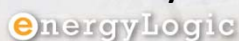


Leveraging Raters in Energy Code Development , Adoption, and Execution



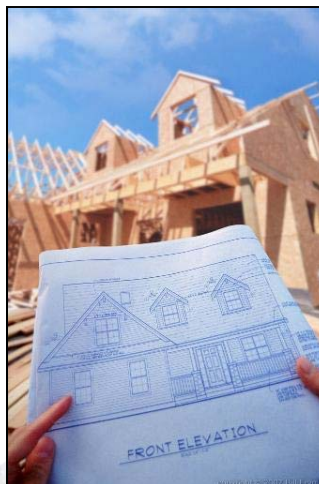
Presented by Robby Schwarz



Helping Colorado Builders Achieve Peak Performance

Agenda

- IECC Code development overview
- Where can Raters get involved
- Chapter 1
 - Alternative materials
 - Construction documents and defining the thermal envelope
- What are Ratings and what are inspections
- Overview of SPP and ERI



Change is Hard ... Change is Good... Change can be Made Easier

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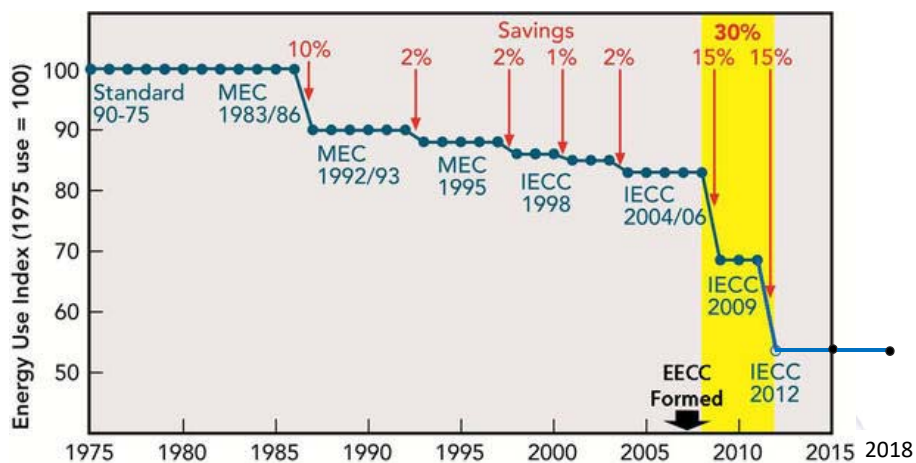




Energy Code

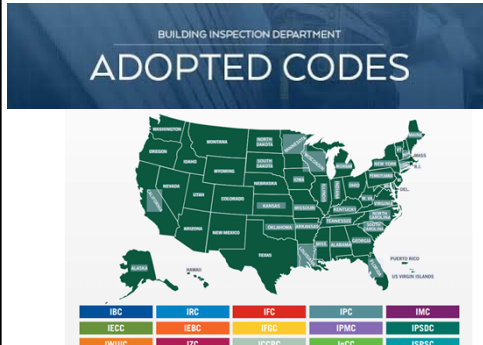
Its not your Daddy's code?

No longer building the minimum ___ house allowable!



The key factor of code development

Adoption

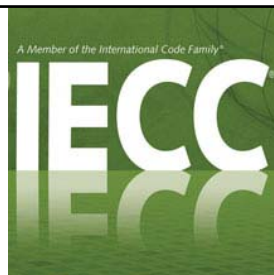


Amendment

a·mend·ment

- ə'men(d)mənt/
- *noun*
- a minor change in a document.
- a change or addition to a legal or statutory document.

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INTENT & IMPACT DIFFERENCE

in·tent

/in'tent/

noun

1. intention or purpose.
"with alarm she realized his intent"
synonyms: aim, intention, purpose, objective, object, goal,

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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**

- Durability



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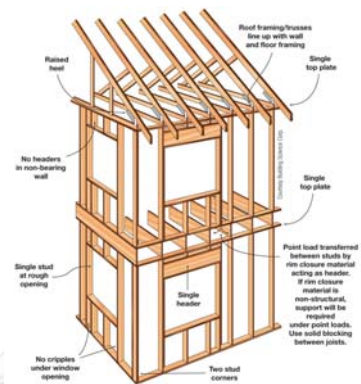
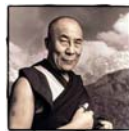


2015 IECC – Intent

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

**“Learn the rules
so you know how
to break them
properly”**

Author: Dalai Lama
Date: Feb 25, 2008

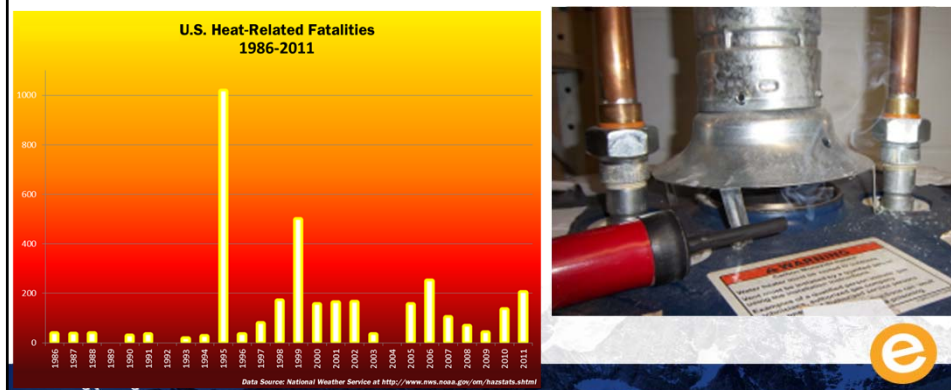


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2012/2015 IECC – Intent

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



Chapter 1: Administration

- Often the Chief Building Official deletes Chapter 1 and inserts their own administrative provisions
- However the IECC has code requirements in Chapter 1 that are important for Raters
- Good to promote that jurisdictions amend this chapter rather than delete it

R102.1

- The Code official **shall be permitted to approve an alternative material, design or method of construction** where the code official finds that the proposed design is satisfactory and complies with the intent of the provision of this code and that the material, method or work offered is for the purpose intended, at least the equivalent of that prescribed in this code



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R103.1 General

- Construction documents, technical reports and other supporting data **shall be submitted** in one or more sets **with each application for a permit.**
- The construction documents and technical reports **shall be prepared by a registered design professional** where required by the statutes of the jurisdiction in which the project is to be constructed.

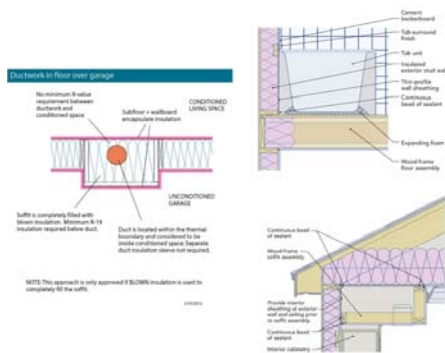
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R103.2 Information on Construction documents



Example Details



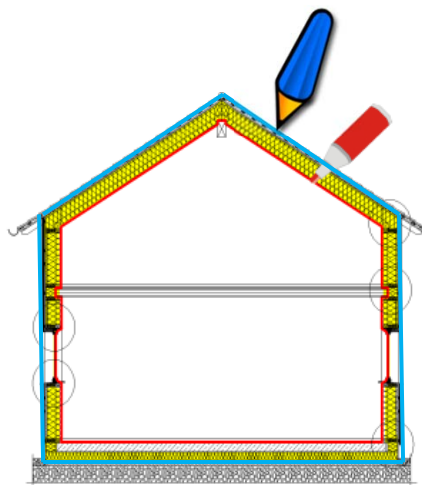
- Details shall include but are not limited to:
 - Insulation location and R-values
 - Window U-value & SHGC
 - Mechanical System design criteria
 - Mechanical and water heater Type, size and efficiency
 - Duct sealing, insulation and location
 - **Air sealing details**

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New in the 2015

- 103.2.1 Building Thermal Envelope depiction:
 - The buildings thermal envelope shall be represented on the construction documents
 - Blue – Exterior air barrier
 - Yellow Thermal Barrier
 - Red Interior air barrier



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AIR SEALING DETAILS

Window airtight detailing, Door airtight detailing, Roof penetration airtight detailing, etc.

ENERGY COMPLIANCE FOR A NEW SINGLE FAMILY RESIDENCE AT 442 SOUTH VINE STREET

- PROJECT SHALL COMPLY WITH THE 2015 IECC RESIDENTIAL PROVISIONS AND THE 2015 IRC, CHAPTER 11
- ALL MANDATORY REQUIREMENTS IN IECC SECTIONS R401 THROUGH R404 AND IRC SECTIONS N1101.14 THROUGH N1104 SHALL BE MET
- COMPLIANCE SHALL BE SHOWN USING METHOD 2 (SIMULATED PERFORMANCE ALTERNATIVE, IECC SECTION R405 AND IRC SECTION N1105)
- THE ENERGY COMPLIANCE SUBMITTAL SHALL INCLUDE:
 - COMPLIANCE REPORT SUBMITTED BY:
 - EnergyLogic
 - Robby Schwarz
 - 720 838 0677
 - robby@energylogic.com
 - 3605 West 50th Avenue
 - Denver, CO 80221
 - ENERGY COMPLIANCE CERTIFICATE, RE: SHEET A101X
 - BUILDING SECTIONS SHOWING THE BUILDING THERMAL ENVELOPE, RE: SHEET A101X
 - AIR SEALING DETAILS AND NOTES, RE: SHEET A101X
 - HVAC MANUALS D, J, AND S
- UPON COMPLETION OF THE BUILDING, A COMPLIANCE REPORT BASED ON THE AS-BUILT CONDITION OF THE BUILDING SHALL BE SUBMITTED TO THE BUILDING OFFICIAL BEFORE A CERTIFICATE OF OCCUPANCY CAN BE ISSUED. THE COMPLIANCE REPORT MUST INCLUDE ALL REQUIREMENTS OUTLINED IN IECC SECTION R405.4.2.2 AND IRC SECTION N1105.4.2.2.
- AS REQUIRED IN IECC SECTION R401.3 AND IRC SECTION N1101.14, A PERMANENT CERTIFICATE SHALL BE COMPLETED BY THE BUILDER AND POSTED ON A WALL IN THE SPACE WHERE THE FURNACE IS LOCATED. THE CERTIFICATE MUST BE POSTED BY THE TIME OF THE PROJECT'S FINAL INSPECTION AND SHALL USE THE INCLUDED ENERGY COMPLIANCE CERTIFICATE FOR POSTING.

PLEASE NOTE: IN ADDITION TO THE AIR SEALING DETAILS SHOWN ON SHEET A101X, THE FOLLOWING CONSTRUCTION METHODS SHALL BE EMPLOYED WHERE APPLICABLE TO COMPLY WITH THE REQUIREMENTS OF IECC R402.1.1 AND R402.2.1:

- 2 OR 3 STUD INSULATED CORNERS
- LADDER BLOCKING WHERE INTERIOR WALLS MEET EXTERIOR WALLS TO FULLY INSULATE THEM
- INSULATED HEADERS
- SEALING THE DRYWALL TO THE TOP PLATE ADJACENT TO THE VENTILATED ATTIC
- RAISED HEEL TRUSS TO ENSURE THAT INSULATION CAN FULLY COVER THE TOP PLATE

IECC Residential Compliance / Simulated performance Path R405 section 1405

Location: Building: Submitter:

Component	Material	U-Value	Area	Weighted U-Value
Roof	Asph/Flt	0.07	1000	70
Walls	2x6 w/ Insulation	0.13	1000	130
Windows	Double Glazed	0.35	1000	350
Doors	Insulated	0.25	1000	250
Basement	Concrete	0.15	1000	150
Attic	Insulation	0.04	1000	40
Foundation	Insulation	0.05	1000	50
Interior	Interior	0.10	1000	100
Exterior	Exterior	0.03	1000	30
Total				1000

EnergyLogic logo and signature line.

BUILDING THERMAL ENVELOPE

ENERGY COMPLIANCE FOR A NEW SINGLE FAMILY RESIDENCE AT 442 SOUTH VINE STREET

- PROJECT SHALL COMPLY WITH THE 2015 IECC RESIDENTIAL PROVISIONS AND THE 2015 IRC, CHAPTER 11
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- RAISED HEEL TRUSS TO ENSURE THAT INSULATION CAN FULLY COVER THE TOP PLATE

What is a Raters responsibilities?

- Different types of Ratings, different responsibilities
- HERS minimum rated features vs. Code mandatory
- HERS Index and HERC vs. ERI and ERI Report
- Testing for code vs. for a HERS Ratings
 - Blower door
 - Duct leakage



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What is a Rating?

- Methodology for evaluating a house
 - Provides
 - Alignment
 - uniformity
 - Consistency
 - May
 - Assess performance
 - Demonstrate compliance
 - Offer certification
- Energy
- Code
- EnergyStar
- LEED
- Other Program
- Warranty
- Audit

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Asset Rating

RESNET HERS Rating

- Minimum rated features
- Not a Pass / Fail evaluation



Minimum rated features of a home include:

- Building envelope features
- Water heating
- Space heating and cooling systems
- Passive solar
- Solar domestic water heating
- Appliances
- One-site power production

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RESNET Insulation Grading

Modeling guidance for derating the R-value of insulation

- When it is possible to inspect insulation as installed (i.e., new construction), inspectors shall rate the installation as "Grade I, II, or III" according to the following guidelines

• Grade 1



• Grade 2



• Grade 3



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Air sealing and insulation

N1101.13 (R303.2)

- Materials, systems and equipment **shall be installed in accordance with the manufacturer's instructions** and the *International Building Code* or the *International Residential Code*, as applicable.



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Recommendations for
Installation in Residential
and Other Light-Frame
Construction

Fiber Glass Building Insulation



Insulation Installation Instructions

Insulation Institute
KNOWLEDGE. LEADERSHIP. CONFIDENCE.

About NAIMA | New

About Insulation

Why Insulate

Insta

I'm a Homeowner > Installation > Doing it Yourself > Walls and Knee Walls

Instructions for Installing Wall and Knee Wall Insulation

This section provides info on "How to Install Insulation." It contains specific information on installation details for walls and knee walls that will assist with proper installation to meet RESNET Grade 1 criteria for fiber glass and mineral wool batt insulation. Includes information on special situations as wells tips for insulating near pipes, along rim or band joists and around doors and windows.

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RESNET Standards Grade 1 Insulation Installation

- Installed according to manufacturer's instructions
- Fills each cavity side-to-side and top-to-bottom
- No substantial gaps, voids, compressions, or obstructions
- Split or fitted tightly around wiring or obstructions in wall
- Occasional very small gaps are acceptable for "Grade 1"
- Wall insulation shall be enclosed on all six sides
- Must be in substantial contact with the sheathing material.
- Inset stapling is neat (no buckling), and the batt is only compressed at the edges of each cavity, to the depth of the tab itself.

Compression or incomplete fill amounting to **2% or less**, if the empty spaces are **less than 30%** of the intended fill thickness, are acceptable for "Grade 1".

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RESNET Standards – Grade I Insulation

Gray areas illustrate compression

Gray areas illustrate gaps & Voids

Code Rating

- Compliance Rating
 - Minimum rated features
 - Pass / Fail evaluation



Mandatory Requirements

- Compliance modeling
 - UA Compliance
 - Cost Compliance
 - EIR Compliance
- Insulation installation
- Air Barriers
- Air leakage 3/5ACH
- Duct Leakage 4%
- High Efficacy Lighting

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Terminology

▪ Mandatory requirements

- Requirements that must be met by every building unless there is a specific exception in the code and regardless of the compliance path that is used

▪ Prescriptive requirements

- Requirements that must be met by every building unless an approved tradeoff is utilized or unless there is a specific exception in the code

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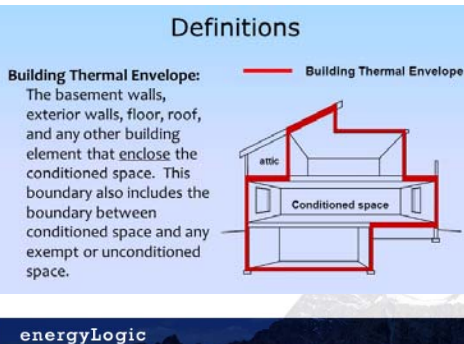


Items listed in this table are mandatory and sometimes not clear



**TABLE R402.4.1.1
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. The 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 ceiling material.
Ceilings/roofs	The air barrier in any dropped ceiling/ceffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop-down stairs or knee-wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/ceffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cracks within corners and headers of frame walls shall be sealed by completely filling the cavity with a material having a thermal resistance of R-2 per inch minimum. Exterior thermal envelope insulation, the framing walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window-door units and framing, and skylights and framing shall be sealed.	
Rain joints	Rain joints shall include the air barrier.	Rain joints shall be maintained.
Floors (including above garage and conditioned floors)	The air barrier shall be installed at any exposed edge of insulation.	1. Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of joist/beam decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Where provided, mineral fiber insulation, insulation shall be permanently attached to the crawl-space walls.
Shafts, penetrations	Drift shafts, utility penetrations, and fire shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Slots in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that conforms to the available cavity space.
Garage separations	Air sealing shall be provided between the garage and conditioned space.	
Excessed lighting	Excessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Excessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		After installation, shall be cut to fit around wiring and plumbing in exterior walls, or insulation shall be installed such that insulation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.	Exterior walls adjacent to showers and tubs shall be insulated.
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 booms	HVAC register booms that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall seal in a manner that is recommended by the manufacturer. Caulking or other adhesive sealers shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	



Program Rating

- Certification/Labeling Rating
 - Minimum rated features
 - Pass / Fail evaluation



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EnergyStar v3

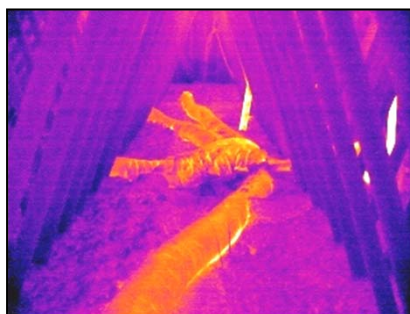
- HERS Index target
- Thermal enclosure checklist
- Rater HVAC checklist
- HVAC design report
- HVAC commissioning report
- Builder water management checklist
- Footnote requirements



R403.3.3 Duct testing (Mandatory).

Leakage testing required when any portion of ductwork is in unconditioned space

- Attic
- Unconditioned crawl space
- Isolated mechanical room with natural draft appliance
- Floor over garage?
- Exterior wall?



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EnergyStar requires duct testing regardless of the location of the duct

Total Duct leakage



Duct Leakage to outside

Must be tested when using the performance path of code



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Energy Code Inspection



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R104.4 Approved Inspection Agency

- The *code official* is authorized to accept reports of **third party inspection agencies** not affiliated with the *building* design or construction, provided such agencies are *approved* as to qualifications and reliability relevant to the building components and systems they are inspecting.
- Becomes important for the Simulated Performance and Energy Rating Index Path



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Fundamental Questions

Is It There?



Does It Work?



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Fundamental Questions

Is It There?



Does It Work?



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R104.2 Required inspections.

- The *code official* or his or her **designated agent**, upon notification, shall make the inspections set forth in Sections R104.2.1 through R104.2.5.
 - Footing and Foundation
 - Framing and rough in
 - Plumbing and rough in
 - Mechanical rough in
 - Final Inspection



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R104.2.1 Footing and foundation inspection.

- Inspections associated with footings and foundations shall verify compliance with the code as to
 - **R-value**
 - Location
 - thickness
 - **Depth of burial and protection of insulation**

.... as required by the code and approved plans and specifications.



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R104.2.2 Framing and rough-in inspection.

- Inspections at framing and rough-in shall be made before application of interior finish and **shall verify compliance** with the code as to types of insulation and **corresponding *R*-values** and **their correct location and proper installation**



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R104.2.2 Framing and rough-in inspection.

- Fenestration properties (*U*-factor and SHGC) and proper installation; and **air leakage controls** as required by the code and approved plans and specifications.

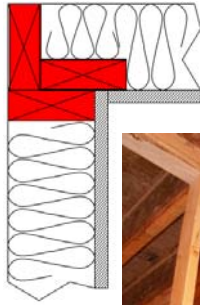
NFRC		MILCO WINDOWS	
National Fenestration Rating Council			
CERTIFIED		ENERGY Performance	
* Energy savings will depend on your specific climate, house and lifestyle.			
* For information, visit NFRC's web site at www.nfrc.org			
Technical Information			
U-Factor	Shade Heat Gain Coefficient	Visible Transmittance	
0.35	0.30	0.51	
0.34	0.30	0.52	



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R104.2.2 Framing and rough-in inspection. Mandatory requirements



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R104.2.4 Mechanical rough-in inspection.

- Inspections at mechanical rough-in shall verify compliance as required by the code and *approved* plans and specifications as to ...
 - Installed HVAC equipment type and size
 - Required controls
 - System insulation and corresponding *R*-value
 - **System air leakage control**
 - Programmable thermostats
 - Dampers
 - **Whole-house ventilation**
 - And **minimum fan efficiency**



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R104.2.5 Final inspection.

- The *building* shall have a final inspection and shall not be occupied until *approved*.
- The final inspection shall include verification of the installation of all required
 - *building* systems
 - Blower door test
 - equipment and controls
 - Ventilation
 - and their proper operation
 - and the required **number of high-efficacy** lamps and fixtures.



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R104.6 Re-inspection and testing.

- Where any work or installation does not pass an initial test or inspection, the **necessary corrections shall be made** to achieve compliance with this code. **The work or installation shall then be resubmitted to the *code official* for inspection and testing.**



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R401.3 Certificate (Mandatory)

- A permanent certificate **shall be completed and posted** on or in the electrical distribution panel by the builder or registered design professional
- The certificate shall list....
 - R-values of insulation
 - R-values of ducts outside conditioned spaces
 - Window U-value and SHGC
 - Results of duct system and building envelope air leakage testing
 - Types and efficiencies of heating, cooling and service water heating equipment.



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IECC 2015 Label *8925 Place to live*

Building Envelope Specs

Ceiling: R-38
 Above Grade Walls: R-23
 Foundation Walls: R-11
 Exposed Floor: R-44
 Slab: R-0
 Infiltration: 3 ACH50
 Duct Insulation: R-9.5
 Duct Leakage: 0 CFM25

Window & Door Specs

Window: U = 0.340, SHGC = 0.280
 Door: R-7

Mechanical Equipment Specs

Heating: Furnace • Natural Gas • 92.5 AFUE
 Cooling: N/A
 Hot Water: Water Heater • Natural Gas • 0.62
 Energy Factor

Builder or Design Professional

Signature: _____

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Thank you!



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720-838-0677

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