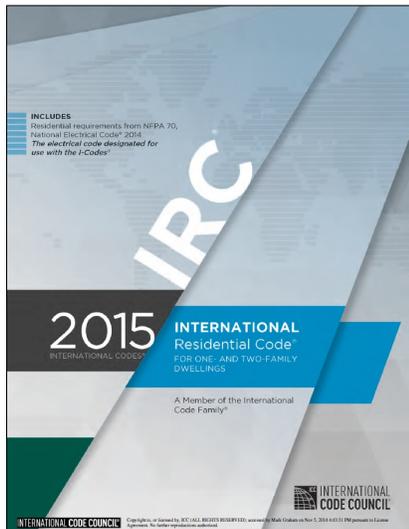
Sec. 1511-Reroofing (previously Sec. 1510)

- Re-covering/replacement languages reformatted
- Exception added clarifying secondary drains do not need to be added in roof system re-covering and replacement projects

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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

Most changes incorporated into IBC 2015, Chapter 15 have also been incorporated into IRC 2015

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Ch. 9-Roof assemblies

Sec. R905-Requirements for roof coverings

- Underlayment requirements consolidated into Sec. R905.1.1-Underlayment and Table R905.1.1(1)-Underlayment types
- Wood shingle/shake nails:
 - Hot-dipped galvanized or Type 304 stainless-steel
 - Type 316 stainless-steel within 15 miles of salt water coastal areas and for fire-retardant and pressure-impregnated, preservative-treated wood shingles/shakes

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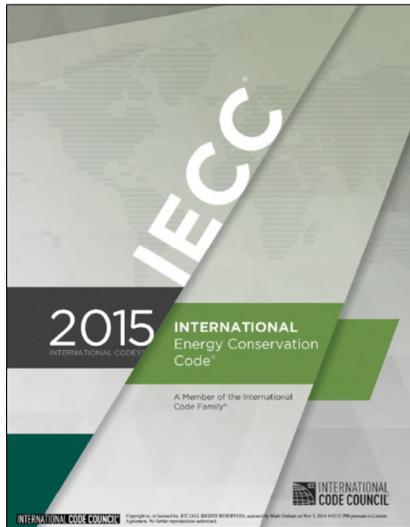
Ch. 9-Roof assemblies

- Rooftop PV requirements:
 - Removed from IRC 2012, Ch. 23-Solar energy systems (IRC 2015, Ch. 23-Solar thermal energy systems)
 - Added Chapter 3-Building planning, Sec. R324-Solar energy systems
 - Added R905.16-Photovoltaic shingles
 - Added R907-Rooftop-mounted photovoltaic systems
 - Added R909-Rooftop-mounted photovoltaic panel systems

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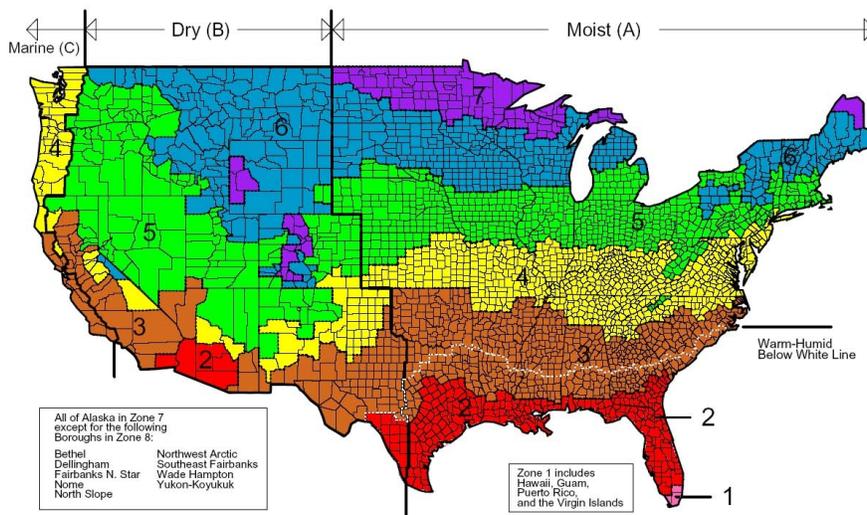
International Energy Conservation Code, 2015 Edition



- Applicable to all buildings, including existing buildings (reroofing)
- Format:
 - Commercial provisions (C) vs. Residential provisions (R)
 - Ch. 1-Scope and Admin.
 - Ch. 2-Definitions
 - Ch. 3-General requirements
 - Ch. 4-Energy efficiency
 - Ch. 5-Existing buildings
 - Ch. 6-Reference standards

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IECC 2015, Fig. C301.1-Climate zones



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Ch 4[CE]-Commercial energy efficiency

Sec. C401.2-Application

- Reference to ASHRAE 90.1 changed from 2010 edition to 2013 edition

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Ch 4[CE]-Commercial energy efficiency

Sec. C402-Building envelope requirements

- Section reformatted
- Low-energy buildings exempted:
 - Less than 3.4 Btu/h · ft² or 1.0 watt/ ft² of floor area
 - No *conditioned space*
 - Greenhouses
- Equipment buildings exempted (Sec. C402.1.2)

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Ch 4[CE]-Commercial energy efficiency

Sec. C402.1.3-Insulation component R-value-based method

- Use Table C402.1.3

Sec. C402.1.4-Assembly U-factor, C-factor or F-factor-based method

- Use Table C402.1.4

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Roofing-specific adaptation of Table C402.1.3

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-19 + R-11 LS	R-38	
	R-25ci (Group R)			
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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Ch 4[CE]-Commercial energy efficiency

Sec. C402.3-Roof solar reflectance and thermal emittance

- Climate zones 1, 2 and 3, low-slope roofs over cooled, conditioned spaces (some exceptions)
- Three-year aged solar reflectance 0.55 and three-year thermal emittance of 0.75, or three-year aged solar reflectance index of 64
- Aged calculation method based upon CRRC-1-12 (Sec. C402.3.1)

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Ch 4[CE]-Commercial energy efficiency

Sec. C402.5-Air leakage-thermal envelope (Mandatory)

- All Climate zones, except 2B (IECC 2012 exempted Climate zones 1, 2, and 3)
- Whole building testing (ASTM E779); allowable maximum air leakage rate of 0.40 cfm/ft²
- Materials (Sec. C402.5.1.2.1) and Assemblies (C402.5.1.2.2) options
- Deemed-to-comply Materials options:
 - Closed cell SPF, minimum 1.5 pcf density,
 - Built-up roofing membrane
 - Modified bituminous roof membrane
 - Fully-adhered single-ply roof membrane

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Ch. 4[CE]-Commercial energy efficiency

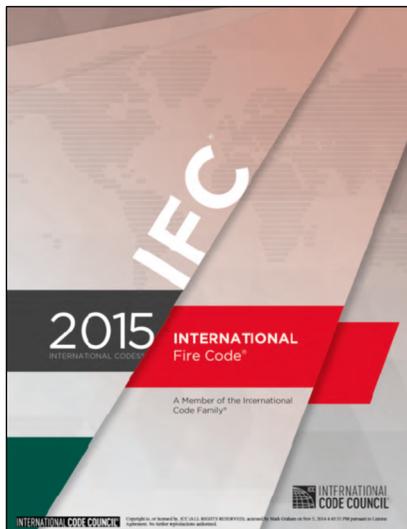
Sec. C503-Alterations

- New exception to Sec. 503.1-General:
“4. *Air barriers* shall not be required for *roof recover* and roof membrane replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.”

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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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Ch. 6-Building services and systems

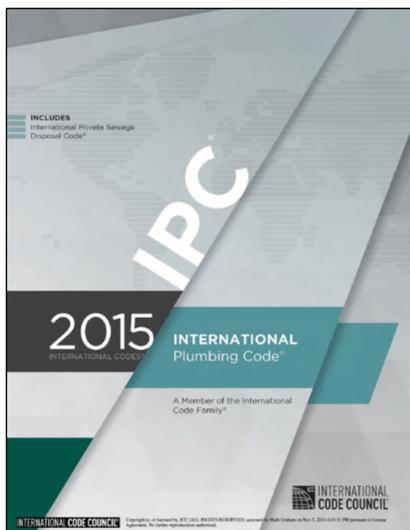
Sec. 605.11-Solar photovoltaic power systems

- Section reorganized
- New requirements applicable to Group R3 buildings (low-occupancy boarding houses, care facilities)

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International Plumbing Code, 2015 Edition



- Applicable to all plumbing systems, except those applicable to IRC 2015
- Roofing-related requirements:
 - Ch. 9-Storm drainage

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Ch. 11-Storm drainage

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

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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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 — set time, design, materials and construction methods to those specifically prescribed in codes and meeting code performance requirements. However, most states contain provisions that allow building officials to approve alternatives that are not specifically permitted by the code.

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:

"IBC-11. Alternative materials, design and methods of construction and equipment. The provisions of this 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 workmanlike 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 the 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

ICC's alternative approval provisions provide a viable means for you or your 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 single-ply underlayment, fiber cement and synthetic shingles, shales and slates metal shingles, some specialty asphalt shingles and hot, fluid-applied membrane roof systems.

ICC's alternative approval provisions also can be used to gain a building official's approval for roof green types the code does not specifically address.

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

As discussed, I am not aware of any manufacturer of vegetative green roof systems that has obtained a specific, special evaluation report. However, I hope these features will prompt evaluation reports to help roofing professionals obtain building official's 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 Code Manual, Third Edition*.

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

July 2008 www.professionroofing.net



ICC/NIBS survey

www.ICCsafe.org

INTERNATIONAL CODE COUNCIL
People Helping People Build a Safer World™

THE FUTURE OF CODE OFFICIALS
Results and Recommendations from a Demographic Survey

AUGUST 2014

National Institute of BUILDING SCIENCES



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

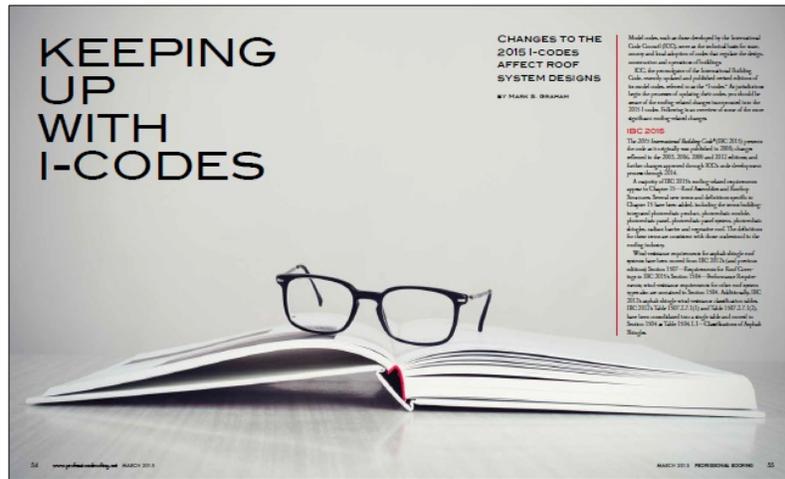
- May possess a bachelor's degree (27 percent), or have no additional education beyond high school (25 percent)
- If they hold a bachelor's degree, it is probably in engineering, but it could be in management, accounting, finance, etc.
- Holds a professional license, certificate, certification or other credential
- Current role is as an 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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Professional Roofing, March 2015

Pages 54-60

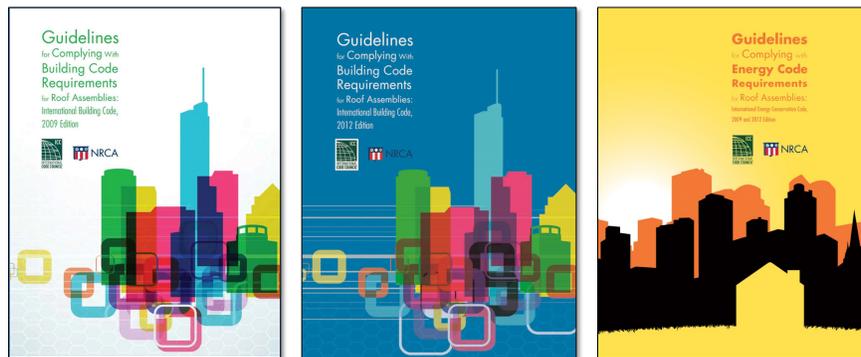


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NRCA code manuals

shop.nrca.net or (866) ASK-NRCA



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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/Membership/Pages/join.aspx>

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Looking into the future....

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Wind design for roof assemblies

*Specifying a wind warranty, in itself,
is not proper wind design*



Proper wind design

- Determine wind loads
 - IBC Ch. 16-Structural Design
 - ASCE 7-10, “Minimum Design Loads for Buildings and Other Structures”
- Design for resistance
 - FM 4474
 - UL 580 or UL 1897

*IBC requires (Sec. 1603) design wind loads
to be shown in the Construction Documents*



Design wind load determination

www.roofwinddesigner.com



Roof Wind Designer is intended to provide users with an easy-to-use means for determining roof systems' design wind loads for many commonly encountered building types that are subject to building code compliance.

Design-wind loads are derived using the American Society of Civil Engineers (ASCE) Standard ASCE 7, "Minimum Design Loads for Buildings and Other Structures." This standard is a widely recognized consensus standard and is referenced in and serves as the technical basis for wind load determination in the International Building Code and NFPA 5000: Building Construction and Safety Code. Roof Wind Designer allows users to choose between the 2005 or 2010 editions of ASCE 7. Roof Wind Designer uses Method 1—Simplified Method, 2005 edition, and the Envelope Procedure, Part 2: Low-rise Buildings (Simplified) of Chapter 30, 2010 edition. For a more detailed explanation of the two options, please [click here](#).

Also, Roof Wind Designer determines roof systems' minimum recommended design wind-resistance loads, which are derived from the building's design wind loads, taking into consideration a safety factor in reliance of ASTM D6630, "Standard Guide for Low Slope Insulated Roof Membrane Assembly Performance." Using these minimum recommended design wind-resistance loads, users can select appropriate wind resistance classified roof systems.

Roof Wind Designer has been developed and is maintained by the National Roofing Contractors Association (NRCA), with the support of the Midwest Roofing Contractors Association (MRCA) and the North/East Roofing Contractors Association (NERCA). Currently, this application is available at no cost.

Questions regarding Roof Wind Designer can be directed to the [Contact Us](#) page.

To register for a new account [click here](#). If you already have an account, [click here](#) to login.



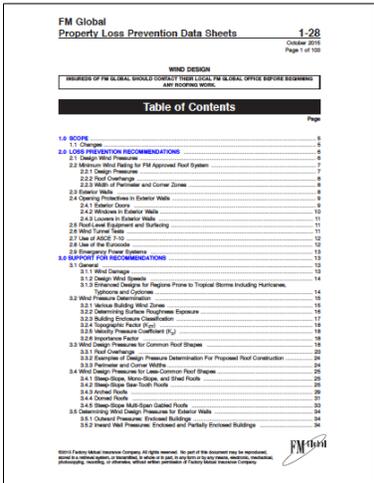


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FM 1-28 has been updated

www.fmglobaldatasheets.com



FM Global
Property Loss Prevention Data Sheets **1-28**
October 2015
Page 1 of 108

WIND DESIGN

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- October 2015 update
- Based upon ASCE 7-05 with enhancements
- Reformatted
- Be cautious of FM-insured projects
- See *Professional Roofing*, March 2016



Professional Roofing, March 2016

TECH TODAY

A new consideration
FM 1-28 has been updated, further complicating wind designs
by Mark S. Graham

FM 1-28 typically results in higher design wind pressures and recommended resistance ratings

FOR A FULL-SCALE FM 1-28
and example calculations comparing
the difference between FM 1-28
and ASCE 7-10, log on to www.professionalroofing.com

14 www.professionalroofing.com MARCH 2016

- Use RoofNav's ratings calculator
- Apply a 2.0 safety factor
- Roof overhang factors (Table 7)
- Windborne debris separation distances
- Roof-mounted equipment (ASCE 7-10)
- Tornado-resistant design (Appendix)



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

ASCE 7-16 (public review draft)

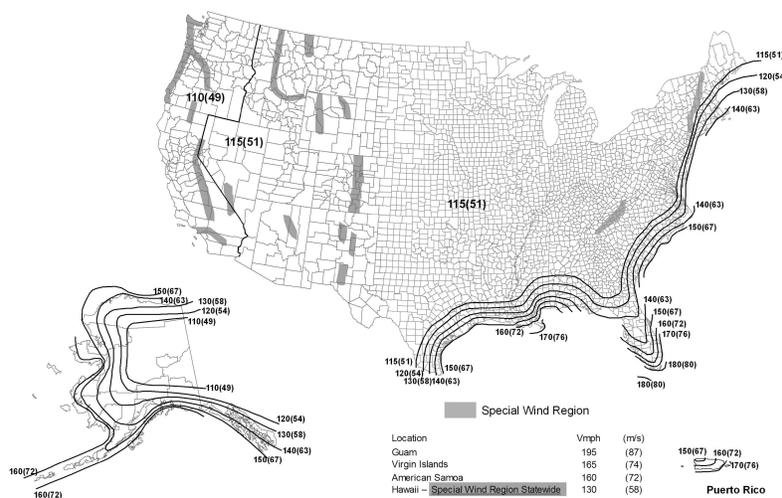
- Revised basic wind speed map
- Changes (and new) pressure coefficients
- Revised perimeter and corner zones

Expect higher field, perimeter and corner uplift pressures



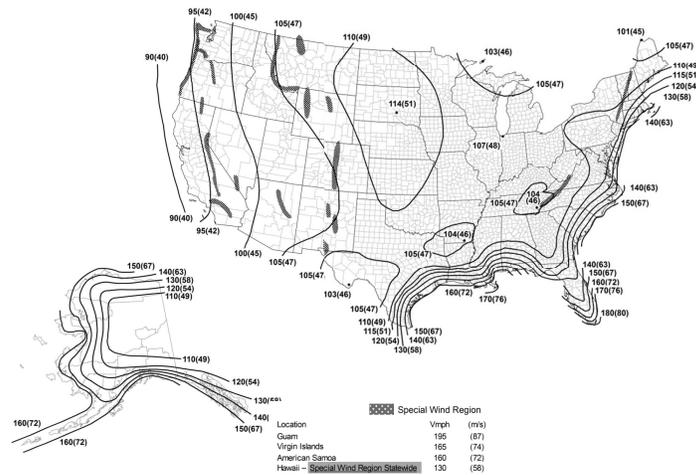
ASCE 7-10 basic wind speed map

Fig. 1607A-- V_{ult} for Risk Category II Buildings



ASCE 7-16 (draft) basic wind speed map

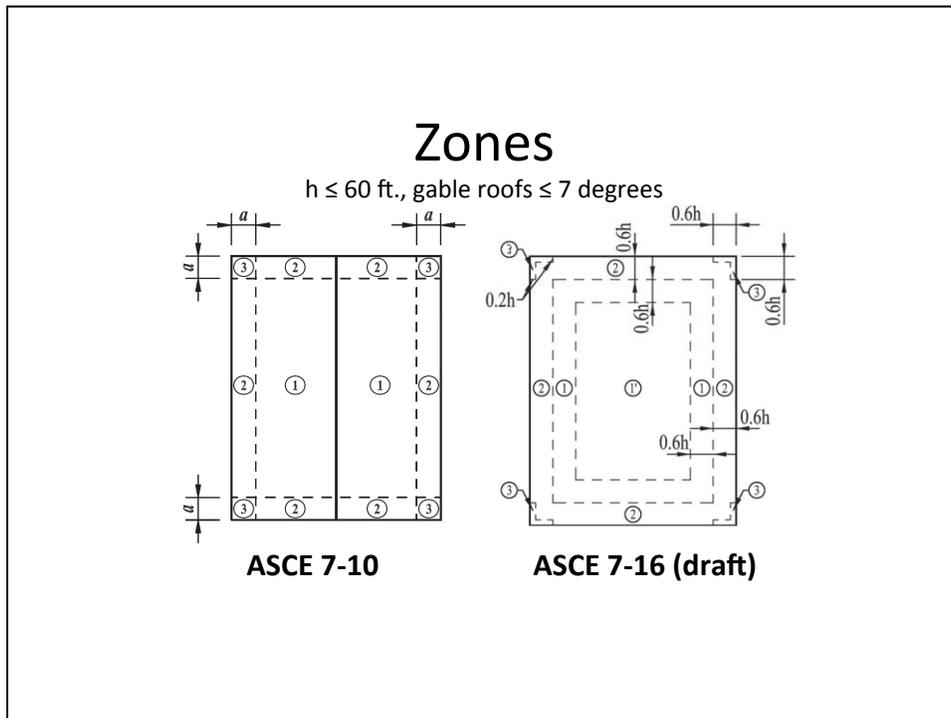
Risk Category II Buildings



GC_p pressure coefficients

$h \leq 60$ ft., gable roofs ≤ 7 degrees

Zone	ASCE 7-10	ASCE 7-16 (draft)
1'	--	-0.9
1	-1.0	-1.7
2 (perimeter)	-1.8	-2.3
3 (corners)	-2.8	-3.2

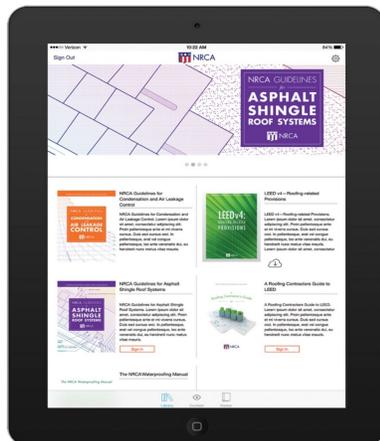


*Proper wind design is oftentimes avoided...
and it's only going to get more complicated*

The NRCA Roofing Manual



NRCA App



- NRCA App available on the Apple Store and Google Play Store for tablets
- iPhone App also available
- Register within App as being an NRCA member
- The NRCA Roofing Manual is viewable to NRCA members
- Favorite and send pages features



Manual online

www.nrca.net

- Available to all NRCA member registered users (multiple users per member company)
- “Members only” section, click on “My account”, the “Electronic file”
- View, download and print



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