



Wealth Builder/Partners in Growth Conference

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Omni Amelia Island Plantation Resort, Amelia Island, Florida

Code compliance: Challenges and opportunities

presented by

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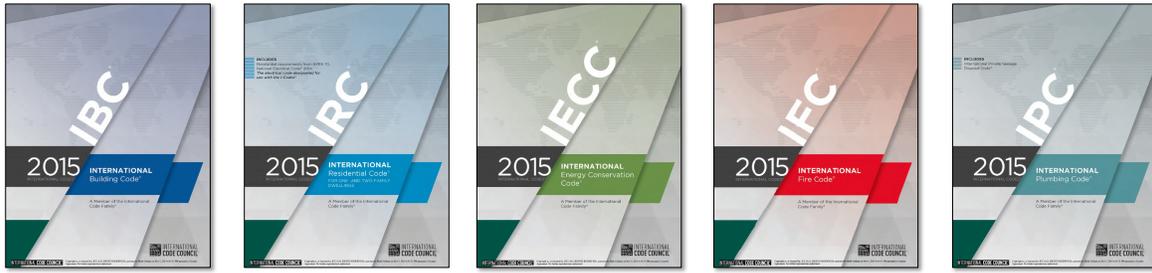


Some background

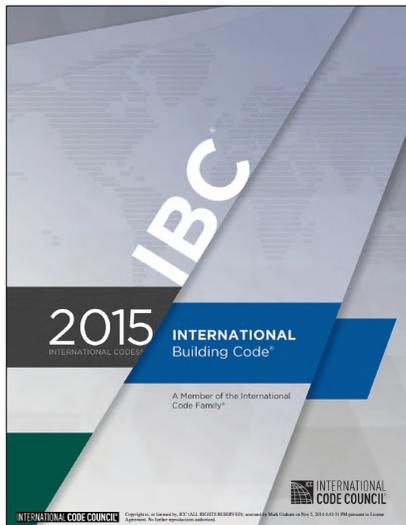
- The I-codes are “model codes” developed by the International Code Council (ICC)
- Model codes serve as the technical basis for state or local code adoption
- The code provides the minimum legal requirements for building construction...and operation
- The code is enforced by the “authority having jurisdiction”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

Roofing-specific provisions

Discussed in this presentation



International Building Code, 2015 Edition



- Applicable to all buildings and structures, except those where IRC 2015 applies
- 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

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1501.1-Scope:

- Roof assemblies and rooftop structures
- Design, materials, construction and quality

Sec. 1511-Reroofing:

- Recovering or replacing shall comply with Ch. 15 (only)
- Exceptions: “positive drainage” and secondary drains

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1504-Wind resistance:

- Determine wind loads using Ch. 16-Structural Design (ASCE 7-10)
- Tested load resistance using:
 - BUR, MB, single ply: FM 4474, UL 580 or UL 1897
 - Ballasted systems: ANSI/SPRI RP-4 and Table 1504.8
 - Structural metal panels:
 - Structural standing seam: Tested using ASTM E1592 or FM 4474
 - Through fastened: Tested using FM 4474, UL 580 or ASTM E1592
 - Aluminum: Designed using Sec. 2002.1 (ADM)
 - Steel: Designed using Sec. 2210.1 (AISI S100)

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1505-Fire classification:

- Tested using ASTM E108 or UL 790 (Class A, Class B, Class C)
- *Listed* by an *approved* testing agency
- Exempted from testing, listing and approval:
 - Brick, masonry or exposed concrete surfaces
 - Metal sheets/shingles, tile or slate on non-combustible decks
 - Metal sheets on non-combustible framing (no deck)
 - 16 oz. copper sheets or slate on combustible decks

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1505-Fire classification:

- Required classifications [Table 1505.1]:
 - Class A: Only in a fire district (IBC 2015, Appendix D) or where the *International Wildland-urban Interface Code* is adopted
 - Class B: Type IA, IB, IIA, IIIA, IV or VB construction
 - Class C: Type IIB, IIIB or VB construction

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1506-Materials:

- “...Roof coverings shall be applied in accordance with... the manufacturer’s installation instructions...”

Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1507-Requirements for roof coverings:

- Many ASTM standard references
- Systems-specific prescriptive requirements

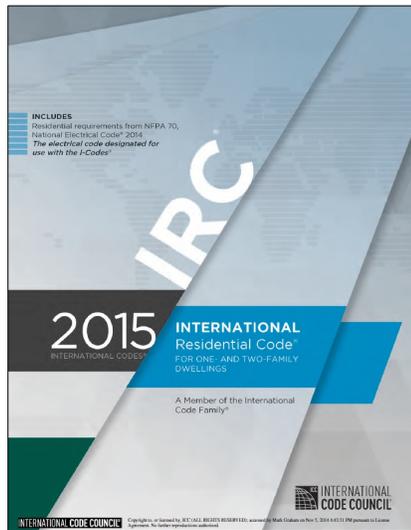
Ch. 15-Roof assemblies and rooftop structures

International Building Code, 2015 Edition

Sec. 1511-Reroofing:

- Same Ch. 15 requirements (only) as new construction
- Roof replacement (vs. recovering) is required where:
 - Roof is “water soaked” or deteriorated
 - Existing slate, clay, cement or cement-asbestos
 - Two or more existing roofs
 - Removal of “all” layers is required [Sec. 1511.3]

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

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

Attic ventilation

International Building Code

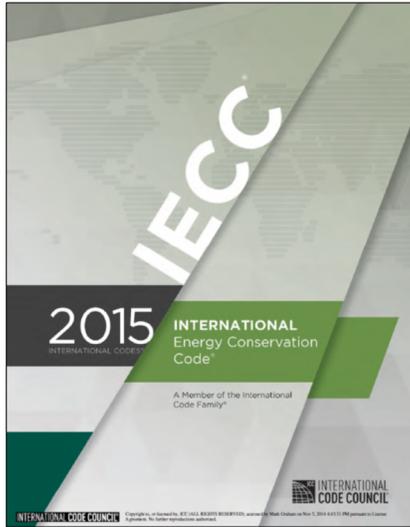
- 1:150 ratio
- 1:300 ratio permitted:
 - In Climate Zones 6, 7 and 8 with a Class I or II vapor retarder, and
 - $40\% \leq 50\%$ of ventilation within 3 feet of the ridge
 - Unvented attic option

International Residential Code

- 1:150 ratio
- 1:300 ratio permitted:
 - In Climate Zones 6, 7 and 8 with a Class I or II vapor retarder, and
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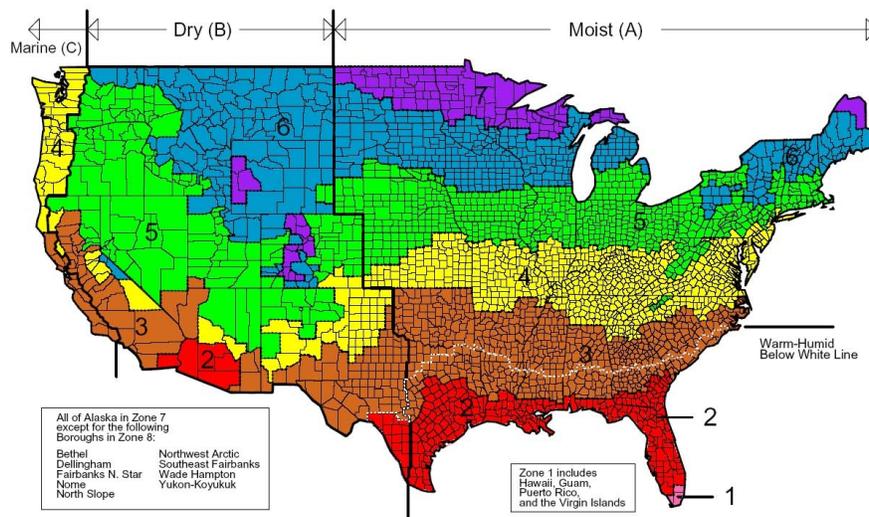
Attic ventilation requirements are finally consistent in IBC 2015 and IRC 2015

International Energy Conservation Code, 2015 Edition



- Applicable to all buildings, including existing buildings (roof replacement)
- 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

IECC 2015, Fig. C301.1-Climate zones



Ch. 4[RE]-Residential energy efficiency

International Energy Conservation Code, 2015 Edition

Sec. R402-Building Thermal Envelope

- Minimum R-values: Use Table R402.1.2 (see table on following slide)
- Air leakage requirement (mandatory)

Roofing-specific adaptation of Table R402.1.2

Residential Buildings (Insulation requirements by component)

Climate zone	Ceiling R-value
1	30
2	38
3	
4	49
5	
6	
7	
8	

Ch. 4[RE]-Residential energy efficiency

International Energy Conservation Code, 2015 Edition

Sec. R402.4-Air leakage (Mandatory)

- Climate Zones 1 & 2: Not exceeding 5 air changes per hour
- Climate Zones 3 – 8: Not exceeding 3 air changes per hour

Ch. 4[CE]-Commercial energy efficiency

International Energy Conservation Code, 2015 Edition

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)

Ch. 4[CE]-Commercial energy efficiency

International Energy Conservation Code, 2015 Edition

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

- Use Table C402.1.3 (see table on following slide)

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

- Use Table C402.1.4

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

Ch. 4[CE]-Commercial energy efficiency

International Energy Conservation Code, 2015 Edition

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)

Ch. 4[CE]-Commercial energy efficiency

International Energy Conservation Code, 2015 Edition

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

Ch. 4[CE]-Commercial energy efficiency

International Energy Conservation Code, 2015 Edition

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.”

Status of states' energy code adoption

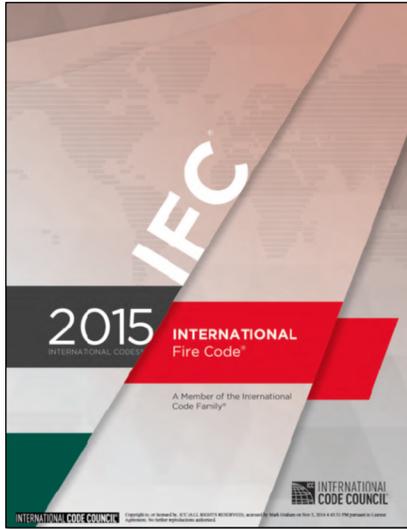
www.nrca.net/Technical/EnergyCodes

The screenshot shows the NRCA website page for 'Energy codes'. The page includes a navigation menu with links for 'Members only', 'Bookstore', 'Technical', 'Education', 'Member directory', 'Government advocacy', 'Safety and insurance', 'About', and 'Consumers'. The main content area is titled 'Energy codes' and contains several sections:

- Energy codes:** A paragraph explaining that most roofing professionals understand a building's roof assembly serves an important role in controlling a building's overall energy efficiency and building owners' heating and cooling costs. However, some may not realize that codes mandate minimum thermal insulation requirements for the energy efficiency of most buildings.
- Links:** A section titled 'Energy codes by state' with a link to 'Click here to access NRCA's database of energy codes by state.'
- EnergyWise Roof Calculator Online:** A section explaining that IECC provides two methods of determining commercial buildings' minimum insulation requirements: the use of specific tables within the Code or compliance with American Society for Heating, Refrigerating and Air-Conditioning Engineers Inc. (ASHRAE) Standard 90.1 (ASHRAE 90.1), "Energy Standard for Buildings Except Low-Rise Residential Buildings," building envelope provisions.
- Roofing-related Energy Code Requirements:** A section explaining that if you want to become more familiar with roofing-related energy code requirements, you are encouraged to read "Conserving energy" by Mark Graham, NRCA's Associate Executive Director of Technical Services. This article provides an overview of energy codes' minimum requirements and how these requirements apply to existing buildings when reroofing.

On the right side of the page, there are sections for 'Renew your membership' (with a link to renew), 'Roofing industry news' (with a link to February FHO), and 'Find a contractor' (with a form for roof type and ZIP code).

International Fire Code, 2015 Edition



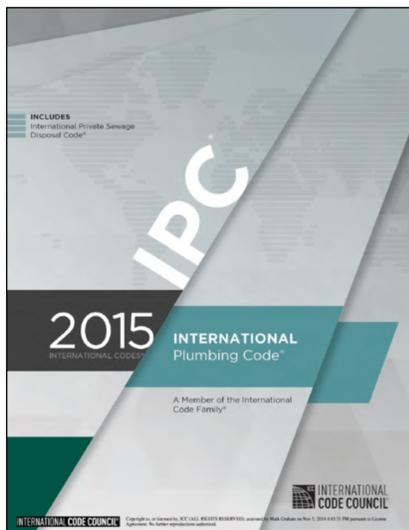
Applicability:

- Structures, facilities and conditions
- Existing conditions and operations

Roofing-related provisions:

- 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

International Plumbing Code, 2015 Edition



- Applicable to all plumbing systems, except those applicable to IRC 2015
- Roofing-related requirements:
 - Ch. 9-Storm drainage
 - e.g., roof drains, scuppers, gutters and downspouts

Alternatives to code requirements

Tech Today

Other options
Take advantage of alternative approval provisions in building codes
by Mark S. Graham

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 that are not specifically permitted by IBC.

Roofing products
Roofing products that are not specifically permitted by IBC but have an evaluation report include synthetic steep-slope underlayment, fiber cement and epoxy sheet, shingles, shakes and slates, metal shingles, some specially applied shingles and box, fluid-applied membrane roof systems.

IBC's alternative approval provisions also can be used to gain a building official's approval for roof systems 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 structural 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 official approval through the code's alternative approval provisions.

Additional information about building code requirements specific to roofing products and roof systems is provided in *The 2009 IBC Building Code Manual, Third Edition*. ■ ■ ■

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

July 2008 www.professionroofing.net

Professional Roofing, July 2008

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

In summary

- Be knowledgeable of the applicable codes
- Beware of the status of state and local adoptions
- Comply with the Code

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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