



## Changes to Residential Provisions of the 2012 International Energy Conservation Code

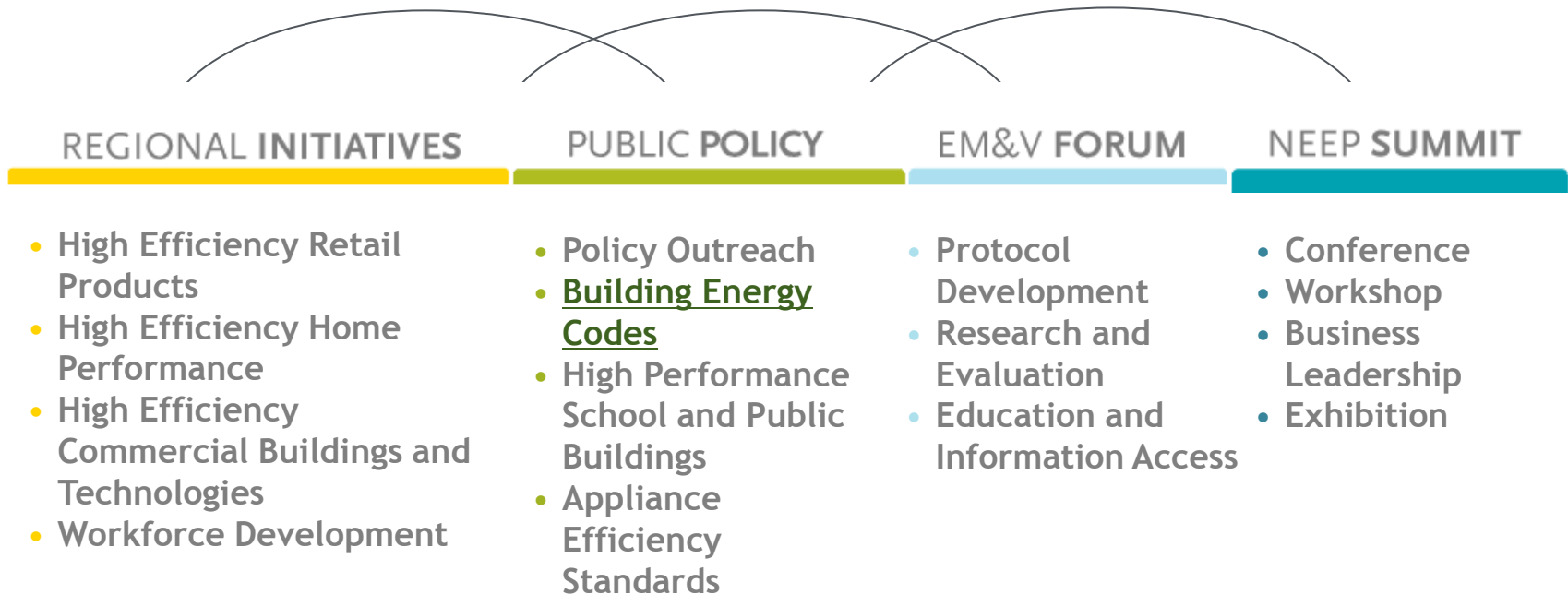
Edited & Presented by Donald Vigneau AIA

Additional Editing by Kevin Rose



# WHAT DOES NEEP DO?

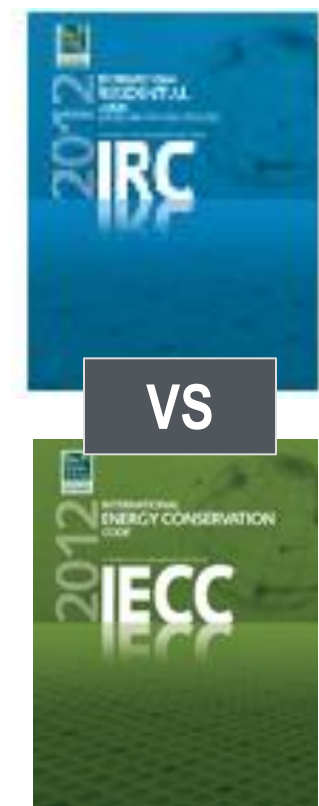
## FACILITATE PARTNERSHIPS...



TO ADVANCE THE EFFICIENT USE  
OF ENERGY EFFICIENCY

# Relationship Between IRC & IECC

- ✓ IECC addresses only energy. 2012 has format change: from Chapter 4 to 4[RE]; 5 to 5[CE]
- ✓ IRC addresses all topics (*structural, plumbing, etc.*)
  - Allows builder to carry only one code book
- ✓ In 2012, consolidated with IRC energy chapter (actually a change to the IRC, not the IECC)
  - Chapter 11 *duplicates RE*; covers energy efficiency
- ✓ IECC addresses both residential and commercial;
- ✓ IRC addresses subset of residential:  
detached one- and two-family dwellings and  
attached townhouses 3 stories or under



# Scope

## Section R101.4.3/R402.3.6 - Additions, Alterations, Renovations, Repairs



### Scoping unchanged except **INTENT:** *“Useful life of each building”*

- Code applies to any new construction
- Unaltered portion(s) do not need to comply
- Additions can comply alone or in combination with existing building
- Replacement fenestration that includes both glazing and sash must meet R402.3.6 :
  - ✓ **0.40 SHGC in Climate Zone 4**
  - U-factors in Climate Zones 4**
- Exceptions UNCHANGED

- New requirements added
  - Building envelope air leakage testing (R402.4.1.1 + DE mods)
  - Duct leakage sealing methods (R403.2.2 + DE mods)
  - Whole-house mechanical ventilation (R403.5 + DE mods)
  - Pool heaters; uninsulated covers (R403.9)
  - Lighting efficacy becomes 75% of fixtures (R404.1)
- Moisture control requirements (vapor retarders) revised; 2009 moved to IRC R601.3 (Table + 5 other sections)
- Changes have a bar | at the margin to clue you in



- 6 new Definitions: *skylight* changed to match 90.1 (60°)
- More thermal envelope improvements – Table 402.2.1
- No mechanical trade-offs for Performance R-values
- Performance path glazing/leakage changed (T405.5.2[1])



# ENVELOPE: Control Priorities



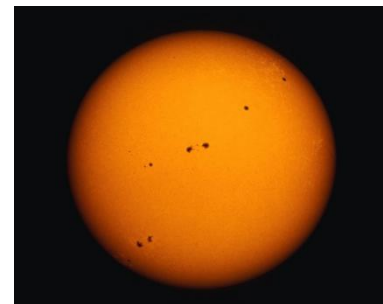
- WATER

- AIR



- WATER VAPOR

- THERMAL



[www.buildingscience.com](http://www.buildingscience.com)

## SIDING/CLADDING

“ALL SIDINGS LEAK”



- Ventilate
- Protect drainage plane
- Avoid dams against TYVEK

## DRAINAGE PLANES

- Flash all transitions
- Maintain continuity
- Let gravity do the work
- Eliminate dams (or protect siding)
- Manage at ground level



- Eliminate interior layer vapor retarder
- Seal joints/seams at the sheathing membrane from foundation to ridge
- Use c.i. insulation outside, cavity insulation inside
- Air tested leakage < 20% of conventional home
- Requires HRV ventilation for heating/cooling seasons

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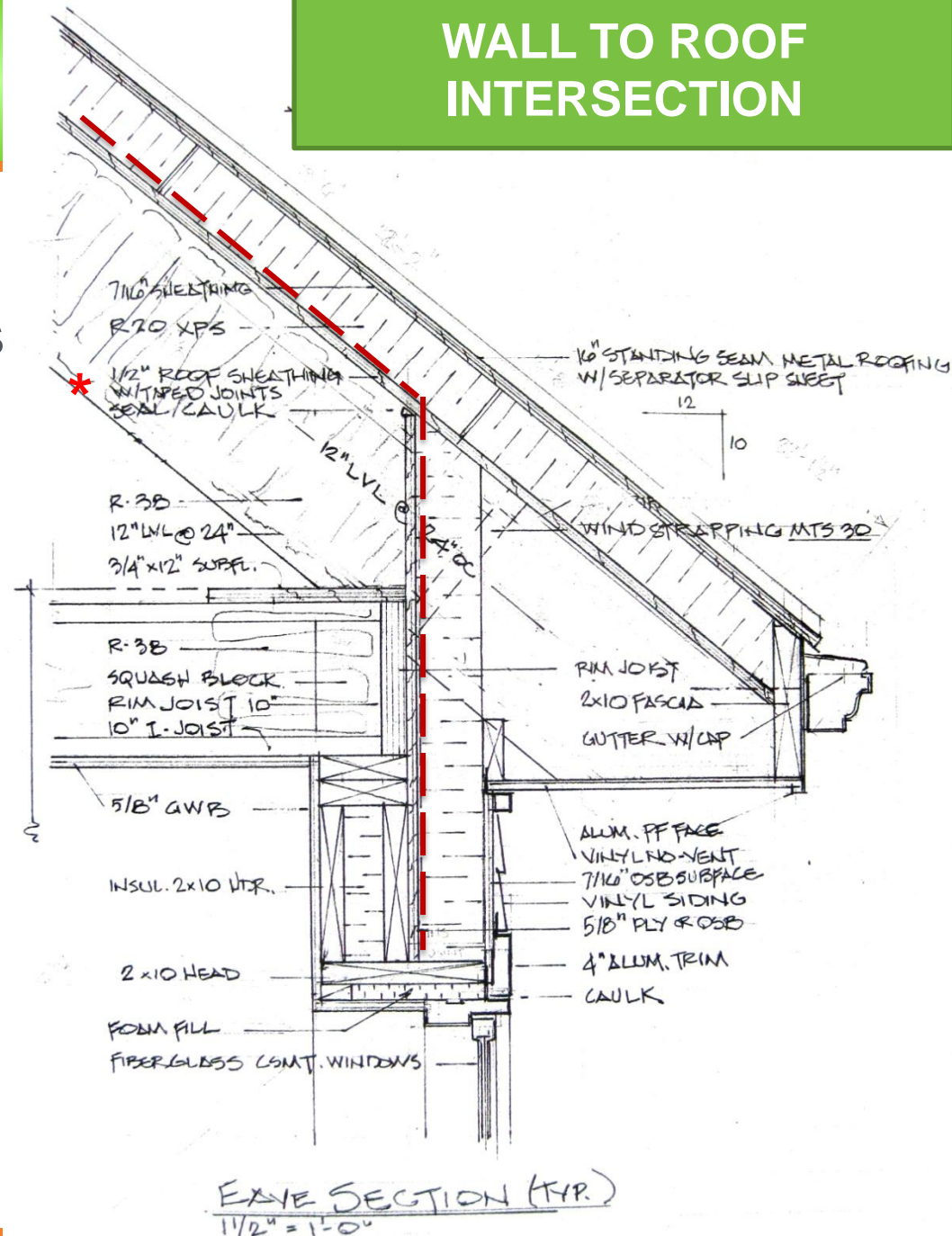
## Section R303.4



# DETAILING ENVELOPE

- Use of “**outsulation**” puts the air / vapor barrier plane at wall and roof sheathing lines; keeping the rigid insulation board outside the plane of the foundation. Note where window unit is set.

## WALL TO ROOF INTERSECTION



Vapor retarder requirements allow the use of **a coat of alkyd paint** to satisfy the requirement in Zone 4 when:

- An **impermeable insulating sheathing** with a minimum value of **R-5** is located **outside** of a 2x4 stud wall with **cavities insulated to R-3.4 per inch (R-11)**;
- An **impermeable insulating sheathing** with a minimum value of **R-7.5** is located **outside** of a 2x6 stud wall with **cavities insulated to R-3.4 per inch (R-18.7)**;



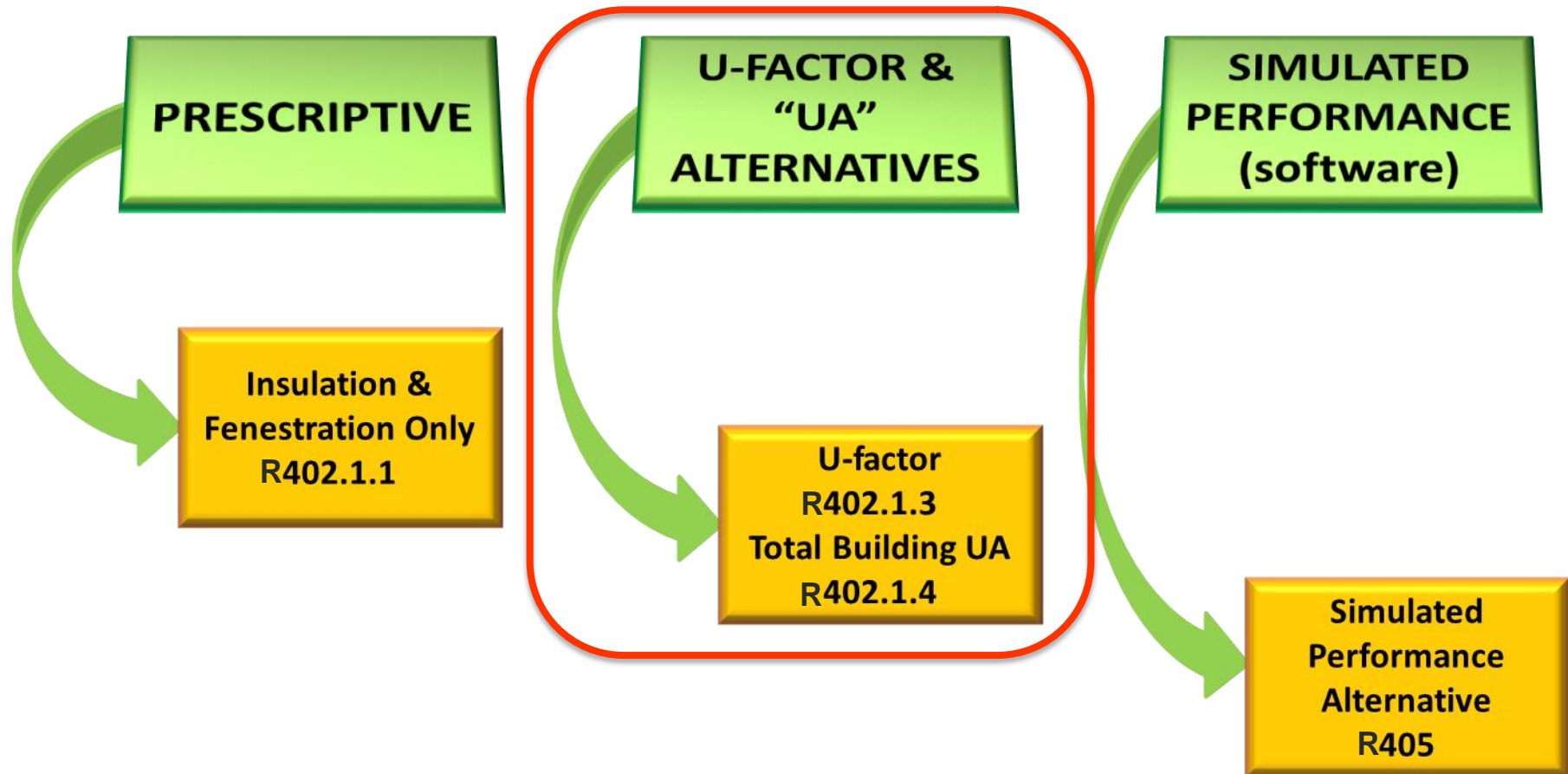
## Prescriptive (Climate-Specific) Requirements:

- ✓ Roofs
- ✓ Above grade walls
- ✓ Foundations
  - Basements
  - Slabs
  - Crawlspace
- ✓ Skylights, windows, and doors
- ✓ Solar Heat Gain Coefficient (*SHGC*) **NOW IN DELAWARE**

## Mandatory Requirements (*apply everywhere*):

- ✓ Infiltration control
- ✓ Duct insulation, sealing, and testing
- ✓ HVAC / **SWH controls**
- ✓ Piping Insulation
- ✓ Equipment sizing
- ✓ Dampers
- ✓ Lighting

# IECC Compliance - Three Options





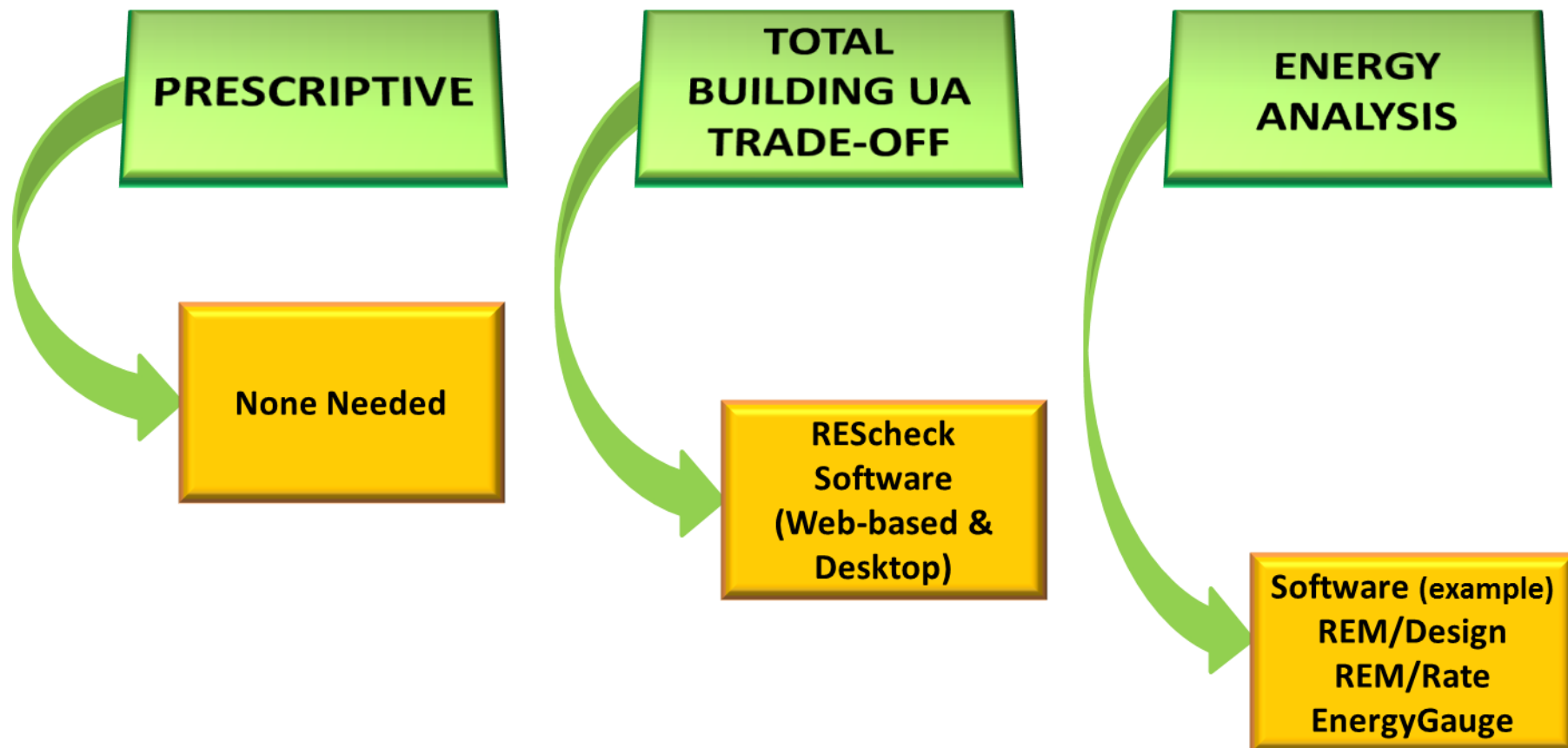
## IECC Terminology

- ✓ Prescriptive – R-value or U-factor; SHGC
  - Required choices based upon zone, construction type
- ✓ UA Alternative
  - Required performance; can be modified by trading for compensating envelope improvements elsewhere
- ✓ Mandatory
  - Required; cannot be traded down, even in the Simulated Performance Path

Some elements have “hard limits” a/k/a “trade-off limits”

- ✓ prescriptive requirement can only be reduced so far
- ✓ performance requirements can only be reduced so far





- **WINDOWS**
- **SKYLIGHTS\***
- **DOORS\***



# Windows, Doors, Skylights

## Section R402

- ✓ Meet U-factors
- ✓ Meet SHGC: 0.40
- ✓ Skylight is now < 60° from horizontal



# U-Factors and SHGC

	<b>World's Best Window Co.</b> Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: <b>Vertical Slider</b>	
<b>ENERGY PERFORMANCE RATINGS</b>		
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
<b>0.35</b>	<b>0.32</b>	
<b>ADDITIONAL PERFORMANCE RATINGS</b>		
Visible Transmittance	Air Leakage (U.S./I-P)	
<b>0.51</b>	<b>0.2</b>	
Condensation Resistance		
<b>51</b>	<b>—</b>	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. <a href="http://www.nfrc.org">www.nfrc.org</a></small>		

NFRC 100

NFRC 200

NOT REQUIRED

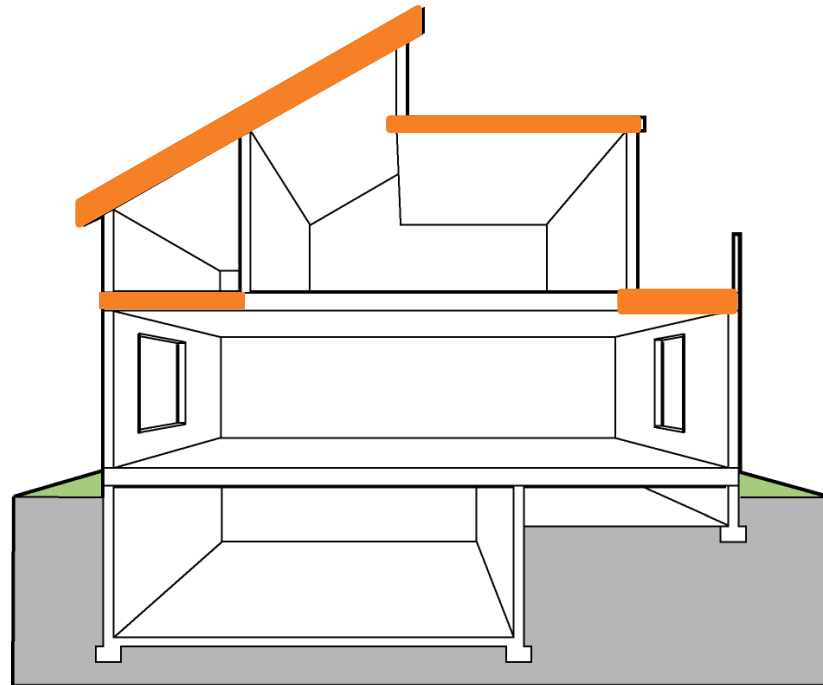
NFRC 400

## Requirements based on

- ✓ Assembly type
- ✓ Continuous insulation
- ✓ Insulation between framing (cavity insulation)

## Meet or exceed R-values

- **R-49 is the NEW value for Zone 4**



# Insulation and Fenestration Requirements by Climate Zone

**TABLE R402.1.1**  
**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

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

For SI: 1 foot = 304.8 mm.

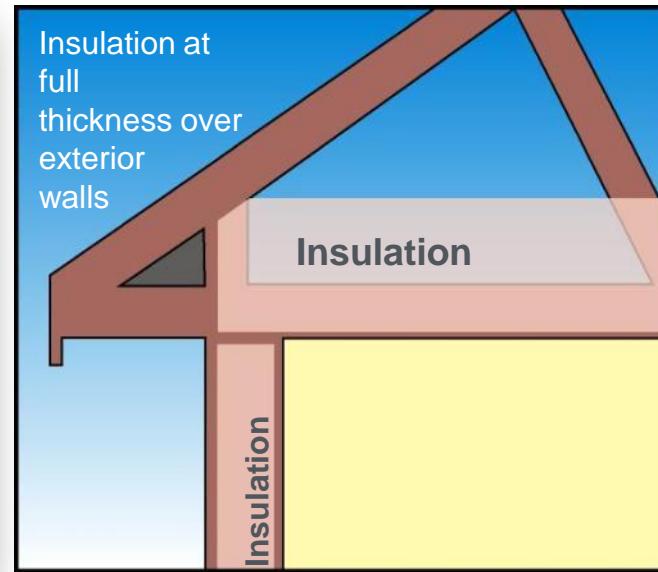
- R*-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall not be less than the *R*-value specified in the table.
- The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
- "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.
- There are no SHGC requirements in the Marine Zone.
- Basement wall insulation is not required in warm-humid locations as defined by Table R301.1 and Table R301.1.
- Or insulation sufficient to fill the framing cavity, R-19 minimum.
- First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation *R*-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used – to maintain a consistent total sheathing thickness.
- The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

Table Notes



# Ceilings with Attics, Cont'd.

## Section R402.2.1



Prescriptive R-value path encourages raised heel truss (*aka, energy truss*)

- ✓ If insulation is full height over exterior wall top plate
  - R-30 complies where R-38 is required
  - R-38 complies where R-49 is required

**Note:** This reduction *ONLY* applies to the R-value prescriptive path, not the U-factor or Total UA alternatives

# Ceilings without Attic Spaces

## Section R402.2.2 - (e.g., vaulted)

- ✓ R-30 allowed for 500 ft<sup>2</sup> or 20% total insulated ceiling area, whichever is less, where
  - ✓ Required Insulation levels are > R-30
  - ✓ Insufficient space available to accommodate higher levels
- ✓ However; Table R402.1.1 Note “a” does not allow a batt insulation with a face value of R-30 to be squeezed into a too shallow cavity (2x8); it requires a minimum cavity depth of at least 2x10 (9-1/4”), or a combination of batt + continuous insulation

*Note: This reduction ONLY applies to the R-value prescriptive path, not the U-factor or Total UA alternatives*

# Steel-Frame Ceilings

## Section R402.2.6

- ✓ “R-X + Y” means R-X cavity plus R-Y continuous
- ✓ In ceilings, insulation that exceeds the height of the framing must cover the framing

Table keys on the wood-frame requirement for the corresponding building component

Table R402.2.6  
Steel-Frame Ceiling, Wall and Floor Insulation  
(R-Value)

Wood Frame R-value Requirement	Cold-Formed Steel Equivalent R-value <sup>a</sup>
Steel Truss Ceilings <sup>b</sup>	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings <sup>b</sup>	
R-30	R-38 in 2x4, or 2x6, or 2x8 R-49 any framing
R-38	R-49 2x4, or 2x6, or 2x8, or 2x10
Steel Framed Wall	
R-13	R-13 + 4.2 or R-19 + 2.1, or R-21 + 2.8 or R-0 + 9.3 or R-15 + R-3.8 or R-21 + 3.1
R-13+R-3	R-0 + 11.2 or R-13 + 6.1, or R-15 + 5.7 or R-19 + 5.0 or R-21 + 4.7

# Wood-Frame Walls

## Section R402

Table R402.1.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b, e</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE
1	NR	0.75	0.25	30	13
2	0.40	0.65	0.25	38	13
3	0.35	0.55	0.25	38	20 or 13+5 <sup>h</sup>
4 except Marine	0.35	<b>0.55</b>	<b>0.40</b>	<b>49</b>	<b>20 or 13+5<sup>h</sup></b>
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 <sup>h</sup>
6	0.32	0.55	NR	49	20+5 or 13+10 <sup>h</sup>
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 <sup>h</sup>

h. First value is cavity insulation, second is continuous insulation or insulated siding, so “13+5” means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used – to maintain a consistent total sheathing thickness.

# Mass Wall Requirements

## Section R402.2.5

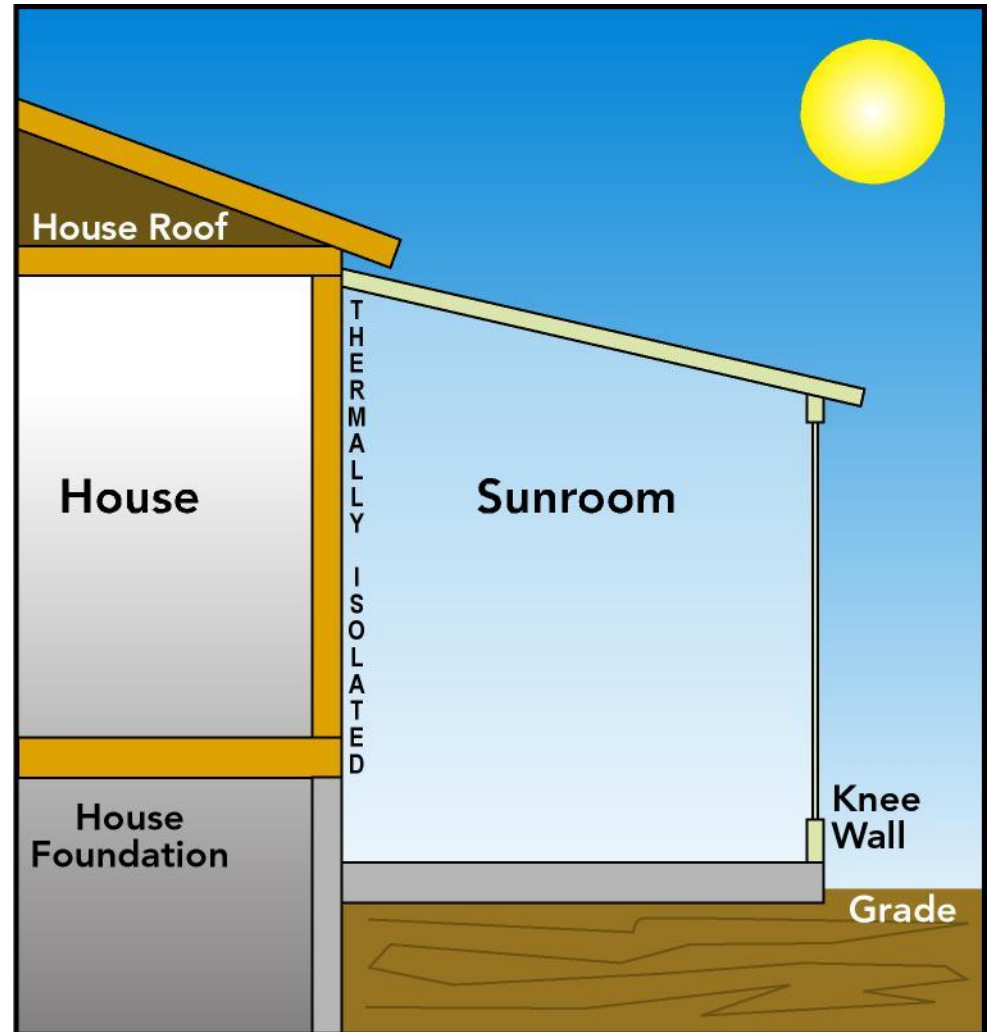
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1	NR	0.75	0.25	30	13	3/4
2	0.40	0.65	0.25	38	13	4/6
3	0.35	0.55	0.25	38	20 or 13+5 <sup>h</sup>	8/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 <sup>h</sup>	<b>8/13</b>
5 and Marine 4					20 or 13+5 <sup>h</sup>	13/17
6					0+5 or 13+10 <sup>h</sup>	15/20
7 and 8					0+5 or 13+10 <sup>h</sup>	19/21

**Second (higher) number applies when more than half the R-value is on the interior of the mass (i.e., when the thermal mass is insulated from the conditioned space)**

# Sunroom Requirement Changes

- Ceiling Insulation R-19
- Wall Insulation R-13
- Fenestration **U-0.45**
  - (0.50)
- Skylight **U-0.70**
  - (0.75)
- SHGC (new) **0.40**
  -





# Building Thermal Envelope

## Section R402.4.1 – Air Leakage

Compliance must be by testing:

- ✓ Whole-house pressure test

Air Leakage Rate	Climate Zone	Test Pressure
$\leq 5$ ACH	1-2	50 Pascals
$\leq 3$ ACH*	3-8	<b>50 Pascals</b>

- Testing may occur at any time after creation of all building envelope penetrations\*
- ✓ Table R402.4.1.1 must also be field verified
- ✓ **Delaware Exceptions\***

**Delaware Exceptions:** Dwelling units with 2,000 ft<sup>2</sup> or less of conditioned floor area (CFA) may satisfy R402.4.1.2 if they attain:

(1) a HERS Score of 69; and

(2) an air leakage rate per 100sf of not more than:

- 4 ACH 50/ for homes  $\geq 1,500$  SF &  $\leq 2,000$  SF
- 5 ACH 50 for homes  $< 1,500$  SF

3 ACH 50 is still required for homes  $> 2,000$  SF

TYPE	AIR INFILTRATION RATE
Windows, sliding glass doors, and skylights	$\leq 0.3 \text{ cfm/ft}^2$
Swinging doors	$\leq 0.5 \text{ cfm/ft}^2$

### Exceptions

- ✓ Site-built windows, skylights, and doors

# Mandatory Requirements

## Section R402.4 - Air Leakage

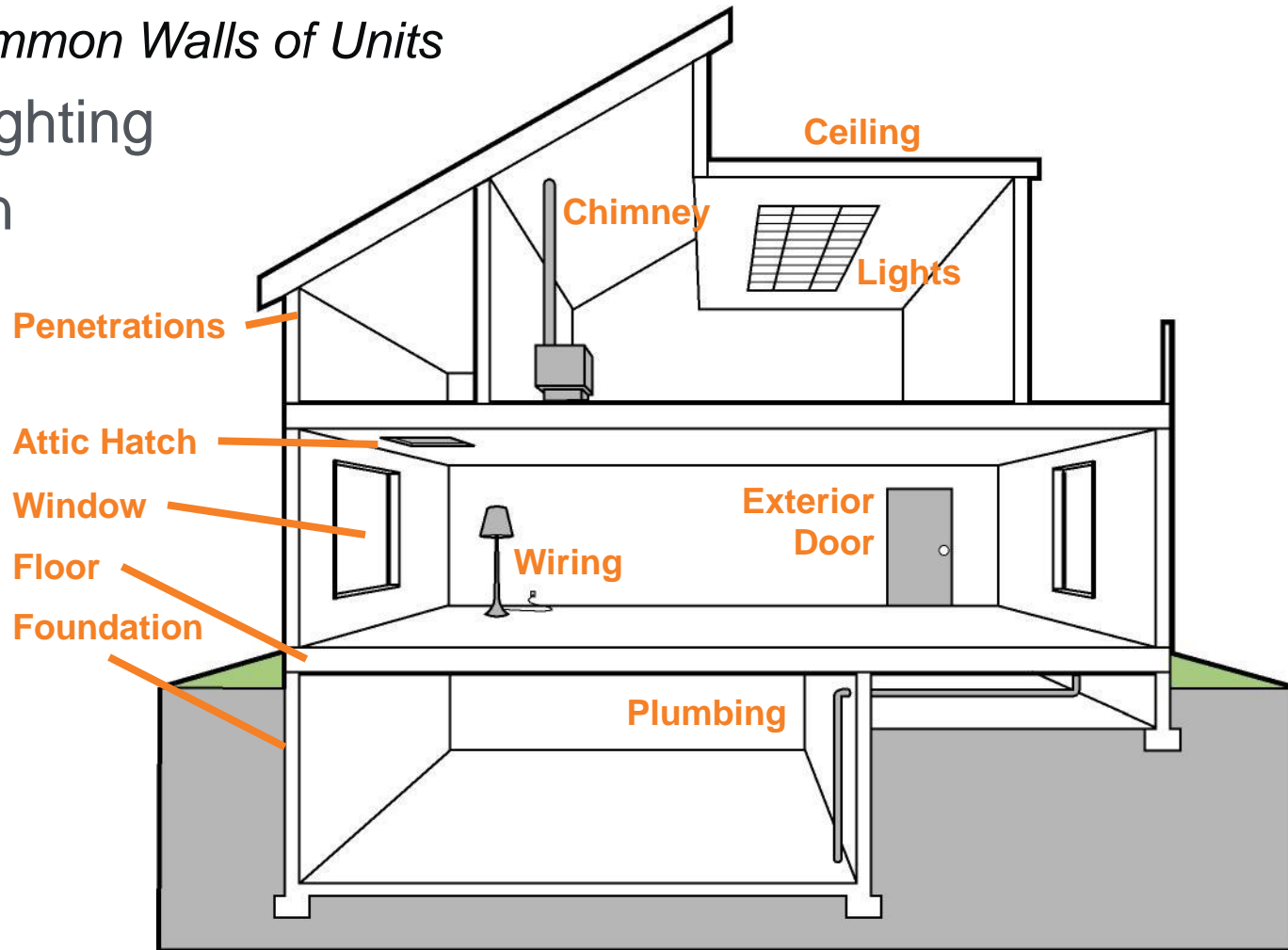
- ✓ Building thermal envelope (Section R402.4.1)

- ✓ *Added Common Walls of Units*

- ✓ Recessed lighting

- ✓ Fenestration

- ✓ Fireplaces

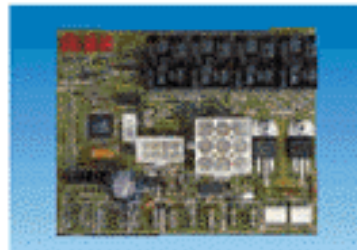
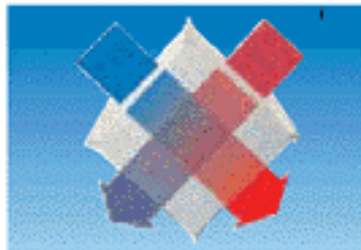
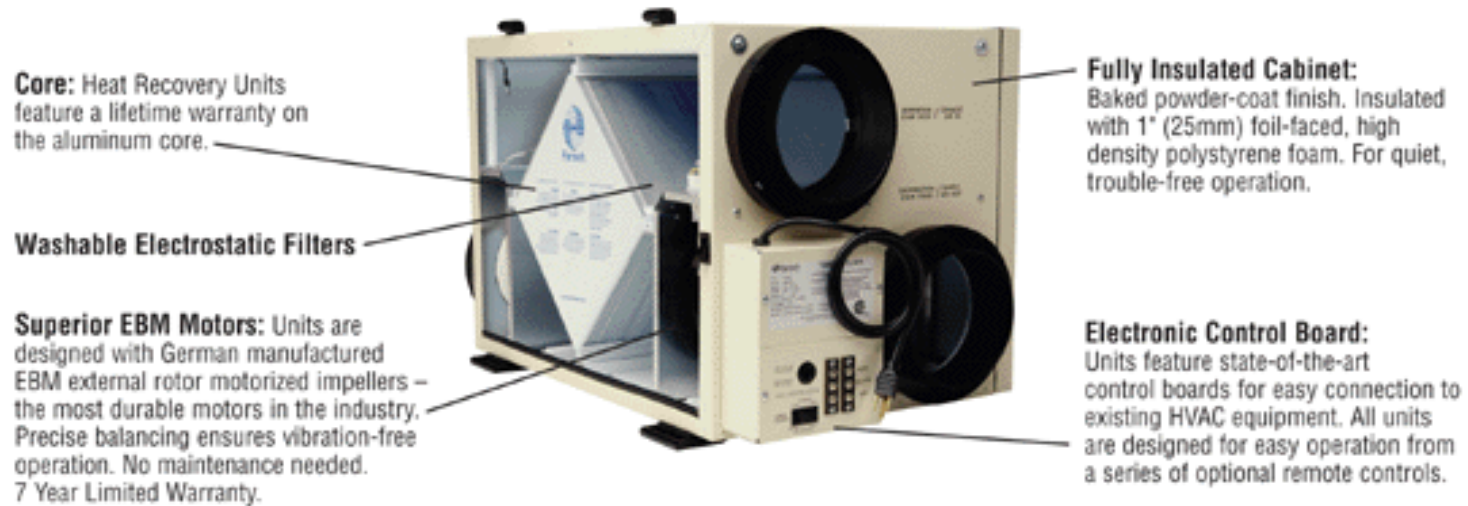


# A Combined Table - R402.4.1.1

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.
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.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing 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.

(partial table)

# CONTROLLING VENTILATION

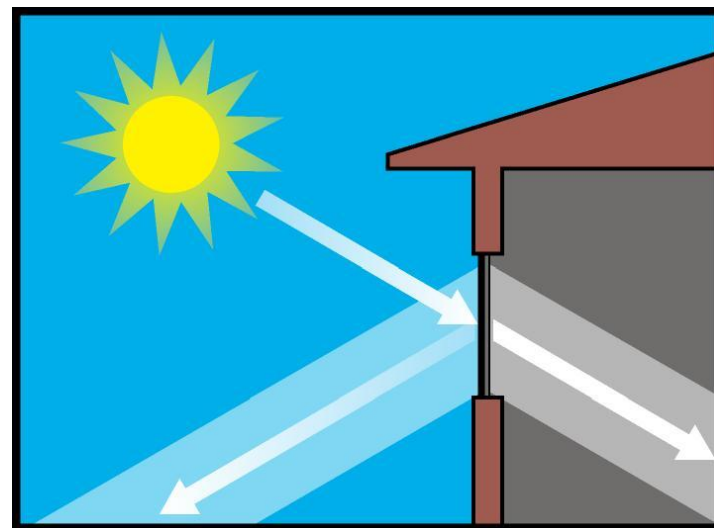




**R402.5.** Hard limits on U-factor in northern U.S. (cannot exceed, even in trade-offs)

Climate Zones	U-Factor Maximum
4-5	0.48
6-8	0.40

- ✓ **U-0.35 for windows/doors**
- ✓ U-factors of individual windows or skylights can be higher if maximum area-weighted average is  $\leq$  these limits.
- ✓ **U-0.55 for skylights**
- ✓ **SHGC – 0.40 (new)**



Less stringent insulation  
R-value and glazing  
U-factor requirements

Sunroom definition:

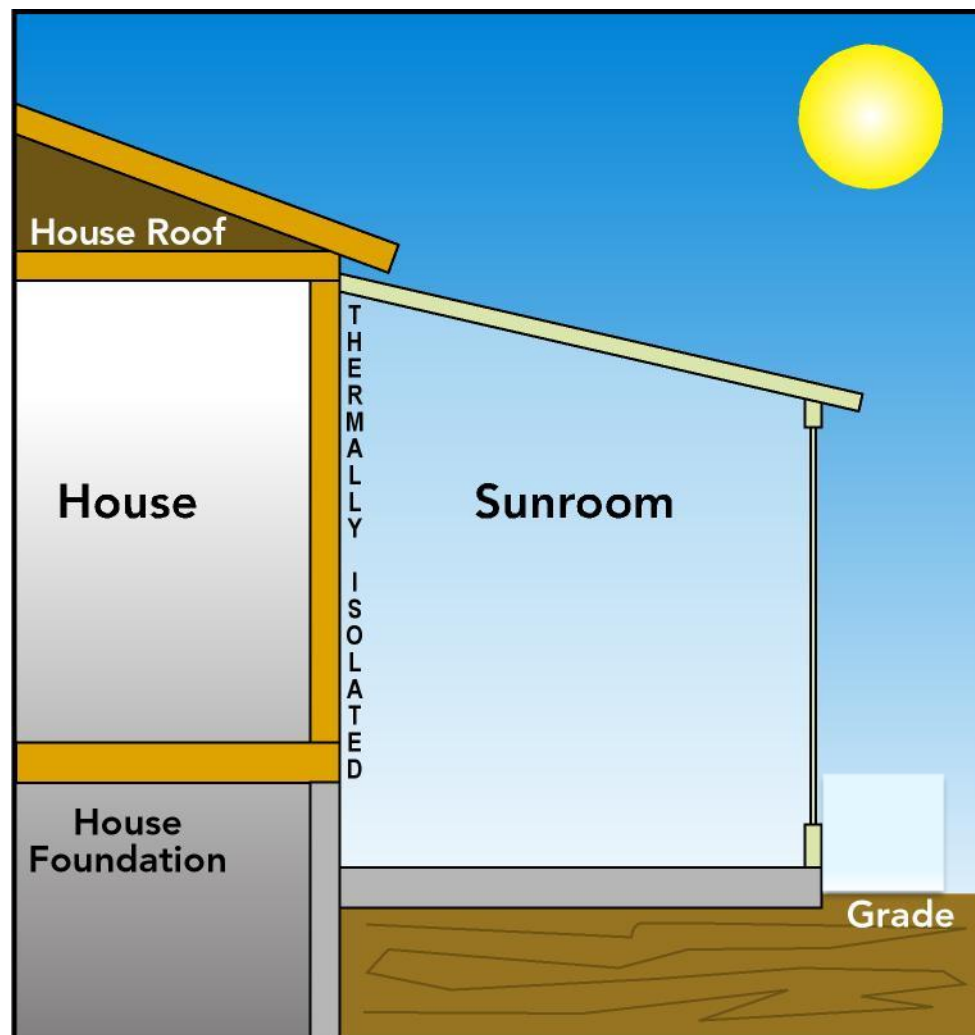
- ✓ One story structure
- ✓ Glazing area >40% glazing of gross exterior wall and roof area
- ✓ ~~Separate heating or cooling system or zone~~
- ✓ Must be thermally isolated (closeable doors / windows to the remainder of the house)
- ✓ Can always meet Table R402.1.1 requirements with unlimited glass
- ✓ **No separate floor R-value (R19)**



# Sunroom Requirements

## Section R402.2.12

- ✓ Ceiling Insulation
  - Zones 1-4 **R-19**
- ✓ Wall Insulation
  - All zones **R-13**
- ✓ Fenestration U-Factor
  - Zones 4-8 **0.45** (0.50)
- ✓ Skylight U-Factor
  - Zones 4-8 **0.70** (0.75)





U.S. Department of Energy  
**Energy Efficiency  
and Renewable Energy**

Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable



Building Energy Codes Program

## Mechanical Systems & Equipment

# NAECA

Equipment efficiency set by Federal law,  
not the I-Codes

## ACCA Standards

- J – Load Calculations
- S – Equipment Selections
- **D – Duct Design (n/r)**
- “Heating and cooling *equipment shall be sized* in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other *approved heating and cooling calculation methodologies*”



<http://www.acca.org/store/product.php?pid=97>

- ✓ Controls
- ✓ Heat pump supplementary heat
- ✓ Ducts
  - Sealing (Mandatory) – **post-construction test option**
  - Insulation (Prescriptive) - unchanged
- ✓ HVAC piping insulation
- ✓ Service hot water circulating systems
- ✓ Ventilation
  - Dampers
- ✓ Equipment sizing
- ✓ Multiple dwelling units: systems –  
**use CE 403 & 404? Or 90.1 Section 6.3?**
- ✓ Snow melt controls
- ✓ Pools and in-ground permanently installed spas



### ✓ Sealing (Mandatory)

- Joints and seams to comply with either IMC or IRC
- All ducts, air handlers, and filter boxes to be sealed (*Section R403.2.2*)



### • Exceptions

- No additional joint seals required for air-impermeable spray foam products
- ~~Where duct connection is partially inaccessible, 3 screws or rivets to be equally spaced on exposed portion of joint to prevent a hinge effect~~
- Continuously welded and locking-type longitudinal joints and seams in ducts operating at static pressures < 2 in. w.c. don't require additional closure systems

# Piping Insulation – DE mods

## Section R403.3 - Mandatory

### Delaware modifications proposed:

- ✓ R-3 required on
  - HVAC systems (see DE list – 7 items)
    - Exception: Piping that conveys fluids between 55 and 105°F
- If exposed to weather,
  - protect from damage, including
    - Sunlight
    - Moisture
    - Equipment maintenance
    - Wind
  - Provide shielding from solar radiation that can cause degradation of material
  - Adhesive tape is not allowed
- ~~Exception: meet uninsulated run length requirements in Table R403.4.2~~



Image courtesy of Ken Baker, K energy

### ✓ Ventilation

- Building to have ventilation meeting IRC or IMC or with other approved means
- Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating

### ✓ **DNREC proposing 6 cfm/100sf for final or rough test**

### ✓ Whole-house mechanical ventilation system fans to meet efficacy in Table R403.5.1

#### ✓ Exception

- ✓ When fans are integral to tested and listed HVAC equipment, powered by electronically commutated motor

# Duct Tightness Tests

## Section R403.2.2



### ✓ Rough-in test

- Total leakage  $\leq 6?$  cfm/100 ft<sup>2</sup> of conditioned floor area
  - if air handler not installed at time of test, total air leakage  $\leq 3$  cfm/per 100 ft<sup>2</sup>

**Exception:** Test not required if air handler & all ducts are located in building thermal envelope

### ✓ Post construction test

- Total leakage:  $\leq 6?$  cfm/per 100 ft<sup>2</sup> of conditioned floor area
  - including manufacturer's air handler enclosure
- All register boots taped or otherwise sealed





# Building Cavities

## Section R403.2.3 - Mandatory

Framing cavities cannot be used as ducts or plenums (supply **or return**)  
90.1-2010 allows for this in commercial construction



# Sealed Air Handler

## Section R403.2.2.1 (new)

**NEW** - Air handlers to have manufacturer's designation for an air leakage of  $\leq 2\%$  of design air flow rate per ASHRAE 193





# Multi-family HVAC & Snow-Melt Systems - *Section R403.7*

All systems that serve multiple dwelling units shall comply with 90.1 Sections 6 and 7 in lieu of Section R403

- Shutoff controls for snow- and ice-melting systems
  - Automatic when pavement temperature is  $> 50^{\circ}\text{F}$  and no precipitation is falling
  - Automatic or manual when outdoor temperature is  $> 40^{\circ}\text{F}$



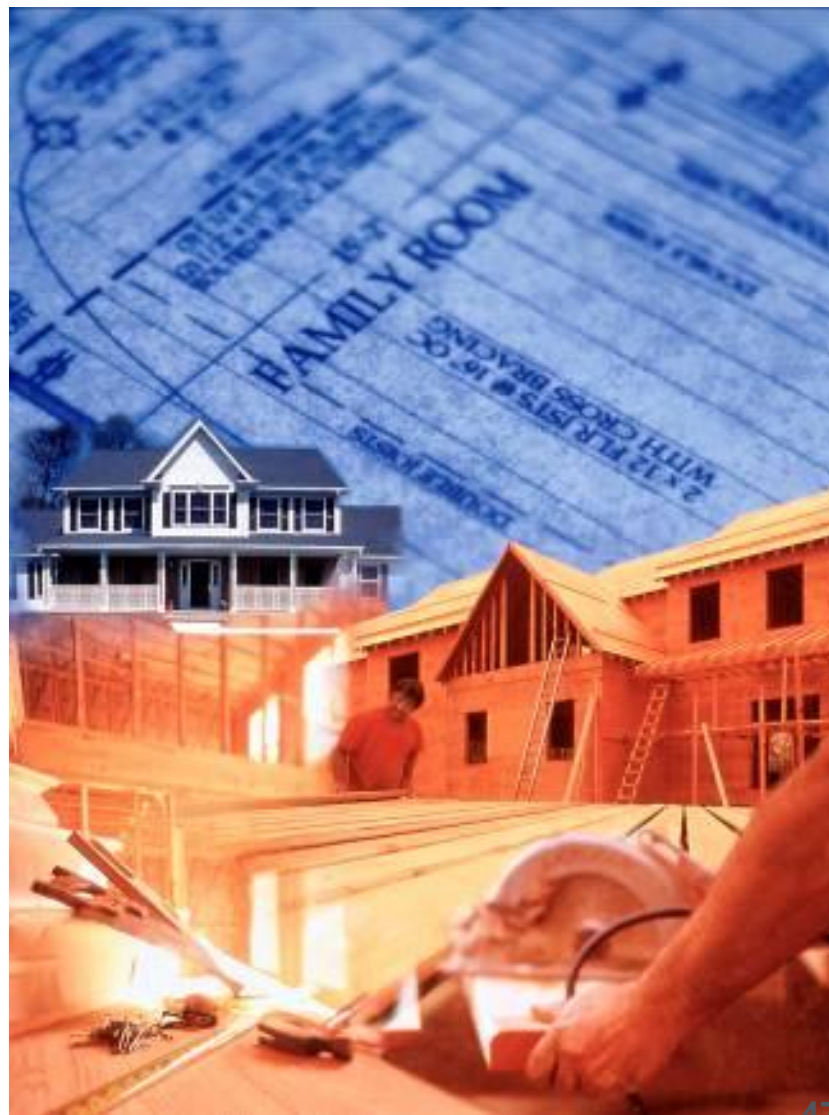
A minimum of **75 percent** of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps, or **75 percent** of permanently installed lighting fixtures to contain only high efficacy lamps

### Exception:

- ✓ Low-voltage lighting



- ✓ Glazing limited to 15%
  - Includes conditioned basements
- ✓ Internal shading changes
- ✓ Air exchange = **3 ACH**
  - 3<sup>rd</sup> Party testing
- ✓ Air-source heat pump used as standard where resistance heating is proposed



## Desktop Software Tools



Windows version or  
Mac version

**Free downloads!**

## Web-Based Tools



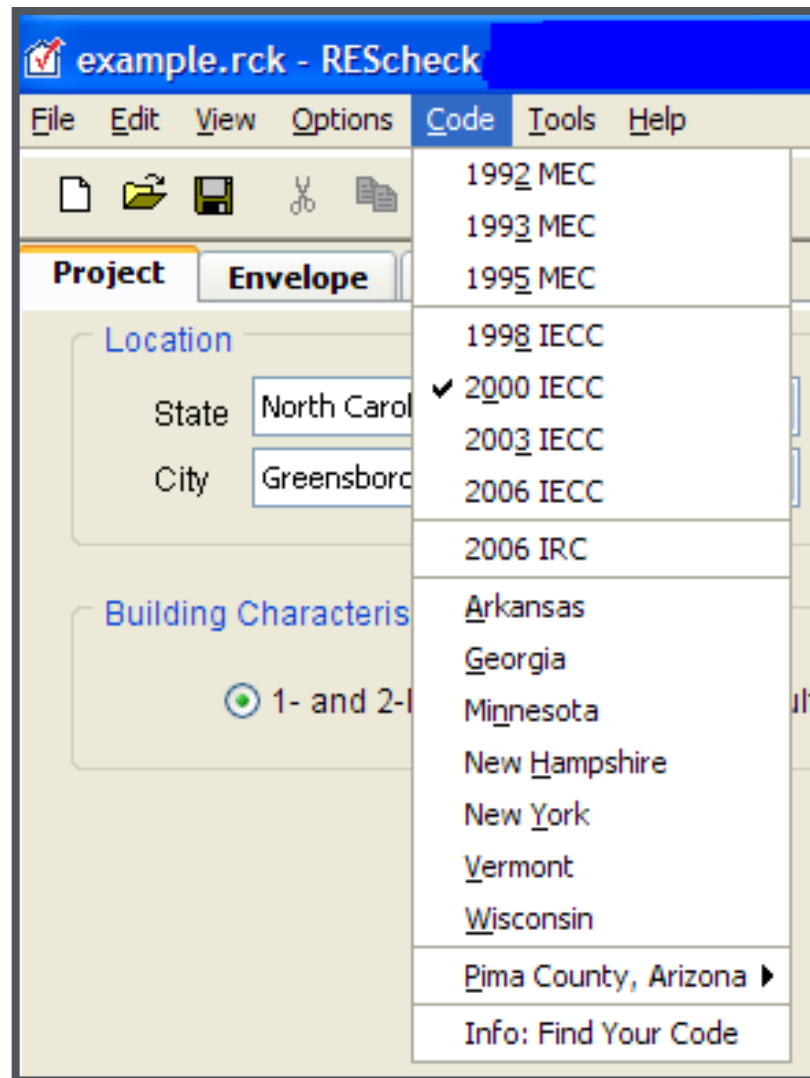
1. Select the Appropriate Program and Code
2. Enter Project Information
3. Enter Building Components from “TOOLS”
  - FIRST: use Area Calc in Envelope tab under ‘Tools’
  - Calculate shapes in Area Calc with Shapes Calculator
  - WHEN DONE: Save data to Envelope tab entries
  - Drag & drop windows/doors into correct wall areas

4. Enter Mechanical Equipment (optional)
5. View/Print the Compliance Report
  4. Print checklist and certificate
6. Save the Data File and the Report



# Appropriate Code

- Energy code applicable to your state/jurisdiction (Code Menu)
  - Status of State Codes
- Default
- Preferences



# Project Information

- Project location
- Project type
- Building Area (ft<sup>2</sup>)
- Project details for report (optional)
  - Title/Site/Permit
  - Owner/Agent
  - Designer/Contractor
  - Notes

Project Details (optional)

**Title/Site/Permit** | Owner/Agent | Designer/Contractor

Enter the project title, construction site, and permit information.  
This information will appear on the compliance certificate.

Title:

**Construction Site**

Address 1:

Address 2:

City:

State: North Carolina

Zip Code:

**Permit**

Permit #:

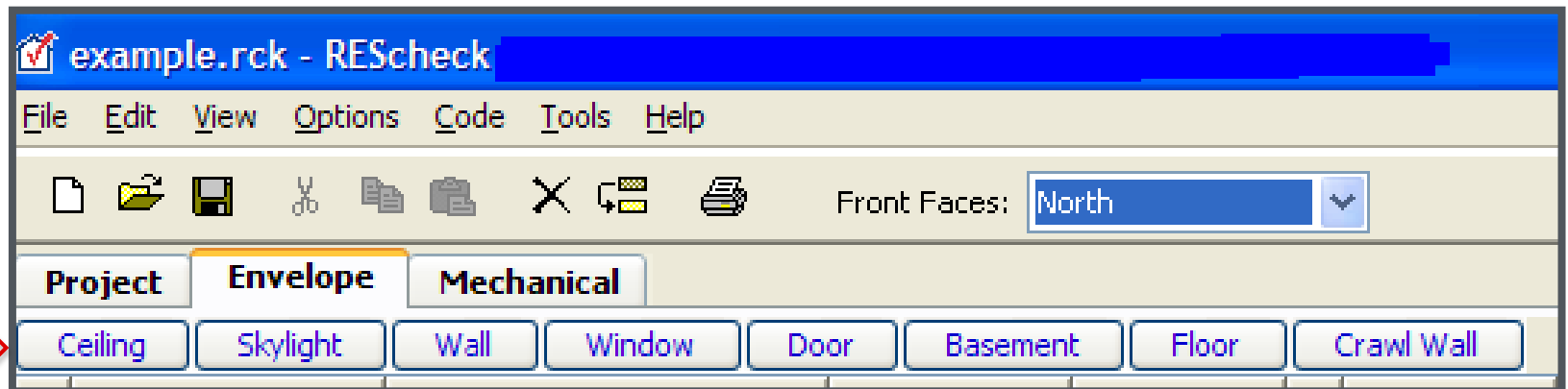
Permit Date:

Notes:

OK Cancel

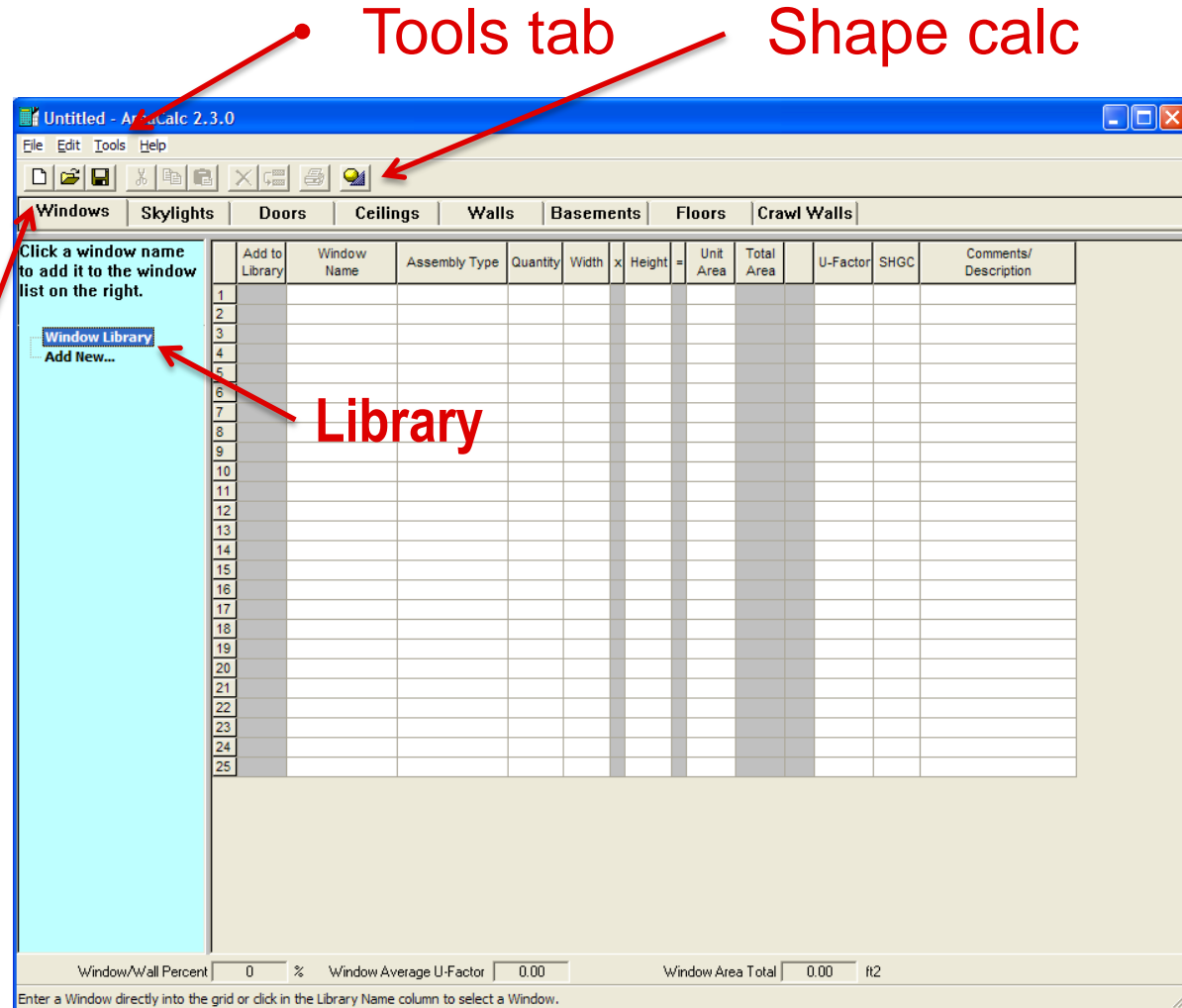
# Envelope Screen

- Changes based on code and/or location selected
  - SHGC column
  - Overhang P/F column
  - Orientation option
    - Front Faces ??



# AREACALC TOOL

- REScheck tab bar
- Calculates building component areas and UA's
- Library allows for saving windows, doors, skylights
- Areas can be transferred into REScheck (*New button*)



# Screen Operations

The screenshot shows the REScheck software interface for a file named 'example.rck'. The 'Envelope' tab is selected, and the 'Wall' sub-tab is active. A table lists building components with their assemblies, areas, and various energy performance metrics. At the bottom, a 'Compliance Bar' indicates the building 'Passes'. A 'Status Bar' at the very bottom provides instructions for entering gross ceiling/roof area. A red circle highlights the '14.8 % Better Than Code' value in the compliance bar.

	Component	Assembly	Gross Area or Slab Perimeter		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	SHGC	Depth of Insulation (ft)
Building										
1	Ceiling 1	Flat Ceiling or Scissor Truss	729	ft2	38.0	0.0	0.03	22		
2	Ceiling 2	Flat Ceiling or Scissor Truss	392	ft2	30.0	0.0	0.035	21		
3	Wall 1	Wood Frame, 16" o.c.	1647	ft2	13.0	6.0	0.061	82		
4	Door 1	Glass	84	ft2			0.4	34	0.25	
5	Window 1	Vinyl Frame, Double Pane...	204	ft2			0.45	92	0.35	
6	Door 2	Solid	20	ft2			0.54	11		
7	Wall 2	Wood Frame, 16" o.c.	276	ft2	13.0	0.0	0.082	21		
8	Door 3	Solid	18	ft2			0.35	6		
9	Floor 1	All-Wood Joist/Truss, Ov...	938	ft2	19.0	0.0	0.047	44		
10	Floor 2	All-Wood Joist/Truss, Ov...	32	ft2	30.0	0.0	0.033	1		
11	Floor 3	Slab-On-Grade:Unheated	82	ft		8.0	0.779	64		2.0

Compliance **Passes** Max. UA 467 Your UA 398 **14.8 % Better Than Code**

Enter the gross ceiling/roof area in sq. ft. (including the area of skylights).

**Compliance Bar** →  
**Status Bar** →

**Included in latest 2009 version**

- Only incorporate components that separate conditioned space from unconditioned space
- Only use applicable buttons
- Can group “like” components
- Use of “other” assembly type
- Gross area of components entered
  - Program deducts fenestration and calculates net area



# Screen Operations

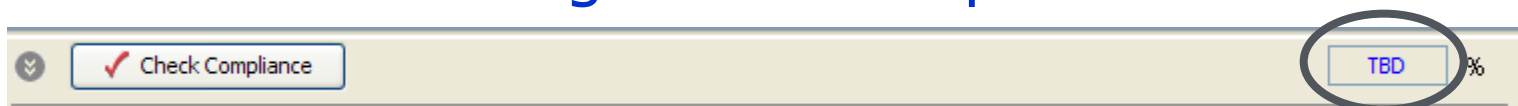
- Compliance Bar
- Status Bar
- Colors - **Red** : missing info, errors; failing

The screenshot shows the REScheck software interface. The title bar reads "example.rck - REScheck". The menu bar includes File, Edit, View, Options, Code, Tools, and Help. The toolbar contains icons for file operations. The "Envelope" tab is selected, with sub-tabs for Ceiling, Skylight, Wall, Window, Door, Basement, Floor, and Crawl Wall. A table lists building components with columns for Component, Assembly, Gross Area or Slab Perimeter, Cavity Insulation R-Value, Continuous Insulation R-Value, U-Factor, UA, SHGC, and Depth of Insulation (ft). The first row shows "Building" with a "Ceiling 1" component. The "Gross Area or Slab Perimeter" cell contains a red "0", which is circled in the image.

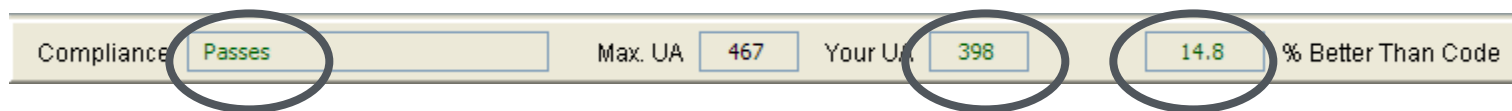
	Component	Assembly	Gross Area or Slab Perimeter	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	SHGC	Depth of Insulation (ft)
1	Ceiling 1	Flat Ceiling or Scissor Truss	0	38.0	0.0	0.03	0		

# Screen Operations

- Compliance Bar
- Status Bar
- Colors – **Blue**: Looking for data input



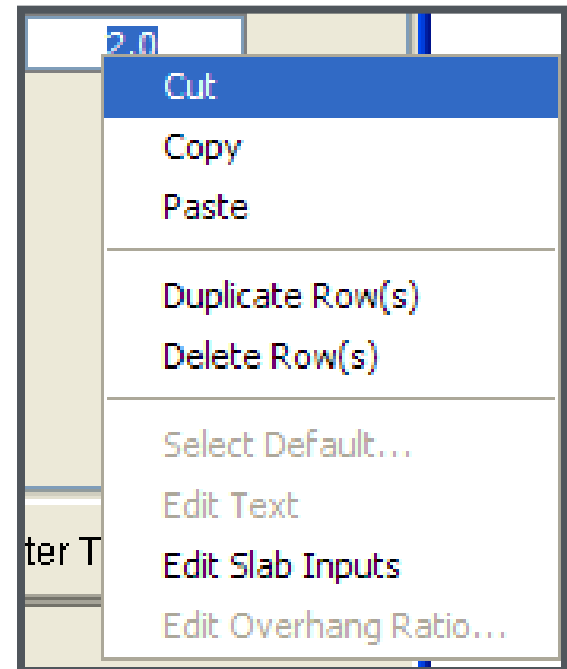
– **Green**: It passes (so far)



– **Red**: Go back and look at your UA's

# Screen Operations

- Compliance Bar
- Status Bar
- Colors
- Right Mouse Button
  - “Context” Menu



# Compliance Report

- Project complies
- View/Print Report

## Project Information

## Building Components

## Compliance Statement

## Project Notes



REScheck Software Version 4.2.0  
**Compliance Certificate**

Project Title: North Meadows Development

Energy Code: 2000 IECC  
Location: Greensboro, North Carolina  
Construction Type: Single Family  
Glazing Area Percentage: 15%  
Heating Degree Days: 3865

Construction Site:  
Permit Date: 3/17/00

Owner/Agent:

Designer/Contractor:

**Compliance: Passes**

Compliance: 14.8% Better Than Code Maximum UA: 467 Your UA: 398

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	729	38.0	0.0		22
Ceiling 2: Flat Ceiling or Scissor Truss	592	30.0	0.0		21
Wall 1: Wood Frame, 16" o.c.	1647	13.0	6.0		82
Door 1: Glass	84			0.400	34
Window 1: Vinyl Frame, Double Pane with Low-E	204			0.450	92
Door 2: Solid	20			0.540	11
Wall 2: Wood Frame, 16" o.c.	276	13.0	0.0		21
Door 3: Solid	18			0.350	6
Floor 1: All-Wood Joist/Truss, Over Unconditioned Space	938	19.0	0.0		44
Floor 2: All-Wood Joist/Truss, Over Outside Air	32	30.0	0.0		1
Floor 3: Slab-On-Grade/Unheated Insulation depth: 2'0"	82		8.0		64

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2000 IECC requirements in REScheck Version 4.2.0 and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

Name - Title \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

**Project Notes:**

Previously saved project information:  
1010 Construction Ave.  
Greensboro, North Carolina  
Gulford County  
Careful Builders, Inc.  
120 W. St.  
Greensboro, NC 27411

# Panel Certificate

- Under IECC 2009-based codes, panel certificate option



**View / Print Report**

Select Report Options

☐ Compliance Certificate

☐ Inspection Checklist

☒ Panel Certificate

OK Cancel



## 2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Wall	0.00
Floor	0.00
Ceiling / Roof	0.00
Ductwork (unconditioned spaces):	

Glass & Door Rating	U-Factor	SHGC
Window		
Door		

Heating & Cooling Equipment	Efficiency
Heating System:	
Cooling System:	
Water Heater:	

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Comments: \_\_\_\_\_



## Score + Store

**Score and Store is an application for gathering compliance checklists from states in an effort to gauge the 90% compliance effort.**

Log in below to complete checklists for your state. If you don't have an account, you should contact [linda.connell@pnl.gov](mailto:linda.connell@pnl.gov).

<input type="text" value="Name"/>	<input type="text" value="Password"/>	<input type="button" value="Login"/>
-----------------------------------	---------------------------------------	--------------------------------------

Contact: [Technical Support](#)  
[Security & Privacy](#)

## COMPLIANCE APPROACHES



**Prescriptive**

**Trade-off**

**Performance  
(IECC)**



## RESCheck uses these in Compliance Checklists (v.4.4.4)

Welcome markus.kobold@pnl.gov [Account](#) [Logout](#)

[Manage user accounts](#)
[Manage templates](#)

---

[Back to My Checklists](#)

### New Checklist

Building Class ☐ Commercial ☒ Residential  
 Energy Code   
 Climate Zone

---

**EVALUATION** Name of Evaluator(s)  Date Collected

---

**CONTACT** Name  Phone  Email

---

**BUILDING INFO**

Building ID  Building Type   
 Building Name  Project Type   
 Building Address   
 Subdivision   
 Lot Number   
 State   
 County   
 Jurisdiction

---

**COMPLIANCE**

Conditioned Floor Area  ft<sup>2</sup>  
 Compliance Software   
 Green Building/Above Code

Compliance Approach  
☐ Prescriptive  
☐ Trade-Off  
☐ Performance

Next

Contact: [Technical Support](#)  
[Security & Privacy](#)

Welcome markus.kobold@pnl.gov [Account](#) [Logout](#)

[Manage user accounts](#)
[Manage templates](#)

---

[Back to My Checklists](#) 3. Framing / Rough-In Inspection

### Framing / Rough-In Inspection

TOTAL SCORE: 100% [Save Checklist](#)

For Building: 123-XT-XT, 123 Main St.  
Evaluated by Kate Mon on 01/29/2011 [Edit](#)

	IECC 2009	CODE VALUES	VERIFIED VALUE(S)	COMPLIES	COMMENTS
502.4.1 502.4.2 FR1	Fenestration meets maximum air leakage requirements.		<input type="text"/> cfm/sq ft	<input type="text" value="Yes"/>	<input type="text"/>
502.4.1 502.4.2 FR2	Doors meet maximum air leakage requirements.		<input type="text"/> cfm/sq ft	<input type="text" value="No"/>	<input type="text"/>
502.4.1 502.4.2 FR3	Fenestration and doors labeled for air leakage.			<input type="text" value="Not Observable"/>	<input type="text"/>
502.4.7 FR4	Vestibules installed per approved plans.			<input type="text" value="N/A"/>	<input type="text"/>
502.2.1 FR5	Roof insulation R-value.	R=	<input type="text"/>	<input type="text" value="N/A"/>	<input type="text"/>
	<input type="checkbox"/> Above deck <input type="checkbox"/> Metal <input type="checkbox"/> Attic				
303.2 FR6	Roof insulation R-value installed per manufacturer's instructions.			<input type="text" value="N/A"/>	<input type="text"/>
502.3.1 502.1.1 FR7	Performance compliance approach submitted for vertical fenestration area >40% or skylight area >3%.			<input type="text" value="N/A"/>	<input type="text"/>
502.3.2 FR8	Vertical fenestration U-Factor.	U=	<input type="text"/>	<input type="text" value="N/A"/>	<input type="text"/>
502.3.2 FR9	Skylight fenestration U-Factor.	U=	<input type="text"/>	<input type="text" value="N/A"/>	<input type="text"/>
502.3.2 FR10	Vertical fenestration SHGC value.	SHGC:	<input type="text"/>	<input type="text" value="N/A"/>	<input type="text"/>
502.3.2 FR11	Skylight SHGC value.	SHGC:	<input type="text"/>	<input type="text" value="N/A"/>	<input type="text"/>
303.1.3	Fenestration products rated in accordance with			<input type="text" value="N/A"/>	<input type="text"/>

- Score + Store
- Sample Results

## Checklist Metrics

### Code Requirements with Highest Compliance Rate (Top 3)

PR6 - [8.4.1.1] Feeder connectors sized in accordance with approved plans.

PR7 - [8.4.1.2] Branch circuits sized for maximum drop of 3%.

ME8 - [6.4.4.1.2] HVAC ducts and plenums insulated.

### Code Requirements with Lowest Compliance Rate (Top 3)

PR1 - [4.2.2] Plans and/or specifications provide all information with which compliance can be determined for the building envelope and delineate and document where exceptions to the standard are claimed.

FR3 - [5.4.3.2] Fenestration and doors labeled for air leakage.

FR2 - [5.4.3.2] Doors meet maximum air leakage requirements.

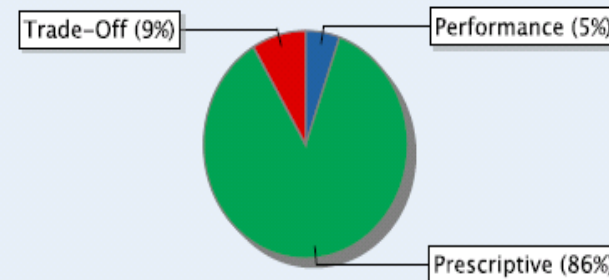
### Code Requirements Most Frequently Not Observed (Top 3)

FR14 - [5.8.2.3, 5.5.3.6] U-factor of opaque doors associated with the building thermal envelope meets requirements.

FR12 - [5.8.2.1] Fenestration products rated in accordance with NFRC.

FR13 - [5.8.2.2] Fenestration products are certified as to performance labels or certificates provided.

### Compliance Approach Breakdown



# Evaluating the Buildings – DOE's Job

## Residential Data Collection Checklist

2009 International Energy Conservation Code

Climate Zone 3

- Climate Specific: CT – Zone 5

Date: \_\_\_\_\_ Name of Evaluator(s): \_\_\_\_\_

- Support for all compliance approaches

Building Name & Address: \_\_\_\_\_ Conditioned Floor Area: \_\_\_\_\_ ft<sup>2</sup>

Building Contact: \_\_\_\_\_ Phone: \_\_\_\_\_ Email: \_\_\_\_\_

Compliance Approach: ☒ Prescriptive (402.1.2 or 402.1.3) ☐ UA Trade-Off (402.1.4) ☐ Building Performance (405)

State: \_\_\_\_\_ Jurisdiction: \_\_\_\_\_

Building Type: ☒ Single Family ☐ Modular ☐ Townhouse

Multifamily: ☐ Apartment ☐ Condominium

Project Type: ☐ New Construction ☐ Addition to existing building ☐ Existing building renovation<sup>1</sup>

- Evaluations divided into phase of construction

- Code requirements divided by tiers - (1, 2, 3) based on

Item Number	Description of Item	Code Value	Verified Value	Complies			Comments/Notes/Findings
				Y	N	N/A	
PR1 [103.2] <sup>1</sup>	Construction drawings and documentation submitted and available. Documentation sufficiently demonstrates energy code compliance.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
PR2 [403.6] <sup>2</sup>	HVAC loads calculations: Heating system size(s): Cooling system size(s):		kBtu: _____ kBtu: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

- energy impact

- Values and comments captured, including generic information (building type, use, size, etc.)

Additional Comments: \_\_\_\_\_

# MAGIC NUMBER: Generating a Sample

A large, green, 3D-style number '44' is centered on a yellow rectangular background. The number has a slight shadow and a beveled edge, giving it a three-dimensional appearance.

**<http://www.energycodes.gov/resource-center>**

- 44 new residential dwellings  
44 new commercial buildings
- 44 existing residential renovations 44  
existing commercial renovations
- Distributed throughout state based on  
population (one Climate Zone)
- Distributed over a representative sample:  
different building sizes and uses



# TRAINING DATA COLLECTORS

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy



***Thank you for your time!***

***QUESTIONS??***



Northeast Energy Efficiency Partnerships

[dvigneau@neep.org](mailto:dvigneau@neep.org)

781-860-9177 Ext.136

[krose@neep.org](mailto:krose@neep.org)

781-860-9177 Ext.158