



Fall Education Seminar
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Covering the codes

presented by

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1



International Code Council (ICC)

Kansas adoptions

Local adoption

2



International Building Code, 2012 Edition (IBC 2012)



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International Building Code, 2012 Edition

101.2 Scope. The provisions of this code shall apply to the construction, *alteration*, relocation, enlargement, replacement, *repair*, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exception: Detached one- and two-family *dwelling*s and multiple single-family *dwelling*s (townhouses) not more than three *stories* above *grade plane* in height with a separate *means of egress* and their accessory structures shall comply with the *International Residential Code*.

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Ch. 15-Roof Assemblies and Rooftop Structures

International Building Code, 2012 Edition

SECTION 1501

GENERAL

1501.1 Scope. The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies and rooftop structures.

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Sec. 1510-Reroofing

International Building Code, 2012 Edition

1510.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exception: Reroofing 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.

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Sec. 1503-Weather Protection

International Building Code, 2012 Edition

[P] 1503.4 Roof drainage. Design and installation of roof drainage systems shall comply with Section 1503 of this code and Sections 1106 and 1108, as applicable, of and the *International Plumbing Code*.

[P] 1503.4.1 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*.

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Sec. 1503-Weather Protection

International Building Code, 2012 Edition

1503.6 Crickets and saddles. A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches (762 mm) wide as measured perpendicular to the slope. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

Exception: Unit skylights installed in accordance with Section 2405.5 and flashed in accordance with the manufacturer's instructions shall be permitted to be installed without a cricket or saddle.

AAMA/WDMA/CSA 101/I.S./A440

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Sec. 1504-Performance Requirements

International Building Code, 2012 Edition

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. Roof systems with built-up, modified bitumen, fully adhered or mechanically attached single-ply through fastened metal panel roof systems, and other types of membrane roof coverings shall also be tested in accordance with FM 4474, UL 580 or UL 1897.

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Sec. 1504-Performance Requirements

International Building Code, 2012 Edition

1504.3.2 Metal panel roof systems. Metal panel roof systems through fastened or standing seam shall be tested in accordance with UL 580 or ASTM E 1592.

Exception: Metal roofs constructed of cold-formed steel, where the roof deck acts as the roof covering and provides both weather protection and support for structural loads, shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2210.1.

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Sec. 1504-Performance Requirements

International Building Code, 2012 Edition

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 ANSI/SPRI RP-4.

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Sec. 1504-Performance Requirements

International Building Code, 2012 Edition

1504.5 Edge securement for low-slope roofs. Low-slope built-up, modified bitumen and single-ply roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, except V_{ult} wind speed shall be determined from Figure 1609A, 1609B, or 1609C as applicable.

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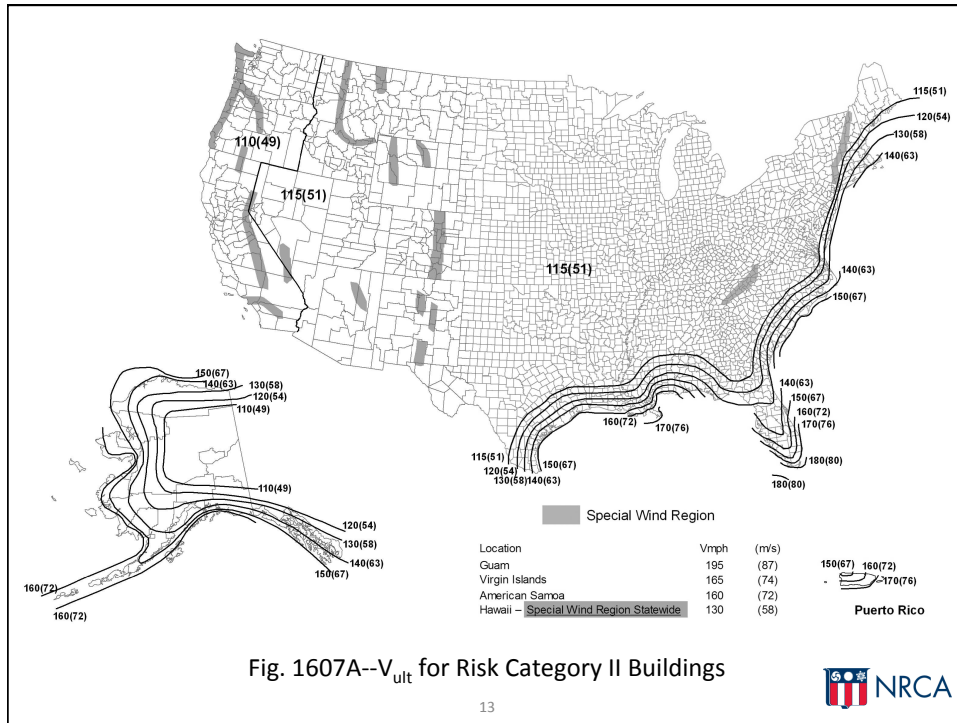


TABLE 1609.3.1

WIND SPEED CONVERSIONS a, b, c

V_{ult}	100	110	120	130	140	150	160	170	180	190	200
V_{asd}	78	85	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.44 m/s.

- a. Linear interpolation is permitted.
- b. V_{asd} = nominal design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1.
- c. V_{ult} = ultimate design wind speeds determined from Figures 1609A, 1609B, or 1609C.

Sec. 1505-Fire Classification

International Building Code, 2012 Edition

1505.1 General. Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E 108 or UL 790. In addition, fire-retardant-treated wood roof coverings shall be tested in accordance with ASTM D 2898. The minimum roof coverings installed on buildings shall comply with Table 1505.1 based on the type of construction of the building.

Exception: Skylights and sloped glazing that comply with Chapter 24 or Section 2610.



Sec. 1505-Fire Classification

International Building Code, 2012 Edition

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

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

- a. Unless otherwise required in accordance with the *International Wildland-Urban Interface Code* or due to the location of the building within a fire district in accordance with Appendix D.
- b. Nonclassified roof coverings shall be permitted on buildings of Group R-3 and Group U occupancies, where there is a minimum fire-separation distance of 6 feet measured from the leading edge of the roof.
- c. Buildings that are not more than two stories in height and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles.



Sec. 1505-Fire Classification

International Building Code, 2012 Edition

1505.2 Class A roof assemblies. Class A roof assemblies are those that are effective against severe fire test exposure. Class A roof assemblies and roof coverings shall be *listed* and identified as Class A by an *approved* testing agency. Class A roof assemblies shall be permitted for use in buildings or structures of all types of construction.

Exceptions:

1. Class A roof assemblies include those with coverings of brick, masonry or an exposed concrete roof deck.
2. Class A roof assemblies also include ferrous or copper shingles or sheets, metal sheets and shingles, clay or concrete roof tile or slate installed on noncombustible decks or ferrous, copper or metal sheets installed without a roof deck on noncombustible framing.
3. Class A roof assemblies include 16 oz/sq. ft. (0.0416 kg.m²) copper sheets installed over combustible decks.

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Sec. 1505-Fire Classification

International Building Code, 2012 Edition

1505.8 Photovoltaic systems. Rooftop installed photovoltaic systems that are adhered or attached to the roof covering or photovoltaic modules/shingles installed as roof coverings shall be labeled to identify their fire classification in accordance with the testing required in Section 1505.1.

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Sec. 1506-Materials

International Building Code, 2012 Edition

1506.1 Scope. The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

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Sec. 1507-Requirements for Roof Coverings

International Building Code, 2012 Edition

- Asphalt shingles
- Clay & concrete tile
- Metal roof panels
- Metal roof shingles
- Roll roofing
- Slate shingles
- Wood shingles
- Wood shakes
- Built-up roofs
- Modified bitumen roofs
- Thermoset single-ply roofs
- Thermosplastic single-ply roofs
- SPF roofs
- Liquid-applied roofing
- Roof gardens/landscaped roofs
- Photovoltaic modules/shingles

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Sec. 1507-Requirements for Roof Coverings

IBC 2012, Section 1507.2-Asphalt Shingles

1507.2.7 Attachment. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.

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Sec. 1507-Requirements for Roof Coverings

IBC 2012, Section 1507.2-Asphalt Shingles

1507.2.7.1 Wind resistance. Asphalt shingles shall be tested in accordance with ASTM D 7158. Asphalt shingles shall meet the classification requirements of Table 1507.2.7.1(1) for the appropriate maximum basic wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D 7158 and the required classification in Table 1507.2.7.1(1).

Exception: Asphalt shingles not included in the scope of ASTM D 7158 shall be tested and labeled to indicate compliance with ASTM D 3161 and the required classification in Table 1507.2.7.1(2).

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**TABLE 1507.2.7.1(1)
CLASSIFICATION OF ASPHALT
ROOF SHINGLES PER ASTM D 7158^a**

NOMINAL DESIGN WIND SPEED, V_{asd}^b , (mph)	CLASSIFICATION REQUIREMENT
85	D, G or H
90	D, G or H
100	G or H
110	G or H
120	G or H
130	H
140	H
150	H

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

a. The standard calculations contained in ASTM D 7158 assume exposure category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

b. V_{asd} shall be determined in accordance with Section 1609.3.1.



**TABLE 1507.2.7.1(2)
CLASSIFICATION OF ASPHALT
ROOF SHINGLES PER ASTM D 3161**

NOMINAL DESIGN WIND SPEED, V_{asd}^a , (mph)	CLASSIFICATION REQUIREMENT
85	A, D or F
90	A, D or F
100	A, D or F
110	F
120	F
130	F
140	F
150	F

For SI: 1 foot = 304.8 mm; 1 mph = 0.447 m/s.

a. V_{asd} shall be determined in accordance with Section 1609.3.1.



Liquid-applied Roofing

IBC 2012, Section 1507.15--Liquid-applied Roofing

1507.15 Liquid-applied roofing. The installation of liquid-applied roofing shall comply with the provisions of this section.

1507.15.1 Slope. Liquid-applied roofing shall have a design slope of a minimum of one-fourth unit vertical in 12 units horizontal (2-percent slope).

1507.15.2 Material standards. Liquid-applied roofing shall comply with ASTM C 836, ASTM C 957, ASTM D 1227 or ASTM D 3468, ASTM D 6083, ASTM D 6694 or ASTM D 6947.

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Vegetative Roofs

IBC 2012, Section 1507.16--Roof Gardens and Landscaped Roofs

1507.16 Roof gardens and landscaped roofs. Roof gardens and landscaped roofs shall comply with the requirements of this chapter and Sections 1607.12.3 and 1607.12.3.1 and the *International Fire Code*.

1507.16.1 Structural fire resistance. The structural frame and roof construction supporting the load imposed upon the roof by the roof gardens or landscaped roofs shall comply with the requirements of Table 601.

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Rooftop Photovoltaic

IBC 2012, Section 1509—Rooftop Structures

1509.7 Photovoltaic systems. Rooftop mounted photovoltaic systems shall be designed in accordance with this section.

1509.7.1 Wind resistance. Rooftop mounted photovoltaic systems shall be designed for wind loads for component and cladding in accordance with Chapter 16 using an effective wind area based on the dimensions of a single unit frame.

1509.7.2 Fire classification. Rooftop mounted photovoltaic systems shall have the same fire classification as the roof assembly required by Section 1505.

1509.7.3 Installation. Rooftop mounted photovoltaic systems shall be installed in accordance with the manufacturer's installation instructions.

1509.7.4 Photovoltaic panels and modules. Photovoltaic panels and modules mounted on top of a roof shall be listed and labeled in accordance with UL 1703 and shall be installed in accordance with the manufacturer's installation instructions.



Sec. 1510-Reroofing

International Building Code, 2012 Edition

1510.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15.

Exception: Reroofing 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.



Sec. 1510-Reroofing

International Building Code, 2012 Edition

1510.3 Recovering versus replacement. New roof coverings shall not be installed without first removing all existing layers of roof coverings down to the roof deck where any of the following conditions occur:

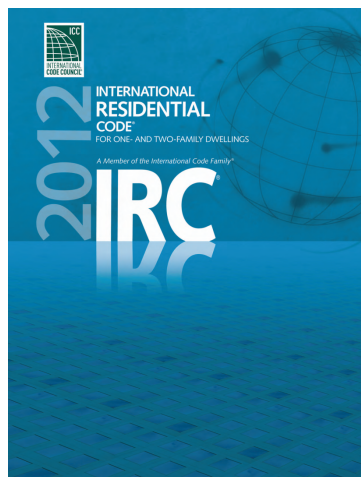
1. Where the existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is wood shake, slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

Exceptions:...

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International Residential Code, 2012 Edition (IRC 2012)



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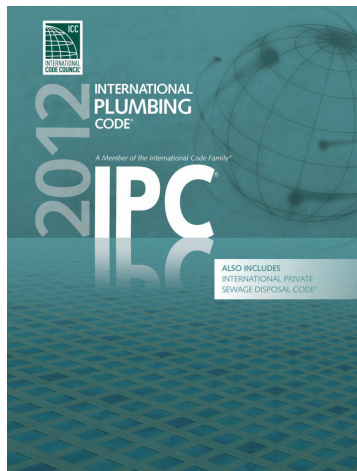
International Residential Code, 2012 Edition

- Chapter 9-Roof Assemblies
- Similar to IBC 2009, Chapter 15
- More prescriptive-based language

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**International Plumbing Code,
2012 Edition (IPC 2012)**



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International Plumbing Code, 2012 Edition

Roof drain, drain piping, scupper, gutter and
downspout sizing is dictated by the
International Plumbing Code.

IPC Chapter 11-Storm Drainage

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**International Fire Code,
2012 Edition (IFC 2012)**



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International Fire Code, 2012 Edition

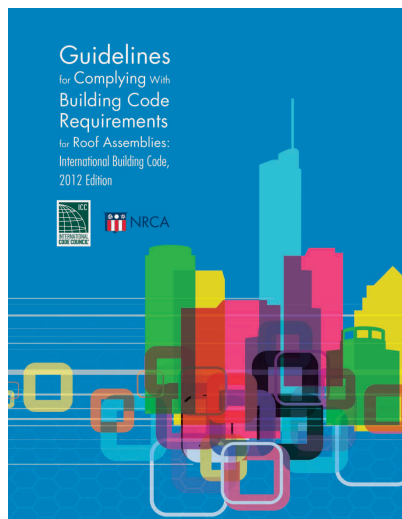
Fire safety during roofing operations and rooftop PV and vegetative roof systems are dictated by the *International Fire Code*.

IFC Sec. 303-Kettles (e.g., ≥ 20 ft.)
IFC Sec. 3317-Safeguarding Roofing Operations
IFC Sec. 605.11-Solar Photovoltaic Power Systems
IFC Sec. 317-Rooftop Gardens and Landscaped Roofs

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Building Codes Manual (2012 Codes)

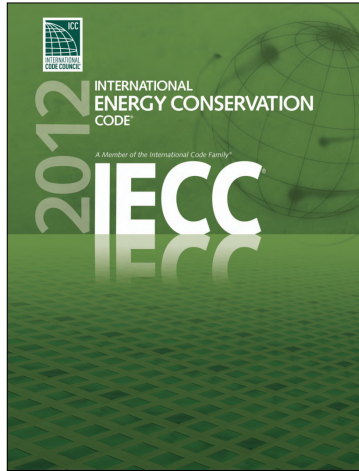


- Based on 2012 I-codes:
 - IBC 2012
 - IRC 2012
 - IECC 2012
 - IPC 2012
 - IFC 2012
- Includes roofing-related code text and NRCA commentary on each section
- Co-branded with ICC; NRCA promotes to industry and ICC promotes to code officials
- Available in March 2013

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International Energy Conservation Code, 2012 Edition (IECC 2012)



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Format of IECC 2012

IECC – Commercial

Ch. 1[CE]: Scope and Admin.
Ch. 2[CE]: Definitions
Ch. 3[CE]: General Req.
Ch. 4[CE]: Commercial Energy Efficiency
Ch. 5[CE]: Referenced Stds.
Index

IECC – Residential

Ch. 1[RE]: Scope and Admin.
Ch. 2[RE]: Definitions
Ch. 3[RE]: General Req.
Ch. 4[RE]: Residential Energy Efficiency
Ch. 5[RE]: Referenced Stds.
Index

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Commercial vs. Residential

- Commercial unless Residential
- R202-General Definitions:

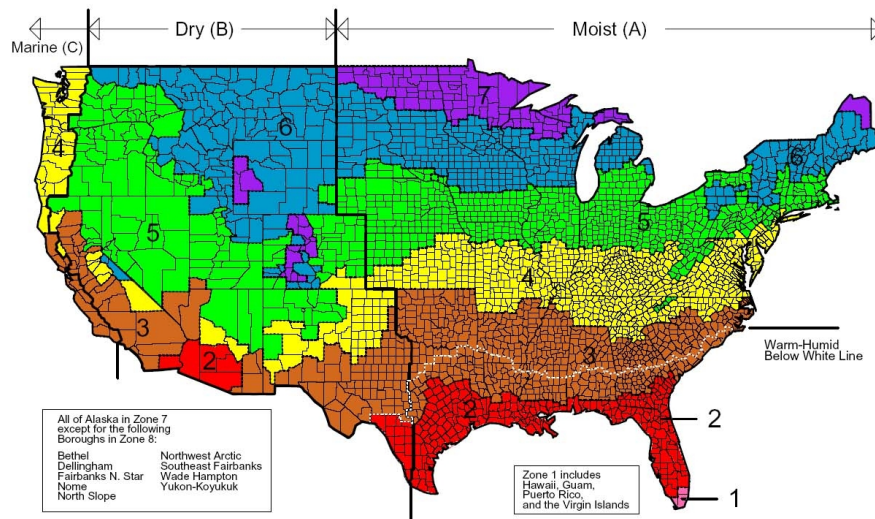
Residential Building. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane

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Climate zones

IECC 2012, Section C301 and Sec. R301—Climate Zones



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IECC – Residential Provisions

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Roofing-specific adaptation of Table R402.1.1

International Energy Conservation Code, 2012 Edition

Insulation and Fenestration Requirements by Component^a	
Climate zone	Ceiling R-value
1	30
2	38
3	
4	49
5	
6	
7	
8	

^a R-values are minimums. ...
[Other footnotes omitted for clarity]

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IECC – Commercial Provisions

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Roofing-specific adaptation of Table C402.2

International Energy Conservation Code, 2012 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			
3			
4	R-25 ci	R-25 + R-11 LS	R-49
5			
6	R-30ci	R-30 + R-11 LS	R-49
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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R-value determination

IECC 2012, Section C303.1.4-Insulation Product Rating

C303.14 Insulation product rating. The thermal resistance (R-value) of insulation shall be determined in accordance with the U.S. Federal Trade commission R-value rule (CFR Title 16, Part 460) in units of $h \times ft^2 \times ^\circ F/Btu$ at a mean temperature of 75°F (24°C).

What about tapered insulation?

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Tapered insulation

International Energy Conservation Code, 2012 Edition

C402.2.1 Roof assembly. The minimum thermal resistance (R-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.2, based on construction materials used in the roof assembly. Skylight curbs shall be insulated to the level of roofs with insulation entirely above deck or R-5, whichever is less.

Exceptions:

1. Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25 mm) or less and where the area-weighted U-factor is equivalent to the same assembly with the R-value specified in Table C402.2.
2. ...

IECC Commentary indicates Exception 1 applies to tapered insulation systems.

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2012 IECC Code and Commentary

Tapered insulation

“...The exception to this section permits a roof that is “continuously insulated” to have areas that do not meet the required *R*-values, provided that the area-weighted values are equivalent to the specified insulation values. This type of insulation referred to as tapered insulation is where the roof insulation varies to provide slope for drainage....”

[continued...]

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2012 IECC Code and Commentary

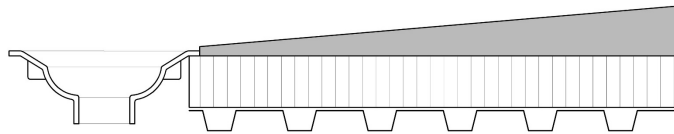
Tapered insulation

“...This 1-inch (25 mm) limitation does not prevent the provisions from being applied to roofs that have a greater variation; it simply does not allow the additional thickness to be factored into the average insulation values. Where the variation exceeds 1 inch (25 mm), it would be permissible to go to the thinnest spot and measure the *R*-value at that point (for the example call this Point “a”). Then go to a point that is 1 inch (25 mm) thicker than Point “a” and measure the *R*-value there (for the example, call this Point “b”). The remaining portions of the roof that are thicker than the additional 1-inch (25 mm) portion (Point “b”) would simply be assumed to have the same *R*-value that Point “b” had. All portions of the roof that meet or exceed the Point “b” *R*-value would simply use the Point “b” *R*-value when determining the area weighted *U*-factor for the roof. “

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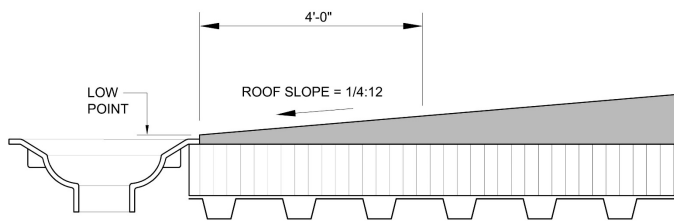
Graphically depicted...



49



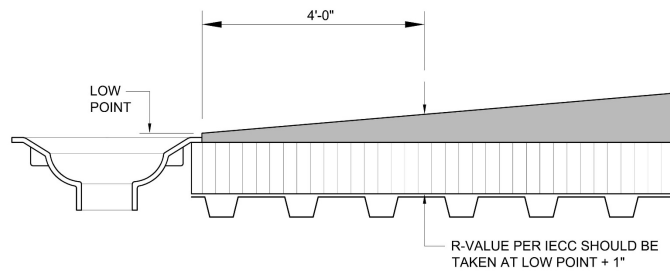
Graphically depicted...



50



Graphically depicted...



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Summary – IECC 2012 – Commercial Provisions

- R-value increases
- Mandatory reflectivity requirements in Climate Zones 1-3
- Air barriers requirements in Climate Zones 4-8

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So....

- Do increased R-values make sense?
- Is there a realistic payback?

...we've done some calculations

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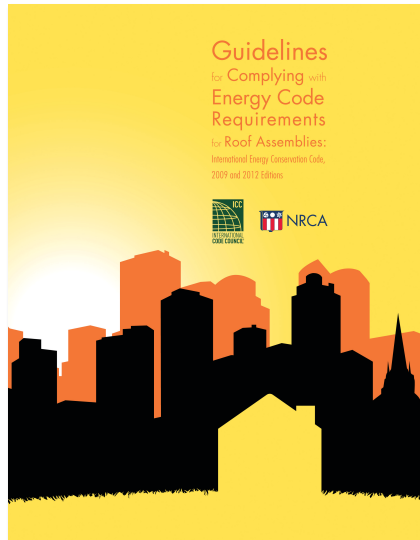
In a mixed climate

10,000 sq. ft. single-story building in Kansas City

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	51,295,159 Btu	9.4 years
R-15 to R-20	28,314,737 Btu	19.4 years
R-20 to R-25	16,299,591 Btu	31.3 years
R-25 to R-30	11,492,711 Btu	68.0 years

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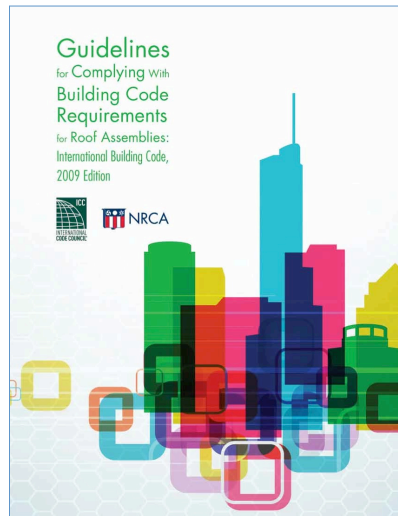
Guidelines for Complying with Energy Code Requirements for Roof Assemblies: International Energy Efficiency Code, 2009 and 2012 Editions

Contact NRCA Customer Service:
1-888-ASK-NRCA (275-6722)
or shop.nrca.net

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Building Codes Manual (2009 Codes)

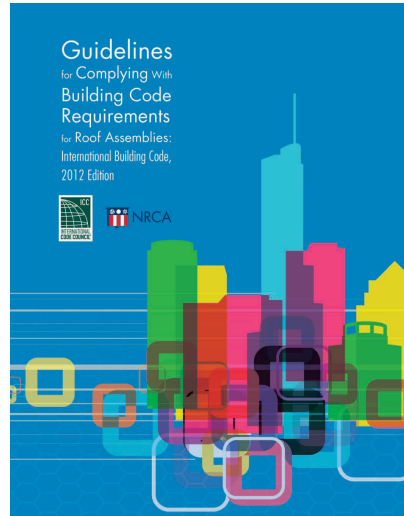


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- Includes roofing-related code text and NRCA commentary on each section
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In summary

- Be knowledgeable of applicable codes
- Watch for state/local modifications
- Comply with the applicable codes
- Building/Residential Code
- Plumbing Code
- Fire Code
- Energy Code

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