

Company	Acme HVAC Inc.
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Date	12/9/10

This HVAC load calculation has been performed using sound engineering principles as prescribed by Manual J seventh and eighth abridged editions and ASHRAE Fundamentals. Duct sizing has been performed as prescribed by Manual D.

1. Design Conditions

	Indoor	Outdoor	Temp. Diff.
Winter	70	20	50
Summer	75	92	17

2. How would you describe the summer humidity in your area? Moderately Humid 40

3. Volume of building (cubic feet) 12992

4. How tight is the house? Average-over 1500 Sq. Ft. 0

5. Number of occupants 4

6. Overhang Characteristics (this section optional)

	East	West	S/SE/SW
Distance of overhang from top of window (Ft.)	0	0	0.5
Length of overhang	0	0	1.5

7. Solar gain through glasses

Facing	Total area-Sq. Ft.	Type of glass	HTM	Linear ft.	Unshaded	Shaded	BTUH
N/Shaded	65	Double	24	below OH		65	
NE/NW	0		0				
South	60	Double	40	9	29	30	1176
SE/SW	0		0	0	0	0	0
East	24	Double	75	0	24	0	1800
West	22	Double	75	0	22	0	1650
Total North and Shaded						95	2294
Skylight	0		150				0
Total solar gain							6920
Adjust for tinted or reflective window coating					NO	1	6920

8. Ducts/Pipes

Location Enclosed in unconditioned space 0.7

Insulation R-8 0.08

Duct Loss/Gain 0.056

9. Load Calculation

Elements of Load	Insulation	Area/lin.ft.	U-value	BTUH Loss	BTUH Gain
Gross Wall		1376 sq. ft.	Glass	Solar Gain	6920
Glass 1	Trpl or Low-E	171 sq. ft.	0.42	3591	
Glass 2		0 sq. ft.	0	0	
Skylights		0 sq. ft.	0	0	
Doors	Insulated or Storm	33 sq. ft.	0.4	660	224
Net walls	R-11	1172 sq. ft.	0.08	4688	1593
Ceilings	R-19	1624 sq. ft.	0.055	4466	4019
Floors	R-11	1624 sq. ft.	0.08	3248	0
Open Floors		0 sq. ft.	0	0	0
Slab Floors		0 lin. ft.	0	0	0
Infiltration				8336	2834
People					1200
Appliances					btuh 1200
Sub total				24989	17992
Ducts				1399	1007
Sub total				26388	19000
Latent load					4122
TOTAL BTUH				26388	23122

Basement Calculation

Elements of Load	Insulation	Area/lin.ft.	U-value	BTUH Loss	BTUH Gain
Walls above grade		0			
Glass		0	0	0	
North		0	0		0
South		0	0		0
East		0	0		0
West		0	0		0
Doors		0	0	0	0
Net walls above		0	0	0	0
Walls below grade		0	0	0	0
Ceilings		0	0	0	0
Floors		0	0.024	0	0
Infiltration		0		0	0
Number of people		0	300		0
Appliances					0
Sub total				0	0
Latent load					0
Total BTUH				0	0
Total whole house load including basement				26388	23122

Energy Cost Analysis

Heat Loss	26388	Heating degree days (from map)	3300
Heat Gain	23122	Cooling degree days (from map)	1500
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	Price
Air Conditioning		10	0.14	\$431
Heating	PROPANE GAS	0.8	2.25	\$1284
Total annual operating cost of system 1				\$1716

System #2 (more efficient)

		Efficiency	Fuel Cost	Price
Air Conditioning		15	0.14	\$287
Heating	HEAT PUMP	8.5	0.14	\$589
Total annual operating cost of system 2				\$876

Payback and ROI

Cost of new or more efficient system	\$7650
Cost of less efficient system	\$0
Rebates or credits	\$1500
Net or Additional investment	\$6150
Yearly savings	\$839
Payback (years)	7.3
Return on Investment (ROI)	13.7%

Total Heat Loss	25927
Total Heat Gain	22547
System CFM	800

Room name		Kitchen	din room	bedroom 1	m bebroom	m bath	bath 2	bedroom 2	office
Gross Wall	Sq. Ft.	224	128	72	208	40	40	200	112
North Windows	Sq. Ft.	10	15	15	15	10	0	0	0
NE/NW Windows	Sq. Ft.	0	0	0	0	0	0	0	0
South Windows	Sq. Ft.	0	0	0	0	0	0	12	24
SE/SW Windows	Sq. Ft.	0	0	0	0	0	0	0	0
East Windows	Sq. Ft.	0	0	0	12	0	0	12	0
West Windows	Sq. Ft.	10	0	0	0	0	0	0	0
Skylight	Sq. Ft.	0	0	0	0	0	0	0	0
Doors	Sq. Ft.	11	0	0	0	0	0	0	0
Net Walls	Sq. Ft.	193	113	57	181	30	40	176	88
Ceiling	Sq. Ft.	196	224	146	168	50	70	132	196
Floor-crawl	Sq. Ft.	196	224	146	168	50	70	132	196
Floor-open	Sq. Ft.	0	0	0	0	0	0	0	0
Floor-slab	Lin. Ft.	0	0	0	0	0	0	0	0
Volume	Cu.Ft.	1568	1792	1168	1344	400	560	1056	1568
People	Number	0	0	1	1	0	0	1	1
Appliance	BTUH	1200	0	0	0	0	0	0	0
Duct Loss		187	166	111	165	46	47	140	156
Duct Gain		187	81	75	140	27	19	138	123
Latent		497	568	370	426	126	177	335	497
Heat Loss		3536	3147	2097	3116	870	899	2653	2949
Heat Gain		4039	2109	1800	3082	646	547	2950	2828
Cooling CFM		143	74	63	109	22	19	104	100
Heating CFM		109	97	64	96	26	27	81	91

Room name		liv room							
Gross Wall	Sq. Ft.	352							
North Windows	Sq. Ft.	0							
NE/NW Windows	Sq. Ft.	0							
South Windows	Sq. Ft.	24							
SE/SW Windows	Sq. Ft.	0							
East Windows	Sq. Ft.	0							
West Windows	Sq. Ft.	0							
Skylight	Sq. Ft.	0							
Doors	Sq. Ft.	21							
Net Walls	Sq. Ft.	307							
Ceiling	Sq. Ft.	420							
Floor-crawl	Sq. Ft.	420							
Floor-open	Sq. Ft.	0							
Floor-slab	Lin. Ft.	0							
Volume	Cu.Ft.	3360							
People	Number	0							
Appliance	BTUH	0							
Duct Loss		352							
Duct Gain		184							
Latent		1066							
Heat Loss		6655							
Heat Gain		4543							
Cooling CFM		161							
Heating CFM		205							

Total measured length of duct	64
Total equivalent length of fittings	182
Available static pressure for duct	0.19
Friction loss	0.077

Room name	No. outlets	Outlet CFM	Room CFM	Duct diam.	Air vel.
Supply trunk 1st section		0		16	573
Supply trunk 2nd section		408		12	519
Supply trunk 3rd section		0		2	0
Return trunk 1st section		0		16	573
Return trunk 2nd section		0		2	0
Return trunk 3rd section		0		2	0
Kitchen	1	109	109	7	408
din room	1	97	97	7	363
bedroom 1	1	64	64	6	329
m bebroom	1	96	96	7	360
m bath	1	26	26	4	307
bath 2	1	27	27	4	318
bedroom 2	1	81	81	7	306
office	1	91	91	7	340
liv room	2	102	205	7	384

Equipment selection as per Manual S

	Indoor	Outdoor
Winter	70	20
Summer	75	92
ID design RH	50%, 63F WB	
altitude	1500	

	BTUH	Nom. tons
Total heat loss	26388	
Total heat gain	23122	1.9
Sensible heat gain	19000	
Latent heat gain	4122	
sensible/total ratio	0	
target cooling TD	19	
approx. cooling CFM	909	

Equipment size limits (BTUH output)

	Air conditioner / heat pump		Furnance output	Boiler output
	cool climate	heat climate		
Maximum size	26591	28903	36944	36944
Selected size	Ok	Ok	Ok	Ok

Manufacturer's Equipment Specifications

Equipment	Manufacturer	Model No	BTUH output (heating)	Clg. Capacity @ OD design temp.		
furnance	acme	9040	36000			
boiler			0	total	sensible	latent
heat pump			N/A	0	0	0
air conditioner				23800	19500	4300
evaporator	acme	AC030				
air handler						
Total capacity with altitude correction			33840	23264	19061	4203

Blower CFM (heating)	700
Blower CFM (cooling)	900
Temp rise (heating)	46
Temp drop (cooling)	19

Available static pressure for duct system

Blower ext. static press.	0.5
coil pressure drop	0.1
filter pressure drop	0.15
register pressure drop	0.03
grille pressure drop	0.03
other	0.05
other	0
other	0
Available SP for duct	0.14

Supplemental heat needed for heat pump

HP capacity @ 47F	0
HP capacity @ 17F	0
HP capacity @ ODDT	0
BTUH supplemental heat	0
KW supplemental heat	0