Part 1: Heat Loss/Gain

1. Determine the U-value for a wall assembly consisting of:

   Wood Bevel Exterior Lapped Sheathing (0.75” x 10”)
   ½” Plywood (Douglas Fir)
   2”x4” Douglas Fir framing with 3-1/2” Fiberglass Batt Insulation
   ½” Sound Deadening Board
   ½” Gypsum Board

2. Determine the average weight of one square foot of this wall.
Part 2: Heating and Cooling Loads

Complete the heating and cooling load calculations for the following conditions:

Building Name: Miller Office Building, 375 South 1530 East, Salt Lake City, UT
Winter Design Conditions (97.5%): 8°F ODBT; \( w = 0.0006\) # H\(_2\)O/# of dry air
Summer Design Conditions (2.5%): 95°F ODBT; MDR: 32°F

Building Plan Dimensions: 90' x 150' (4 stories tall)
Gross Wall Area (SF): N=4100  E=7200  S=4300  W=7100
Glazing Area (SF): N=1000  E=1980  S=1208  W=1860
Projection Factors: N=0.20  E=0.20  S=0.50  W=0.20

Wall Description: 4" Brick
2" Rigid Insulation
8" Concrete Block
0.75" Airspace
0.5" Gypsum Board

Wall thermal properties:
\( U_{\text{wall}} = 0.054 \text{ Btu/sf-°F} \)
Heat content = 27.33 Btu/sf-°F

Roof Description: Built Up Roof
0.625" Plywood Deck
1.25" Air Space
R-19 Insulation
0.5" Gypsum Board
0.5" Acoustic Tile

Roof thermal properties:
\( U_{\text{roof}} = 0.042 \text{ Btu/sf-°F} \)
Color: dark
Vented: yes

Slab Description: Unheated slab on grade; \( U_{\text{slab}} = 0.16 \text{ Btu/sf-°F} \);
48" deep vertically oriented rigid insulation, \( R = 5.4 \);
Groundwater temperature: 53°F

Window Description: Glazing: Insulating Double Paned with 0.5" airspace, Clear inside/Heat Absorbing Outside. \( E = 0.15 \) on surface 2.
Frames: Commercial aluminum with thermal breaks.
Interior Shading: Low transmittance high reflectance
Drapes: \( U_{df} = 0.46; VT = 0.37; SC = 0.32 \)

Skylight Description: Glazing: same as windows, no interior shading
Area (sf): 675 sf.
Door Description: 1-3/4" Solid urethane foam core with thermal break.
Area (SF): N=18  E=36  S=18  W=36
U_{\text{door}} = 0.19  \text{ Btuh/sf-}^{\circ}\text{F}

Equipment Description: Power Density: 0.5 watt/sf

Lighting Description:  
Power Density: 1.5 watt/sf  
Daylighting Controls: None  
Design Lighting Level: 50 fc  
Type: Fluorescent

Occupant Description: Offices: seated, light work, no smoking permitted
Winter Interior Conditions: 68°F/45% RH; w= 0.0066  
Summer Interior Conditions: 75°F  
Number of Occupants: 378  
Ventilation Required (cfm): 7560 (20 cfm/person)

On the attached forms, complete the heating and cooling load calculations for this building. Since the building is positively pressurized, ignore infiltration. For the DETD cooling load calculation, ignore the doors.

1. What is the design heating load?

2. What is the design cooling load?