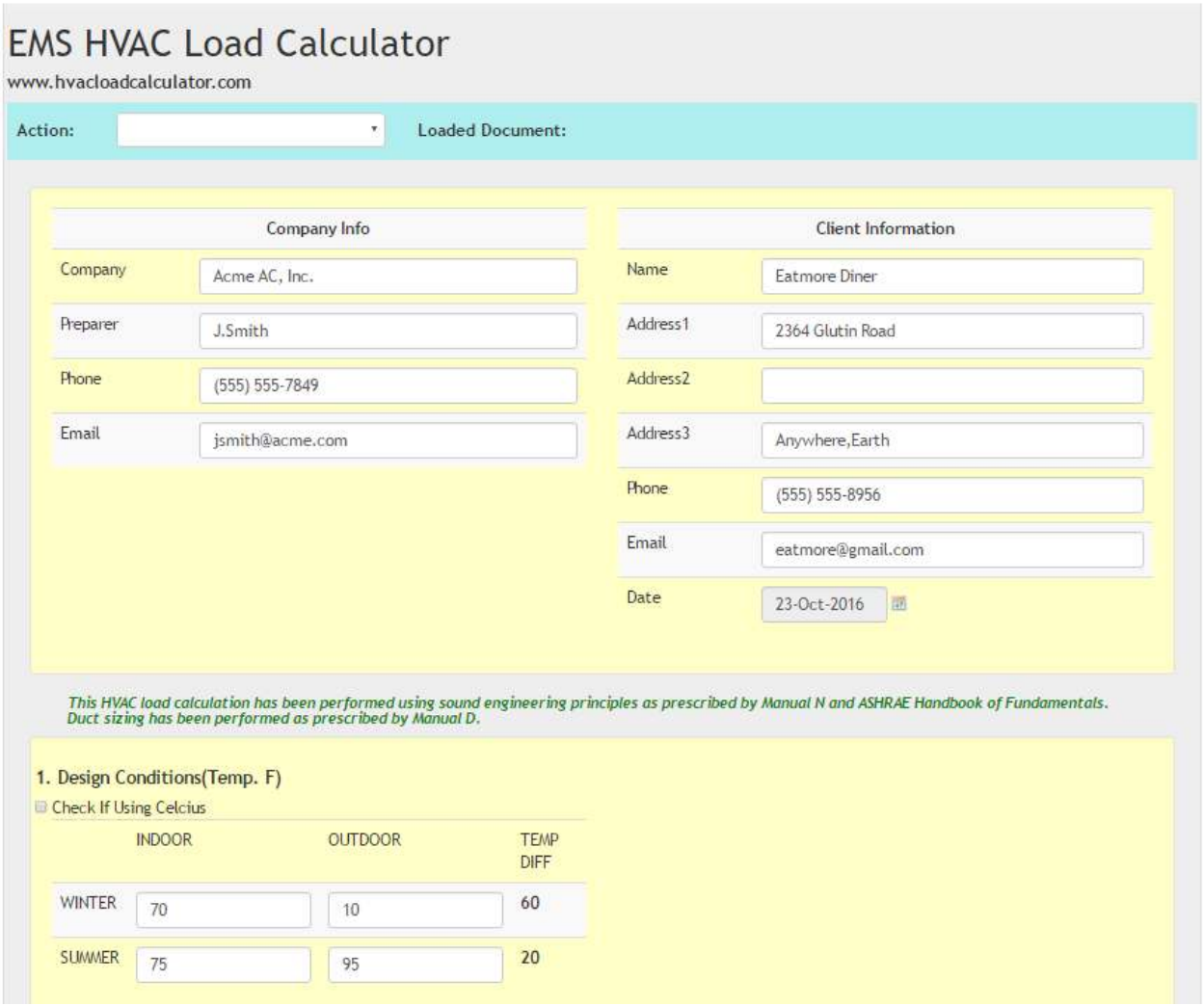
Commercial load calculator instructions

Step 1

Enter your company information

Enter the client's information

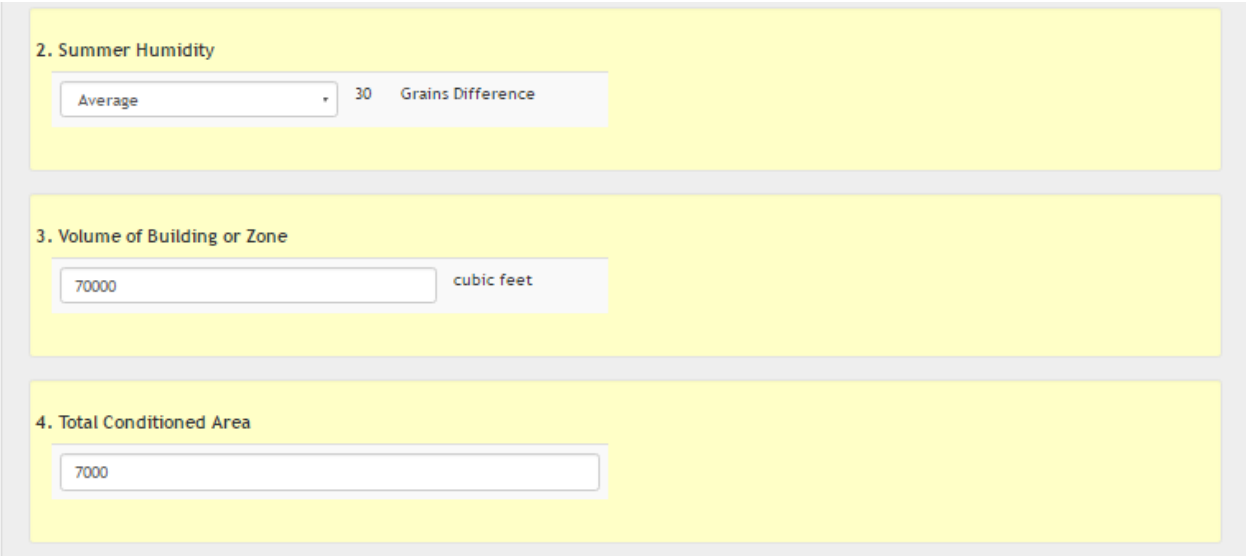


1. Design conditions

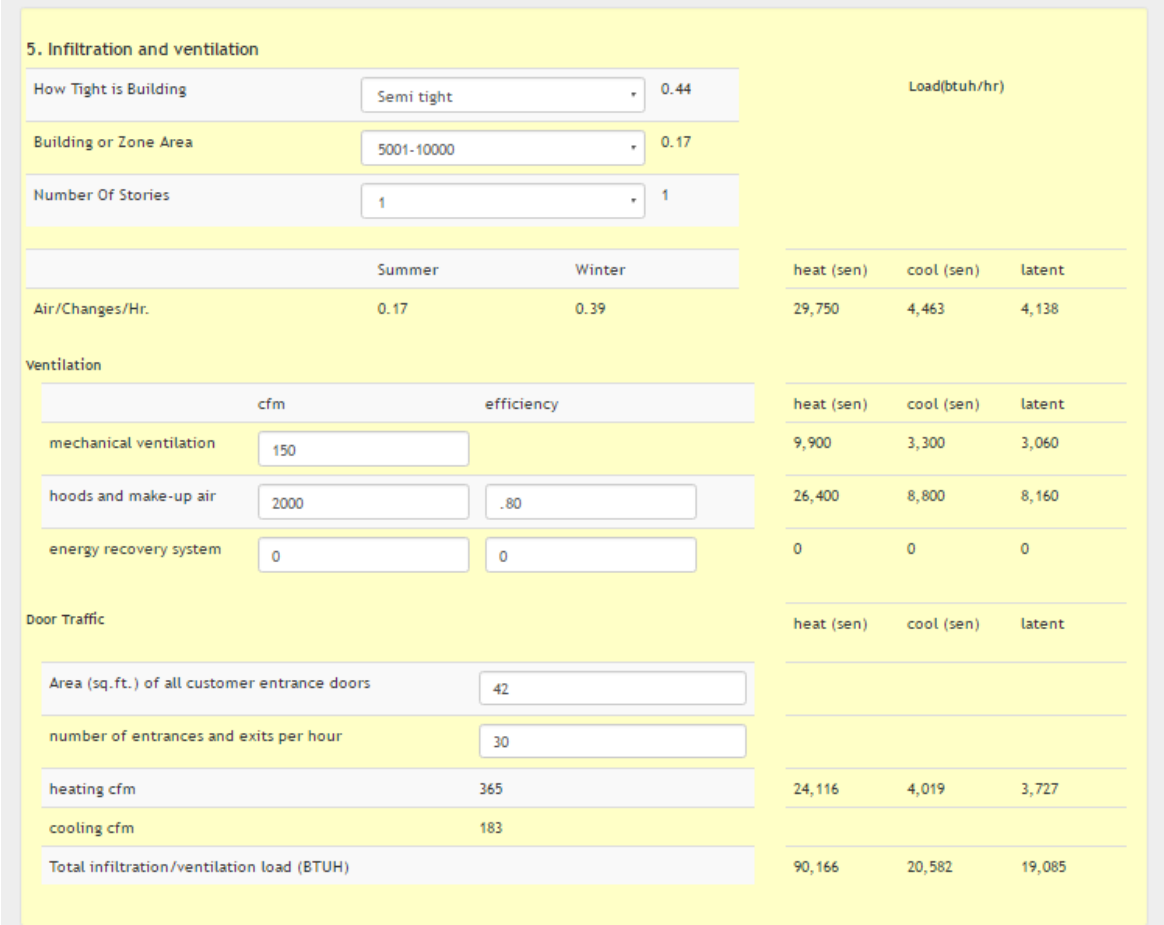
Enter the desired *indoor* temperature for summer and winter. This temperature may vary according to building use. For example: A restaurant my desire a 70 degree indoor temperature during the winter while a welding shop may only need 60 degrees.

The winter and summer *outdoor* design temperature is the coldest and warmest temperature you would expect to encounter during a typical season. This is *not* the coldest

or warmest temperature on record. [Click here to get outdoor design temperatures] for your area as per the VA Plumbing Code.



2. Select the humidity level for your area.
3. Enter the volume of the building or zone. (Volume = area x average ceiling height)
4. Enter the area of the building or zone. (Area = length x width)
5. Infiltration and ventilation
    a. Select the *tightness*, the *area* of the building or zone and the number of *stories.*
    b. Enter the CFM and efficiency of all ventilating devices.
    c. Enter the area (sq.ft.) of all customer entrance doors and estimate the number of entrances and exits per hour.



5. Infiltration and ventilation

			Load(btuh/hr)
How Tight is Building	Semi tight	0.44	
Building or Zone Area	5001-10000	0.17	
Number Of Stories	1	1	

	Summer	Winter	heat (sen)	cool (sen)	latent
Air/Changes/Hr.	0.17	0.39	29,750	4,463	4,138

Ventilation

	cfm	efficiency	heat (sen)	cool (sen)	latent
mechanical ventilation	150		9,900	3,300	3,060
hoods and make-up air	2000	.80	26,400	8,800	8,160
energy recovery system	0	0	0	0	0

Door Traffic

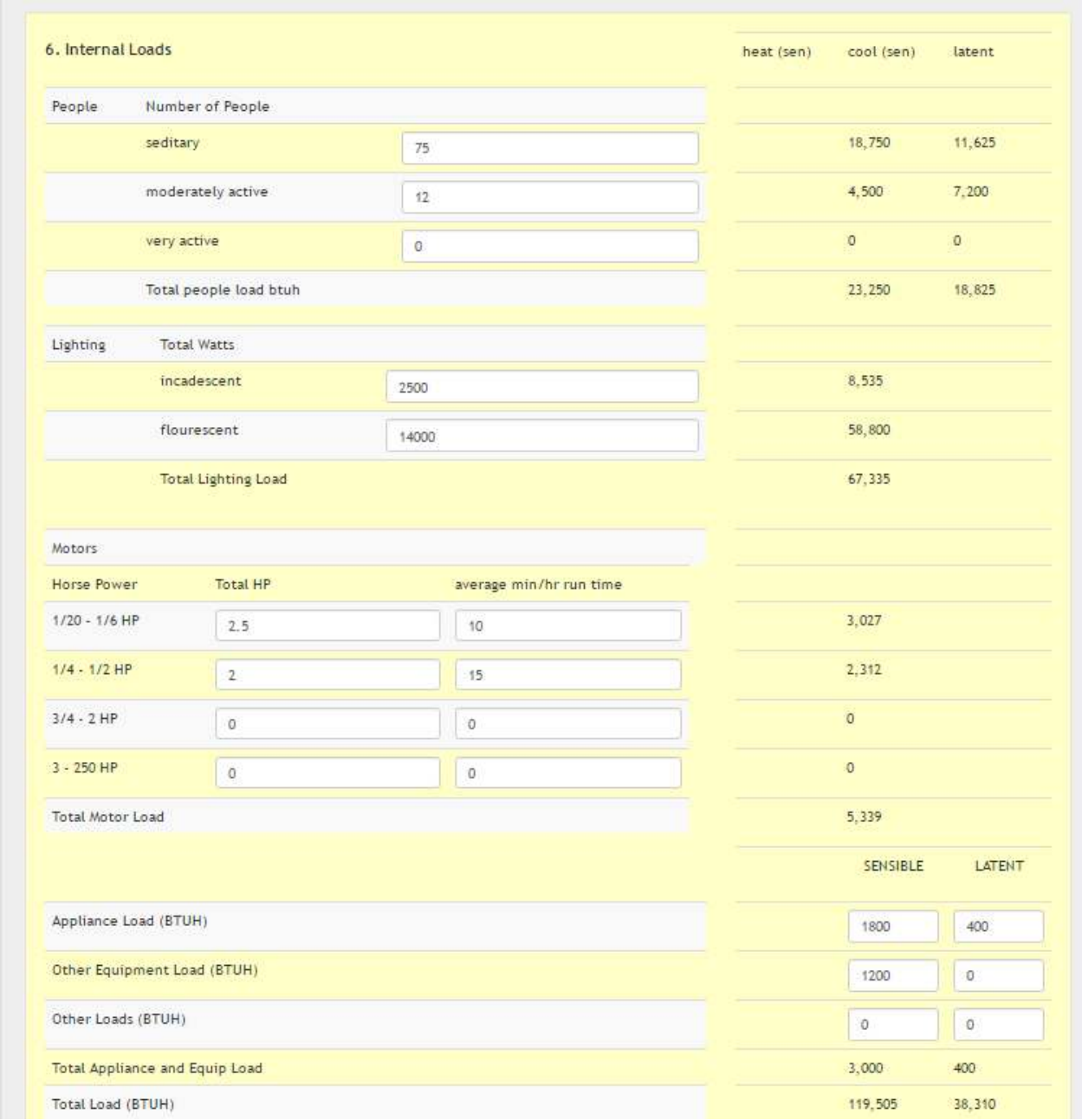
		heat (sen)	cool (sen)	latent
Area (sq.ft.) of all customer entrance doors	42			
number of entrances and exits per hour	30			
heating cfm	365	24,116	4,019	3,727
cooling cfm	183			
Total infiltration/ventilation load (BTUH)		90,166	20,582	19,085

6. Internal loads
   a. Enter the number of people at the various activity levels
   b. Lighting
      a. Enter the total *wattage* of all incandescent lighting
      b. Enter the total *wattage* of all florescent lighting
   c. Motors- Enter the total *HP* of all motor falling into each horsepower group.
   d. Appliance load – **Do not include appliance loads of those under ventilation hoods.**
      Enter the *total* BTUH rating of all appliances that **are not** under a hood.
      Enter the *total* BTUH rating of all other equipment and other loads in the building.

BTUH = watts x 3.413

or

BTUH = KW x 3413

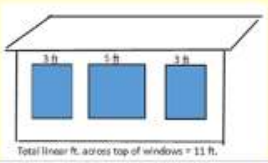


6. Internal Loads			heat (sen)	cool (sen)	latent
People	Number of People				
	seditary	75		18,750	11,625
	moderately active	12		4,500	7,200
	very active	0		0	0
	Total people load btuh			23,250	18,825
Lighting	Total Watts				
	incadescent	2500		8,535	
	flourescent	14000		58,800	
	Total Lighting Load			67,335	
Motors					
Horse Power	Total HP	average min/hr run time			
1/20 - 1/6 HP	2.5	10		3,027	
1/4 - 1/2 HP	2	15		2,312	
3/4 - 2 HP	0	0		0	
3 - 250 HP	0	0		0	
Total Motor Load				5,339	
				SENSIBLE	LATENT
Appliance Load (BTUH)				1800	400
Other Equipment Load (BTUH)				1200	0
Other Loads (BTUH)				0	0
Total Appliance and Equip Load				3,000	400
Total Load (BTUH)				119,505	38,310

Refrigeration with remote condenser -

Coolers that have outdoor condensers help to cool the indoor space. Therefore, the EMS load calculator gives a partial credit on the cooling load based on the refrigerated unit's capacity.

Overhang Characteristics



Enter all measurements decimally
1" = .1 7" = .6
2" = .2 8" = .7
3" = .3 9" = .8
4" = .3 10" = .8
5" = .4 11" = .9
6" = .5
Example- 2 ft. 8 in. = 2.7 ft.

	EAST	WEST	S/SE/SW
Distance of OH from top of window (A)	.5	0	0
Length of overhang (B)	6	0	0
Total linear ft. across top of windows located below overhang	30	0	0

Is it an overhang or a porch?

If the window is located under a structure that is always totally shaded such as a porch, awning or carport, then it is considered as facing north thus, its area should be included with the north facing windows. In the Sample House Plan the only window facing east is under a covered porch, therefore, its area is added to the North facing windows and there are no east facing windows.

Solar GainThrough Glass

☐ Check this box if using manufacturer specifications and enter the latitude, U-value and SHGC

Latitude | U-Value | SHGC

Facing	Area(sq ft)	Type Glass	HTM	Unshaded	Shaded	BTUH
N/Shaded	0	Double	24.00	0	131	3,139
NE/NW	0		0.00	0	0	0
South	24	Double	40.00	24	0	960
SE/SW	0		0.00	0	0	0
East	150	Double	75.00	19	131	1,440
West	0		0.00	0	0	0
Does glass have reflective coating?		No	1			5,539
Skylight	16	Tinted	100			1600
					Total Solar Gain	7,139

Fenestration (Glass)

1. If the window manufacture's specs are available, check the box and enter the latitude, U-value and SHGC. (Do not select type of glass if manufacture's specs are used)

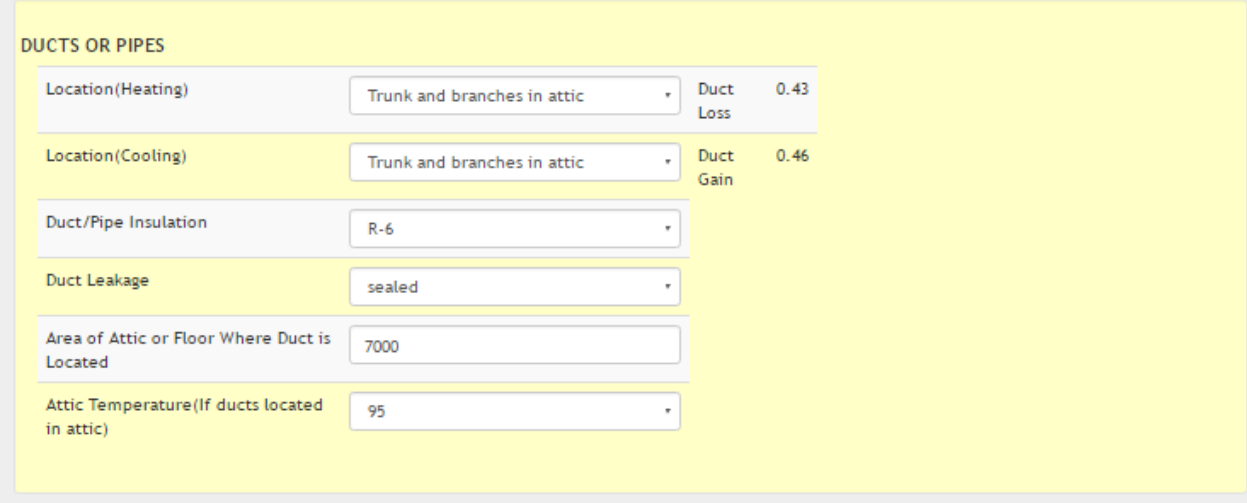
2. Enter the area (sq. Ft.) of all windows facing north. Include any permanently shaded windows, even if facing another direction. Enter the area of all remaining windows facing their respective direction.

3. If you did not use manufacture's specs, select the type of glass from the dropdown.

4. If glass has reflective coating, select YES, otherwise NO

5. Enter area (sq. ft.) of skylight and select type of glass

The total solar gain is the total amount of btuh entering the house through all glass surfaces. It takes into account both radiation and conduction.



Ducts or pipes

1. Select location of duct work

2. Select insulation on ducts

3. Select whether 'sealed' or 'unsealed'

4. Enter the ceiling or floor area the ductwork is either above or below. For example: If a building is one story and all ductwork is in the attic, laying on a 1768 sq. ft. ceiling, enter 1768. If, however, the home is 2 stories (839 sq. ft. on each floor) then only the duct work in the upper ceiling would be exposed to outside conditions. In which case, you would enter 839.

5. Select the attic temperature. Make your best guess, as this is a function of radiant heat, conduction and attic ventilation.

Load Calculation

Elements of Load	Area or Lin. Ft	Insulation/R-value	U-Value	Heat Loss Btuh	Heat Gain Btuh	Latent Btuh
Solar Gain from Glass					7,139	
Gross Wall (SqFt)	3800					
Glass 1	174	Double	0.56	5,846		
Glass 2 (SqFt)	0		0.00	0		
Skylight (SqFt)	16	Double	0.56	538		
Doors (SqFt)	0		0.00	0	0	
Overhead Door (SqFt)	90	Metal - no ins	1.20	6,480	2,160	
Net Wall	3,536	R-11	0.10	21,216	7,072	
Ceiling (SqFt)	7000	R-19	0.05	20,580	15,435	
Floor						
Over Crawl or Unheated Basement (SqFt)	0		0.00	0	0	
Open-Beach House Above Carport (SqFt)	0		0.00	0	0	
Slab On Grade (Enter Linear Ft)	380	No Insulation	0.80	18,240	0	
		Infiltration and Ventilation		90,166	20,582	19,085
		People			23,250	18,825
		Lighting			67,335	
		Motors			5,339	
		Appliances and Equipment			1,800	400
		Sub Total		163,066	150,112	38,310
		Duct Loss/Gain		70,119	69,051	6,825
		Total Loads		233,185	219,163	45,135
		Credits For Refrigeration			-6,000	

Load calculation

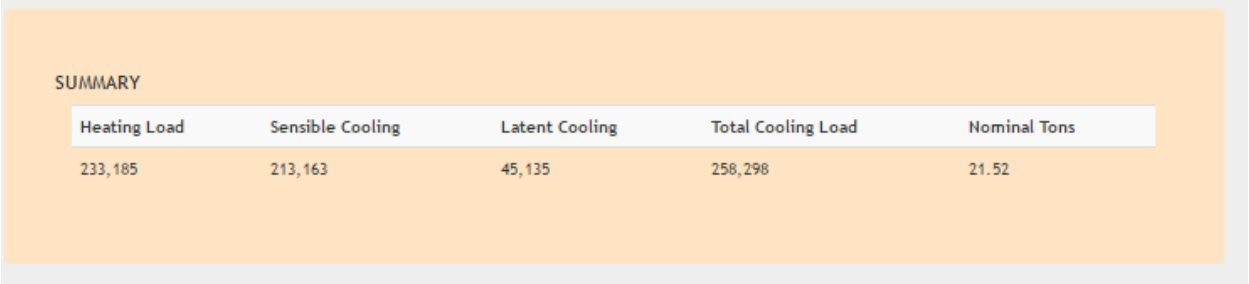
1. Enter the gross area of all exposed walls* the wall. Gross area is the total area including windows and doors

   Gross area = perimeter of building x wall height

   **Exposed wall* means any wall that is exposed to the outdoor conditions. Also includes any wall between a conditioned and unconditioned space. Example: the wall between the building and unheated warehouse is exposed.
2. Glass 1- Value is entered automatically. Select type of glass

3. Glass 2- Enter the area (sq. ft.) only if there is a significant amount of different glass. For example: one half the building has single glass while the other half is double glass.
4. Skylight- Enter the area (sq. ft.) of skylight and select type of glass.
5. Doors- Enter area of doors and select insulation value. (Note: separate the glass from doors. If a west facing 3' x 7' door is half-glass, then enter 11 sq. ft. in the door cell and 10 sq. ft. in Step 2, west facing windows **Sliding glass doors** should be treated as windows
6. Net Wall- Automatically calculated

   Net Wall = Gross wall - all openings
7. Ceiling- Enter the area of all *exposed* ceilings. The Sample building has 7000 sq.ft. of *exposed* ceiling, If the building were 2 stories (3500 sq. ft. on each floor) then it would only have 3500 sq. ft. of exposed ceiling



SUMMARY

Heating Load	Sensible Cooling	Latent Cooling	Total Cooling Load	Nominal Tons
233,185	213,163	45,135	258,298	21.52

Summary

The summary gives the loads of the building. Use these loads to size the heating and cooling equipment.

The example above indicates the heating system most have a *total output* of 233,188 BTUH.

The cooling equipment must have a *minimum total capacity* of 258,298 BTUH, which is equal to 21.52 tons.

Note: the cooling equipment must be able to handle *both* the *sensible* and *latent* loads. As an example: suppose 264,000 BTUH (22 tons) is selected. However, the manufacture's specs state, of the 264,000 BTUH total capacity, only 184,000 BTUH is sensible capacity while 80,000 BTUH is latent capacity. In this case the equipment will fall short on covering the sensible load. The equipment size will therefore need to be increased until both loads are satisfied.

Duct sizing

1. Select the type of duct material: metal, flex or duct board.
2. Enter the friction rate. Generally, a friction rate between .05 and .1 will perform satisfactorily. The lower the friction rate the quieter the system. If noise is a concern, then it is best to keep the velocity below 700 feet per minute (FPM).
   Note: Use the same friction rate for all ducts in the system.

3. Enter the CFM the duct must handle.
   For example: The start of a main trunk for a five-ton air conditioner must handle 2000 CFM. At a friction rate of .08 the calculator indicates an 18.9” round duct is needed. As runs are taken off the main, enter the CFM of each run to determine its size.
4. The calculator will give the round duct size.
5. To convert the round duct to rectangular:
   a. Determine the height (inches) you wish the duct to be (14”).
   b. The width dimension (inches) will be calculated (23.6”)