

Modeling Walkout Basement

The instructions on modeling walkout basements are as follows:

Configuration 1 (Walkout with no slab)

For walkout basements with no slab, calculate the equivalent depth below grade based on the actual area of its below grade wall. Then, use the basement thermal load calculator “BasementHLR.xls” to calculate its foundation heat loss.

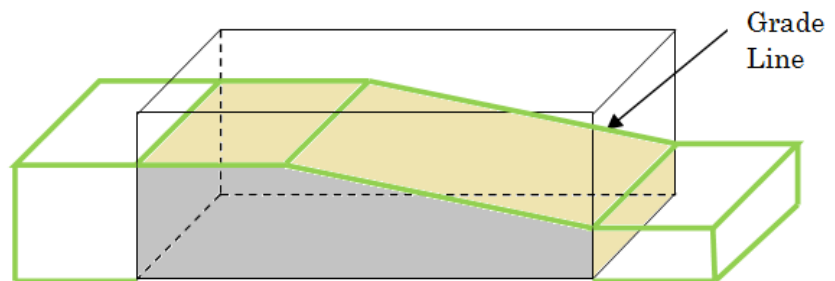


Figure 1

Step i) Calculate the areas of above & below grade wall areas based on project plans & drawings.

Step ii) Calculate the equivalent depth below grade using the following formula.

$$\text{Equivalent Depth Below Grade} = \frac{\text{Below Grade Wall Area}}{\text{Walkout Basement Exposed Perimeter}}$$

Step iii) Use the CSA F280-12 Spreadsheet “BasementHLR.xls”, to calculate the heat loss for the walkout basement using the equivalent depth below grade.

Step iv): Apportion the foundation heating load to applicable rooms located in the walkout basement based on exposed perimeter ratio.

$$\text{Apportioned Heating Load for a Room} = \text{Foundation Heating Load} \times \frac{\text{Room Exposed Perimeter}}{\text{Foundation Exposed Perimeter}}$$

Configuration 2 (Walkout with slab)

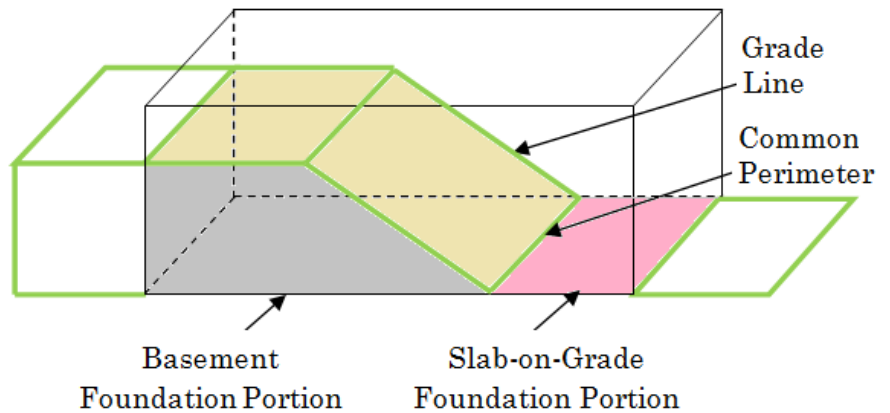


Figure 2

For walkout basements with a slab, treat the walkout as a combination of basement and slab-on-grade foundations. For the basement portion, calculate the equivalent depth below grade based on the actual area of its below grade wall divided by the exposed perimeter for basement portion.

$$\text{Equivalent Depth below Grade} = \frac{\text{Below Grade Wall Area}}{\text{Exposed Perimeter of Basement Portion Only}}$$

Then use the CSA basement thermal load calculator “BasementHLR.xls” for the basement portion. For the slab-on-grade portion, use the CSA slab-on-grade thermal load calculator “SlabOnGrade.xls” to calculate its heat loss. In both cases, enter the exposed perimeter into the calculators based on the total perimeter of the basement and slab portions respectively, less the common perimeter shared by the intersection of the basement and slab portions as per **Figure 2**.

Step i) For a walkout basement with slab (shown above), divide the foundation into two portions; basement foundation and slab-on-grade foundation.

Step ii) Calculate the heating load for the basement foundation portion using the same method as per “Configuration 1 (Walkout with no Slab)”

Step iii) Use the above calculated depth below grade in CSA F280-12 “BasementHLR” spreadsheet to calculate the heating load for basement foundation portion.

Step iv) Apportion the calculated heating load to applicable rooms located in the basement foundation portion.

Step v) For slab-on-grade foundation portion, calculate its foundation heating load using the CSA F280-12 “SlabOnGradeHLR.xls” spreadsheet, and apportion the calculated heating load to applicable rooms located in the slab-on-grade foundation portion.

Example

Configuration 1 (Walkout with no slab)

Calculate the foundation heat loss for the walkout basement for a house located in London, Ontario. The house information is provided as follows:

Soil Conditions:

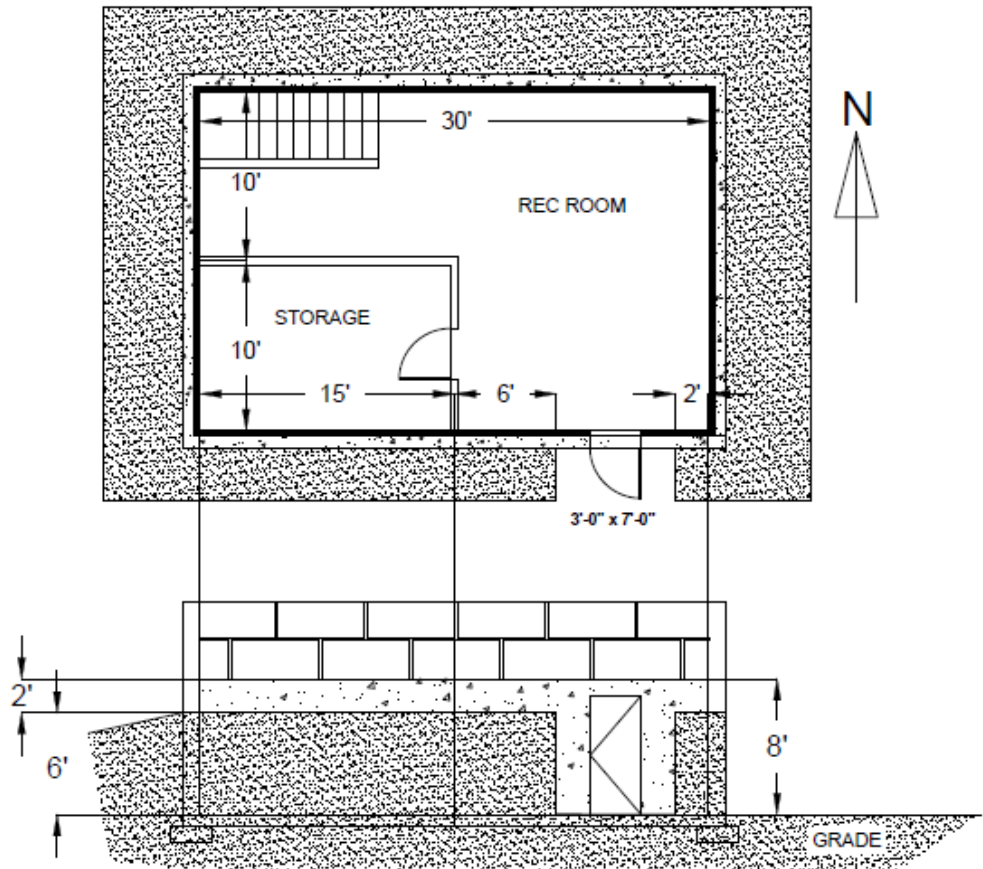
- Normal Conductivity
- Water Table Level – Normal

Insulation Configuration:

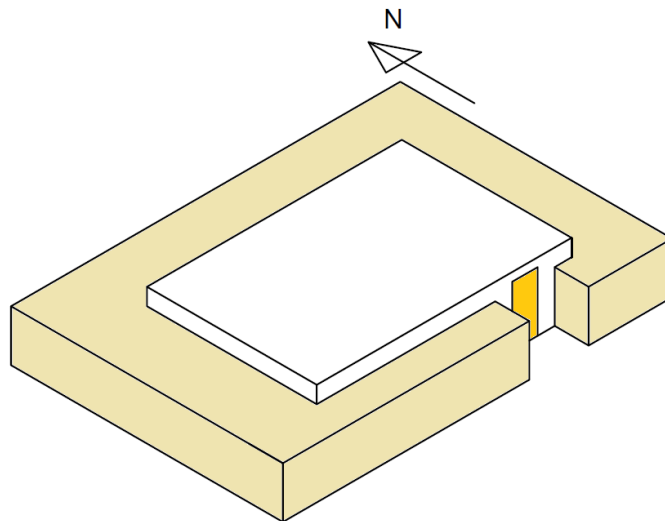
- Basement foundation configuration = BCIN_1
- Concrete walls and floors
- Interior surface of basement wall insulated over full height (Interior insulation = 2.3 RSI)
- Slab is uninsulated

Example (Configuration 1)

Project House Plans & Drawings:



Note: The foundation has 7' of exposed slab for the door opening. However, since this exposed portion is relatively small compared to the entire foundation, the entire foundation will be simply treated as a walkout without slab



When a project house has a basement with a relatively small exposed slab (as in this example), the designer can treat the entire foundation as a basement in order to simplify calculations

Solution for Example (Configuration 1)

Note: The example walkout basement as shown above shows that majority of basement envelope is below grade except for the small opening for walk-out exit. Thus, this can be treated as a walkout basement without slab.

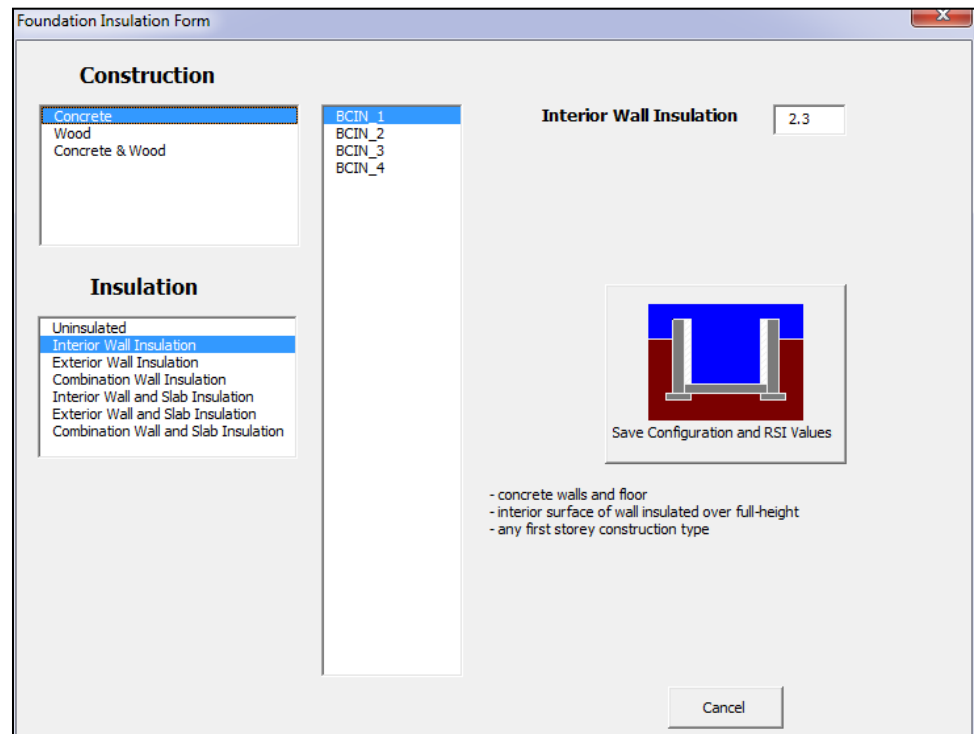
Below Grade Basement Wall Area:

$$= 6 \times (6 + 15 + 10 + 10 + 30 + 20 + 2) = 558 \text{ ft}^2$$

Equivalent Depth below Grade:

$$= \frac{\text{Below Grade Wall Area}}{\text{Exposed Perimeter of Walkout Basement}}$$

$$= \frac{558}{2 \times (30 + 20)} = \frac{558}{100} = 5.58 \text{ ft } (= 1.70 \text{ m})$$



Screenshot of Walkout Basement Insulation Configuration

Solution for Example (Configuration 1 (Cont'd))

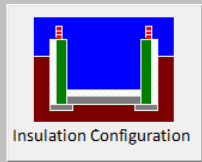
Residential Foundation Thermal Load Calculator

Supplemental tool for CAN/CSA-F280

Foundation Heating Load for Basement Portion:

992 W = 3385 Btuh

This heating load is to be assigned to Storage room and Recreational room based on exposed perimeter ratio

Weather Station Description	
Province:	Ontario
Region:	London
Site Description	
Soil Conductivity:	Normal conductivity: dry sand, loam, clay
Water Table:	Normal (7-10 m, 23-33 Ft)
Foundation Dimensions	
Floor Length (m):	9.144
Floor Width (m):	6.096
Exposed Perimeter (m):	30.48
Wall Height (m):	2.44
Depth Below Grade (m):	1.7
Window Area (m ²):	0
Door Area (m ²):	1.95
	
Radiant Slab	
Heated Fraction of the Slab:	0
Fluid Temperature (°C):	33
Design Months	
Heating Month	1
Foundation Loads	
Heating Load (Watts):	992

Screenshot of Walkout Basement Heat Load Calculation

Foundation Conductive Heat Loss for Storage Room

$$\begin{aligned}
 &= \frac{\text{Basement Foundation Load}}{\text{Basement Foundation Exposed Peri.}} \times \frac{\text{Storage Room Exposed Peri.}}{\text{Basement Foundation Exposed Peri.}} \\
 &= 3385 \text{ Btuh} \times \frac{25 \text{ ft}}{100 \text{ ft}} = 846 \text{ Btuh}
 \end{aligned}$$

Foundation Conductive Heat Loss for Recreation Room

$$\begin{aligned}
 &= \frac{\text{Basement Foundation Load}}{\text{Basement Foundation Exposed Peri.}} \times \frac{\text{Recreation Room Exposed Peri.}}{\text{Basement Foundation Exposed Peri.}} \\
 &= 3385 \text{ Btuh} \times \frac{75 \text{ ft}}{100 \text{ ft}} = 2539 \text{ Btuh}
 \end{aligned}$$

Example

Configuration 2 (Walkout with Slab)

Calculate the foundation heat loss for the walkout basement for a house located in London, Ontario.

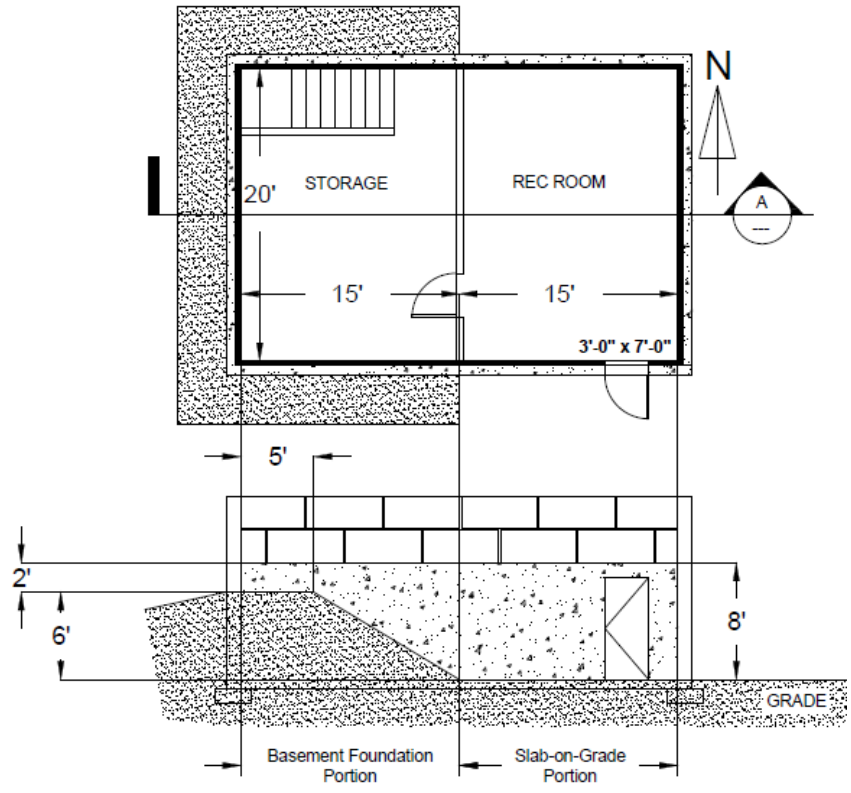
Soil Conditions:

- Normal Conductivity
- Water Table Level – Normal

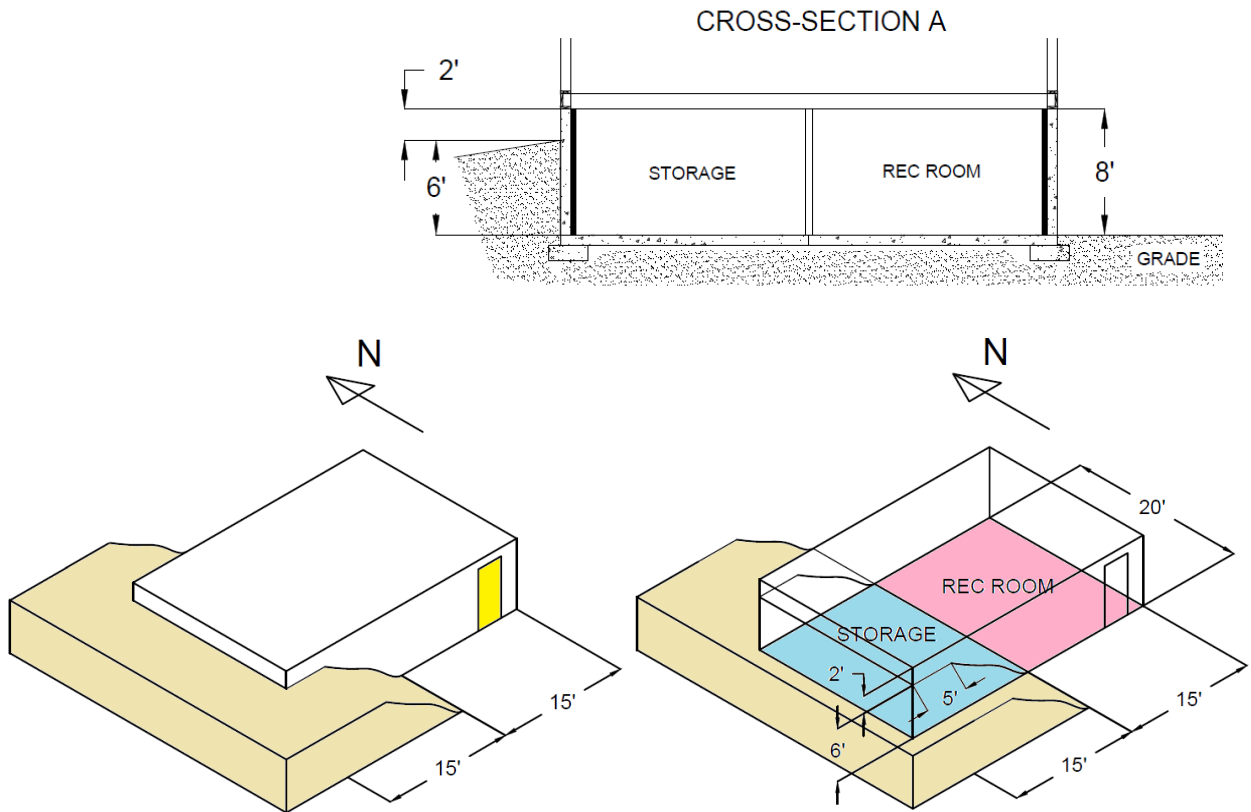
Insulation Configuration:

- Basement foundation configuration = BCIN_1
- Slab-on-grade foundation configuration = SCN_1
- Concrete walls and floors
- Interior surface of basement wall insulated over full height (Interior insulation = 2.3 RSI)
- Slab is uninsulated

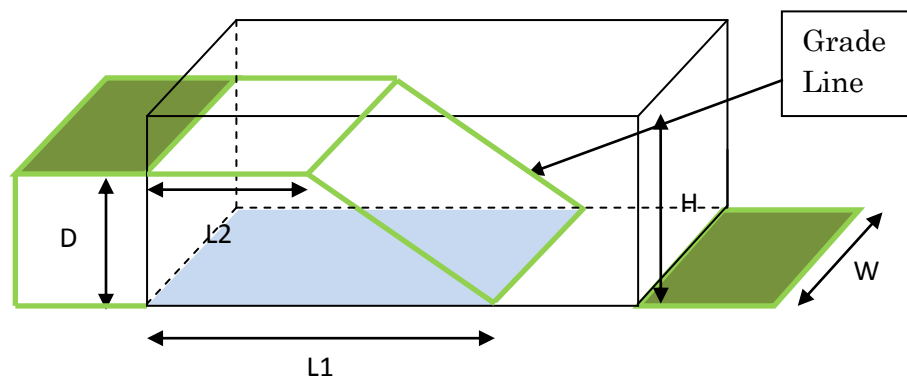
Project House Plans & Drawings:



Example Configuration (Walkout with Slab (Cont'd))



Solution for Example (Configuration 2)



From project drawings and plans:

$$L1 = 15 \text{ ft} \quad L2 = 5 \text{ ft} \quad W = 20 \text{ ft} \quad H = 8 \text{ ft} \quad D = 6 \text{ ft}$$

Below Grade Basement Wall Area:

$$= 2 \times (\text{Area of a Trapezoid}) + (\text{Area of a Rectangle})$$

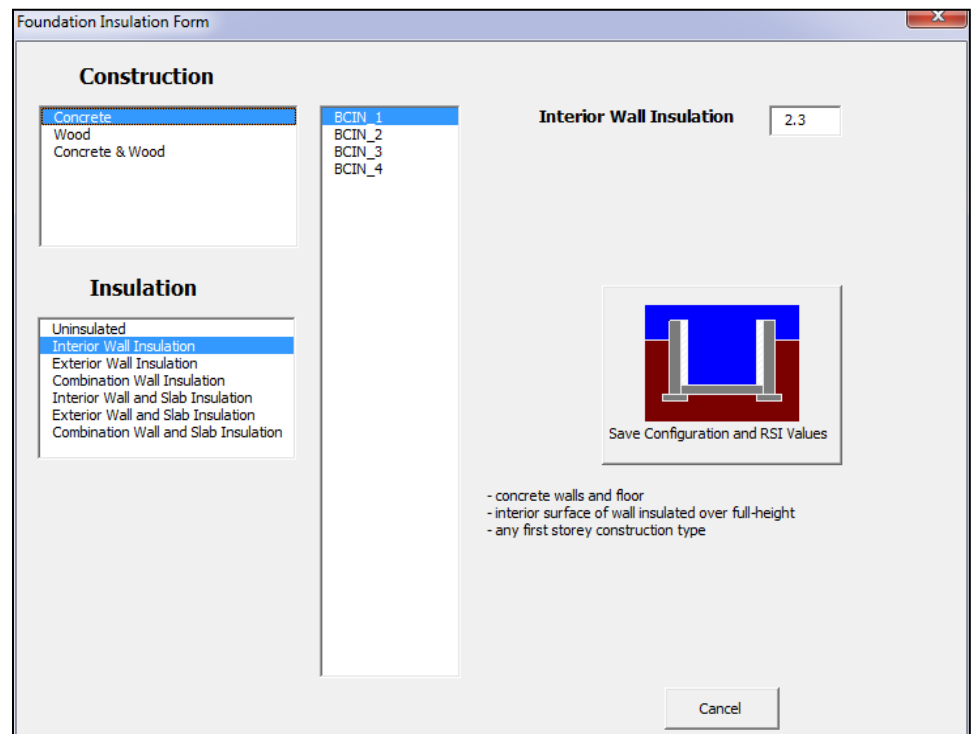
$$= 2 \times [(L1 + L2) \div 2 \times D] + W \times D$$

$$= 2 \times [(15 + 5) \div 2 \times 6] + 20 \times 6 = 240 \text{ ft}^2$$

Equivalent Depth below Grade:

$$= \frac{\text{Below Grade Wall Area}}{\text{Exposed Perimeter of Basement Portion only}}$$

$$= \frac{240}{2 \times 15 + 20} = 4.8 \text{ ft} (= 1.46 \text{ m})$$



Screenshot of Insulation Configuration for Basement Portion

Solution for Example (Configuration 2 (Cont'd))

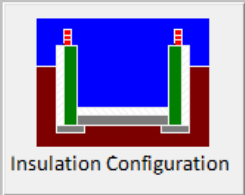
Residential Foundation Thermal Load Calculator

Supplemental tool for CAN/CSA-F280

Foundation Heating Load for Basement Portion:

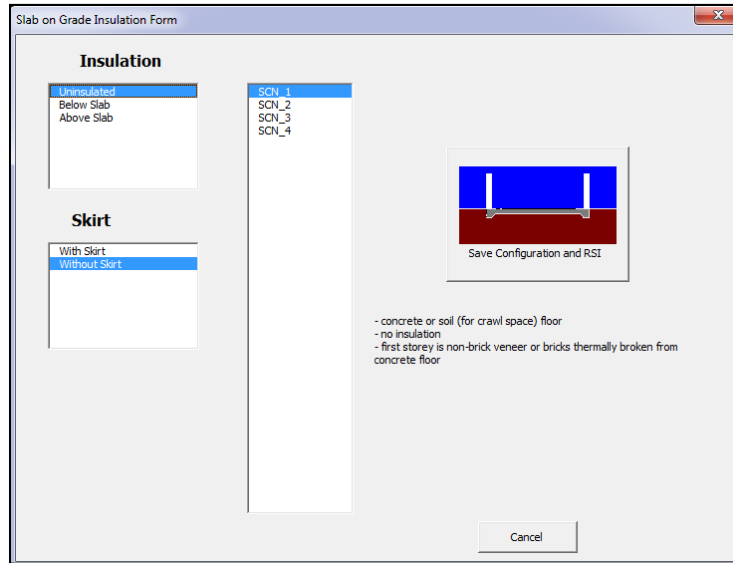
684 W = 2334 Btuh

This heating load is to be assigned to Storage room (the room located in basement portion)

Weather Station Description		
Province:	Ontario	
Region:	London	
Site Description		
Soil Conductivity:	Normal conductivity: dry sand, loam, clay	
Water Table:	Normal (7-10 m, 23-33 Ft)	
Foundation Dimensions		
Floor Length (m):	4.57	 <p>Insulation Configuration</p>
Floor Width (m):	6.1	
Exposed Perimeter (m):	15.24	
Wall Height (m):	2.44	
Depth Below Grade (m):	1.46	
Window Area (m ²):	0	
Door Area (m ²):	0	
Radiant Slab		
Heated Fraction of the Slab:	0	
Fluid Temperature (°C):	33	
Design Months		
Heating Month	1	
Foundation Loads		
Heating Load (Watts):	684	

Screenshot of Heat Load Calculation for Basement Portion

Solution for Example (Configuration 2 (Cont'd))



Screenshot of Insulation Configuration for Slab-on-Grade Portion

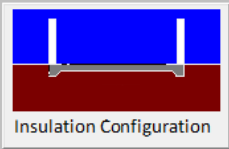
Residential Slab on Grade Thermal Load Calculator

Supplemental tool for CAN/CSA-F280

Foundation Heating Load for Slab-on-Grade Portion:

$$242 \text{ W} = 826 \text{ Btuh}$$

This heating load is to be assigned to Storage room (the room located Slab-on-Grade portion)

Weather Station Description		
Province:	Ontario	
Region:	London	
Site Description		
Soil Conductivity:	Normal conductivity: dry sand, loam, clay	
Water Table:	Normal (7-10 m, 23-33 Ft)	
Floor Dimensions		
Length (m):	4.57	 <p>Insulation Configuration</p>
Width (m):	6.1	
Exposed Perimeter (m):	15.24	
Radiant Slab		
Heated Fraction of the Slab:	0	
Fluid Temperature (°C):	33	
Design Month		
Heating Month	1	
Results		
Heating Load (Watts):	242	

Screenshot of Heat Load Calculation for Basement Portion