The RESCheck Option for Compliance With the 2009 International Energy Conservation Code

U.S. Department of Energy
Building Energy Codes Program

Edited & Presented by

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NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

"Facilitating Partnerships to advance the efficient use of energy"

MISSION

Promote the efficient use of energy in homes, buildings and industry in the Northeast U.S.

ORGANIZATION

Regional nonprofit since 1996

PRIMARY AUDIENCES

- State policy makers (11 + D.C.)
- Efficiency program administrators

APPROACH

Overcome barriers to efficiency through ***strategic regional collaboration*** of public policies and programs

WHAT DOES NEEP DO?

FACILITATES PARTNERSHIPS...

REGIONAL INITIATIVES

- High Efficiency Retail Products
- High Efficiency Home Performance
- High Efficiency Commercial Buildings and Technologies
- Workforce Development

PUBLIC POLICY

- Policy Outreach
- Building Energy Codes
- High Performance School and Public Buildings
- Appliance Efficiency Standards

EM&V FORUM

- Protocol Development
- Research and Evaluation
- Education and Information Access

NEEP SUMMIT

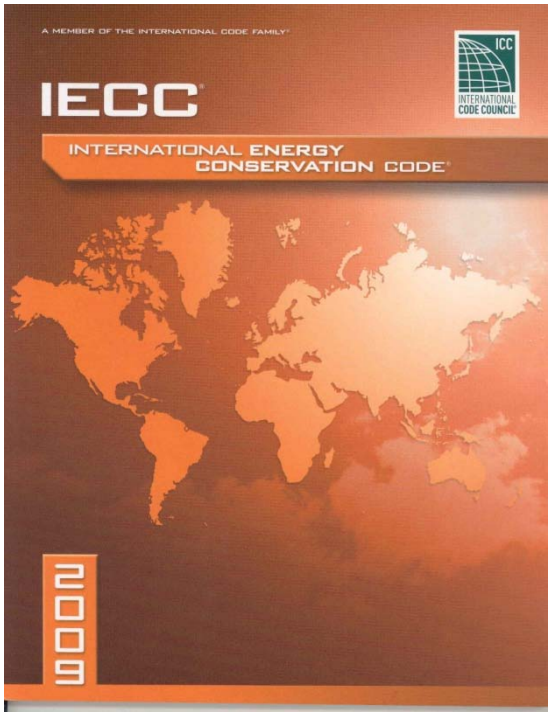
- Conference
- Workshops
- Business Leadership
- Exhibition

TO ADVANCE THE EFFICIENT USE OF ENERGY EFFICIENCY

The MUBEC Adoption

- CHAPTER 3

- CHAPTER 6



What's Changed Since IECC 2003?

- Stringency – some key differences
- New requirements
  - Building envelope tightness
  - Duct testing
  - Lighting equipment
  - Pool controls and covers
  - Snow melt controls
- Moisture control requirements moved to IRC
- No mechanical trade-offs allowed

Vapor Retarder – IT MOVED!

Moisture Control

IECC / IRC

(Was in IECC 402.5/N1102.5)

- R302.10.1 Insulation
- R408.1 crawl spaces
- R506.2.3 Slabs
- R601.3 Walls (Table)
- R806.4 Attics
- N1102.2.9 Crawl Space
- M1601.4.5 Ducts

IBC

(Was in IECC 502.5)

- 202 Definitions
- 719 Insulation facings
- 1203.3.2 Crawl Space.4
- 1405.3 Frame Walls
- 1502 Roofs (general)
- 1910.1 Floor Slabs

Scope: Residential Buildings

IRC only for single-family, duplex, and townhouses

- IECC has all low-rise (1-3 stories) houses, condos, and apartments [R-2, R-3, R-4], but not hotels/motels [R-1]
- All buildings that are not “residential” by definition are “commercial”

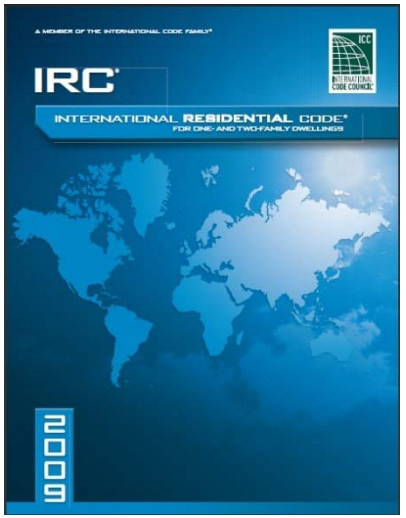
Includes repairs, alterations, and additions

e.g., window replacements

Relationship Between IRC and IECC

- **IECC addresses only energy**

- **IECC addresses both residential and commercial; IRC addresses only detached one- and family dwellings and townhouses**



- **IRC addresses all codes** (structural, plumbing, etc.)
  - **Allows builder to carry only one code book**
  - **Chapter 11 has energy, BUT**

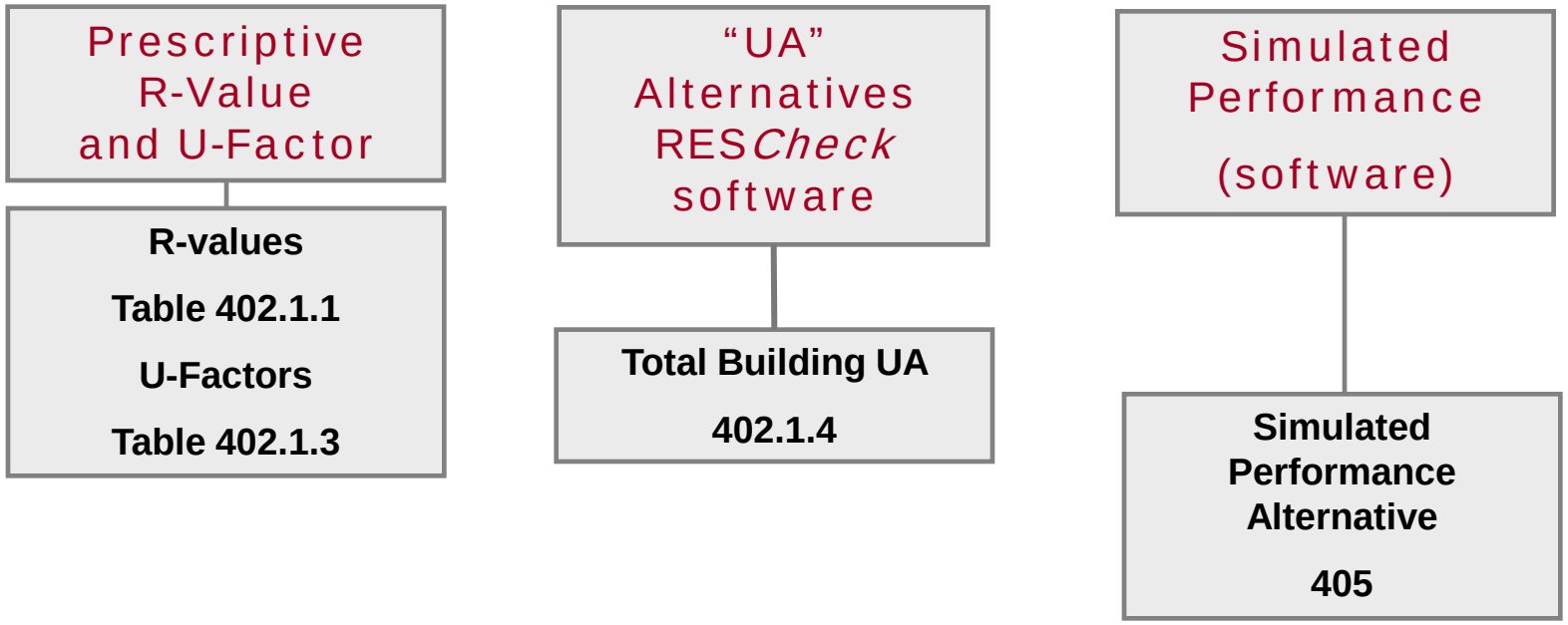
- **Energy requirements in IRC and IECC <u>not identical</u>**

- **MUBEC requires IRC compliance with IECC energy provisions**

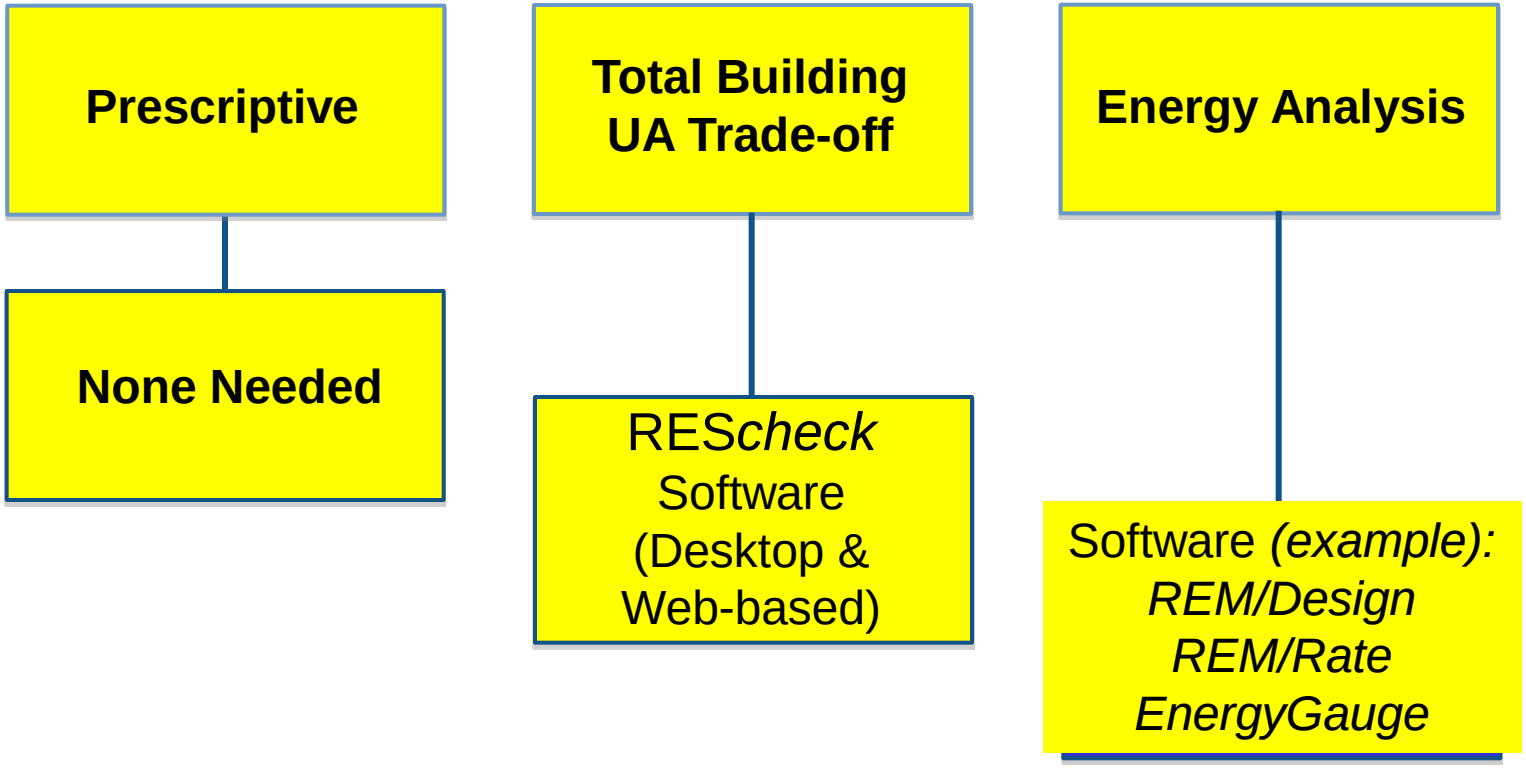
Overview of Residential Code Requirements

- **Focus is on building envelope**
  - Ceilings, walls, windows, floors, foundations
  - Sets insulation levels, window U-factors and solar heat gain coefficients
  - Infiltration control - caulk and seal to prevent air leaks
- **Ducts – seal and insulate**
- **Limited space heating, air conditioning, and water heating requirements**
  - Federal law sets most equipment efficiency requirements, not the I-codes
- **No appliance requirements**
- **Lighting equipment**
  - **50%** of lamps to be high-efficacy lamps

IECC Compliance - Three Options



Code Compliance Tools

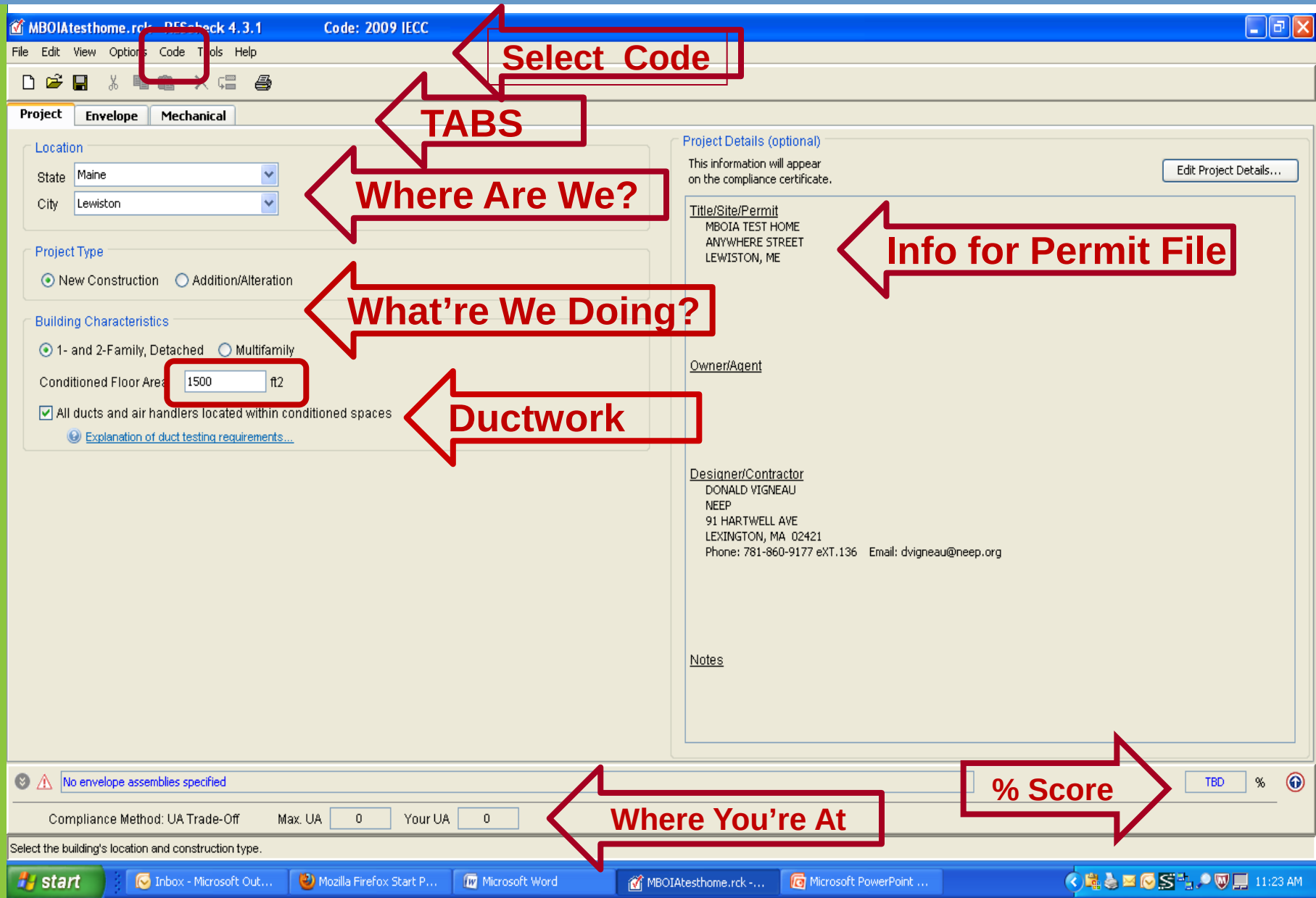


U-Factor; Total UA (RES*check* Approach)

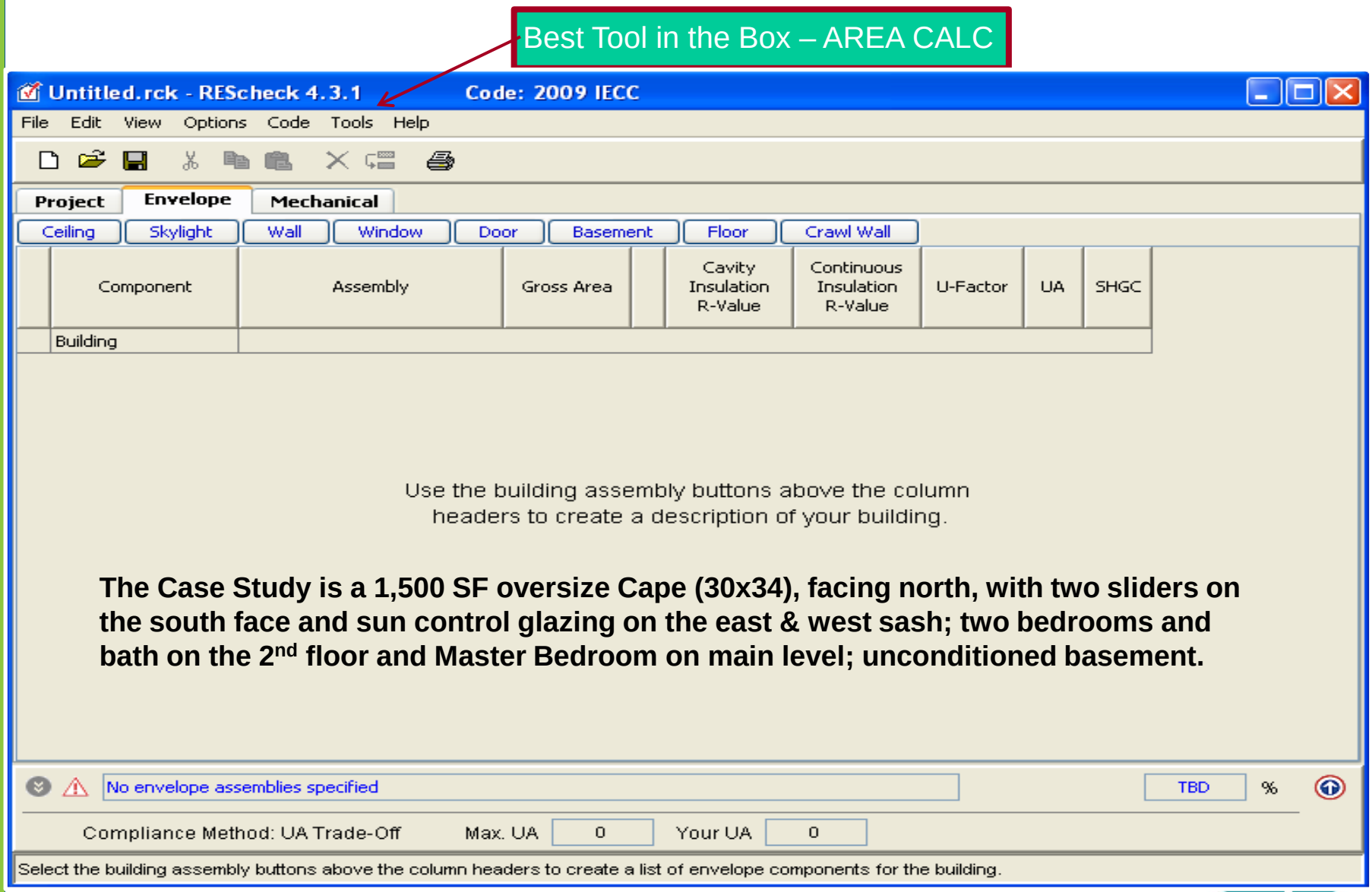
- **U-factor Alternative**
  - A **Prescriptive Option**, but uses U-factors instead of R-values
    - Allows for innovative or less common construction techniques such as structural insulated panels, or masonry veneers
- **Total UA Alternative**
  - Uses U-factor alternative information but allows **trade-offs** across all envelope components

RESCheck – The Project Screen

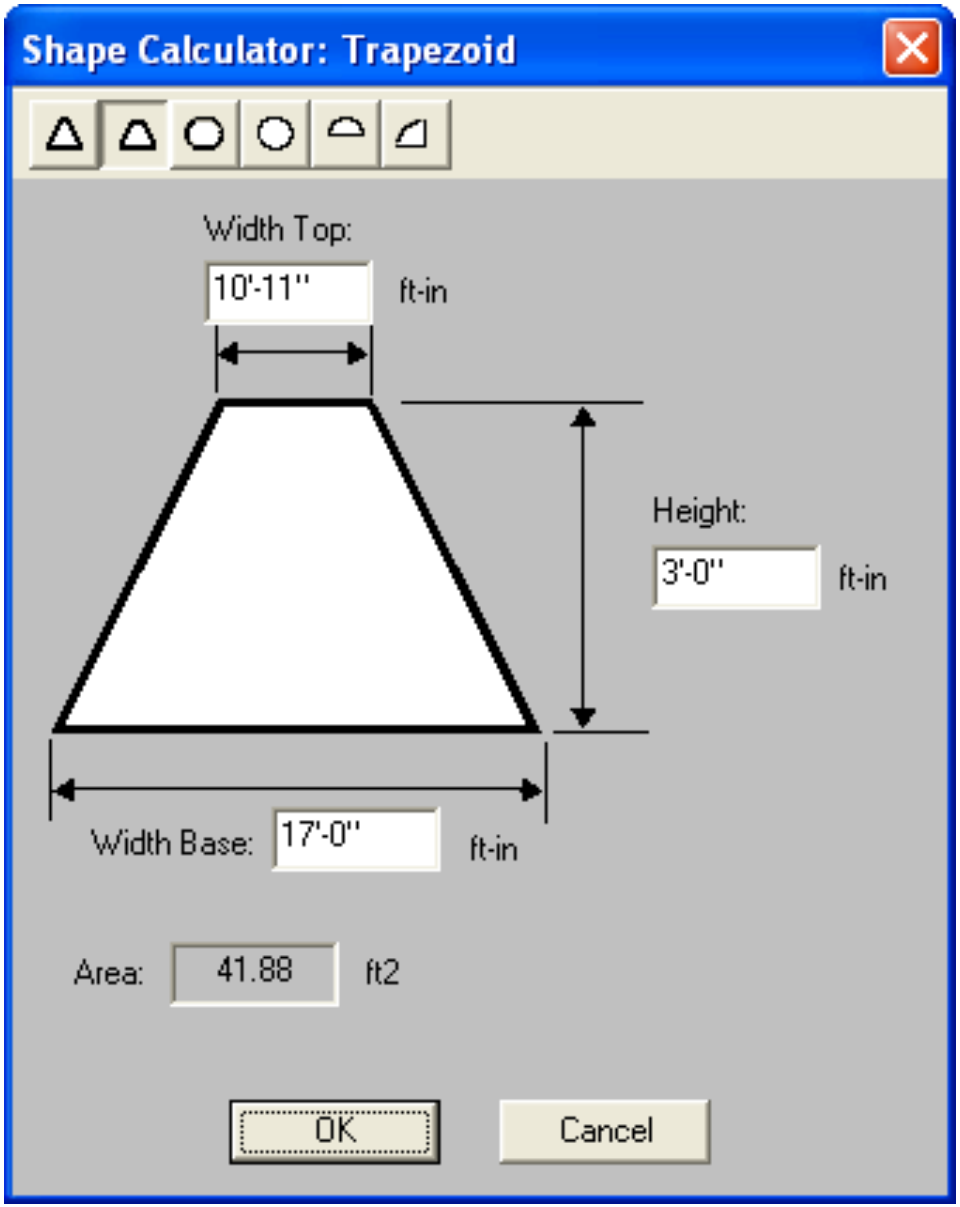
v 4.4.1



Envelope – The Component Tabs



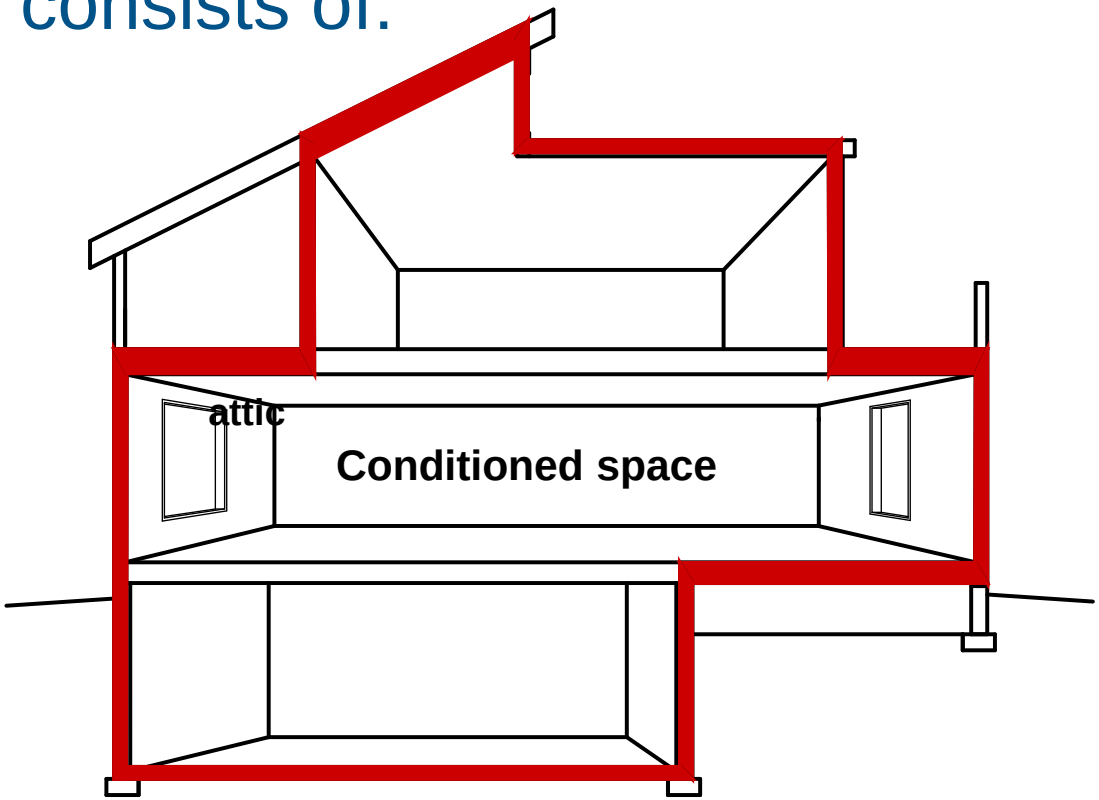
THE SHAPE CALCULATOR TOOL



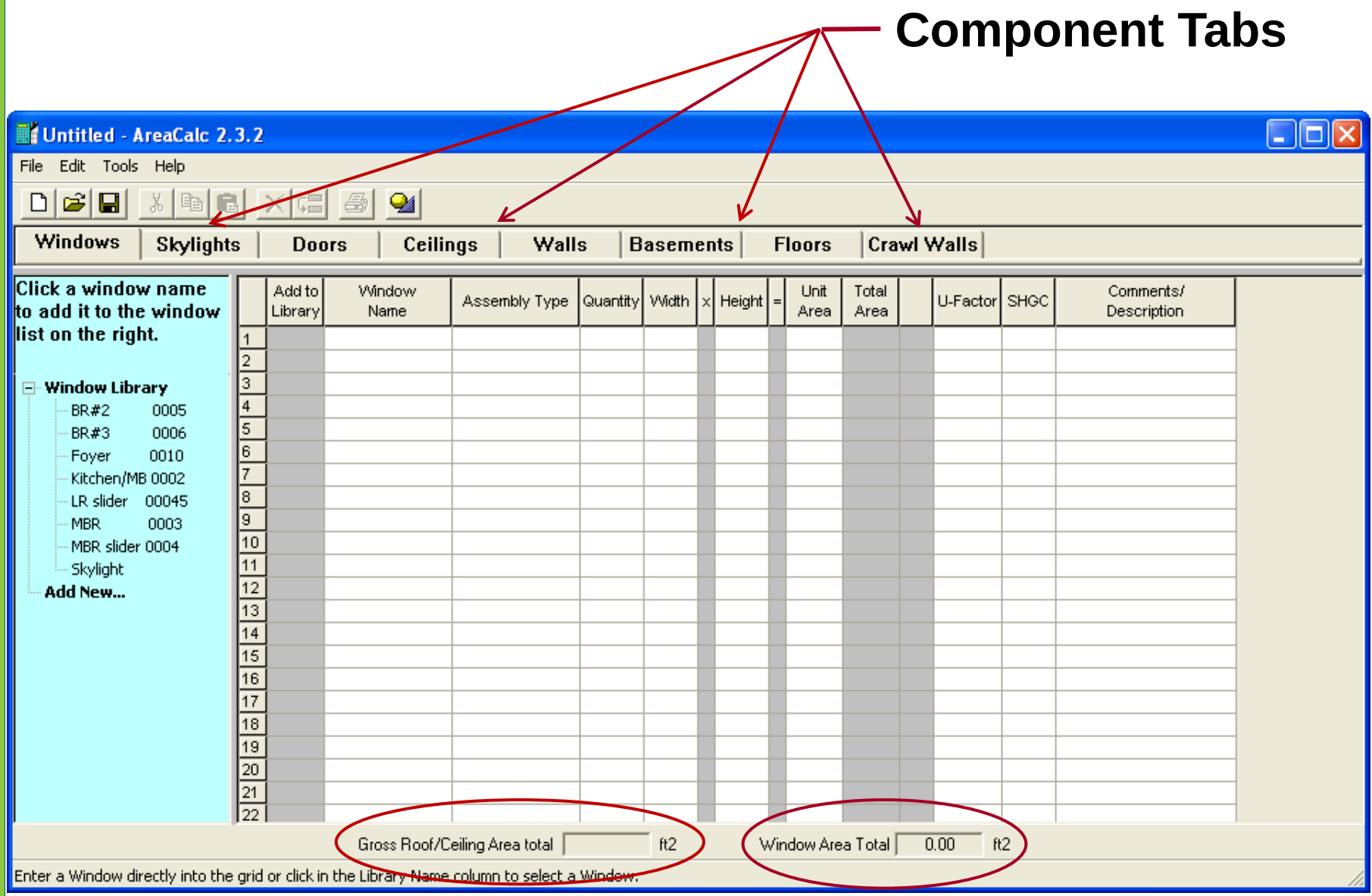
Calculates areas for common shapes of walls, fancy windows

Building Envelope RES*Check* Analysis

- Building Envelope consists of:
  - Fenestration
  - Ceilings
  - Walls
    - Above grade
    - Below grade
    - Mass walls
  - Floors
  - Slab
  - Crawl space
- The program knows the values for your zone



AREA CALC – Take-Off Tool



U-Factor Requirements by Climate Zone

Table 402.1.3
Equivalent U-Factors[a]

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR[b]	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR[d]	CRAWL SPACE WALL U-FACTOR[c]
1	1.20	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50	0.65	0.035	0.082	0.141	0.047	0.091[c]	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
b. When more than half the insulation is on the interior, the **mass wall *U*-factors shall be** a maximum of 0.17 in Zone 1, 0.14 in Zone 2, 0.12 in Zone 3, 0.10 in Zone 4 except Marine, and **the same as the frame wall *U*-factor in** Marine Zone 4 and **Zones 5 through 8**.
c. Basement wall *U*-factor of 0.360 in warm-humid locations as defined by Figure 301.1 and Table 301.2.

Windows – U-Factors

- Strict limits on U-factor in northern U.S. (cannot be traded off)

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

  - U-0.75 for skylights in Zones 4-8
  - These are based on building average; individual windows or skylights can be worse if area-weighted average meets these requirements

Fenestration: UA Alternative Limits

- An *area weighted average* of windows and doors is used to satisfy the U-factor and SHGC requirements
  - *Area-weighted average* U-factor and SHGC are subject to hard limits, even in trade-offs - the RES*Check* program knows this. It also knows that solid doors have no SHGC
  - NFRC rated and certified information (on labels)

    Exceptions:
    - Default Glazing
    - Default Doors

Fenestration Exemptions: Different Rules

Prescriptive Path Only – **not used in RES*Check***

- Exemptions
  - 15 ft^2 of glazing (Section 402.3.3)
  - 24 ft^2 of one side-hinged opaque door assembly (Section 402.3.4)
  - Cathedral ceilings < 500sf or 20%; whichever less
- Replacement fenestration must meet
  - U-factors in all Zones **BUT**
  - No maximum SHGC in Climate Zones 7 or 8

AREA CALC – WINDOWS AND DOORS

MBOIAtest - AreaCalc 2.3.2

File Edit Tools Help

Windows | Skylights | Doors | Ceilings | Walls | Basements | Floors | Crawl Walls

Click a window name to add it to the window list on the right.

- Window Library
  - Basement E
  - Basement W
  - Bath
  - Bedroom 2
  - Bedroom 3
  - BR#2 0005
  - BR#3 0006
  - Entry

	Add to Library	Window Name	Assembly Type	Quantity	Width	x	Height	=	Unit Area	Total Area		U-Factor	SHGC	Comments/ Description
1		Kitchen	Vinyl Frame, Dou	1	4'-0"		3'-5"		13.67	13.67	ft2	0.290	0.400	
2		Bath	Vinyl Frame, Dou	1	4'-0"		3'-5"		13.67	13.67	ft2	0.290	0.400	
3	⇦	M Bedroom	Vinyl Frame, Dou	1	2'-0"		4'-0"		8.00	8.00	ft2	0.290	0.400	
4		Entry	Vinyl Frame, Dou	1	1'-8"		4'-0"		6.67	6.67	ft2	0.290	0.400	
5		M Bedroom	Vinyl Frame, Dou	1	6'-0"		6'-8"		40.00	40.00	ft2	0.290	0.470	
6		Living Room	Vinyl Frame, Dou	1	6'-0"		6'-8"		40.00	40.00	ft2	0.290	0.470	
7		Bedroom 2	Vinyl Frame, Dou	1	4'-8"		4'-0"		18.67	18.67	ft2	0.290	0.400	
8		Bedroom 3	Vinyl Frame, Dou	1	4'-8"		3'-5"		15.94	15.94	ft2	0.290	0.400	
9		Basement E	Metal Frame, Dou	1	2'-8"		1'-6"		4.00	4.00	ft2	0.450	0.400	
10		Basement W	Metal Frame, Dou	1	2'-8"		1'-6"		4.00	4.00	ft2	0.450	0.400	
11														

Gross Roof/Ceiling Area total ft2 Window Area Total 164.62 ft2

Enter a Window directly into the grid or click in the Library Name column to select a Window.

MBOIAtest - AreaCalc 2.3.2

File Edit Tools Help

Windows | Skylights | Doors | Ceilings | Walls | Basements | Floors | Crawl Walls

Click a door name to add it to the door list on the right.

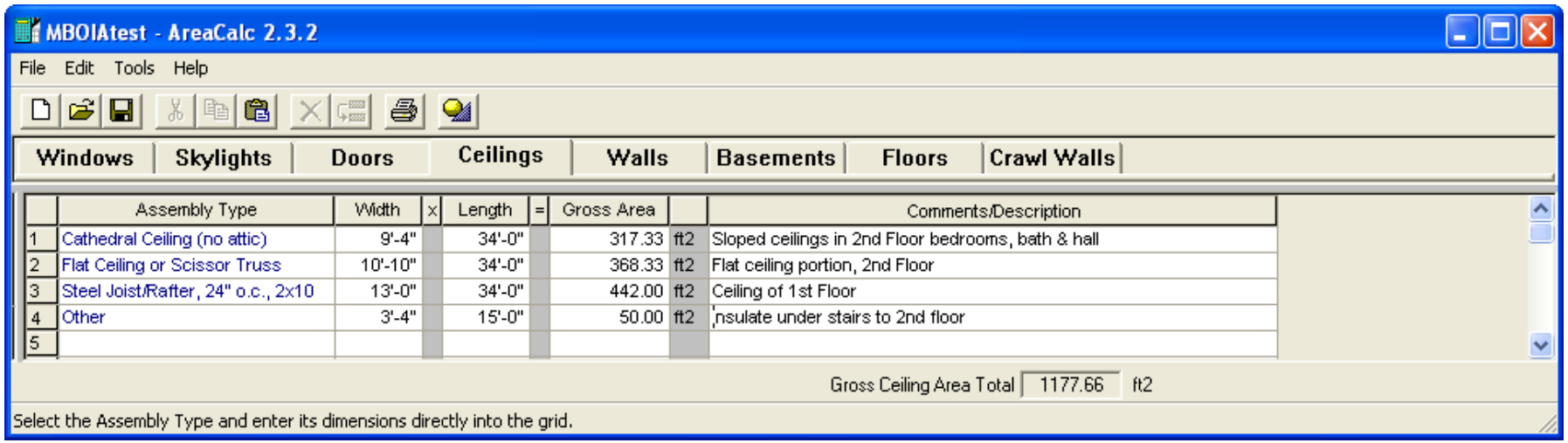
- Door Library
  - Basement
  - Entry

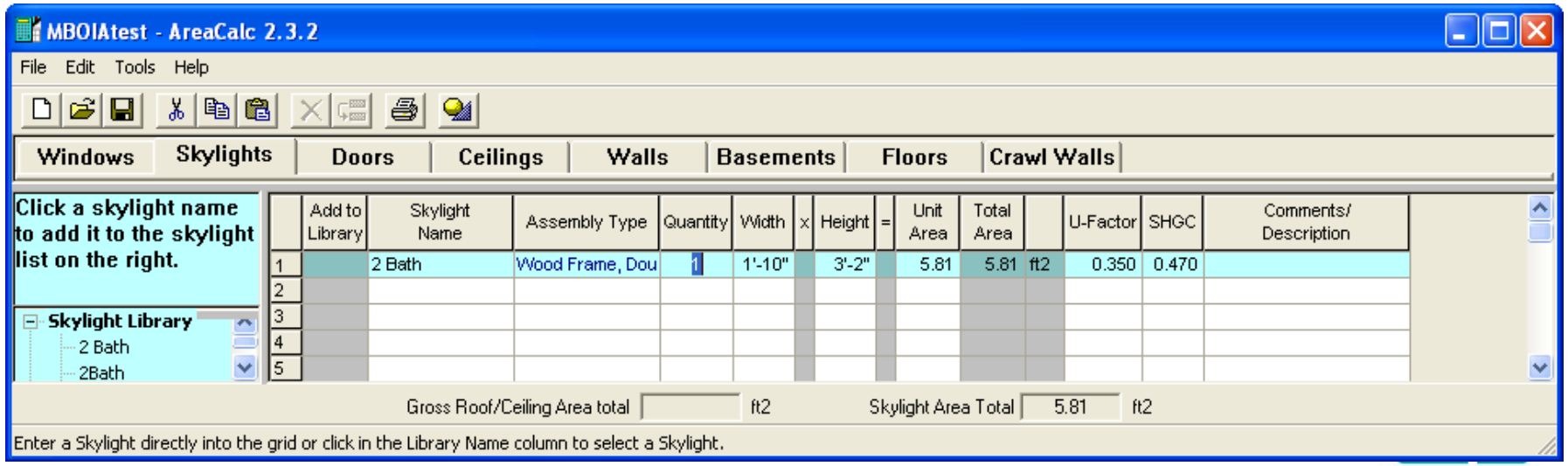
	Add to Library	Door Name	Assembly Type	Quantity	Width	x	Height	=	Unit Area	Total Area		U-Factor	SHGC	Comments/ Description
1		Entry	Solid	1	3'-0"		6'-8"		20.00	20.00	ft2	0.350		
2		Kitchen	Solid	1	2'-6"		6'-8"		16.67	16.67	ft2	0.350		
3														
4														
5														

Gross Roof/Ceiling Area total ft2 Door Area Total 36.67 ft2

Enter a Door directly into the grid or click in the Library Name column to select a Door.

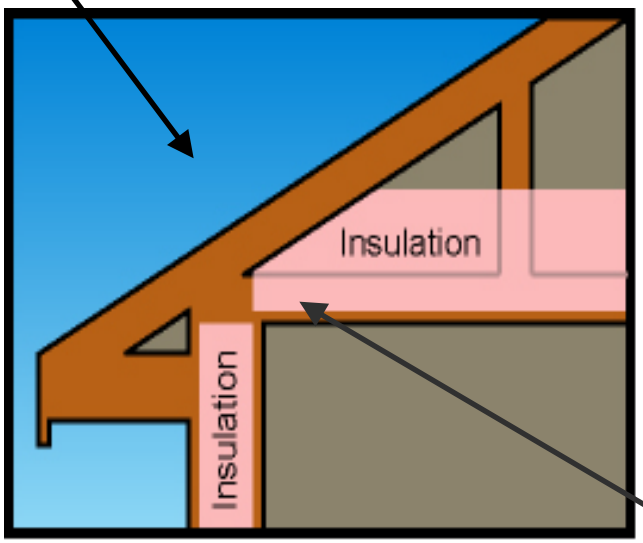
AREA CALC – CEILINGS & SKYLIGHTS





Standard Roof Truss – SELECTION

Possibility of ice dam formations

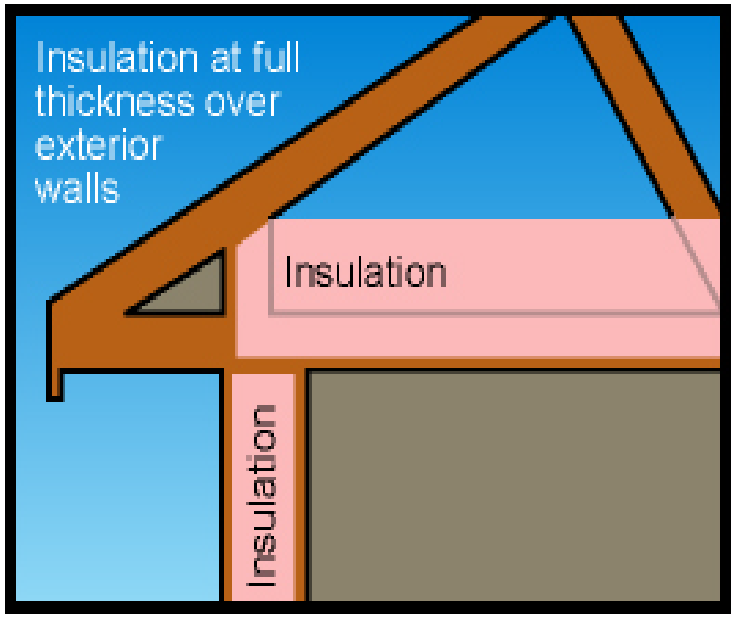


Cold corners contribute to condensation and mold growth

- Ceiling insulation code requirements assume standard truss systems

Raised Heel Truss - SELECTION

- Raised Heel Energy Truss the insulation is full height over exterior wall
  - *R-30 instead of R-38
  - *R-38 instead of R-49
- **(*RES*Check allows no* credit)**



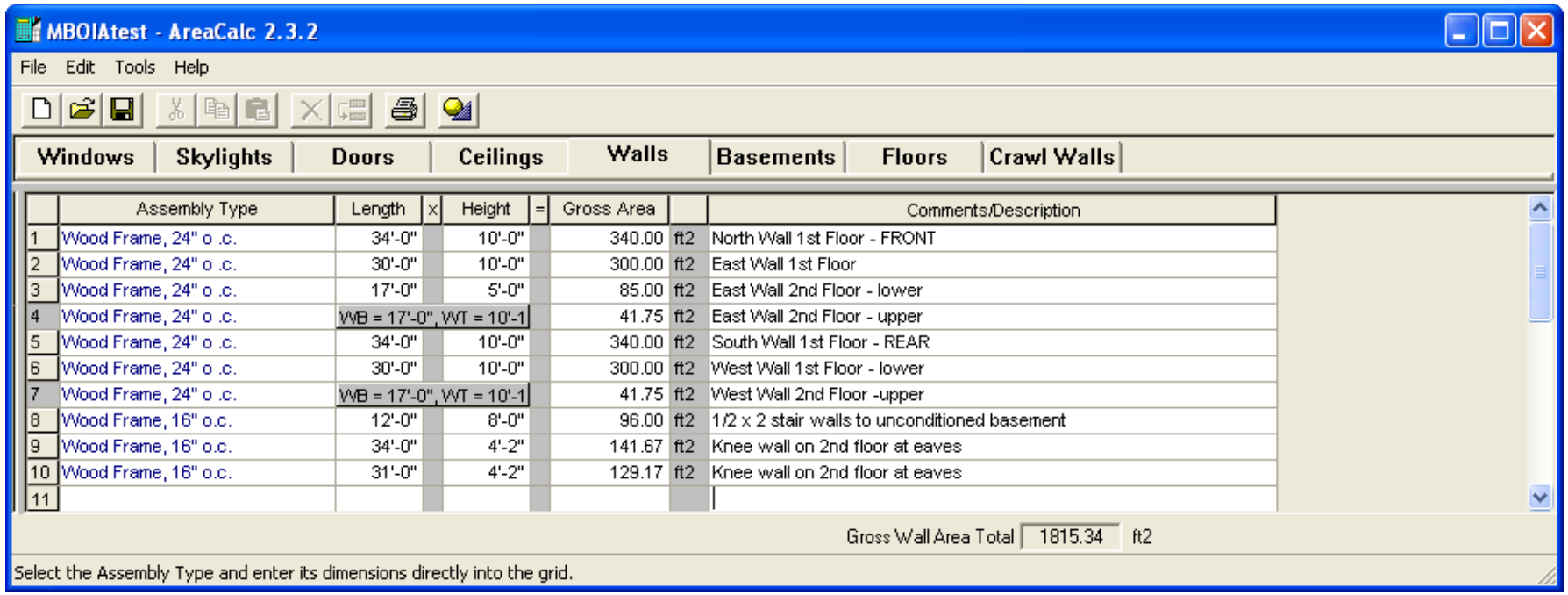
Insulation and Fenestration Requirements by Climate Zone

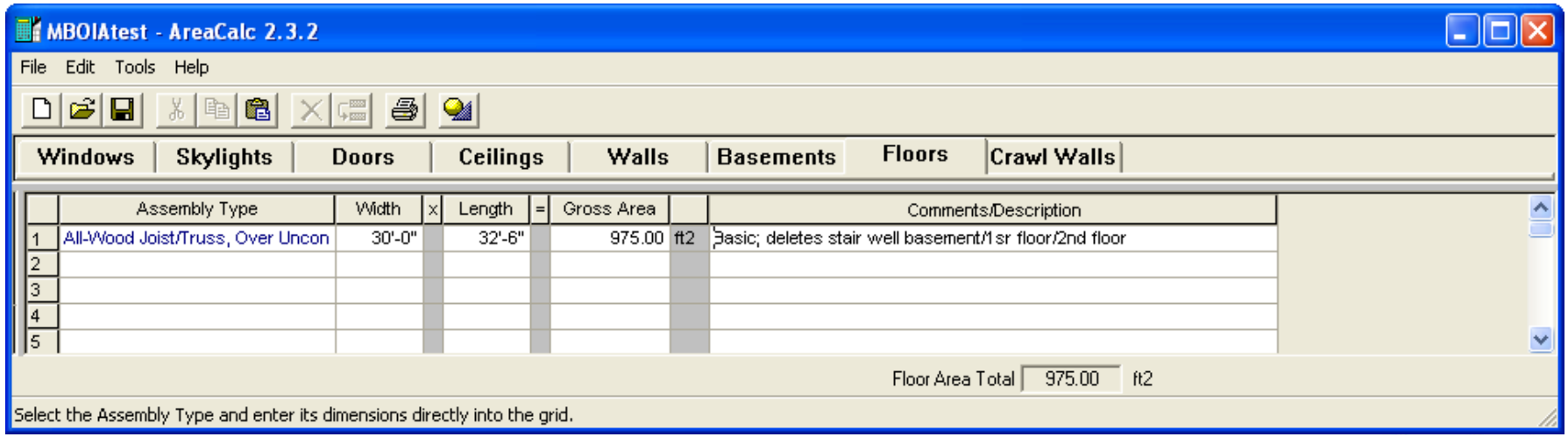
Table 402.1.1
Insulation and Fenestration Requirements by Component[a]

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

[a] *R*-values are minimums, *U*-factors and SHGC are maximums, **R-19 batts** compressed into a nominal 2 x 6 framing cavity such that the *R*-value is **reduced by R-1** or more shall be **marked with the compressed batt *R*-value in addition to the full thickness *R*-value**.
[b] The fenestration *U*-factor column excludes skylights. The **SHGC column applies to all** glazed fenestration.
[c] "15/19" means **R-15 continuous** insulated sheathing 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 insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
[d] **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 Zones 1 through 3 for heated slabs.
[e] There are no SHGC requirements in the Marine Zone.
[f] Basement wall insulation is not required in warm-humid locations as defined by Figure 301.1 and Table 301.1.
[g] **Or insulation sufficient to fill the framing cavity, R-19 minimum**.
[h] **"13+5" means R-13 cavity insulation plus R-5 insulated sheathing.** If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
[i] **The second *R*-value applies when more than half the insulation is on the interior of the mass wall**.
[j] For impact rated fenestration complying with Section R301.2.1.2 of the *IRC* or Section 1608.1.2 of the *IBC*, maximum *U*-factor shall be 0.75 in Zone 2 and 0.65 in Zone 3.

AREA CALC – WALLS AND FLOORS





Ceilings without Attic Spaces - SELECTION

- **Where:**
  - **Insulation levels are required > R-30 and**
  - **Not sufficient amount of space to meet higher levels**
    - **R-30 allowed for 500 ft^2 or 20% total insulated ceiling area, whichever is less**
    - **<u>Exception DOES NOT apply when using RES*Check*</u>**

Access Hatches and Doors (MANDATORY)

- Weatherstrip and insulate doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces)
  - Insulate to level equivalent to surrounding surfaces
    - e.g., required ceiling insulation = R-38; attic hatch insulated to R-38
- Provide access to all equipment that prevents damaging or compressing the insulation
- Install a wood framed or equivalent baffle or retainer when loose fill insulation is installed

Mass Walls - SELECTION

- What type
  - Concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth, ~~**and solid timber/logs**~~ (not by MUBEC)
- Provisions
  - At least 50% of the required R-value must be on the exterior or integral to the wall
  - When more than half the insulation is on the interior, the mass wall U-factors:

Climate Zones	U-Factor Maximum
1	0.17
2	0.14
3	0.12
4 except Marine	0.10
4 Marine	same as above grade frame wall
5-8	same as above grade frame wall

Steel-Frame – SELECT EQUIVALENTS

- Ceilings, walls, and floors
- Exceptions
  - Climate Zones 1 and 2: **ci** can be reduced to R-3 for 24” oc walls

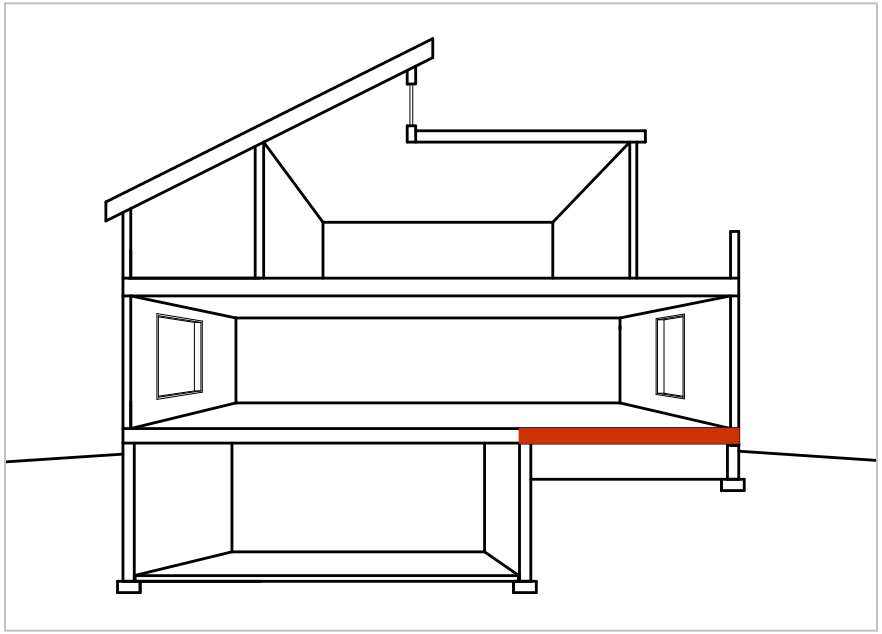
Table 402.2.5
Steel-Frame Ceiling, Wall and Floor Insulation (R-Value)

Wood Frame R-value	Cold-Formed Steel Equivalent R-value[a]
Steel Truss Ceilings[b]	
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[b]	
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 + 5 or R-15 +4, or R-21 +3 or R-0+10
R-19 ☹	R-13 + 9 or R-19 +8 or R-25 +7
R-21	R-13 +10 or R-19 +9 or R-25 +8
Steel Joist Floor	
R-13	R-19, 2x6 R-19 + 6 in 2x8 or 2x10
R-19	R-19 + 6 in 2x6 R-19 +12 in 2x8 or 2x10

Floors over Unconditioned Space

- Space can be unheated basement or a crawlspace or outdoor air

Climate Zones	R-Value
1-2	13
3-4ab	19
4c-6	30*
7-8	38*

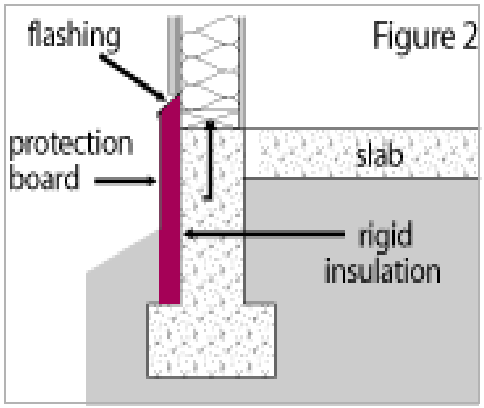


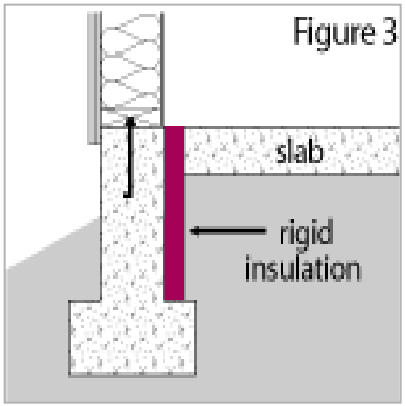
- Insulation must maintain permanent contact with underside of subfloor

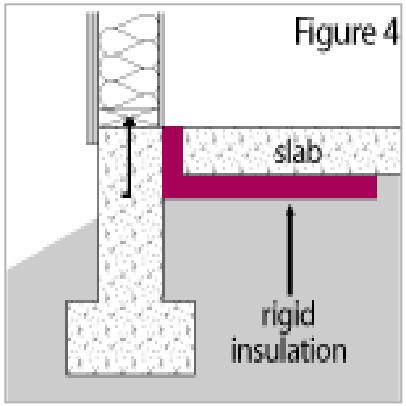
***Exception: Climate Zones 6 & 7 R-19 permitted if cavity is completely filled (note 'g')**

Slab Edge Insulation - SELECTION

- Slabs with a floor surface < 12 inches below grade
  - R-10 (typically 2 inches) insulation in Zones 4 and above
  - Downward from top of slab a minimum of 24” (Zones 4 and 5) or 48” (Zones 6, 7, and 8)
  - Insulation can be vertical or extend horizontally under the slab or out from the building (must be under 10 inches of soil)

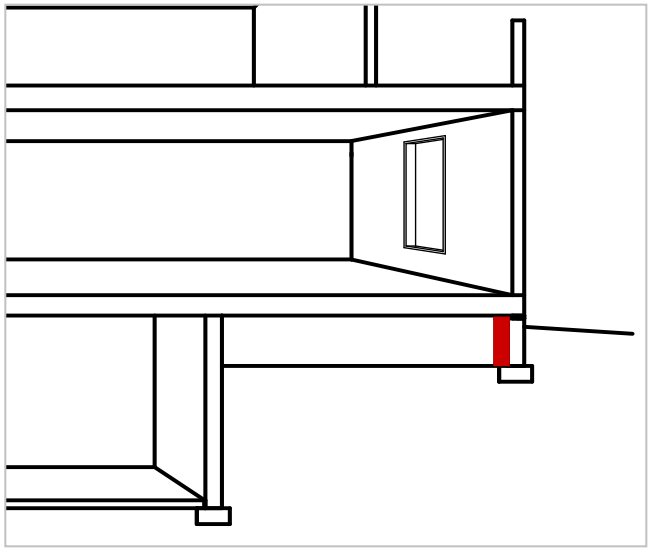




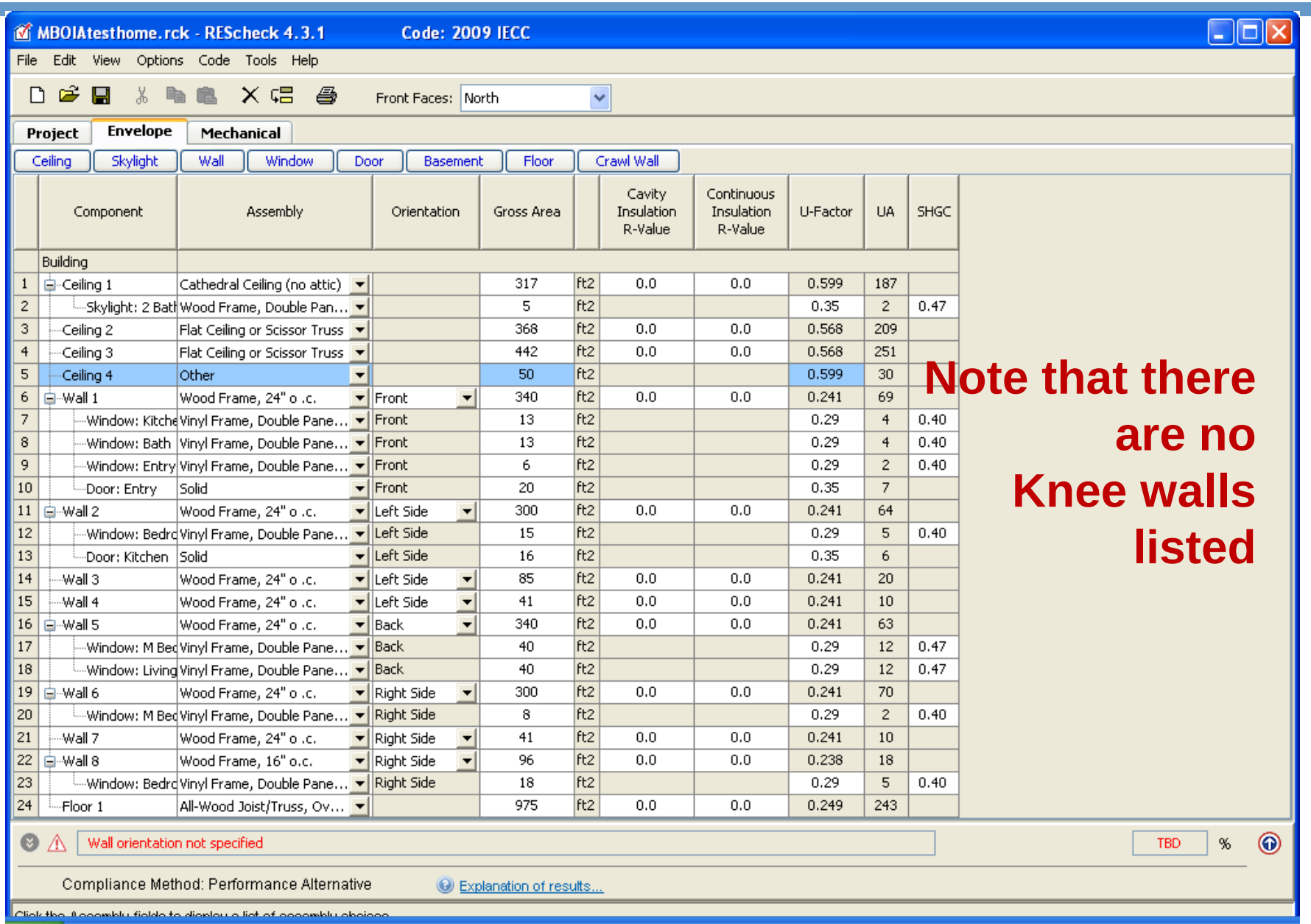


Crawlspace Wall Insulation - SELECTION

- Unvented Crawlspaces
  - Space should be mechanically vented or conditioned (See Section R408 of the IRC)
  - Cover exposed earth with a continuous Class I vapor retarder



AREA CALC – Transfers to RES*Check*



MBOIAtesthome.rck - REScheck 4.3.1 Code: 2009 IECC

File Edit View Options Code Tools Help

Front Faces: North

Project | Envelope | Mechanical

Ceiling | Skylight | Wall | Window | Door | Basement | Floor | Crawl Wall

	Component	Assembly	Orientation	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	SHGC
	Building									
1	Ceiling 1	Cathedral Ceiling (no attic)		317	ft2	0.0	0.0	0.599	187	
2	Skylight: 2 Bath	Wood Frame, Double Pan...		5	ft2			0.35	2	0.47
3	Ceiling 2	Flat Ceiling or Scissor Truss		368	ft2	0.0	0.0	0.568	209	
4	Ceiling 3	Flat Ceiling or Scissor Truss		442	ft2	0.0	0.0	0.568	251	
5	Ceiling 4	Other		50	ft2			0.599	30	
6	Wall 1	Wood Frame, 24" o .c.	Front	340	ft2	0.0	0.0	0.241	69	
7	Window: Kitche	Vinyl Frame, Double Pane...	Front	13	ft2			0.29	4	0.40
8	Window: Bath	Vinyl Frame, Double Pane...	Front	13	ft2			0.29	4	0.40
9	Window: Entry	Vinyl Frame, Double Pane...	Front	6	ft2			0.29	2	0.40
10	Door: Entry	Solid	Front	20	ft2			0.35	7	
11	Wall 2	Wood Frame, 24" o .c.	Left Side	300	ft2	0.0	0.0	0.241	64	
12	Window: Bedrc	Vinyl Frame, Double Pane...	Left Side	15	ft2			0.29	5	0.40
13	Door: Kitchen	Solid	Left Side	16	ft2			0.35	6	
14	Wall 3	Wood Frame, 24" o .c.	Left Side	85	ft2	0.0	0.0	0.241	20	
15	Wall 4	Wood Frame, 24" o .c.	Left Side	41	ft2	0.0	0.0	0.241	10	
16	Wall 5	Wood Frame, 24" o .c.	Back	340	ft2	0.0	0.0	0.241	63	
17	Window: M Bed	Vinyl Frame, Double Pane...	Back	40	ft2			0.29	12	0.47
18	Window: Living	Vinyl Frame, Double Pane...	Back	40	ft2			0.29	12	0.47
19	Wall 6	Wood Frame, 24" o .c.	Right Side	300	ft2	0.0	0.0	0.241	70	
20	Window: M Bed	Vinyl Frame, Double Pane...	Right Side	8	ft2			0.29	2	0.40
21	Wall 7	Wood Frame, 24" o .c.	Right Side	41	ft2	0.0	0.0	0.241	10	
22	Wall 8	Wood Frame, 16" o.c.	Right Side	96	ft2	0.0	0.0	0.238	18	
23	Window: Bedrc	Vinyl Frame, Double Pane...	Right Side	18	ft2			0.29	5	0.40
24	Floor 1	All-Wood Joist/Truss, Ov...		975	ft2	0.0	0.0	0.249	243	

Wall orientation not specified

TBD %

Compliance Method: Performance Alternative

Explanation of results...

Note that there are no Knee walls listed

MOVING ROWS TO CORRECT LOCATION

To Select:

- CLICK ON ROW #

To Move with Mouse:

- Move pointer over selected row
- Click and hold (drag & drop)
- Move up or down over wall/ceiling where it is located on the plans (red highlight)
- Let it go (drop)

Air Leakage Control – The Report

Mandatory Requirements

- Building envelope
  - Sealed with caulking materials or
  - Closed with gasketing systems
  - Joints and seams sealed or taped or covered with a moisture vapor-permeable wrapping material

Air Sealing and Insulation

- 2 options to demonstrate compliance
  - When tested air leakage is <7 ACH when tested with a blower door at pressure of 33.5 psf (Section 402.4.2.1)
    - Testing after rough-in and installation of building envelope penetrations
  - When items listed in Table 402.4.2, applicable to the method of construction, are field verified (Section 402.4.2.2) through inspection

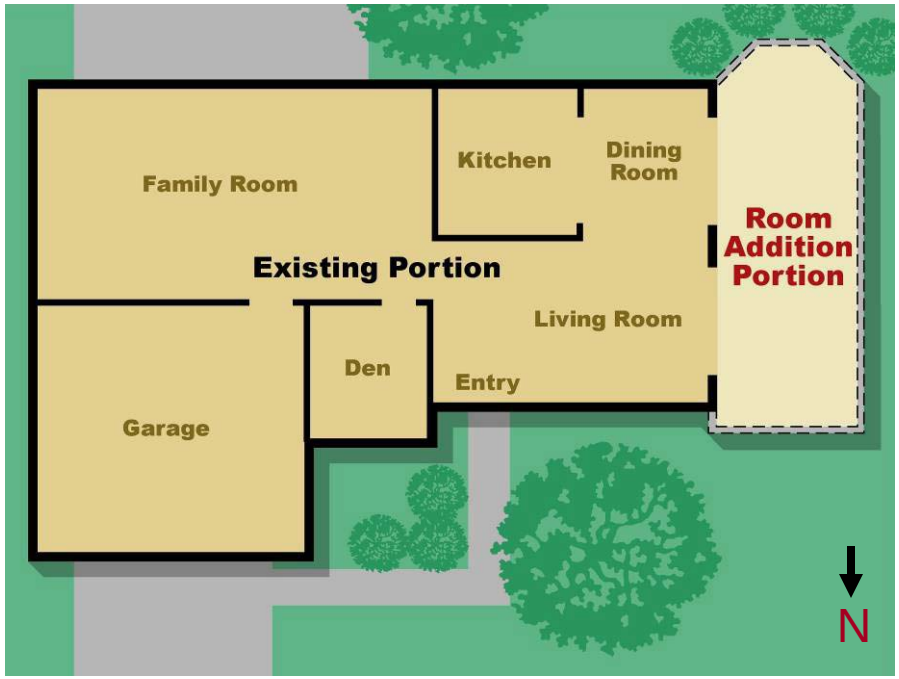
Recessed Lighting Fixtures

Mandatory Requirements

- Type IC rated and labeled in a sealed or gasketed enclosure
- Type IC rated and labeled as meeting ASTM E 283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm of air movement
- Sealed with a gasket or caulk between the housing and interior wall or ceiling covering
- (GWB box eliminated)

Additions - CONSIDERATIONS

- Treat as a stand-alone building
- Additions must meet the prescriptive requirements in Table 402.1.1



RES*Check* DOESN'T DO Sunrooms

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

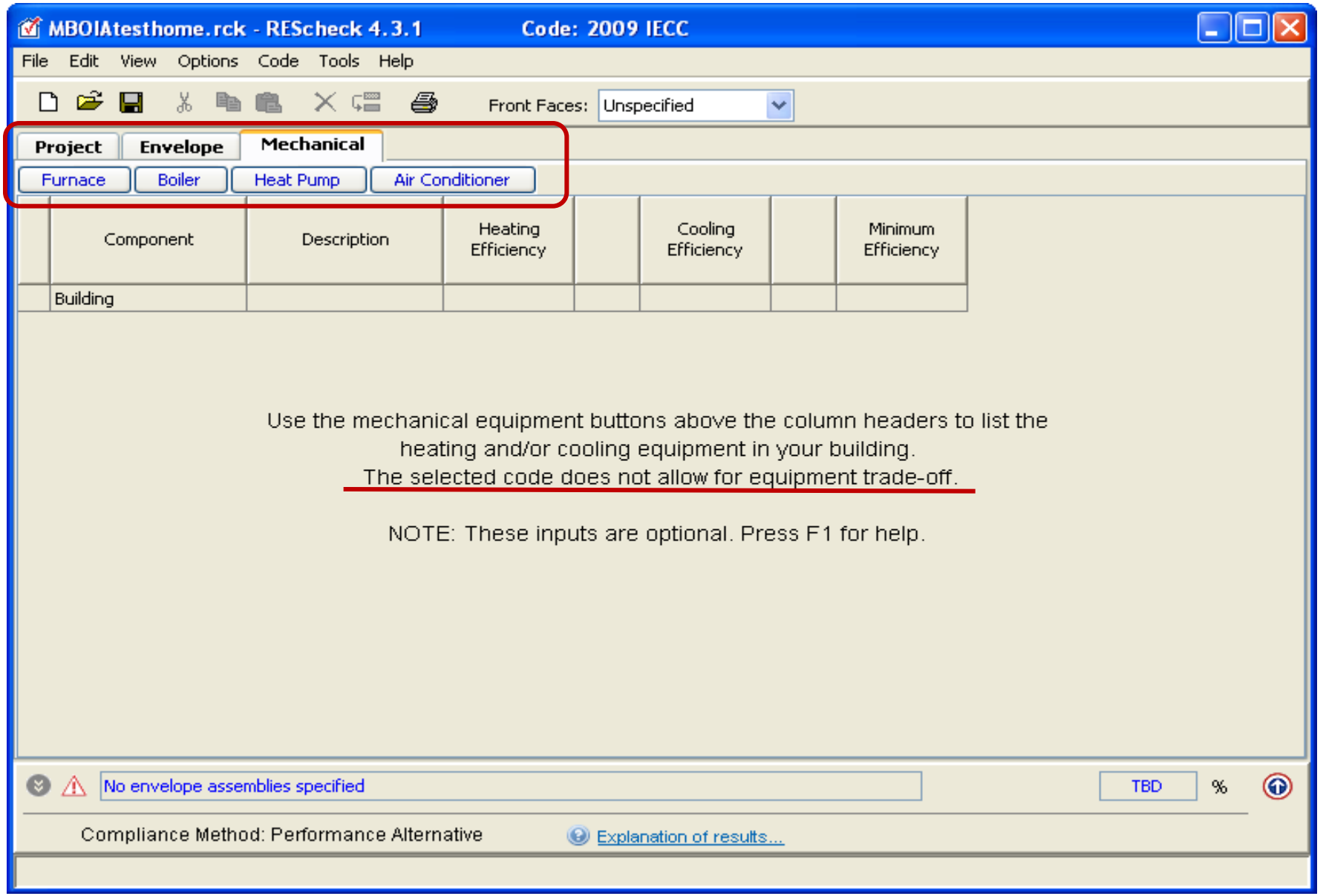
Sunroom definition:

- Glazing area >40% glazing of gross exterior wall and roof area
- Separate heating or cooling system or zone
- Must be thermally isolated (closeable doors or windows to the rest of the house)

Mechanical Systems & Equipment

- Equipment efficiency set by Federal law, not the I-Codes
- Calls for SELECTIONS of HVAC and Service Water ONLY if OPTIONS chosen
- No major effects, unlike prior RES*Checks*

HVAC – The Mechanical Tabs



Ventilation and Equipment Sizing

Mandatory Requirements

- **Ventilation**
  - Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating
- **Equipment Sizing**
  - IECC references Section M1401.3 of the IRC (MUBEC deletes Chapter 14)
  - Load calculations shall be performed in accordance with **ACCA Manual 'J'** or other approved methods
  - Load calculations determine the proper capacity (size) of equipment – **ACCA 'S'**
    - **Goal is "big enough to ensure comfort but no bigger – right-sized"**

DESIGN LOADS / EQUIPMENT SIZING

ACCA Standards

- **J – Load Calculations**
- **S – Equipment Selections**
- **D – Duct Design**

- "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

Ducts

- **Insulation** (Prescriptive)
  - Ducts outside the building envelope: R-8
  - All other ducts: R-6
  - **Exception:** all HVAC system inside the envelope

- **Sealing** (Mandatory)
  - Joints and seams shall comply with IRC, Section M1601.4.1 **(MUBEC deletes – use UL 181A)**
- Building framing cavities shall not be used as supply ducts

Duct Tightness Tests - (Section 403.2.2)

Mandatory Requirements

- All ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed

- Duct tightness shall be verified *by either* –
  - Post construction test
  - Or Rough-in test

    - **Exception: Duct tightness test is not required if the air handler and all ducts are located within conditioned space**

POOL HEATERS – No Standing Pilots

Lighting Equipment (MANDATORY)

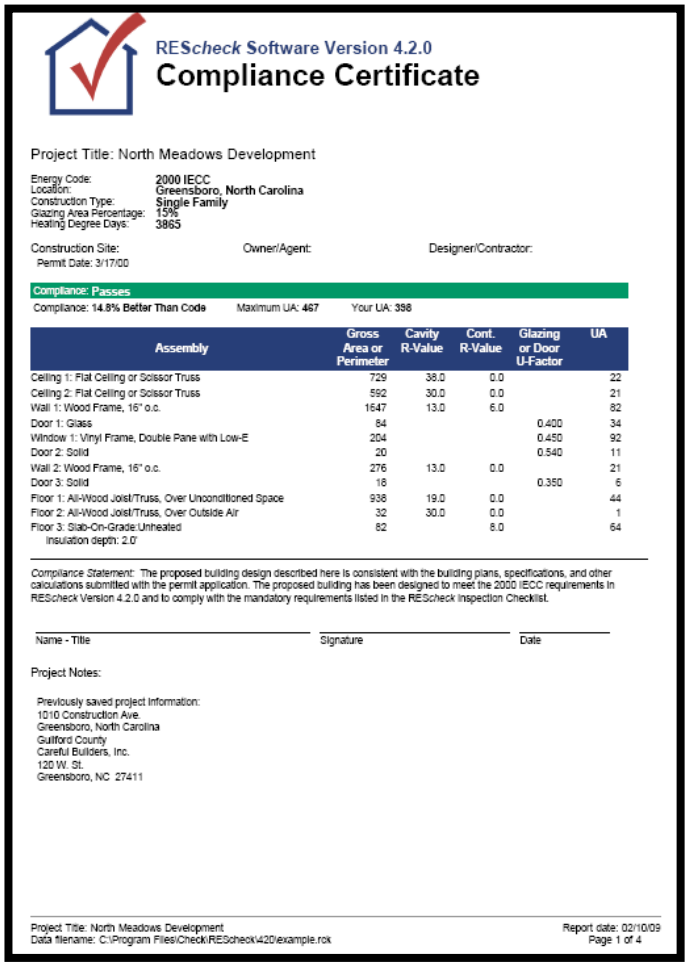
- A minimum of 50 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps (Section 404.1)

Simulated Performance Alternative

- Requires computer software with specified capabilities (local official may approve other tools)
- Section 405 specifies “ground rules”
  - These will generally be “hidden” in compliance software calculation algorithms
  - Very similar ground rules are used in home federal tax credits and ENERGY STAR Home guidelines
- Includes both envelope and equipment
- Allows greatest flexibility. Credits features such as:
  - High efficiency furnaces, air-conditioners, etc.
  - Tight ducts (must be leak tested) or hydronic systems
  - Exterior shading, favorable orientation, thermal mass, SHGC, etc.

Compliance Report

- Project Information
- Building Components
- Compliance Statement
- Project Notes



RES*check* 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: Owner/Agent: Designer/Contractor:
Permit Date: 3/17/00

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 RES*check* Version 4.2.0 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Name - Title Signature Date

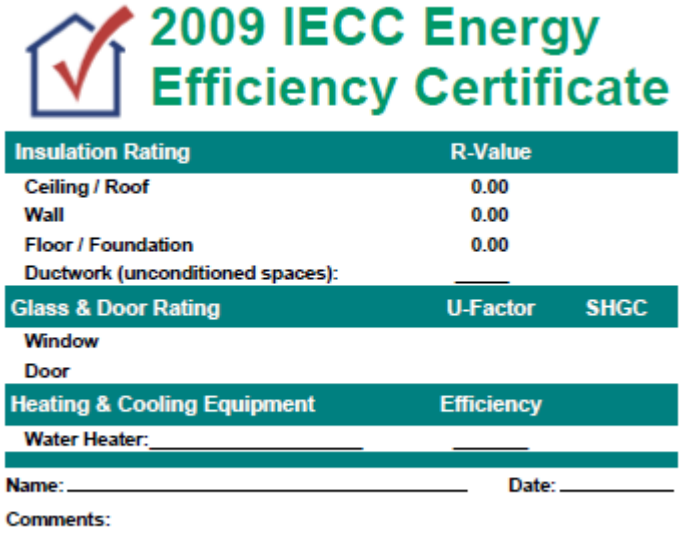
Project Notes:

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

Project Title: North Meadows Development
Data filename: C:\Program Files\Check\REScheck\420\example.rck
Report date: 02/10/09
Page 1 of 4

CERTIFICATE – Prints with Report

- Includes the following:
  - R-values of insulation installed for the thermal building envelope including ducts outside conditioned spaces
  - U-factors for fenestration
  - SHGC for fenestration
  - HVAC efficiencies/types
  - SWH equipment
- Permanently posted on the electrical distribution panel
- Don’t cover or obstruct the visibility of other required labels



2009 IECC Energy Efficiency Certificate

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

Glass & Door Rating	U-Factor	SHGC
Window		
Door		

Heating & Cooling Equipment	Efficiency
Water Heater:_____	_____

Name: _____ Date: _____

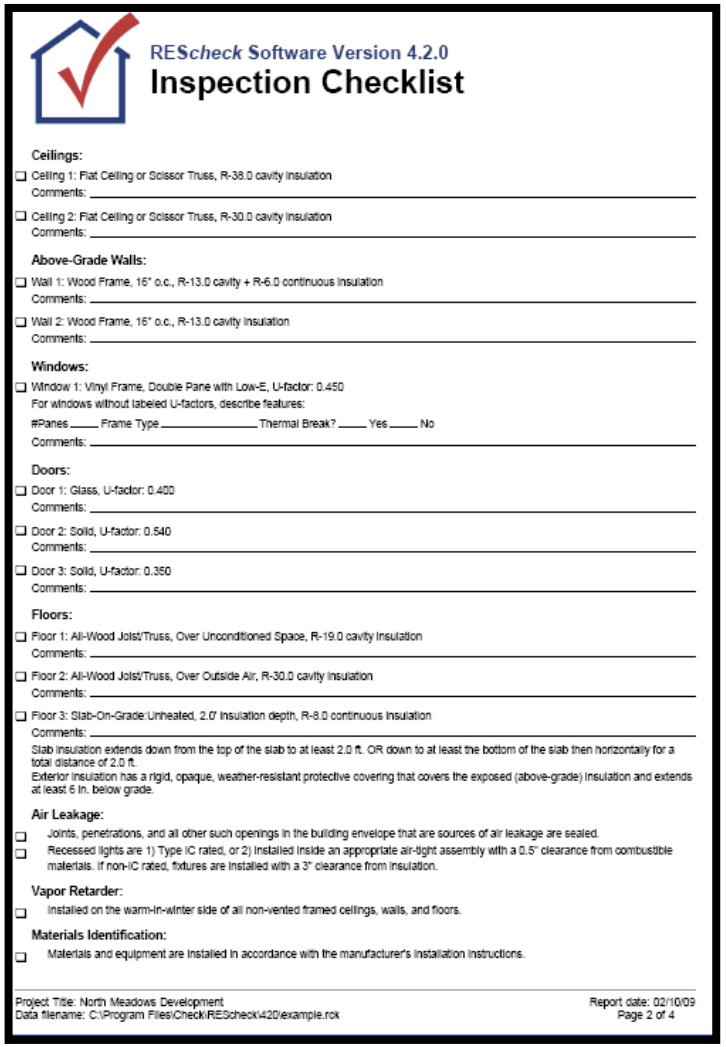
Comments:

Certificate (cont'd)

- States if a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed
  - Certificate lists gas-fired unvented room heater, electric furnace or baseboard electric heater
- No efficiency listed for the above systems

Inspection Checklist

- Mandatory requirements
  - Program presumes these requirements are met



RES*check* Software Version 4.2.0

Inspection Checklist

Ceilings:

☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-38.0 cavity insulation
Comments: _____

☐ Ceiling 2: Flat Ceiling or Scissor Truss, R-30.0 cavity insulation
Comments: _____

Above-Grade Walls:

☐ Wall 1: Wood Frame, 16" o.c., R-13.0 cavity + R-6.0 continuous insulation
Comments: _____

☐ Wall 2: Wood Frame, 16" o.c., R-13.0 cavity insulation
Comments: _____

Windows:

☐ Window 1: Vinyl Frame, Double Pane with Low-E, U-factor: 0.450
For windows without labeled U-factors, describe features:
#Panes ____ Frame Type _____ Thermal Break? ____ Yes ____ No
Comments: _____

Doors:

☐ Door 1: Glass, U-factor: 0.400
Comments: _____

☐ Door 2: Solid, U-factor: 0.540
Comments: _____

☐ Door 3: Solid, U-factor: 0.350
Comments: _____

Floors:

☐ Floor 1: All-Wood Joist/Truss, Over Unconditioned Space, R-19.0 cavity insulation
Comments: _____

☐ Floor 2: All-Wood Joist/Truss, Over Outside Air, R-30.0 cavity insulation
Comments: _____

☐ Floor 3: Slab-On-Grade:Unheated, 2.0' insulation depth, R-8.0 continuous insulation
Comments: _____
Slab insulation extends down from the top of the slab to at least 2.0 ft. OR down to at least the bottom of the slab then horizontally for a total distance of 2.0 ft.
Exterior insulation has a rigid, opaque, weather-resistant protective covering that covers the exposed (above-grade) insulation and extends at least 6 in. below grade.

Air Leakage:

☐ Joints, penetrations, and all other such openings in the building envelope that are sources of air leakage are sealed.

☐ Recessed lights are 1) Type IC rated, or 2) installed inside an appropriate air-tight assembly with a 0.5" clearance from combustible materials. If non-IC rated, fixtures are installed with a 3" clearance from insulation.

Vapor Retarder:

☐ Installed on the warm-in-winter side of all non-vented framed ceilings, walls, and floors.

Materials Identification:

☐ Materials and equipment are installed in accordance with the manufacturer's installation instructions.

Project Title: North Meadows Development
Data filename: C:\Program Files\Check\REScheck\420\example.rck

Report date: 02/10/09
Page 2 of 4

BUILDING ENERGY CODES UNIVERSITY

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Residential Requirements of the 2009 International Energy Conservation Code

www.energycodes.gov/university

PNNL-SA-65859

UNDERSTANDING RESCheck

THANK YOU

Don Vigneau, AIA

www.neep.org

Northeast Energy Efficiency Partnerships

91 Hartwell Avenue, Lexington, MA 02421

P: 781.860.9177 Ext.136