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**Building code update**


**Mark S. Graham**  
Associate Executive Director, Technical Services  
National Roofing Contractors Association



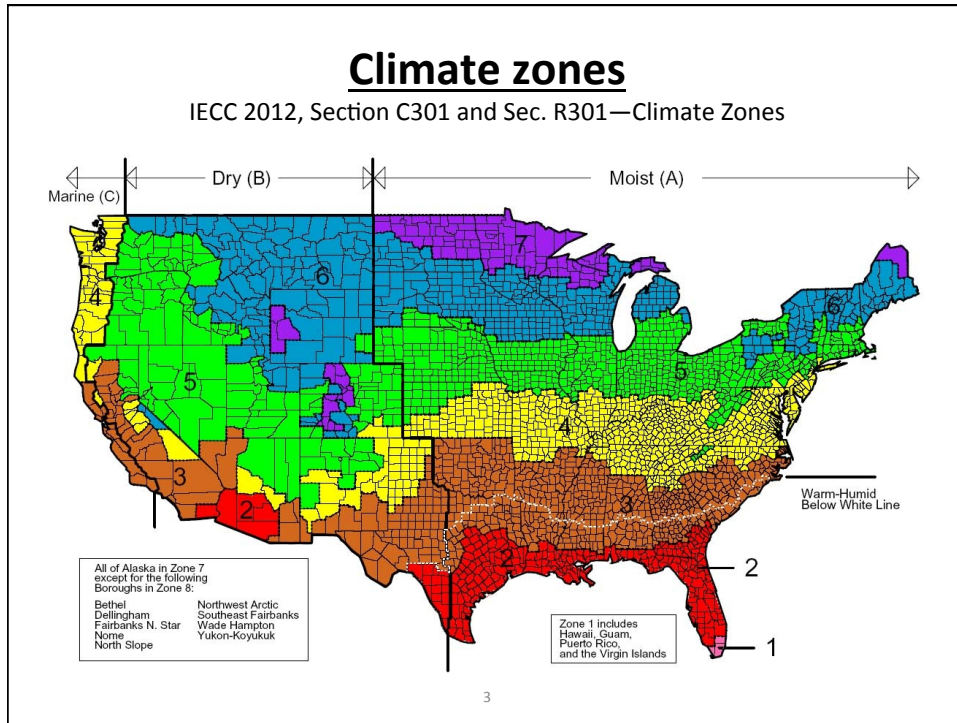
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**Some background**

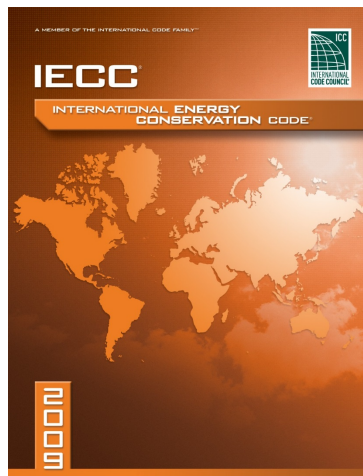
- The International Energy Conservation Code is a “model code” developed by the International Code Council (ICC)
- Model codes serve as the technical basis for state or local code adoption
- The code provides the minimum legal requirements for building construction...and operation
- The code is enforced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



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



### **Roofing-specific adaptation of Table 402.1.1**

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

<b>Insulation and Fenestration Requirements by Component<sup>a</sup></b>	
<b>Climate zone</b>	<b>Ceiling R-value</b>
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)*

<b>Opaque Thermal Envelope Assembly Requirements</b>			
<b>Climate zone</b>	<b>Roof assembly configuration</b>		
	<b>Insulation entirely above deck</b>	<b>Metal buildings (with R-5 thermal blocks)</b>	<b>Attic and other</b>
1	R-15ci	R-19	R-30
2	R-20ci	R-13 + R-13	R-38
3			
4			
5	R-25ci	R-13 + R-19	R-49
6			
7	R-25ci	R-13 + R-19	R-49
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

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

**Renewable Energy, Ferrous Building**  
 Mail Station 02-21, 1000 Independence Avenue SW, Washington, DC 20460-1021, 2012-2017-1074, email: [rebh@efmh.gov](mailto:rebh@efmh.gov), Fax: 1-800-455-6273, [www.eia.doe.gov](http://www.eia.doe.gov), U.S. Department of Energy, Office of the General Counsel, Ferrous Building, EG-71, 1000 Independence Avenue SW, Washington, DC 20460, 2012-2017-1074, email: [rebh@efmh.gov](mailto:rebh@efmh.gov).

**SUPPLEMENTARY INFORMATION:**  
 A. Statutory Requirements  
 B. Regulatory Requirements  
 C. Enforcement  
 D. Enforcement Statement  
 E. Enforcement Statement  
 F. Changes to the 2012 IECC That Increase Energy Efficiency  
 G. Changes to the 2012 IECC That Decrease Energy Efficiency  
 H. Changes to the 2012 IECC That Have a Net Effect on Energy Efficiency  
 I. Public Comment Procedures With DOE  
 J. Confidentiality  
 K. State Determinations  
 L. Regulatory Approval  
 M. Review Under Executive Order 13606  
 N. Review Under the Regulatory Flexibility Act  
 O. Review Under the National Environmental Policy Act of 1969  
 P. Review Under Executive Order 13132  
 Q. Review Under Executive Order 13175  
 R. Review Under the Unfunded Mandates Reform Act of 1995  
 S. Review Under the Federal Acquisition Regulation Act of 2009  
 T. Review Under Executive Order 12121  
 U. Review Under Executive Order 13175

**Introduction**  
 A. Statutory Requirements  
 The title of the Energy Conservation and Performance Act, as amended (ECPA), establishes requirements for the Building Energy Standards Program. (42 U.S.C. 6331-6337 (Section 6331A)) ECPA provides for the 2012 Model Energy Code (MEC), the 2012 edition of the code. It requires the Secretary must determine, not later than 12 months after the review, 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. 6331C(1)) The Department, following procedures set by the ECPA and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) considers high-rise (greater than three

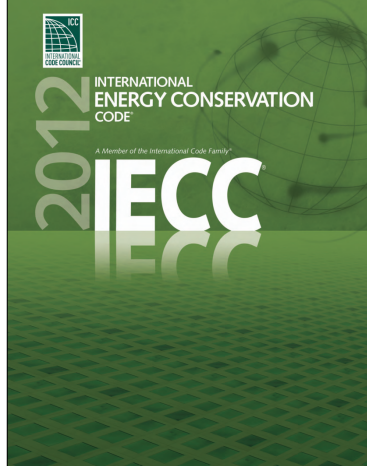
stories) multifamily residential buildings and hotel, motel, and other transient residential buildings (Type of use) eligible for enhanced building performance code purposes. Low-rise multifamily buildings (Type of use) and two-family detached and attached buildings, including townhouses, row houses, and low-rise multifamily buildings (Type of use) are eligible for enhanced building performance code purposes. (42 U.S.C. 6331C(2)) The Secretary determines that the revision would improve energy efficiency there, and later than 2 years after the date of the publication of the affirmative determination, each State is required to certify that it has complied with the building code regarding energy efficiency in the revised code and file a determination whether it is appropriate to revise its code to meet or exceed the provisions of the successor code. (42 U.S.C. 6331C(3)(B)) Determinations are to be made: (1) After public notice and hearing; (2) in writing; (3) before the time through which such determination and approval process at the hearing, and (4) available to the public. (42 U.S.C. 6331C(3)(C)) In addition, if a State determines that it is not appropriate to revise its residential building code, the Secretary, in writing, the reasons, which are to be available to the public. (42 U.S.C. 6331C(3)(D))

**Background**  
 The IECC MEC establishes a national model code for energy efficiency requirements for buildings. In 1987, the Council of American Building Officials (CABO) was incorporated into the IECC. (16 USC 4301, 4302) In 1993, the International Energy Conservation Code (IECC) was established by the 1993 MEC. (16 USC 4301, 4302) The IECC MEC increased energy efficiency requirements for buildings. (16 USC 4301, 4302) In 1997, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 1999, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 2001, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 2003, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 2006, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 2009, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302) In 2012, the IECC MEC was incorporated into the IECC. (16 USC 4301, 4302)

- 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



# International Energy Conservation Code, 2012 Edition (IECC 2012)



## 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.

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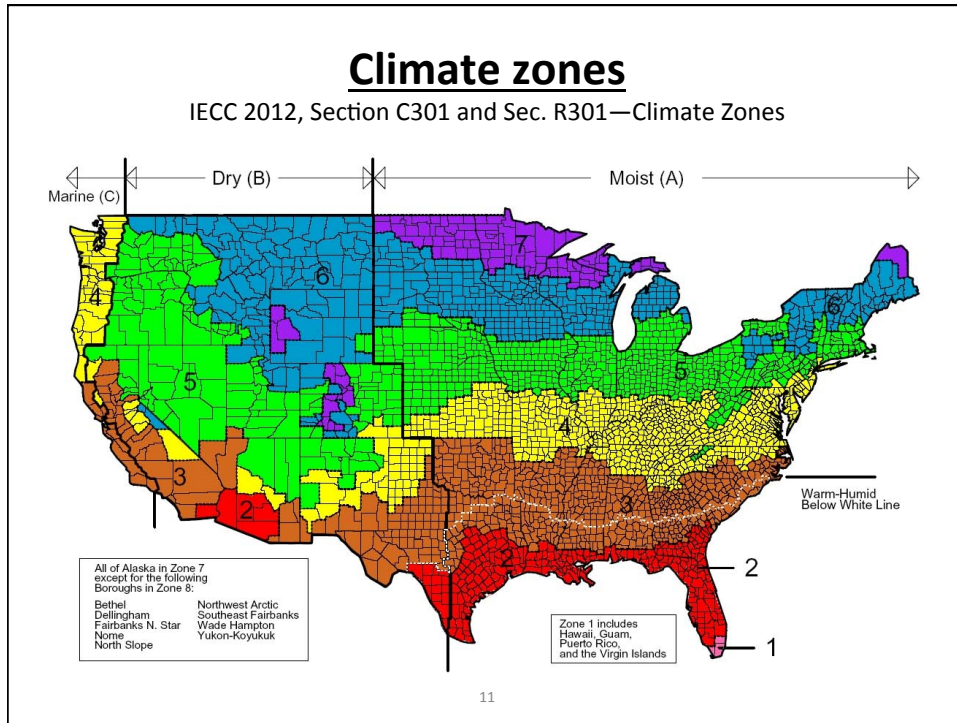
## Commercial vs. Residential

- 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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## IECC – Residential Provisions

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## **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

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## **Minimum thermal insulation requirements**

*IECC 2012, Section R402-Building Thermal Envelope*

**R402.1 General (Prescriptive).** The *building thermal envelope* shall meet the requirements of Sections R402.1.1 through R402.1.4.

**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.

**R402.1.2 R-value computation.** Insulation material used in layers, such as framing cavity insulation and insulated sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films

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## 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	49
5	
6	
7	
8	
<sup>a</sup> R-values are minimums. ... [Other footnotes omitted for clarity]	



**R402.2 Specific insulation requirements (Prescriptive).** In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.12.

**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.

**R402.2.3 Eave baffle.** For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

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## 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 Building thermal envelope.** The building thermal envelope shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

**R402.4.1.1 Installation.** The components of the building thermal envelope as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction. Where required by the code official, an approved third party shall inspect all components and verify compliance.

**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...

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### **Roofing-specific adaptation of Table R402.4.1.1**

*International Energy Conservation Code, 2012 Edition*

<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.

### **Summary – IECC 2012 – Residential Provisions**

- R-value increases
- Mandatory air barriers requirements

## **IECC – Commercial Provisions**

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## **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

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## **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.

[Continued...]

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**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

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## **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. 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.

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**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. Unit skylight curbs included as a component of an NFRC 100 rated assembly shall not be required to be insulated.

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

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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-25 + 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)



## 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?



## 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

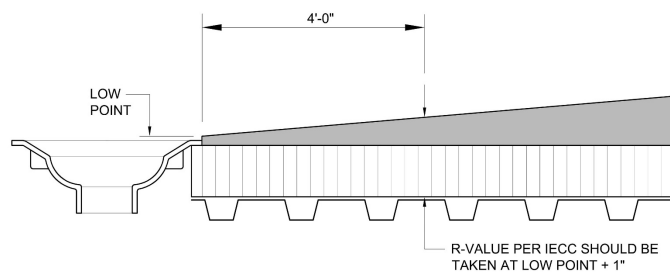
### Tapered insulation

“...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...



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**TABLE C402.2.1.1**  
**MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS<sup>a</sup>**

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]

## **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...]

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**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. 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<sup>3</sup>) having a thickness of not less than 1-1/2 inches (36 mm).

[Continued....]

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6. Open cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m<sup>3</sup>) 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<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.

[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.

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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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**International Energy Conservation Code, 2012 Edition**

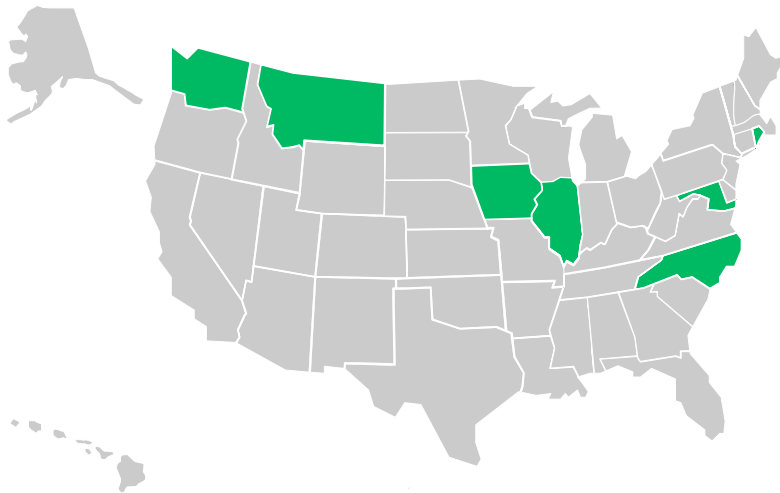
Status of states' adoptions

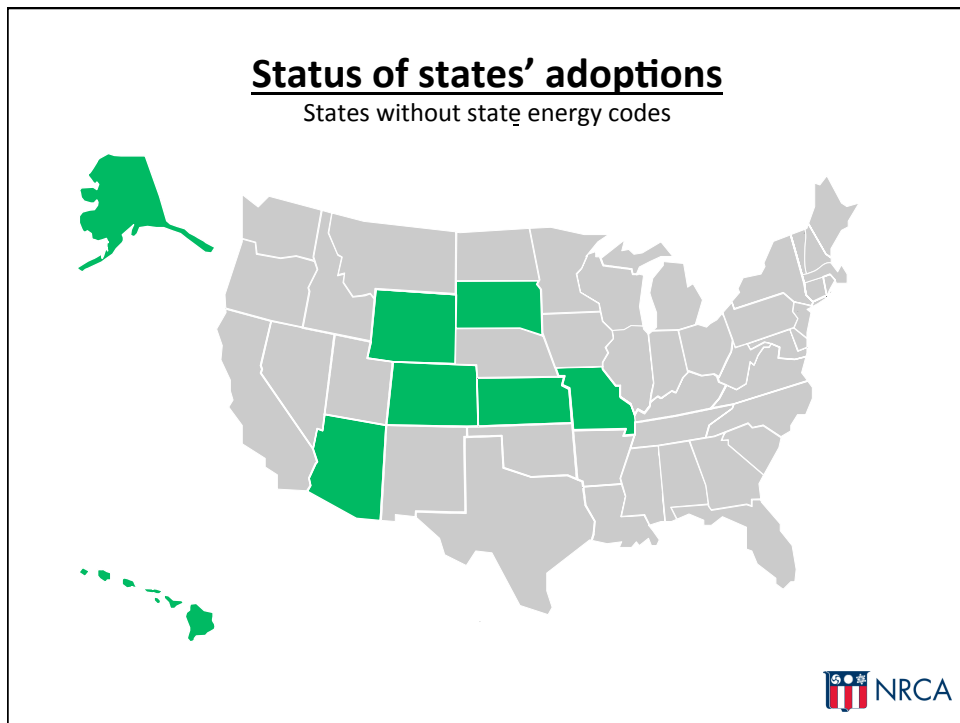
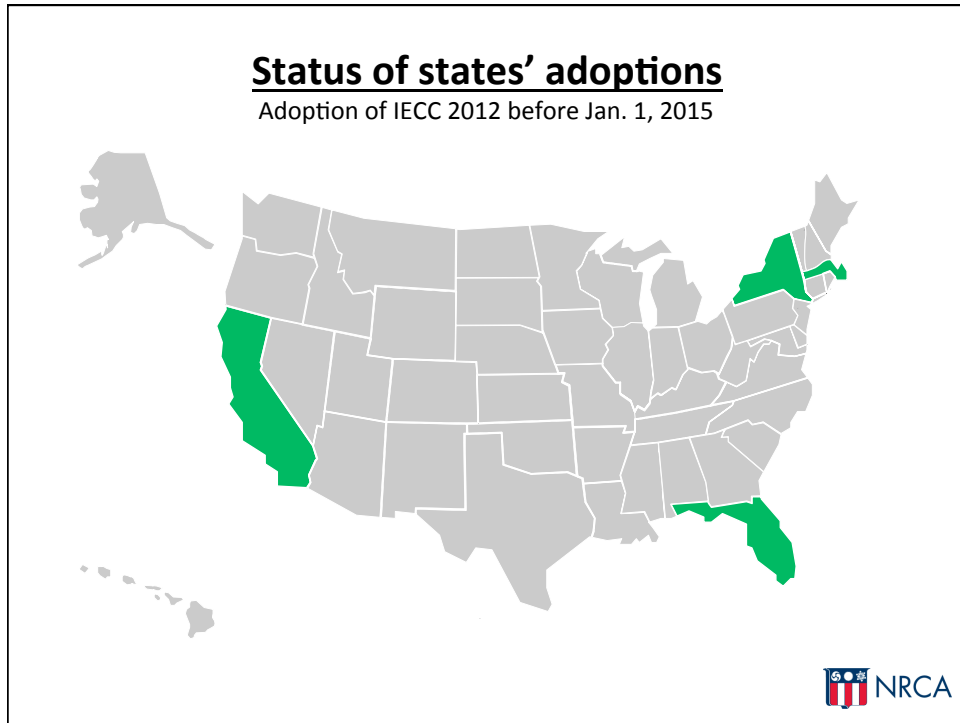
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**Status of states' adoptions**

Adoption of IECC 2012 before May 17, 2014







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

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

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**In summary**

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

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**So....**

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

...we've done some calculations



**In a cooling climate**

10,000 sq. ft. single-story building in Miami, FL

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	14,094,020 Btu	15.0 years
R-15 to R-20	7,870,571 Btu	30.7 years
R-20 to R-25	4,561,644 Btu	49.3 years
R-25 to R-30	3,232,756 Btu	106.7 years



### In a heating climate

10,000 sq. ft. single-story building in Philadelphia, PA

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	41,460,316 Btu	9.1 years
R-15 to R-20	28,581,971 Btu	15.5 years
R-20 to R-25	14,447,291 Btu	28.3 years
R-25 to R-30	10,155,248 Btu	61.6 years

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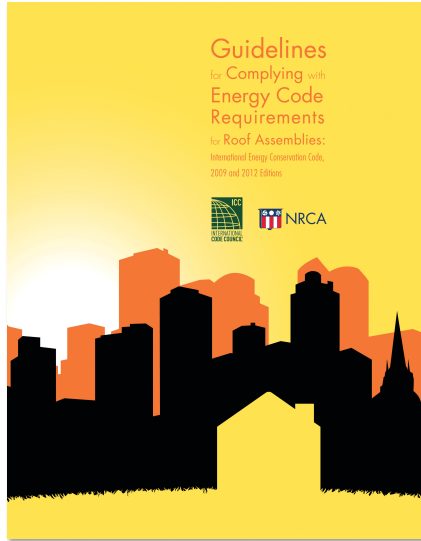
### In a heating climate

10,000 sq. ft. single-story building in Boston, MA

R-value increase	Annual Btu savings	Payback time
R-10 to R-15	45,495,237 Btu	6.9 years
R-15 to R-20	31,526,924 Btu	11.5 years
R-20 to R-25	15,748,557 Btu	21.2 years
R-25 to R-30	11,098,822 Btu	46.4 years

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

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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

**Related sites**

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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.



## Questions?

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