



**ENERGY CODES
IN ACTION!**

**U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY CODES CONFERENCE 2015**

MARCH 23 - 26, 2015 // NASHVILLE AIRPORT MARRIOTT
600 MARRIOTT DRIVE, NASHVILLE, TENNESSEE 37214

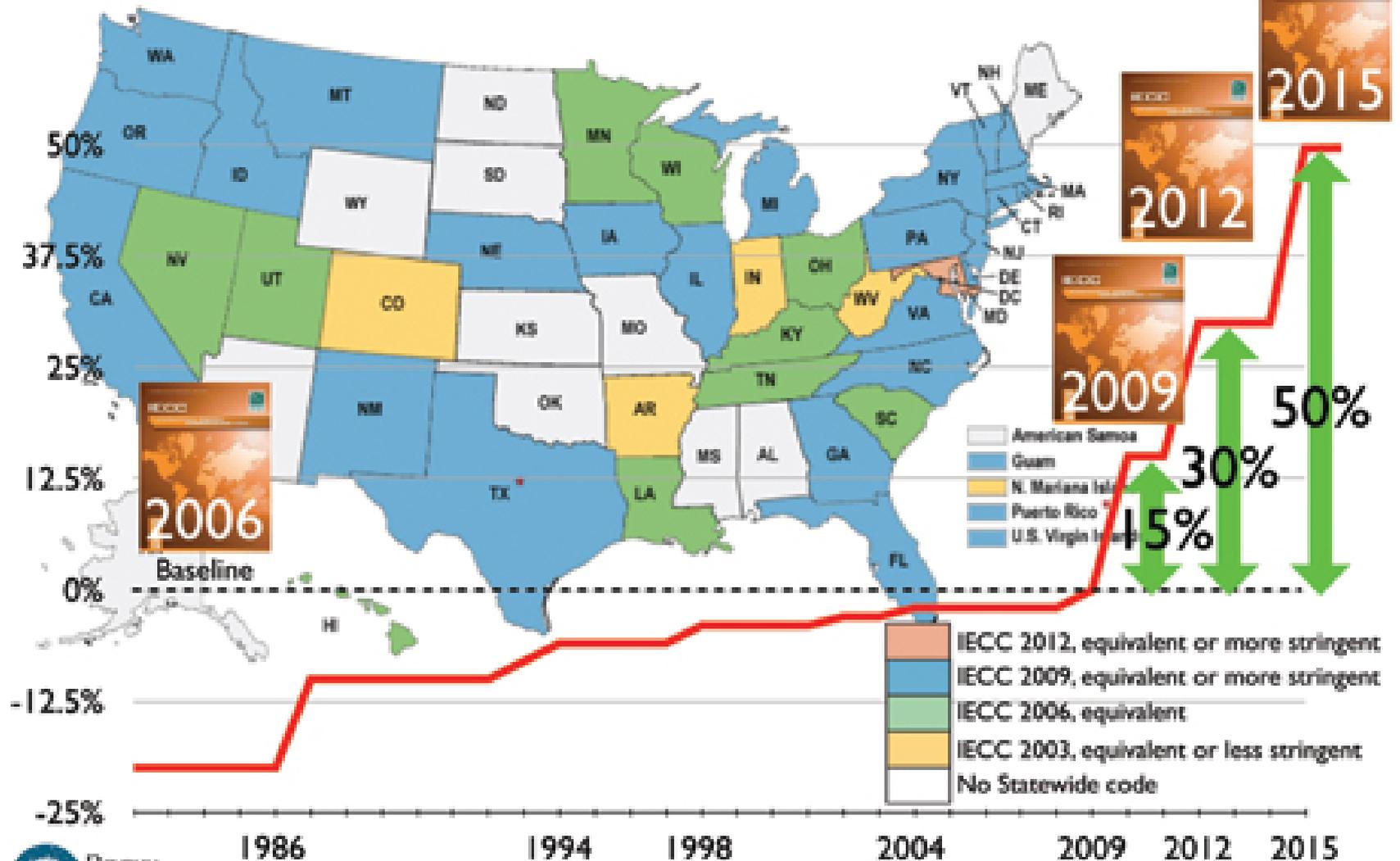
U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy | Building Energy Codes
U.S. Department of Energy

Demonstrating Code Compliance with The Energy Rating Index: **an in the field perspective**

Presented By: Robby Schwarz

Building Energy Codes Improving FASTER...

Relative to 2006 IECC (International Energy Conservation Code) Baseline

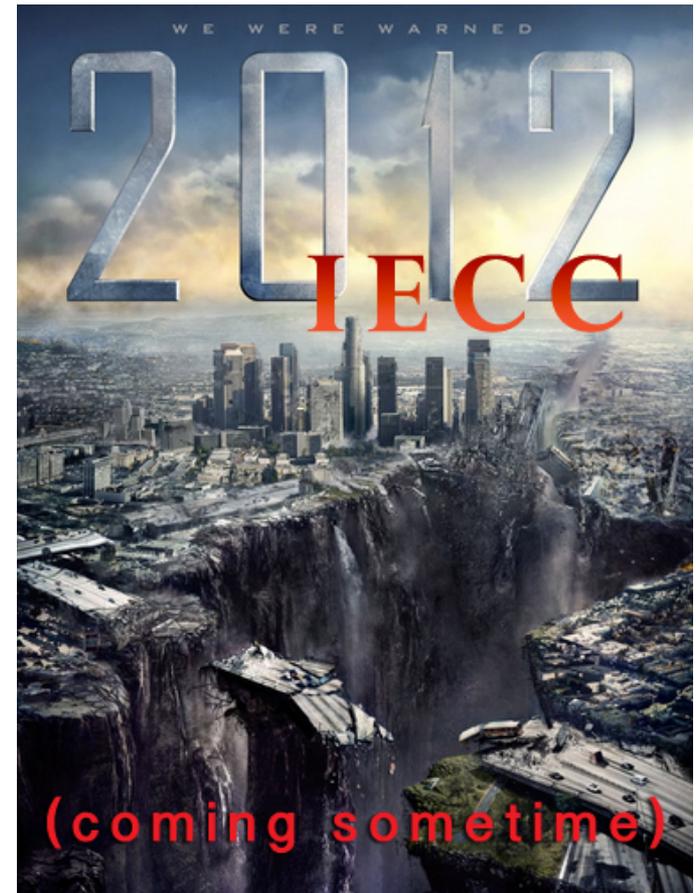


Interpreted from: www.energycodes.gov (Jan. 2012, J. Brew, RMI)

Code Adoption Cycle

- 2012 International Energy Conservation code
- The code that got peoples attention

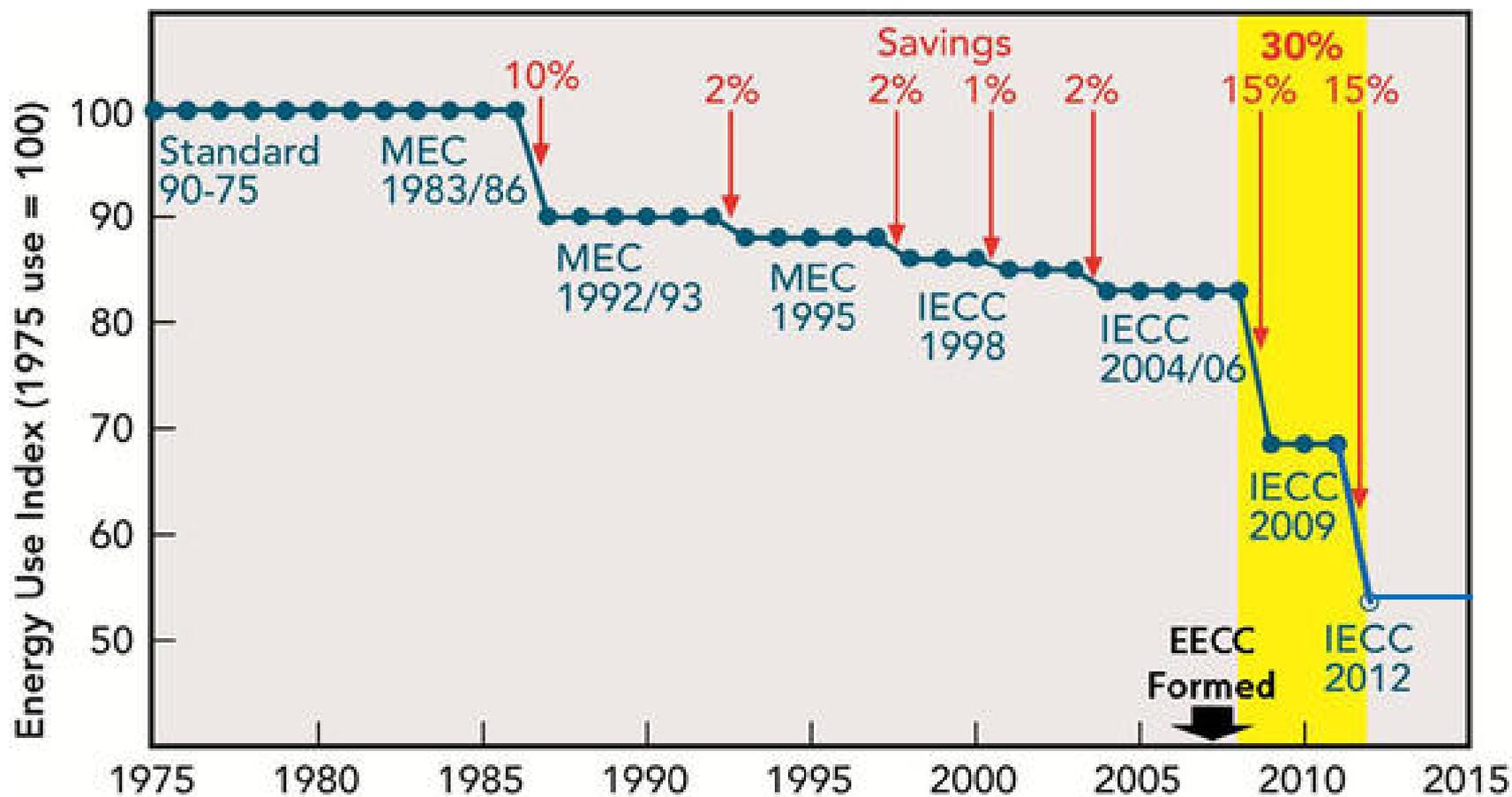
- Adoption and development are out of sync



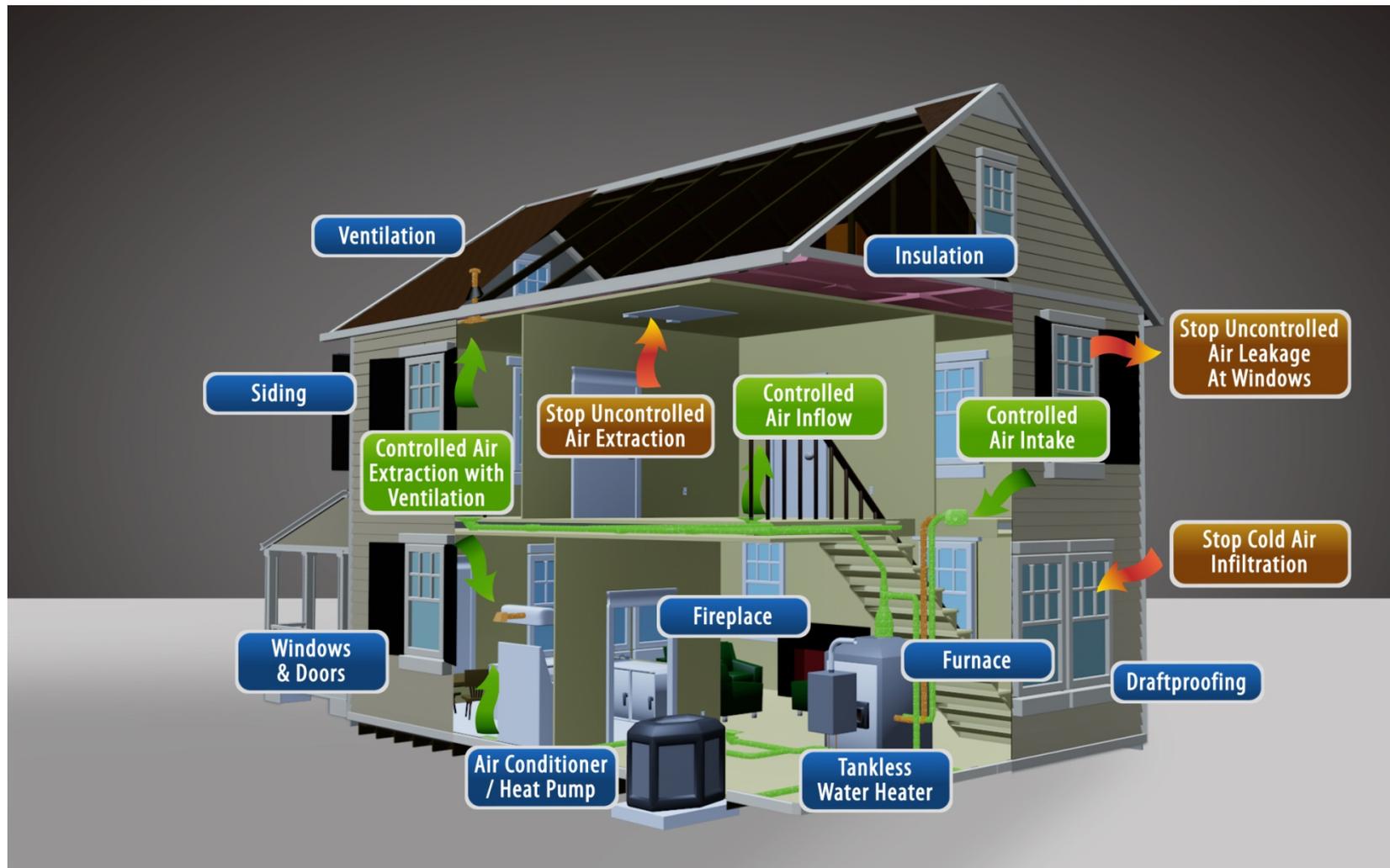
Energy Code

Its not your Daddy's code?

- No longer building the minimum ___ house allowable!



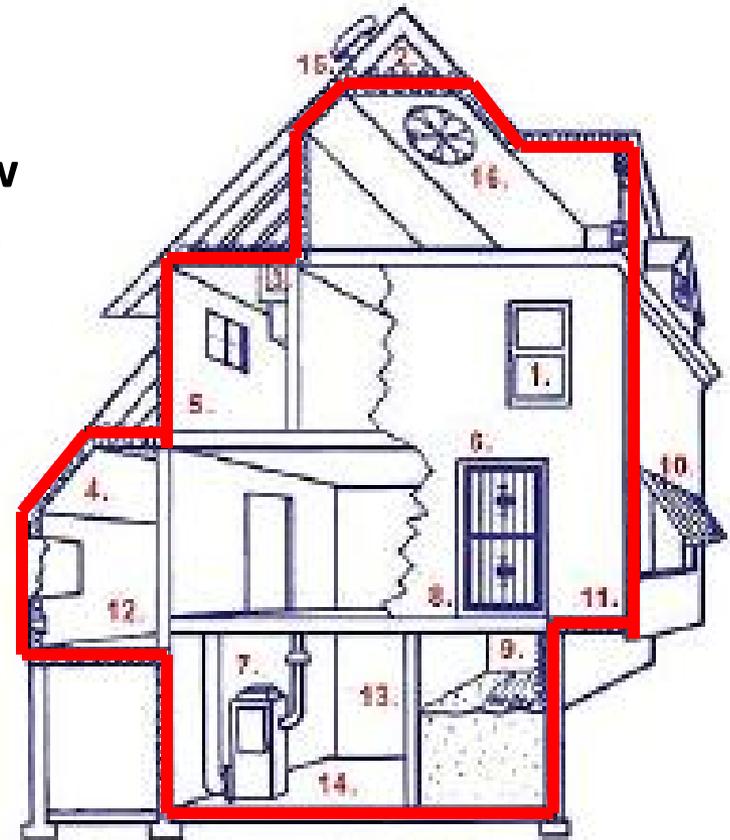
Applied Building Science and Systems Thinking



What / Where is the Thermal Envelope?



- Control
 - Air Flow
 - Moisture Flow
 - Thermal Flow



Fundamental Questions

Is It There?



Does It Work?

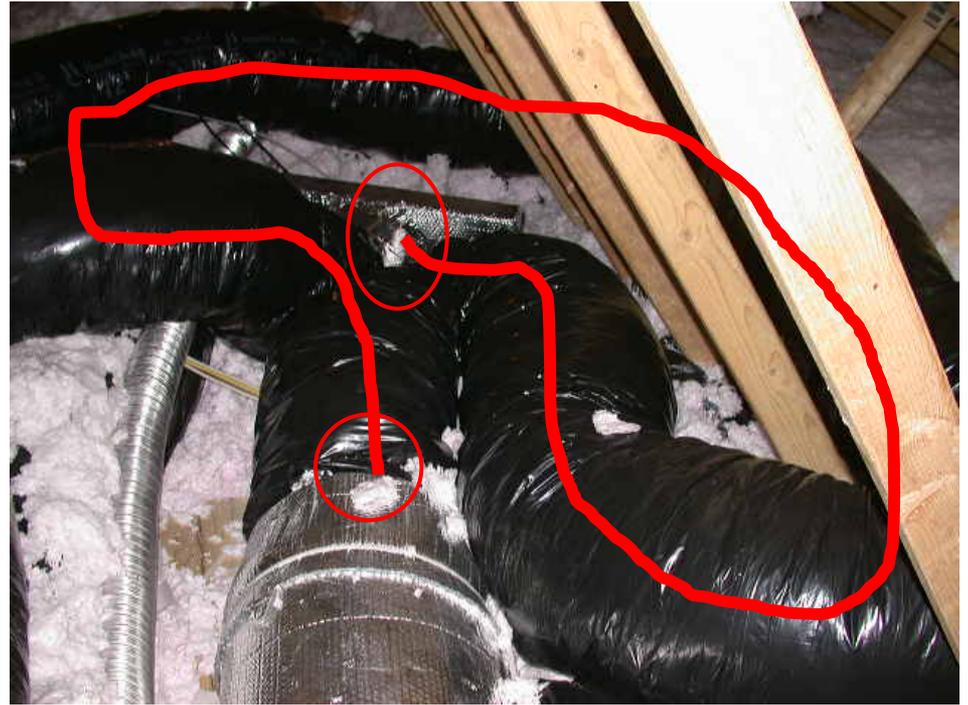


Fundamental Questions

Is It There?



Does It Work?



Fundamental Questions

Is It There?



Does It Work?



Fundamental Questions

Is It There?



Does It Work?



The Reference Home/Twin Home Concept Used by modeling software for Code Compliance

2015 reference design house
Built from table 405.5.2(1)

vs.

Rated Home: Builders desired house

- The reference home is the **geometric twin** of the rated home *configured to a standard set of thermal performance characteristics*:
- I.e. The 2015 IECC Prescriptive path
- The home you are building and evaluating, compared to the “Reference” home in order to quantify performance and demonstrate compliance with the Energy code.



Energy Costs?



- **405.3 Performance-based compliance.** Compliance based on simulated energy performance requires that a proposed residence (proposed design) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design.

Property

2015 ERI Base House
1234 Place to Live
Denver, CO 80221

Organization

EnergyLogic, Inc
(970) 556-0839
Robby Schwarz

HERS

Confirmed
2/10/2015
Rating No: 34332
Rater ID: 1215211

Weather: Denver, CO

2015 ERI Compliance
2015 Prescriptive Path HERS

Builder

This home MEETS the annual energy cost requirements and verifications of Section 405 of the 2015 International Energy Conservation Code based on a climate zone of 5B. In fact, this home surpasses the requirements by 6.3%.



Home

energyLogic
analysis. insight. answers.
www.energylogic.com

Uniform Energy Rating System

1 Star	1 Star Plus	2 Stars	2 Stars Plus
500-401	400-301	300-251	250-201

HERS Index: **55**

General Information

Conditioned Area: 4481 sq. ft.
 Conditioned Volume: 43734 cubic ft.
 Bedrooms: 3

Mechanical Systems Features

Heating: Fuel-fired
 Water Heating: Instant water
 Cooling: Air conditioning
 Duct Leakage to Outside: 50.00 CFM
 Ventilation System: Exhaust On
 Programmable Thermostat: Heating: Yes

Building Shell Features

Ceiling Flat: R-38
 Vaulted Ceiling: NA
 Above Grade Walls: R-23
 Foundation Walls: R-11.0
 Slab: R-0.0 Edge

Lights and Appliance Features

Percent Interior Lighting: 100.00
 Percent Exterior Lighting: 0.00
 Refrigerator (kWh/yr): 775.00
 Dishwasher Energy Factor: 0.46

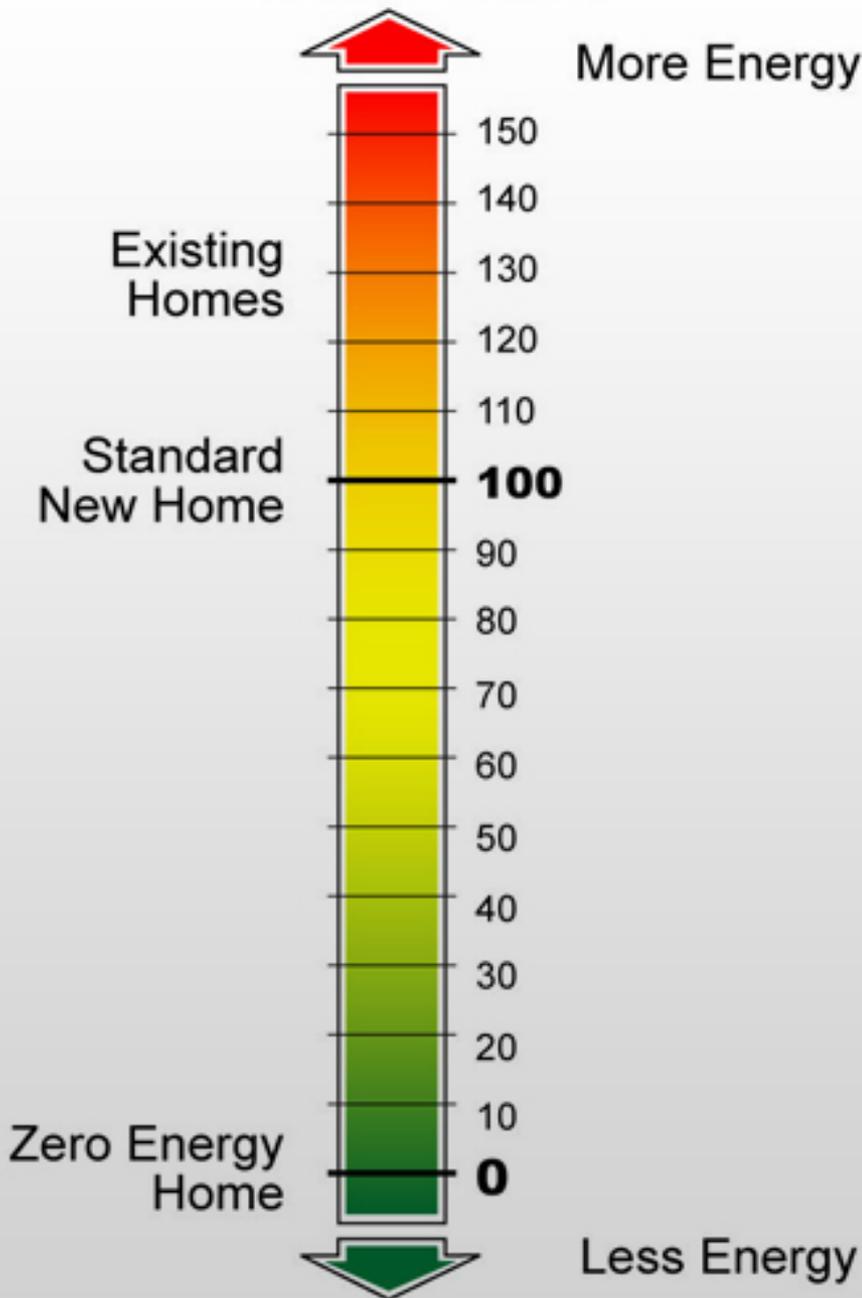
The Home Energy Rating Stan

REM/Rate - Residen

This information doe

© 1985-2012 Aro

HERS® Index



D:
 er: 16805
 er: Robby Schwarz
 te: 5/8/09
 or: Best Built Homes

ated Annual Energy Cost

Confirmed Rating		
MMBtu	Cost	Percent
58.1	\$459	28%
2.6	\$79	5%
15.2	\$111	7%
33.1	\$994	60%
-0.0	\$-0	-0%
	\$0	0%
	\$1643	100%

needs or exceeds the minimum

ia for all of the following:

- ERGY STAR Version 2.5 Home
- ional Energy Conservation Code
- ional Energy Conservation Code
- ional Energy Conservation Code

g Provider

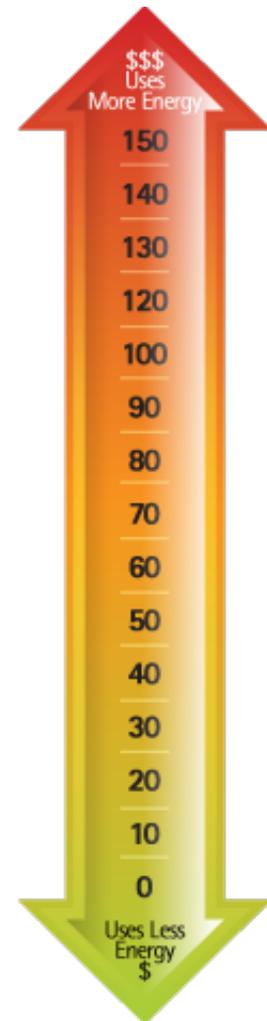


Certified Energy Rater

Section R406 of the 2015 IECC

Energy Rating Index Compliance Alternative

- What is an Energy Rating Index



Code Book misprint and the Errata

er·ra·tum

i' rätəm, -' rā-, -' rat-/ *noun*

plural noun: **errata**

An error in printing or writing.

A list of corrected errors appended to a book or published in a subsequent issue of a journal.

- **R406.2 Mandatory requirements.** Compliance with this section requires that the ~~mandatory~~ provisions identified in Sections ~~R401.2~~ R401 through R404 labeled as 'mandatory' and Section R403.5.3 be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.2 or 402.1.4 of the 2009 *International Energy Conservation Code*.



Mandatory sections of the 2015 IECC

- R402.4 Air leakage (Mandatory)
 - Table R402.4.1.1
 - R402.4.1.2 Testing
 - Air leakage rate 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



R406.1 Mandatory Requirements

- The building thermal envelope shall be **greater than or equal** to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or 402.1.3 of the **2009 *International Energy Conservation Code***.



2009 IECC vs. 2015 IECC Prescriptive Table

Climate Zone	Window U-Factor	Window SHGC	Ceiling R-Value	Wood Framed Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab R-Value and Depth	Crawl Space Wall R-Value
1	1.2 NR	0.30 0.25	R-30	R-13	R-3/4	R-13	0	0	0
2	0.65 0.40	0.30 0.25	R-30 38	R-13	R-4/6	R-13	0	0	0
3	0.35 0.35	0.30 0.25	R-30 38	R-13 20 or 13+5	R-5/8 8/13	R-19	R-5/13	0	R-5/13
4 except Marine	0.35 0.35	NR 0.40	R-38 49	R-13 20 or 13+5	R-5/10 8/13	R-19	R-10/13	R-10, 2ft	R-10/13
5 and Marine 4	0.35 0.32	NR	R-38 49	R-20 or 13+5	R-13/17	R-30	R-10/13 15/19	R-10, 2ft	R-10/13 15/19
Climate Zone 6	0.35 0.32	NR	R-49	R-20 or 13+5 20 or 13+10	R-15/20	R-30	R-15/19	R-10, 4ft	R-10/13 15/19
Climate Zone 7 & 8	0.35 0.32	NR	R-49	R-21 20 or 13+10	R-19/21	R-38	R-15/19	R-10, 4ft	R-10/13 15/19



Table R406.4 Maximum Energy Rating Index

Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

- Compliance based on an ERI analysis requires that the *rated design* be shown to have an ERI less than or equal to the appropriate value listed in Table R406.3, when compared to the *ERI reference design*



Features that Impact the ERI

(Lower the score)

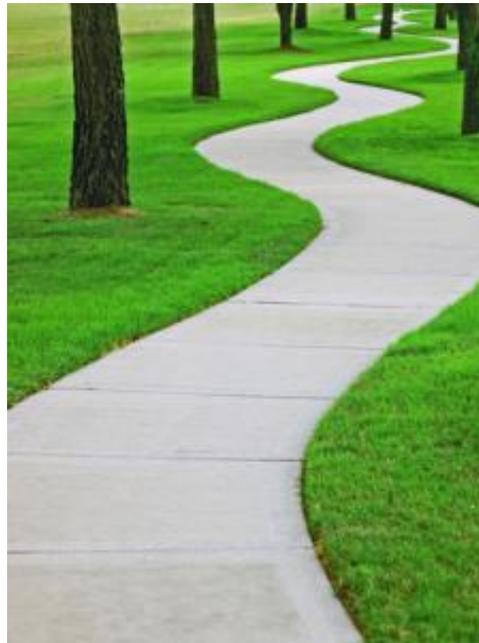
- Mechanical equipment
 - High efficiency furnace
 - High efficiency AC
 - High efficiency water heater
- More R-value than required by the 2009 IECC
- House orientation with the ERI
- House tightness below 3 ACH50
- Duct leakage to the outside
- Duct location
- Whole house fan
- CFL or LED Lighting above 75%
- High efficiency appliances
- Solar



Code Compliance Paths



Prescriptive Path



UA Compliance Path



**Simulated
Performance Path**



**Energy Rating Index
Path**



End Goal



Prescriptive Path

UA Compliance Path

Simulated Performance Path

Energy Rating Index Path



Base Case Compliance

2015 Compliance Reality

- 2 story
- 2800 Square Feet
- Single Family Detached
- Conditioned basement

- UA Alternative
 - Pass by 6.3%
- Simulate Performance
 - Pass by 1.8%
- Corresponding HERS Index
 - HERS 72

House Specs

- Foundation R-15
- Slab R-0
- Floor over garage R-30
- Rim R-19
- Walls blown R-20
- Windows U-32/SHGC.32
- Doors R-5/ R-2.2
- Attic R-49 flat R-38 edge
- Furnace 80 AFUE w/ 150 CFM LTO & 10% in attic R-8
- Water Heater 62 EF
- AC 13 Seer
- 3 ACH50 & Exhaust Ventilation
- Default appliances 75% CFL



Typical Code House in Colorado

2015 Compliance Reality

- 2 story
- 2800 Square Feet
- Single Family Detached
- Conditioned basement

- UA Alternative
 - Pass by 3%
- Simulate Performance
 - Pass by 6.9%
- Corresponding HERS Index
 - HERS 61

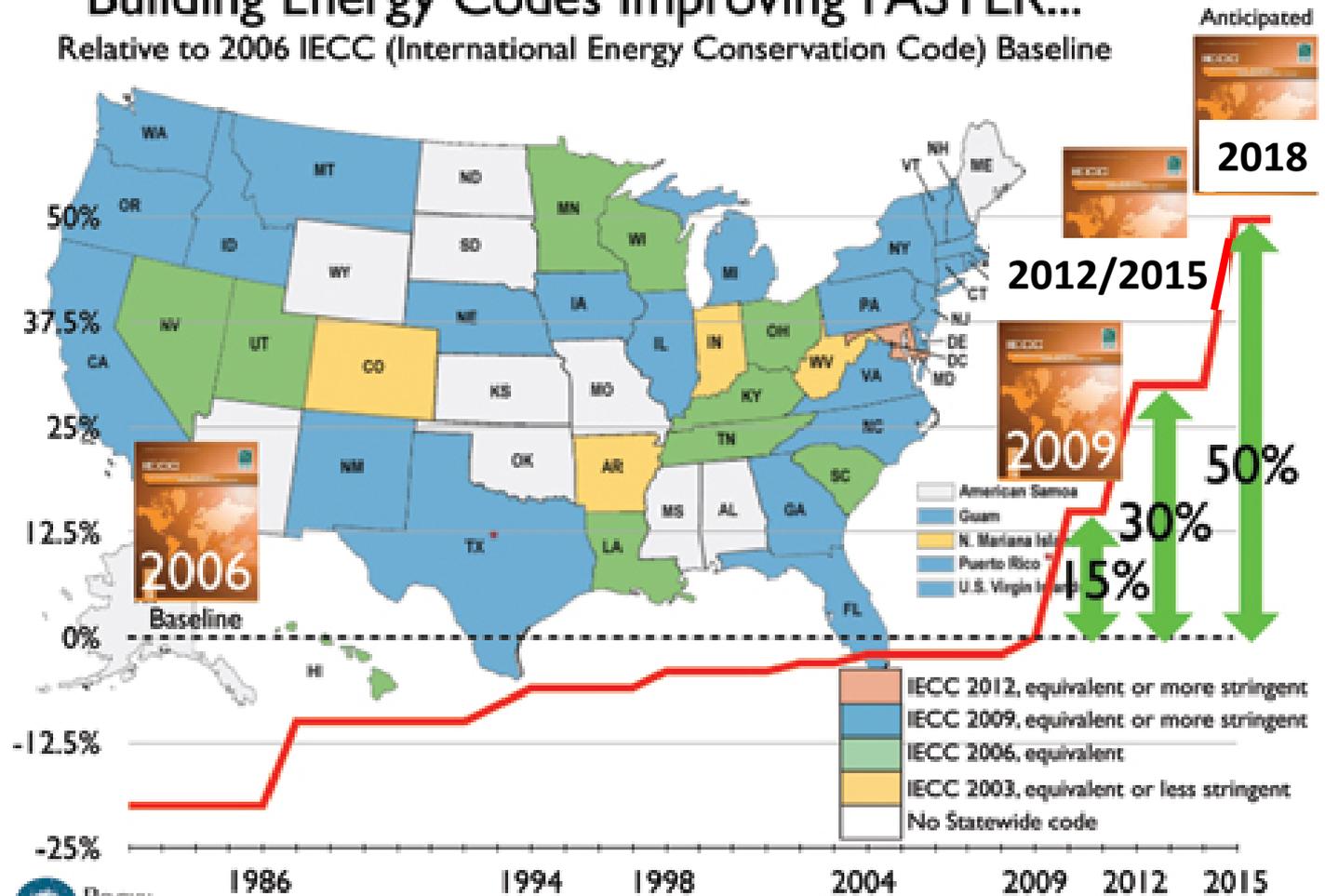
House Specs

- Foundation R-11
- Slab R-0
- Floor over garage R-50
- Rim R-19
- Walls blown R-23
- Windows U-34/SHGC.32
- Doors R-5/ R-2.2
- Attic R-38 flat R-30 edge
- Furnace 92.5 AFUE w/ 50 CFM LTO & 10% in attic R-8
- Water Heater 62 EF
- AC 13 Seer
- 2.5 ACH50 & Exhaust Ventilation
- Default appliances 100% CFL



What to do??

Building Energy Codes Improving FASTER... Relative to 2006 IECC (International Energy Conservation Code) Baseline



Rocky
Mountain
INSTITUTE

Interpreted from: www.energycodes.gov; Jan. 2012; J. Brew, RMI

HERS® Advisor

HERS® Designer



- Manager of teams and projects
- Clear Understanding of the Residential Energy Services Network (RESNET)
 - its functions
 - stakeholders
 - and role in the residential construction industry.
- This course provides an advisory and management focused approach to the HERS course to suit the needs of
 - Code officials
 - Architects
 - Engineers
 - Builders,
 - Estimators, and Industry consultants

HERS Advisor

- The course includes 6 modules.
- Module 1 – Introduction & RESNET structure and Role
- Module 2 – HERS Rater Guiding Principles (Building Science Basics)
- Module 3 – Inspections & Diagnostic Testing
- Module 4 – Overview of Modeling & The HERS Index
- Module 5 – HERS and The International Energy Conservation Code (IECC)
- Module 6 – Final Exam

HERS Designer

- Ability to create a accurate from plans rating/analysis





Thank you!

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