

# Overview of DOE's Building Energy Code Compliance Tools

## Building Energy Codes Program



Search [energycodes.gov](http://energycodes.gov)

  
  
Search Help ▶ More Search Options

### About the Program

### Compliance Tools

- Residential (REScheck)
- Commercial (COMcheck)
- On-line Commercial Code
- Federal Building Codes
- Commercial

### Training/Education

- Training Presentations
- State Training
- Consumer Education
- Energy Codes Glossary
- 2004 National Workshop

### Implementation Tools

- DOE 2004 Proposals
- DOE Determinations
- DOE Assistance
- Resource Materials
- Status of State Energy Codes
- Setting the Standard

### Technical Support/FAQs



DOE's Building Energy Codes Program is an information resource on national model energy codes. We work with other government agencies, state and local jurisdictions, national

The Program recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement.

**REScheck**

[REScheck](#), [REScheck-Web](#), [REScheck Package Generator](#)

**COMcheck**

[COMcheck-EZ](#), [COMcheck Package Generator](#)

[www.energycodes.gov](http://www.energycodes.gov)  
[techsupport@becp.pnl.gov](mailto:techsupport@becp.pnl.gov)

- Site Map
- HELP** - Ask a Codes Expert
- EEER Information Center
- Helpful Links
- Handy Format
- EVENTS

### 2004 National Workshop on State Building Energy Codes

July 12-14, 2004

- ### NEWS
- REScheck Now Includes the 2003 IECC
  - Newly Released — *Setting the Standard* Update  
July 2004
  - ICC Final Action Hearings  
May 17-20, 2004

REScheck-Web™

COMcheck-EZ™ Package

# Residential Compliance Tools

**Free**

## Desktop Software Tools



## Web-Based Tools



## Printed Materials

**Compliance Guides**

**Prescriptive Tables**



# Commercial Compliance Tools

## Desktop Software Tools



## Web-Based Tools



## Printed Materials

**Compliance Guides**

**Prescriptive Tables**



**Free**

# Training Tools

- PowerPoint presentations with faculty notes
- Case studies
- Online training
- Online videos

Case Study – REScheck Software



Jones Residence, Bowman, SC

Case Study – COMcheck-EZ Software



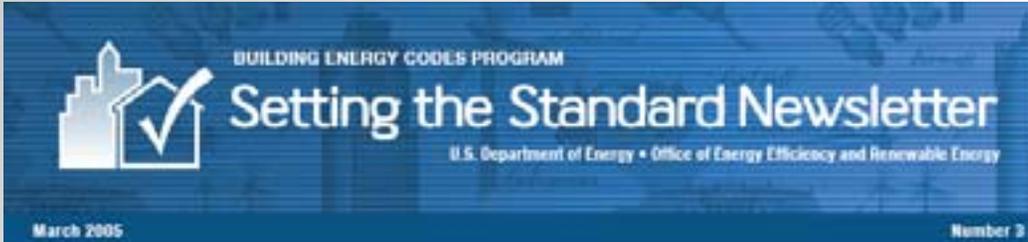
*Sigma 4 Office Building*  
Richland, WA

# Setting the Standard Newsletter

- Register on-line to receive the latest up-to-date information on energy code related issues.

## Newsletter

- <http://www.energycodes.gov/news/>



The image shows the cover of the 'Setting the Standard' newsletter. At the top left is a logo of a city skyline with a checkmark inside a house outline. To the right of the logo, the text reads 'BUILDING ENERGY CODES PROGRAM' in small letters, followed by 'Setting the Standard Newsletter' in large white letters, and 'U.S. Department of Energy • Office of Energy Efficiency and Renewable Energy' in smaller white letters below it. At the bottom left of the blue header, it says 'March 2005' and at the bottom right, 'Number 3'.

## Basements: Advantages and Disadvantages of Finishing Basements During Initial Construction of the Home

The 2000 and 2003 Editions of the International Energy Conservation Code (IECC) require basement walls to be insulated if the basement is considered part of the heated and/or cooled living space (conditioned space). If the basement is initially designed to be unfinished, insulation is required in the basement ceiling. The 2003 IECC requires floors over unheated spaces or basement walls that define the conditioned space (Section 502.2.5.3 or 502.2.3.6) to meet the applicable overall thermal transmittance factor (U-factor) or the minimum R-value based on the prescriptive specifications on an individual component basis. In basic terms this means, if the basement is unconditioned, the floor above the basement (basement ceiling) must be insulated and meet all the requirements of the IECC for floors over an unconditioned space. If the basement is considered part of the conditioned building envelope, the basement walls must be insulated and meet all the requirements of the IECC for basement walls. The requirements in the code vary depending on location and climate conditions. Requirements in the IECC include some of the following: Insulation Installation (Section 102.4), Moisture Control (Section 502.1.1), and Caulking and Sealants (Section 502.1.4.2).

Many homes are being constructed with unfinished basements to reduce initial costs. In most cases, the homeowner eventually finishes the basement for additional living space by installing basement wall insulation. Because most basements are eventually occupied, the advantages and disadvantages of conditioning the basement should be thoroughly reviewed prior to permitting and construction.

Table 1 provides a list of advantages and disadvantages of basement wall insulation compared to basement ceiling insulation.

# BCEP Resource Center



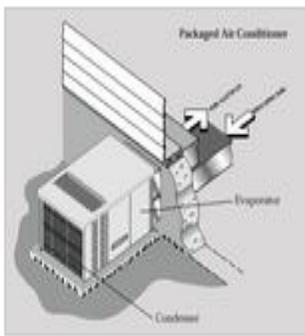
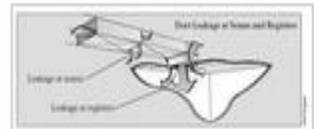
SEARCH: Graphics FOR: duct system approach HVAC » SEARCH

BROWSE: Select a Topic... » GO!

## Graphics Search Results

Keywords: *duct system approach HVAC*

Viewing: 1-9 of 92



[Printer-friendly Format](#)

### ADDITIONAL RESOURCES

- [Articles](#)
- [Online Tools](#)
- [Presentations](#)
- [Videos](#)



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



Building Energy Codes

# How to Use REScheck *Energy Code Compliance Software*

U.S. Department of Energy  
Building Energy Codes Program

# When does REScheck apply?

## Residential New Construction and Additions

- 1-2 single family dwellings
- Multifamily dwellings: 3 or more attached dwelling units less than 3 stories in height
  
- State Dependent
  - Not all states have the same code, some states have state specific energy codes
  - Check to see what code is applicable in your state and if REScheck is accepted
  - [Status of State Codes](#)
  - [http://www.energycodes.gov/implement/state\\_codes/index.stm](http://www.energycodes.gov/implement/state_codes/index.stm)

# Residential Requirements

## 1) Mandatory Requirements:

- Moisture Control
- Air Leakage - Recessed Lighting Fixtures
- Infiltration Control
- Solar Heat Gain Coefficient
- Building Mechanical Systems and Equipment
- Service Water Heating



## 2) Climate Specific Requirements:

- Foundations
  - Crawlspace
  - Slabs
  - Basements
- Above Grade Walls
- Skylights, Windows, and Doors
- Roofs
- Duct Insulation

# What is REScheck?

- REScheck is a computer program that can be used to demonstrate Energy Code Compliance
- The Software is self-contained
  - Energy Code book can be used as needed for reference only
- Relatively simple to use and very flexible

# What Do I Need to Know?

## Information you need to use REScheck:

1. General Understanding of Windows-based Computer Programs
2. Basic Information about the Builder and Home to be Constructed
3. House Plans including Exterior Wall Areas, Glazing Areas, Roof/Ceiling Areas, Basement Wall Areas, etc.
4. Insulation R-Values, NFRC Glazing and Door U-Factors, etc.
5. Heating and Cooling System Efficiencies

- 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](http://www.energycodes.gov)  
 Technical Support: [techsupport@becp.pnl.gov](mailto:techsupport@becp.pnl.gov)

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

Loading... 





Project Envelope

State South Carolina

City Bowman

Construction Type

1- and 2-Fam

- 1992 MEC
- 1993 MEC
- 1995 MEC
- 1998 IECC
- 2000 IECC
- ✓ 2003 IECC
- Arkansas
- Georgia
- Massachusetts
- Minnesota
- New Hampshire
- New Jersey
- New York
- Vermont
- Wisconsin
- Pima, Arizona

Front Faces: North

Project Information

Date Of Plans

March 15, 2004

Title

Jones Residence - P

Description

Jones Residence

1000 Maple Street

Designer/Contractor

Done Right Construc

Notes

Plan 3677

Expand the Screen  
Title Bar  
Menu Bar  
Toolbar  
Make sure the correct code is chosen

Compliance Passes Max. UA 850 Your UA 634 25.4 % Better Than Code

Ready Max. SHGC 0.40 Your SHGC 0.40

Three Main Screens  
Your Building Compared to the Energy Code

State: South Carolina  
City: Bowman  
Construction Type: 1- and 2-Family, Detached

Project Information  
Date Of Plans: March 15, 2004  
Title: Jones Residence  
Description: Jones Residence  
1000 Maple Street  
Designer/Contractor: Done Right Construction  
Notes: Plan 3677

Compliance: Passes  
25.4% Better Than Code

State South Carolina

City Bowman

Construction Type  
 1- and 2-Family, Detached  Multifamily

Project Information

Date Of Plans  
March 15, 2004

Title  
Jones Residence - Plan 3677

Description  
Jones Residence  
1000 Maple Street

Designer/Contractor  
Done Right Construction

Notes  
Plan 3677

Construction Type  
Basic Information

Compliance Passes

Max. UA 850

Your UA 634

25.4 % Better Than Code

# Envelope Section

 JonesResidence Code: 2003 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 or Slab Perimeter	Cavity Insulation R-Value	Conti Insu R-V
	Building					
1	-----Ceiling 1	All-Wood Joist/Rafter/Truss 		2415 ft2	38.0	0
2	[-]---Exterior Wall 1	Wood Frame, 16" c.c. 	Front 	911 ft2	19.0	0
3	-----Door 1					
4	-----Window main	Vinyl Frame, Double Pane 	Front	369 ft2		

**Building Components are added by clicking on these**

# Mechanical Requirements in REScheck

- Mandatory requirements such as duct insulation are listed in the Inspection Checklist
- The Checklist is prepared by the software automatically based on user-entered input such as applicable code and building location

## **Duct Insulation:**

Return Ducts in unconditioned spaces must be insulated to R-4

Supply Ducts outside the building must be insulated to R-8

|

## **Duct Insulation:**

- [ ] | Supply ducts in unconditioned attics or outside the building must be insulated to R-8.
- [ ] | Return ducts in unconditioned attics or outside the building must be insulated to R-4.
- [ ] | Supply ducts in unconditioned spaces must be insulated to R-8.
- [ ] | Return ducts in unconditioned spaces (except basements) must be insulated to R-2.
- [ ] | Where exterior walls are used as plenums, the wall must be insulated to R-8.
- | Insulation is not required on return ducts in basements.

# Mechanical Requirements in REScheck

- No user entries are required
- Only get “credit” for high-efficiency equipment

Project	Envelope	Mechanical				
Furnace	Boiler	Heat Pump	Air Conditioner			
Component	Description	Heating Efficiency	Cooling Efficiency	Minimum Efficiency		
Building						

Use the blue-on-white buttons at the top of the screen to list the heating and/or cooling equipment in your building.

Trade-off provided only for selected high efficiency equipment.

No trade-off available for electric resistance heating or geothermal heat pumps.

NOTE: These inputs are optional. Press F1 for help.

# SWH Requirements in REScheck

- Mandatory requirements such as heat traps are listed in the Inspection Checklist
- No software entries for Service Water Heating

## Service Water Heating:

Water heaters with vertical pipe risers must have a heat trap on both the inlet and outlet unless the water heater has an integral heat trap or is part of a circulating system

### Service Water Heating:

[ ] | Water heaters with vertical pipe risers must have a heat trap on both the inlet and outlet unless the water heater has an integral heat trap or is part of a circulating system.

[ ] | Insulate circulating hot water pipes to the levels in Table 1.

### Circulating Hot Water Systems:

[ ] | Insulate circulating hot water pipes to the levels in Table 1.

### Swimming Pools:

[ ] | All heated swimming pools must have an on/off heater switch and require a cover unless over 20% of the heating energy is from non-depletable sources. Pool pumps require a time clock.

### Heating and Cooling Piping Insulation:

[ ] | HVAC piping conveying fluids above 105 °F or chilled fluids below 55 °F must be insulated to the levels in Table 2.

# Need Help?

JonesResidence Cod

File Edit View Options Code Tools Help

Help Topics

About REScheck...

Project Envelope Mechanical

Furnace Boiler Heat Pump Air Conditioner

	Component	Description	Heat Efficiency
	Building		
1	Furnace 1	Forced Hot Air	78

REScheck Help

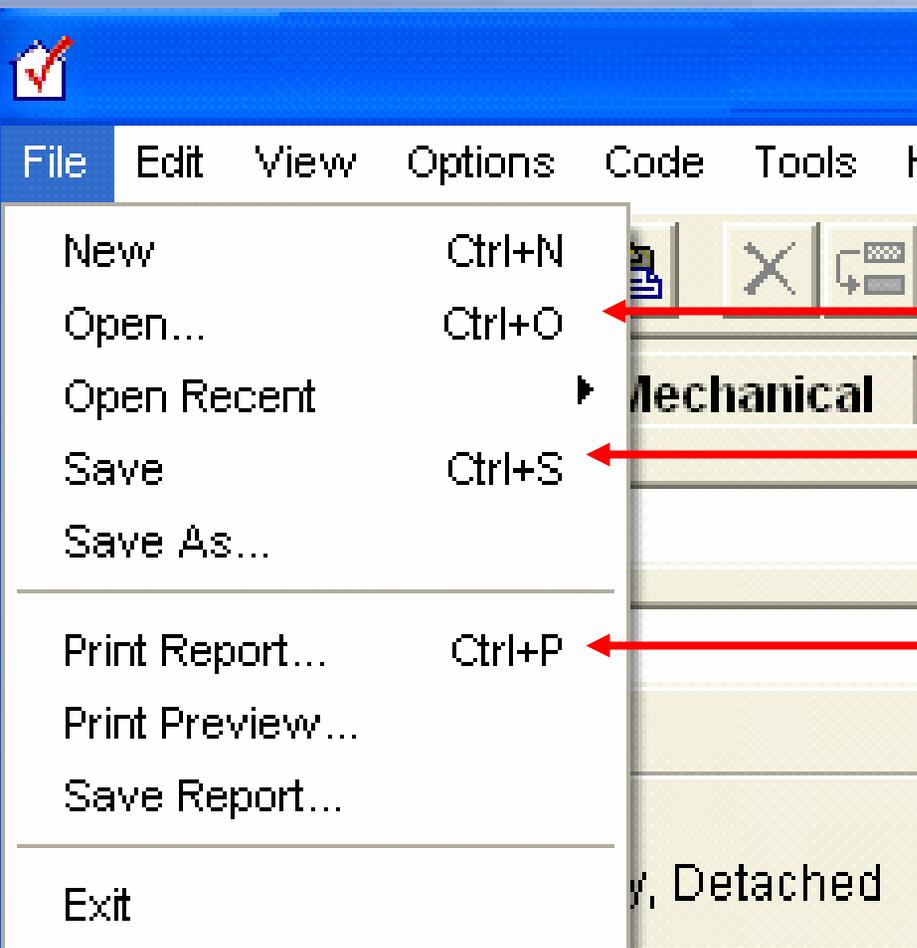
Back Forward Print

Contents Index Search

- Software User's Guide
  - Software Overview
  - Screen Layout
  - Colors Used in the Software
  - Table Columns and Rows
  - Project Folder
  - Envelope Folder
  - Mechanical Folder
  - Wisconsin Heating Loads
  - Menus
  - Changing Location Files
  - Appendix A: Additions
  - Appendix B: Glazing Defaults
  - Appendix C: Building Envelope
  - Definitions

## Software User's Guide

This user's guide describes how to use the REScheck™ Software. REScheck is designed to demonstrate compliance with the requirements of the Council of American Building Officials (CABO) Model Energy Code (MEC) and the International Code Council (ICC) International Energy Conservation Code (IECC). It is the most flexible approach for meeting the MEC insulation and window requirements (refer to the *Basic Requirements Guide* in the REScheck Workbook for additional requirements that must also be satisfied). The REScheck software runs on the Microsoft Windows operating system.



Last files worked on are here

Save as many files as you like

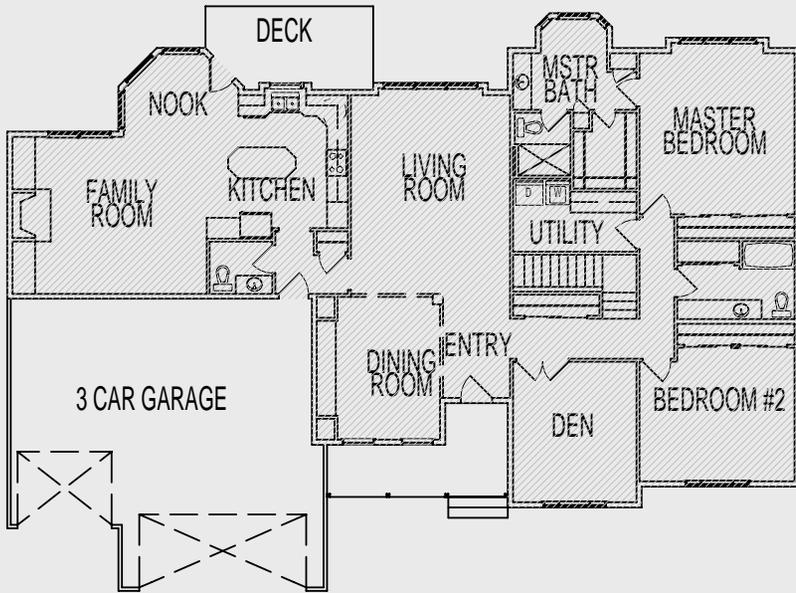
Print and Preview reports

# Case Study – REScheck Software

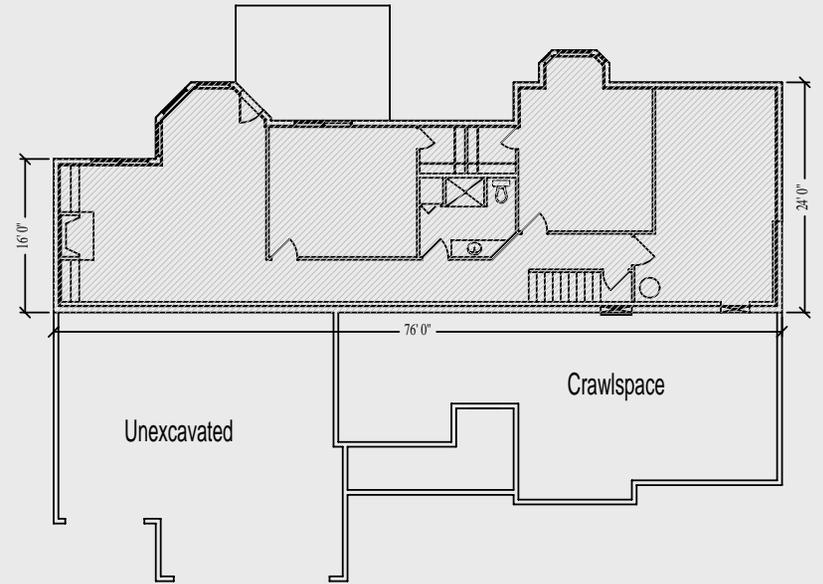


Jones Residence

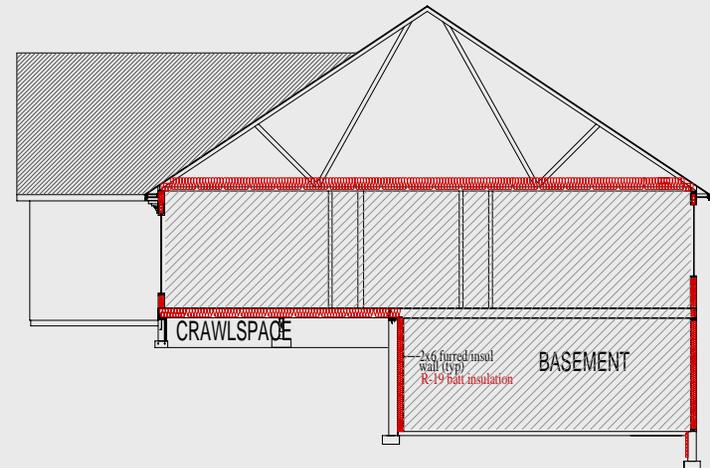
➤ Building Envelope



**Conditioned Main Floor**



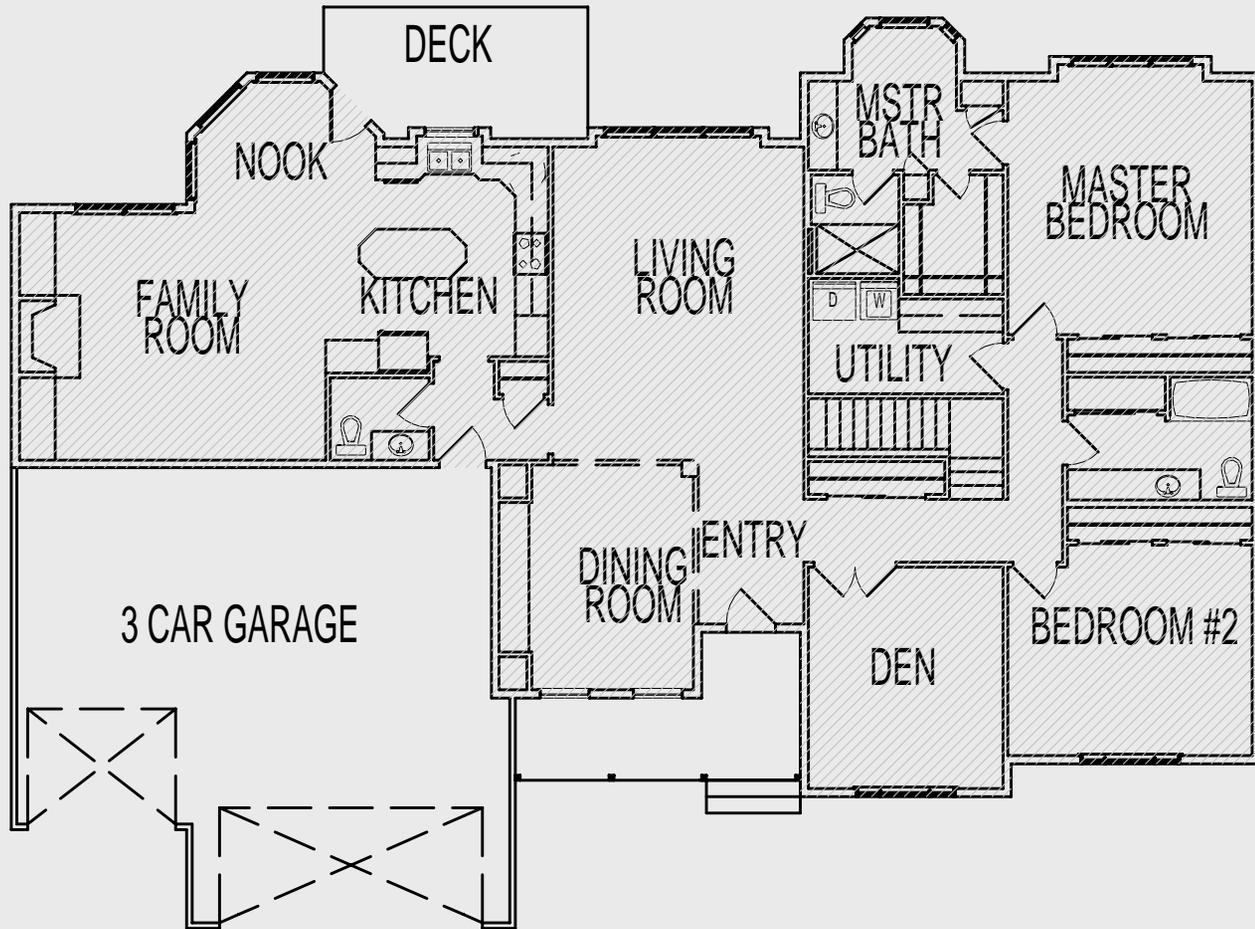
**Conditioned Basement**



**Building Section**

➤ Ceiling Area

Ceiling Area  
2415 s.f.



# Roofs in REScheck

Project		Envelope		Mechanical			
Ceiling	Skylight	Wall	Window	Door	Basement	Floor	Crawl Wall
Component		Assembly		Gross Area		Cavity	Continuous
Building							
1	Ceiling 1	Raised or Energy Truss					



Select the **Ceiling** button to add a ceiling component to the description of your design on the *Envelope* screen. Each unique ceiling assembly should be entered as a separate component, but multiple ceiling elements sharing the same construction may be entered as one component with appropriate total area.



### Raised Heel or Energy Truss

To receive credit for a raised heel truss (often referred to as an energy truss) the insulation must achieve its full thickness over the exterior walls. Scissor trusses meeting this criteria may also be entered as a raised truss.

Standard Truss

Raised Heel or Energy Truss

Do not display this message again

OK

➤ Exterior Wall Areas

12' Exterior Walls - 689 s.f.

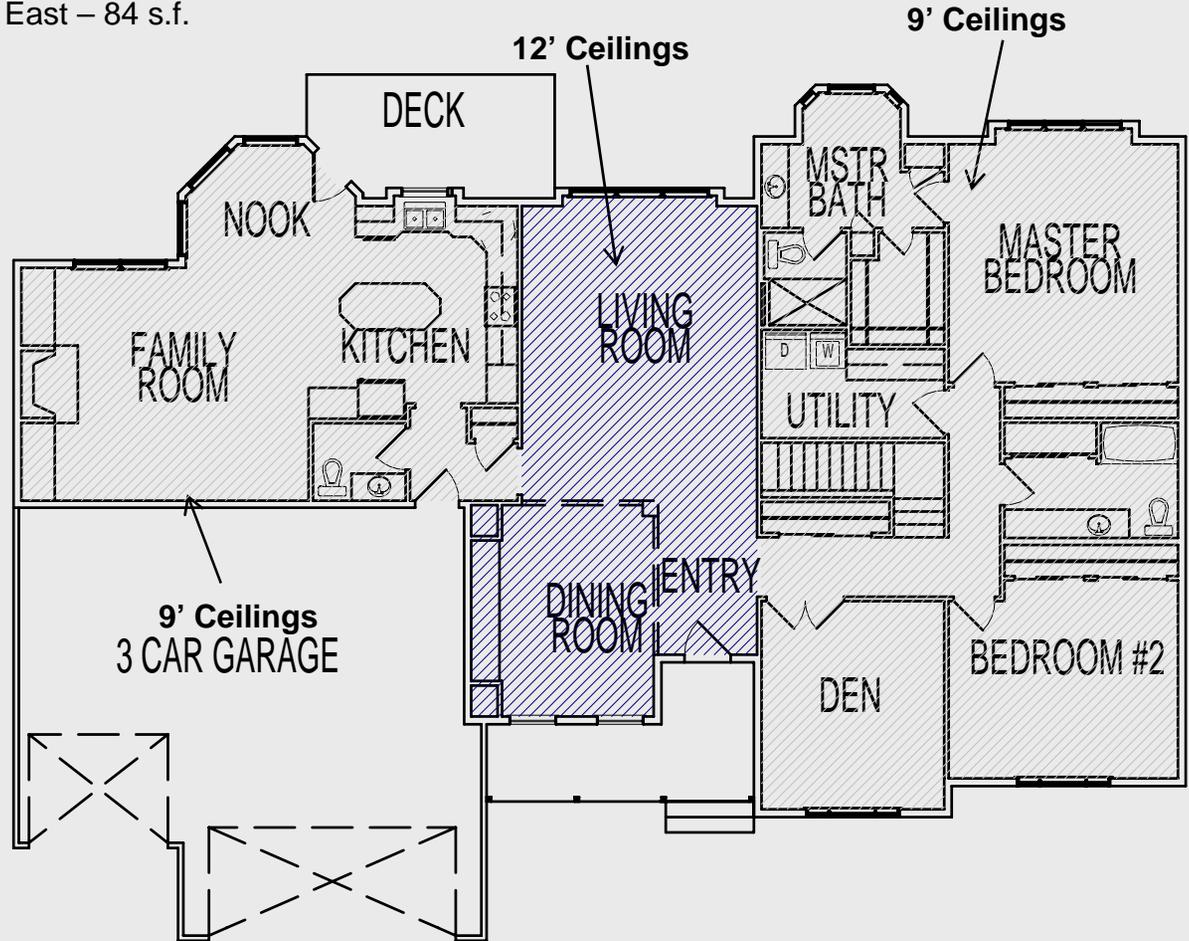
North – 221 s.f.  
South – 234 s.f.  
East – 52 s.f.  
West – 182 s.f.

9' Exterior Walls - 2180 s.f.

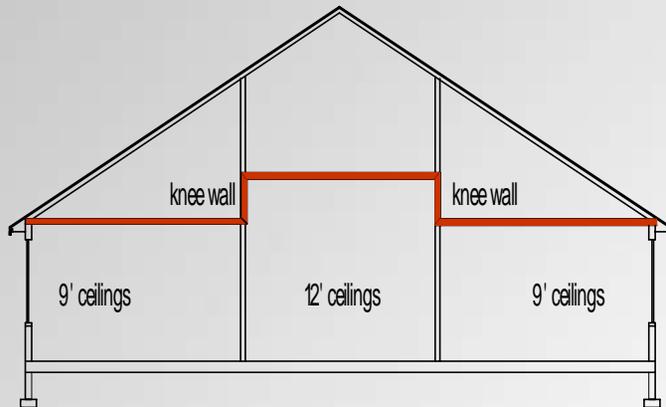
North – 690 s.f.  
South – 600 s.f.  
East – 440 s.f.  
West – 450 s.f.

3' knee walls (between 9'&12' sections) – 153 s.f.

West – 69 s.f.  
East – 84 s.f.

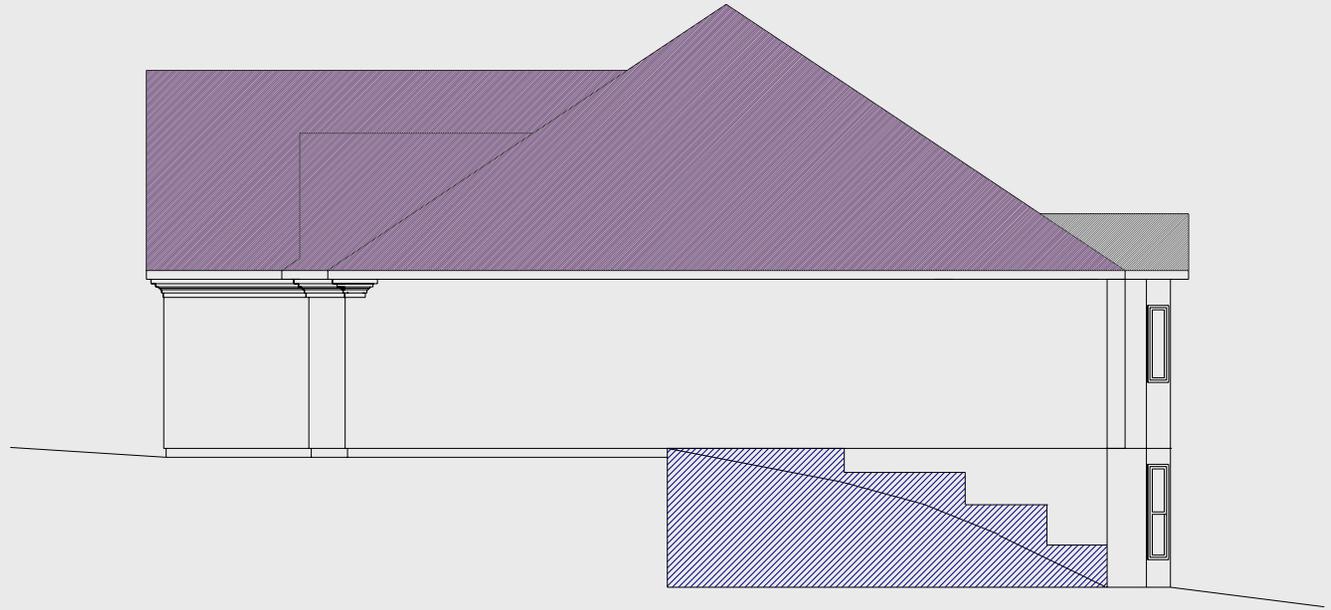


# Knee Wall Insulation



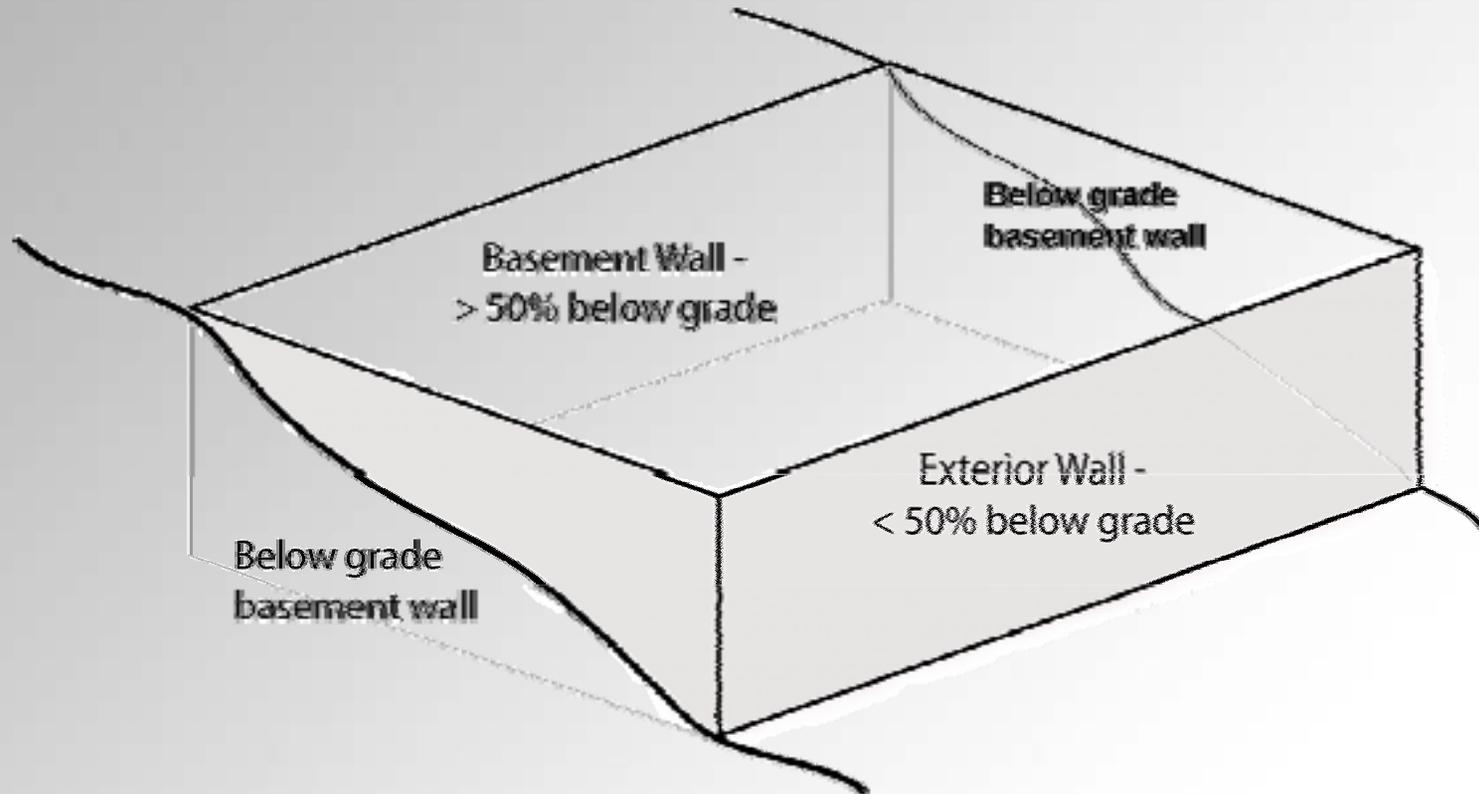
**No, No... Never cut the batts too short**

- Basement Walls -
  - below grade



>50% below grade =  
below grade concrete basement wall

# Defining Below-Grade Walls



# Ways to Insulate Basement Walls



**Interior Studs w/batts**



**Exterior Rigid Foam**

# Below-Grade Walls in REScheck

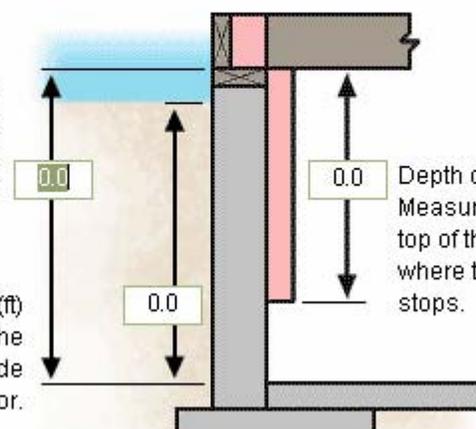
Project		Envelope		Mechanical	
Ceiling		Skylight		Wall	
Window		Door		Basement	
Component	Assembly	Gross Area			
Building					
1	Basement Wall 1	Solid Concrete or Masonry	0	ft2	
<ul style="list-style-type: none"> <li>Solid Concrete or Masonry</li> <li>Masonry Block with Empty Cells</li> <li>Masonry Block with Integral Insulation</li> <li>Wood Frame</li> <li>Insulated Concrete Forms</li> <li>Other</li> </ul>					

### Basement Walls

Enter the specified dimensions in feet (not inches) in the boxes provided. A basement wall less than 50% below grade is considered an above-grade wall and must be entered using the Wall button.

Wall Height (ft)  
Measured from the top of the wall to the basement floor.

0.0



0.0

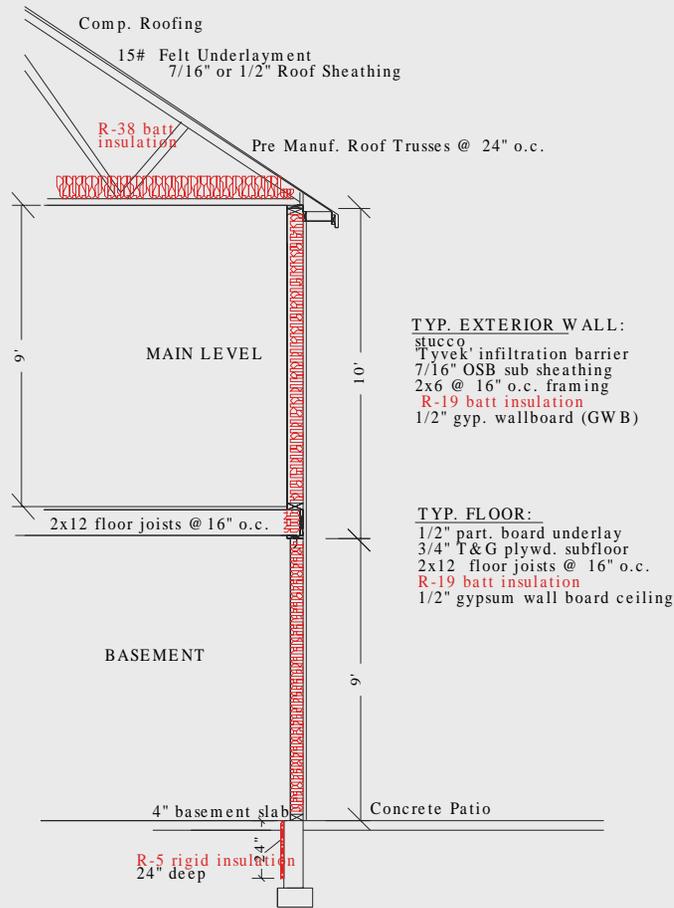
Depth of Insulation (ft)  
Measured from the top of the wall to where the insulation stops.

0.0



Any individual wall of a conditioned basement with an average depth 50% or more below grade should be entered using the *Basement* button. Walls of conditioned basements with an average depth LESS than 50% below grade should be entered as an above-grade wall using the *Wall* button.

➤ Including Rim Joists in the Exterior Wall Area



BASEMENT SECTION @ EXTERIOR WOOD WALL

➤ Basement Wall Areas

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

Below Grade Bsmt Walls = 1044 s.f.

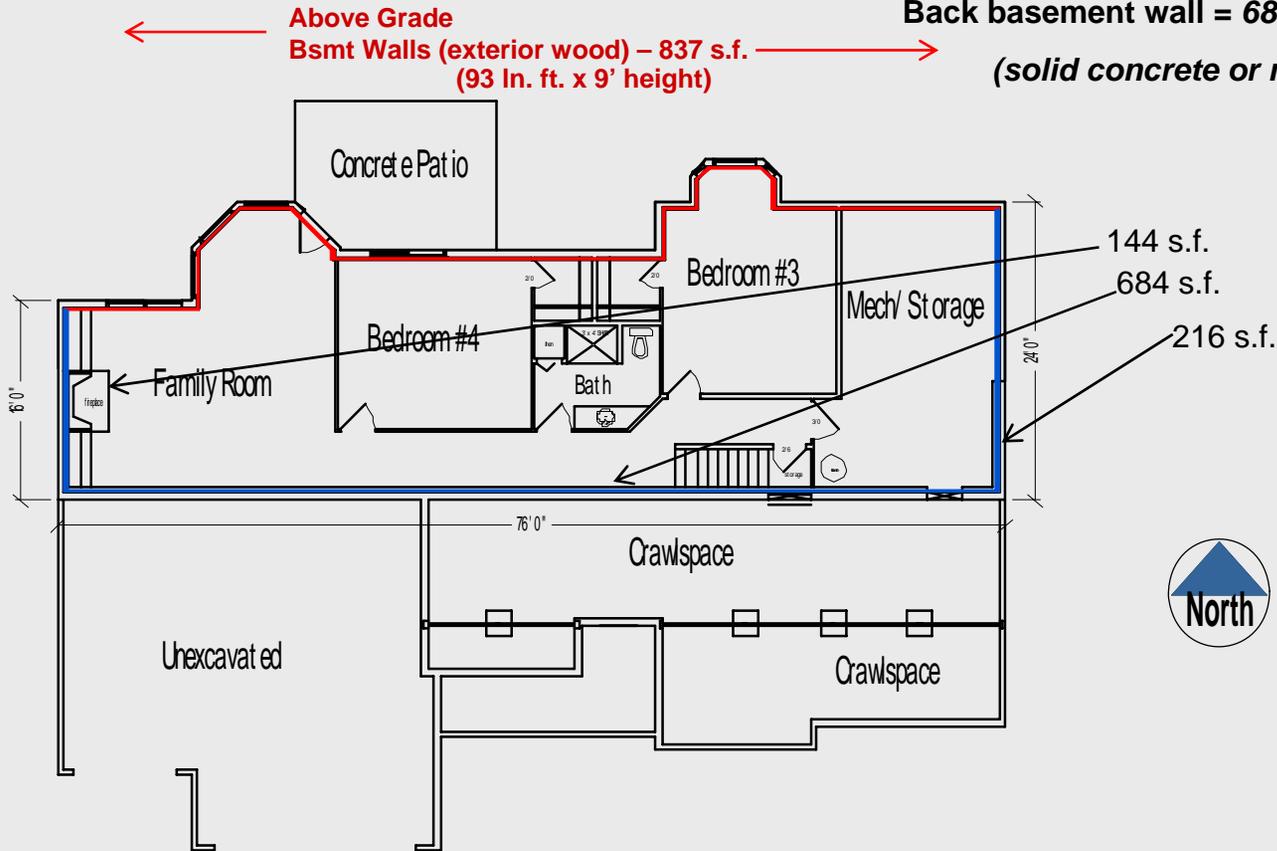
Side basement walls = 360 s.f.

•West Wall – 144 s.f

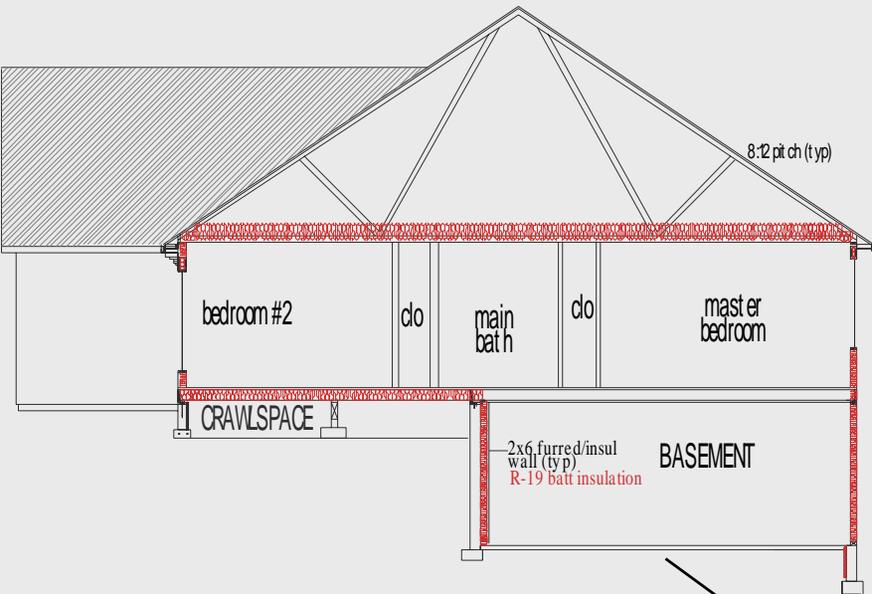
•East Wall – 216 s.f.

Back basement wall = 684 s.f. (76'x9')

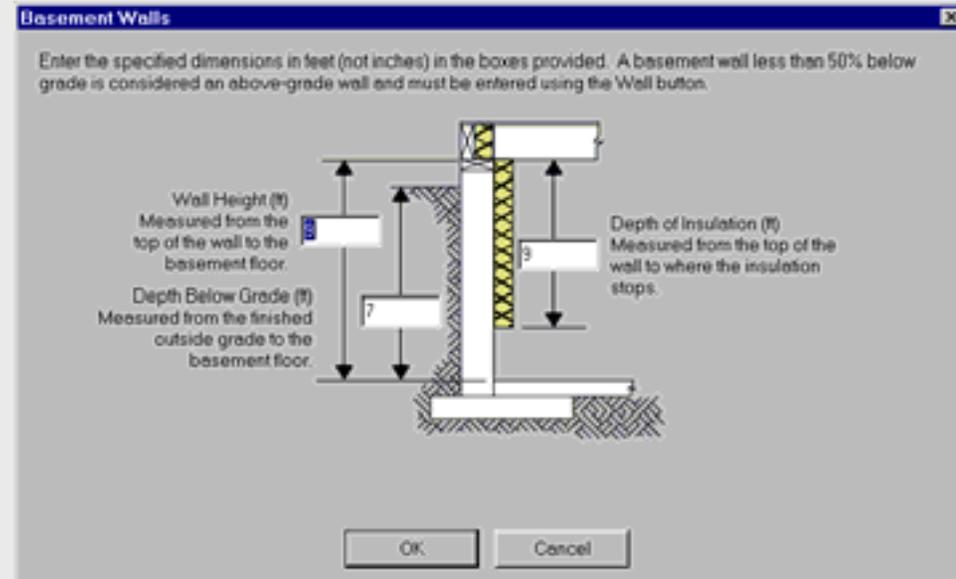
(solid concrete or masonry)



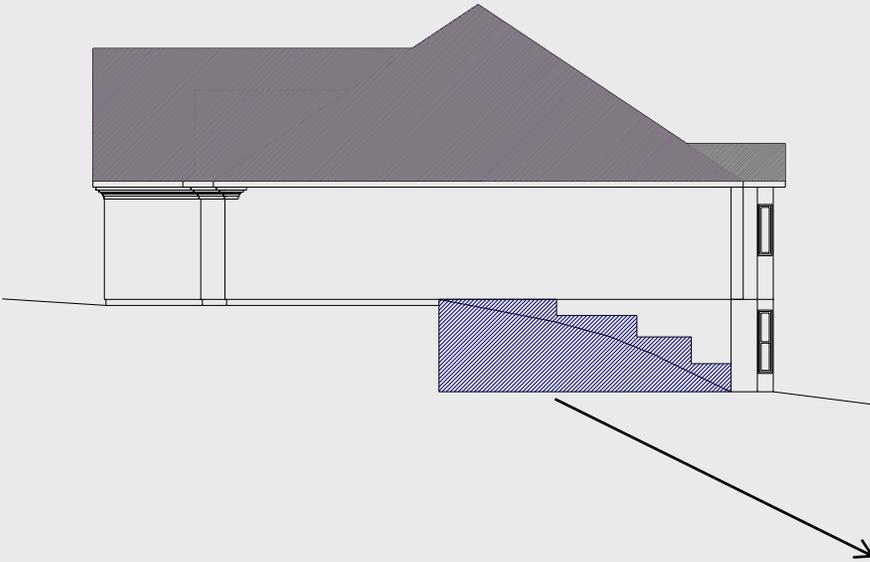
## ➤ Basement Walls



“back” below grade basement wall  
(entire back wall is adjacent to  
crawlspace)



## ➤ Basement Walls



“side” below grade basement walls

**Basement Walls**

Enter the specified dimensions in feet (not inches) in the boxes provided. A basement wall less than 50% below grade is considered an above-grade wall and must be entered using the Wall button.

Wall Height (ft)  
Measured from the top of the wall to the basement floor.

Depth Below Grade (ft)  
Measured from the finished outside grade to the basement floor.

Depth of Insulation (ft)  
Measured from the top of the wall to where the insulation stops.

3

45

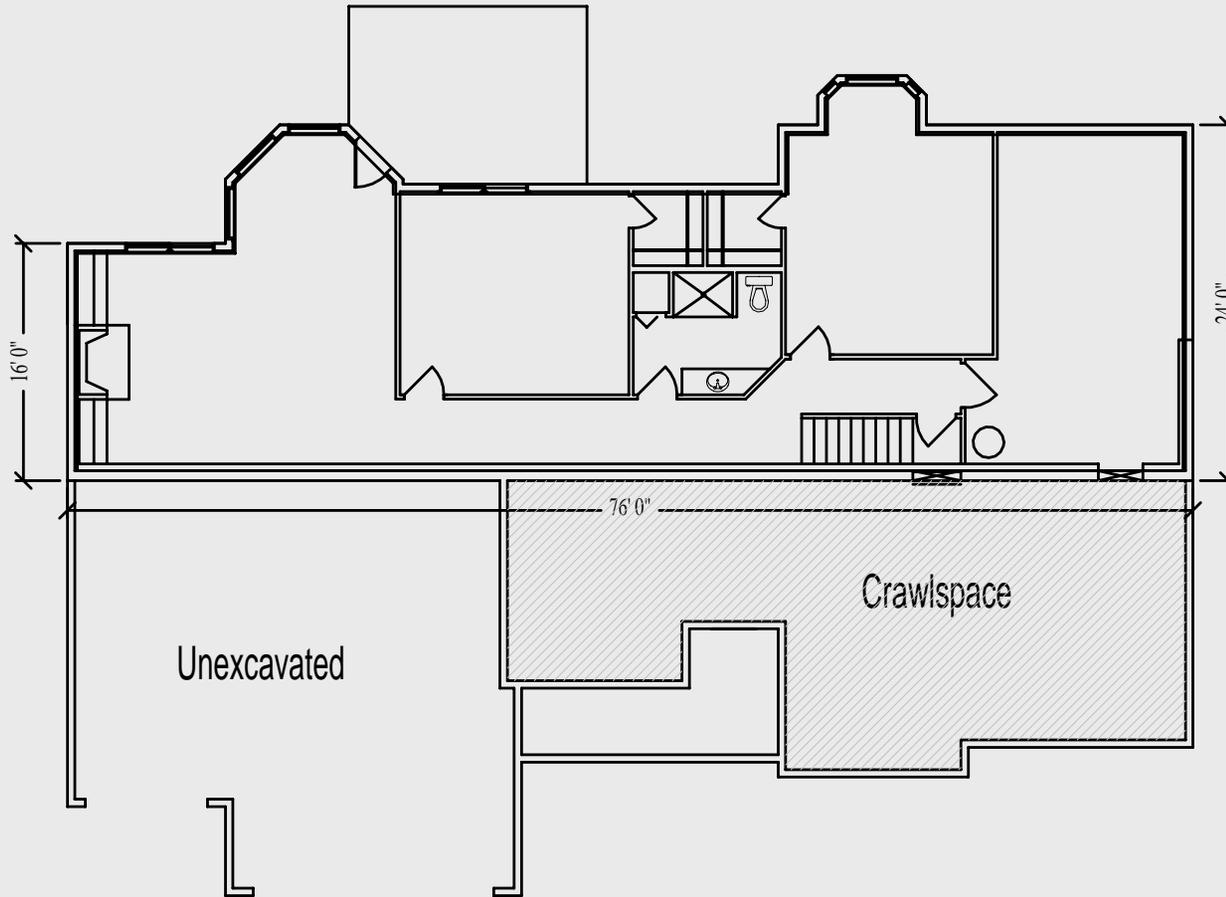
3

OK Cancel

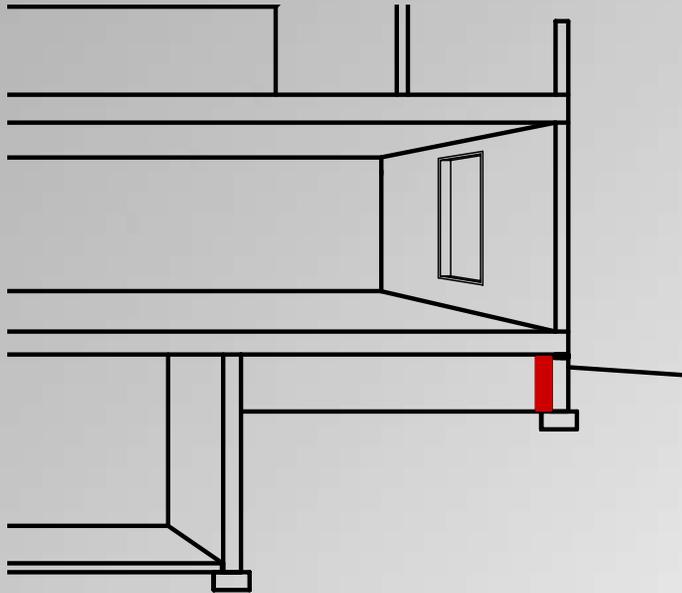
The diagram shows a cross-section of a basement wall. The wall is shown with a yellow hatched insulation layer on its exterior side. Dimension lines indicate the following measurements: 'Wall Height (ft)' is 3 feet, measured from the top of the wall to the basement floor; 'Depth Below Grade (ft)' is 45 feet, measured from the finished outside grade to the basement floor; and 'Depth of Insulation (ft)' is 3 feet, measured from the top of the wall to where the insulation stops.

➤ Floor Area

Crawlspace Area - 783 s.f.



# Crawlspace Wall Insulation



**Insulated crawlspace wall =**

- no foundation vents
- + mechanically vented or conditioned



# Crawlspace Walls in REScheck

Project		Envelope		Mechanical											
Ceiling		Skylight		Wall		Window		Door		Basement		Floor		Crawl Wall	
Component	Assembly	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	Wall Height (ft)	Depth Below Grade (ft)	Depth Below Inside Grade (ft)	Depth Insulation (ft)				
Building															
1	Crawl 1	Solid Concrete or Masonry	0	ft2	0.0	0.0	0.0	0	0.0	0.0	0.0				

### Unventilated Crawl Space Walls

The crawl space wall option applies only to walls of unventilated crawl spaces. Enter the specified dimensions in feet (not inches) in the boxes provided.

Wall Height (ft)  
Measured from the top of the wall to top of the footing.

Depth Below Grade (ft)  
Measured from outside grade to the top of the footing.

Depth of Insulation (ft)  
Include the total vertical plus horizontal distance.

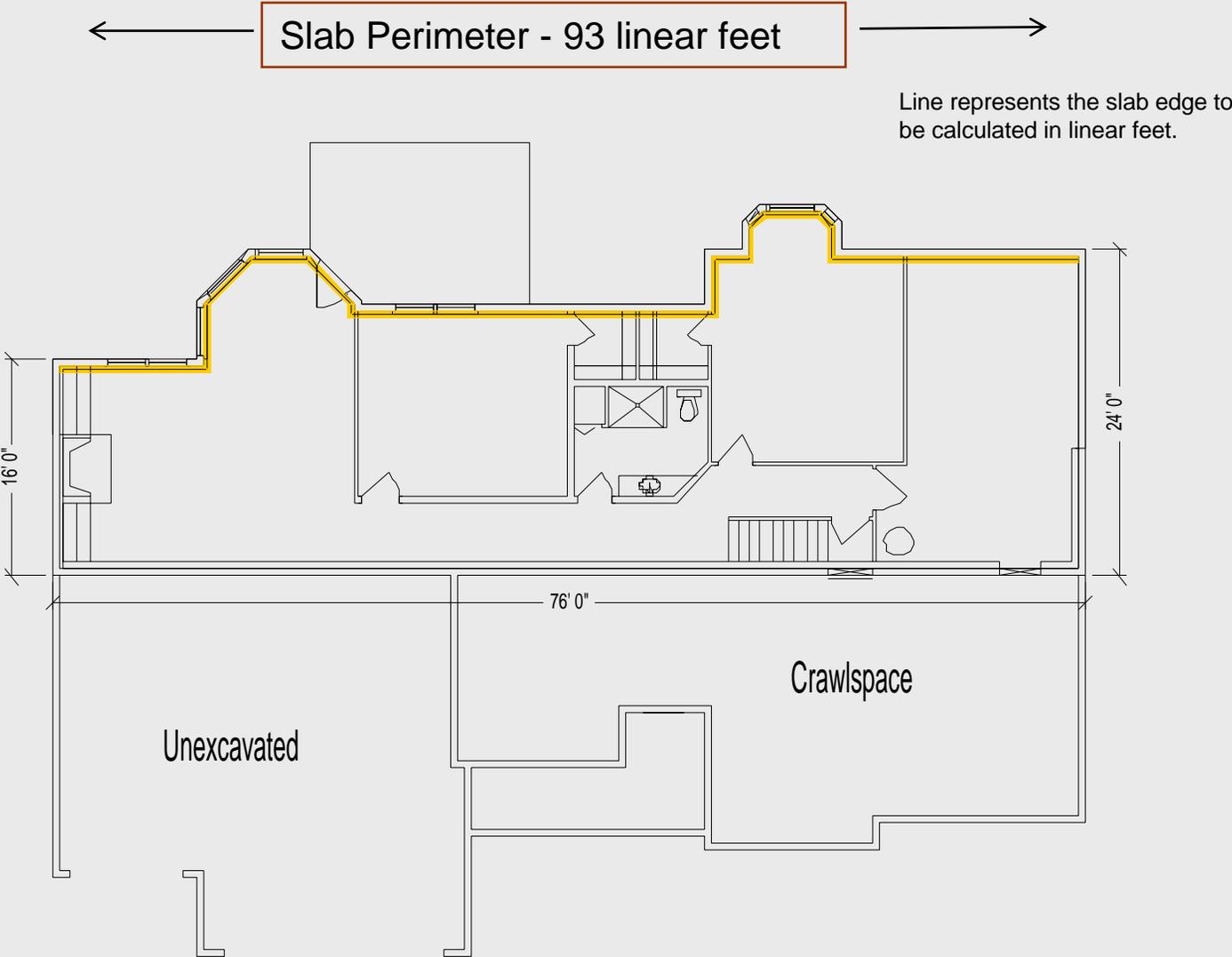
Depth Below Inside Grade (ft)  
Measured from inside grade to the top of the footing.

Compliance  Inve

Click the Assembly fi

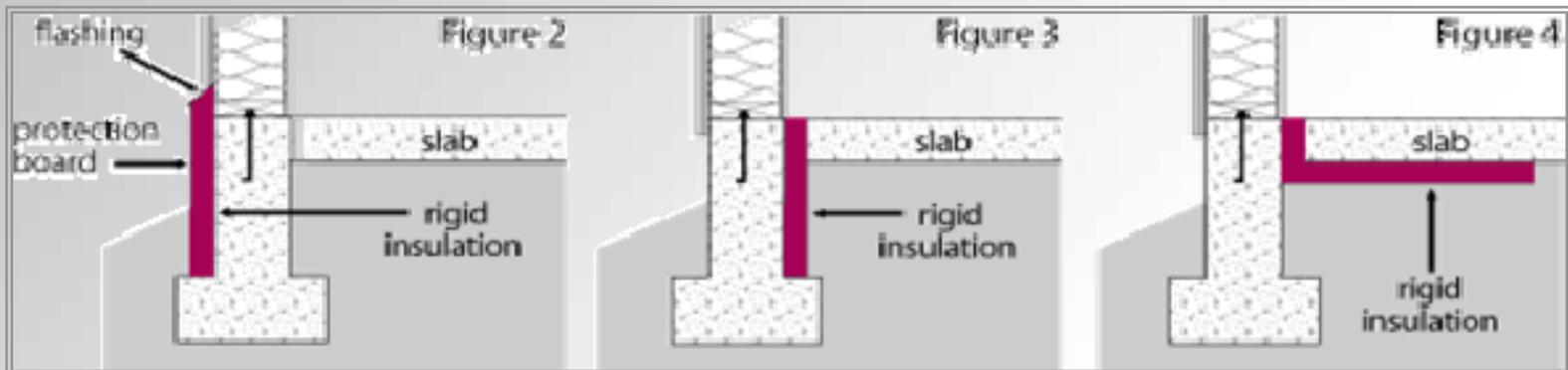
ter Than Code

➤ Slab Perimeter

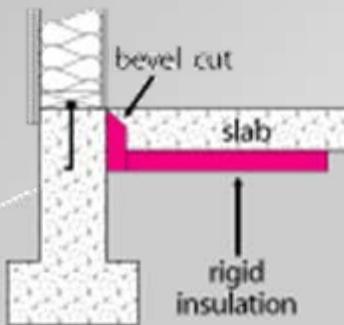


# Slab Edge Insulation

- Proposed R-value must meet or exceed
- Downward from top of slab a minimum of 24" (< 6000 HDD), 48" (> 6000 HDD)
- Downward to at least the bottom of the slab and then horizontally – 24" (< 6000 HDD), 48" (> 6000 HDD)



# Slab Edge Insulation

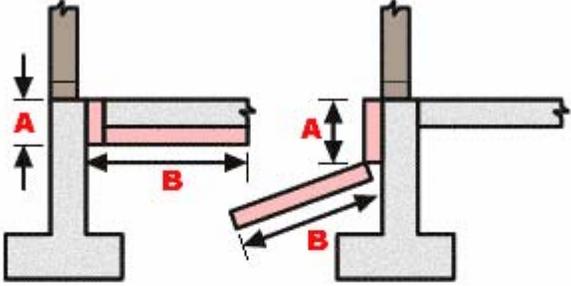


# Slabs in REScheck

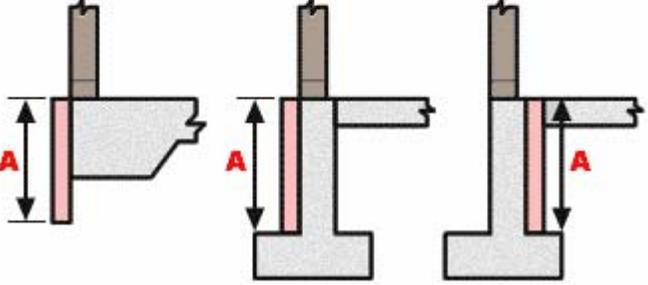
Project		Envelope		Mechanical	
Ceiling		Skylight		Wall	
Window		Door		Basement	
Component	Assembly	Gross Area			
Building					
1	Floor 1	Click here to select Asse...	0	ft2	
		All-Wood Joist/Truss			
		Slab-On-Grade	Unheated		
		Structural Insulated Panels	Heated		
		Other			

**Slab-On-Grade Floors** ✕

Enter the depth of the insulation (ft.), including the total vertical and horizontal distance:  ft.



Horizontal Insulation ( $A + B = \text{Insulation Depth}$ )



Vertical Insulation ( $A = \text{Insulation Depth}$ )



- 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.

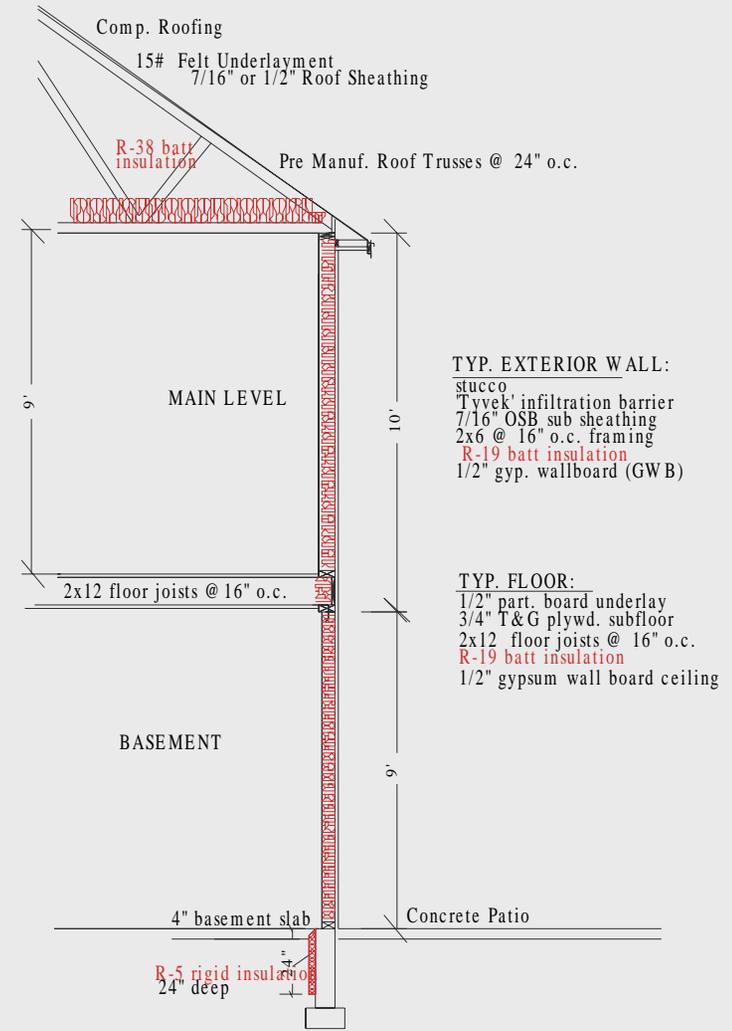
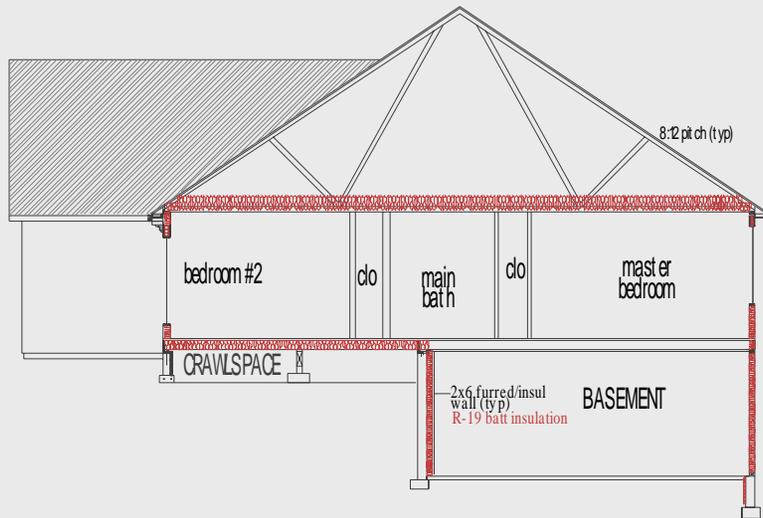
# Insulation Levels

Roof/Ceiling - R-38 batts

Wall - R-19 batts

Floor - R-19 batts

Slab - R-5 rigid (24" vertical)



➤ Window/ Door Area

Glass Doors <50% glass - 40 s.f.; U-value = 0.50

North – 40 s.f.

Opaque Doors - 40 s.f.; U-value = 0.50

South – 40 s.f.

Window Area - 533 s.f.;

U-value = 0.40 & SHGC .40

North – 369 s.f.

South – 149 s.f.

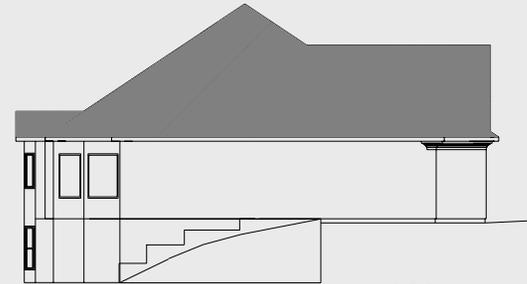
West – 15 s.f.



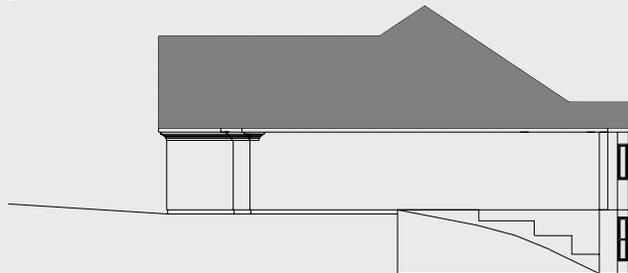
**South**



**North**

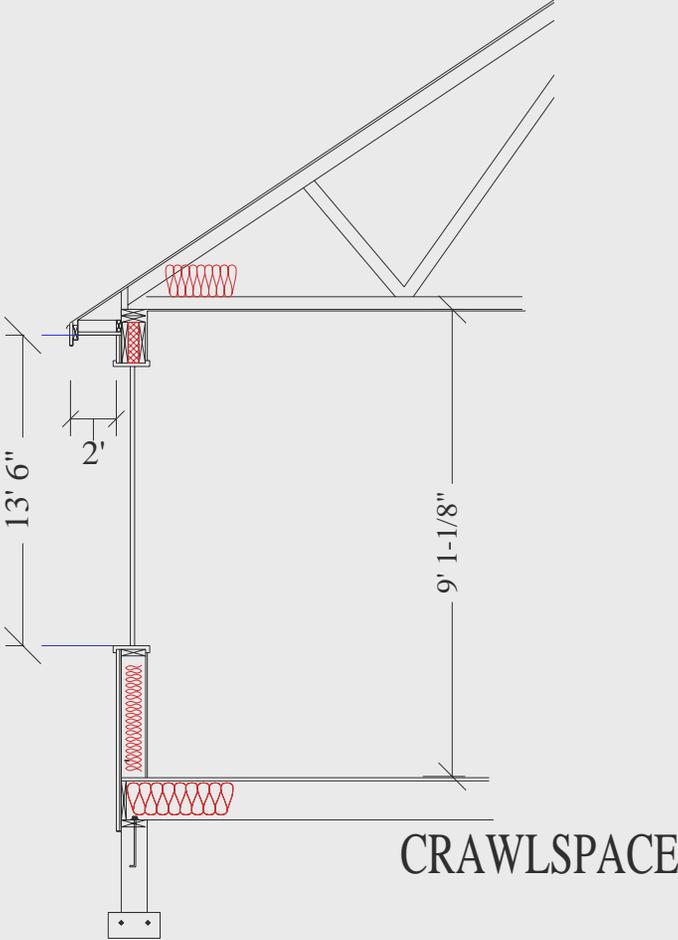
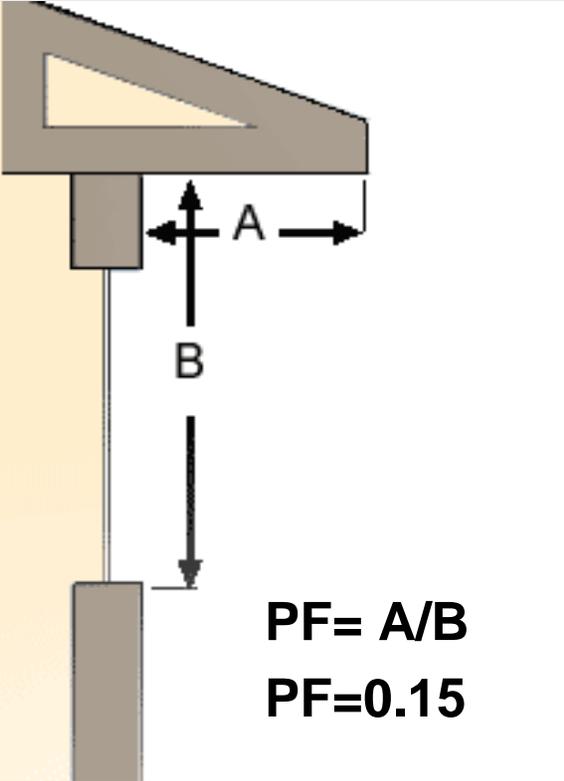


**West**

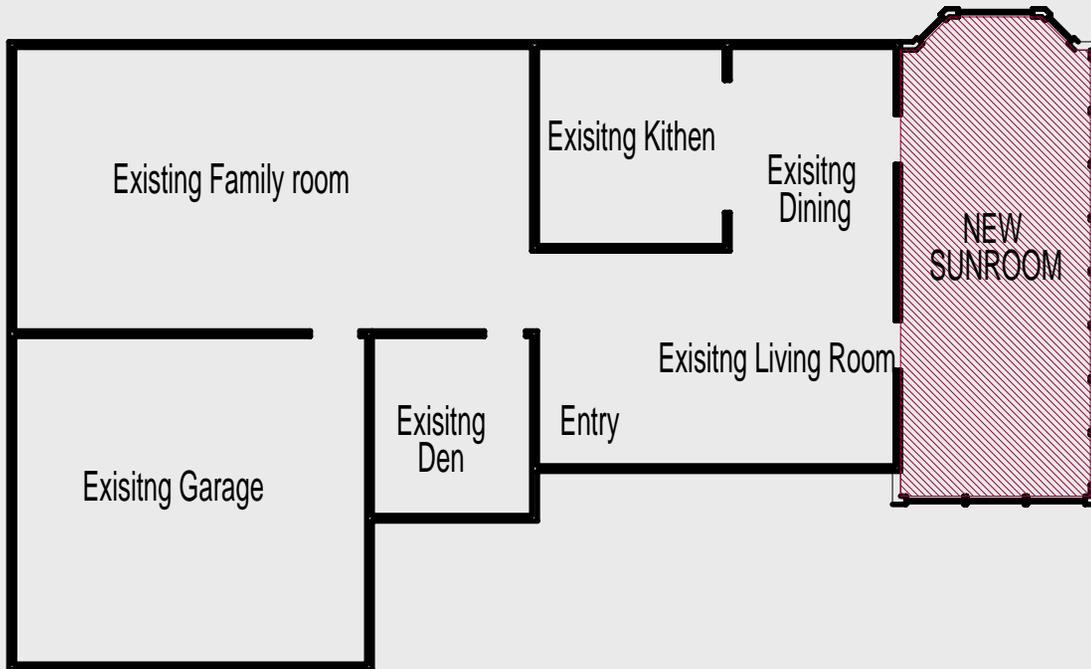


**East**

# Overhang/Projection Factor (PF)



## Sunroom Addition

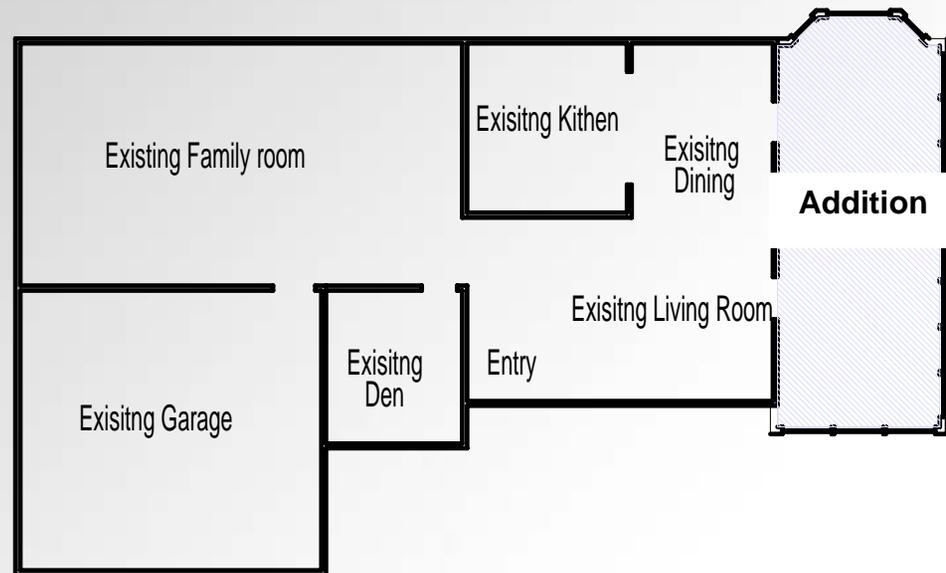


- Ceiling – 350 s.f.
- East Wall – 18 s.f.
- West Wall – 252 s.f.
- West Windows – 144 s.f.  
(U-value .35/SHGC .40)
- North Wall – 112 s.f.
- North Windows – 63 s.f.  
(U-value .35/SHGC .40)
- South Wall – 126 s.f.
- South Windows – 51 s.f.  
(U-value .35/SHGC .40)
- Floor – 350 s.f.



## ➤ Compliance options for additions

- Treat as a stand-alone building
- Bring entire building into compliance



# Special Rules for Sunrooms

## Sunroom addition defined:

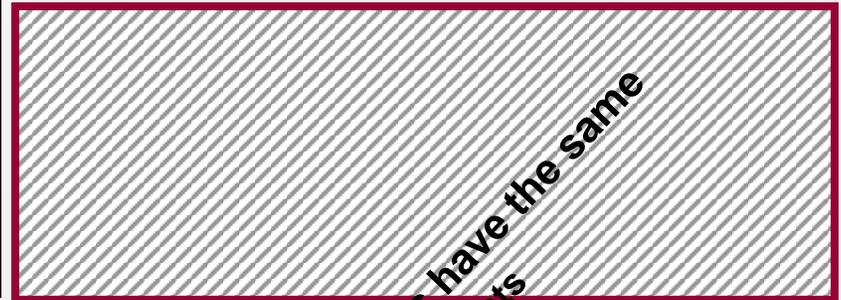
- Area less than 500 ft<sup>2</sup>
- Have > 40% glazing of gross exterior wall and roof area
- Separate heating or cooling system or zone
- Must be thermally isolated and not used as a kitchen or sleeping quarters



# Sunroom/Addition Requirements

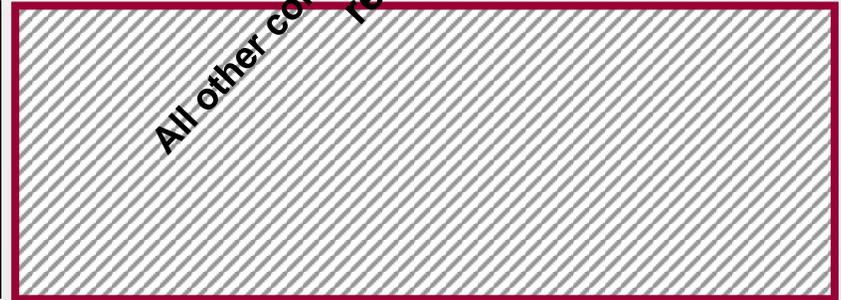
## 2003 IECC Prescriptive Criteria Sunrooms

HDD	MAX	MINIMUM	
	Fenestration U-factor	Ceiling R-value	Wall R-value
0 – 1,999	.75	R-19	R-13
2,000 – 3,999	.50	R-19	R-13
4,000 – 5,999	.50	R-19	R-13
6,000 – 8,499	.50	R-24	R-13
8,500 – 12,999	.50	R-24	R-13



## Prescriptive Criteria Additions and Window Replacement

HDD	MAX	MINIMUM	
	Fenestration U-factor	Ceiling R-value	Wall R-value
0 – 1,999	.75	R-26	R-13
2,000 – 3,999	.50	R-30	R-13
4,000 – 5,999	.40	R-38	R-18
6,000 – 8,499	.35	R-49	R-21
8,500 – 12,999	.35	R-49	R-21



# Questions/Comments

➤ Help Desk – on-line electronic form

<http://www.energycodes.gov/support/helpdesk.php>

Email

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