

**Lab 6. Residential Heating Load (2.5 Points)**

This assignment will take you further into the science (and art) of heating load calculations. I want you to do a detailed whole house heat loss calculation and design load using the following information. The basic house is a 32' by 32' two-story with a walkout basement on the south side. It has an attached garage that wraps around a portion of the first floor on the west and north sides. There is an open porch across the front of the first floor (north) and a screened porch across one-half of the first floor on the east side.

Located in St. Paul, Minnesota  
Use 99% design conditions

## Area take-offs

Basement slab is a total 1024 square feet  
Total volume is 27,648 cubic feet

## Important construction details

4" basement floor slab is insulated with extruded polystyrene; southern 8' has 3" and rest has 2"  
10" basement walls (and stem wall) have exterior waterproofing with 2-3/4" extruded polystyrene.  
Rim joist has 2" of extruded polystyrene and 3/4" plywood sheathing on the outside of the rim joist  
(1-1/8" OSB) and 1-1/2" extruded covered by 3/4" polyisocyanurate on the inside.  
Exterior walls are 2x6 @ 16" o.c. with blown-in-blanket (R-22) and 25/32" fiberboard sheathing  
Assume vinyl siding for all exterior walls  
House/garage wall is 2x6 @ 16" o.c. with blown-in blanket fiberglass and 5/8" drywall  
Ceiling is raised heel roof trusses @ 24' o.c. with R-50 blown-in fiberglass  
Attic hatch is drywall plus 3" of extruded polystyrene and an R-19 batt  
Windows and patio doors are aluminum clad wood with triple glazing, two 0.10 low-e coatings,  
and 1/2" argon  
Front door and sidelights are insulated steel in wood frame with 45% double low-e, argon glass  
House/garage door is insulated steel in wood frame  
Airtight construction (350 cfm @ 50 Pa; effective leakage area of 25 sq. in.)  
Ventilation is provided with a 75% efficient HRV; normal ventilation rate will be 90 cfm  
Heating will be a combination space and water heat; CAE = 92%  
Ductwork is uninsulated, but pretty tight (5%/5%)