



**Partners in Growth Conference**

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***Energy Code Update***

presented by

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"The statements in this presentation represent the views of the presenter and GAF assumes no responsibility for the accuracy of the information presented."



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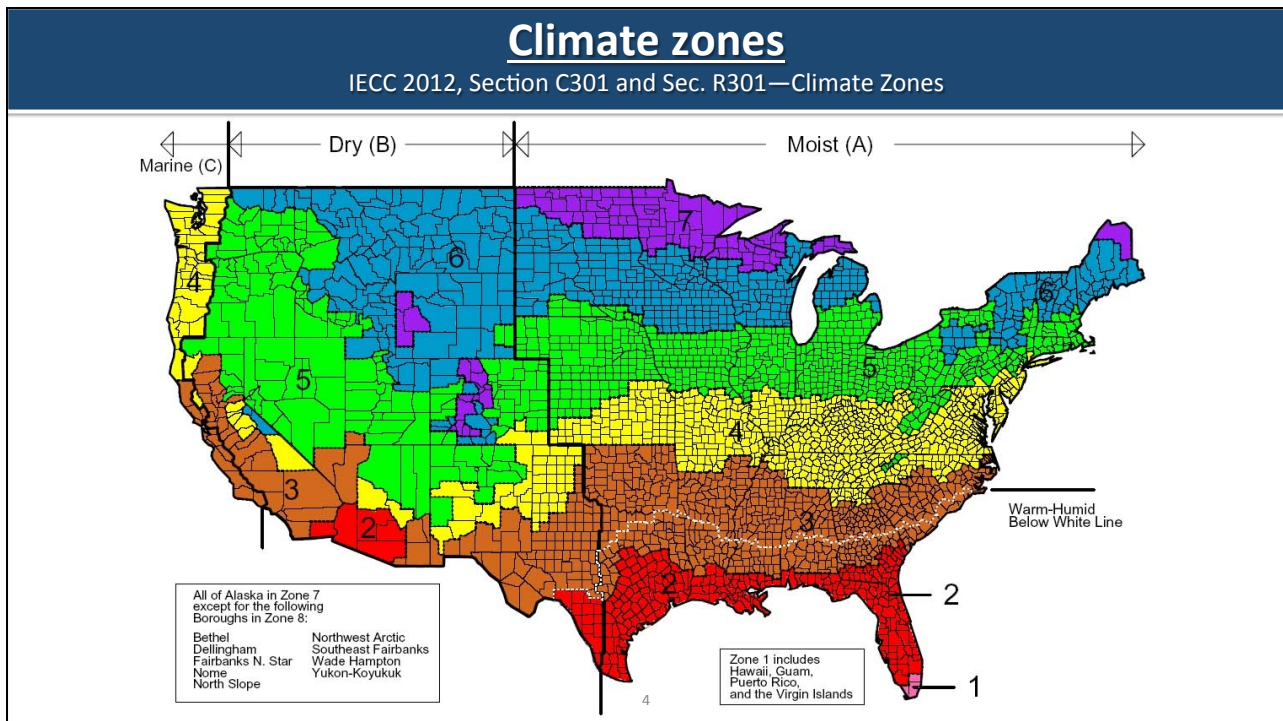
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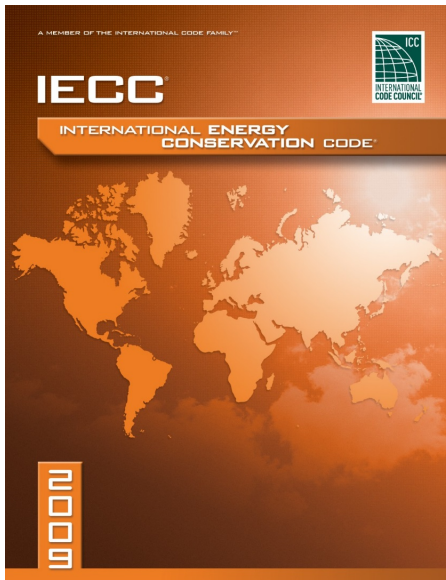
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## Background

- The International Energy Conservation Code is a “model code” 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





**International Energy Conservation Code, 2009 Edition (IECC 2009)**

**Roofing-specific adaptation of Table 402.1.1**

*International Energy Conservation Code, 2009 Edition (Residential buildings)*

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

<sup>a</sup> R-values are minimums. ...  
[Other footnotes omitted for clarity]

Roofing-specific adaptation of Table 502.2(1) International Energy Conservation Code, 2009 Edition (Commercial buildings)			
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-15ci	R-19	R-30
2	R-20ci	R-13 + R-13	R-38
3			
4			
5			
6	R-25ci	R-13 + R-19	R-49
7			
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)

**Federal Register, May 17, 2012**

**Key points:**

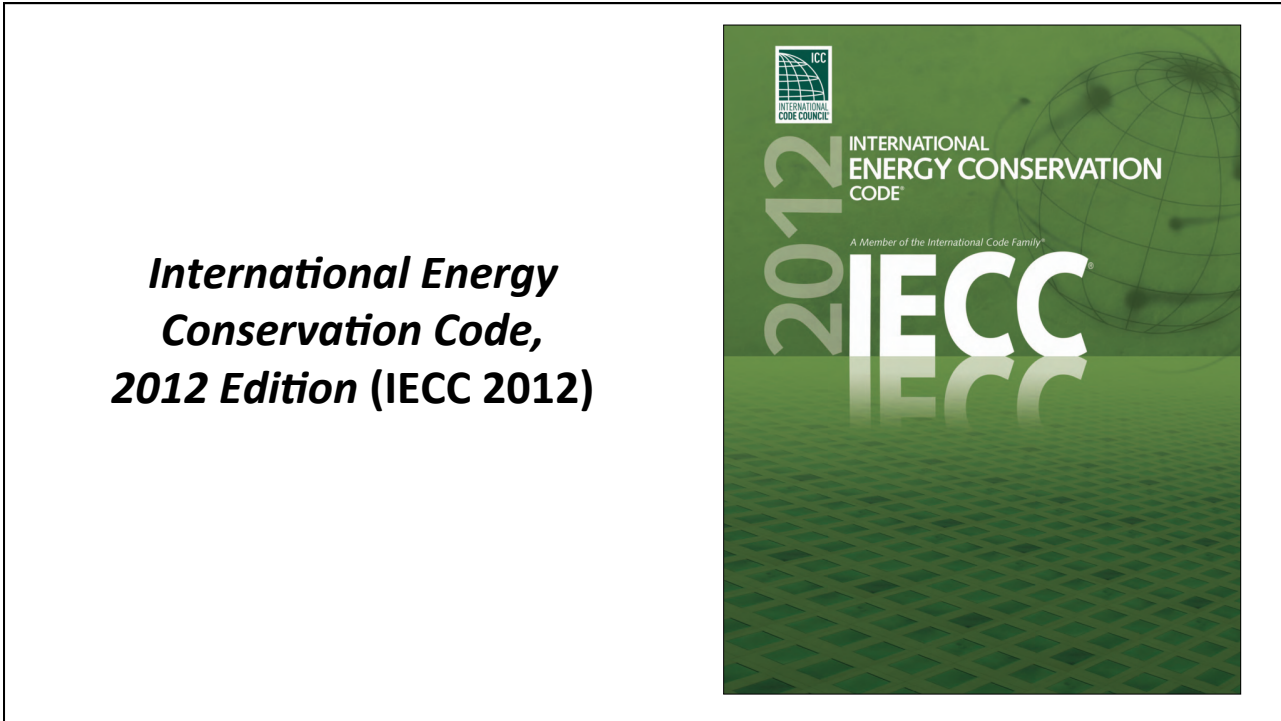
- US DOE has determined IECC 2012 will achieve greater energy efficiency in low-rise residential buildings than IECC 2009
- States must certify by May 17, 2014 their energy code meets or exceeds the levels of IECC 2012

**This triggers most states to update their state energy code**

**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



<b><u>Format of IECC 2012</u></b>	
<p><b><u>IECC – Commercial</u></b></p> <p>Ch. 1[CE]: Scope and Admin.</p> <p>Ch. 2[CE]: Definitions</p> <p>Ch. 3[CE]: General Req.</p> <p>Ch. 4[CE]: Commercial Energy Efficiency</p> <p>Ch. 5[CE]: Referenced Stds. Index</p>	<p><b><u>IECC – Residential</u></b></p> <p>Ch. 1[RE]: Scope and Admin.</p> <p>Ch. 2[RE]: Definitions</p> <p>Ch. 3[RE]: General Req.</p> <p>Ch. 4[RE]: Residential Energy Efficiency</p> <p>Ch. 5[RE]: Referenced Stds. Index</p>

## 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

## IECC 2012 – Residential Provisions

## **Ch. 4[RE]—Residential Energy Efficiency**

*International Energy Conservation Code, 2012 Edition*

- Sec. R401—General
- Sec. R402—Building Thermal Envelope
- Sec. R403—Systems
- Sec. R404—Electrical Power and Lighting Systems
- Sec. R405—Simulated Performance Alternative

## **Minimum thermal insulation requirements**

*IECC 2012, Section R402-Building Thermal Envelope*

### **R402.1.1 Insulation and fenestration criteria.**

The building thermal envelope **shall meet the requirements of Table R402.1.1** based upon the climate zone specified in Chapter 3.



## Roofing-specific adaptation of Table R402.1.1

*International Energy Conservation Code, 2012 Edition*

Insulation and Fenestration Requirements by Component <sup>a</sup>	
Climate zone	Ceiling R-value
1	30
2	38
3	
4	
5	49
6	
7	
8	
<sup>a</sup> R-values are minimums. ... [Other footnotes omitted for clarity]	

**R402.2.1 Ceilings with attic spaces.** When Section R402.1.1 would require R-38 in the ceiling, **R-30 shall be deemed to satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves.** Similarly, **R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.** This reduction shall not apply to the U-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.



**R402.2.2 Ceilings without attic spaces.** Where Section R402.1.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. **This reduction** of insulation from the requirements of Section R402.1.1 shall be **limited to 500 square feet (46 m<sup>2</sup>) or 20 percent of the total insulated ceiling area**, whichever is less. This reduction shall not apply to the U- factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

### **Air retarders**

IECC 2012, Section R402.4-Air Leakage (Mandatory)

**R402.4 Air leakage (Mandatory).** The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

**R402.4.1.2 Testing.** The building or dwelling unit shall be tested and verified as having an air leakage rate of **not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8.** Testing shall be conducted...

<b><u>Roofing-specific adaptation of Table R402.4.1.1</u></b> <small>International Energy Conservation Code, 2012 Edition</small>	
<b>Air Barrier and Insulation Installation</b>	
<b>Component</b>	<b>Criteria</b>
Air barrier and thermal barrier	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed. Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.

<b><u>Summary – IECC 2012 – Residential Provisions</u></b>
<ul style="list-style-type: none"> <li>• R-value increases</li> <li>• Mandatory air barriers requirements</li> </ul>

## **IECC 2012 – Commercial Provisions**

### **Ch. 4[CE]—Commercial Energy Efficiency**

*International Energy Conservation Code, 2012 Edition*

- Sec. C401—General
- 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

## **Ch. 4—Commercial Energy Efficiency**

*International Energy Conservation Code, 2012 Edition*

**C401.2 Application.** Commercial buildings shall comply with one of the following:

1. The requirements of **ANSI/ASHRAE/IESNA 90.1**
2. The requirements of **Sections C402**, C403, C404 and C405. In addition, commercial buildings shall comply with either Section C406.2, C406.3 or C406.4
3. The requirements of Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

### **C401.2.1 Application to existing**

**buildings.** Additions, alterations and repairs to existing buildings shall comply with one of the following:

1. Sections C402, C403, C404 and C405; or
2. ANSI/ASHRAE/IESNA 90.1

### Minimum thermal insulation requirements

IECC 2009, 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. ...

**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.

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.

Roofing-specific adaptation of Table C402.2 <i>International Energy Conservation Code, 2012 Edition</i>			
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			
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)

**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<sup>2</sup> x °F/Btu at a mean temperature of 75°F (24°C).

What about tapered insulation?

## Tapered insulation

*International Energy Conservation Code, 2012 Edition*

**C402.2.1 Roof assembly.** The minimum thermal resistance (R-value) of the insulating material installed within 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.

**IECC Commentary indicates  
Exception 1 applies to  
tapered insulation systems.**

### **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.

## 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....**”

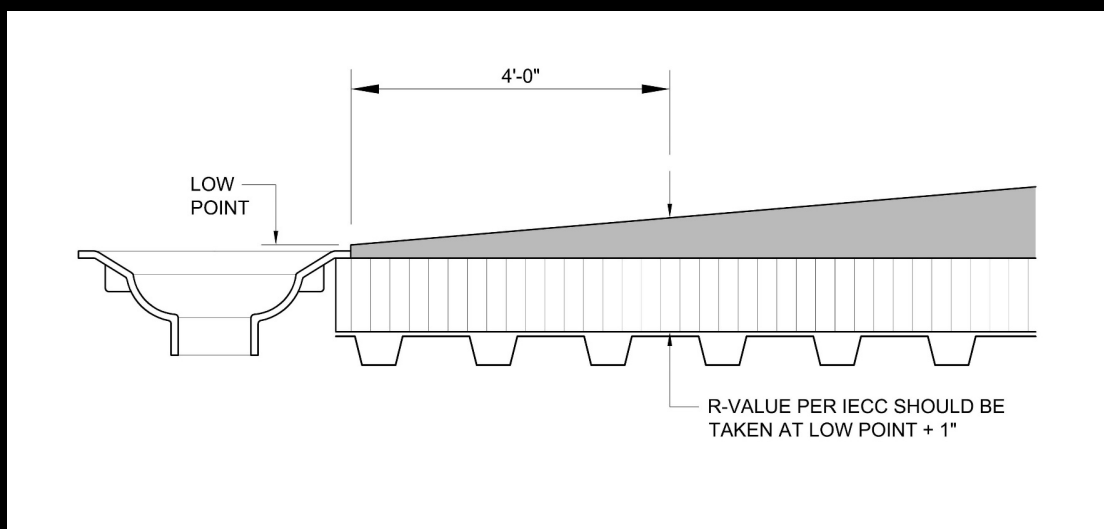


## 2012 IECC Code and Commentary

### 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. ...”

### Graphically depicted...



<b>TABLE C402.2.1.1</b>	
<b>MINIMUM ROOF REFLECTANCE AND EMITTANCE</b>	
<u>OPTIONS<sup>a</sup></u>	
Three-year aged solar reflectance <sup>b</sup> of 0.55 and three-year aged thermal emittance of 0.75	
Initial solar reflectance <sup>b</sup> of 0.70 and initial thermal emittance <sup>c</sup> of 0.75	
Three-year-aged solar reflectance index <sup>d</sup> of 64	
Initial solar reflectance index <sup>d</sup> of 82	
[Footnotes omitted for clarity]	

<b>Air retarders</b>	
IECC 2012, Section C402.4-Air Leakage (Mandatory)	
<p><b>C402.4 Air leakage (Mandatory).</b> The thermal envelope of buildings shall comply with Sections C402.4.1 through C402.4.8.</p>	
<p><b>C402.4.1 Air barriers.</b> A continuous air barrier shall be provided throughout the building thermal envelope. <b><u>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.</u></b> The air barrier shall comply with Sections C402.4.1.1 and C402.4.1.2.</p>	
<p><b><u>Exception:</u></b> Air barriers are not required in buildings located in <u>Climate Zones 1, 2 and 3.</u></p>	

**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.**

**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<sup>2</sup> (0.02 L/s · m<sup>2</sup>) 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.

- 1-8 ...
9. Built up roofing membrane.
10. Modified bituminous roof membrane.
11. Fully adhered single-ply roof membrane.

[Continued...]

**C402.4.1.2.2 Assemblies.** Assemblies of materials and components with an **average air leakage not to exceed 0.04 cfm/ft<sup>2</sup>** (0.2 L/s · m<sup>2</sup>) 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;

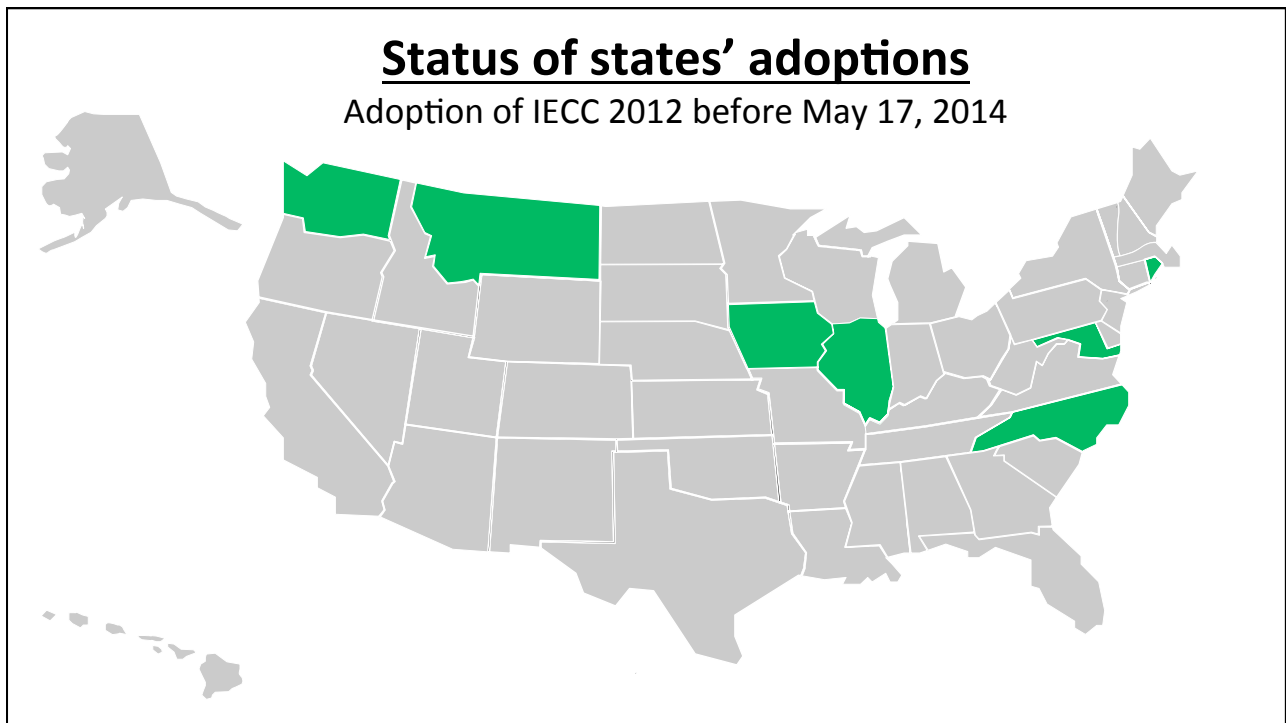
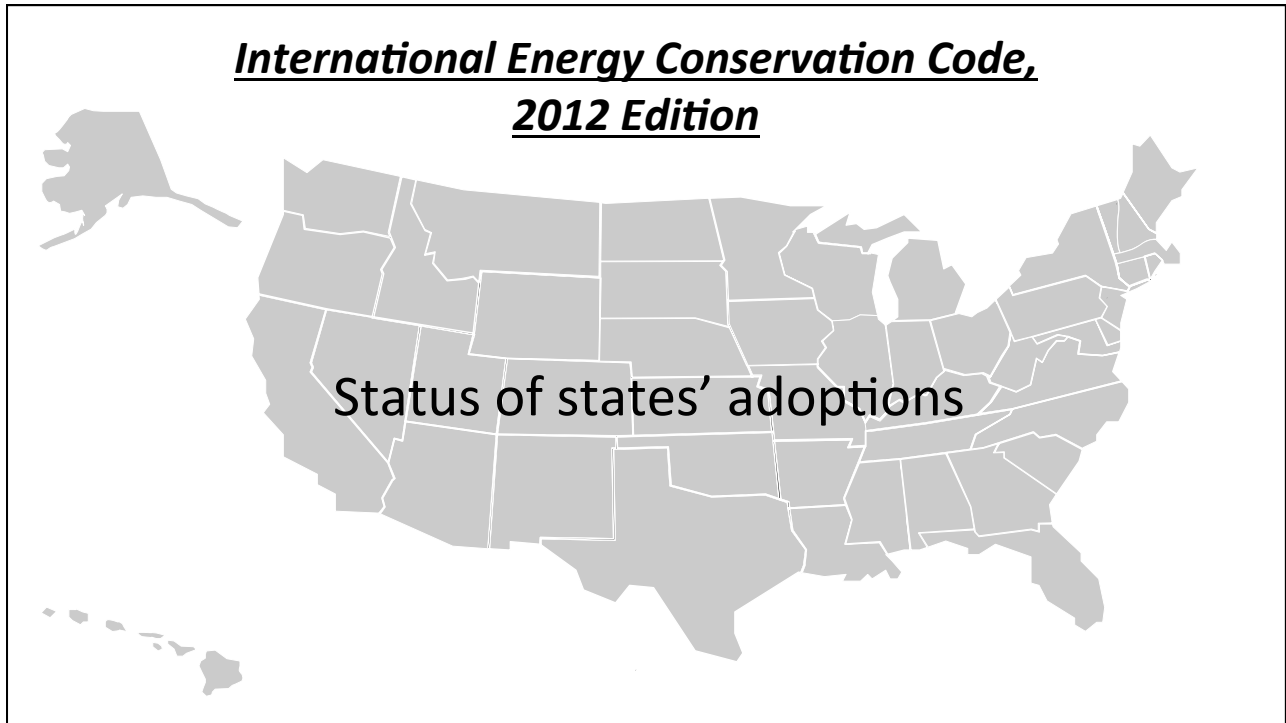
2. A Portland cement/sand parge, stucco or plaster minimum 1/2 inch (12 mm) in thickness.

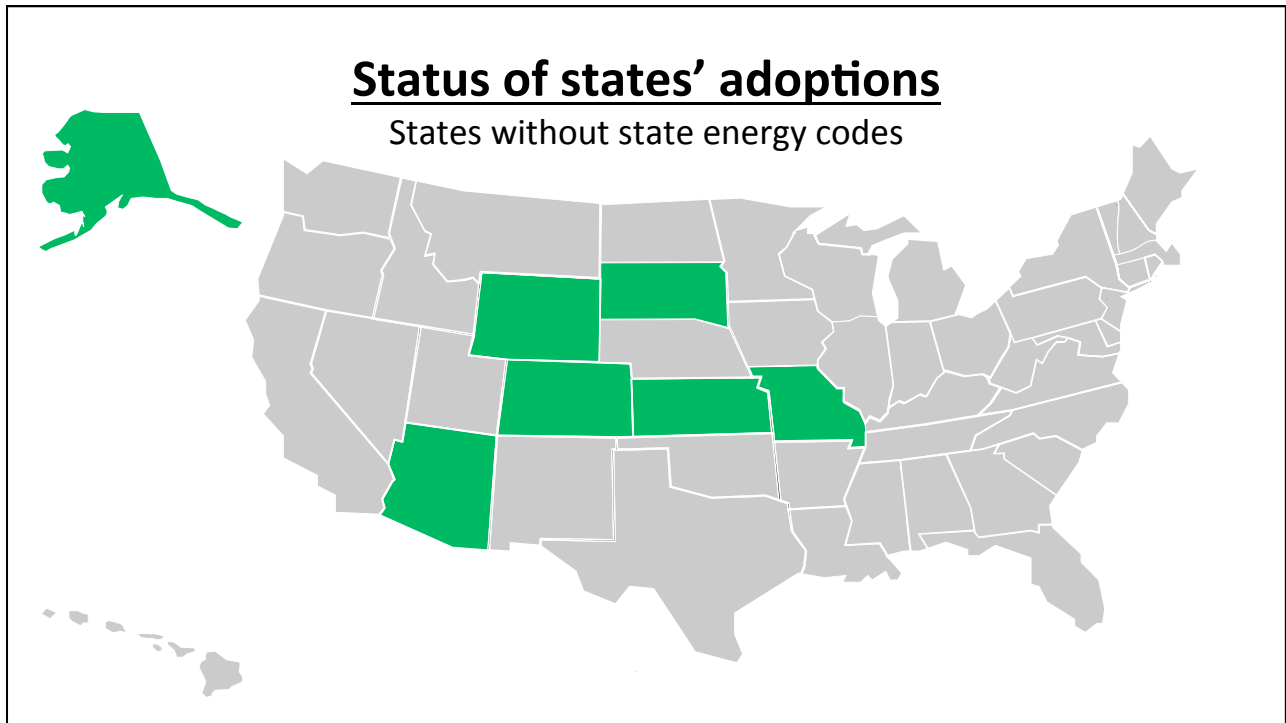
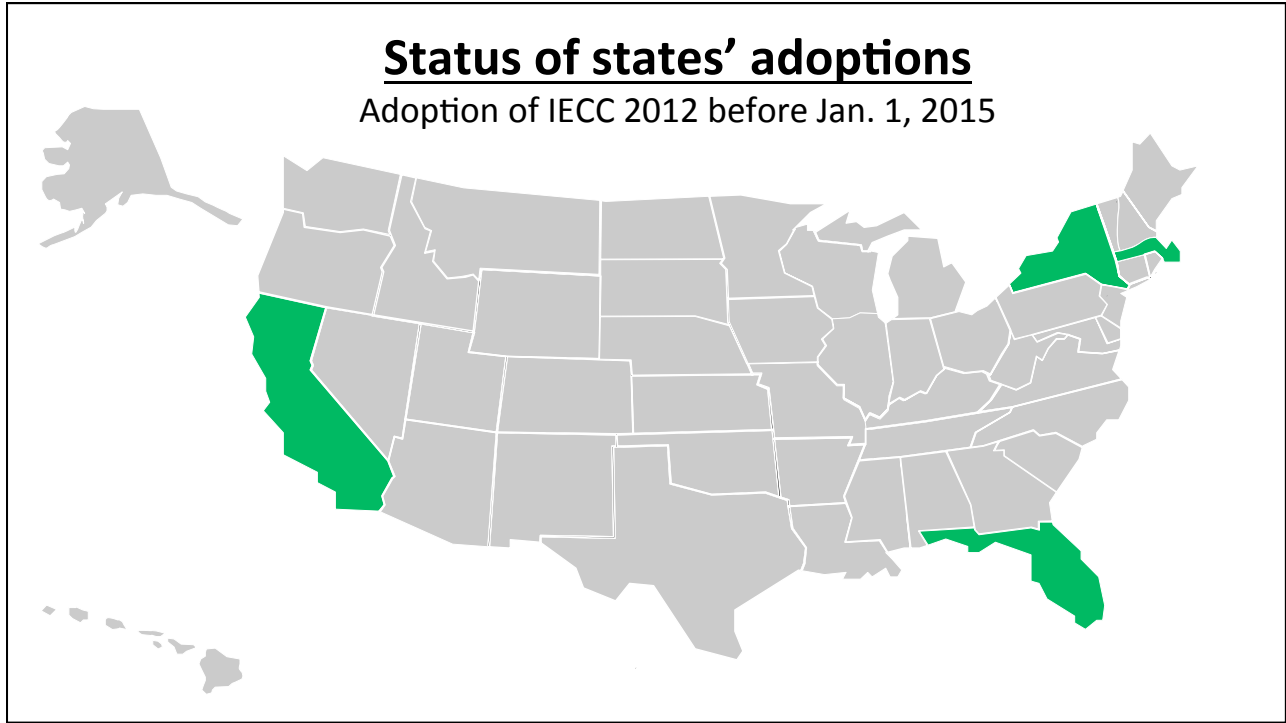
**C402.4.1.2.3 Building test.** The completed building shall be tested and the air leakage rate of the **building envelope shall not exceed 0.40 cfm/ft<sup>2</sup>** at a pressure differential of 0.3 inches water gauge (2.0 L/s · m<sup>2</sup> at 75 Pa) in accordance with ASTM E 779 or an equivalent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

**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.

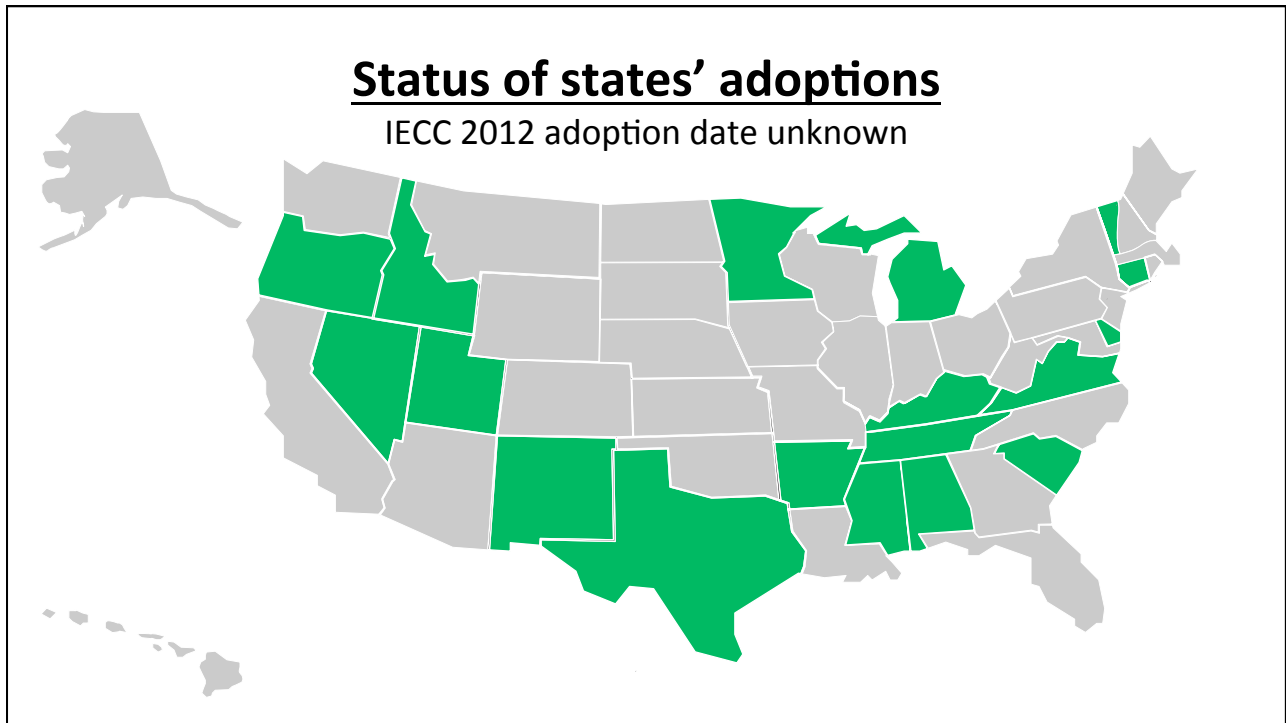
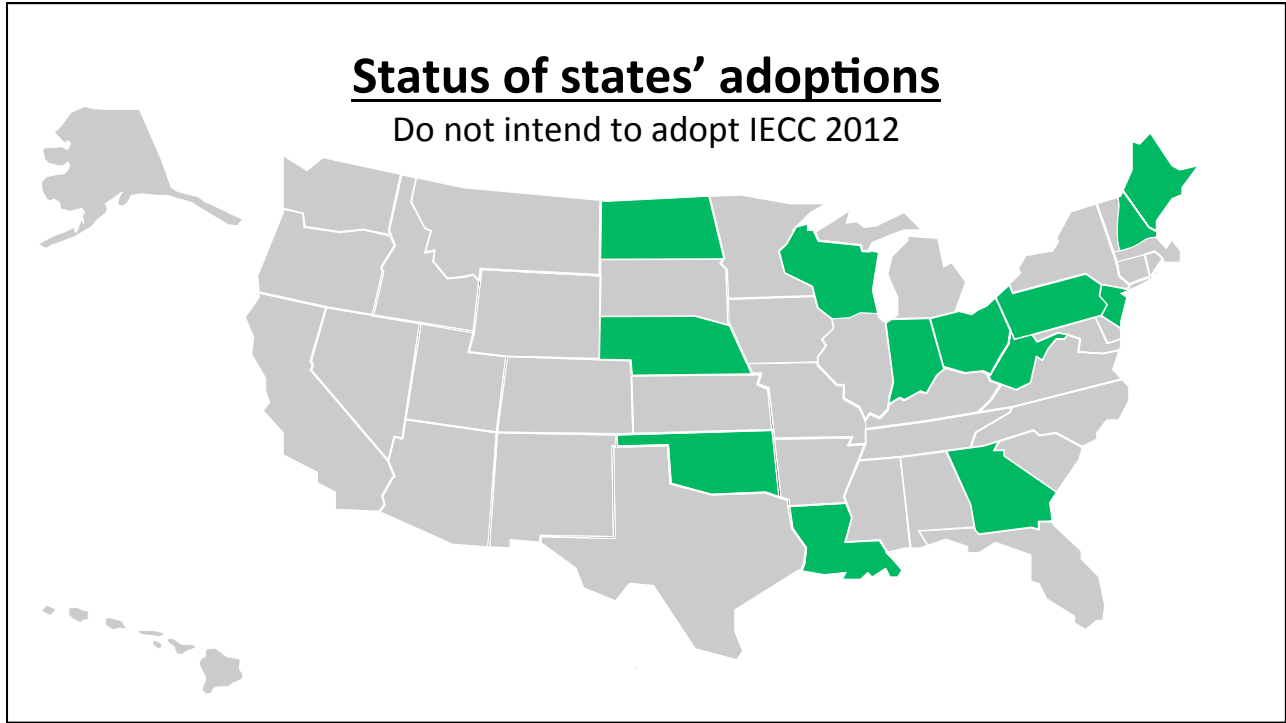
### Summary – IECC 2012 – Commercial Provisions

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









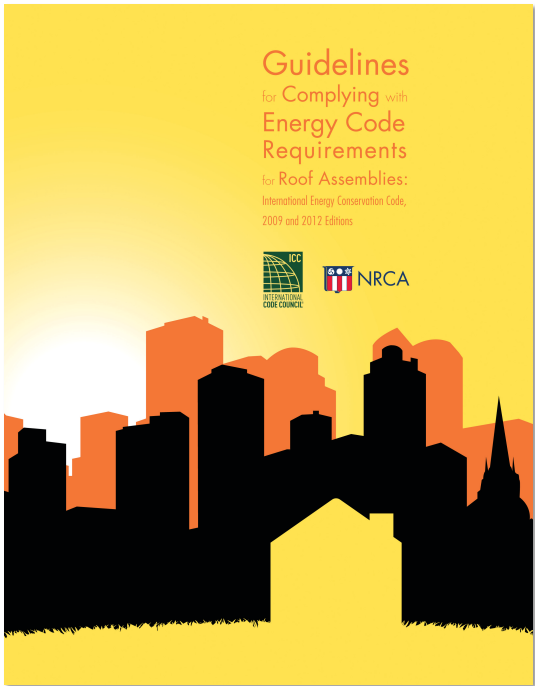
**To check the current status of**  
**States' adoptions**

[www.nrca.net/technical/EnergyCodes](http://www.nrca.net/technical/EnergyCodes)



**In summary**

- IECC 2012 presents challenges...and opportunities
- Beware of the status of state and local adoptions
- Comply with the Code




## **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](http://shop.nrca.net)

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# energywise.nrca.net



## EnergyWise Roof Calculator

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### Welcome to EnergyWise Roof Calculator

EnergyWise Roof Calculator Online is a Web-based application that provides a graphical method of constructing roof assemblies to evaluate thermal performance and estimated energy costs under normal operating conditions.

This application also provides minimum insulation requirements as stipulated in the following codes and standards:

- International Energy Conservation Code (IECC), versions 2006, 2009 and 2012
- International Green Construction Code (IgCC), version 2012
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1, "Energy Standard for Buildings Except Low-rise Residential Buildings," versions 1999 (2001), 2004, 2007 and 2010
- ASHRAE Standard 189.1, "Standard for the Design of High-Performance Green Buildings," versions 2009 and 2011

[Click here](#) for additional information about IECC, IgCC, ASHRAE 90.1 and ASHRAE 189.1

Because this application is intended to be a simplified guide, complex energy calculations, such as solar heat gain and exterior shading considerations, have intentionally not been included. For complex energy evaluation calculations, including evaluations of the entire building envelope, building usage, or changes to heating and air-conditioning equipment, consult the ASHRAE Fundamentals Handbook or an experienced mechanical engineer.

This application determines "Annual Energy Cost" values, which is useful when comparing the energy costs and savings associated with various roof assemblies' designs. This value should not be confused with the building owner's overall energy costs, which in most instances will be somewhat larger than the "Annual Energy Cost" that is attributable to the roof assembly only. For a detailed financial analysis of the long-term costs and potential savings of an energy-efficient roof system, consult an experienced accountant.




#### Related sites

- NRCA
- Professional Roofing
- Alliance for Progress

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In partnership with



The roofing industry's ALLIANCE for Progress

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