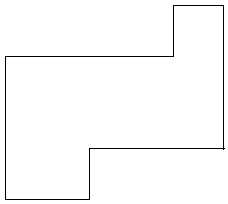
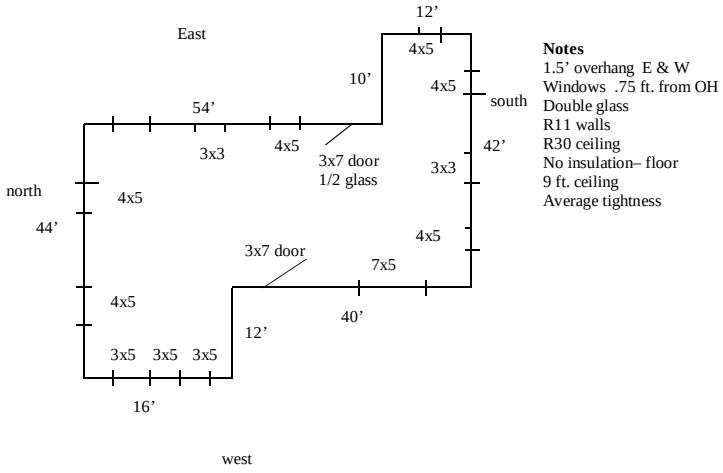
Introduction

The ***EMS*** load calculator is designed to make load calculating as painless as possible. For sizing the equipment, only the first three tabs (Steps 1, 2 & 3) need to be completed. This process should take only 5 - 10 minutes. Acquiring the house measurements, however, will take a bit longer. No program will measure the house for you. Therefore, you must physically measure the house or get the dimensions off a plan. This may take 15-30 minutes. If you need help with calculating dimensions go to our home page. www.johnrwhite.net and click on **NEED TO BRUSH UP ON CONTRACTOR MATH.**

When physically measuring a house, it is easiest to first, draw the footprint of the house as you walk around it **on the outside**.



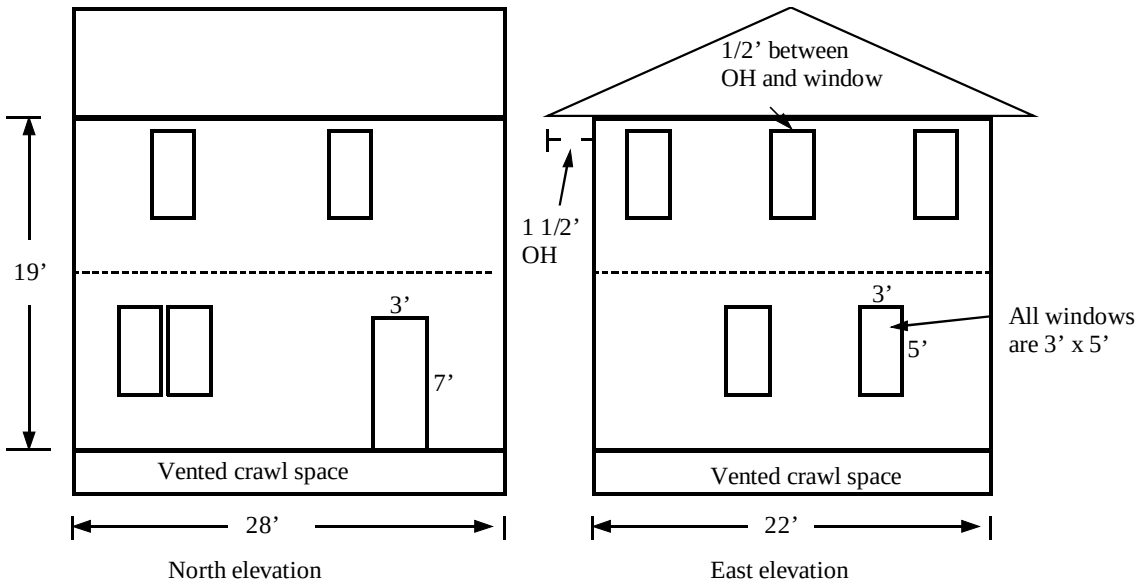
Then walk around it again and write down the measurements and notes as you go (if you try to write down measurements as you walk around the first time. You will surely get you drawing all messed up)

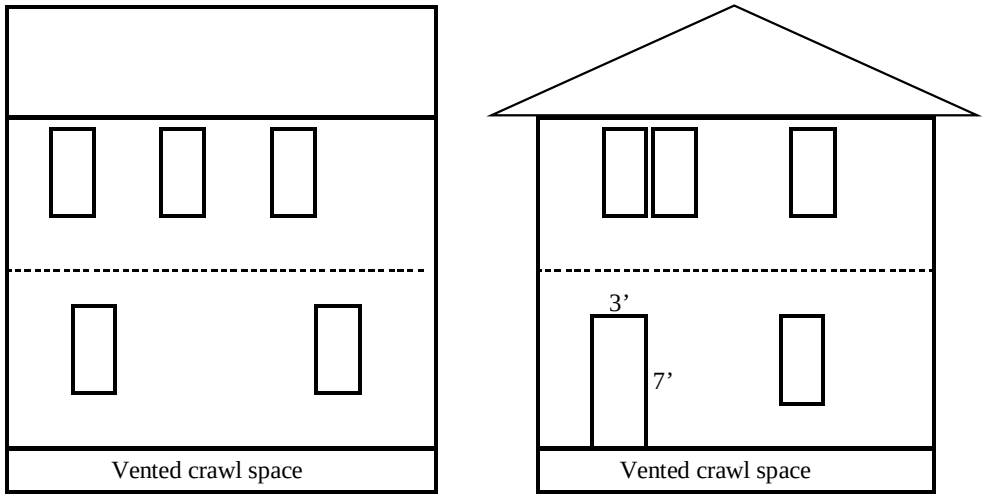


*Because room-by-room calculations are time consuming, **Do not attempt to perform a room-by-room calculation unless you already have the job or until you get the job**. A room-by-room calculations are only used to determine CFM for a forced air system, or convector sizing for boilers and electric baseboard.

To perform a cost analysis, only the first three tabs (Step 1, 2 & 3) need to be completed.

Below are detailed instruction for using the EMS load calculator.





Home is located in Raleigh, NC—3440 heating degree days, 1500 cooling degree days, 20F winter outdoor temperature, 92F summer outdoor temperature, moderately humid.
Windows– vinyl, double glazed, Low-e
Walls R-11
Ceilings R-19
Floors R-11
Tightness of construction– Average
Ductwork– between floors, no insulation

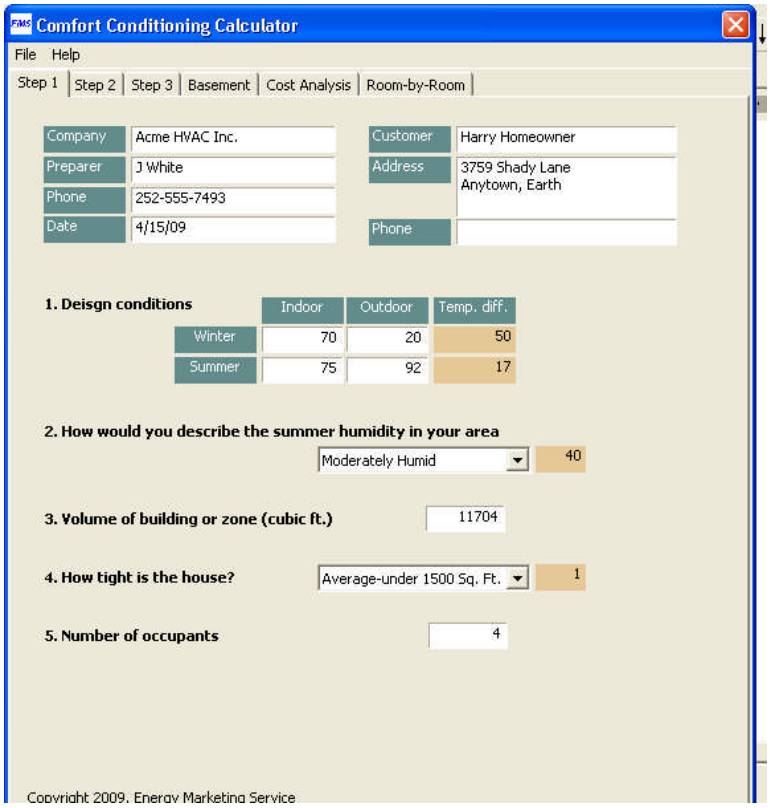
Instructions and illustration for using the EMS LOAD CALCULATOR

Below is a step-by-step explanation for calculating a whole house or block load using the illustration above. If you wish to calculate the load for each floor a separate calculation should be performed for each. **After completing the first three tabs** a room-by-room or zone-by-zone calculation may be performed using the room-by-room tab.

Fill in company and customer information

Step 1 Tab

1. **Design conditions**- enter the winter indoor temperature (usually 70F) and the summer indoor temperature (usually 75F). The outdoor temperature will be the coldest and hottest temperature it normally gets for a typical season.(this is not the record temperatures; for Raleigh we will use 20F for the wintertime temperature and 92F for the summertime temperature)
2. **Humidity**- select the humidity level for your area.
3. **Volume of building or zone**- the volume of our sample home is 11,704 cubic feet (22' X 28' X 19" = 11,704 cu. ft.). If you are calculating the load for only one floor or one zone, enter its volume.
4. **How tight is the house**?- This house has a total area (sq. ft.) of 1232 sq. ft. therefore, select ***average-under 1500 sq. ft.*** Note: If the **entire** house is over 1500 sq. ft. and a calculation is being performed on only one floor or zone that is less than 1500 sq. ft. then use ***over 1500 sq. ft***. nevertheless.
5. **Number of occupants**- if number is unknown, use 1 person for each bedroom, then add 1. A three bedroom home would have 4 occupants.



Step 2 Tab

6. **Overhang characteristics**-This section is used to determine the window area that is shaded by an overhang**. If there are no overhangs or the top of the windows begin more than 1½ ft. below the overhang do not fill in this section**. Our house has an overhang on the north and south sides. The upper story windows begin within 6" from the overhang, therefore, they will be the only windows receiving some shade.

   Under **SOUTH** Enter **.5** as the distance between the window and overhang (convert fractional feet to decimal equivalent- ½ ft. or 6" = .5 ft.) and enter 1.5 as the length of the overhang. Notice there is no place to enter the distances for north facing windows. This is because a north facing window is always shaded. The calculator knows this and automatically considers all north facing glass as shaded

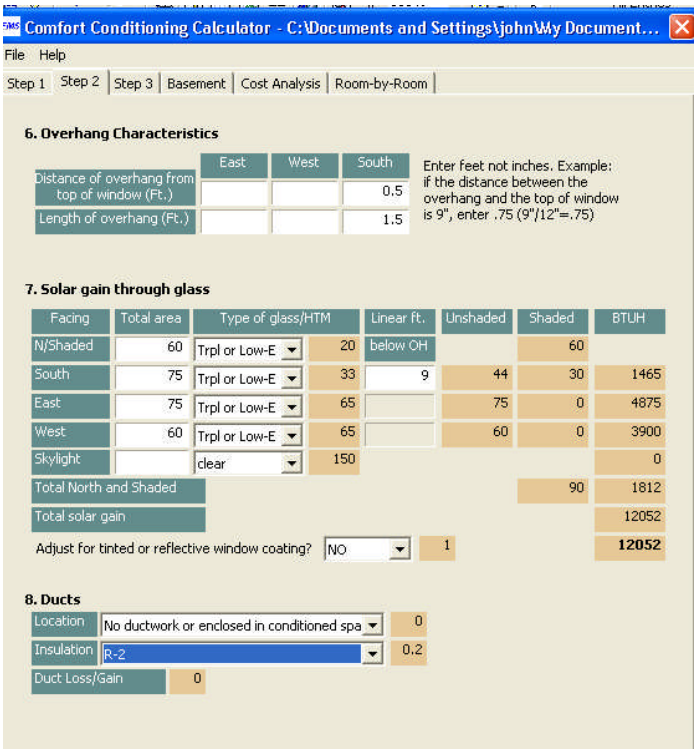
7. **Solar gain through glass**-enter the area (sq. ft.) of all glass facing each direction. If there are windows covered by porches, carports, awnings etc where they are always shaded then treat these windows as if they were facing **north.** Click the dropdown list to select the type of glass. **Note**: Low-e double glass is treated as triple glass
   Skylight- If there are skylights, enter the sq. ft.

   The column labeled **Linear Ft. below OH-** When values are entered in # 6 above **(Overhang Characteristics),** the cell corresponding to the direction will become active. In our example, the south facing cell is active. Enter the total linear feet across the top of all windows effected by the overhang. There are three windows facing south on the second floor that are affected by the overhang, each has 3 feet across the top. In the active cell, enter 9 (3 ft. + 3 ft. + 3 ft.).

8. **Ducts**

   Location- Select the ductwork location from the dropdown box. If the home has no ductwork (electric baseboard or space heaters) or the ducts are located within the building envelope select **no ductwork or enclosed in conditioned space.** Ducts located in attics are **exposed to outdoor temperature**, ducts located in unheated ventilated crawl spaces and unheated basements are **enclosed in unconditioned space.**

   Insulation- Select the amount of duct insulation using dropdown box



Step 3 Tab

9. **Load calculation**- enter the area in **square feet** for the walls, glass, skylights, doors and ceilings.

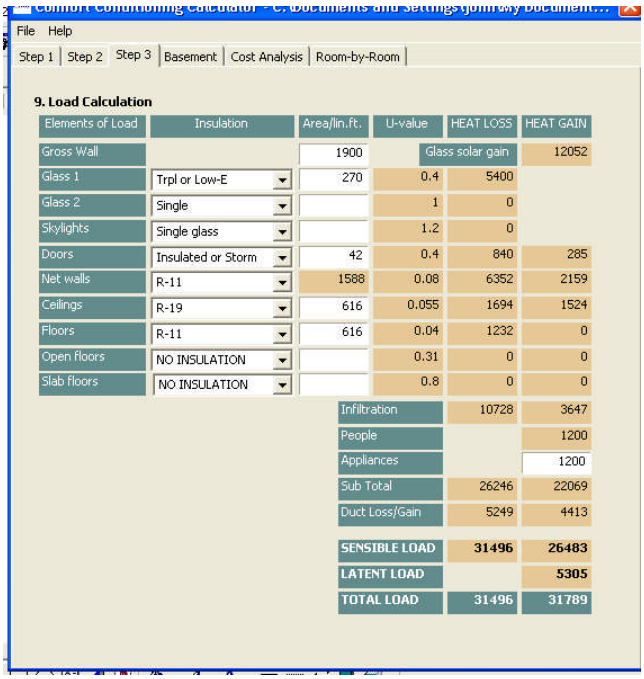
Walls- area= perimeter X height (80' X 19"= 1520 sq. ft..
Doors- 2 doors, 21 sq. ft. each ((3' X 7') X 2) = 42 sq. ft.
Ceiling- Only the second story ceiling is exposed to the outdoor conditions, thus the ceiling area is 22' X 28' = 616 sq. ft.
Floors- Only the first story floor is exposed to outdoor conditions, thus the floor area is 22' X 28' = 616 sq. ft.

*There are three types of floors
Floors- These are floors with crawl spaces or unheated basements below. *Enter square feet*
Open floors- These are elevated and open floors such as beach houses and bonus rooms above garages and carports. *Enter square feet*
Slab floors- If the floor is a slab on grade or less than two feet below grade enter *linear feet of exposed edge.*

Appliances- 1200 BTUH is pre-entered as a default value. The value may be changed by clicking on the cell, highlighting and entering a new value

SENSIBLE LOAD, LATENT LOAD, TOTAL LOAD- these are the calculated heat loss and heat gain of the building. A **heating unit** with a capacity of at least 24,726 BTUH must be installed. An **air conditioner's**

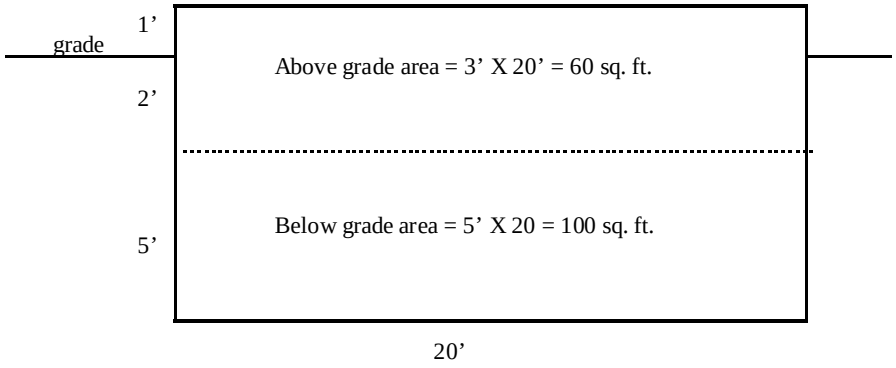
capacity must satisfy both the latent and sensible loads (see manufacturer's specs) 21,553 BTUH sensible and 5305 BTUH latent; total 26,858 BTUH.



Basement tab- floors must be at least 2 ft. below grade to be considered a basement

The values used for a basement are calculated as shown in the previous examples. Below are some precautions.

Walls- the area of the wall must be split between above grade and below grade. All walls within two feet of grade are considered above grade. All wall two feet and deeper are below grade.



Floors- enter the **square feet** not perimeter of basement floor.

Cost analysis Tab

This tab allows you to calculate operating cost, payback, rate of return and compare one system to another.

Enter **heating** and **cooling degree days**. If you do not know the degree days for your area click on the **map** button or go to www.degreedays.net

Air conditioning- enter the **SEER** and the cost per KWH for your area eleven cents must be entered as **.11**

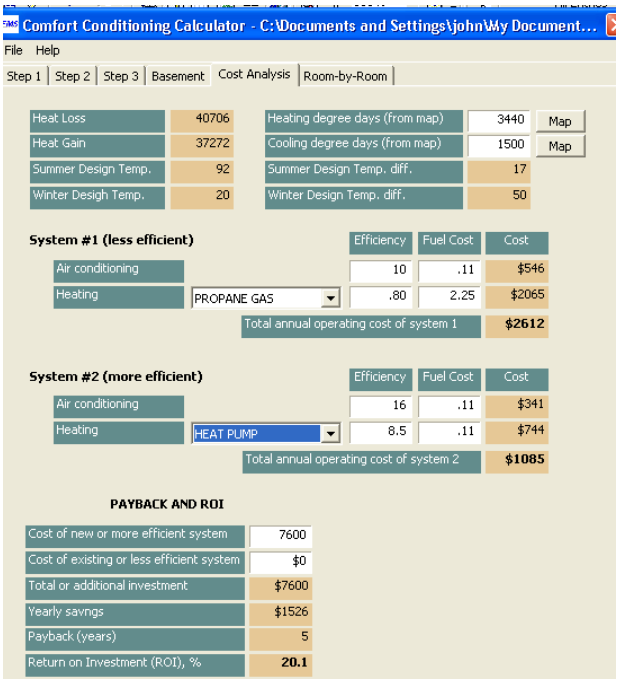
Heating- Click type of heating system in dropdown. Enter the **AFUE** (furnace efficiency) as a decimal, 80% must be entered as **.80.** Heat pump heating efficiency is **HSPF.** Enter of fuel as $/unit. (.08 = eight cents, 1.45 = $1.45)

Units of various fuels (you will have to obtain these costs from your local suppliers)

Electric is sold by the KWHR
Natural gas is sold by the therm or 100 cubic feet
LP gas is sold by the gallon
Oil is sold by the gallon

Savings, payback and rate of return are displayed at bottom of window.

Our example shows, if the customer replaces his old system with a 16 SEER heat pump, it will cost him $7600 and will save him $1526 per year. The system will pay for itself in 5 years and give him a 20.1% return on his investment.

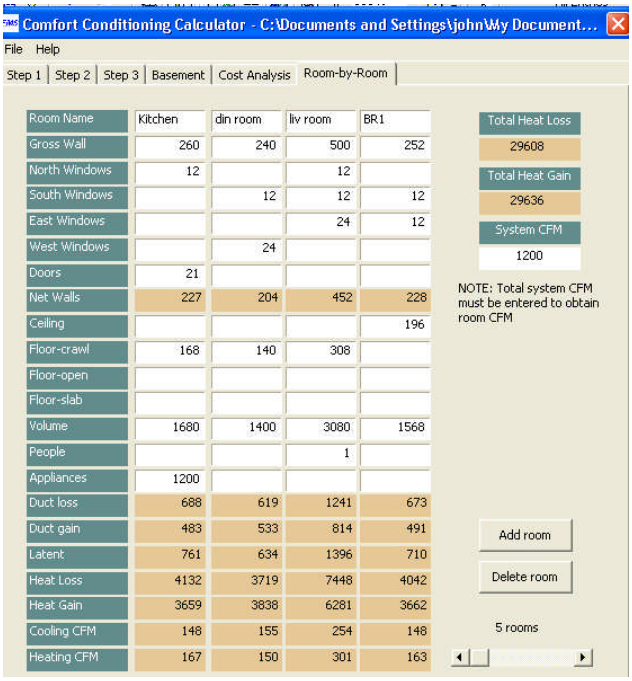


Room-by-room tab

Using the loads calculated on step 3 determine the equipment size. (our example calls for a 3 ton heat pump, 36,000 BTUH, **1200 CFM**). From the manufacturer's specs, determine the CFM and enter this value under **SYSTEM CFM** (1200). Equipment total CFM must be entered in order for the program to determine the room CFM.

After entering total equipment CFM, enter the building component area of each room as indicated below. Only enter areas that are exposed to the outdoor temperature. For example, the kitchen has four walls, but only two are exposed to the outdoor temperature. The kitchen also has a ceiling, but it is not exposed to outdoor temperature, therefore its area is not entered in the cell. The floor is exposed to outdoor temperatures, therefore, its area is entered in the appropriate cell.

Note: The total loads on the Room-by-Room tab may be slightly different from the whole house loads on the Step 3 tab. This is because the shading factors from Step 2 tab are not considered in the Room-by-Room calculation. The CFM figures will be accurate within 5%. If the load differences between Step 3 tab the Room-by-Room tab are more than 5%. you may need to check your measurements.



Room Name	Kitchen	din room	liv room	BR1
Gross Wall	260	240	500	252
North Windows	12		12	
South Windows		12	12	12
East Windows			24	12
West Windows		24		
Doors	21			
Net Walls	227	204	452	228
Ceiling				196
Floor-crawl	168	140	308	
Floor-open				
Floor-slab				
Volume	1680	1400	3080	1568
People			1	
Appliances	1200			
Duct loss	688	619	1241	673
Duct gain	483	533	814	491
Latent	761	634	1396	710
Heat Loss	4132	3719	7448	4042
Heat Gain	3659	3838	6281	3662
Cooling CFM	148	155	254	148
Heating CFM	167	150	301	163

Saving your data and printing a report

To save your work click **File** then **Save as**. A **Save as** window will appear. In the **Save in** box, use the dropdown arrow to find **MY DOCUMENTS,** if it is not already in the box. Click the **New Folder Icon** to right of box and name it **MY LOAD CALCS** (you may use another name if you'd like). In the **File name** box, name your file (Harry Homeowner). Click **SAVE**

To find your load calculation open **MY DOCUMENTS,** then **MY LOAD CALCS,** then **Harry Homeowner.**

To Print a Report you must save your work as an .rtf file

Open the desired load calculation if is not already open. Click **File**, then **Export RTF**. A **Save as** window will open. In the **Save in** box locate **MY LOAD CALCS** using the dropdown menu, if it is not already in the box. In the **File name** box enter the name (Harry Homeowner), then click **Save.** You have just saved your work in an RTF file (RICH TEXT FORMAT).

To Print

Open your word processing program (MS Word, MS works, etc.). Click **File-Open**, Look in **MY DOCUMENTS** using drop down arrow, if not already there. Locate and open **MY LOAD CALCS**. Locate and open **Harry Homeowner**, click **File-Print.** You may also access **MY DOCUMENTS** thru the **START** button.

Tip: To save paper and ink select and print only the pages of the report you need.

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