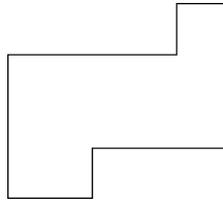


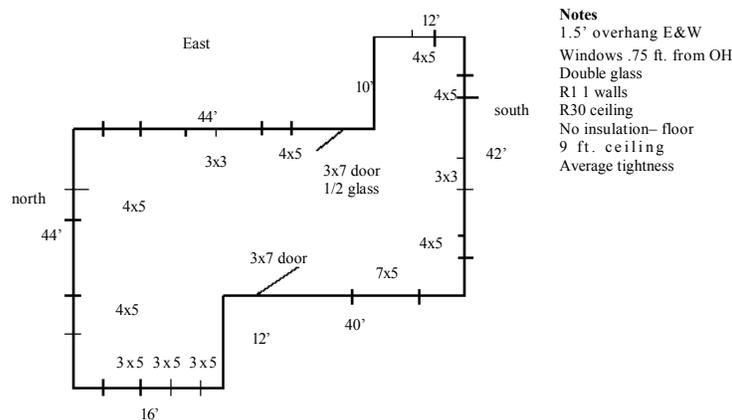
Introduction

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 your drawing all messed up.

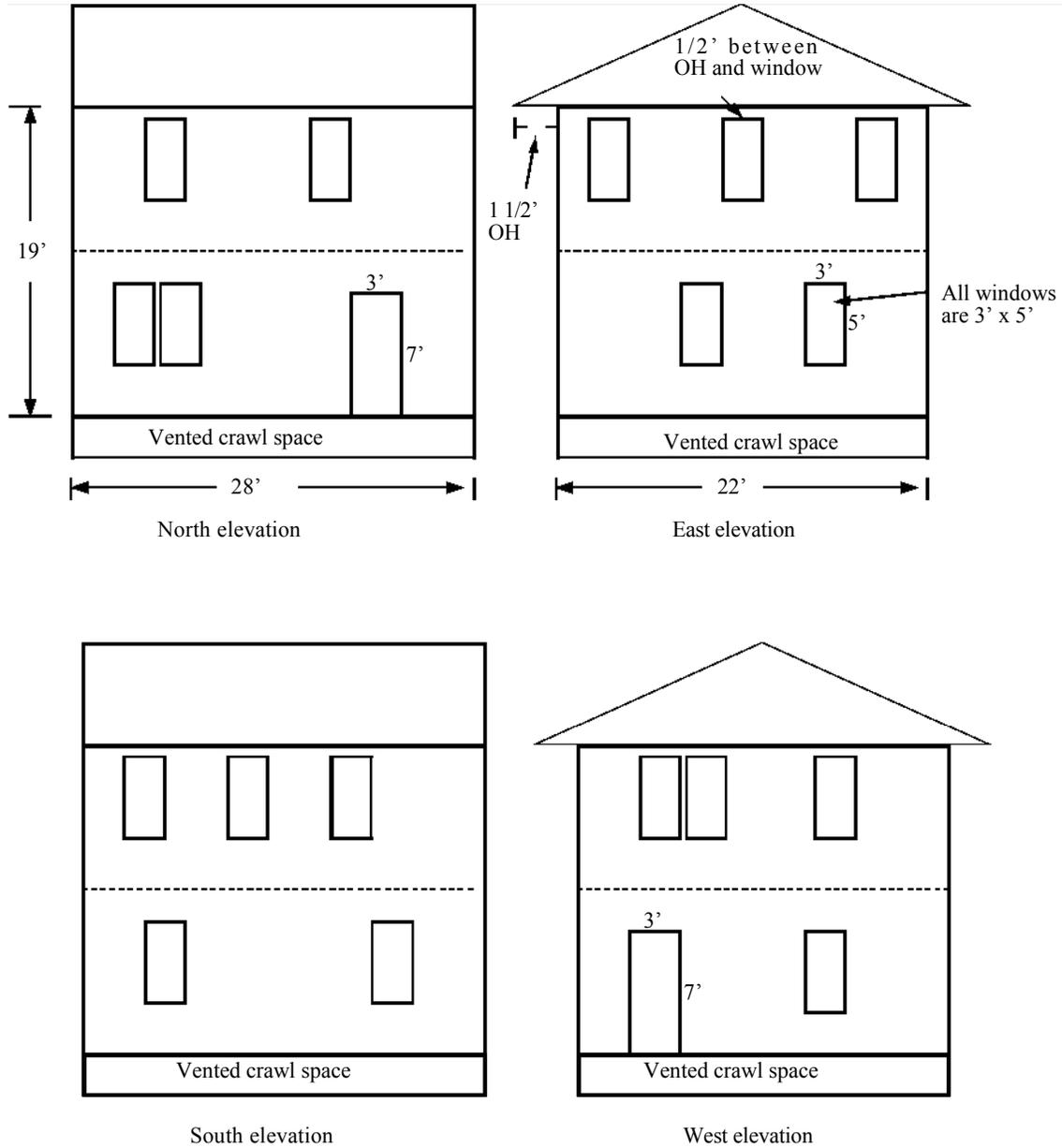


*Because room-by-room calculations are time consuming, **Do not attempt to perform a room-by-room calculation unless you already have the job or until you get the job.** A room-by-room calculation is only used to determine CFM for a forced air system, or convector sizing for boilers and electric baseboard.

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

Below are detailed instructions for using the EMS load calculator.

TWO STORY SAMPLE HOME



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-1 9

Floors R-1 1

Tightness of construction— Average

Ductwork— between floors, no insulation

9 ft. ceilings, 1 ft. between floors

Below is a step-by-step explanation for calculating a whole house (block) load using the above illustration? 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

- 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)
- Humidity-** Select the humidity level for your area.
- 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.
- Number of occupants-** If number is unknown, use 1 person for each bedroom, then add 1. A three bedroom home would have 4 occupants.

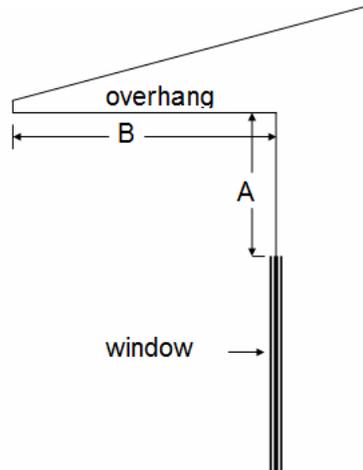
The screenshot shows a software window titled "HVAC Load Calculation (Sample House)". The interface includes a menu bar (File, Tools, Help) and a series of tabs: Step 1, Step 2, Step 3, Basement, Cost Analysis, Room-by-Room, Air Ducts, and Manual S. The "Step 1" tab is active, displaying the following sections:

- Company Information:** A form with fields for Company (Acme HVAC, Inc.), Preparer (J White), Phone (252-555-7853), Customer (Harry Homeowner), Address (768 Shady Lane), Phone (252-555-8976), and Date (2/28/12).
- 1. Design conditions:** A table with columns for Indoor, Outdoor, and Temp. diff. (F).

	Indoor	Outdoor	Temp. diff. (F)
Winter	70	20	50
Summer	75	92	17
- 2. Summer humidity:** A dropdown menu labeled "How would you describe the summer humidity in your area?" with the selection "Moderately Humid" and a value of 40.
- 3. How tight is the house?:** A dropdown menu set to "Average-under 1500 Sq. Ft." and a table for "air changes / hr" with values 1 for winter and 0.5 for summer.
- 4. Fireplace Evaluation:** A table with columns for Number, Evaluation, and CFM.

Number	Evaluation	CFM
1	Average	20
- 5. Number of occupants:** A text input field containing "Number of occupants generally equals number of bedrooms + 1 4".

Step 2 Tab



A is "Distance of overhang from top of window (ft.)"

B is "length of overhang"

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 1-1/2 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- 1/2 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*.

*If you wish to use the window manufacturer's specifications to determine the HTM, check the box labeled **use mfgs specs**. Then enter the latitude, U-value and SHGC. The calculated HTM's will automatically be placed in the appropriate cells.

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 affected 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, “**All duct work in conditioned space**”.

Select attic temperature if ducts are in the attic, the R-value of the insulation, leakage rate (sealed or unsealed) and the area the duct work serves. The **area** the duct work serves will be the floor area of the home or zone. Because the ducts are between the floors on our sample home, the floor area served is only 616 sq. ft., not 1232 sq. ft.

Insulation- Select the amount of duct insulation using dropdown

The screenshot shows a software interface with the following sections:

6. Overhang characteristics

	East	West	S/SE/SW
Distance of overhang from top of window (Ft)			.5
Length of overhang (Ft.)			1.5

7. Solar gain through glass

Use Mfgs Specs Latitude: U-value: SHGC:

Facing	Area (sq. ft.)	Type of glass	HTM	Linear Ft	Unshaded	Shaded	BTUH
N/Shaded	60	Trpl or low-E	20	Below OH		60	
NE/NW		-- Select --					
South	75	Trpl or low-E	33	9	44	31	1465
SE/SW		-- Select --			0	0	0
East	75	Trpl or low-E	65		75	0	4875
West	60	Trpl or low-E	65		60	0	3900
Skylight		-- Select --					0
Total North and Shaded						91	1812
Total solar gain							12052
Adjust for tinted or reflective window coating?				No	1		12052

8. Ducts/Pipes

Ducts location: All duct work in conditioned area Duct gain: 0

Attic temp.	Insulation	Leakage	Area	Duct loss	
-- Select --	R-2	1.85	unsealed 1.9	616	0

Step 3 Tab

9. **Load calculation-** Enter the area in **square feet** for the walls, glass, skylights, doors, ceilings, and floors. Use the dropdown arrow to select the insulation value.

If the desired component R-value is not listed

The component R-values and U-values listed in the dropdown menu are the most common. If you desire to use other values, you may highlight <enter R-value> at the bottom of any cell's dropdown menu and enter any R-value number (enter the number only, 23 instead of R-23)

(U-values found in ACCA Manual J or ASHRAE's Handbook of Fundamentals may also be used)

Walls- area = perimeter X height (100' X 19"= 1900 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 = length x width (22' X 28' = 616 sq. ft.)

Floors- Only the first story floor is exposed to outdoor conditions, thus the floor area = length x width (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.*

4. **Volume of building or zone-** enter the volume (floor area X average ceiling height). 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.

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 27,617BTUH must be installed. An **air conditioner's capacity** must satisfy both the latent and sensible loads (see manufacturer's specs) 20,644 BTUH sensible and 3573 BTUH latent; total 24,217 BTUH.

File Tools Help					
Step 1 Step 2 Step 3 Basement Cost Analysis Room-by-Room Air Ducts Manual S					
9. Load Calculation					
Elements of Load	Insulation/R-value	Area/lin.ft.	U-value	Heat Loss	Heat Gain
Gross Wall		1900	Glass solar gain		12450
Glass 1	Trpl or low-E	270	0.42	5670	
Glass 2	-- Select --			0	
Skylight	-- Select --	0		0	
Doors	Insulated or Storm	42	0.4	840	286
Net walls	R-11	1588	0.08	6352	2160
Ceilings	R-19	616	0.055	1694	1525
Floors	R-11	616	0.08	1232	0
Open floors	-- Select --			0	0
Slab floors	-- Select --			0	0
Volume of your building or zone (cu. Ft.)		11704		11829	1824
	People				1200
	Appliances				1200
	Sub Total			27617	20644
SUMMARY				Duct Loss/Gain	0 0
		BTUH	Tons	SENSIBLE LOAD	27617 20644
Total heating load	27617			LATENT LOAD	3573
Total cooling load	24217	2		Total BTUH	27617 24217

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.

Basement 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 walls two feet and deeper are below grade.

Basement 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. Cents must be entered as **.00** Example, twelve cents = **.12**

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 the **HSPF** rating. Enter of *fuel cost* as \$/unit. (example, .08 = eight cents, 1.45 = \$1.45)

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 chooses a 15 seer heat pump over a 92% efficient propane furnace with a 13 seer air conditioner. He will spend \$1200 extra, but save \$917 annually, resulting in a 1.3 year payback or 76.5% return on his investment of \$1200

File Tools Help

Step 1 Step 2 Step 3 Basement Cost Analysis Room-by-Room Air Ducts Manual S

Heat loss 27617 Heating degree days (from map) 3440 Map

Heat gain 24217 Cooling degree days (from map) 1500 Map

Summer design temp 92 Summer design temp. diff. 17

Winter design temp. 20 Winter design temp. diff. 50

System #1 (less efficient)

	Efficiency	Fuel cost	Cost
Air conditioning	13	.12	\$298
Heating	Propane gas	.92	2.75
Total annual operating cost of system #1			\$1788

System #2 (more efficient)

	Efficiency	Fuel cost	Cost
Air conditioning	15	.12	\$258
Heating	Heat pump	8.5	.12
Total annual operating cost of system #2			\$809

Payback and ROI

Cost of new or more efficient system	7600
Cost of old or less efficient system	6100
Rebates or credits	300
Net or additional investment	\$1200
Yearly savings	\$978.64
Payback (years)	1.2
Return on investment (ROI), %	81.6%

Room-by-room tab

Using the loads calculated on step 3 determine the equipment size. (our example calls for a 2 ton heat pump, 24,000 BTUH). From the manufacturer's specs, determine the CFM and enter this value under **SYSTEM CFM** (800). 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 should equal the whole house loads on the Step 3 tab, however there may be a slight difference. 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. **To assist you in determining the whole house load is equal to the room-by room load, click the "check calculation" button.**

File Tools Help					
Step 1		Step 2		Step 3	
Basement	Cost Analysis	Room-by-Room		Air Ducts	Manual S
Room name	Kitchen	dining room	utility	liv room	Total Heat Loss
Gross wall	250	250	190	310	27801
North windows				30	Total Sensible Heat Gain
NE/NW windows					20712
South windows	15	15			System CFM (Cooling)
SE/SW windows					800
East windows		30			System CFM (Heating)
West windows				15	800
Skylight					Note: Total system CFM must be entered to obtain room CFM.
Doors	21			21	
Net walls	214	205	190	244	
Ceiling					
Floor-crawl	154	154	80	220	Check Calculation
Floor-open					
Floor-slab					
Infiltration	36	45	0	66	Add Room
People	1	1	1	1	Delete Room
Appliances	1200				5 rooms
Heat loss	3264	3779	920	5283	
Sensible Heat Gain	2639	3287	558	2735	
Cooling CFM	102	127	22	106	
Heating CFM	94	109	26	152	

Air Duct tab

Air ducts can only be sized if a Room-by-Room calculation is made.

1. Be sure to enter the system CFM in the Room-by-Room tab.
(System cfm should be obtained from the Equipment Selection tab, Manual S)
2. Determine the duct system **friction rate**.
If you know the measured length, equivalent length and available static pressure, enter the values in the top-left chart then check the **auto** box. The friction rate will be calculated for you.
If you do not have the above information, you may unclick AUTO and enter an arbitrary friction rate, such as .08, in the **Friction loss** cell (**This method is not recommended**).
3. Since the home only has one duct system, you must determine which mode to size the duct system to. If you wish to size the system to work best on air conditioning, check the **use cooling CFM** box.
4. Check flex or metal duct.
5. Determine the number of outlets for each room.

Presto! The ducts are sized for you. Note the air velocity. If the **trunk** velocity is more than **900 FPM** or the **branch** velocity is more than **700 FPM** then you may wish to consider increasing the duct by one size. High velocities produce a noisy system.

The screenshot shows a software interface for duct sizing. At the top, there are menu options: File, Tools, Help. Below that are tabs for Step 1, Step 2, Step 3, Basement, Cost Analysis, Room-by-Room, Air Ducts, and Manual S. The main area contains several input fields and a results table.

Input fields:

- Total measured length of duct: 40
- Total equivalent length of fittings: 142
- Available static pressure for duct: 19
- Friction rate: 0.1 (with a checked 'Auto' checkbox)

Conversion section:

Round to rectangular conversion

Duct diameter inches	Side A inches	Side B inches
13.9	8	22.4

* aspect ratio may not be greater than 4:1

Options: Use heating CFM (dropdown), Flex Duct (selected), Metal Duct (unselected)

	CFM	No. outlets	Outlet CFM	Duct diam.	Air vel.
2nd reduction/branch				0	
3rd reduction/branch				0	
4th reduction/branch				0	
5th reduction/branch				0	
Return trunk/branch					
First section off AHU	800			13.9	756
1st reduction/branch	600			12.5	705
2nd reduction/branch				0	
3rd reduction/branch				0	
4th reduction/branch				0	
5th reduction/branch				0	
Room runs					
Kitchen	100	1	100	6.3	455.9
dining room	116	2	58	5.2	399.4
utility	28	1	28	3.9	334.6

Converting round duct to rectangular

The duct sizes are given in round duct sizes. If you wish to know the rectangular equivalent, enter the required duct diameter and one desired side measurement. The converter will give the other side measurement. In our example, the first section supply duct should be 13.9" round. If the space between floors allows for a maximum of 8" then the rectangular duct would measure 8"x 22.4".

Instructions for Equipment Selection tab

Step 1		Step 2		Step 3	
Basement	Cost Analysis	Room-by-Room	Air Ducts	Manual S	
Equipment selection as per Manual S					
<input checked="" type="checkbox"/> Auto complete	BTUH	Nom.Tons			
Total Heat Loss	27617		Design temp.	Outdoor	Indoor
Total Heat Gain	24217	2	Winter	20	70
Sensible heat gain	20644		Summer	92	75
Latent heat gain	3573		ID design RH	50%, 63F WB	
Sensible/total ratio	0.85		Altitude	800	
Target cooling TD	17		Predominantly	Cooling climate	
Manufacturer's Equipment Specification					
Equipment	Manufacturer	Model No.	BTUH output	Clg. capacity @ OD design temp.	
furnace				total	sensible
boiler				latent	
heat pump/AC	Airstar	HPO24	26300	21700	4600
evaporator	Air Star	EVO30			
air handler	Airstar	AH10			
TOTAL CAPACITY with altitude correction			0	25984	21440
Selected equipment size			OK	OK	OK
Heating CFM		Cooling CFM (Rec.)	Ext. static pressure of blower		
800		1147	.5		
Available static pressure for duct system			Supplemental heat needed for heat pump		
Blower ext. static press.	.5	HP capacity @ 47F			
coil pressure drop	.1	26200			
filter pressure drop	.15	HP capacity @ 17F			
register pressure drop	.03	17500			
grille pressure drop	.03	HP capacity @ ODDT			
other		18370			
Available SP for duct	0.19	BTUH supplemental heat			
		9247			
		KW supplemental heat			
		3			

1. By clicking, thus checking "Auto complete" most of the items below will automatically be entered with data obtained from the calculation.
2. Otherwise, enter total heat loss, total heat gain and sensible gain. Latent heat gain, sens./total ratio, target temperature drop and approximate cooling cfm will automatically be calculated.
3. Enter outdoor and indoor design temperatures. **Outdoor design temperatures** are the lowest and highest temperatures you would *expect* to experience in your area. **Indoor design temperatures** are the temperatures you wish to maintain indoor. Manual J recommends 70 degree for winter and 75 for summer.
4. Enter the altitude above sea level for your area. *Altitude effects equipment capacity.*
5. Using the manufacture's specification sheets, enter the equipment manufacturer, model number and btuh **output** if a furnace or boiler is used for heating. For air conditioners and heat pumps, enter the cooling capacities associated with your area's outdoor design temperature @ 63 degree wet bulb temperature (63 WB corresponds to 50% RH)

Below is an example of a typical performance data sheet for a 2.5 ton heat pump. The highlighted area is ARI's testing conditions (32,100 btuh total capacity, 78% or 25,000 btuh sensible capacity, therefore leaving 7100 btuh latent capacity.) However, if your area has an outdoor design temperature of 105 degrees, the total capacity of the unit will drop to 30,500 btuh, with 81% or 24,000 btuh sensible and the balance, 5500 btuh latent.

IDB		OUTDOOR AMBIENT TEMPERATURE																								
		65°F				75°F				85°F				95°F				105°F				115°F				
		ENTERING INDOOR WET BULB TEMPERATURE																								
AIRFLOW		59	63	67	71	59	63	67	71	59	63	67	71	59	63	67	71	59	63	67	71	59	63	67	71	
70	1292	MBh	33.9	35.1	38.5	-	33.1	34.3	37.8	-	32.3	33.5	36.7	-	31.5	32.7	35.8	-	30.0	31.1	34.0	-	27.8	28.8	31.5	-
		S/T	0.74	0.62	0.43	-	0.76	0.64	0.44	-	0.78	0.65	0.45	-	0.81	0.68	0.47	-	0.84	0.70	0.49	-	0.85	0.71	0.49	-
		ΔT	18	15	12	-	18	16	12	-	18	16	12	-	18	16	12	-	18	15	12	-	17	14	11	-
		kW	2.52	2.57	2.65	-	2.70	2.76	2.84	-	2.86	2.92	3.01	-	3.01	3.07	3.17	-	3.13	3.19	3.29	-	3.23	3.30	3.41	-
		Amps	10.6	10.8	11.1	-	11.3	11.5	11.9	-	12.1	12.4	12.7	-	12.9	13.1	13.5	-	13.6	13.9	14.3	-	14.3	14.6	15.0	-
		Lo Pr	112	119	130	-	118	126	137	-	123	131	143	-	129	137	150	-	135	144	157	-	140	149	162	-
	1150	MBh	32.9	34.1	37.4	-	32.2	33.3	36.5	-	31.4	32.5	35.6	-	30.6	31.7	34.8	-	29.1	30.2	33.0	-	26.9	27.9	30.6	-
		S/T	0.70	0.59	0.41	-	0.73	0.61	0.42	-	0.75	0.62	0.43	-	0.77	0.64	0.45	-	0.80	0.67	0.46	-	0.81	0.67	0.47	-
		ΔT	19	16	12	-	19	16	12	-	19	16	12	-	19	16	12	-	19	16	12	-	17	15	11	-
		kW	2.50	2.55	2.63	-	2.68	2.74	2.82	-	2.84	2.90	2.99	-	2.98	3.05	3.14	-	3.10	3.17	3.27	-	3.21	3.27	3.38	-
		Amps	10.5	10.7	11.0	-	11.2	11.4	11.8	-	12.0	12.3	12.6	-	12.8	13.0	13.4	-	13.5	13.8	14.2	-	14.2	14.5	14.9	-
		Lo Pr	111	118	129	-	117	124	136	-	122	129	141	-	128	136	148	-	134	142	155	-	138	147	161	-
1008	MBh	30.4	31.5	34.5	-	29.7	30.8	33.7	-	29.0	30.0	32.9	-	28.3	29.3	32.1	-	26.9	27.8	30.5	-	24.9	25.8	28.2	-	
	S/T	0.68	0.57	0.39	-	0.70	0.59	0.41	-	0.72	0.60	0.42	-	0.74	0.62	0.43	-	0.77	0.65	0.45	-	0.78	0.65	0.45	-	
	ΔT	19	16	12	-	19	16	13	-	19	16	13	-	19	17	13	-	19	16	12	-	18	15	12	-	
	kW	2.45	2.49	2.57	-	2.62	2.67	2.75	-	2.78	2.83	2.92	-	2.91	2.97	3.07	-	3.03	3.09	3.19	-	3.13	3.20	3.30	-	
	Amps	10.3	10.5	10.8	-	11.0	11.2	11.5	-	11.8	12.0	12.3	-	12.4	12.7	13.1	-	13.1	13.4	13.8	-	13.8	14.1	14.5	-	
	Lo Pr	107	114	125	-	113	121	132	-	118	125	137	-	124	132	144	-	130	138	151	-	134	143	156	-	
75	1292	MBh	34.5	35.5	38.4	41.2	33.7	34.7	37.5	40.3	32.9	33.8	36.6	39.3	32.1	33.0	35.7	38.4	30.5	31.4	34.0	36.4	28.2	29.1	31.5	33.8
		S/T	0.84	0.75	0.57	0.37	0.87	0.78	0.59	0.38	0.89	0.80	0.60	0.39	0.92	0.82	0.62	0.40	0.95	0.85	0.65	0.42	0.96	0.86	0.65	0.42
		ΔT	21	19	16	11	21	19	16	11	21	19	16	11	21	19	16	11	21	19	16	11	19	18	15	10
		kW	2.54	2.59	2.67	2.75	2.72	2.78	2.86	2.95	2.89	2.95	3.04	3.13	3.03	3.09	3.19	3.29	3.15	3.22	3.32	3.43	3.26	3.33	3.43	3.55
		Amps	10.7	10.9	11.2	11.5	11.4	11.6	12.0	12.3	12.2	12.5	12.8	13.3	13.0	13.2	13.8	14.1	13.7	14.0	14.4	14.9	14.4	14.7	15.2	15.7
		Lo Pr	240	258	272	284	269	289	306	319	308	329	348	363	348	375	396	413	392	422	445	465	433	466	492	513
	1150	MBh	33.5	34.5	37.3	40.0	32.7	33.7	36.4	39.1	31.9	32.9	35.6	38.2	31.1	32.1	34.7	37.2	29.8	30.5	33.0	35.4	27.4	28.2	30.5	32.8
		S/T	0.80	0.72	0.54	0.35	0.83	0.74	0.56	0.36	0.85	0.76	0.58	0.37	0.88	0.78	0.59	0.38	0.91	0.81	0.62	0.40	0.92	0.82	0.62	0.40
		ΔT	21	20	16	11	22	20	16	11	22	20	16	11	22	20	16	11	22	20	16	11	20	19	15	10
		kW	2.52	2.57	2.65	2.73	2.70	2.76	2.84	2.93	2.86	2.92	3.01	3.11	3.01	3.07	3.17	3.27	3.13	3.19	3.30	3.40	3.23	3.30	3.41	3.52
		Amps	10.6	10.8	11.1	11.4	11.3	11.5	11.9	12.2	12.1	12.4	12.7	13.2	12.9	13.1	13.5	14.0	13.6	13.9	14.3	14.8	14.3	14.6	15.0	15.5
		Lo Pr	237	255	270	281	266	287	303	316	303	326	344	359	345	371	392	409	388	418	441	460	429	461	487	508
MBh	30.9	31.8	34.4	37.0	30.2	31.1	33.6	36.1	29.5	30.3	32.8	35.2	28.7	29.6	32.0	34.4	27.3	28.1	30.4	32.7	25.3	26.0	28.2	30.3		

TOTAL CAPACITY with altitude correction is the net capacity of the equipment at your area's altitude and must be considered when selecting equipment.

Notice the "Cooling cfm (rec.)". This is the cfm recommended to control humidity in the cooling mode. Using the manufacturer's specs (blower performance chart), enter the *external static pressure** corresponding to the recommended cfm in the adjacent cell labeled, "Ext. static pressure of blower." Once the external static pressure is entered, it will automatically be re-entered in the *available static pressure* section below

In the *available static pressure for duct system* section, enter the pressure drops caused by each component in the system (coils, registers, dampers, etc.)

*The *external static pressure* is the pressure the air exerts upon the ductwork as it leaves the air handler. Some manufactures post an external static pressure that allows for a coil and/or filter in place (you must read footnotes to blower performance chart). If the external static pressure includes coils or filters leave the corresponding cells blank.

If you do not know the pressure drops of the registers and grilles. The generic pressure drop exerted by registers and grilles is about .03. Therefore, enter .03 in the cell next to registers and .03 in the cell next to grilles.

Other- enter manufactures stated pressure drop of any other items in the system. (electric strips, dampers etc.) these may be added together and entered as one total.

***Available static pressure for duct** (per 100 feet) - In order to assure the correct system cfm the ductwork must be sized based in this static pressure.

*Once the *available static* pressure is known, it must be adjusted according to the ductwork's measured and equivalent lengths. This adjustment is commonly referred to as the **friction rate**. The friction rate is the pressure used on duct calculators and friction charts

$$\text{FR} = (\text{Adj. SP} \times 100) / \text{total effective length}$$

This calculation is automatically made on the duct sizing tab

Supplemental heat needed for heat pump.

From the manufactures specs enter the heat pump's capacity at 47 degrees F and 17 degrees F. The program will calculate the amount of supplemental heat needed expressed in both BTUH and KW

SAVE AND PRINT

To save a calculation

Click FILE-SAVE AS, then, create a folder such as MY LOAD CALCS in DOCUMENTS. Name the file (Harry Homeowner) and click SAVE

To print a report

Click FILE-PRINT REPORT, then select the pages you wish to print, click PRINT

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

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