Rhode Island Building Code Seminar

March 15, 2013

Warwick, RI

2012 I-code update: Roofing-related revisions

Mark S. Graham

Associate Executive Director, Technical Services

National Roofing Contractors Association

International Building Code, 2012 Edition (IBC 2012)

NRCA

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 *dwellings* and multiple single-family *dwellings* (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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International Building Code, 2012 Edition

Specific roofing-related requirements

- Ch. 12-Interior Environment (attic ventilation)
- Ch. 13-Energy Efficiency (thermal insulation)
- Ch. 15-Roof Assemblies and Rooftop Structures
- Ch. 16-Structural Design (design loads)
- Ch. 22-Steel (structural metal panel roofing)
- Ch. 24-Glass and Glazing (skylights)
- Ch. 35-Referenced Standards

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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.

Ch. 15-Roof Assemblies and Rooftop Structures

International Building Code, 2012 Edition

- Sec. 1501-Scope
- Sec. 1502-Defintions
- Sec. 1503-Weather Protection
- Sec. 1504-Performance Requirements (wind)
- Sec. 1505-Fire Classification
- Sec. 1506-Materials
- Sec. 1507-Requirements for Roof Coverings
- Sec. 1508-Roof Insulation
- Sec. 1509-Rooftop Structures
- Sec. 1510-Reroofing

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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 lowslope (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.

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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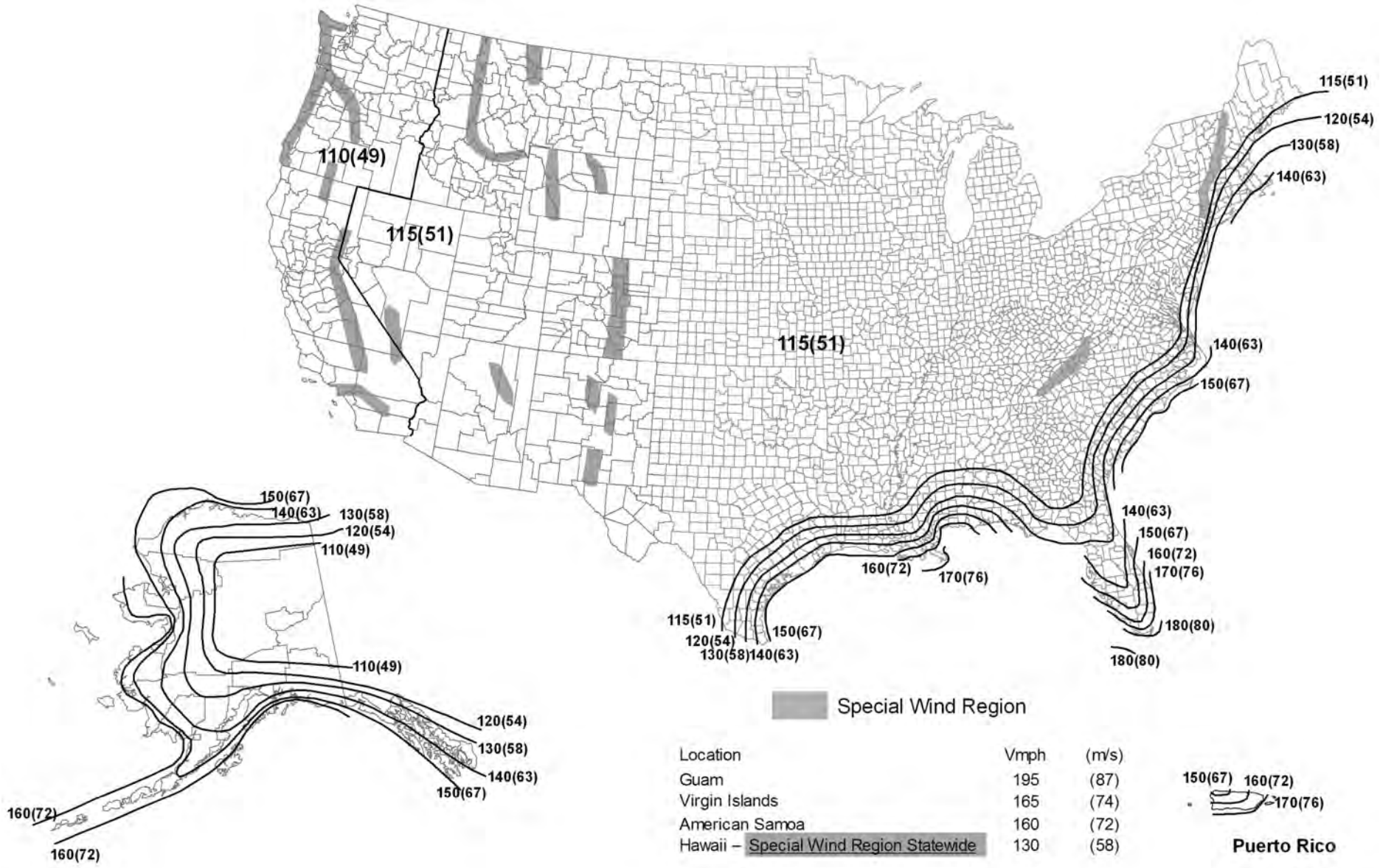

Fig. 1607A--V_{ult} for Risk Category II Buildings

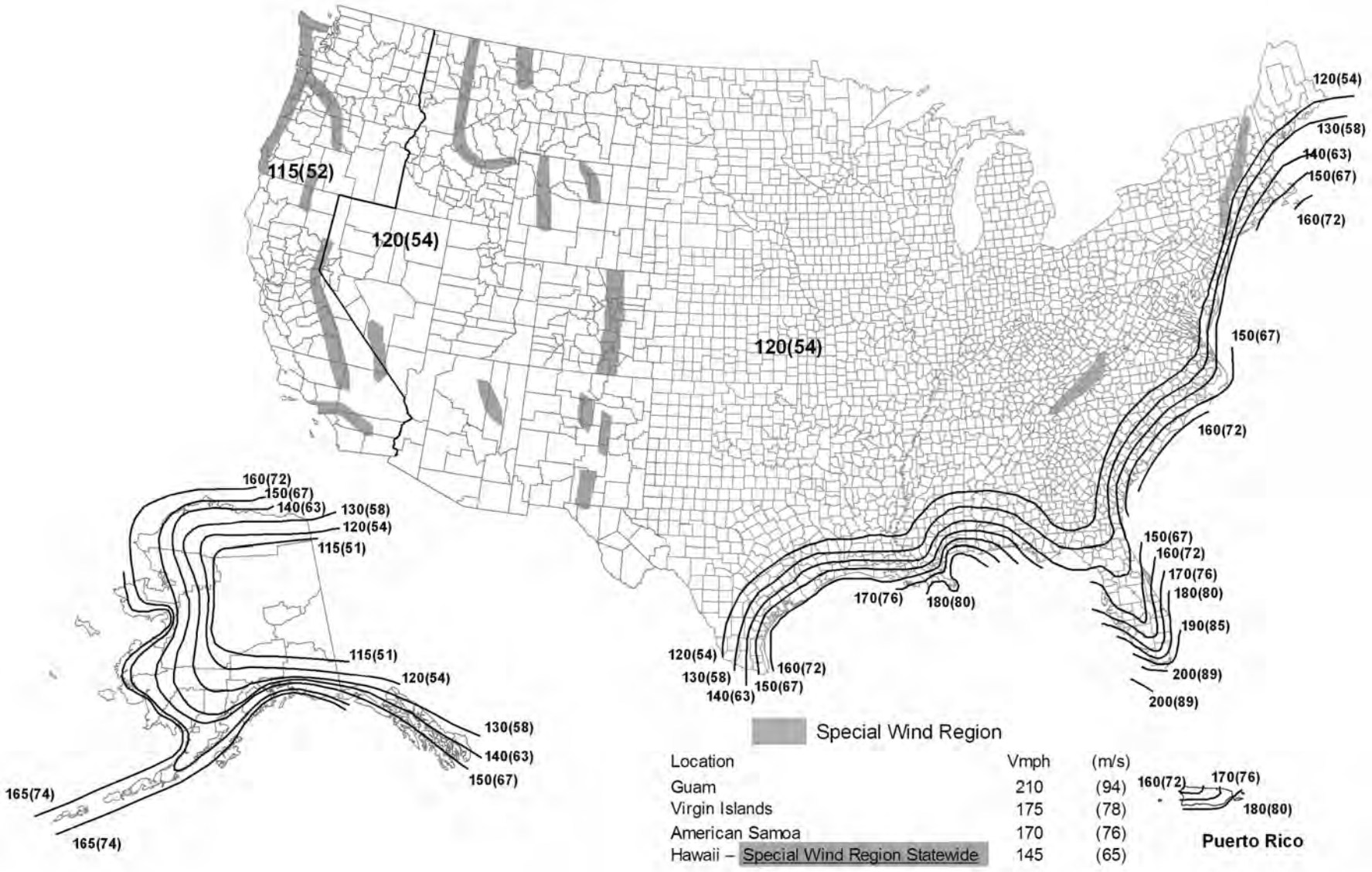

Fig. 1607B--V_{ult} for Risk Category III and IV Buildings

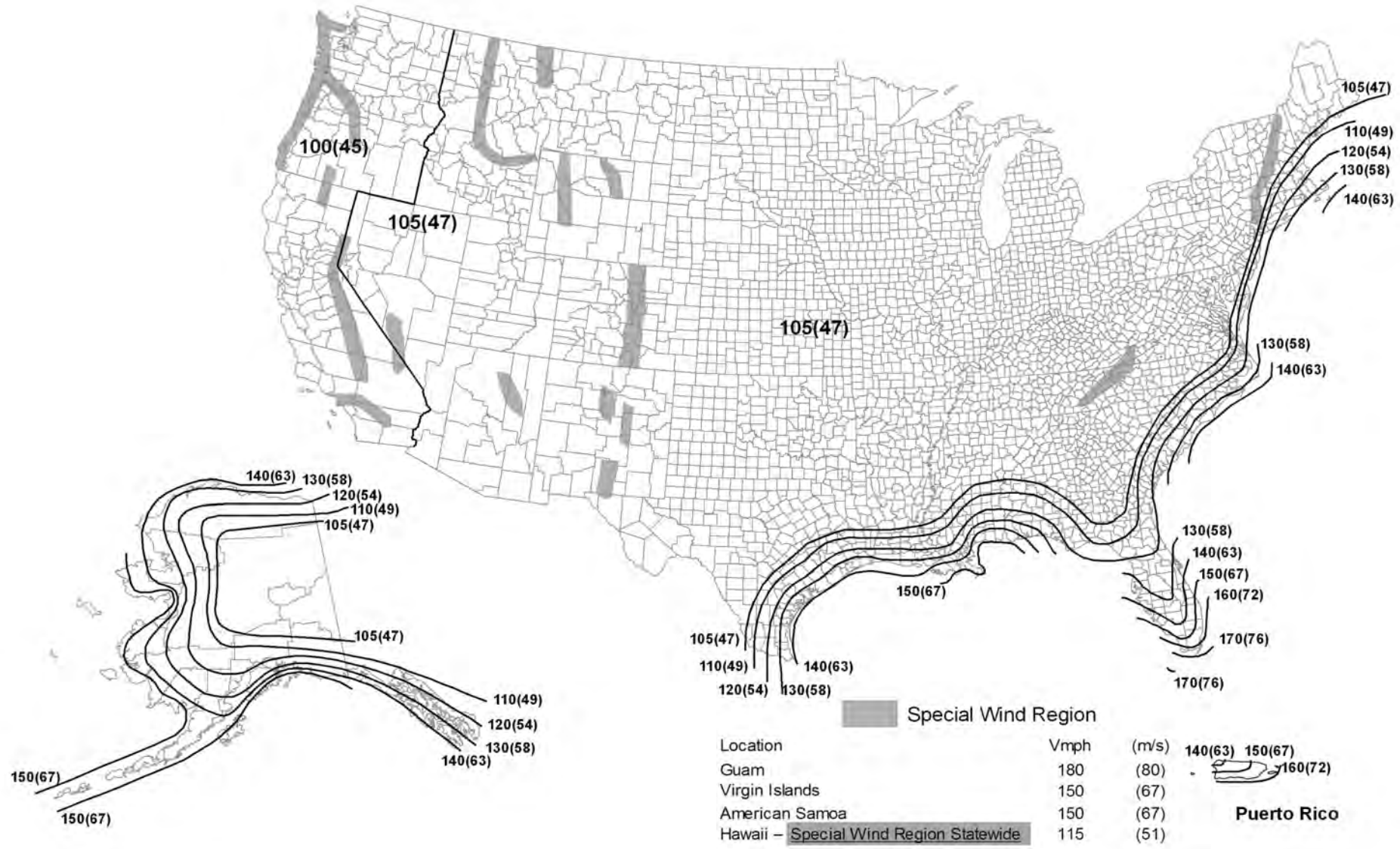

Fig. 1607C--V_{ult} for Risk Category I Buildings

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. 1504-Performance Requirements

International Building Code, 2012 Edition

1504.8 Aggregate. Aggregate used as surfacing for roof coverings and aggregate, gravel or stone used as ballast shall not be used on the roof of a building located in a hurricane-prone region as defined in Section 202, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site.

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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.

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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 m^2.

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 $kg.m^2$) 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.

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.

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.

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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. 1507-Requirements for Roof Coverings

International Building Code, 2012 Edition

1507.2.8.1 High wind attachment. Underlayment applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied with corrosion-resistant fasteners in accordance with the manufacturer's instructions. Fasteners are to be applied along the overlap at a maximum spacing of 36 inches (914 mm) on center…

[Continued…]

V_{asd} is taken from Table 1609.3.1 using V_{ult}

Underlayment installed where V_{asd}, in accordance with Section 1609.3.1, equals or exceeds 120 mph (54 m/s) shall comply with ASTM D 226 Type II, ASTM D 4869 Type IV, or ASTM D 6757. The underlayment shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. Underlayment shall be applied in accordance with Section 1507.2.8 except all laps shall be a minimum of 4 inches (102 mm). Underlayment shall be attached using metal or plastic cap nails with a head diameter of not less than 1 inch (25 mm) with a thickness of at least 32-gauge [0.0134 inch (0.34 mm)] sheet metal. The cap nail shank shall be a minimum of 12 gauge [0.105 inch (2.67 mm)] with a length to penetrate through the roof sheathing or a minimum of 3/4 inch (19.1 mm) into the roof sheathing.

Exception: As an alternative, adhered underlayment complying with ASTM D 1970 shall be permitted.

SPF roof systems

IBC 2012, Section 1507.14.3--Application

1507.14.3 Application. Foamed-in-place roof insulation shall be installed in accordance with the manufacturer's instructions. A liquid-applied protective coating that complies with Table 1507.14.3 shall be applied no less than 2 hours nor more than 72 hours following the application of the foam.

TABLE 1507.14.3

PROTECTIVE COATING MATERIAL STANDARDS

MATERIAL	STANDARD
Acrylic coating	ASTM D 6083
Silicone coating	ASTM D 6694
Moisture-cured polyurethane coating	ASTM D 6947

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.

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.

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.

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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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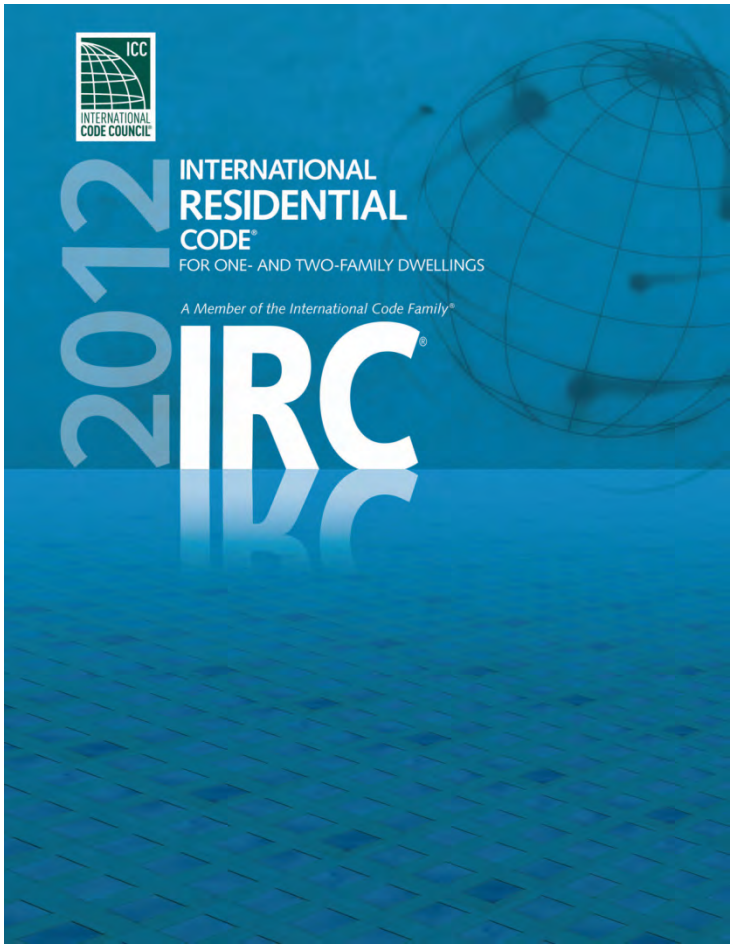
International Residential Code, 2012 Edition (IRC 2012)



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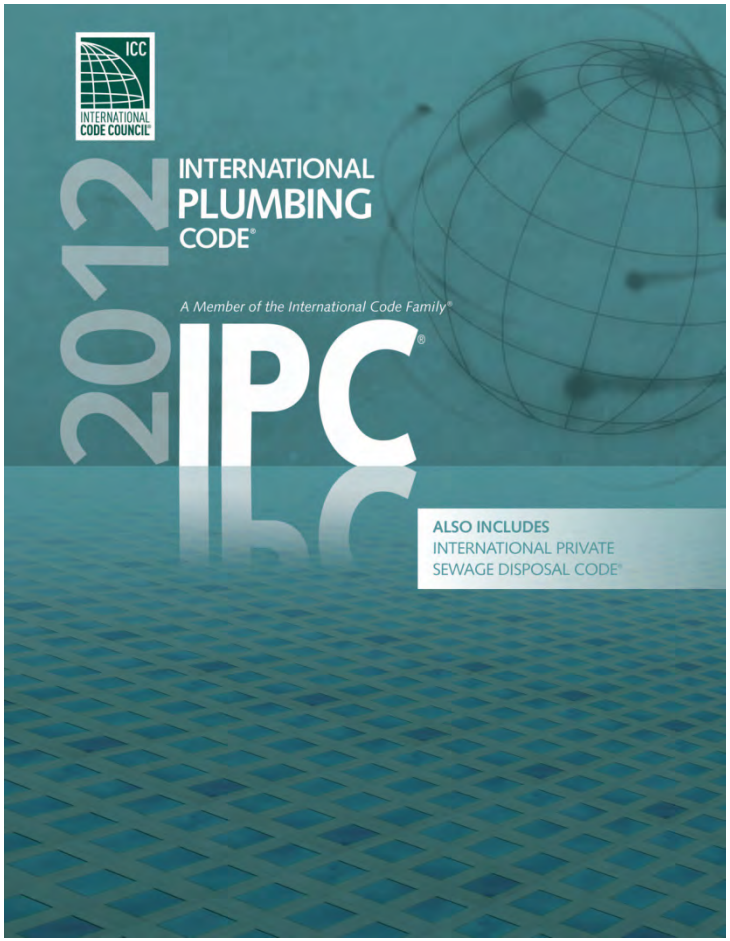
International Residential Code, 2012 Edition

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

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

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-Safegauarding Roofing Operations
IFC Sec. 605.11-Solar Photovoltaic Power Systems
IFC Sec. 317-Rooftop Gardens and Landscaped Roofs

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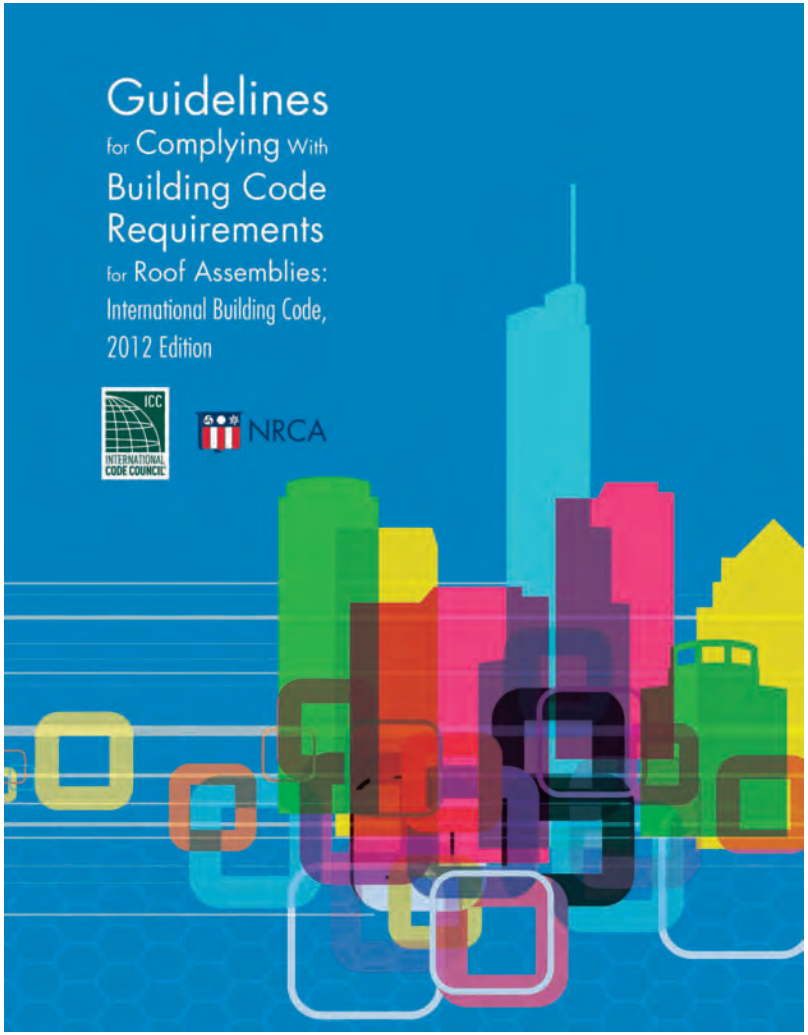
Building Codes Manual (2012 Codes)



- 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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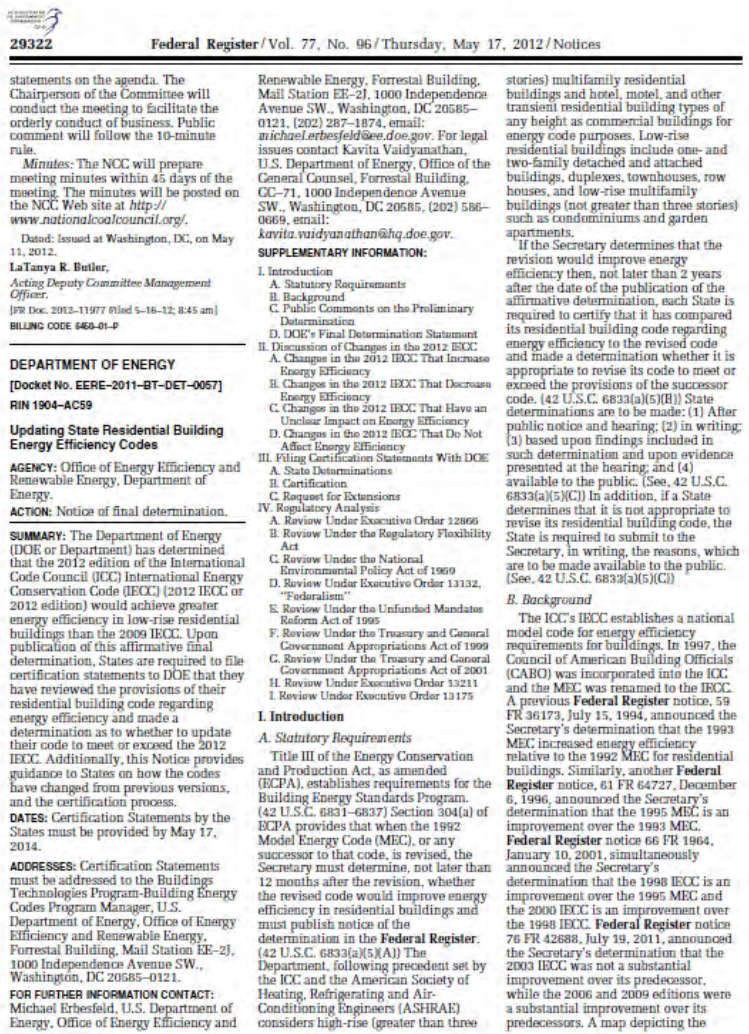
Federal Register, May 17, 2012



29322 Federal Register / Vol. 77, No. 96 / Thursday, May 17, 2012 / Notices

statements on the agenda. The Chairperson of the Committee will conduct the meeting to facilitate the orderly conduct of business. Public comment will follow the 10-minute rule.

Minutes: The NCC will prepare meeting minutes within 45 days of the meeting. The minutes will be posted on the NCC Web site at *http://www.nationalcoalcouncil.org/*.

Dated: Issued at Washington, DC, on May 11, 2012.

LaTanya R. Butler,

Acting Deputy Committee Management Officer.

[FR Doc. 2012–11977 Filed 5–16–12; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

[Docket No. EERE–2011–BT–DET–0057]

RIN 1904–AC59

Updating State Residential Building Energy Efficiency Codes

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Notice of final determination.

SUMMARY: The Department of Energy (DOE or Department) has determined that the 2012 edition of the International Code Council (ICC) International Energy Conservation Code (IECC) (2012 IECC or 2012 edition) would achieve greater energy efficiency in low-rise residential buildings than the 2009 IECC. Upon publication of this affirmative final determination, States are required to file certification statements to DOE that they have reviewed the provisions of their residential building code regarding energy efficiency and made a determination as to whether to update their code to meet or exceed the 2012 IECC. Additionally, this Notice provides guidance to States on how the codes have changed from previous versions, and the certification process.

DATES: Certification Statements by the States must be provided by May 17, 2014.

ADDRESSES: Certification Statements must be addressed to the Buildings Technologies Program-Building Energy Codes Program Manager, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121.

FOR FURTHER INFORMATION CONTACT: Michael Erbesfeld, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE–2J, 1000 Independence Avenue SW., Washington, DC 20585–0121, (202) 287–1874, email: *michael.erbesfeld@ee.doe.gov*. For legal issues contact Kavita Vaidyanathan, U.S. Department of Energy, Office of the General Counsel, Forrestal Building, GC–71, 1000 Independence Avenue SW., Washington, DC 20585, (202) 586–0669, email: *kavita.vaidyanathan@hq.doe.gov*.

SUPPLEMENTARY INFORMATION:

I. Introduction

A. Statutory Requirements

Title III of the Energy Conservation and Production Act, as amended (ECPA), establishes requirements for the Building Energy Standards Program. (42 U.S.C. 6831–6837) Section 304(a) of ECPA provides that when the 1992 Model Energy Code (MEC), or any successor to that code, is revised, the Secretary must determine, not later than 12 months after the revision, whether the revised code would improve energy efficiency in residential buildings and must publish notice of the determination in the **Federal Register**. (42 U.S.C. 6833(a)(5)(A)) The Department, following precedent set by the ICC and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) considers high-rise (greater than three stories) multifamily residential buildings and hotel, motel, and other transient residential building types of any height as commercial buildings for energy code purposes. Low-rise residential buildings include one- and two-family detached and attached buildings, duplexes, townhouses, row houses, and low-rise multifamily buildings (not greater than three stories) such as condominiums and garden apartments.

If the Secretary determines that the revision would improve energy efficiency then, not later than 2 years after the date of the publication of the affirmative determination, each State is required to certify that it has compared its residential building code regarding energy efficiency to the revised code and made a determination whether it is appropriate to revise its code to meet or exceed the provisions of the successor code. (42 U.S.C. 6833(a)(5)(B)) State determinations are to be made: (1) After public notice and hearing; (2) in writing; (3) based upon findings included in such determination and upon evidence presented at the hearing; and (4) available to the public. (See, 42 U.S.C. 6833(a)(5)(C)) In addition, if a State determines that it is not appropriate to revise its residential building code, the State is required to submit to the Secretary, in writing, the reasons, which are to be made available to the public. (See, 42 U.S.C. 6833(a)(5)(C))

B. Background

The ICC's IECC establishes a national model code for energy efficiency requirements for buildings. In 1997, the Council of American Building Officials (CABO) was incorporated into the ICC and the MEC was renamed to the IECC. A previous **Federal Register** notice, 59 FR 36173, July 15, 1994, announced the Secretary's determination that the 1993 MEC increased energy efficiency relative to the 1992 MEC for residential buildings. Similarly, another **Federal Register** notice, 61 FR 64727, December 6, 1996, announced the Secretary's determination that the 1995 MEC is an improvement over the 1993 MEC. **Federal Register** notice 66 FR 1964, January 10, 2001, simultaneously announced the Secretary's determination that the 1998 IECC is an improvement over the 1995 MEC and the 2000 IECC is an improvement over the 1998 IECC. **Federal Register** notice 76 FR 42688, July 19, 2011, announced the Secretary's determination that the 2003 IECC was not a substantial improvement over its predecessor, while the 2006 and 2009 editions were a substantial improvement over its predecessors. A map depicting the

Key points:

- US DOE has determined IECC 2012 will achieve greater energy efficiency in low-rise residential buildings than IECC 2009
- States must certify by May 17, 2014 their energy code meets or exceeds the levels of IECC 2012

This triggers most states to update their state energy code

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Format

International Energy Conservation Code, 2012 Edition

Ch. 1: Administration

- Part 1: Scope and Application
- Part 2: Administration and Enforcement

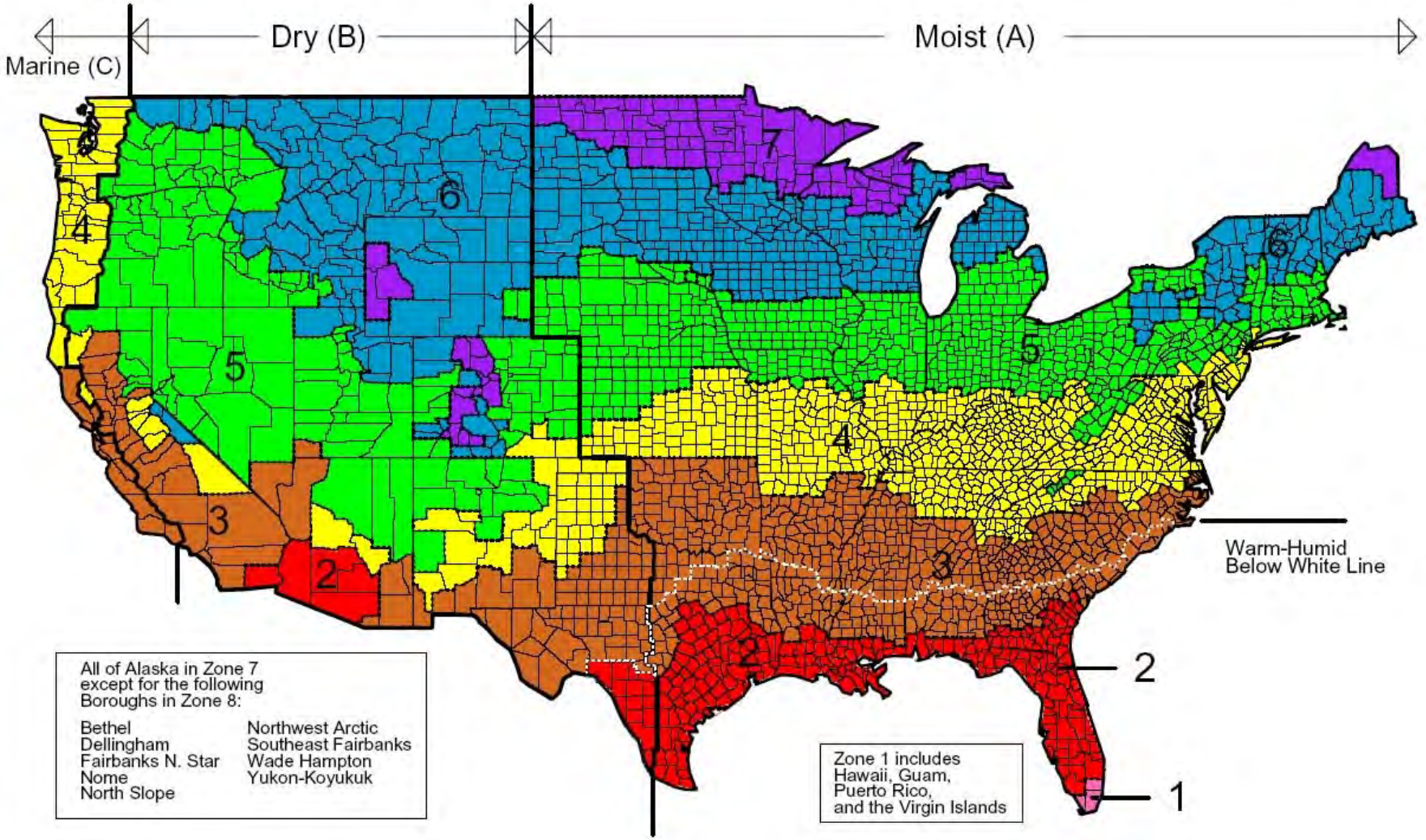
Ch. 2: Definitions

Ch. 3: General Requirements

Ch. 4: Commercial Energy Efficiency

Ch. 5: Reference Standards

Climate Zone Map



International Energy Conservation Code, 2012 Edition

- Ch. 4[CE]-Commercial Energy Efficiency
- Ch. 4[RE]-Residential Energy Efficiency
- ASHRAE 90.1-2010 alternative

Ch. 4—Commercial Energy Efficiency

International Energy conservation Code, 2012 Edition

- Sec. C402—Building Envelope Requirements
- Sec. C403—Building Mechanical Systems
- Sec. C404—Service Water Heating
- Sec. C405—Electrical Power and Lighting Systems
- Sec. C406—Additional Efficiency Package Options
- Sec. C407—Total Building Performance

Minimum thermal insulation requirements

IECC 2012, Section C402.2—Specific insulation Requirements (Prescriptive)

C402.2 Specific insulation requirements (Prescriptive). Opaque assemblies shall comply with Table C402.2. Where two or more layers of continuous insulation board are used in a construction assembly, the continuous insulation boards shall be installed in accordance with Section C303.2. If the continuous insulation board manufacturer's installation instructions do not address installation of two or more layers, the edge joints between each layer of continuous insulation boards shall be staggered.

Ch. 4[CE]-Commercial Energy Efficiency

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. …

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Ch. 4[CE]-Commercial Energy Efficiency

International Energy Conservation Code, 2012 Edition

<table>
<tr><th colspan="4">Minimum thermal insulation requirements
for commercial buildings</th></tr>
<tr><th rowspan="2">Climate zone</th><th colspan="3">Roof assembly configuration</th></tr>
<tr><th>Insulation entirely above deck</th><th>Metal buildings (with R-5 thermal blocks)</th><th>Attic and other</th></tr>
<tr><td>1</td><td rowspan="3">R-20ci</td><td rowspan="5">R-19 + R-11 LS</td><td rowspan="5">R-38</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td rowspan="2">R-25 ci</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td><td>R-30ci</td><td>R-25 + R-11 LS</td><td rowspan="3">R-49</td></tr>
<tr><td>7</td><td rowspan="2">R-35ci</td><td rowspan="2">R-30 + R-11 LS</td></tr>
<tr><td>8</td></tr>
<tr><td colspan="4">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)</td></tr>
</table>

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 x ft^2 x °F/Btu at a mean temperature of 75°F (24°C).

What about tapered insulation?

Ch. 4[CE]-Commercial Energy Efficiency

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.

2012 IECC Code and Commentary

"…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…]

2012 IECC Code and Commentary

"…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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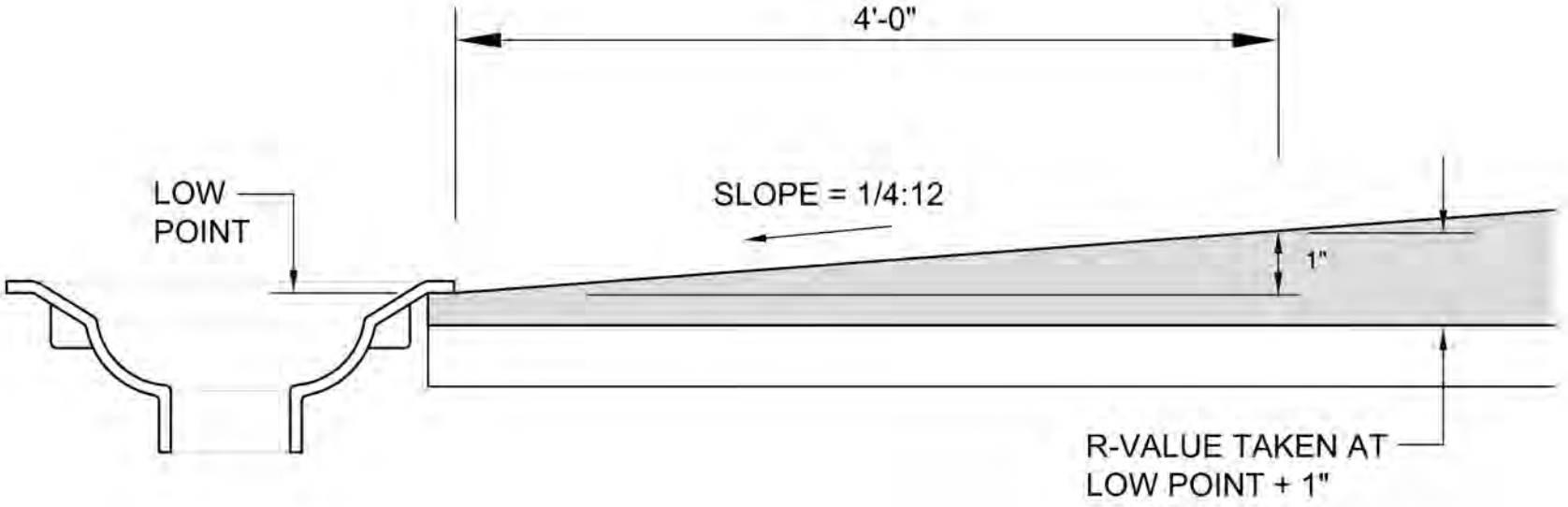
Graphically depicted…



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Solar reflectance and thermal emittance

IECC 2012, Section C402.2.1.1

C402.2.1.1 Roof solar reflectance and thermal emittance. Low-sloped roofs, with a slope less than 2 units vertical in 12 horizontal, directly above cooled *conditioned spaces* in Climate Zones 1, 2, and 3 shall comply with one or more of the options in Table C402.2.1.1.

Exceptions: The following roofs and portions of roofs are exempt from the requirements in Table C402.2.1.1:

1. Portions of roofs that include or are covered by:

1.1 Photovoltaic systems or components.

1.2 Solar air or water heating systems or components.

1.3 Roof gardens or landscaped roofs.

1.4 Above-roof decks or walkways.

1.5 Skylights.

1.6 HVAC systems, components, and other opaque objects mounted above…

[Continued…]

TABLE C402.2.1.1

MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS[a]

Three-year aged solar reflectance[b] of 0.55 and three-year aged thermal emittancec of 0.75
Initial solar reflectance[b] of 0.70 and initial thermal emittance[c] of 0.75
Three-year-aged solar reflectance index[d] of 64
Initial solar reflectance index[d] of 82

[Footnotes omitted for clarity]

Air retarders

IECC 2012, Section C402.4-Air Leakage (Mandatory)

C402.4 Air leakage (Mandatory). The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8.

C402.4.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be permitted to be located on the inside or outside of the building envelope, located within the assemblies composing the envelope, or any combination thereof. The air barrier shall comply with Sections C402.4.1.1 and C402.4.1.2.

Exception: Air barriers are not required in buildings located in Climate Zones 1, 2 and 3.

[Continued…]

C402.4.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

1. The air barrier shall be continuous for all assemblies that are the thermal envelope of the building and across the joints and assemblies.

2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. Air barrier penetrations shall be sealed in accordance with Section C402.4.2. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.

3. Recessed lighting fixtures shall comply with Section C404.2.8. Where similar objects are installed which penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

Exception: Buildings that comply with Section C402.4.1.2.3 are not required to comply with Items 1 and 3.

[Continued…]

C402.4.1.2 Air barrier compliance options. A continuous air barrier for the opaque building envelope shall comply with Section C402.4.1.2.1, C402.4.1.2.2, or C402.4.1.2.3.

C402.4.1.2.1 Materials. Materials with an air permeability no greater than 0.004 cfm/ft^2 (0.02 L/s · m^2) under a pressure differential of 0.3 inches water gauge (w.g.) (75 Pa) when tested in accordance with ASTM E 2178 shall comply with this section. Materials in Items 1 through 15 shall be deemed to comply with this section provided joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than 3/8 inch (10 mm).
2. Oriented strand board having a thickness of not less than 3/8 inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than 1/2 inch (12 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12 mm).
5. Closed cell spray foam a minimum density of 1.5 pcf (2.4 kg/m^3) having a thickness of not less than 1-1/2 inches (36 mm).

[Continued….]

6. Open cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m^3) and having a thickness of not less than 4.5 inches (113 mm).
7. Exterior or interior gypsum board having a thickness of not less than ½ inch (12 mm).
8. Cement board having a thickness of not less than 1/2 inch (12 mm).
9. Built up roofing membrane.
10. Modified bituminous roof membrane.
11. Fully adhered single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (16 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.

[Continued…]

C402.4.1.2.2 Assemblies. Assemblies of materials and components with an average air leakage not to exceed 0.04 cfm/ft^2 (0.2 L/s · m^2) under a pressure differential of 0.3 inches of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E 2357, ASTM E 1677 or ASTM E 283 shall comply with this section. Assemblies listed in Items 1 and 2 shall be deemed to comply provided joints are sealed and requirements of Section C402.4.1.1 are met.

1. Concrete masonry walls coated with one application either of block filler and two applications of a paint or sealer coating;

2. A Portland cement/sand parge, stucco or plaster minimum 1/2 inch (12 mm) in thickness.

C402.4.1.2.3 Building test. The completed building shall be tested and the air leakage rate of the *building envelope* shall not exceed 0.40 cfm/ft^2 at a pressure differential of 0.3 inches water gauge (2.0 L/s · m^2 at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official.

[Continued…]

C402.4.2 Air barrier penetrations. Penetrations of the air barrier and paths of air leakage shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Joints and seals shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials shall be appropriate to the construction materials being sealed. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.

Summary – IECC 2012

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

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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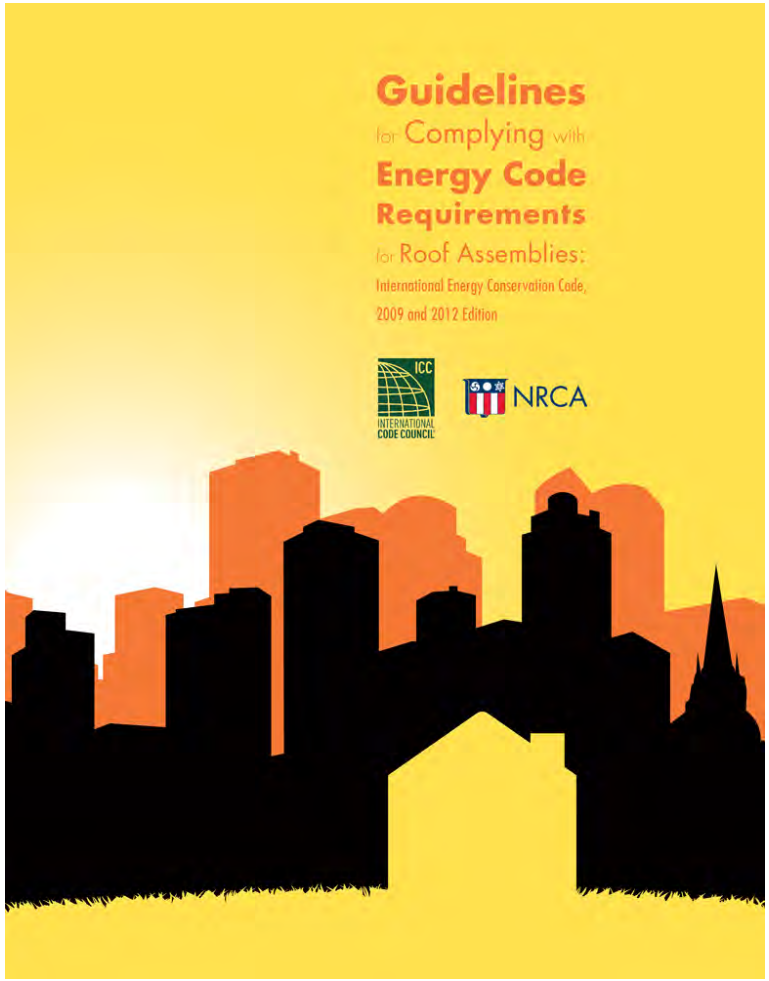
Energy Codes Manual



- Based upon IECC 2012 with ASHRAE 90.1-07 option and IECC 2012 with ASHRAE 90.1-10 option
- Includes roofing-related code text and NRCA commentary on each section
- Appendix has county-specific prescriptive R-value tables
- Co-branded with ICC; NRCA promotes to industry and ICC promotes to code officials

NRCA

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Changes in roofing requirements

The 2012 I-codes will affect roofing practices

by Mark S. Graham

Earlier this year, the International Code Council (ICC) updated its model codes, commonly referred to as I-codes. ICC intends for the latest edition of the I-codes to be adopted by jurisdictions beginning in 2012. Because these new editions contain numerous roofing-related changes, you should pay close attention to the 2012 I-codes.

I-codes

Currently, the I-codes consist of 13 model codes addressing a variety of regulatory topics. Most roofing professionals are most familiar with ICC's International Building Code (IBC), International Residential Code for One- and Two-Family Dwellings (IRC), and International Energy Conservation Code (IECC), which address most buildings and structures, one- and two-family residential buildings, and buildings' minimum thermal insulation requirements, respectively. Other I-codes address topics such as fire prevention, plumbing, mechanical systems and building site zoning.

I-codes are published on a three-year cycle. For example, the IBC and IRC initially were published in 2000 and revised editions were published in 2003, 2006 and 2009.

Revisions to the I-codes are made through ICC's code development process, which consists of interested parties submitting proposed changes, a public hearing with ICC's code development committee during which submitted changes are discussed and an ICC final action hearing where ICC's entire membership votes on all submitted changes. NRCA actively participates in ICC's code development process representing roofing contractors' interests by submitting code change proposals and providing testimony at public hearings and final action hearings on proposals submitted by others. I typically spend five to seven weeks a year being involved in ICC's code development process.

ICC's deadline for changes to IBC's 2012 edition is Jan. 3, 2012, for possible publication in IBC's 2015 edition.

In March 2012, ICC will publish two additional model codes: the International Pool and Spa Code and the International Green Construction Code (IGCC). This article specifically does not address upcoming IGCC requirements.

2012 IBC

Requirements for roof systems primarily are addressed in IBC's Chapter 15—Roof Assemblies and Rooftop Structures.

In Section 1503.6—Crickets and Saddles, an exception has been added that exempts unit skylights from requiring crickets or saddles. Previously, IBC 2009 required crickets or saddles for all roof system penetrations 30 inches or wider, including unit skylights. Unit skylights need to be tested and labeled according to AAMA/WDMA/CSA 101/I.S./A440, "North American Fenestration Standard/Specifications for Windows, Doors and Skylights."

In Section 1504.5—Edge Securement for Low-slope Roofs, the code's requirement for roof edge metal to comply with ANSI/SPRI ES-1 has been clarified to indicate only the wind-resistance testing portions of ANSI/SPRI ES-1 (Test Methods RE-1, RE-2 and RE-3) shall apply. Wind loads on roof edge metal need to be determined using the code's Chapter 16—Structural Requirements, not ANSI/SPRI ES-1's wind load determination method.

In Section 1505—Fire Classification, an exception has been added that exempts copper sheet roofing, minimum 16 ounce, over combustible roof decks from requiring fire testing. Previously, IBC 2009 required copper sheet roof systems to be fire-tested. Using IBC 2012, copper sheet roofing, minimum 16 ounce, over combustible roof deck can be considered Class A without testing.

For steep-slope roof system underlayment, special attachment requirements have been added for high-wind regions. For regions where the nominal design wind speed is greater than 110 mph, corrosion-resistant fasteners shall be applied along the overlap at a maximum spacing of 36 inches on center. Where the nominal design wind speed is 120 mph or greater, underlayment shall have 4-inch minimum laps and be fastened in a 12-inch grid pattern between side laps and 6-inch spacing at laps using metal or plastic cap nails. An exception allows an adhered underlayment to be used in lieu of these special high-wind underlayment lap and attachment requirements.

In Section 1510—Reroofing, an exception has been added that allows any existing ice-dam protection membrane to remain in place and be covered with an additional layer of ice-dam protection membrane during removal of existing steep-slope roof systems. Previous IBC editions could be interpreted as requiring removal of an ice-dam protection membrane, which usually results in roof deck damage.

Specific requirements for rooftop photovoltaic (PV) systems have been added to the roofing chapter of the 2012 IBC. Rack-mounted PV panels or PV systems that are adhered or attached to roof coverings need to be tested and labeled to have the same fire-resistance classification as

Minimum thermal insulation requirements for commercial buildings			
Climate zone	**Roof assembly configuration**		
	Insulation entirely above deck	**Metal buildings (with R-5 thermal blocks)**	**Attic and other**
1	R-20ci	R-19 + R-11 LS	R-38
2	R-20ci	R-19 + R-11 LS	R-38
3	R-20ci	R-19 + R-11 LS	R-38
4	R-25ci	R-19 + R-11 LS	R-38
5	R-25ci	R-19 + R-11 LS	R-38
6	R-30ci	R-25 + R-11 LS	R-49
7	R-35ci	R-30 + R-11 LS	R-49
8	R-35ci	R-30 + R-11 LS	R-49
ci = Continuous insulation LS = Liner system (a continuous membrane installed below the purlins and uninterrupted by framing members; uncompressed, unfaced insulation rests on top of the membrane between the purlins)			

Minimum thermal insulation requirements for commercial buildings

Table 1505—Fire Classifications requires for the building's roof covering. Testing and labeling according to UL 1703, "Flat-Plate Photovoltaic Modules and Panels," also are required. Rack-mounted PV panels need to be designed for wind loads using the component and cladding approach of Chapter 16, which includes considering an effective wind area based upon the dimensions of a single PV unit frame. Roof-covering-integrated PV modules or shingles need to be wind-tested according to ASTM D3161, "Test Method for Wind Resistance of Asphalt Shingles (Fan Induced Method)."

Additional new requirements for rooftop PV systems also are contained in the 2012 International Fire Code (IFC).

2012 IRC

Requirements for roof systems primarily are addressed in IRC's Chapter 9—Roof Assemblies. The roofing-related changes mentioned for IBC 2012 are incorporated into IRC 2012. The following additional revisions also are included.

In Section R903.2—Flashings, a kick-out flashing now is required for steep-slope roof systems to divert runoff water from where an eave intersects a vertical sidewall. When a metal kick-out flashing is used, it should be corrosion-resistant and at least 0.19 of an inch thick (26-gauge galvanized steel).

For asphalt shingle roof systems at sidewall flashing conditions, either a continuous flashing or step flashing now is permitted. Previous IRC editions required step flashing only. Also, a drip edge now needs to be provided at eaves and gables (rakes) and extend a minimum of 2 inches onto the roof deck and a minimum of ¼ of an inch below the roof sheathing. Joints in drip edge sections need to be overlapped a minimum of 2 inches. Drip edges need to be attached at a maximum of 12 inches on center.

In IRC's 2006 and 2009 editions, a requirement was provided that prohibited re-covering roof systems with asphalt shingles in specific regions susceptible to hail damage. This restriction is removed from IRC 2012.

2012 IECC

Thermal insulation requirements for roof systems and attics for commercial and residential buildings are provided in IECC's Chapter 4[CE]—Commercial Energy Efficiency and Chapter 4[RE]—Residential Energy Efficiency, respectively. IECC considers residential buildings to be detached one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as certain buildings three stories or less in height. Commercial buildings are all other buildings not included in the definition of residential buildings.

For commercial buildings, the 2012 IECC generally requires notably higher levels of thermal insulation than previous editions. Minimum thermal insulation requirements using IECC's prescriptive method are provided in the figure. The Climate Zones indicated in the figure's table are provided in Chapter 3[CE]—General Requirements; Climate Zone 1 occurs in south Florida, and climate zone numbers increase in a northerly direction with Climate Zone 8 occurring in Alaska.

Also, for Climate Zones 1, 2 and 3 the 2012 IECC requires low-slope roof systems installed directly over conditioned spaces to have high solar reflectances and thermal emittances. The code's Table C402.2.1.1—Minimum Roof Reflectance and Emittance Options specifies the criteria as follows:

- Three-year aged solar reflectance of 0.55 and three-year aged thermal emittance of 0.75
- Initial solar reflectance of 0.70 and initial thermal emittance of 0.75
- Three-year aged solar reflectance index of 64
- Initial solar reflectance index of 83

Roofs or portions of roofs with PV systems, solar air or hot water systems, roof gardens or vegetative roof systems, decks or walkways, or HVAC systems are exempt from the high solar reflectance and thermal emittance requirements.

For residential buildings covered by the IECC, ceiling R-values of R-30 in Climate Zone 1, R-38 in Climate

Zones 2 and 3, and R-49 in Climate Zones 4 through 8 are required by Table R402.1.1 in Section R402—Building Envelope.

Also, in Section R402.2.3—Eave Baffle, vent baffles are required in vented attics to maintain ventilation openings equal to or greater than the sizes of the vents.

2012 IFC

In the IFC, roofing-related requirements are in multiple locations.

A new subsection, Section 605.11—Solar Photovoltaic Power Systems, addresses ground-based and roof-mounted PV systems. PV systems need to comply with NFPA 70, "National Electric Code," and meet specific marking requirements. For roof-mounted PV systems, additional requirements for the location of DC conductors, rooftop access and pathways, and firefighters smoke ventilation procedures are provided. Generally, for steep-slope roof systems, a 3-foot-wide access pathway clear of any PV modules is required at side edges and ridges and an 18-inch-wide pathway is required along hips and valleys. For low-slope roof systems, generally a 4-foot-wide access pathway is required at the perimeter of PV arrays and no single array shall measure more than 150 feet by 150 feet without an additional pathway.

New requirements applicable to vegetative roof systems also are provided in Section 317—Rooftop Gardens and Landscaped Roofs. No vegetative roof system's area shall exceed 15,625 square feet or a maximum dimension of 125 feet in length or width. For vegetative roof system areas abutting combustible construction, a minimum 6-foot-wide buffer needs to be provided. Also, a maintenance plan for vegetation needs to be provided to and approved by the jurisdiction's fire code official and dead foliage needs to be removed at least twice per year.

PV and vegetative roof systems

Compliance with and enforcement of the 2012 I-codes requirements for PV and vegetative roof systems likely will present unique challenges because the code requirements for these systems are spread among the IBC, IRC and IFC.

For example, for rooftop PV systems, code requirements applicable to electrical code compliance, fire classification and wind resistance are provided in the IBC and IRC. Requirements for DC conductors' locations, rooftop access and pathways, and firefighters smoke ventilation procedures are provided in the IFC.

Also, a new requirement has been added in IFC's Section 105.7.14 indicating a construction permit is required to install or modify PV systems. This requirement does not specify whether the permit should be issued by the fire code official or building (or residential) code official; the local jurisdiction likely will make that decision. The inclusion of a model code permit requirement for PV systems is significant because it is one of the only places in the I-codes that requires construction permits.

Similarly, for vegetative roof systems, code requirements applicable to materials, fire classification testing, and wind loads and resistance are provided in the IBC. Requirements for access pathways, fire standpipes and setbacks from combustible surfaces are provided in the IFC.

Typically, a code jurisdiction's building code official is responsible for plan review and building code or residential code enforcement while the jurisdiction's fire code official enforces the fire code. As a result, for PV and vegetative roof systems, two code officials have separate responsibilities for these systems.

It remains to be seen how individual code jurisdictions will handle this shared code enforcement responsibility or whether some jurisdictions may assign the overall responsibility to either the building code official or fire code official.

Implementation

With the publication of the 2012 I-codes, you should begin preparing for the new code's implementation. ICC intends for the latest edition of the I-codes to be adopted by jurisdictions beginning in 2012.

Because these new editions contain numerous roofing-related changes, be aware of the changes included in the 2012 I-codes and when the new code will be adopted. Code update and adoption timetables are determined by local authorities, typically municipal or state governments. I encourage you to contact the local authorities that have jurisdiction in the areas you work to learn of the specific codes and editions that are currently applicable and any plans or timetable the jurisdictions have for code updates.

On Thursday, Feb. 23, during the 2012 International Roofing Expo,® I will present an educational program where I will provide a more detailed explanation of the changes in the 2012 I-codes.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

Air barriers and the new energy code

IECC 2012's air barrier requirements could limit design options

by Mark S. Graham

The *International Energy Conservation Code,® 2012 Edition* (IECC 2012) includes a new requirement intended to limit air leakage through buildings' thermal envelopes, including roof assemblies. The requirement, a change from IECC 2009, will significantly affect the design and installation of certain roof assemblies.

IECC 2012

IECC 2012 Section C402.4—Air Leakage (Mandatory) requires all commercial (nonresidential) buildings, except those in climate zones 1 through 3, to include a continuous air barrier. Climate zones 1 through 3 include Alabama, Florida, Hawaii, Louisiana, Mississippi and South Carolina and portions of Arizona, Arkansas, California, Georgia, Nevada, New Mexico, North Carolina, Oklahoma, Tennessee, Texas and Utah.

The required air barrier is permitted to be located on the inside or outside of the building envelope, located within assemblies composing the building envelope and any combination thereof. The air barrier is required to be across all joints and assemblies comprising the building envelope. Air barrier joints and seams need to be sealed, including sealing transitions and changes in materials. Special provisions are provided for sealing recessed lighting fixtures, air barrier penetrations, doors and access openings, and outdoor air intakes and exhausts.

IECC 2012 provides for three compliance options for air barrier selection and evaluation: materials, assemblies or whole building testing. Using IECC 2012's materials option, a material with an air permeability no greater than 0.004 cfm/ft² under a pressure differential of 0.3 inches water gauge tested according to ASTM D2178, "Standard Test Method for Air Permeance of Building Materials," complies. Also, a number of specific materials—including minimum ⅜-inch-thick plywood or oriented strand board; minimum ½-inch-thick extruded polystyrene or foil-faced polyisocyanurate insulation or gypsum or cement board; cast-in-place and precast concrete; and built-up, polymer-modified bitumen and fully adhered single-ply membranes—are deemed to comply provided their joints are sealed and materials are installed as air barriers according to manufacturers' instructions.

The assemblies option allows assemblies of materials to comply with an average air leakage not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 inches of water gauge when tested according to ASTM E2357, "Standard Test Method for Determining the Air Leakage of Air Barrier Assemblies"; ASTM E1677, "Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls"; or ASTM 283, "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen."

The whole building option requires complete buildings be tested and the resulting air leakage rate not exceed 0.4 cfm/ft² under a pressure differential of 0.3 inches of water gauge when tested according to ASTM E7979, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization."

ON *the* WEB

To see IECC 2012's climate zone map and obtain IECC 2012, log on to www.professionalroofing.net.

Considerations

Although certain roof system types, including built-up, polymer-modified bitumen and adhered single-ply membranes are considered deemed to comply with the new air barrier requirement, other roof system types will require additional testing to substantiate compliance. These include mechanically attached and ballasted single-ply membranes, metal panels and shingle-type roof coverings.

For some of these roof system types, it may be more practical to provide the necessary air barrier at or below the roof deck level by using a cast-in-place or precast concrete roof deck, spray foam below the roof deck or a gypsum board ceiling. IECC 2012 includes specific density and thickness requirements for closed and open-cell spray foam for it to be considered deemed to comply.

Did you KNOW?

More information about roofing-related requirements contained in IECC 2012 is available in *Guidelines for Complying with Energy Code Requirements for Roof Assemblies: International Energy Conservation Code 2009 and 2012 Editions*. To purchase the manual, go to shop.nrca.net.

I recommend designers consult roof system manufacturers regarding how their specific roof system configurations function as air barriers according to IECC 2012's requirements. Also, roof system manufacturers should be consulted for specific penetration and perimeter sealing instructions to comply with IECC 2012's requirements.

MARK S. GRAHAM is NRCA's associate executive director of technical services.

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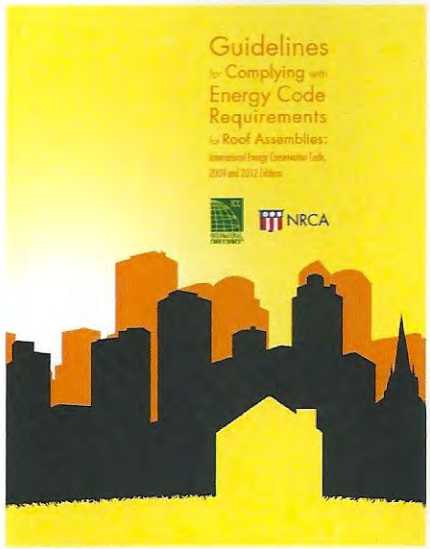

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Order Online
shop.nrca.net
E-mail
info@nrca.net

Mail to: **NRCA Customer Service Department**
P.O. Box 809261
Chicago, IL 60680-9261

Shipping and handling charges:

All orders will be shipped UPS Ground unless otherwise specified.

Order totals:	Add
$1-$25	$5
$26-$100	$10
$101-$200	$20
$201-$300	$30
$301-$500	$40
$501-$1,000	$55
more than $1,000	$100

CD: $10 per CD (when ordering only CDs)

Express Delivery	Order totals:	Add
Next-day UPS	$1-$500	$30
	$500+	$60
Second-day UPS	$1-$500	$20
	$500+	$40
Saturday delivery	$1-$500	$40
	$500+	$80

International: Orders will be assessed an additional 20 percent of the subtotal.
Please note: When ordering 10 or more copies of The NRCA Roofing Manual you will be assessed an additional $10 in shipping fees for each manual ordered. Next-day and second-day charges will be an additional $250 and $150 respectively. Fees apply online, also.

Name _____

Company Name _____ Member ID # _____

Street Address _____
(UPS will not deliver to a P.O. Box.)

City _____ State _____ ZIP _____ Country _____

Telephone _____ Fax _____

E-mail Address _____ Purchase Order # _____

ITEM NUMBER	TITLE	SIZE	QUANTITY	UNIT PRICE	TOTAL

Method of Payment: (Please do not send cash.)
☐ I've enclosed a check or money order, made payable to NRCA, in the amount of $_____.
☐ AMEX ☐ VISA ☐ MASTERCARD ☐ DISCOVER/NOVUS

Credit Card Number Expiration Date (month/year)

Authorized Signature Cardholder's Name Today's Date

Billing Address City/State/ZIP

Subtotal	
Add 9.25 percent sales tax for Illinois deliveries	
Shipping and handling (See chart.)	
Express delivery (if applicable)	
International orders add 20 percent of subtotal	
TOTAL AMOUNT DUE	