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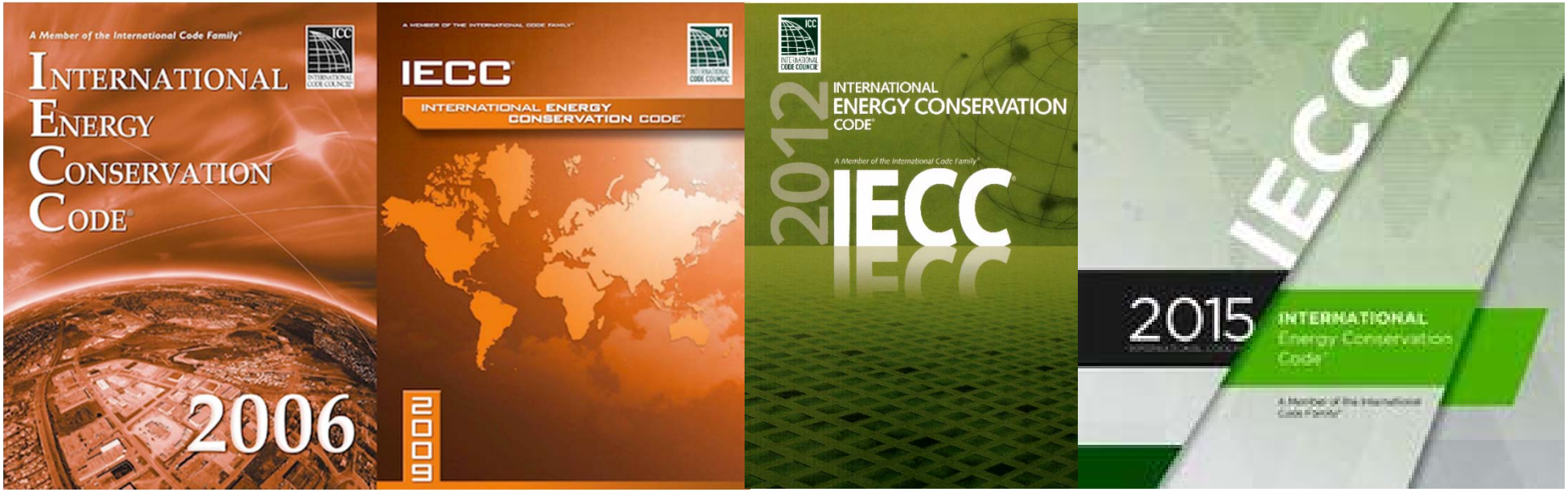
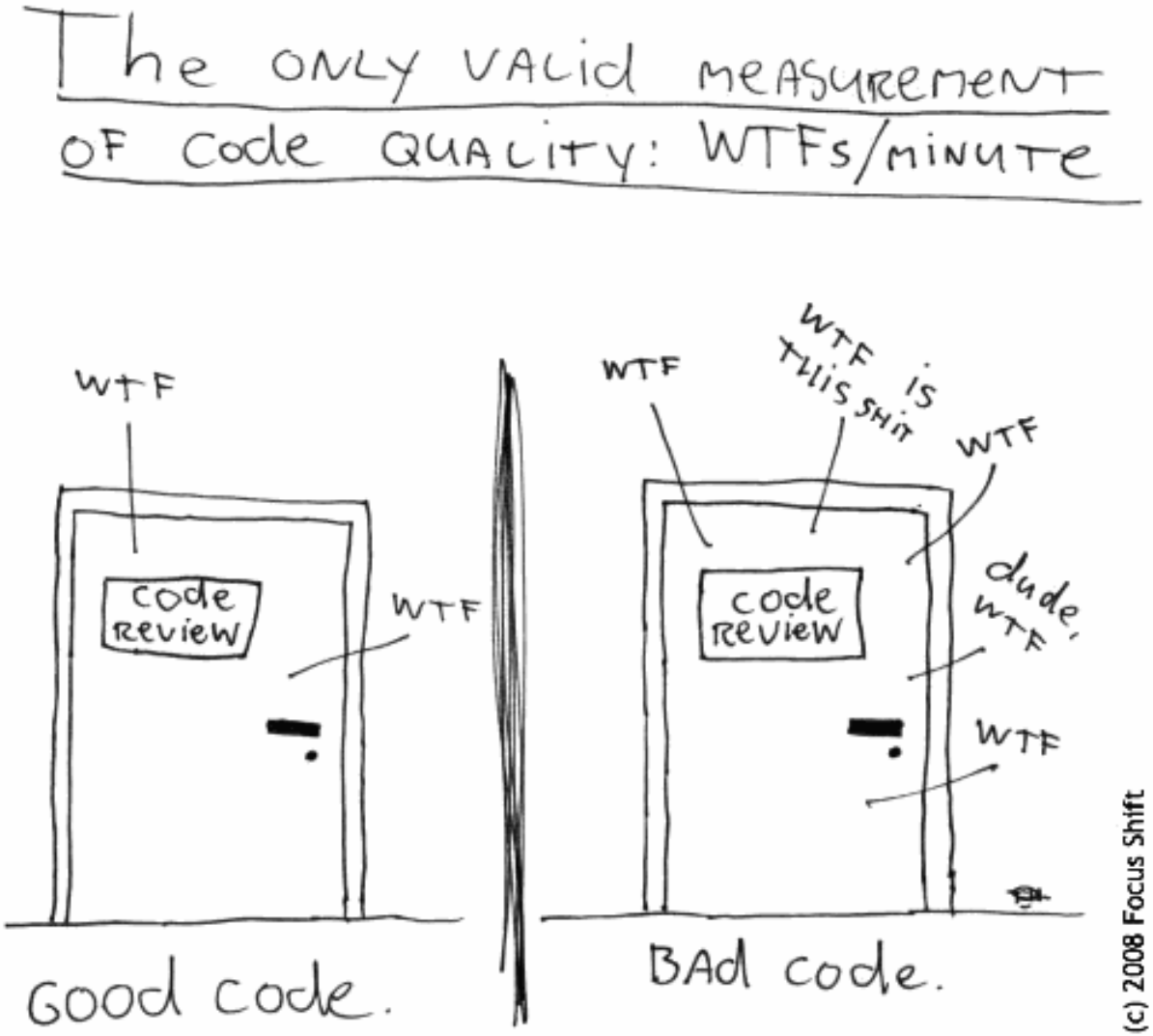
ENERGY CODE COMPLIANCE AND HERS INDEX SCORES

Presented by Robby Schwarz and Steve Byers

Stapleton

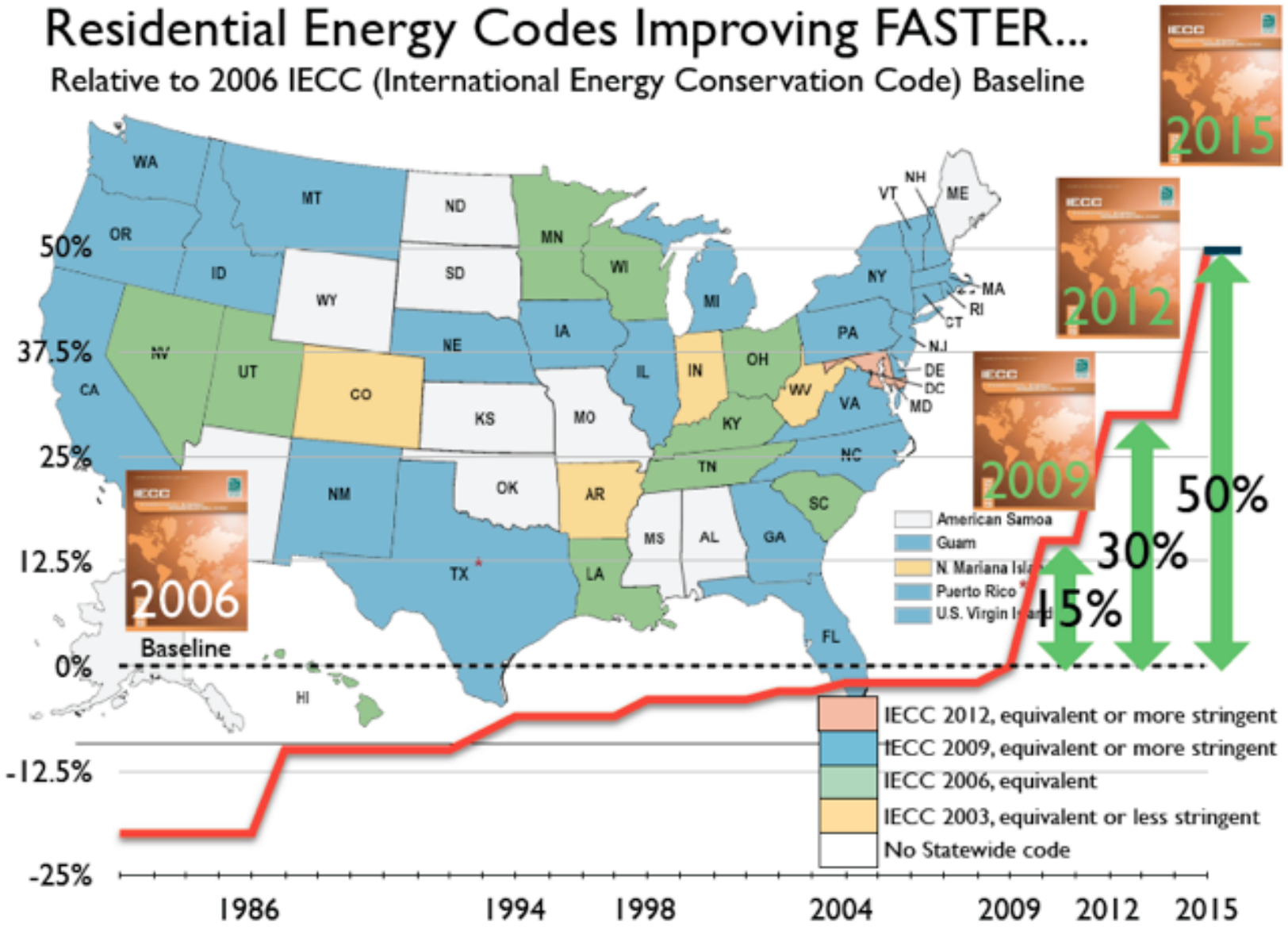

A Member of the International Code Family
INTERNATIONAL ENERGY CONSERVATION CODE
2006
IECC
INTERNATIONAL ENERGY CONSERVATION CODE
2009
2012
INTERNATIONAL ENERGY CONSERVATION CODE
IECC
2015
IECC
INTERNATIONAL
Energy Conservation Code

What does code compliance mean?



Residential Energy Codes Improving FASTER...

Relative to 2006 IECC (International Energy Conservation Code) Baseline



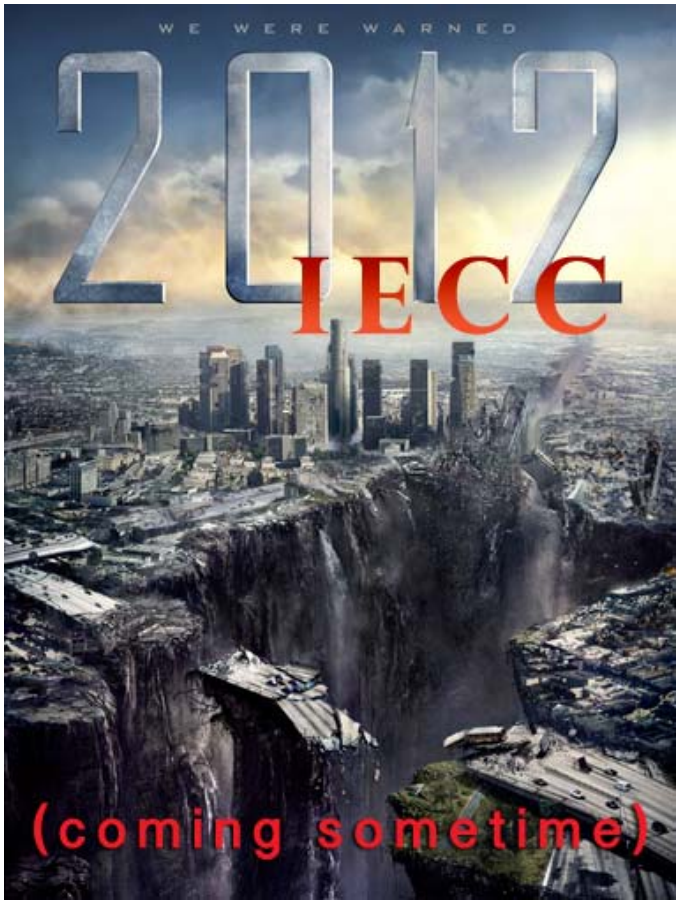
Interpreted from: www.energycodes.gov; Jan. 2012, J.Brew, RMI

Code Adoption Cycle

- 2012 International Energy Conservation code
- The code that got people's attention

- Adoption and development

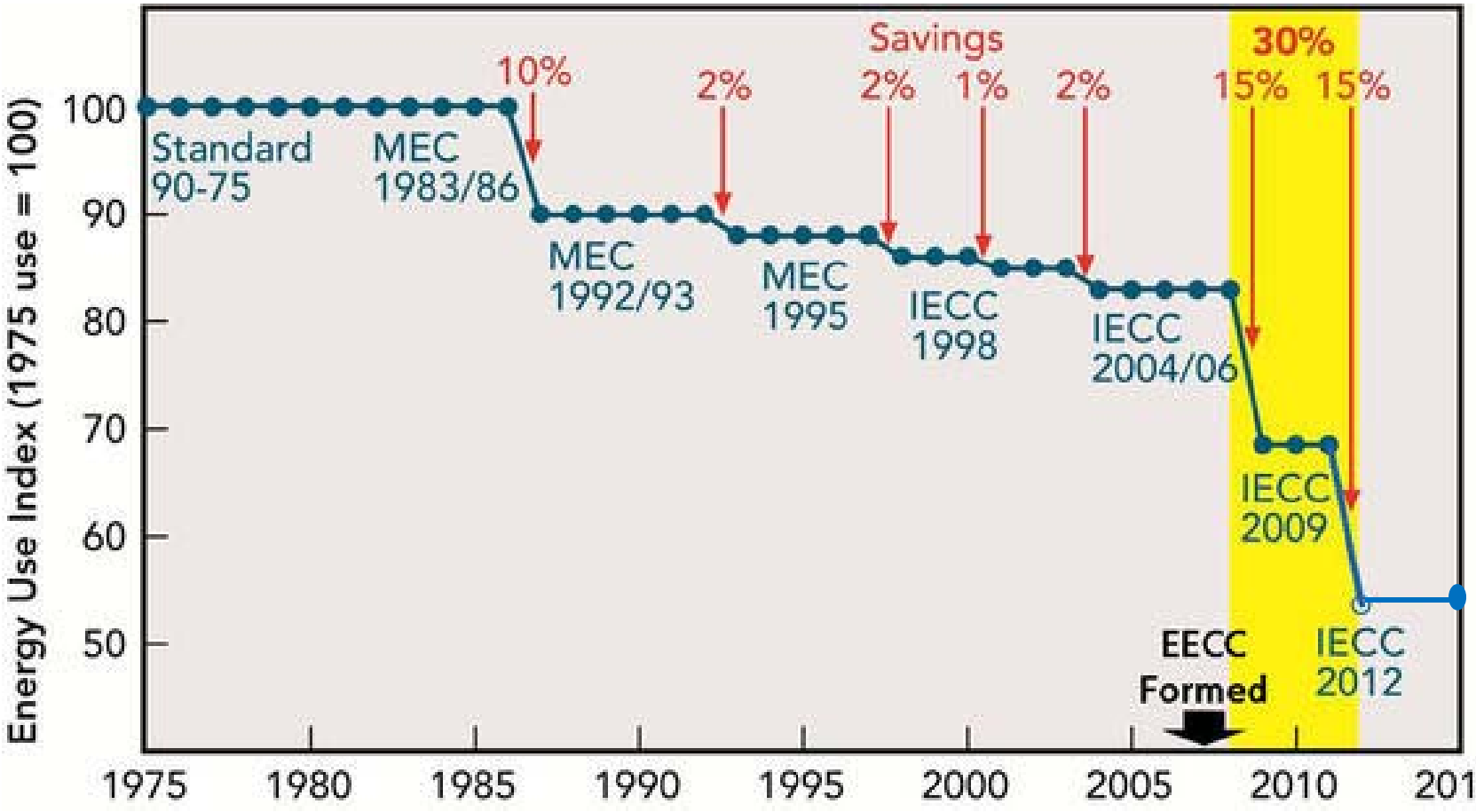
  are out of sync



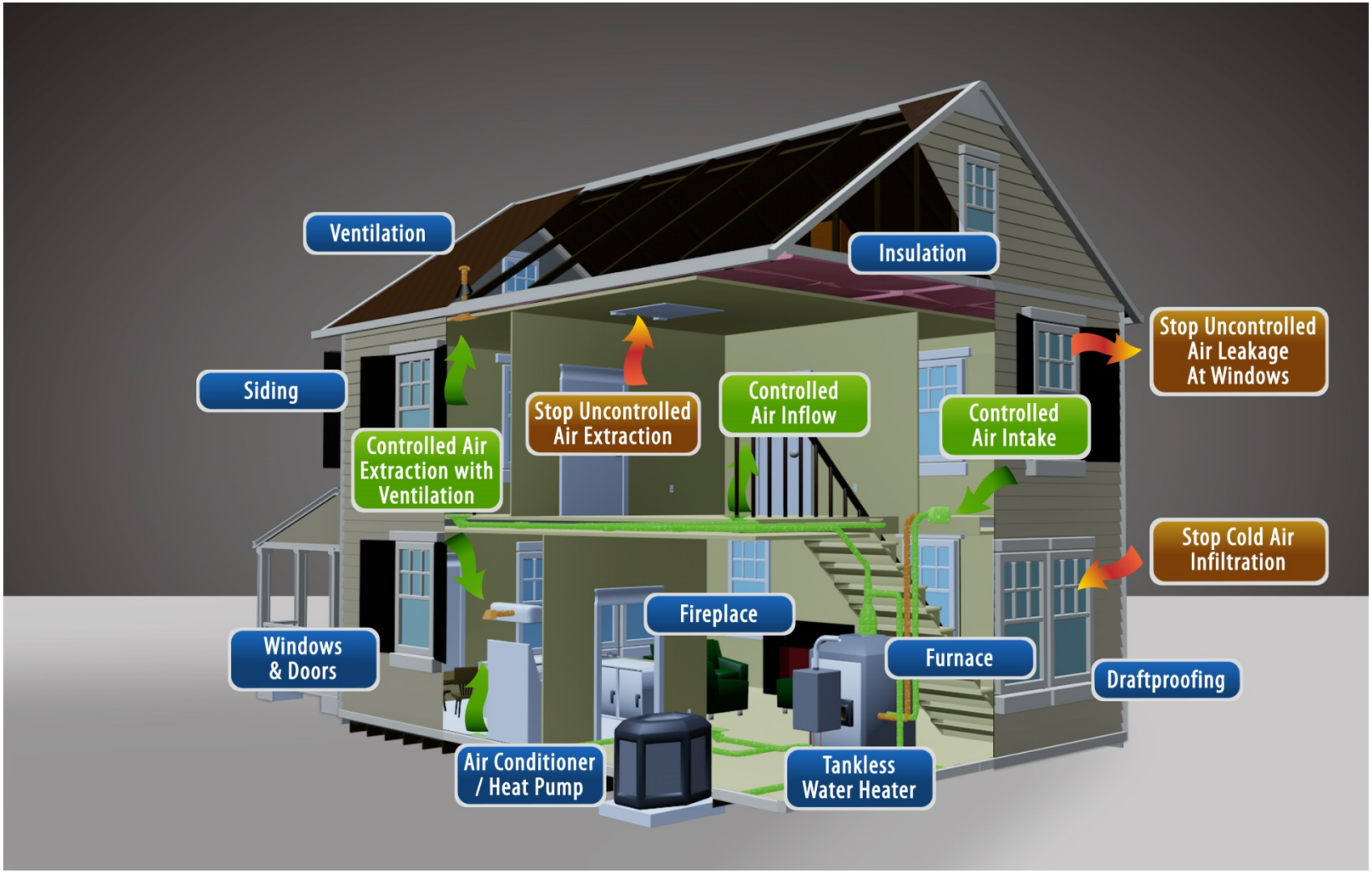
Energy Code

Its not your Daddy's code?

- No longer building the minimum _ _ _ house allowable!



Applied Building Science and Systems Thinking

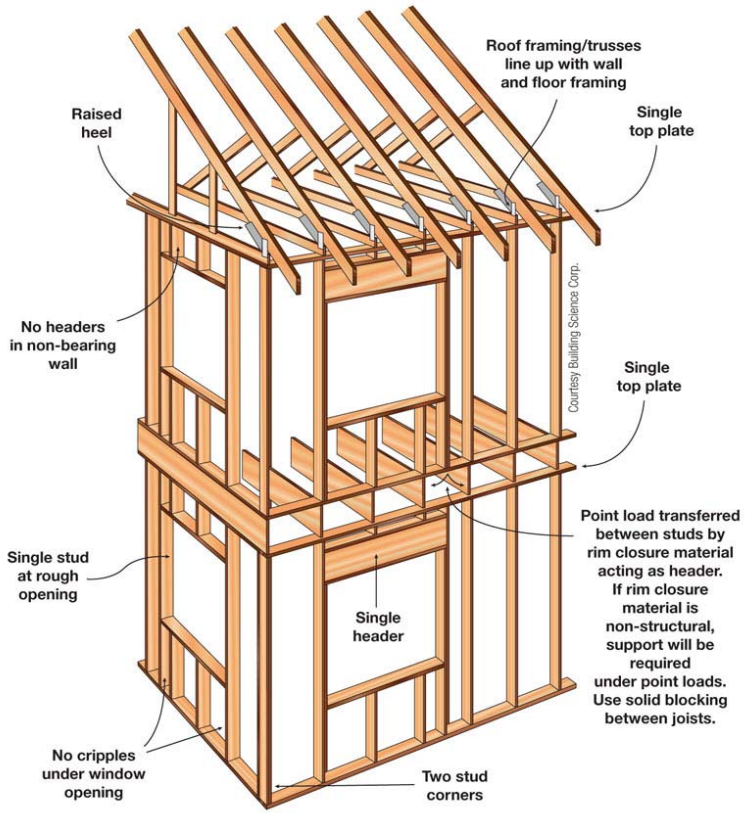


2015 IECC – Intent

- This code shall regulate the design and construction of buildings for the effective use and conservation of energy **over the useful life of each building**.

2015 IECC – Intent

- This code is intended to **provide flexibility** to permit innovative approaches and techniques to achieve this objective.



2015 IECC – Intent

- The code is <u>not intended</u> to **abridge safety, health or environmental requirements** contained in other applicable codes or ordinances.

Code Compliance Paths

Prescriptive Path

UA Compliance Path

Simulated Performance Path

Energy Rating Index Path

Quantifiable Energy Use

- Prescriptive
  - Baseline of comparison
- UA Trade off
  - Area weighted U-Value
- Simulated Performance
  - Annual Cost Compliance
- Energy Rating Index
  - HERS Index

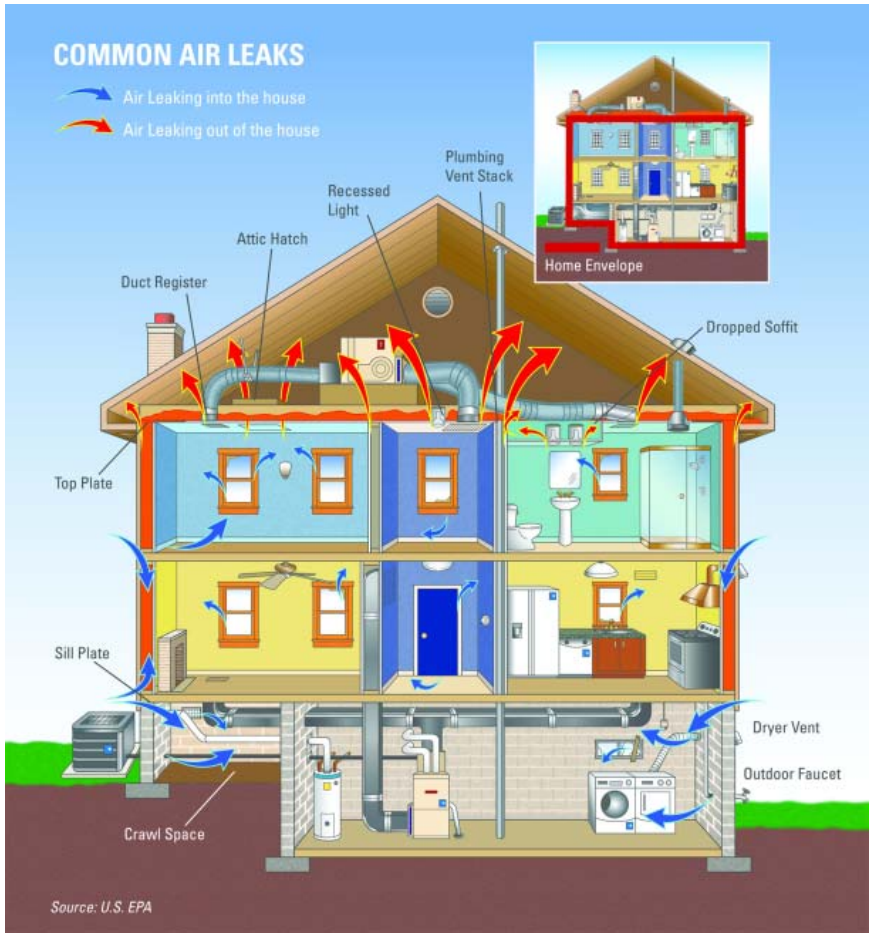
Simulated Performance Path

- Leverages the applied building science and systems thinking that is built into the code
  - Air Flow
  - Thermal Flow
  - Moisture Flow

- More holistic approach rather than a component approach

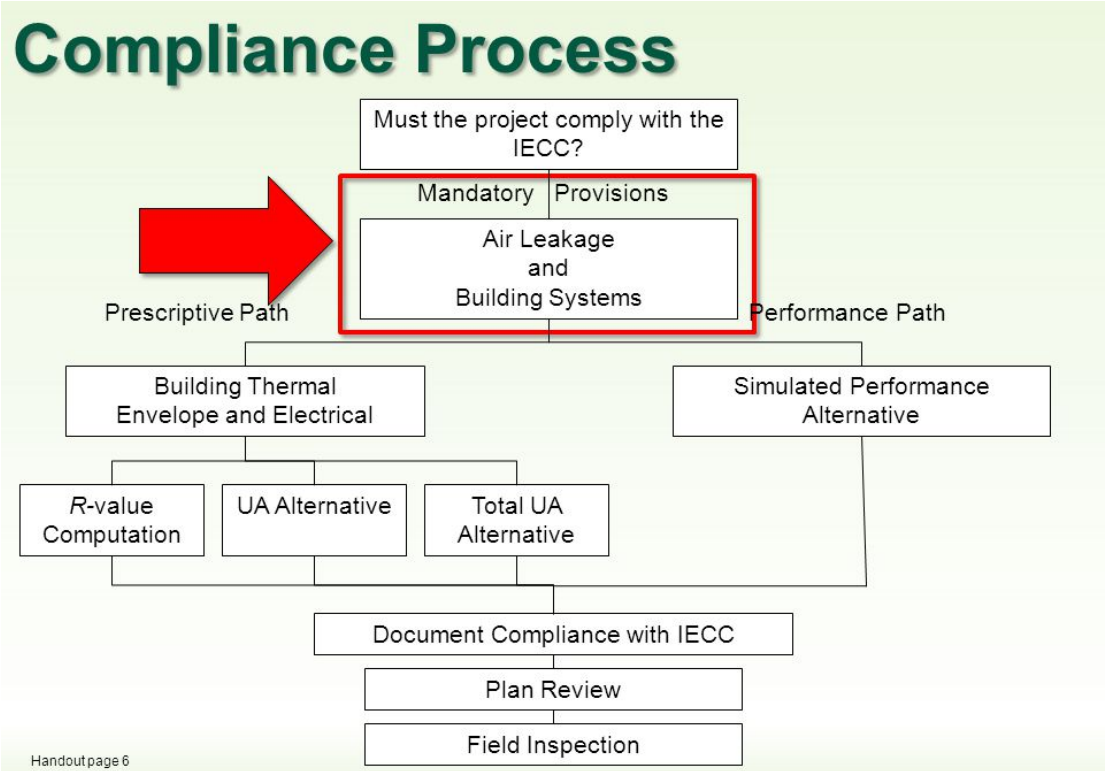
Simulated Performance Path

- This is where the flexibility in the intent of the code lies



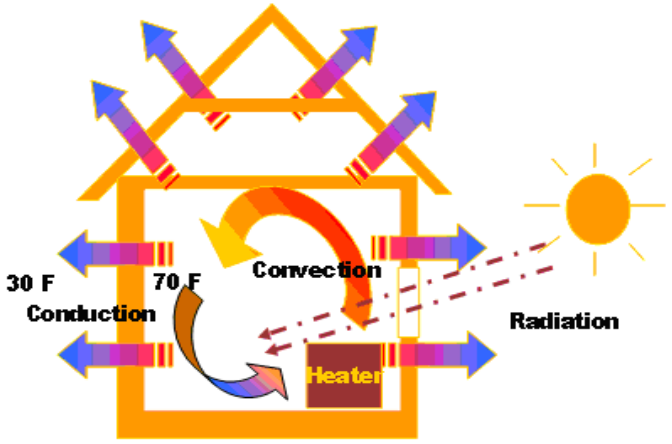
Simulated Performance Path

- R405.2 Mandatory Requirements
  - Compliance with this section requires that the **mandatory provisions** identified in section R401.2 **be met**



R405.3 Performance-based compliance

- Energy Analysis
  - A method of performing whole house performance energy trade offs
    - **Conduction** - Trading off R-values and U-values
    - Convection – Energy moving with air infiltration and exfiltration
    - **Radiation** – Trade offs created by energy moving form warm to cold



What is a Reference Design

- **Reference Design**
  - **A standard set of house specifications that generate a specific level of quantifiable energy performance**

- The concept Code uses to show compliance with the UA Trade Off (ResCheck) and the Simulated Performance Path

The Actual built homes performance will be less than or equal to the performance of the code standard reference design

The Standard reference design for code is the prescriptive path of compliance built in Table 402.1.3

Twin Houses

2015 IECC reference design house

- Geometric Twin
- 2015 IECC prescriptive envelope U-Values in (Table 402.1.3)

vs.

Builder's desired house

- Geometric Twin
- Envelope U-Values based on Builder's Specification

For the Simulated Performance Path:
The Builder's house must have the same or lower annual energy cost then the code reference home

Energy Cost?

- **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.

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2012 IECC ANNUAL ENERGY COST COMPLIANCE

Date: February 01, 2012 Rating No.: 16805

This home MEETS the annual energy cost requirements and verifications of Section 405 of the 2012 International Energy Conservation Code based on a climate zone of 5B. In fact, this home surpasses the requirements by 14.4%.

Duct Leakage (Section 403.2.2): PASSES

This home MEETS the annual energy cost requirements and verifications of Section 405 of the 2012 International Energy Conservation Code based on a climate zone of 5B. In fact, this home surpasses the requirements by 14.4%.

Name: Robby Schwarz Signature:

Organization: EnergyLogic Inc. Date: February 01, 2012

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www.energylogic.com

Home

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:	4461 sq. ft.
Conditioned Volume:	43734 cubic ft.
Bedrooms:	3

Mechanical Systems Features

Heating:	Fuel-fired air di
Water Heating:	Instant water h
Cooling:	Air conditioner,
Duct Leakage to Outside:	50.00 CFM.
Ventilation System:	Exhaust Only: 7
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, R-

Lights and Appliance Features

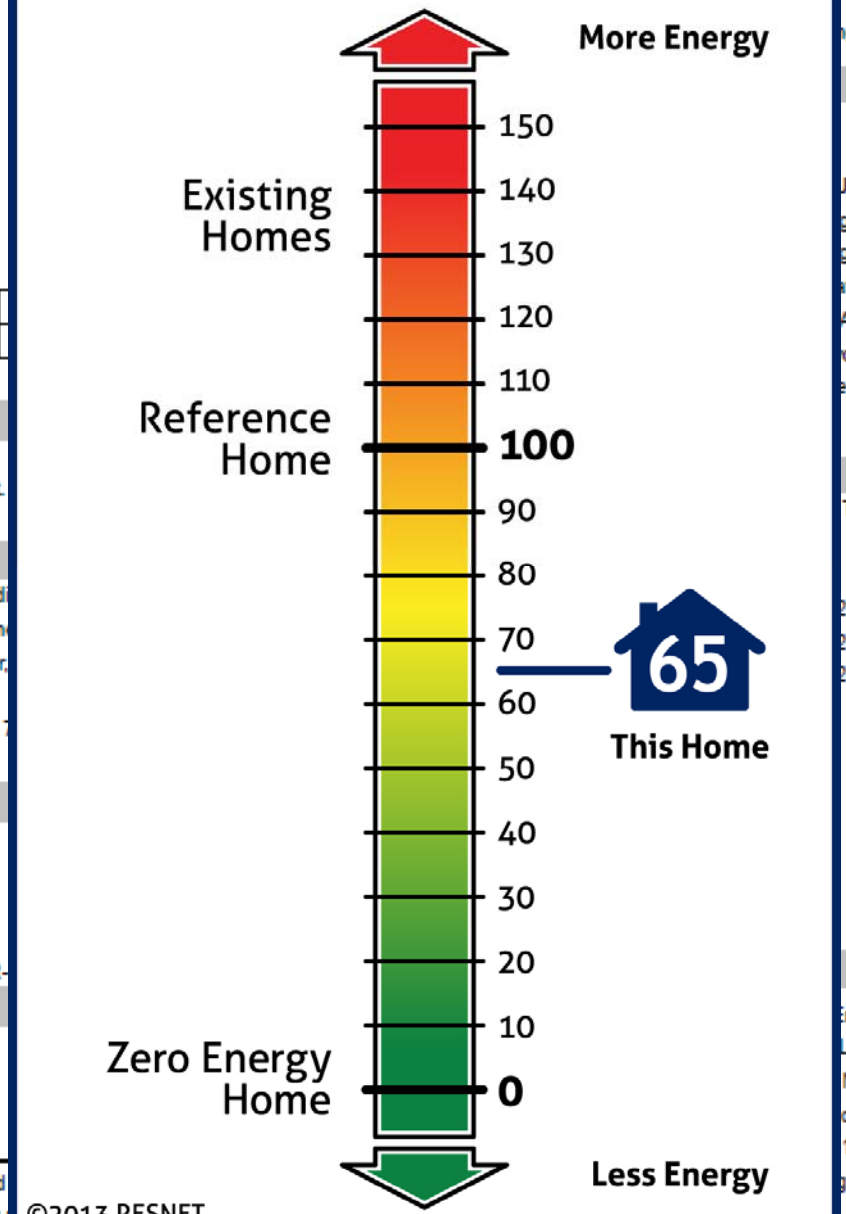
Percent Interior Lighting:	100.00
Percent Exterior Lighting:	0.00
Refrigerator (kWh/yr):	775.00
Dishwasher Energy Factor:	0.46

The Home Energy Rating Standard

REM/Rate - Residential

This information does not constitute any warranty of energy cost or savings.

HERS® Index



Registry ID:
ating Number: 16805
d Energy Rater: Robby Schwarz
Rating Date: 5/8/09
g Ordered For: Best Built Homes

Estimated Annual Energy Cost
Confirmed Rating

Use	MMBtu	Cost	Percent
g	58.1	$459	28%
g	2.6	$79	5%
ater	15.2	$111	7%
Appliances	33.1	$994	60%
oltaics	-0.0	$-0	-0%
e Charges		$0	0%
		$1643	**100%**

This home meets or exceeds the minimum criteria for all of the following:

EPA ENERGY STAR Version 2.5 Home
2006 International Energy Conservation Code
2009 International Energy Conservation Code
2012 International Energy Conservation Code

nergy Rating Provider
Logic, Inc.
N
d, CO 80513
15-0459
glogic.com

NATIONAL MORTGAGE INDUSTRY HERS ACCREDITATION REGISTRY No. 1998-069

Certified Energy Rater

Mandatory Code Requirements

402.4 Air Leakage and Air Barriers (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.

- 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

2012 IECC Table

TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	CRITERIA[a]
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.
Walls	Corners and headers shall be insulated and the junction of the foundation and sill plate shall be sealed. The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.

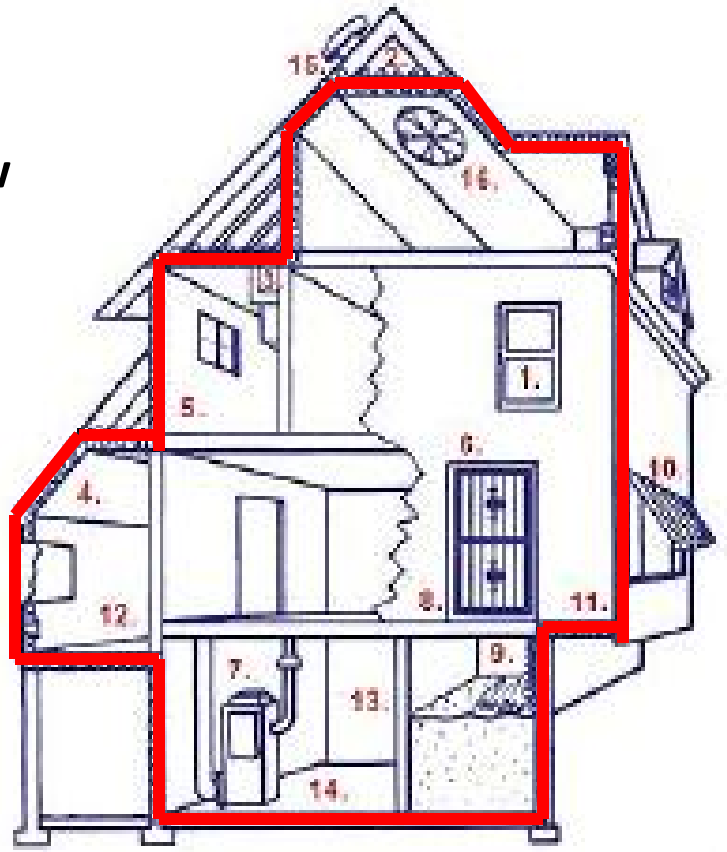
2015 IECC Table

TABLE 402.4.1.1 (N1102.4.1.1)
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General Requirements	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.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.

What / Where is the Thermal Envelope?

- Control
  - **Air Flow**
  - **Moisture Flow**
  - **Thermal Flow**



Fundamental Questions

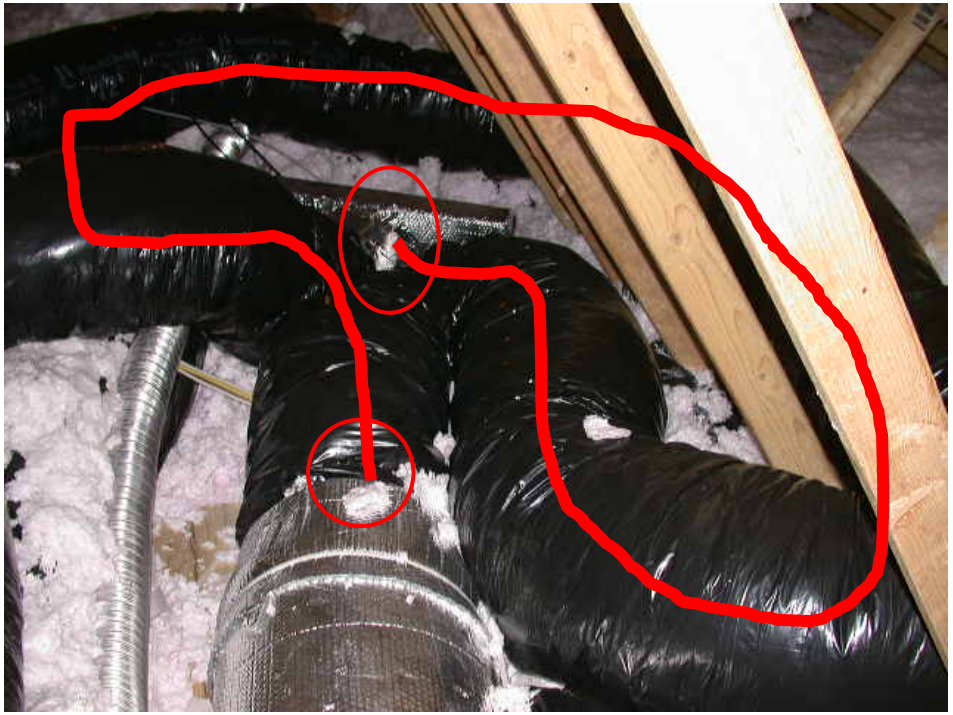
Is It There?

Does It Work?

Fundamental Questions

Is It There?

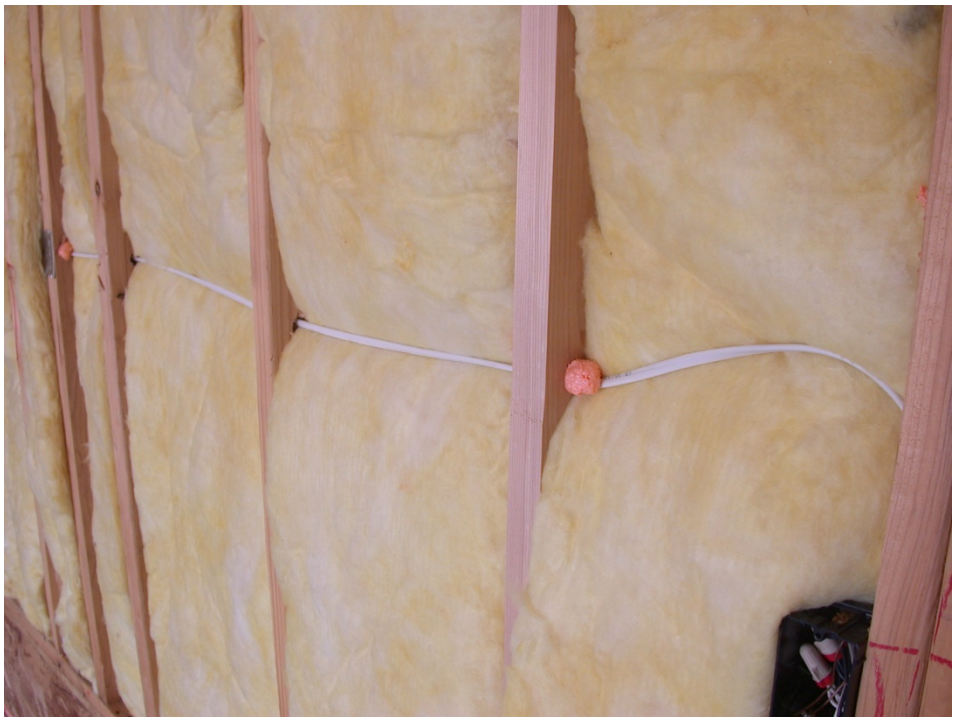
Does It Work?



Fundamental Questions

Is It There?

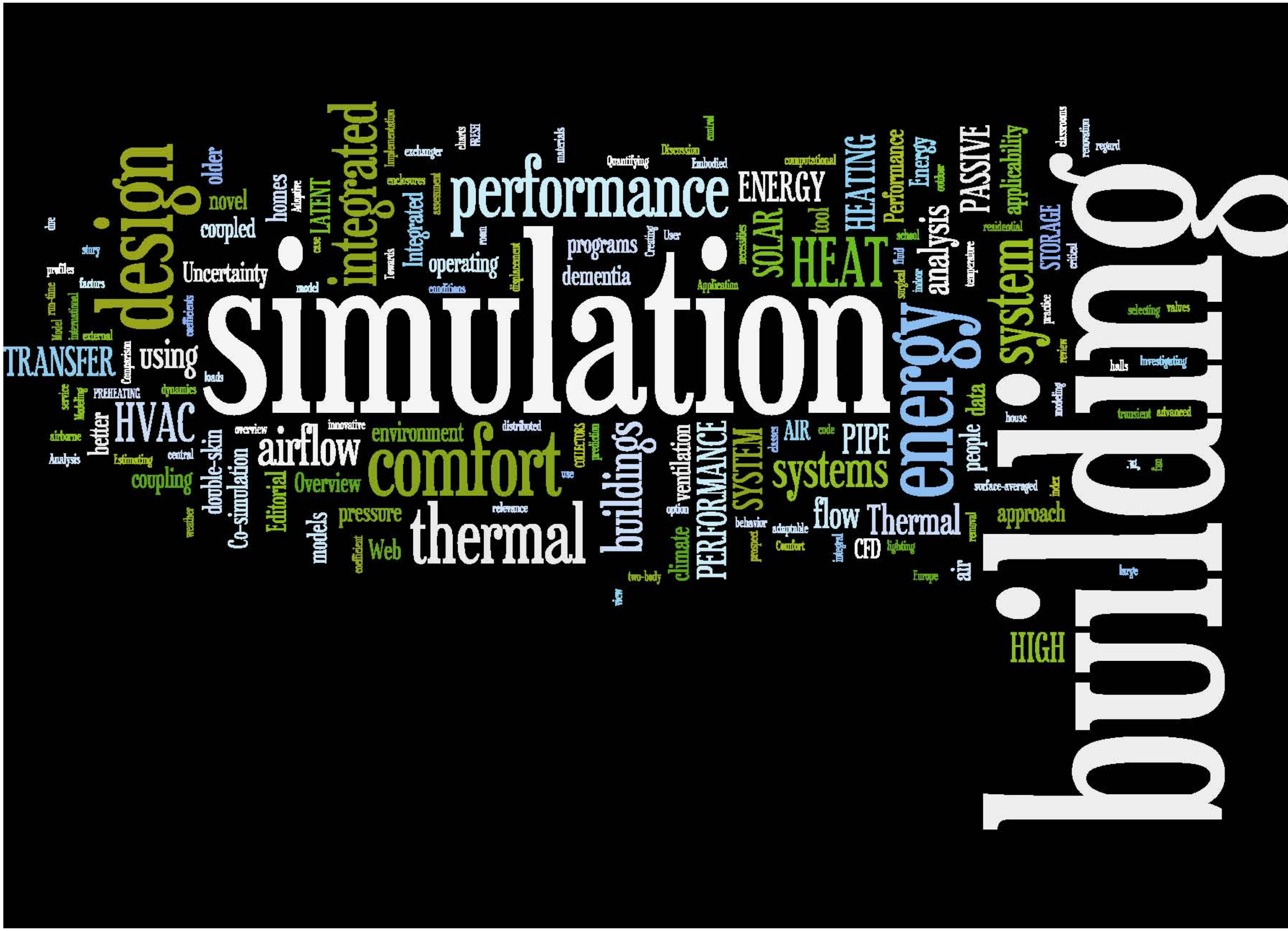
Does It Work?



Fundamental Questions

Is It There?

Does It Work?

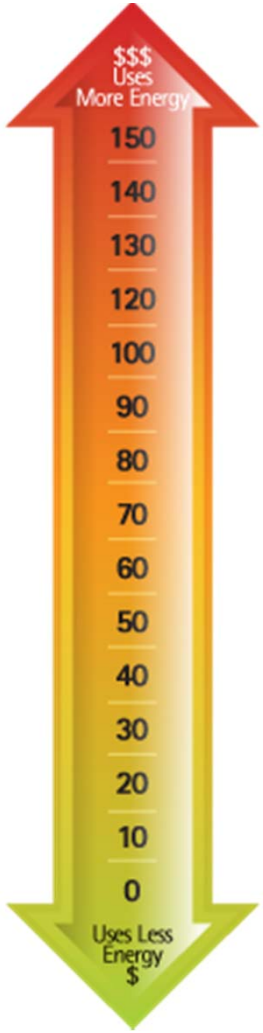

simulation
building
design
integrated
performance
energy
comfort
thermal
buildings
system
systems
HEAT
airflow
HVAC
TRANSFER
using
ENERGY
HEATING
PASSIVE
SOLAR
analysis
Thermal
flow
PIPE
PERFORMANCE
SYSTEM
approach
HIGH
Uncertainty
coupled
novel
older
homes
LATENT
Integrated
operating
programs
dementia
environment
Overview
pressure
Web
models
Editorial
Co-simulation
double-skin
coupling
better
ventilation
climate
AIR
CFD
people
data
applicability
STORAGE
Performance
Energy
tool
air

Section R406 of the2015 IECC

Energy Rating Index Compliance Alternative

- What is an Energy Rating Index

RESNET® HERS INDEX



Code Book misprint and the Errata

er·ra·tum

iˈrätəm,-ˈrā-,-ˈrat-/ *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+5 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+5 or 13+10	R-19/21	R-38	R-15/19	R-10, 4ft	R-10/13 15/19

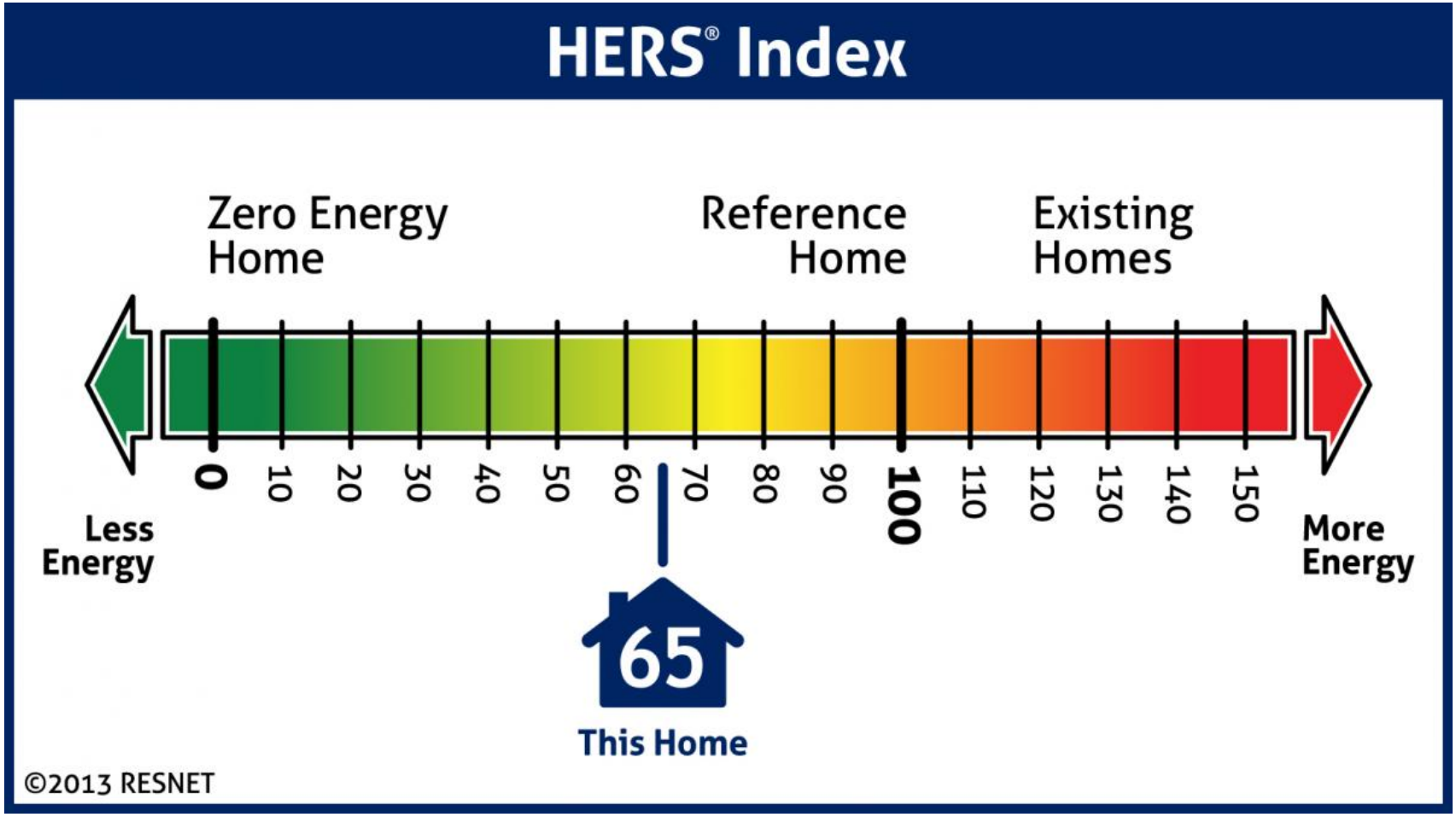

HERS® Index
Zero Energy Home
Reference Home
Existing Homes
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Less Energy
More Energy
65
This Home
©2013 RESNET

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

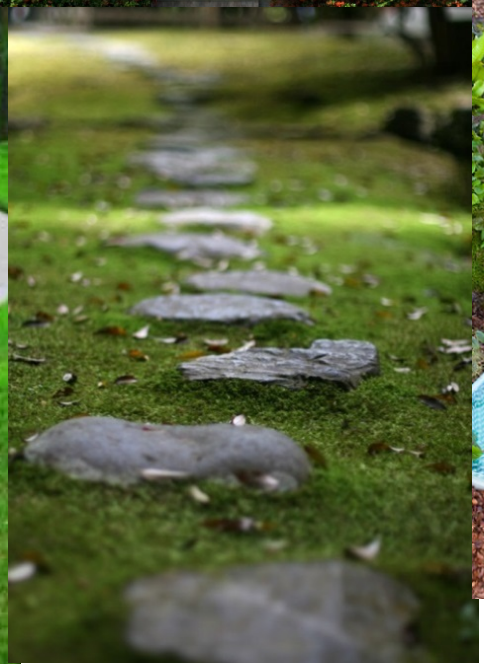
Prescriptive Path

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

Which Path do you Choose?

2015 IECC Energy Rating Index

2015 IECC Simulated Performance

Energy Rating Index Zone 5 – HERS 55

2015 IECC Simulated Performance – HERS 61

Business Opportunities …….

- Plans analysis
  - Cost effective code compliance
  - Energy code plan review
  - HVAC design
- Inspection process
  - Third party
  - Quality Control and Builder Risk Management
  - More inspection from a Rater less from the code official
- Marketing potential
  - HERS Index
  - RESNET Energy Smart Builder
  - EnergyStar
  - Other

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 an accurate from plans rating/analysis

http://energylogicacademy.com/course-catalog/resnet-pro-courses/hers-advisor-2-2/

Thank you!

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