

Roofing Workshop on Air Barriers in Roofing Systems

Energy Efficient Buildings Hub

Navy Yard, Philadelphia, PA

November 6, 2013

Codes related to air barriers
in roofing systems

presented by

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National Roofing Contractors Association



Some background

- National Building Code of Canada
 - CAN/ULC-S742, “Standard for Air Barriers Assemblies-Specification”
- ASHRAE 189.1-09
 - Normative Appendix B
- MA Energy Code
 - State amendment to IECC 2009
- ASHRAE 90.1-10
 - Sec. 5.4.3-Air Leakage
- *International Energy Conservation Code, 2012 Edition*
 - Sec. C402.4-Air Leakage (Mandatory)
 - Sec. R402.4-Air Leakage (Mandatory)



Federal Register, May 17, 2012

2012 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 early release of Executive Order. 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 Web site at www.nccbuilding.org.

Staff: based at Washington, DC on May 11, 2012.

LaTanya S. Butler,
Acting Deputy Compliance Management Officer
301 no. and 1317 P Street, N.E., 20142
BLM/CODE 484-D-P

DEPARTMENT OF ENERGY
(Docket No. EDCM-0911-07-027-007)
100 100-ACCP
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 provide greater energy efficiency in low-rise residential buildings than the 2009 IECC. These publications 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 measures and 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.

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

ADDRESSES: Certification Statements must be addressed to the Buildings and Program Manager, Building Energy Codes Program Manager, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrest Building, Mail Station 38, 1000 Independence Avenue SW, Washington, DC 20585-0038.

FOR FURTHER INFORMATION CONTACT: Michael Dowdell, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Forrest Building, Mail Station 38, 1000 Independence Avenue SW, Washington, DC 20585-0038. For legal issues contact Kevin Kalkreuth, U.S. Department of Energy, Office of the General Counsel, Forrest Building, CG-71, 1000 Independence Avenue SW, Washington, DC 20585, 1000 100-ACCP, Kevin.Kalkreuth@hq.doe.gov.

SUPPLEMENTARY INFORMATION:

I. Introduction

A. Statutory Requirements

Title III of the Energy Conservation and Protection Act, as amended (ECPA), establishes requirements for building energy standards program. 42 U.S.C. 68371 section 3041(a) requires that the 2012 IECC, or any successor to that code, if 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 meet public interest of the International Code Council in the Federal Register. (42 U.S.C. 68371(a)(1)). 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

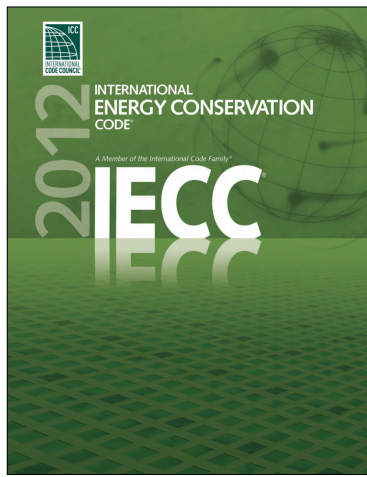
Key points:

- 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.

Index

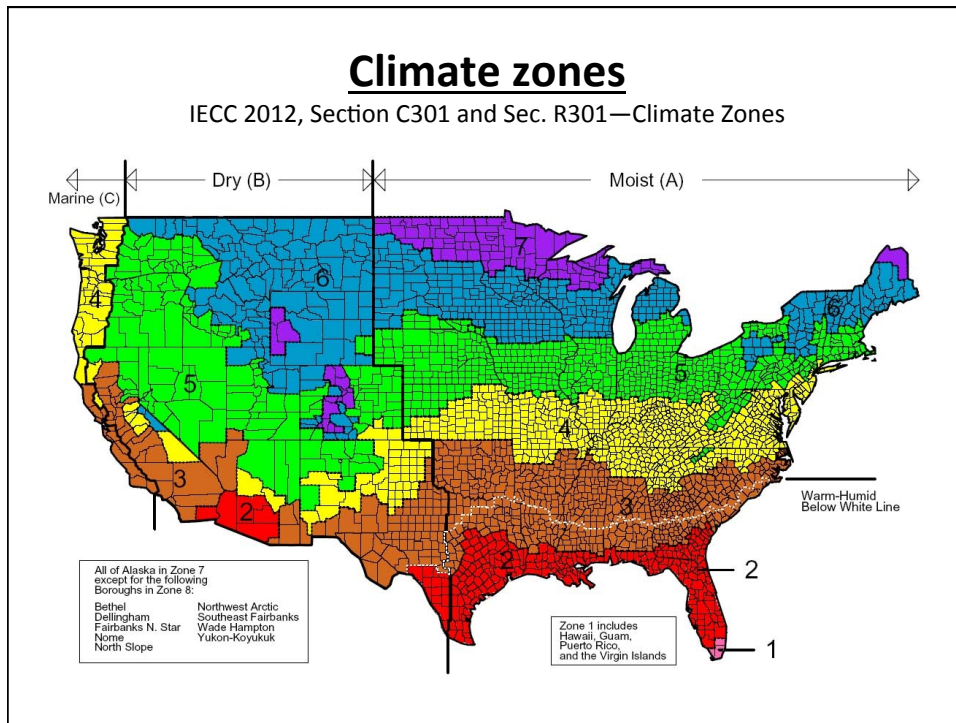


Commercial vs. Residential

- 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 – Residential Provisions



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...

* *



Roofing-specific adaptation of Table R402.4.1.1

International Energy Conservation Code, 2012 Edition

Air Barrier and Insulation Installation	
Component	Criteria
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.



IECC – Commercial Provisions



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...]



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



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...]

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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...]

[Sec. C402.4.1.2.3 refers to whole building testing]



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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.

[continued]

[Sec. C402.4.1.2.1-Materials]

[Sec. C402.4.1.2.2-Assemblies]

[Sec. C402.4.1.2.3-Building test]



C402.4.1.2.1 Materials. Materials with an air permeability no greater than 0.004 cfm/ft² (0.02 L/s · m²) 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/m³) 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/m³) 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 1/2 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 ($0.2 \text{ L/s} \cdot \text{m}^2$) 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.

[Continued...]

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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 ($2.0 \text{ L/s} \cdot \text{m}^2$ at 75 Pa) in accordance with ASTM E 779 or an equivalent method approved by the code official.

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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.



Regarding some state adoptions

- NC: Replaces testing and performance requirements with a prescriptive perimeter sealing requirement.
- IL: Exemption for certain reroofing projects



IECC 2015

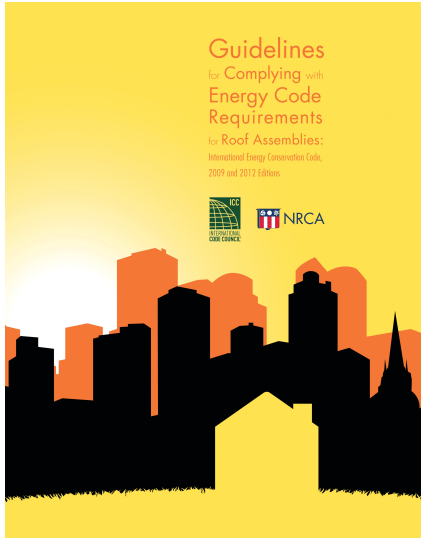
“...Air barriers shall not be required for roof repair, roof recover, and roof replacement where the alterations, renovations or repairs to the building do not also include alterations, renovations or repairs to the remainder of the building envelope...”



Summary

- IECC 2012's air retarder requirements presents challenges for the roofing industry:
 - Non-adhered roof coverings
 - Mechanical attachment of roof system components
- Methods of detailing/interface?
- How will compliance of non-deemed to comply products/assemblies (need to be tested) be documented?
- Performance verification?





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


ICC
INTERNATIONAL CODE COUNCIL

NRCA

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

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