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RES*check*™ Basics

PAM COLE

U.S. Department of Energy - Building Energy Codes Program
AIA Provider #: I014
AIA Course #: EC16-M03
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PNNL-SA-116714

Course Description

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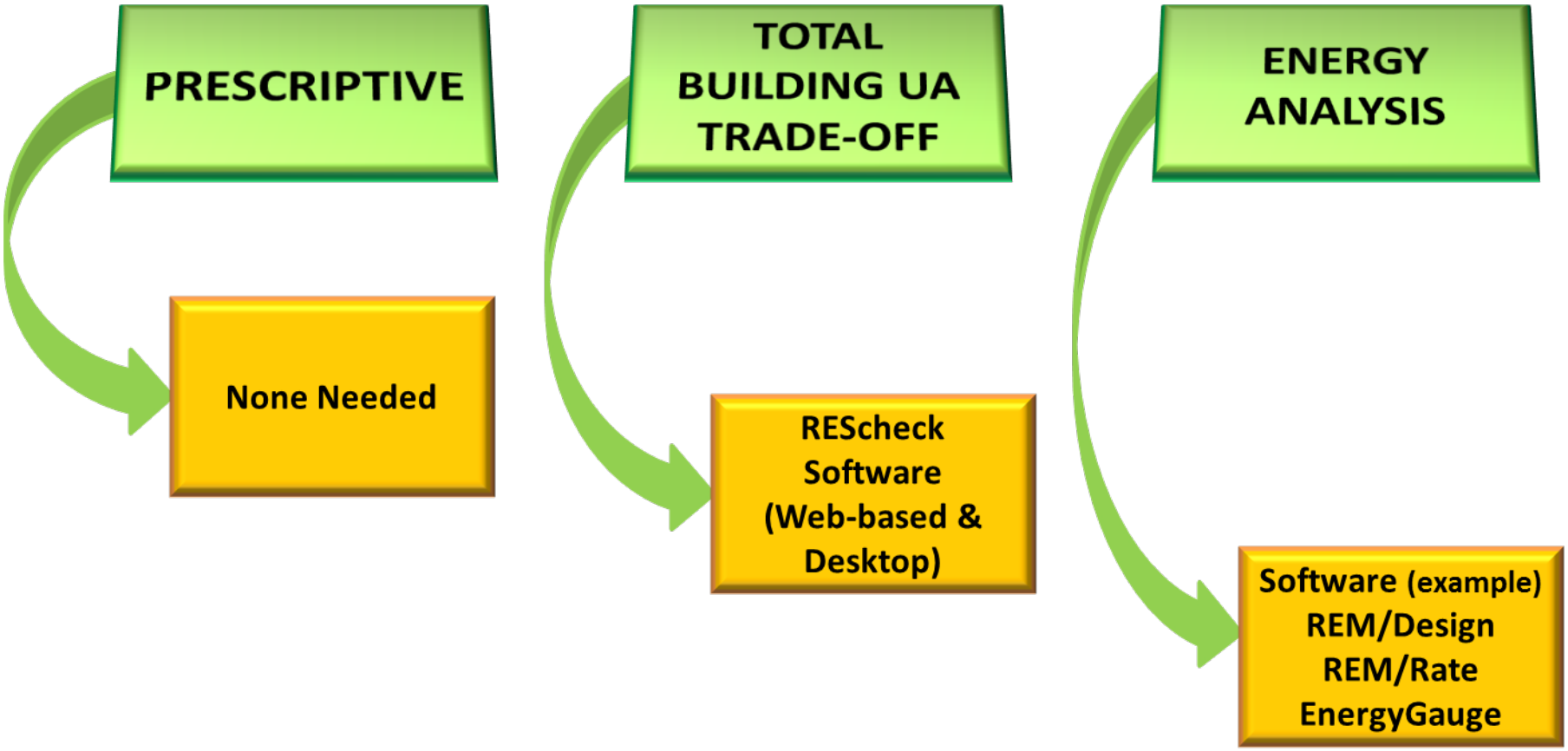
Basics of using the RES*check* software, reviewing generated compliance reports, and the latest and greatest new features.

CONTINUING EDUCATION
AIA

Learning Objectives

1. Obtain an overview of the basic functions and how RES*check* calculates compliance for the building envelope.
2. Be able to identify the construction specifications needed to complete a compliance calculation in the software.
3. Learn how to enter the building envelope components into the software.
4. Understand how the compliance reports are created and what they entail.

Energy Code Compliance Tools



www.energycodes.gov

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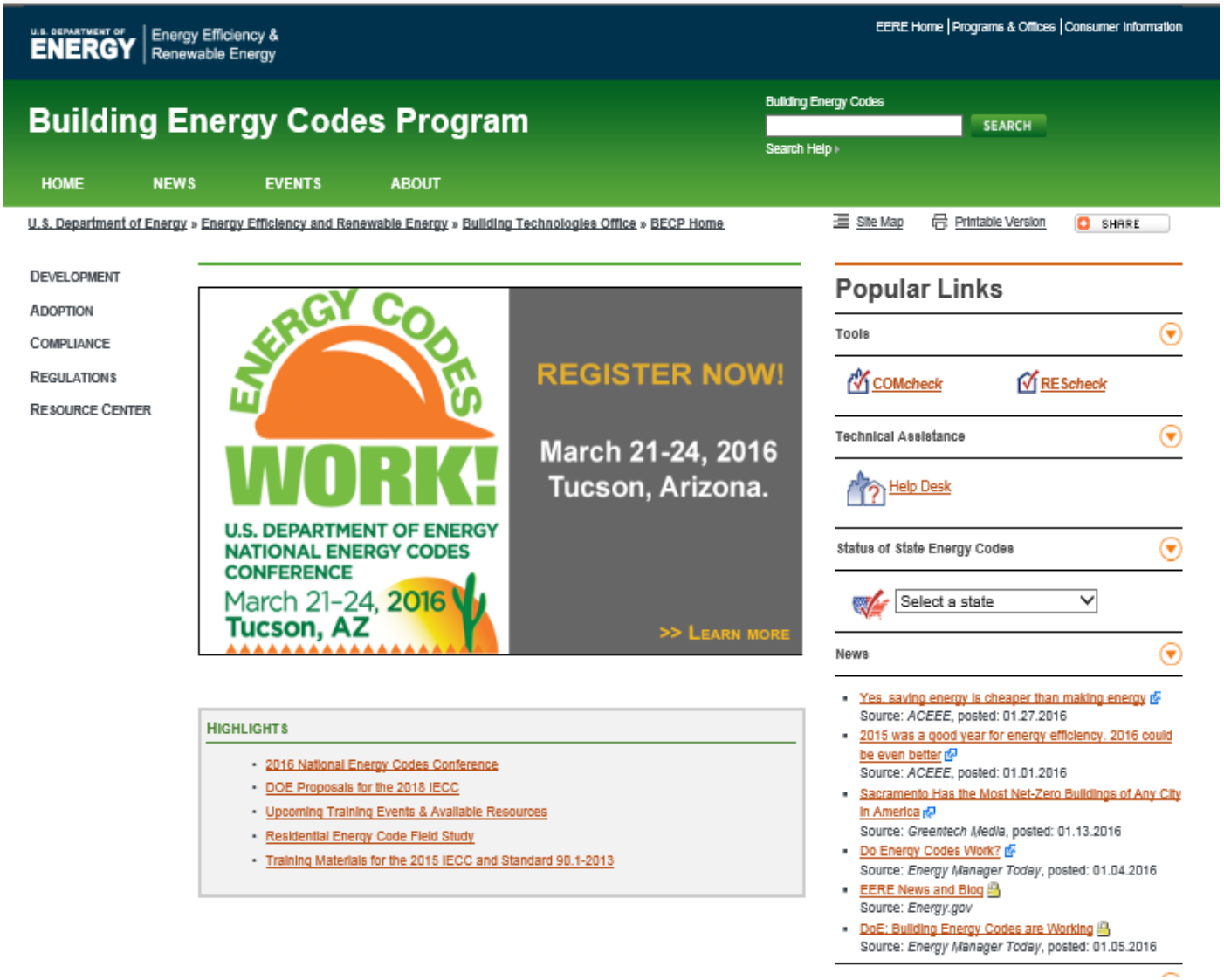

RES*check* Page

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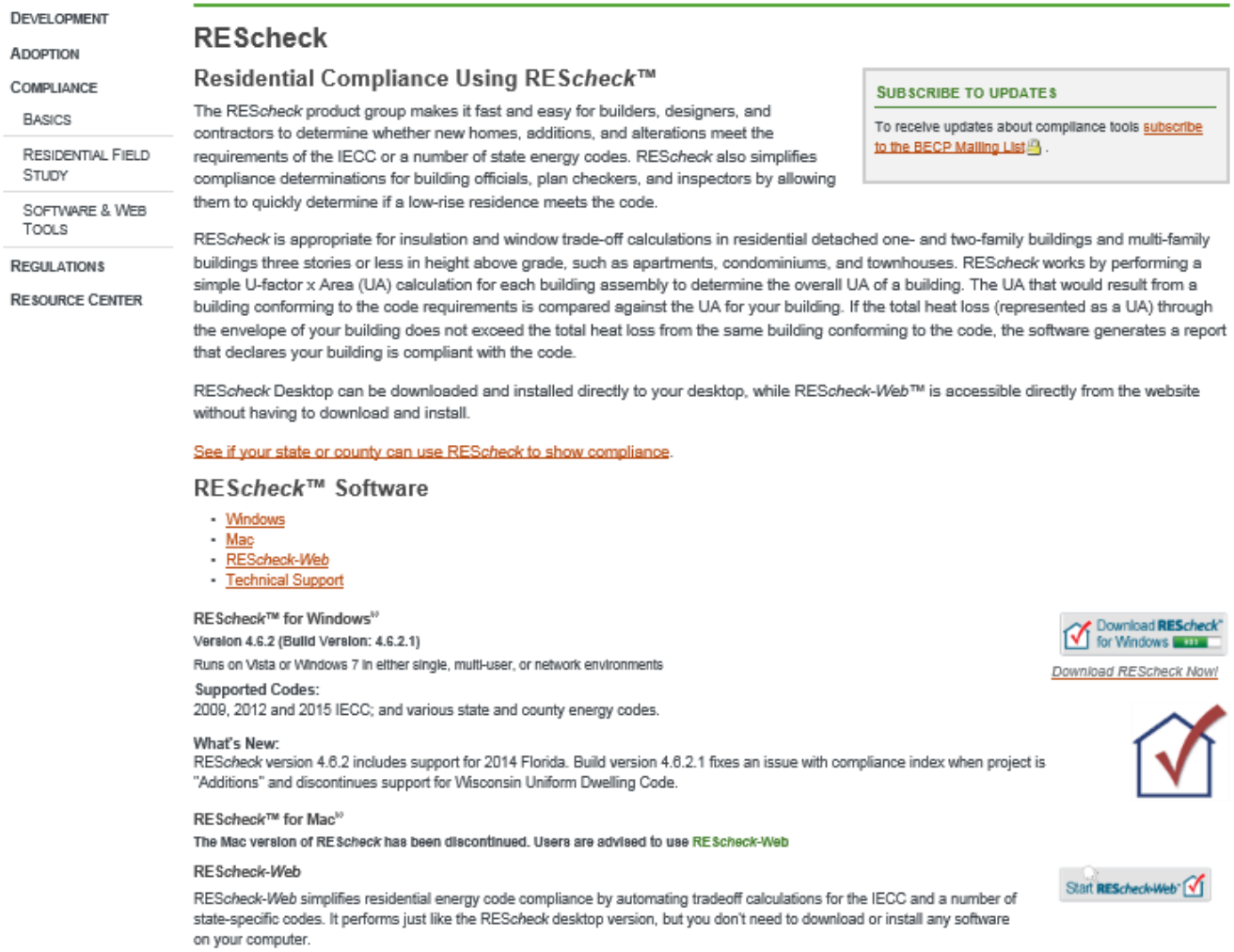
https://www.energycodes.gov/rescheck



DEVELOPMENT
ADOPTION
COMPLIANCE
BASICS
RESIDENTIAL FIELD STUDY
SOFTWARE & WEB TOOLS
REGULATIONS
RESOURCE CENTER

REScheck

Residential Compliance Using RES*check*™

The RES*check* product group makes it fast and easy for builders, designers, and contractors to determine whether new homes, additions, and alterations meet the requirements of the IECC or a number of state energy codes. RES*check* also simplifies compliance determinations for building officials, plan checkers, and inspectors by allowing them to quickly determine if a low-rise residence meets the code.

SUBSCRIBE TO UPDATES

To receive updates about compliance tools subscribe to the BECP Mailing List.

RES*check* is appropriate for insulation and window trade-off calculations in residential detached one- and two-family buildings and multi-family buildings three stories or less in height above grade, such as apartments, condominiums, and townhouses. RES*check* works by performing a simple U-factor x Area (UA) calculation for each building assembly to determine the overall UA of a building. The UA that would result from a building conforming to the code requirements is compared against the UA for your building. If the total heat loss (represented as a UA) through the envelope of your building does not exceed the total heat loss from the same building conforming to the code, the software generates a report that declares your building is compliant with the code.

RES*check* Desktop can be downloaded and installed directly to your desktop, while RES*check-Web*™ is accessible directly from the website without having to download and install.

See if your state or county can use RES*check* to show compliance.

RES*check*™ Software

- Windows
- Mac
- RES*check-Web*
- Technical Support

RES*check*™ for Windows
Version 4.6.2 (Build Version: 4.6.2.1)
Runs on Vista or Windows 7 in either single, multi-user, or network environments

Download REScheck for Windows

Download REScheck Now!

Supported Codes:
2009, 2012 and 2015 IECC; and various state and county energy codes.

What's New:
RES*check* version 4.6.2 includes support for 2014 Florida. Build version 4.6.2.1 fixes an issue with compliance index when project is "Additions" and discontinues support for Wisconsin Uniform Dwelling Code.

RES*check*™ for Mac
The Mac version of RES*check* has been discontinued. Users are advised to use RES*check-Web*

RES*check-Web*

RES*check-Web* simplifies residential energy code compliance by automating tradeoff calculations for the IECC and a number of state-specific codes. It performs just like the RES*check* desktop version, but you don't need to download or install any software on your computer.

Start REScheck-Web

REScheck

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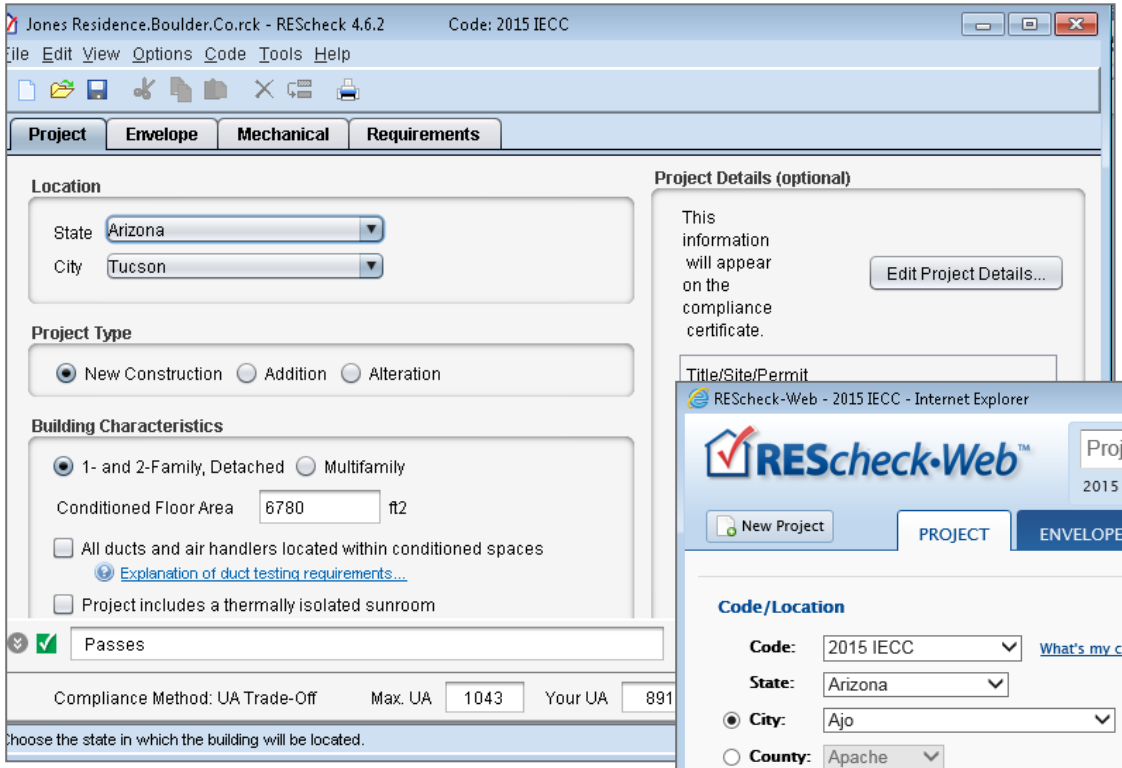
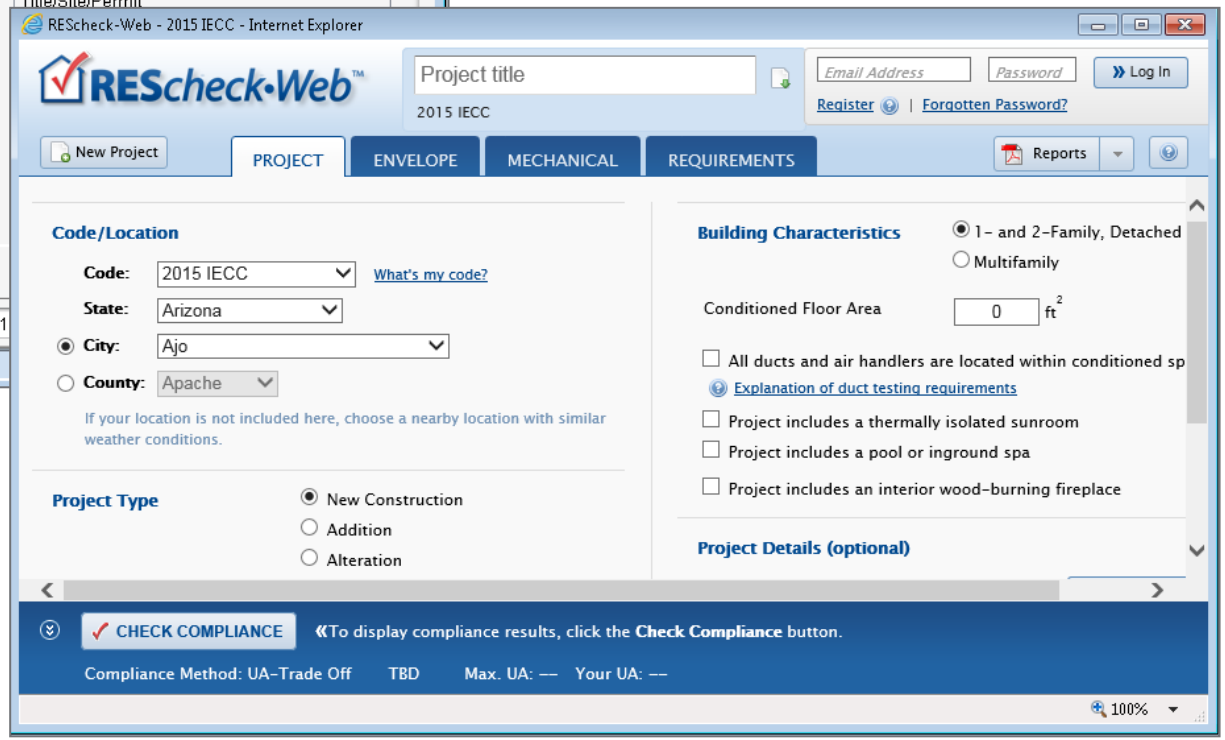


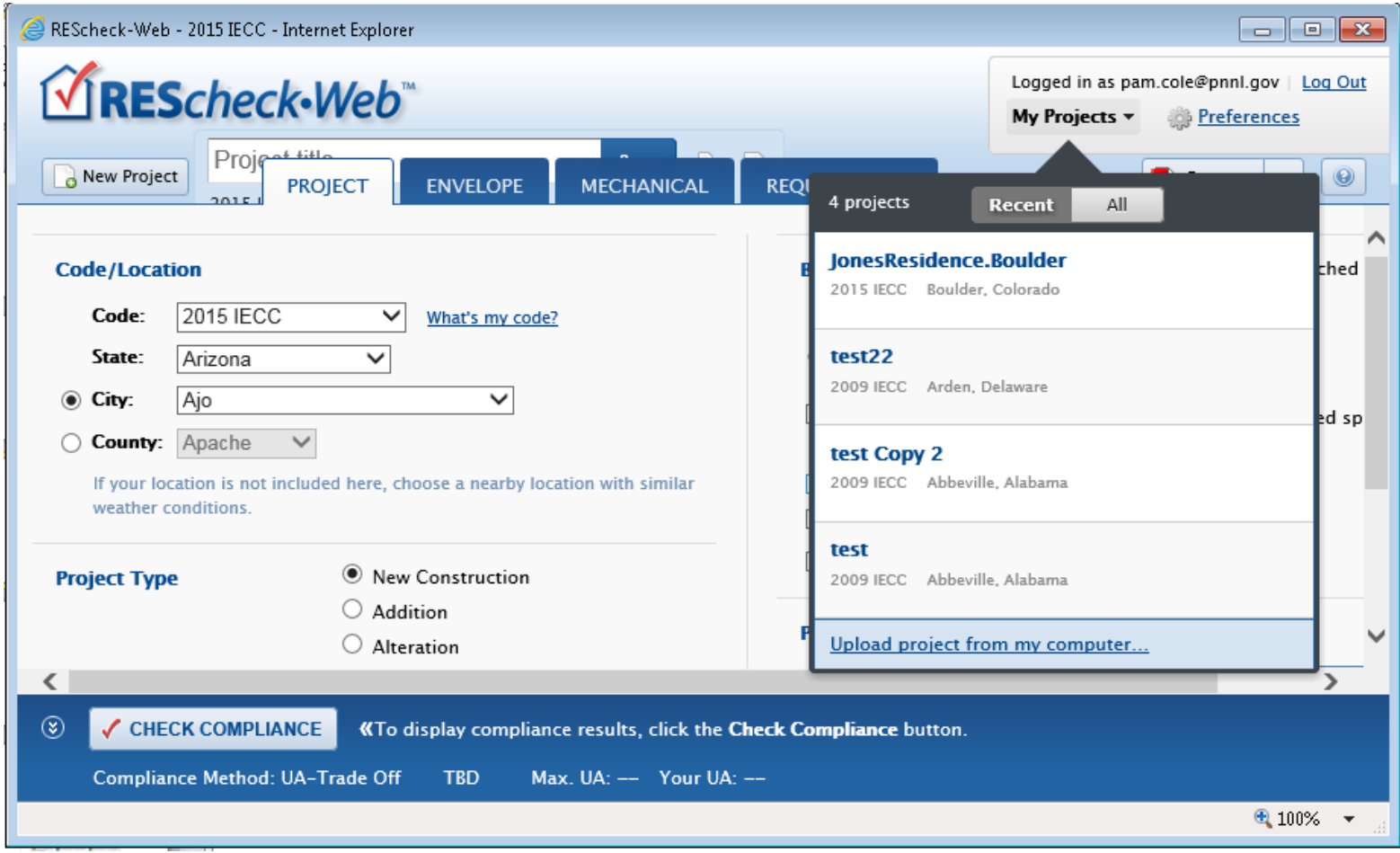
"DESKTOP"



WEB

Data Exchange

- Can exchange files between desktop and web
  - Log in to web
  - My Projects



Walkthrough RES*check* Steps

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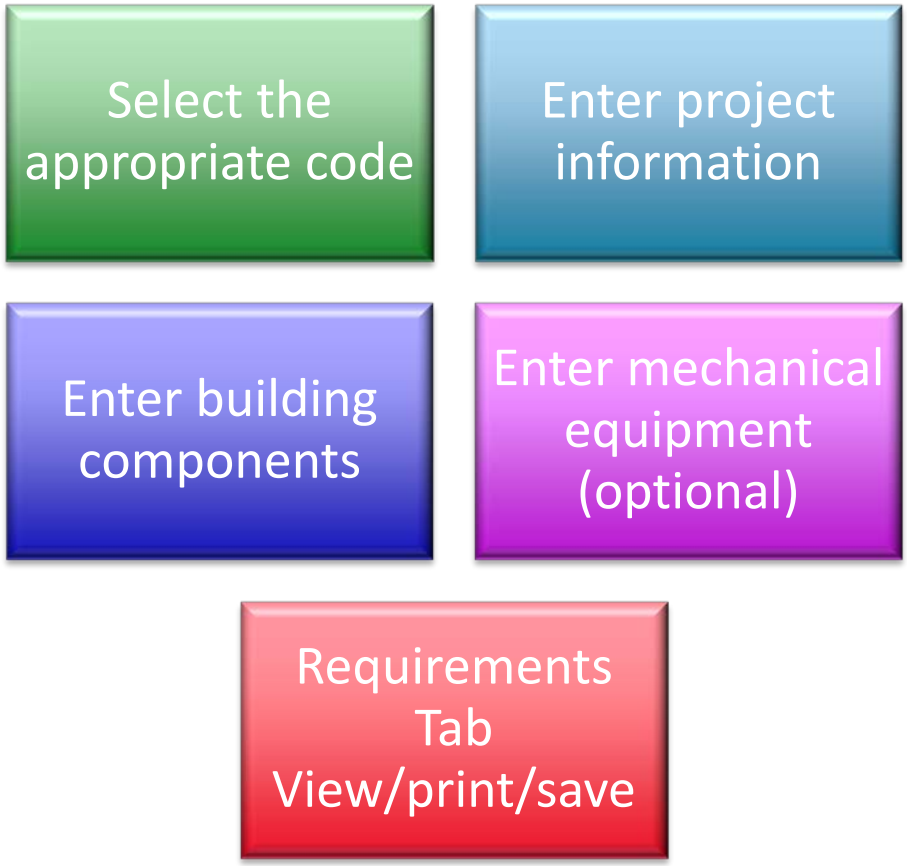

Select the Appropriate Code

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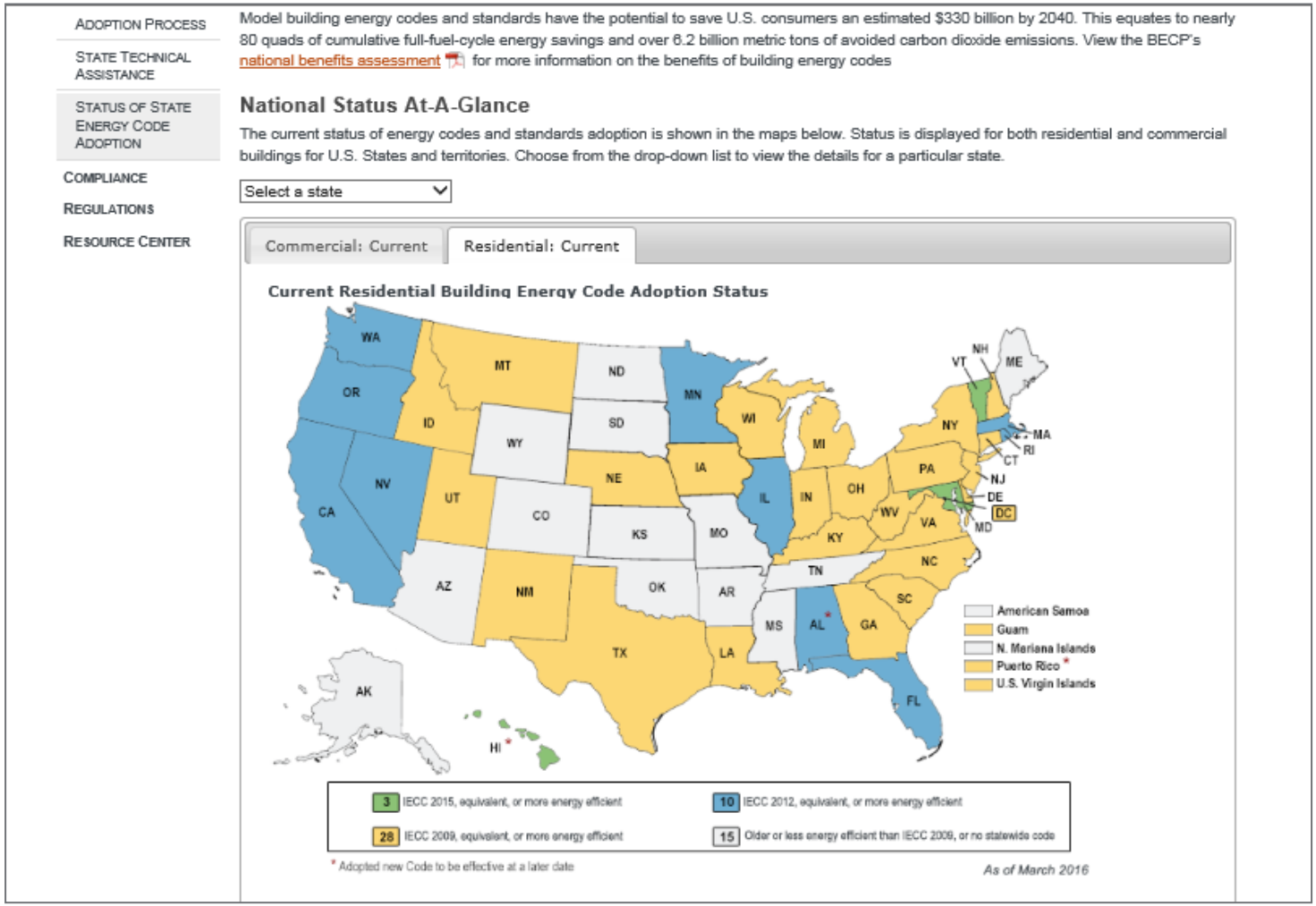
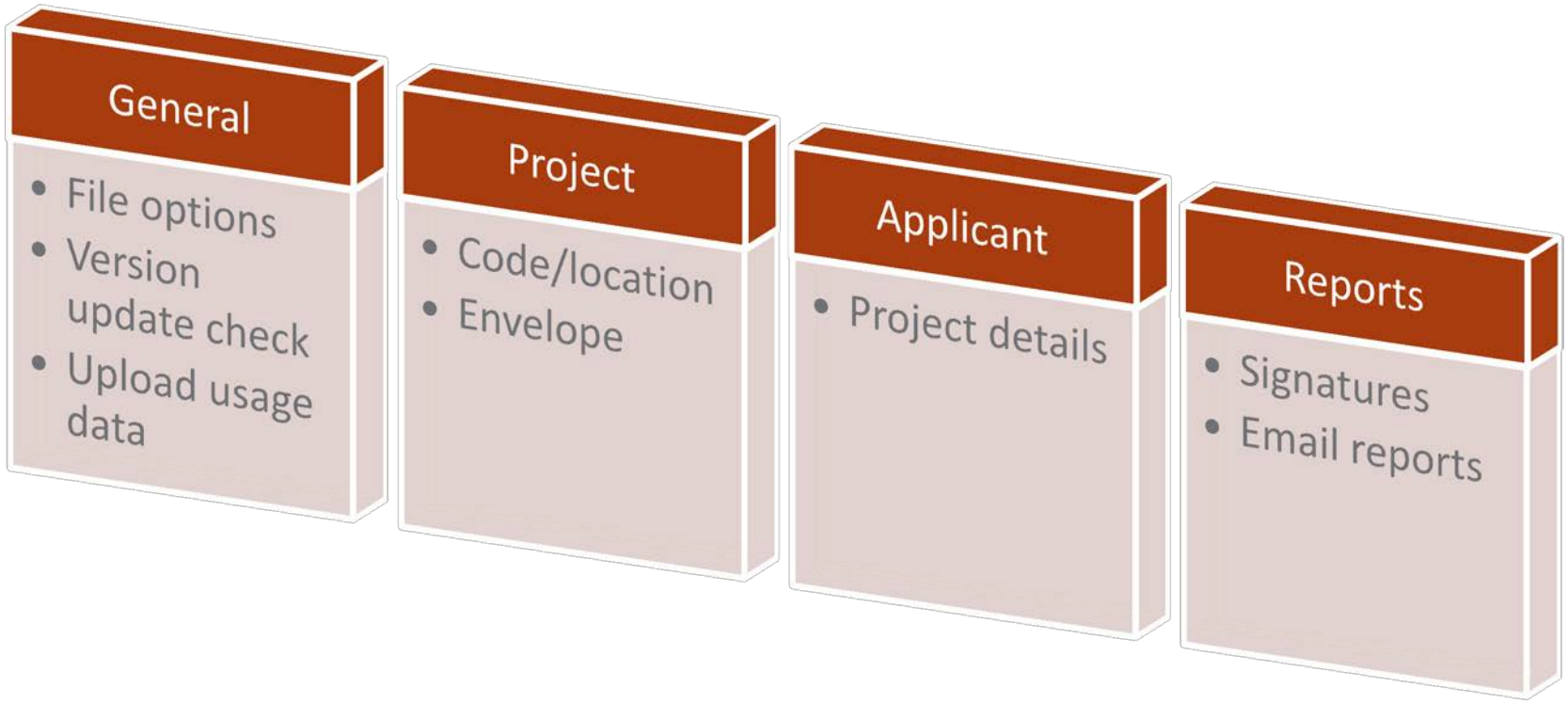
- Applicable to your state/ jurisdiction (Code menu)

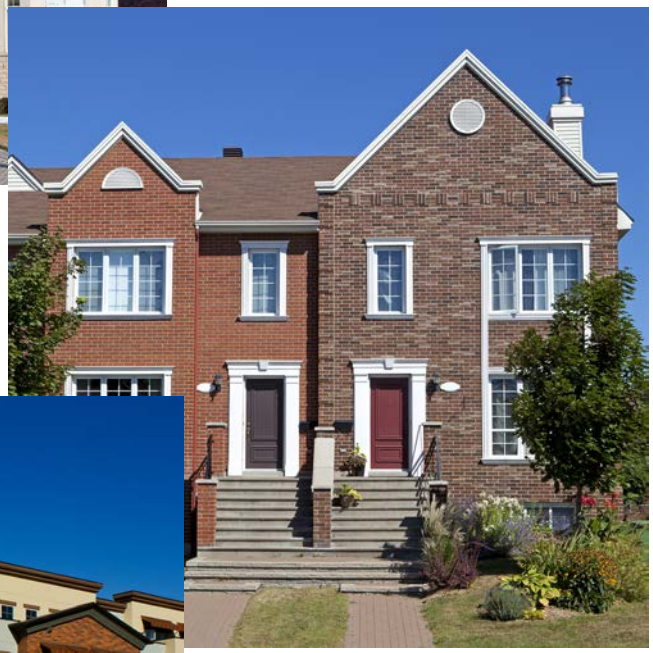


Preferences



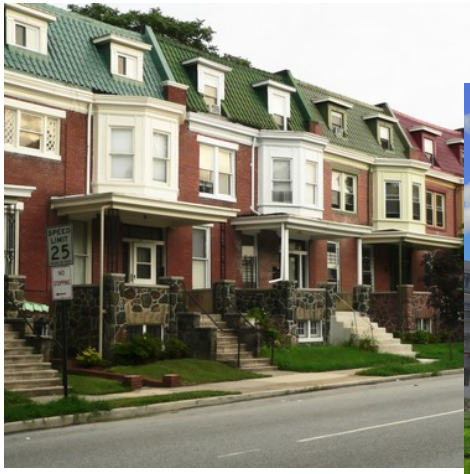
Project Information

- Project Location
  - City/County
- Project Type
  - Single Family
  - Multi Family
  - Addition
  - Alteration
- Project Details
  - Optional
  - Get printed on reports



Project Information – Helpful Hints

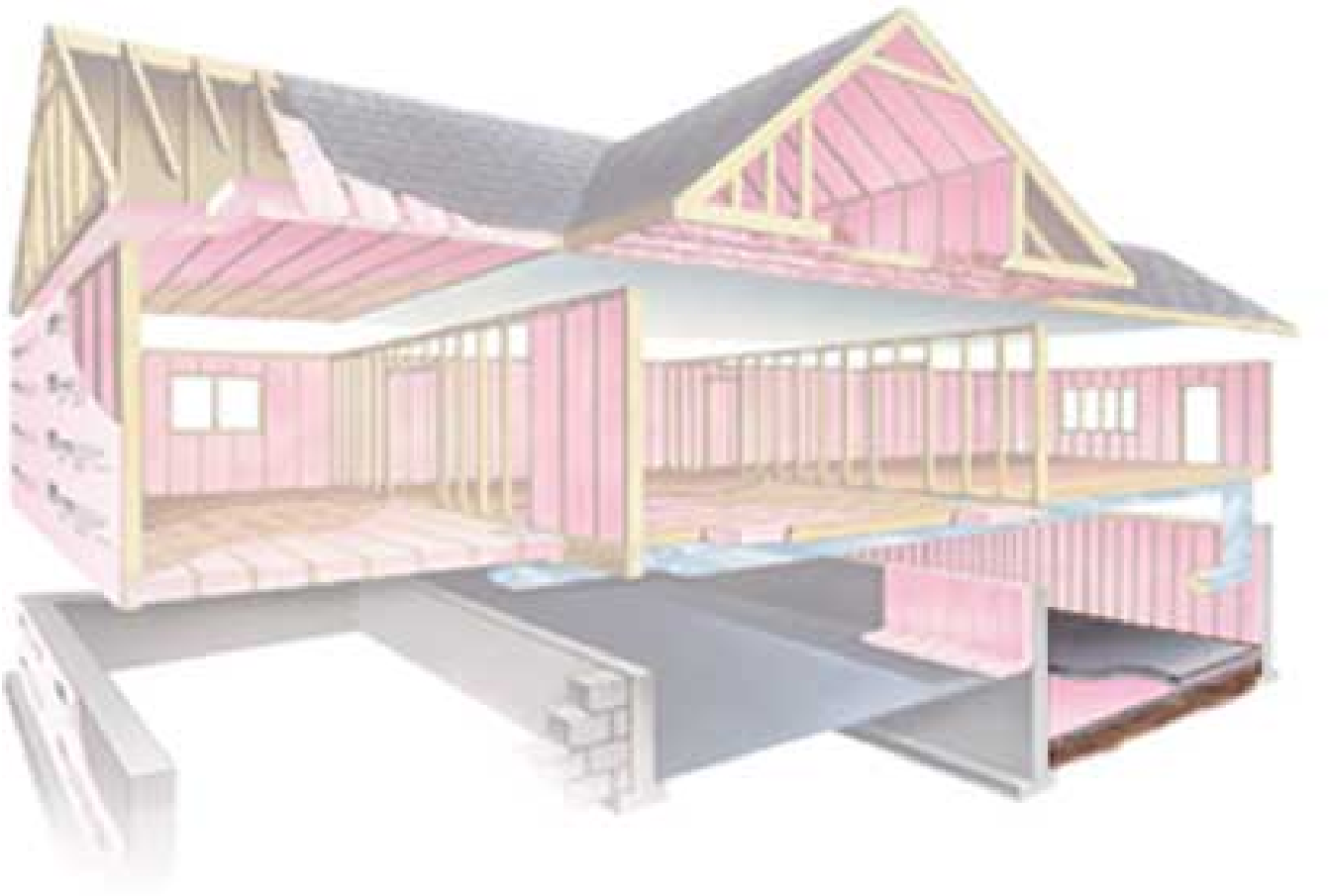
- Multifamily if
  - All multifamily buildings three stories or less in height above grade and
  - Contain three or more attached dwelling units
  - Examples
    - Apartments
    - Condominiums
    - Townhouses
    - Dormitories
    - Rowhouses



Project Information – Helpful Hints

- Select Addition or Alteration on Project screen
- Additions
  - Addition only
  - Addition plus existing home
- Alterations
  - Exemptions may apply

What is the Building Thermal Envelope?

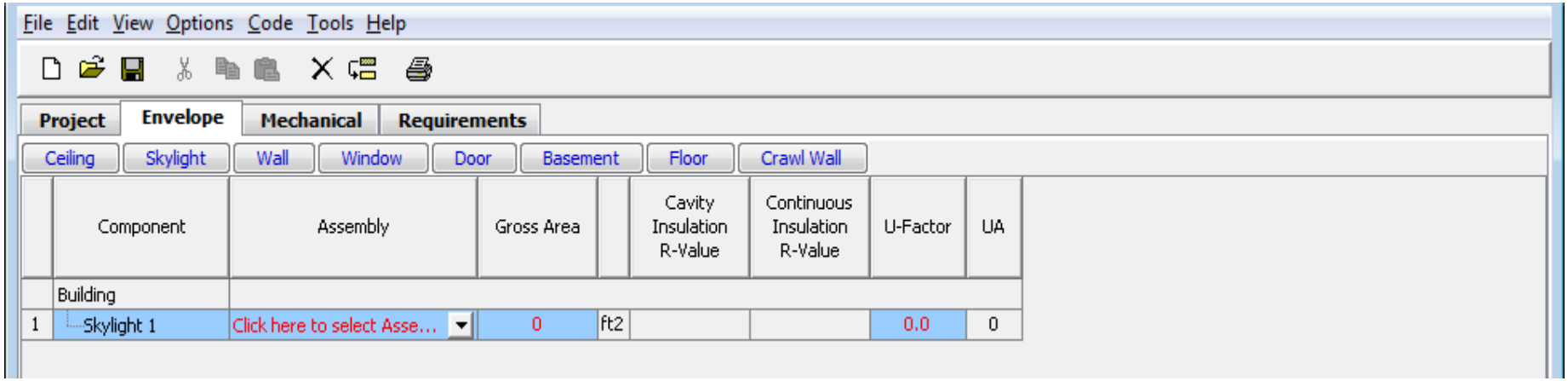


Entering Building Components

Enter only applicable building components

Envelope Helpful Hints

- Don't have to use every button
- Can group "like" components
- Gross area (except slab-on-grade)
  - Gross *wall* area to include peripheral edges of floors (area of band joist and subfloor between floors)
- Use "Other" assembly as needed



Envelope Helpful Hints, con't

- Fenestration ratings – U-factor and SHGC
- Cavity R-value – used for insulation placed between structural members
- Continuous R-value – used for insulation that is continuous across the structure (e.g., rigid insulation)
- After you've entered all building thermal envelope components, hit Check Compliance
  - Look for fields with red text
  - If no compliance results, look for missing data and make sure you've made an entry for Building Use type

SHGCs and U-Factors

Cavity vs. Continuous

Foundations – what button to use

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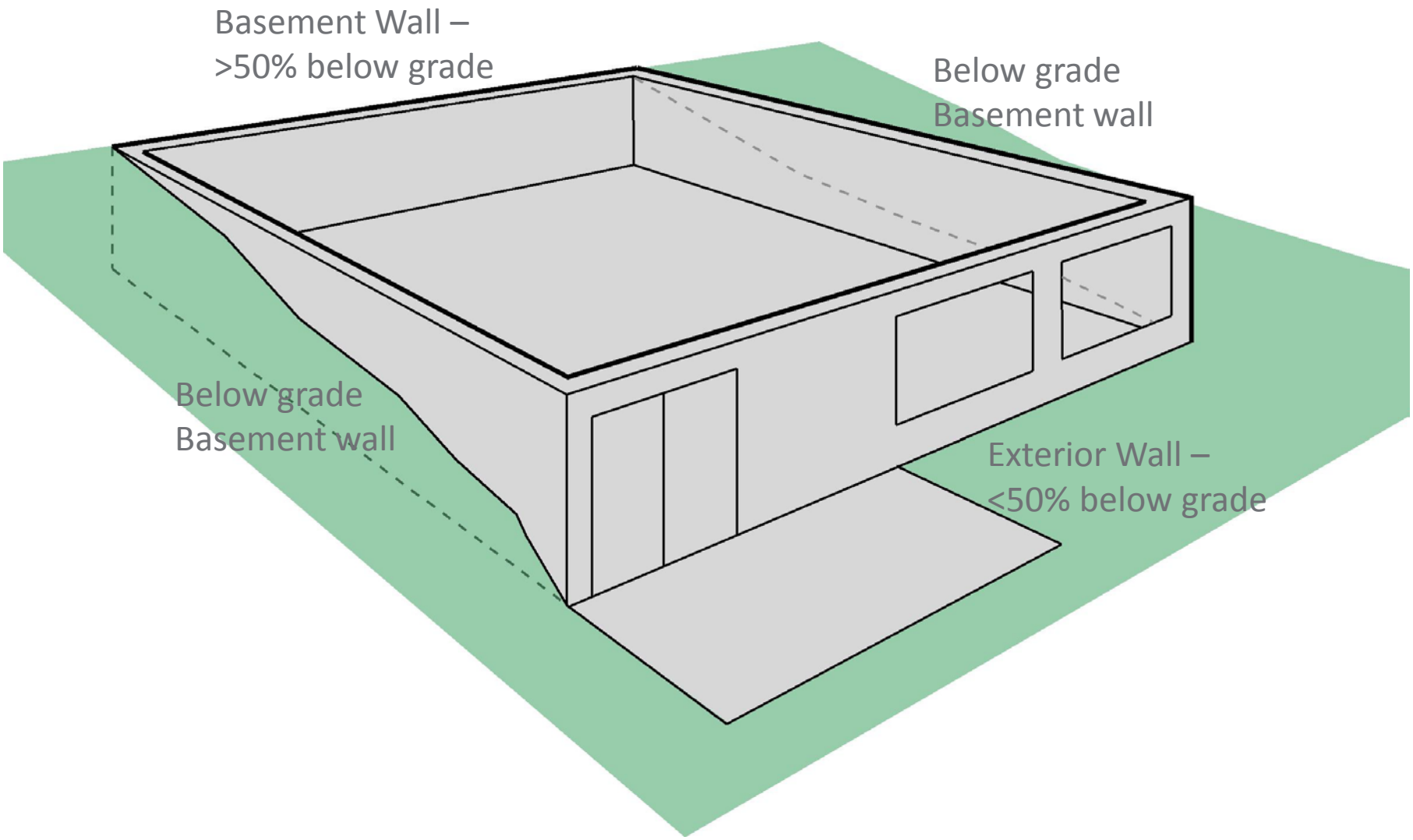
Basement	• Basement is conditioned
Floor	• Separates conditioned from unconditioned space
Crawl Wall	• Crawl space is not vented to the outside and floor above is NOT insulated

What's a Basement Wall?



Basements Helpful Hints

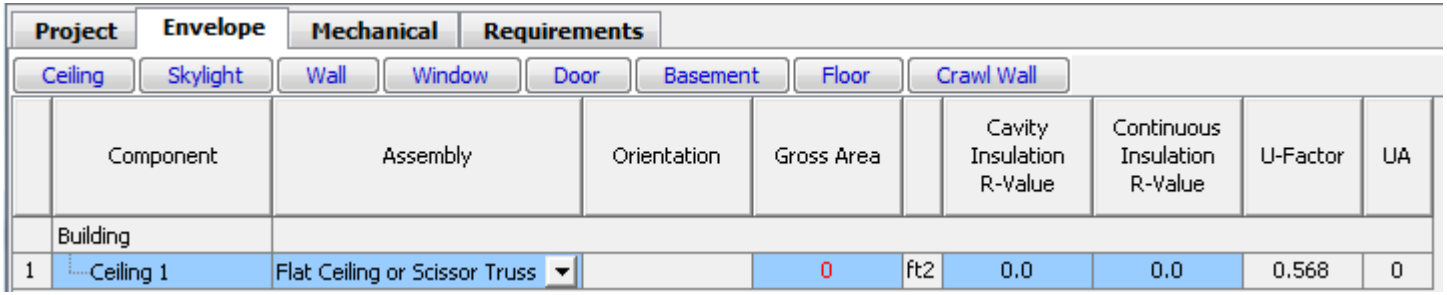
- Wall Height
  - from top of wall to basement floor
  - If not uniform, provide an average height
- Depth Below Grade
  - Depth that the wall extends from finished, outside grade surface to basement floor
  - If sloped or uneven, provide an average depth below grade

Basements Helpful Hints, con't

- Depth of Insulation
  - Requirements are for full depth of basement wall (to 10 ft); RES*check* allows trade offs
  - Measure from top of wall to where insulation stops
    - For a fully insulated wall, depth of insulation would be equal to height of the wall
  - If you enter insulation depth of 0, program assumes no insulation, regardless of values in the insulation fields
- Continuous Insulation
  - Software assumes it's exterior rigid
- Cavity Insulation
  - Software assumes you're furring out on the interior

Colors

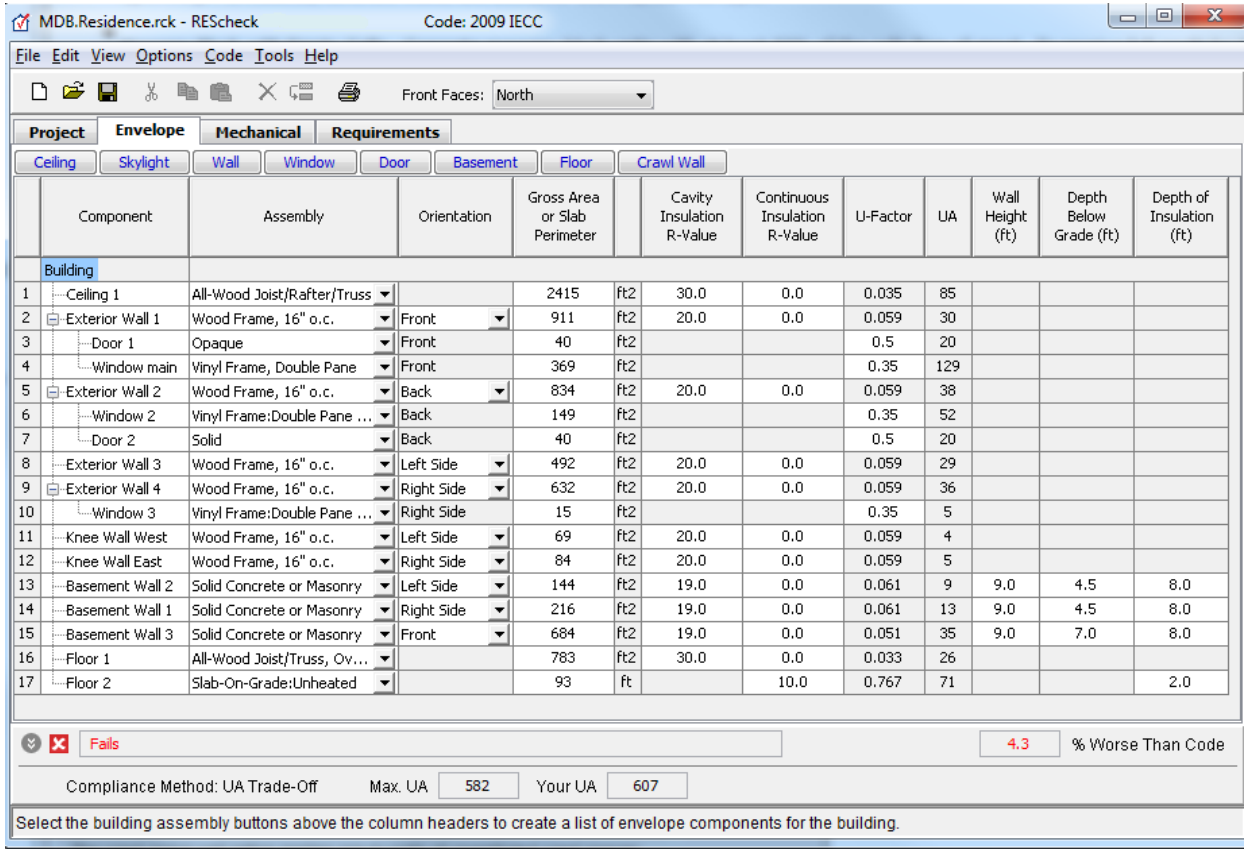
Red



Green

Blue

Screen Operations



Compliance Bar

Status Bar

Compliance - UA

- UA
  - U-factor x Area for each building assembly
  - UA from building conforming to code compared against your building UA

Compliance – Performance Alternative

- Performance alternative
  - Based on simulated performance of your building compared to an equivalent code building
  - Requires additional inputs (over UA approach): building orientation, minimum of four walls having unique orientations, and a minimum of one roof and floor
  - Check Compliance button
- Performance alternative considers the whole building energy performance, whereas UA trade-off method considers only the thermal conductance of envelope components

Compliance Failing – Helpful Hints

- Review building plans to ensure all components are entered correctly
- Confirm takeoffs (areas) are correct
- Confirm insulation values
  - Double check cavity vs. continuous entries
- Look at UA column *(next slide)*

Compliance Failing – Helpful Hints, con't

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Jones Residence.rck - REScheck 4.6.2 Code: 2015 IECC

File Edit View Options Code Tools Help

Project | Envelope | Mechanical | Requirements

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

	Component	Assembly	Gross Area or Slab Perimeter		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	SHGC	Wall Height (ft)	Depth Below Grade (ft)	Depth of Insulation (ft)
7	Door 2	Solid	40	ft2			0.5	20				
8	Wall 3	Wood Frame, 16" o.c.	492	ft2	20.0	0.0	0.059	29				
9	Wall 4	Wood Frame, 16" o.c.	632	ft2	20.0	0.0	0.059	36				
10	Window 3	Vinyl Frame:Double Pa...	15	ft2			0.35	5	0.25			
11	Knee Wall We	Wood Frame, 16" o.c.	69	ft2	20.0	0.0	0.059	4				
12	Knee Wall Ea	Wood Frame, 16" o.c.	84	ft2	20.0	0.0	0.059	5				
13	Basement Wa	Solid Concrete or Mas...	144	ft2	0.0	0.0	0.418	60		9.0	4.5	0.0
14	Basement Wa	Solid Concrete or Mas...	216	ft2	0.0	0.0	0.418	90		9.0	4.5	0.0
15	Basement Wa	Solid Concrete or Mas...	684	ft2	0.0	0.0	0.267	183		9.0	7.0	0.0
16	Floor 1	All-Wood Joist/Truss:O...	783	ft2	19.0	0.0	0.047	37				
17	Floor 2	Slab-On-Grade:Unhea...	93	ft		0.0	1.042	97				0.0

Fails 50.8 % Worse Than Code

Compliance Method: UA Trade-Off Max. UA 591 Your UA 891

Select the building assembly buttons above the column headers to create a list of envelope components for the building.

Requirements Tab

- Mandatory requirements
  - Air leakage
  - Building mechanical systems and equipment
  - Service water heating
  - Duct construction, insulation, testing
- For each requirement, the user
  - Notes that a code requirement is
    - Met
    - Exempt
    - Does not apply
  - Notes how compliance for applicable requirements are documented
- This information is shown on the report in the “Comments/ Assumptions” column of the Inspection Checklist

Reports

- File ⟹ View / Print Report
- Choices, choose any or all
  - Compliance Certificate
  - Inspection Checklist
  - Panel Certificate

Reports

- Implement Requirements tab
- Inspection checklists set up by phase of construction
  - Plan Review
  - Footing/Foundation
  - Rough-in
  - Final

Reports – Sample Compliance Certificate, con't

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REScheck Software Version 4.6.2

Compliance Certificate

Project Jones Residence - Plan 3677

Energy Code:	**2015 IECC**
Location:	**Tucson, Arizona**
Construction Type:	**Single-family**
Project Type:	**New Construction**
Conditioned Floor Area:	**6,780 ft2**
Glazing Area	**18%**
Climate Zone:	**2 (1447 HDD)**
Permit Date:	**March 15, 2016**
Permit Number:	

Construction Site:

Owner/Agent:
J.J. Jones

Verify energy code, location, construction type, and conditioned floor area

Compliance: Passes using UA trade-off

Compliance: **14.6% Better Than Code** Maximum UA: **1043** Your UA: **891** Maximum SHGC: **0.25** Your SHGC: **0.25**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	2,415	30.0	0.0	0.035	85
Wall 1: Wood Frame, 16" o.c.	911	20.0	0.0	0.059	30
Window 1: Vinyl Frame:Double Pane SHGC: 0.25	369			0.270	100
Door 1: Solid	40			0.500	20
Wall 2: Wood Frame, 16" o.c.	834	20.0	0.0	0.059	38

Reports – Sample Compliance Certificate, con't

SHGC: 0.25					
Door 2: Solid	40			0.500	20
Wall 3: Wood Frame, 16" o.c.	492	20.0	0.0	0.059	29
Wall 4: Wood Frame, 16" o.c.	632	20.0	0.0	0.059	36
Window 3: Vinyl Frame:Double Pane with Low-E SHGC: 0.25	15			0.350	5
Knee Wall West: Wood Frame, 16" o.c.	69	20.0	0.0	0.059	4
Knee Wall East: Wood Frame, 16" o.c.	84	20.0	0.0	0.059	5
Basement Wall 1: Solid Concrete or Masonry Wall height: 9.0' Depth below grade: 4.5' Insulation depth: 0.0'	144	0.0	0.0	0.418	60
Basement Wall 2: Solid Concrete or Masonry Wall height: 9.0' Depth below grade: 4.5' Insulation depth: 0.0'	216	0.0	0.0	0.418	

Project Title: Jones Residence - Plan 3677 Report date: 03/
Data filename: J:\NationalWorkshop\2016\Pre Conference Day\Jones Residence.rck Page 1

Verify Values are Consistent with Plans

	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Basement Wall Wall height: 9 Depth below g Insulation dep	684	0.0	0.0	0.267	183
Floor 1: All-Woo	783	19.0	0.0	0.047	37
Floor 2: Slab-On Insulation dep	93		0.0	1.042	97

Verify Compliance Statement is Signed

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 2015 IECC requirements in RES*check* Version 4.6.2 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Done Right Construction
Name - Title

Signature

Date

Envelope Sample Inspection Checklist

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2009 IECC	Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
402.1.1 [FO1][1]	Slab edge insulation R-value.	R-_____ ☐ Unheated ☐ Heated	R-_____ ☐ Unheated ☐ Heated	☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
303.2, 402.2.8 [FO2][1]	Slab edge insulation installed per manufacturer's instructions.			☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	Requirement will be met.
402.1.1 [FO3][1]	Slab edge insulation depth/length.	_____ ft	_____ ft	☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
402.1.1 [FO4][1]	Conditioned basement wall insulation R-value. Where internal insulation is used, verification may need to occur during Insulation Inspection. Not required in warm-humid locations in Climate Zone 3.	R-_____	R-_____	☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
303.2 [FO5][1]	Conditioned basement wall insulation installed per manufacturer's instructions.			☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	Requirement will be met.
402.2.7 [FO6][1]	Conditioned basement wall insulation depth of burial or distance from top of wall.	_____ ft	_____ ft	☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
303.2.1 [FO11][2]	A protective covering is installed to protect exposed exterior insulation and extends a minimum of 6 in. below grade.			☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	Requirement will be met.
403.8 [FO12][2]	Snow- and ice-melting system controls installed.			☐Complies ☐Does Not Comply ☐Not Observable ☐Not Applicable	

Envelope Sample Inspection Checklist, con't

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Code Section #

Value from Plans

Compliance

302.1, 403.7 [PR2]²	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr____ Cooling: Btu/hr____	Heating: Btu/hr____ Cooling: Btu/hr____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable

Inspection Type

Value from Field

Panel Certificate

2015 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Above-Grade Wall	20.00
Below-Grade Wall	0.00
Floor	19.00
Ceiling / Roof	30.00
Ductwork (unconditioned spaces):	_____

Glass & Door Rating	U-Factor	SHGC
Window	0.27	0.25
Door	0.50	

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

Name:_____ Date:_____

Comments

AreaCalc

- RES*check* desktop
- Calculates building areas
- Areas can be transferred into RES*check*

Case Study – RES*check* Software

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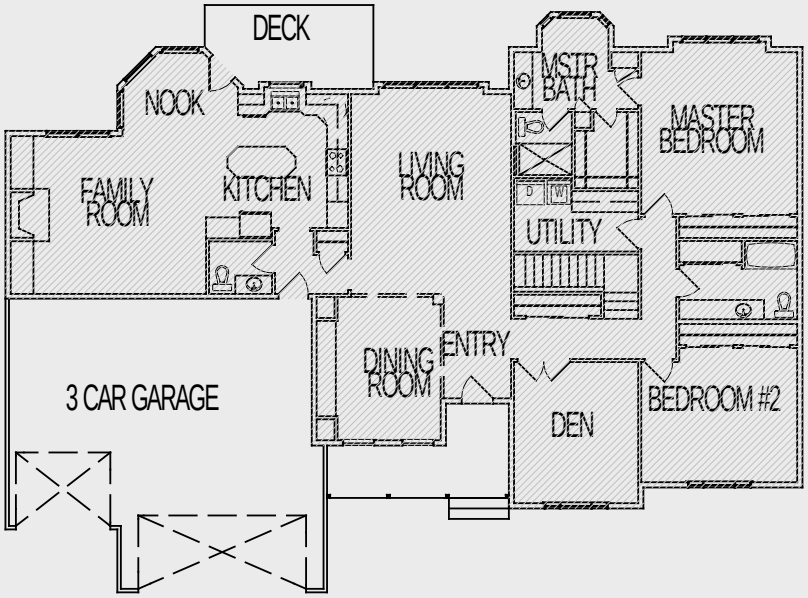
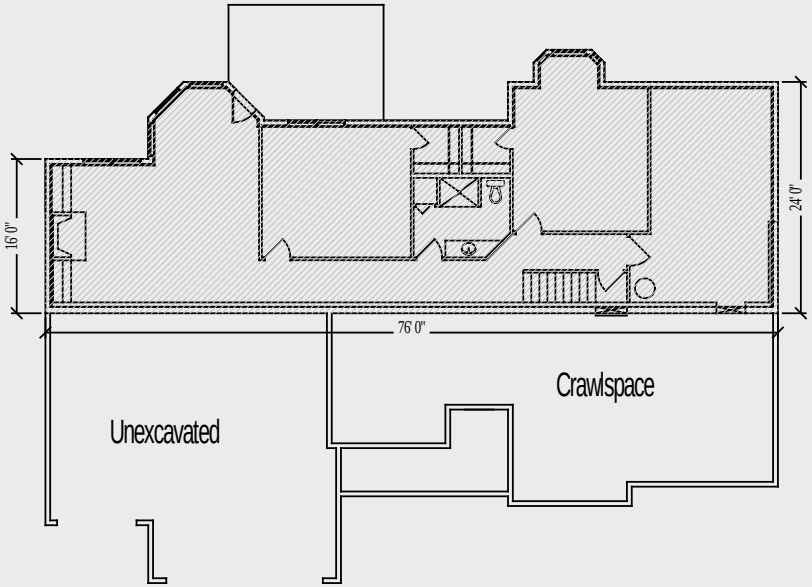
Jones Residence

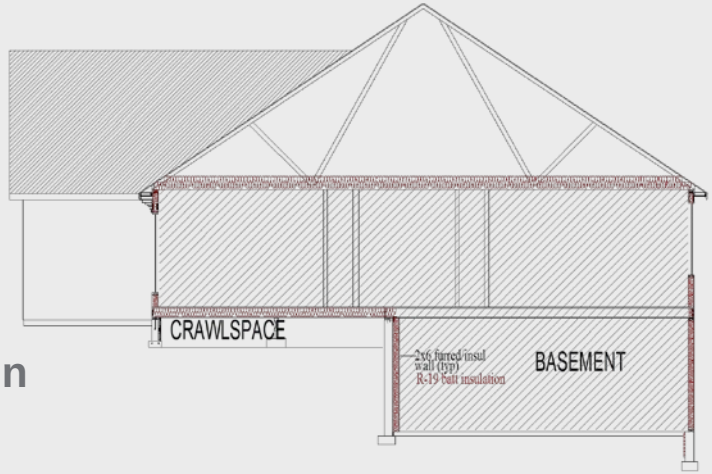
Building Envelope



Conditioned Main Floor

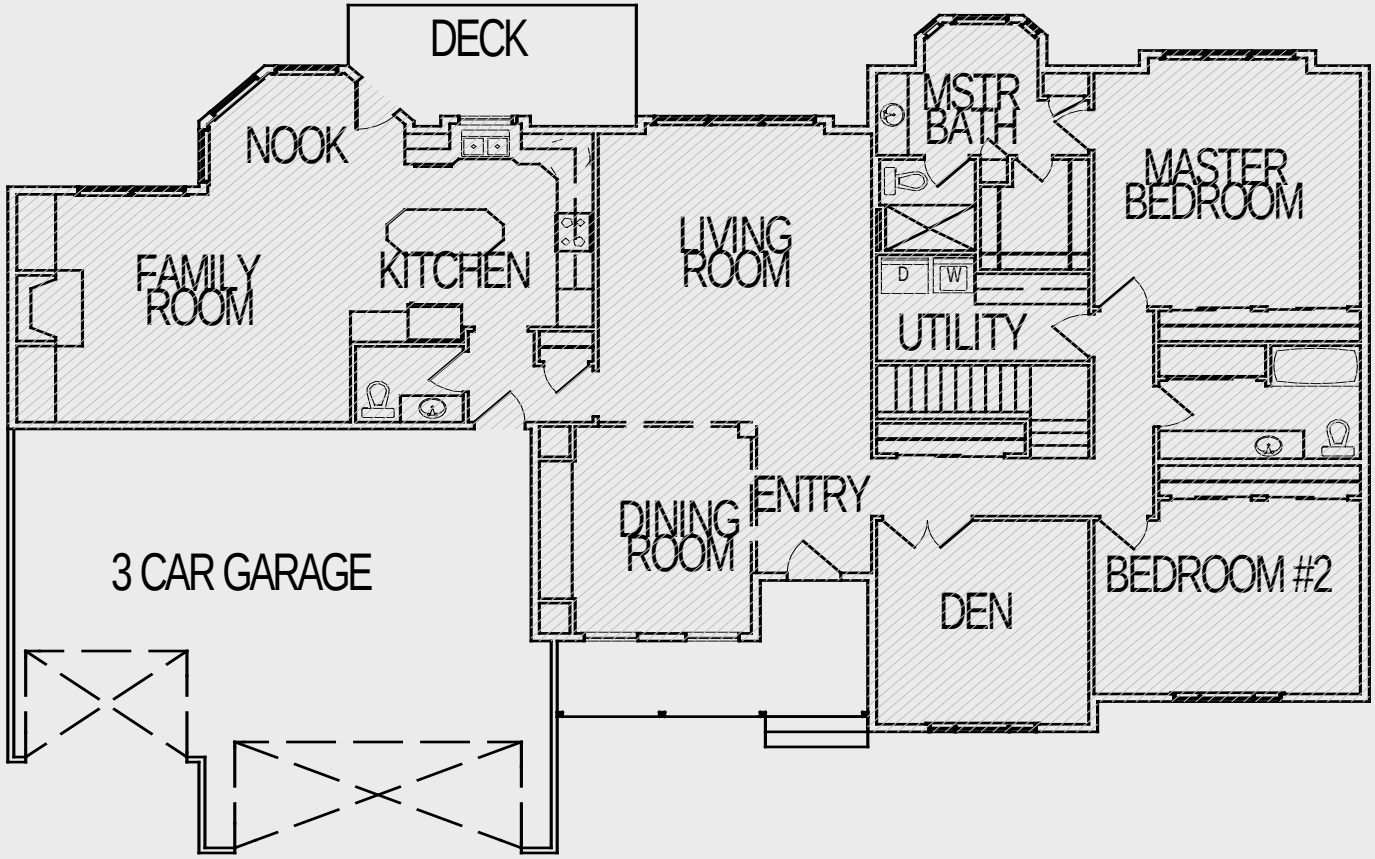


Conditioned Basement



Building Section

Ceiling Area - **2415 sf**



Exterior Wall Areas

12’ Exterior Walls – **689 sf**

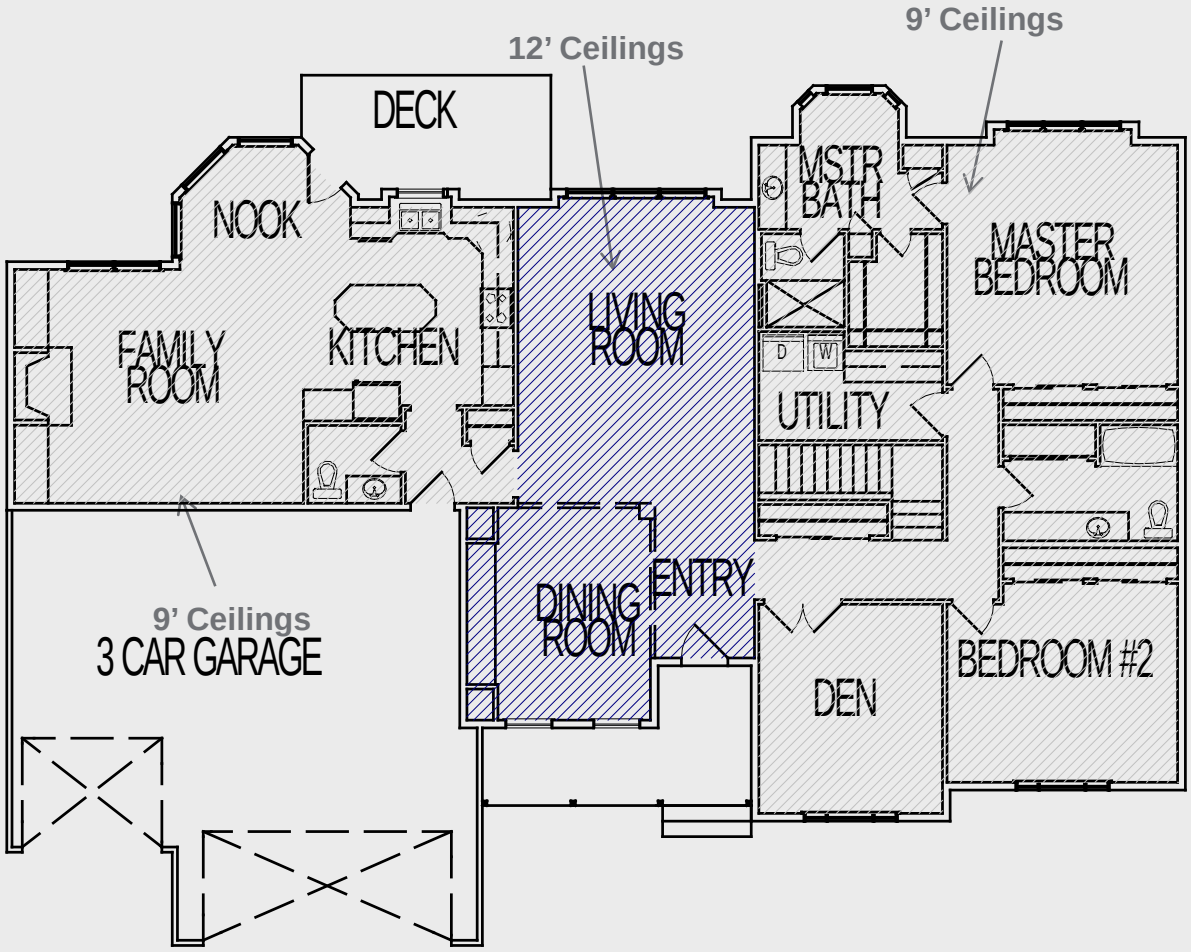
- North – 221 sf
- South – 234 sf
- East – 52 sf
- West – 182 sf

9’ Exterior Walls – **2180 sf**

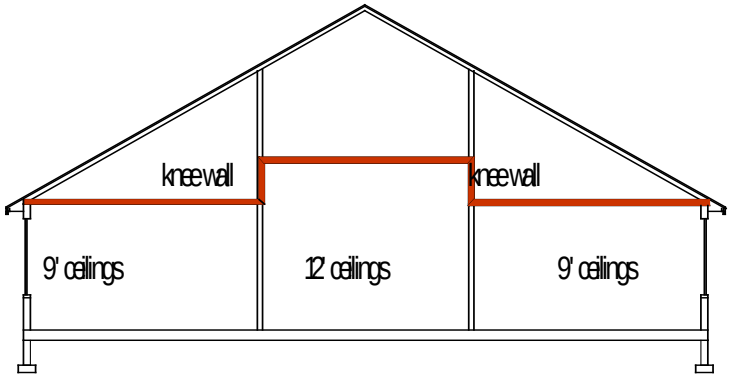
- North – 690 sf
- South – 600 sf
- East – 440 sf
- West – 450 sf

3’ knee walls (between 9’&12’ sections) – **153 sf**

- West – 69 sf
- East – 84 sf

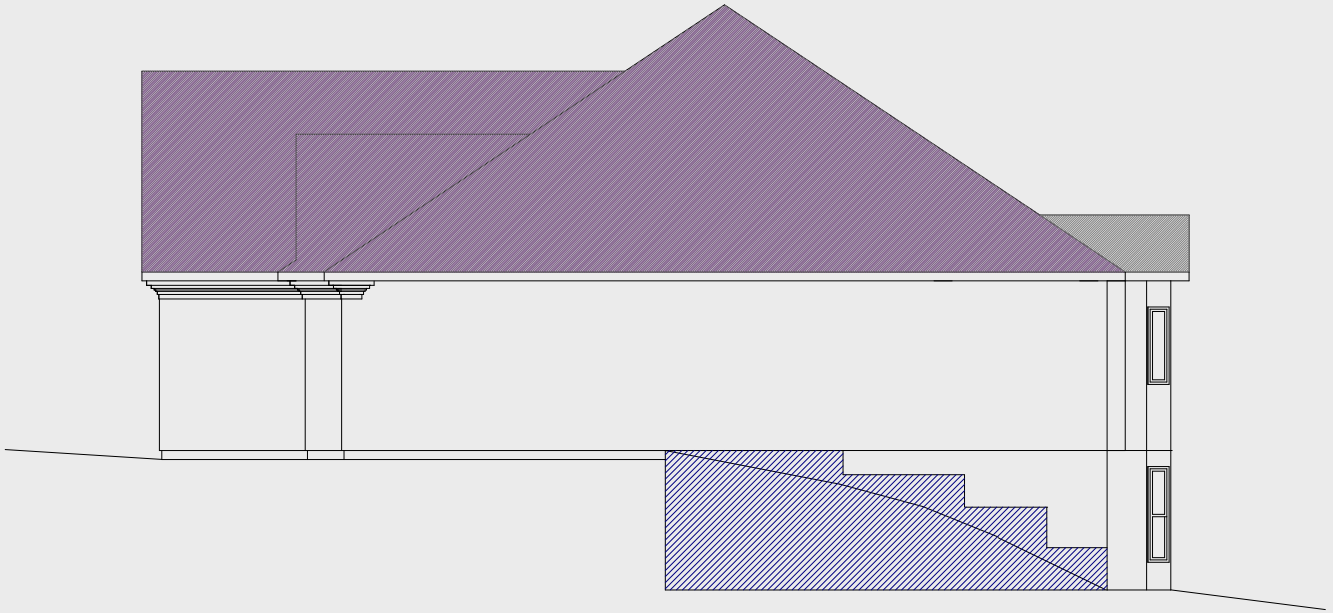


Knee Wall Insulation



No, No… Never cut the batts too short

- Basement Walls – below grade



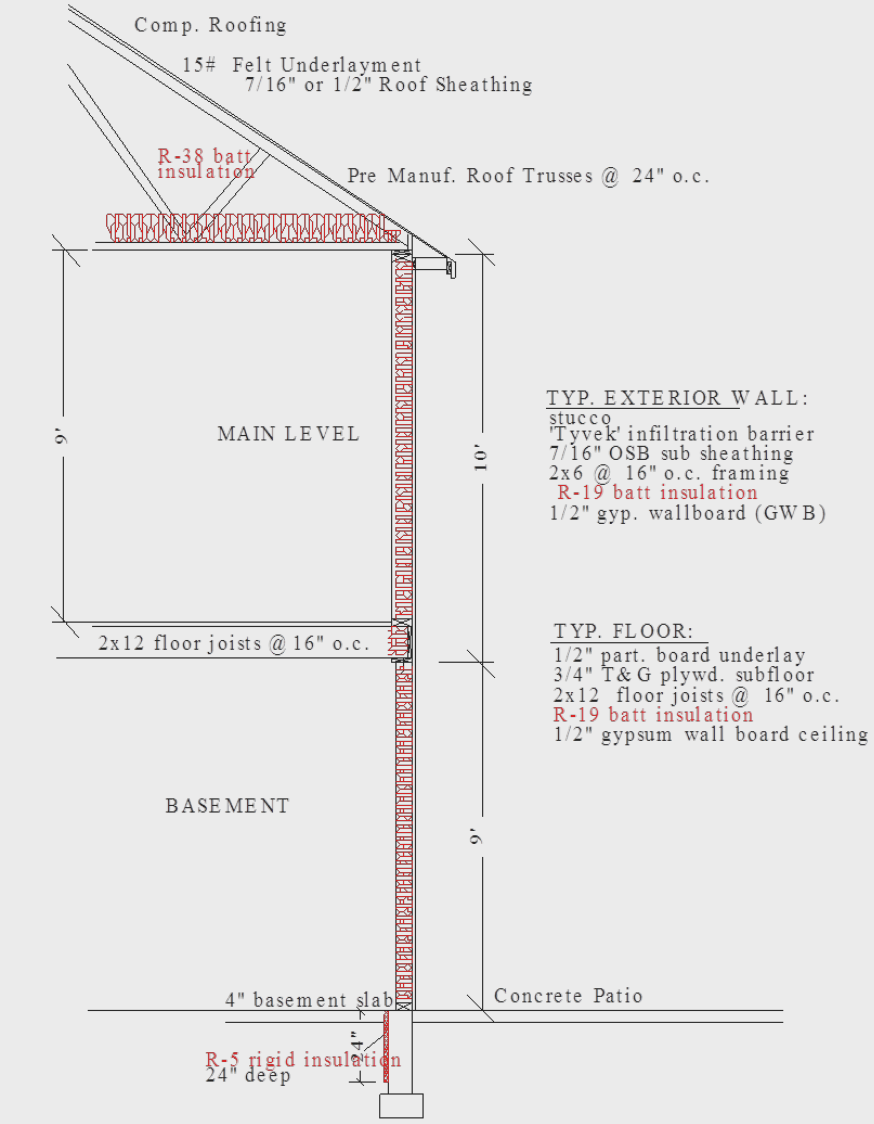
>50% below grade = below grade concrete basement wall

Ways to Insulate Basement Walls

Interior Studs w/batts

Exterior Rigid Foam

Including Rim Joists in the Exterior Wall Area



BASEMENT SECTION @ EXTERIOR WOOD WALL

Basement Wall Areas

Above Grade Bsmt Walls (exterior wood) = 837 sf (93’ x 9’)
(entered as wood frame wall. not a basement wall)

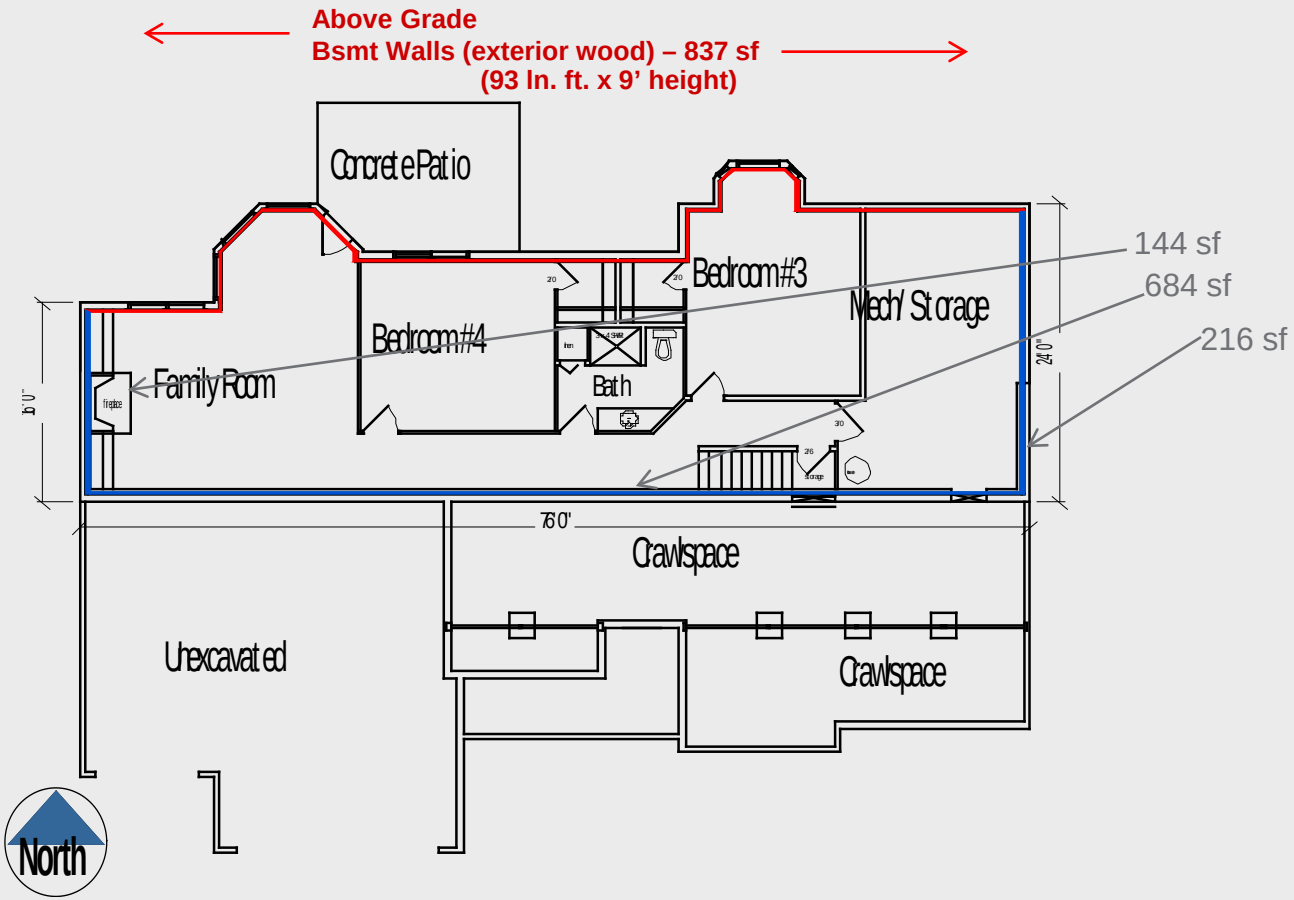
Below Grade Bsmt Walls = 1044 sf

Side basement walls = 360 sf

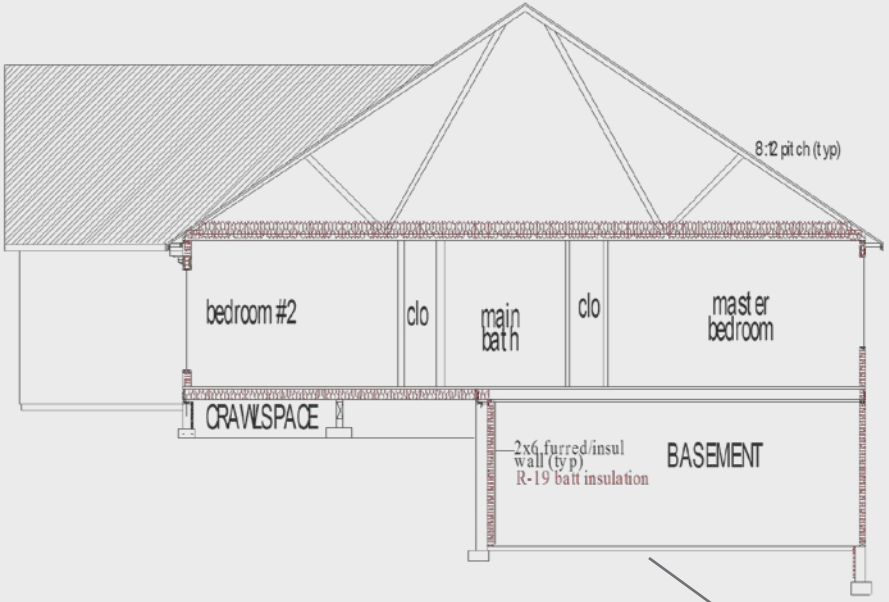
West Wall – 144 sf

East Wall – 216 sf

Back basement wall = *684 sf* (76’x9’)

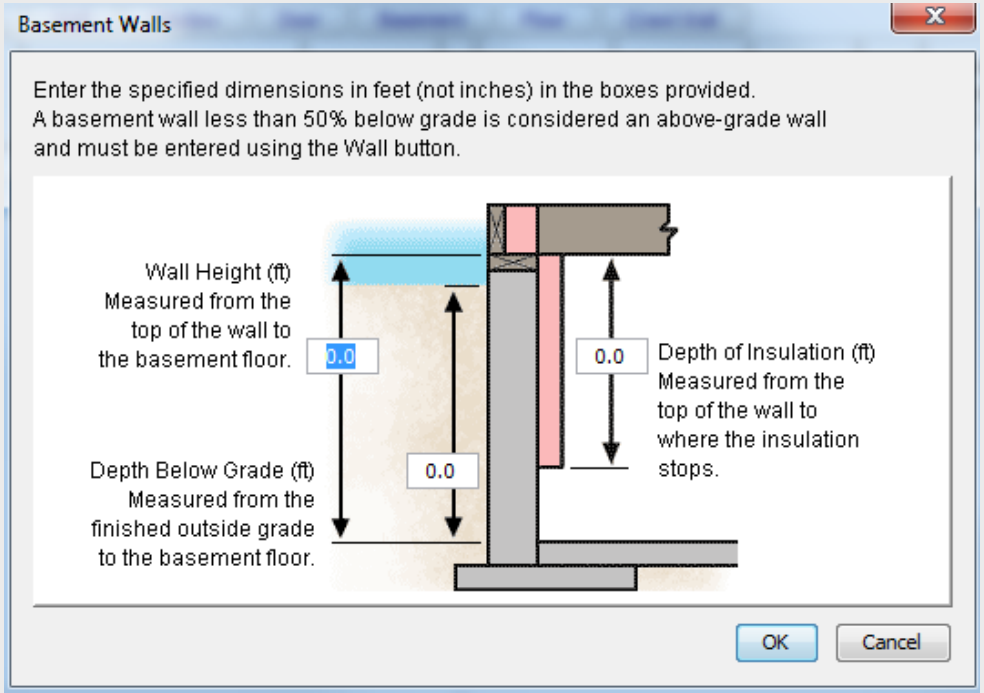


Basement Walls

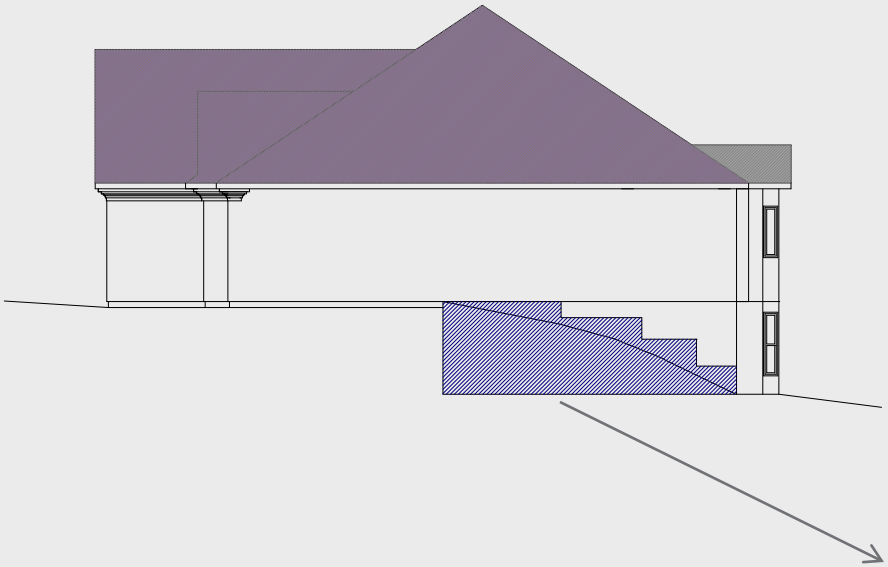


"back" below grade basement wall

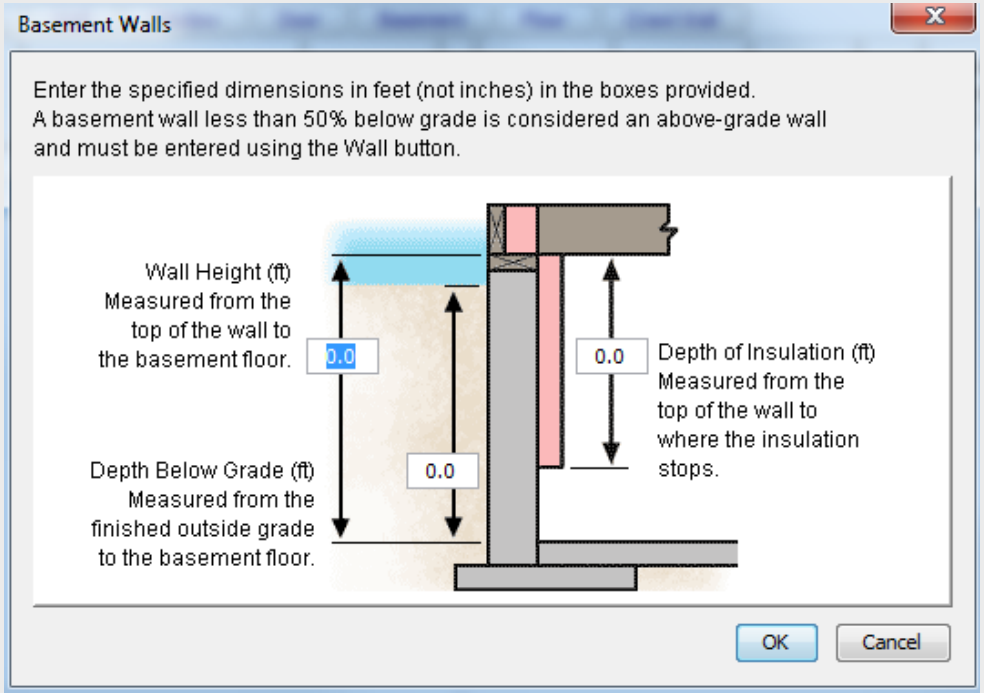
(entire back wall is adjacent to crawlspace



Basement Walls

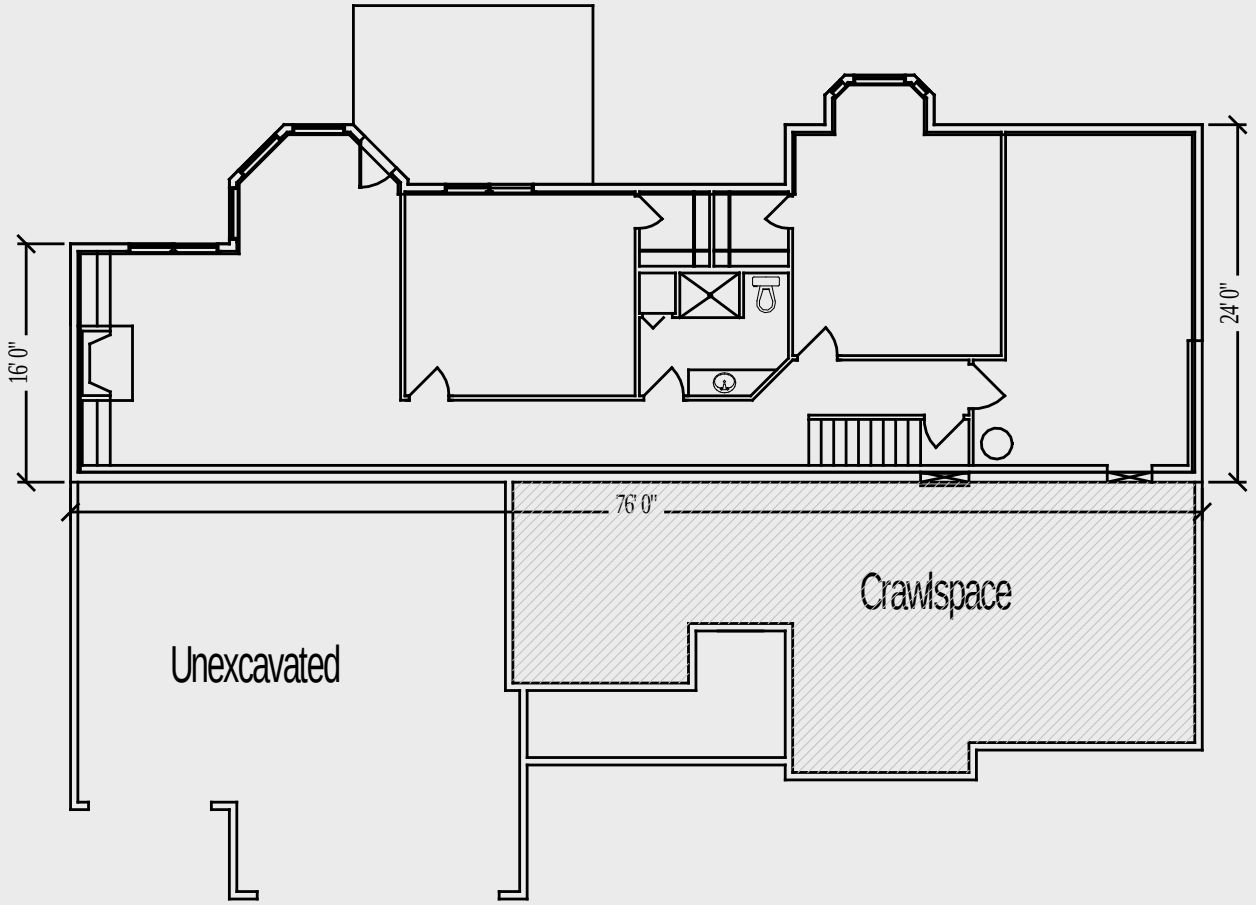


“side” below-grade basement walls

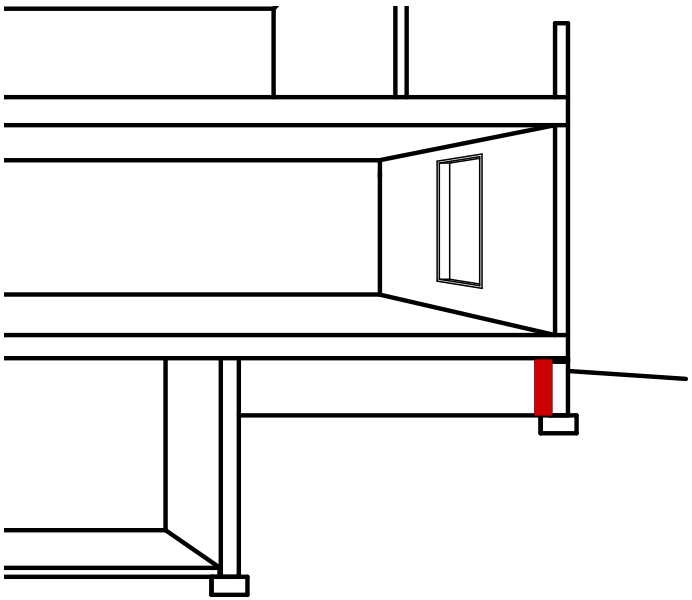


Floor Area

Crawlspace Area – 783 sf



Crawlspace Wall Insulation

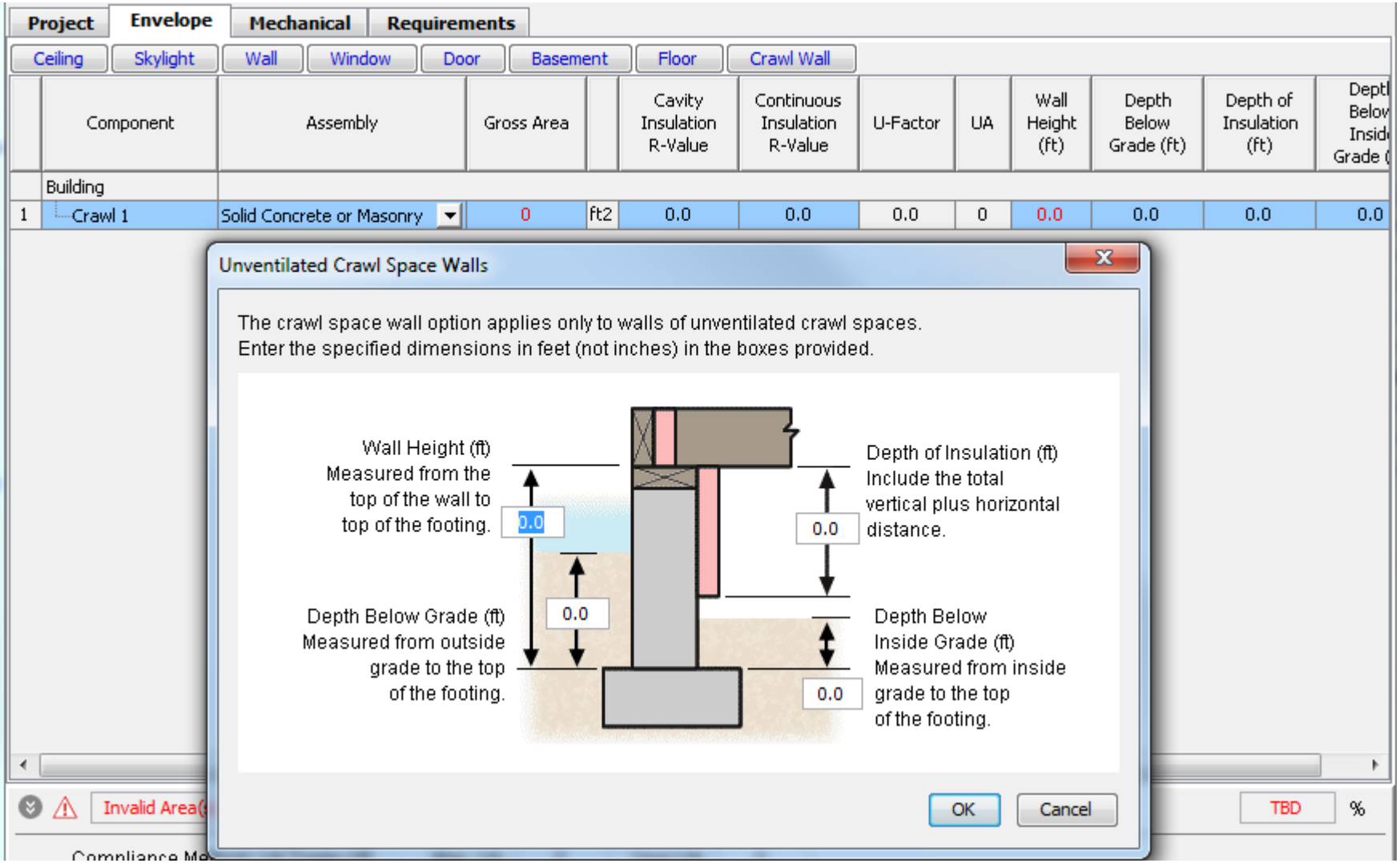


Example of an Insulated crawlspace wall =

- **- no foundation vents to the exterior**
- **+ mechanically vented/conditioned**

This case study does NOT have a conditioned crawlspace

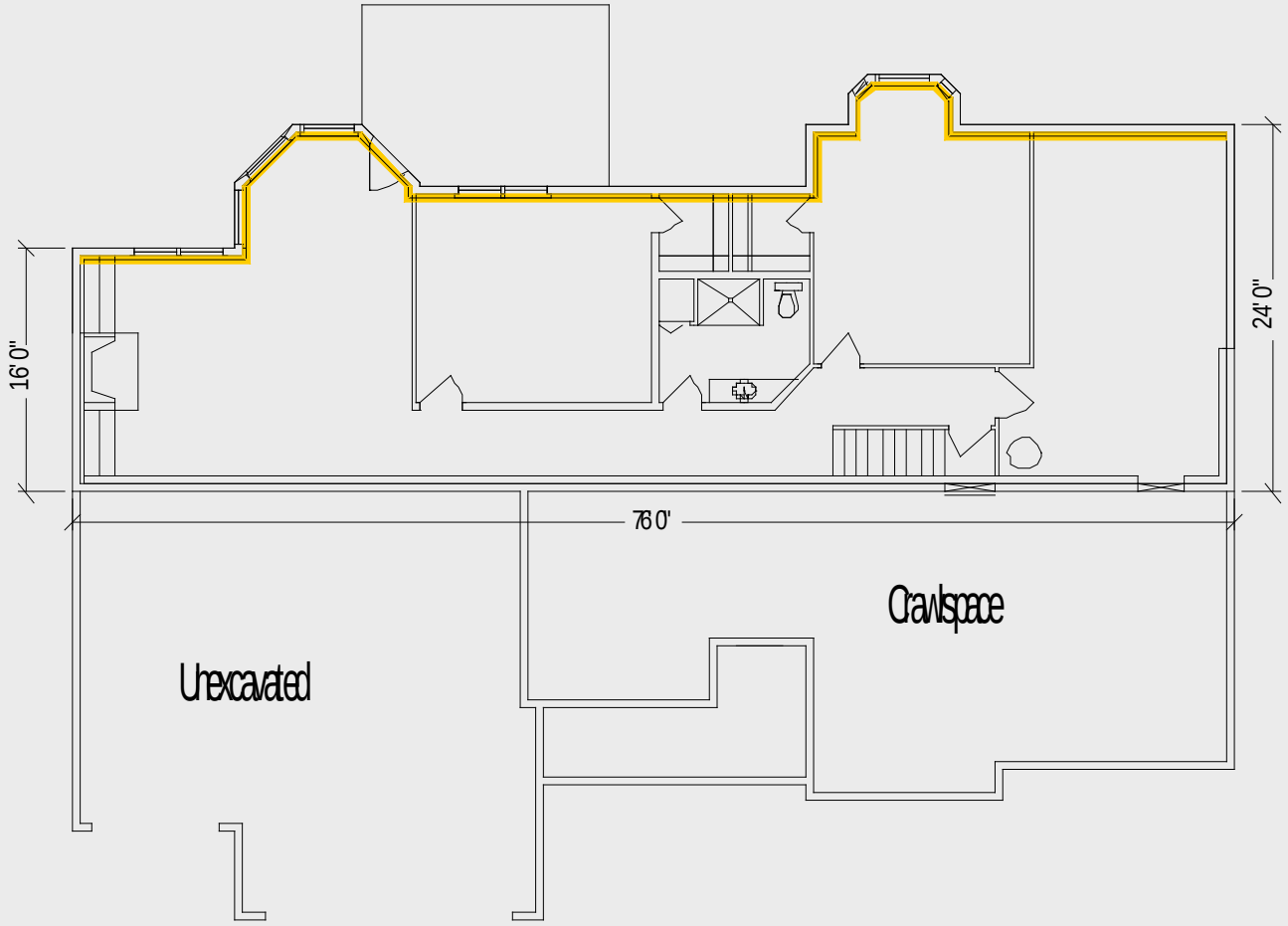
Crawlspace Walls in RES*check*



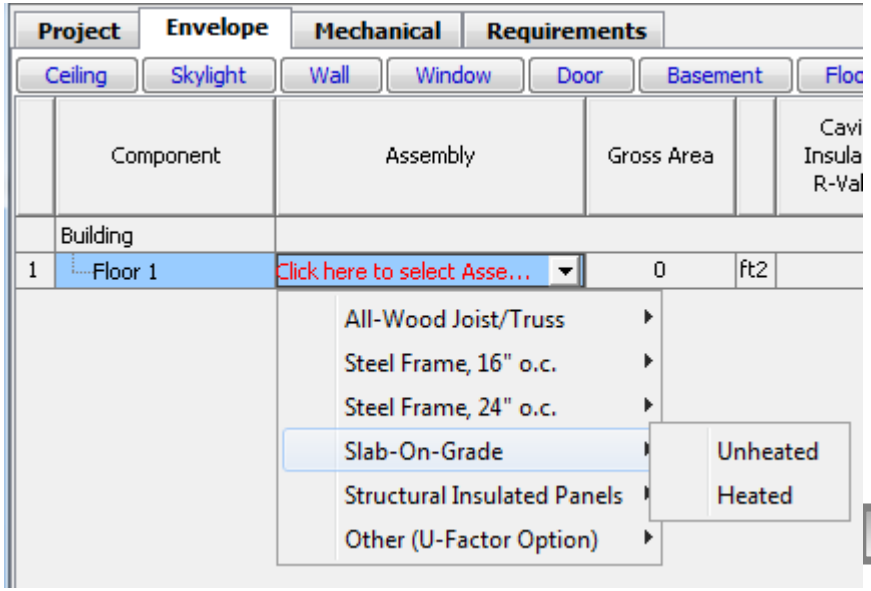
Slab Perimeter

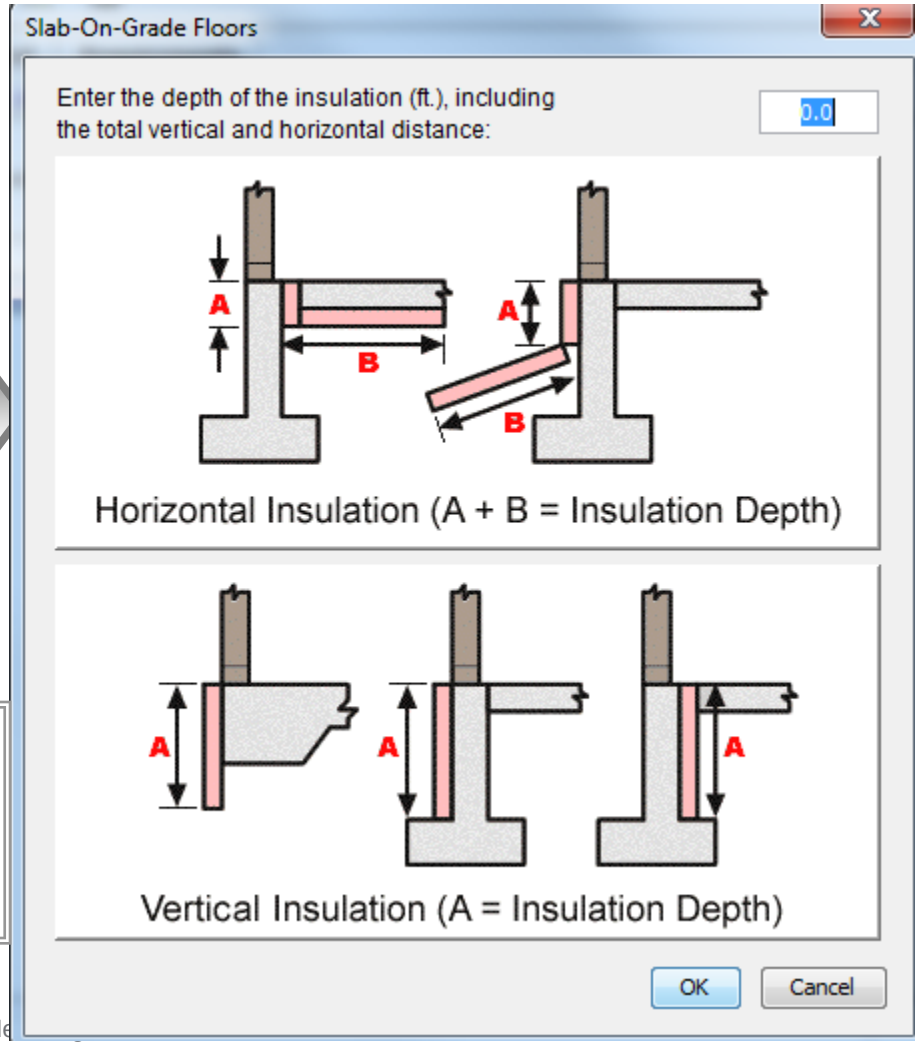
Slab Perimeter – 93 linear feet

Line represents the slab edge to be calculated in linear feet



Slabs in RES*check*





HELP

- Depth of Insulation - Enter the depth (ft) of the insulation you intend to install as measured from the top of the slab to where the insulation stops. This distance should include the total vertical plus horizontal distance. Refer to the illustration below of acceptable configurations. If you enter a depth of 0, the program assumes no insulation is to be installed.

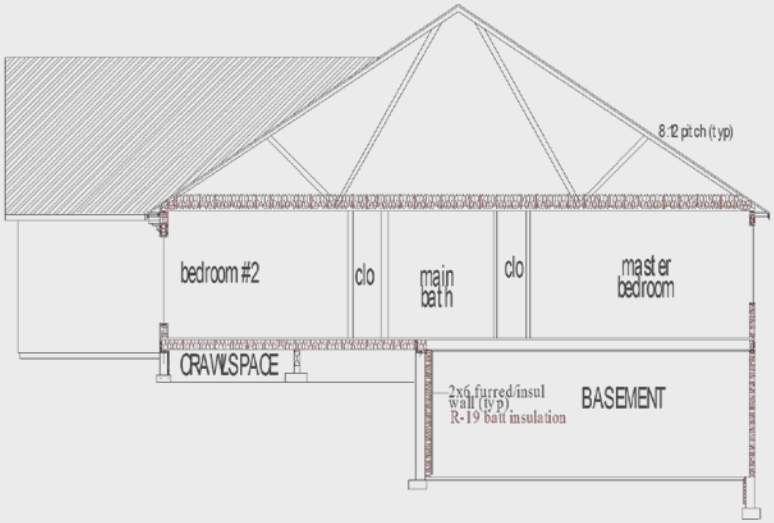
Insulation Levels

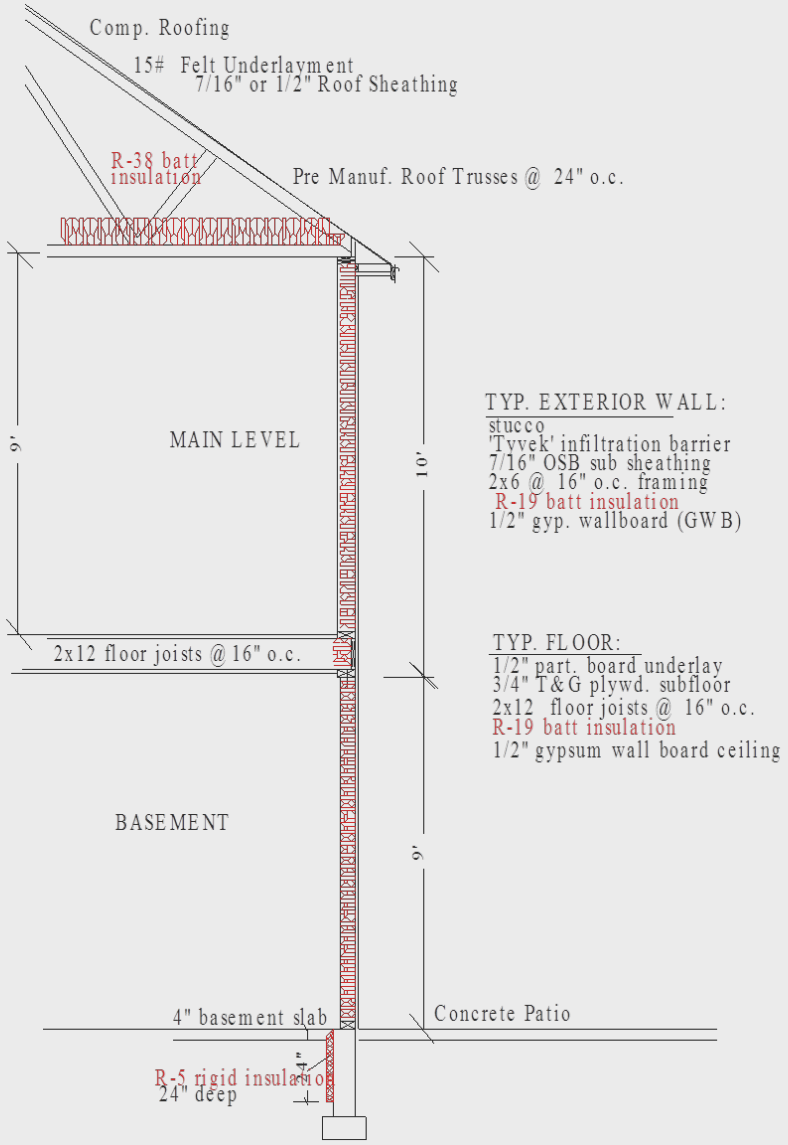
Roof/Ceiling

Walls (above and below grade)

Floor over vented crawl space

Slab-on-grade





- Window/ Door Area

Window Area - 533 sf

North – 369 sf
South – 149 sf
West – 15 sf

U-factor = 0.35

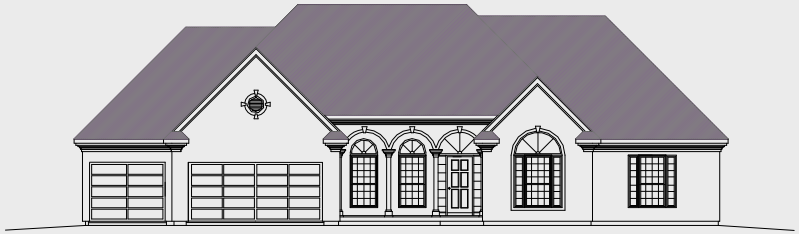
U-factor = 0.27
SHGC = .25

Glass Doors <50% glass - 40 sf; **U-factor** = 0.50

North – 40 sf

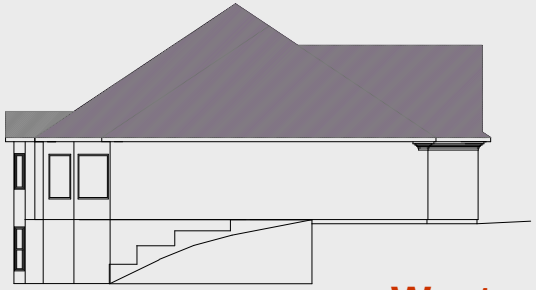
Opaque Doors - 40 sf; **U-factor** = 0.50

South – 40 sf

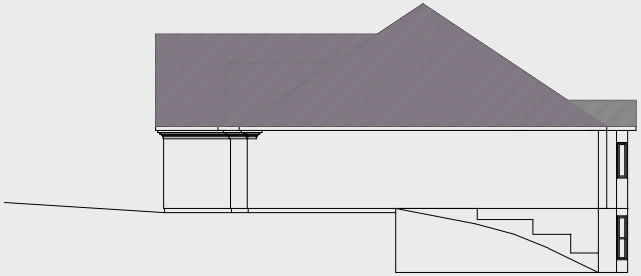


South

North



West



East


Microsoft Outlook
Internet Explorer
Firefox Setup 1.0PR
ETR
Microsoft Photo Editor
Mozilla Firefox
Adobe Reader 6.0
Work_Pkg
URL's and Emails
Software Analysis
URL's
Attendee_List
Microsoft PowerPoint
Link Check
Implementati...
Microsoft Word
Desktop Stuff
COMcheck-EZ 3.0 Release 1a
Microsoft Outlook
Emails
Microsoft Excel
Articles
PhotoStudio 5
Adobe Acrobat 6.0 Professi...
REScheck™
DOE's Building Energy Codes Program
Internet Address: www.energycodes.gov
Technical Support: techsupport@becp.pnl.gov
Energy Efficiency and Renewable Energy · U.S. Department of Energy
Loading...
Recycle Bin
Drawing Pad
start
Inbox - Micro...
Windows Me...
2 Microsoft ...
EZ-Casestud...
Microsoft Pho...
Untitled.rck - ...
1:26 PM

THANK YOU!

Pam Cole
pam.cole@pnnl.gov

Building Energy Codes Program
www.energycodes.gov

BECP help desk
http://www.energycodes.gov/resource-center/help-desk