



We Speak  Building

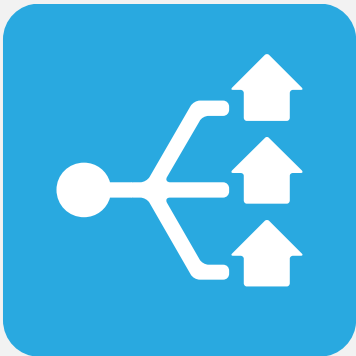
The text "We Speak" is in green, and "Building" is in blue. A graphic element between them consists of a blue house icon and a green speech bubble icon overlapping each other.

# Performance Requirements and Options in the International Energy Conservation Code

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## Programs



- ✓ Design
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- ✓ M&V



- Energy Code History and Trajectory
- Energy Code Compliance Paths
- Overview of Performance-Related Requirements





# Energy Code History

*Sub-heading*

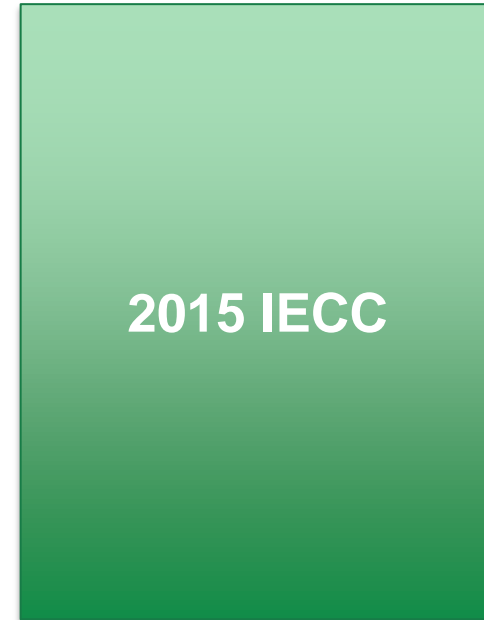
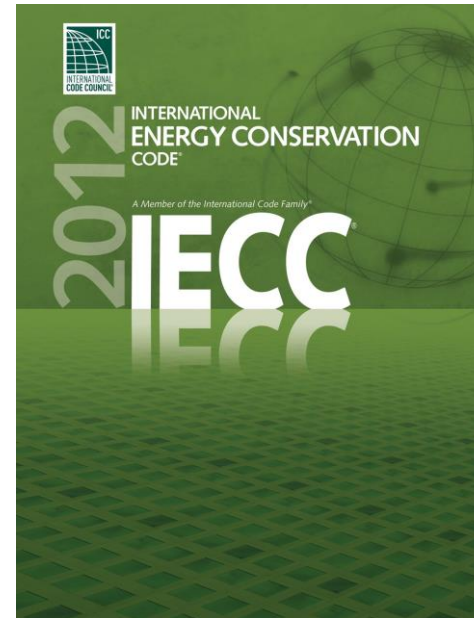
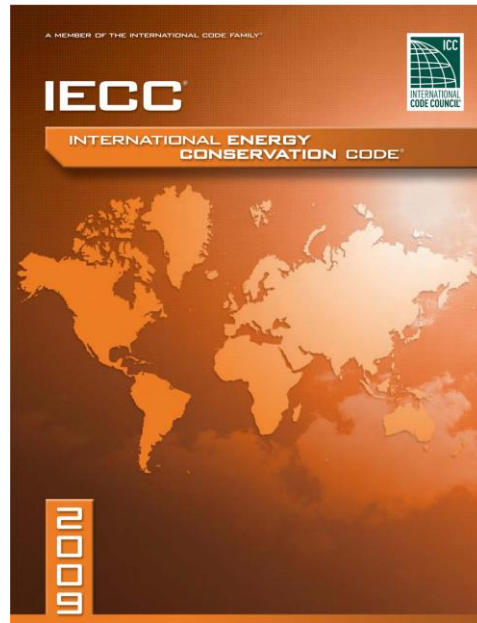
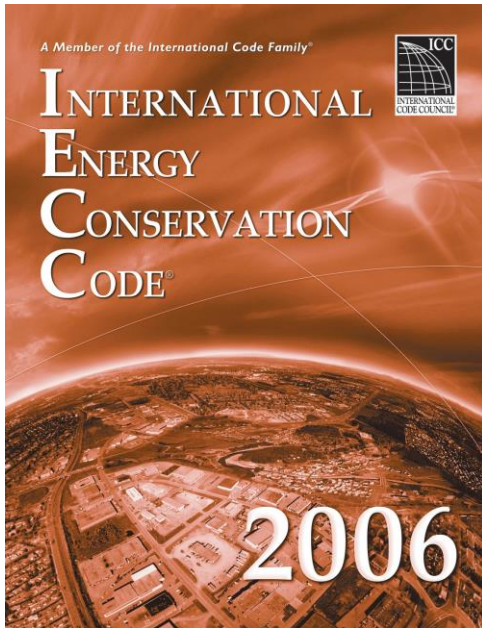
# Model Building Codes

- Early 1990s
  - Building Officials Code Administrators International (BOCA)
  - Southern Building Code Congress International (SBCCI)
  - International Conference of Building Officials (ICBO)
- 1994 Merger
  - International Code Council (ICC)
    - I-Codes
    - Adopted by states or municipalities (and sometimes modified)

# DOE Energy Policy

- Energy Conservation and Policy Act (ECPA)
  - Periodically review model codes
  - Participate in code development process
  - Seek adoption technically feasible and economically justified energy efficiency measures
  - States required to review latest model energy code and adopt, or explain why not to the Secretary
- Building Energy Codes Program
  - **Current goal:** 50% more efficient than 2006 IECC

# The March of the Energy Code – Efficiency Increases



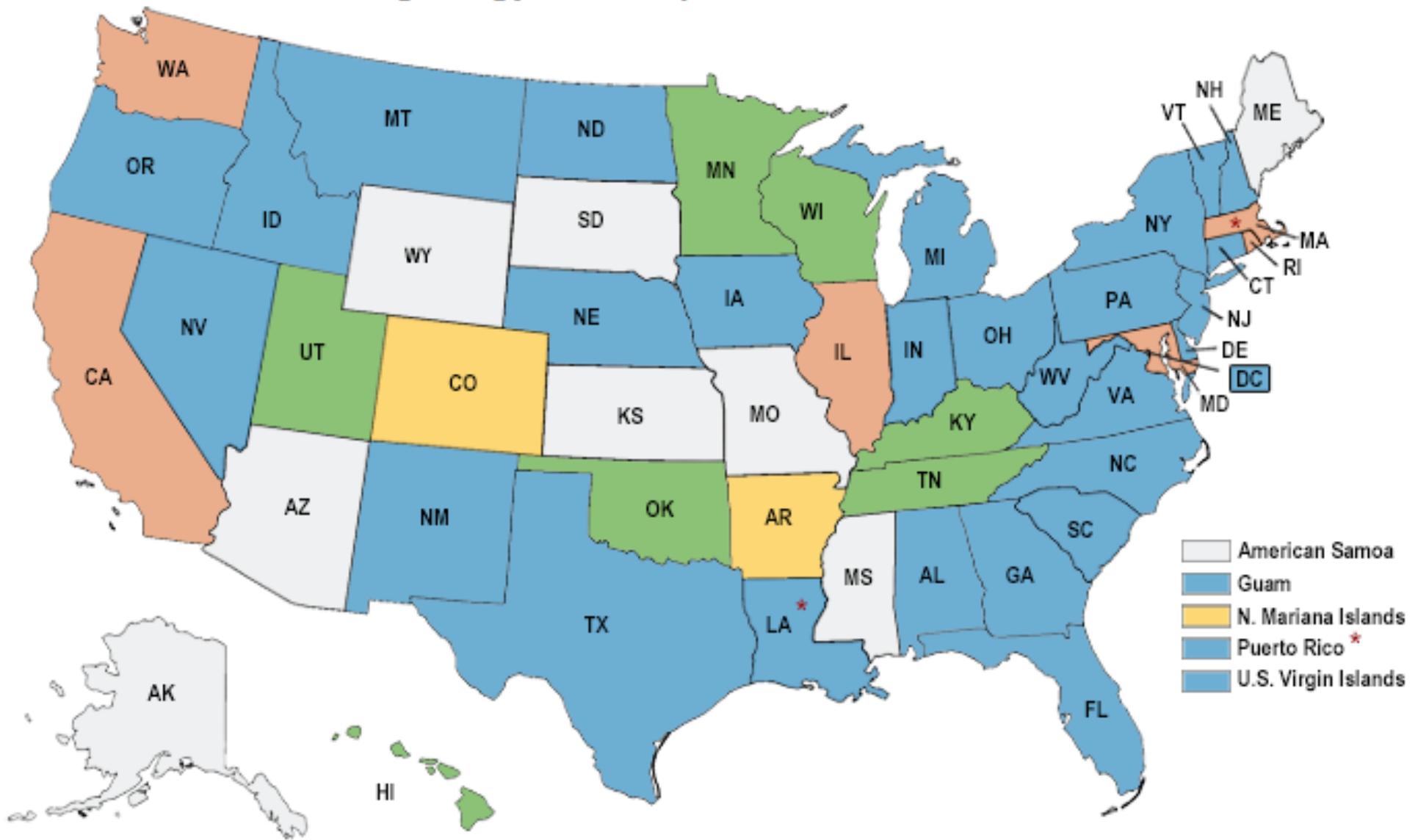
15%

15%

6%?



# Current Residential Building Energy Code Adoption Status



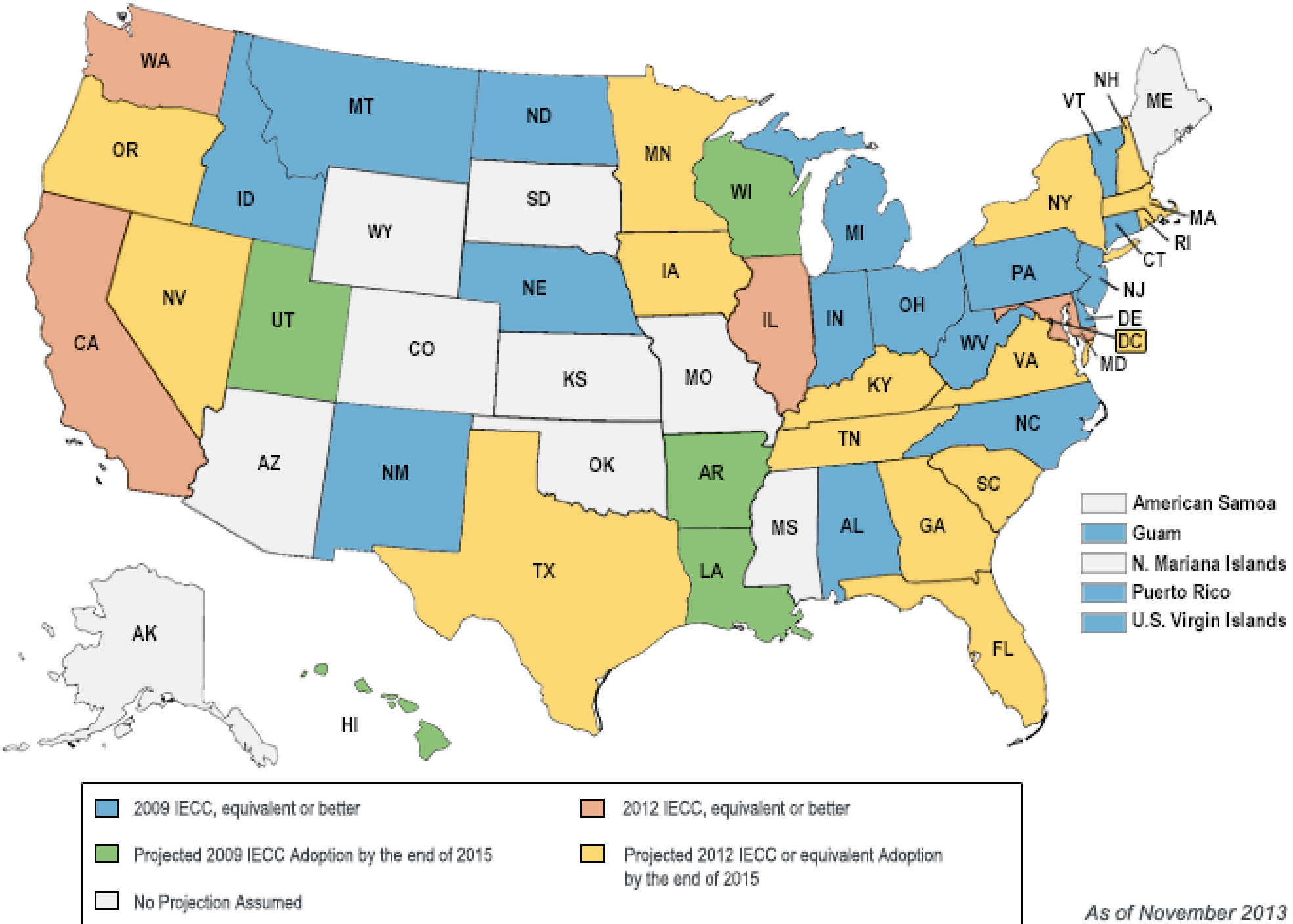
<b>6</b> IECC 2012, equivalent or more energy efficient	<b>30</b> IECC 2009, equivalent or more energy efficient	<b>8</b> IECC 2006, equivalent or more energy efficient
	<b>3</b> IECC 2003, equivalent or less energy efficient	<b>9</b> No Statewide Code

\* Adopted new Code to be effective at a later date

As of January 2014



**Projected Residential Building Energy Code Adoption Activity**



Source: [www.energycodes.gov](http://www.energycodes.gov)

Projections are based on current code status and typical state adoption cycles.

# Compliance Pathways

A decorative graphic consisting of several overlapping, wavy bands of color. The colors are various shades of green and blue. The bands flow from the left side of the image towards the right, creating a sense of movement and depth. The top band is a bright green, followed by a darker green, and then a blue band. The bands overlap in a way that creates a layered, three-dimensional effect.

# Compliance Pathways

## 1. Prescriptive Path

- Insulation requirements, two sub-paths:
  - Prescriptive R- and U-values
  - UA Alternative (*REScheck*)
- Air leakage, duct insulation and leakage
- Equipment sizing/selection
- Lighting

## 2. Performance Path

- Simulated Performance Alternative (REM/Rate, etc.)

## 3. Energy Rating Index Path (2015 only)

# Performance-Related Requirements

A decorative graphic consisting of several overlapping, wavy bands of color. From top to bottom, the bands are: a light green band, a dark green band, a blue band, and another light green band. The bands flow from the left side of the image towards the right, with some overlapping and tapering off.

# Performance-Related Code Requirements - Timeline

2006

- Air sealing list
- Simulated Performance Alternative

2009

- Blower door test (optional)
- Detailed air sealing and insulation inspection criteria
- Duct testing
- Simulated Performance Alternative

2012

- Blower door test
- Detailed air sealing and insulation inspection criteria
- Duct testing
- Simulated Performance Alternative

2015

- Blower door test
- Detailed air sealing and insulation inspection criteria
- Duct testing
- Simulated Performance Alternative
- Energy Index Path

- Building envelope air tightness and insulation installation shall be demonstrated by:
    - Blower door test
    - Visual inspection
- 2009: One or the other  
2012: Both  
2015: Both
- Building official may require third party agency to conduct either blower door test, visual inspection or both

# Building Envelope Leakage Limits

**2009**



**7 ACH50**

**2012**



**Climate zones 1-2:  
5 ACH50**

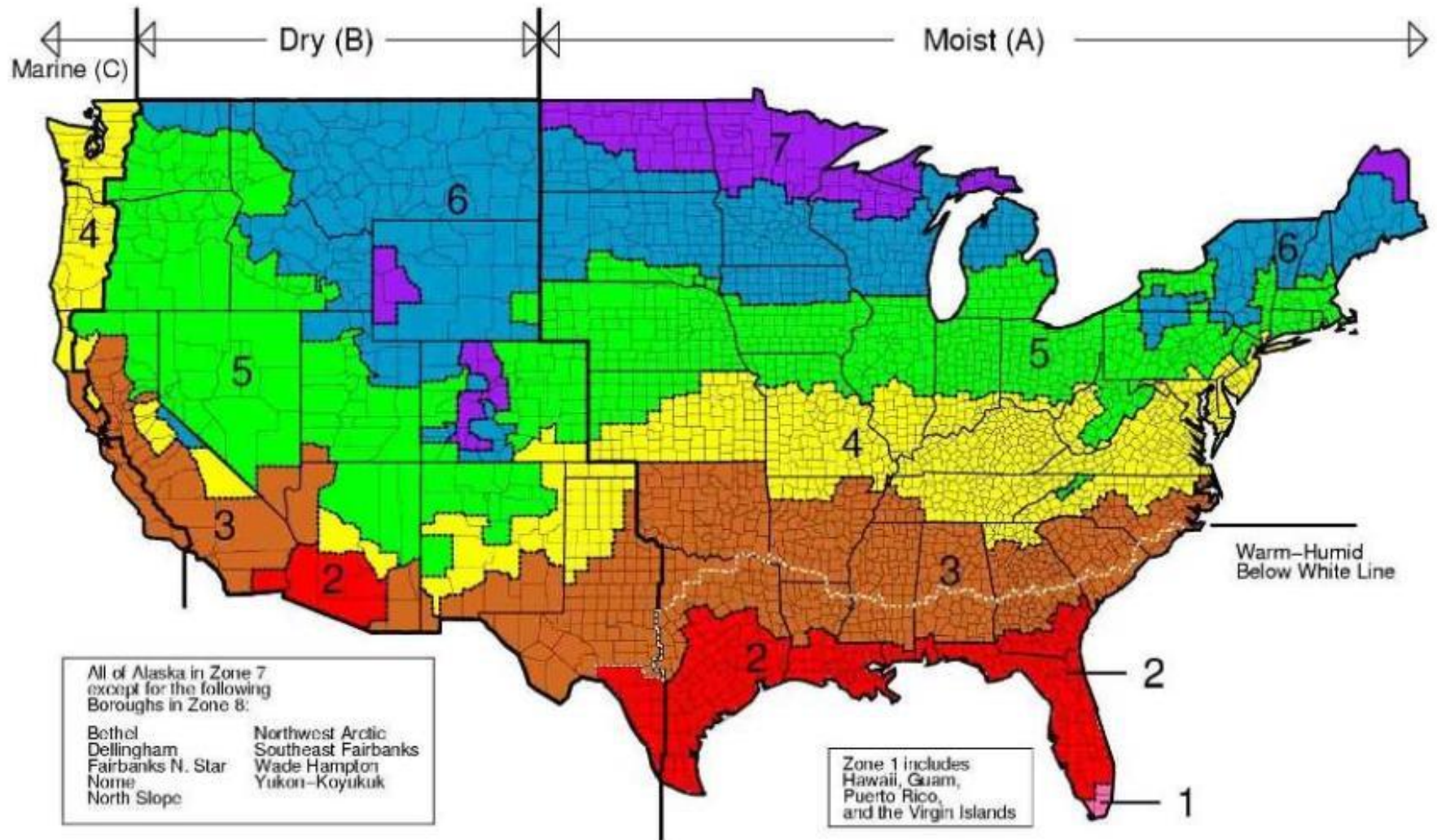
**Climate zones 3-8:  
3 ACH50**

**2015**





# Climate Zones



# IECC Duct Sealing Verification

**Maximum CFM25 per 100 sq. ft. conditioned floor area**

	2009	2012	2015
<b>Post-construction test</b>			
Leakage to Outdoors	8	NA <sup>1</sup>	NA <sup>1</sup>
Total Leakage	12	4	4
<b>Rough-in test</b>			
Total Leakage	6	4	4
Total w/o air handler	4	3	3

<sup>1</sup>Leakage to outdoors option eliminated.

# Energy Rating Index Path – 2015 IECC

<b>Climate Zone</b>	<b>Required Index</b>	
1 and 2	52	<b>(59)</b>
3	51	<b>(59)</b>
4	54	<b>(63)</b>
5	55	<b>(63)</b>
6	54	<b>(62)</b>
7 and 8	53	

Plus, 2009 IECC envelope requirements as mandatory minimum

# Appendix

The background features several overlapping, wavy bands of color. From top to bottom, there is a light green band, a dark green band, and a blue band. These bands curve across the page, creating a dynamic, abstract design.

*Referenced only if there are related questions*

# 2009 IECC Insulation and Fenestration Requirements

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION <sup>b,e</sup> SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.20	0.75	0.30	30	13	3 / 4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	0.30	30	13	4 / 6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	0.30	30	13	5 / 8	19	5 / 13 <sup>f</sup>	0	5 / 13
4 except Marine	0.35	0.60	NR	38	13	5 / 10	19	10 / 13	10, 2ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 <sup>h</sup>	13 / 17	30 <sup>g</sup>	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	20 or 13+5 <sup>h</sup>	15 / 19	30 <sup>g</sup>	15 / 19	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19 / 21	38 <sup>g</sup>	15 / 19	10, 4 ft	10 / 13

# 2012 IECC Insulation and Fenestration Requirements

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION <sup>b,e</sup> SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	<b>NR</b>	0.75	<b>0.25</b>	30	13	3 / 4	13	0	0	0
2	<b>0.40</b>	<b>0.65</b>	<b>0.25</b>	<b>38</b>	13	4 / 6	13	0	0	0
3	<b>0.35</b>	<b>0.55</b>	<b>0.25</b>	<b>38</b>	13	<b>8/13</b>	19	5 / 13 <sup>f</sup>	0	5 / 13
4 except Marine	0.35	<b>0.55</b>	<b>0.40</b>	<b>49</b>	<b>20 or 13+5</b>	<b>8/13</b>	19	10 / 13	10, 2ft	10 / 13
5 and Marine 4	<b>0.32</b>	<b>0.55</b>	NR	<b>49</b>	20 or 13+5	13 / 17	30 <sup>g</sup>	<b>15 / 19</b>	10, 2 ft	<b>15 / 19</b>
6	<b>0.32</b>	<b>0.55</b>	NR	<b>49</b>	<b>20+5 or 13+10</b>	15 / 20	30 <sup>g</sup>	15 / 19	10, 4 ft	<b>15 / 19</b>
7 and 8	<b>0.32</b>	<b>0.55</b>	NR	<b>49</b>	<b>20+5 or 13+10</b>	19 / 21	38 <sup>g</sup>	15 / 19	10, 4 ft	<b>15 / 19</b>



COMPONENT	CRITERIA <sup>a</sup>
Air barrier and thermal barrier	<p><b>A continuous air barrier shall be installed in the building envelope.</b></p> <p><b>Exterior thermal envelope contains a continuous air barrier.</b></p> <p>Breaks or joints in the air barrier shall be sealed.</p> <p>Air-permeable insulation shall not be used as a sealing material.</p>
Ceiling/attic	<p>The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed.</p> <p><b>Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.</b></p>
Walls	<p>Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed.</p> <p><b>The junction of the top plate and top of exterior walls shall be sealed.</b></p> <p><b>Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.</b></p> <p><b>Knee walls shall be sealed.</b></p>





Windows, skylights and doors	The space between window/door jambs and framing and <b>skylights and framing</b> shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.



Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Narrow cavities	Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, <b>or insulation that on installation readily conforms to available space shall extend behind piping and wiring.</b>



Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls. <b>Fireplaces shall have gasketed doors.</b>