



Project Report

General Project Information

Project Title: Johnson Residence
 Designed By: Joe Larsen
 Project Date: Tuesday, September 16, 2008
 Company Name: Larsen Tech, Inc.
 Company Representative: Joe Larsen
 Company Address: 943 E. Fillmore St.
 Company City: Colorado Springs, CO 80907
 Company Phone: (719) 329-0085
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 Company E-Mail Address: heatingdesigns@aol.com

Design Data

Reference City: Eagle, Colorado
 Daily Temperature Range: High
 Latitude: 39 Degrees
 Elevation: 6539 ft.
 Altitude Factor: 0.785
 Elevation Sensible Adj. Factor: 1.000
 Elevation Total Adj. Factor: 1.000
 Elevation Heating Adj. Factor: 1.000
 Elevation Heating Adj. Factor: 1.000

	Outdoor Dry Bulb	Outdoor Wet Bulb	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-7	0	50	72	71
Summer:	95	59	50	75	-45

Check Figures

Total Building Supply CFM:	2,368	CFM Per Square ft.:	0.266
Square ft. of Room Area:	8,910	Square ft. Per Ton:	2,202
Volume (ft ³) of Cond. Space:	99,483	Air Turnover Rate (per hour):	1.4

Building Loads

Total Heating Required Including Ventilation Air:	156,835 Btuh	156.835 MBH
Total Sensible Gain:	43,696 Btuh	135 %
Total Latent Gain:	-11,346 Btuh	-35 %
Total Cooling Required Including Ventilation Air:	32,350 Btuh	2.70 Tons (Based On Sensible + Latent)
		4.05 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
 All computed results are estimates as building use and weather may vary.
 Be sure to select a unit that meets both sensible and latent loads.



Miscellaneous Report

System 1 Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-7	0	50	72	70.75
Summer:	95	59	50	75	-44.89

System 2 Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-7	0	50	72	70.75
Summer:	95	59	50	75	-44.89

Duct Sizing Inputs

	Main Trunk	Runouts
Calculate:	No	No
Use Schedule:	No	No
Roughness Factor:	0.00300	0.01000
Pressure Drop:	0.1000 in.wg./100 ft.	0.1000 in.wg./100 ft.
Minimum Velocity:	650 ft./min	450 ft./min
Maximum Velocity:	900 ft./min	750 ft./min
Minimum Height:	0 in.	0 in.
Maximum Height:	0 in.	0 in.

Outside Air Data

	Winter	Summer
Infiltration:	0.370 AC/hr	0.190 AC/hr
Above Grade Volume:	X 99,483 Cu.ft.	X 99,483 Cu.ft.
	36,809 Cu.ft./hr	18,902 Cu.ft./hr
	X 0.0167	X 0.0167
Total Building Infiltration:	613 CFM	315 CFM
Total Building Ventilation:	200 CFM	200 CFM

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier:	17.28	= (1.10 X 0.785 X 20.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier:	-23.97	= (0.68 X 0.785 X -44.89 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier:	68.24	= (1.10 X 0.785 X 79.00 Winter Temp. Difference)

---System 2---

Infiltration & Ventilation Sensible Gain Multiplier:	17.28	= (1.10 X 0.785 X 20.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier:	-23.97	= (0.68 X 0.785 X -44.89 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier:	68.24	= (1.10 X 0.785 X 79.00 Winter Temp. Difference)



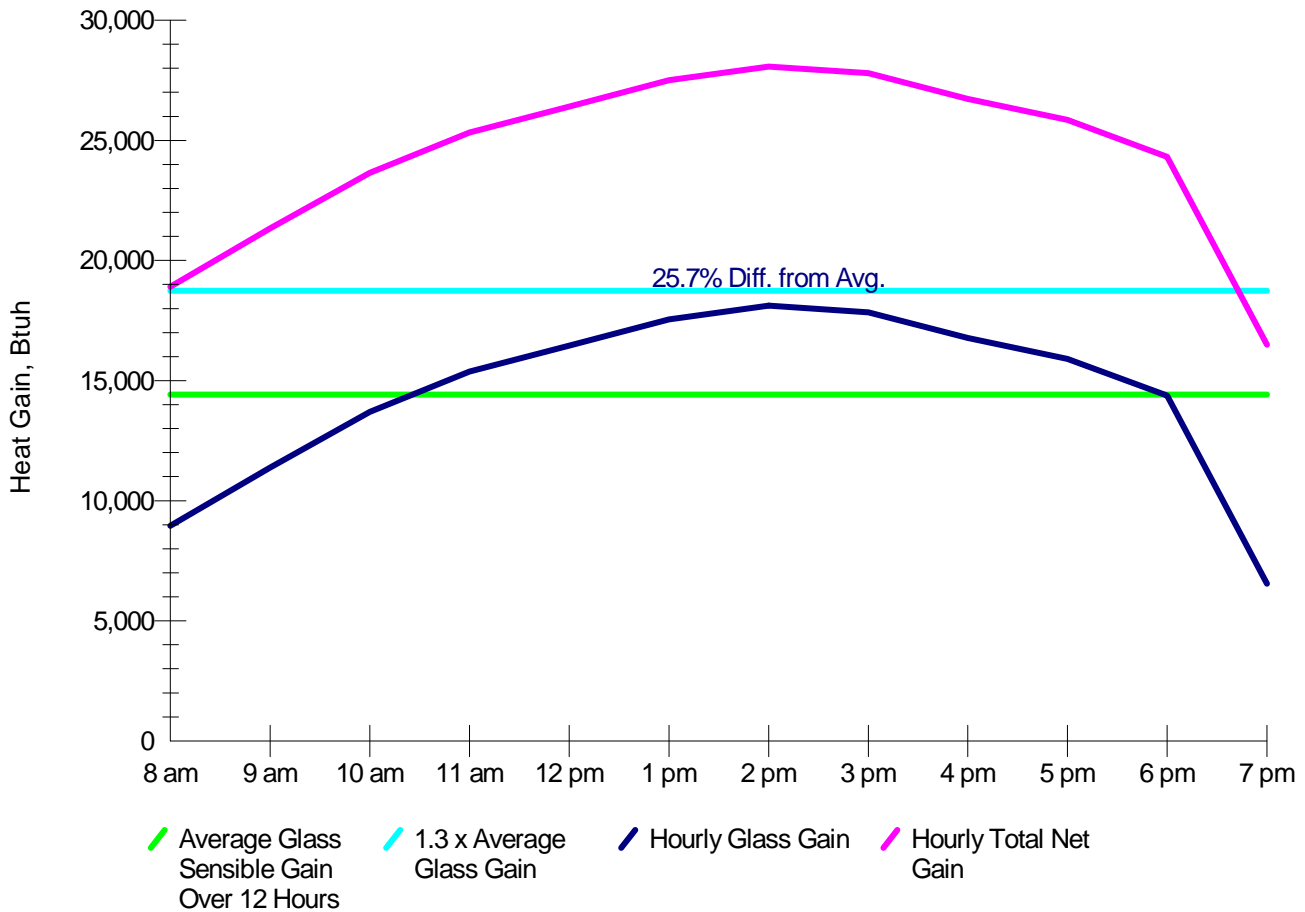
Load Preview Report

Scope	Has AED	Net Ton	Rec Ton	ft. ² /Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duct Size
Building		2.70	4.05	2,202	8,910	43,696	-11,346	32,350	156,835	2,368	2,329	2,368	
System 1	Yes	1.75	2.67	2,286	6,100	28,823	-7,805	21,018	102,054	1,541	1,538	1,541	0*
Ventilation						2,246	-3,116	-870	8,871				
Zone 1					730	3,358	-756	2,602	14,597	241	194	241	
21-Garage #1 / Storage					730	3,358	-756	2,602	14,597	241	194	241	2-0*
Zone 2					295	1,357	-347	1,010	5,395	89	79	89	
3-Basement Bath					110	208	-100	108	1,731	29	12	29	1-0*
4-Basement Bedroom					185	1,149	-247	902	3,664	61	67	61	1-0*
Zone 3					1,405	5,556	-1,034	4,522	18,847	312	322	312	
1-Shop/Storage					230	917	-187	730	3,783	63	53	63	1-0*
2-Sauna					55	120	-57	63	830	14	7	14	1-0*
17-Basement Rec Room					1,120	4,519	-790	3,729	14,234	235	262	235	2-0*
Zone 4					810	6,056	-624	5,432	12,739	211	351	211	
5-Master Bedroom					490	4,316	-309	4,007	8,875	147	250	147	1-0*
6-Master Bath					320	1,740	-315	1,425	3,864	64	101	64	1-0*
Zone 5					1,106	8,987	-670	8,317	16,298	270	520	270	
7-Powder Room					30	52	-35	17	339	6	3	6	1-0*
8-Laundry					115	79	-52	27	508	8	5	8	1-0*
9-Kitchen					336	3,641	-378	3,263	6,826	113	211	113	1-0*
16-Great Room					625	5,215	-205	5,010	8,625	143	302	143	1-0*
Zone 6					1,754	9,432	-1,258	8,174	25,307	419	546	419	
10-Hallway					629	4,060	-444	3,616	8,539	141	235	141	1-0*
11-Main Level Rec Room					1,125	5,372	-814	4,558	16,768	277	311	277	3-0*
System 2	Yes	0.94	1.38	2,040	2,810	14,873	-3,541	11,332	54,781	827	791	827	0*
Ventilation						1,209	-1,678	-469	4,777				
Zone 7					1,040	4,757	-939	3,818	21,530	356	275	356	
22-Garage #2					1,040	4,757	-939	3,818	21,530	356	275	356	3-0*
Zone 8					477	3,763	-347	3,416	7,949	131	218	131	
12-Bedroom 2					412	2,764	-314	2,450	6,979	115	160	115	1-0*
14-Bath 2					65	999	-33	966	970	16	58	16	1-0*
Zone 9					703	5,077	-178	4,899	11,107	184	294	184	
13-Bedroom 3					275	3,139	-196	2,943	4,826	80	182	80	1-0*
18-Bath 3					65	41	0	41	149	2	2	2	1-0*
20-Upper Loft Left					363	1,897	18	1,915	6,132	101	110	101	1-0*
Zone 10					590	4,586	-399	4,187	9,418	156	265	156	
15-Bedroom 4					230	2,320	-171	2,149	3,980	66	134	66	1-0*
19-Bath 4					60	807	-28	779	899	15	47	15	1-0*
23-Upper Loft Right					300	1,459	-200	1,259	4,539	75	84	75	1-0*
Sum of room airflows may be greater than system airflow because system has multiple zones.													



System 1 - - Adequate Exposure Diversity Test

Test For Adequate Exposure Diversity



AED Calculation Summary

--- SYSTEM HAS ADEQUATE EXPOSURE DIVERSITY. ---

System is on N, E, S, W rosette.

Peak load exceeds 12-hour average load by 25.7%.

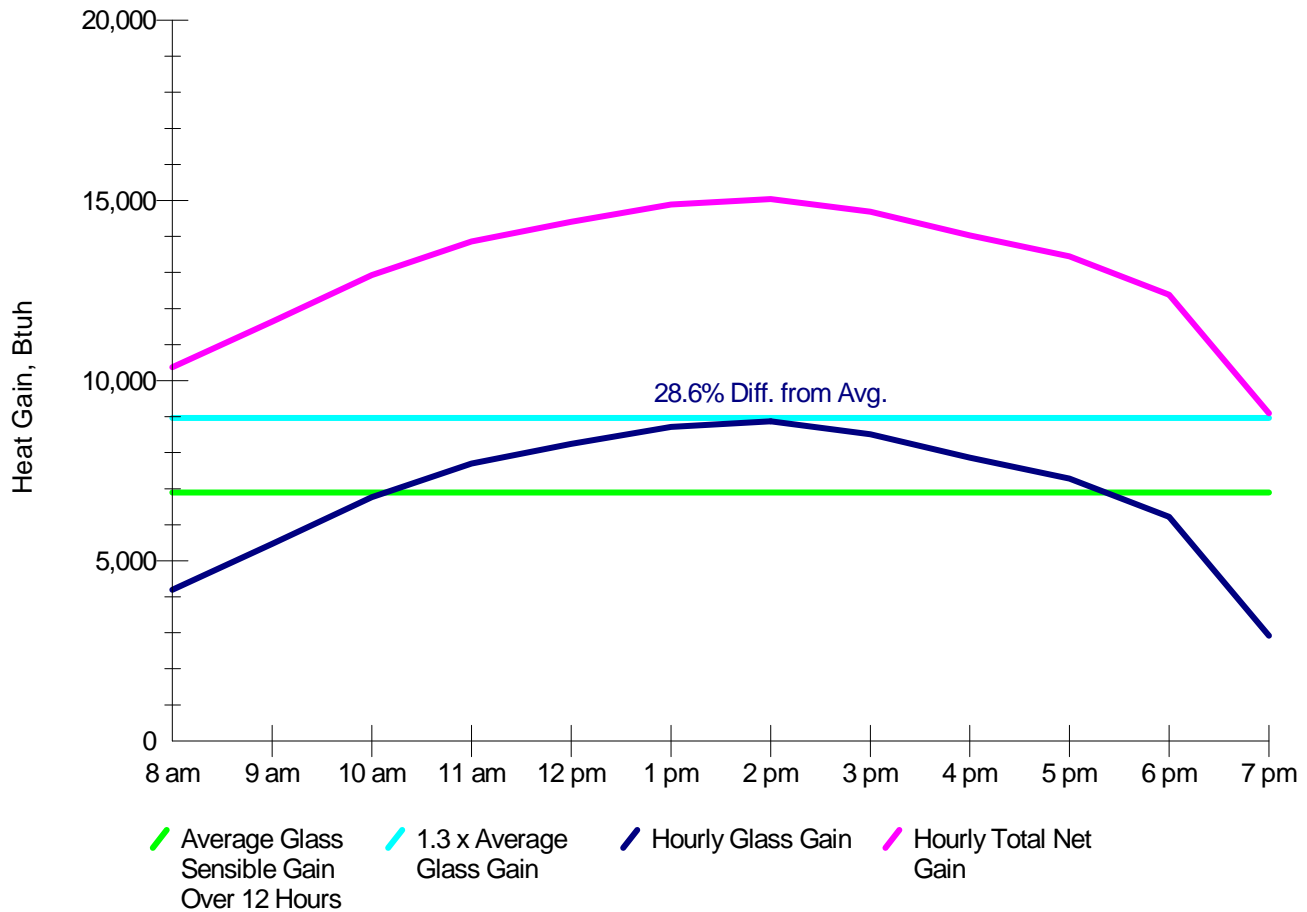
AED Excursion (amount by which peak exceeds 1.3 x average): 0 Btuh

Definition: A system has adequate exposure diversity if the peak-hour glass load for the entire conditioned space does not exceed the average glass load for the entire conditioned space by more than 30 percent.



System 2 - - Adequate Exposure Diversity Test

Test For Adequate Exposure Diversity



AED Calculation Summary

--- SYSTEM HAS ADEQUATE EXPOSURE DIVERSITY. ---

System is on N, E, S, W rosette.

Peak load exceeds 12-hour average load by 28.6%.

AED Excursion (amount by which peak exceeds 1.3 x average): 0 Btuh

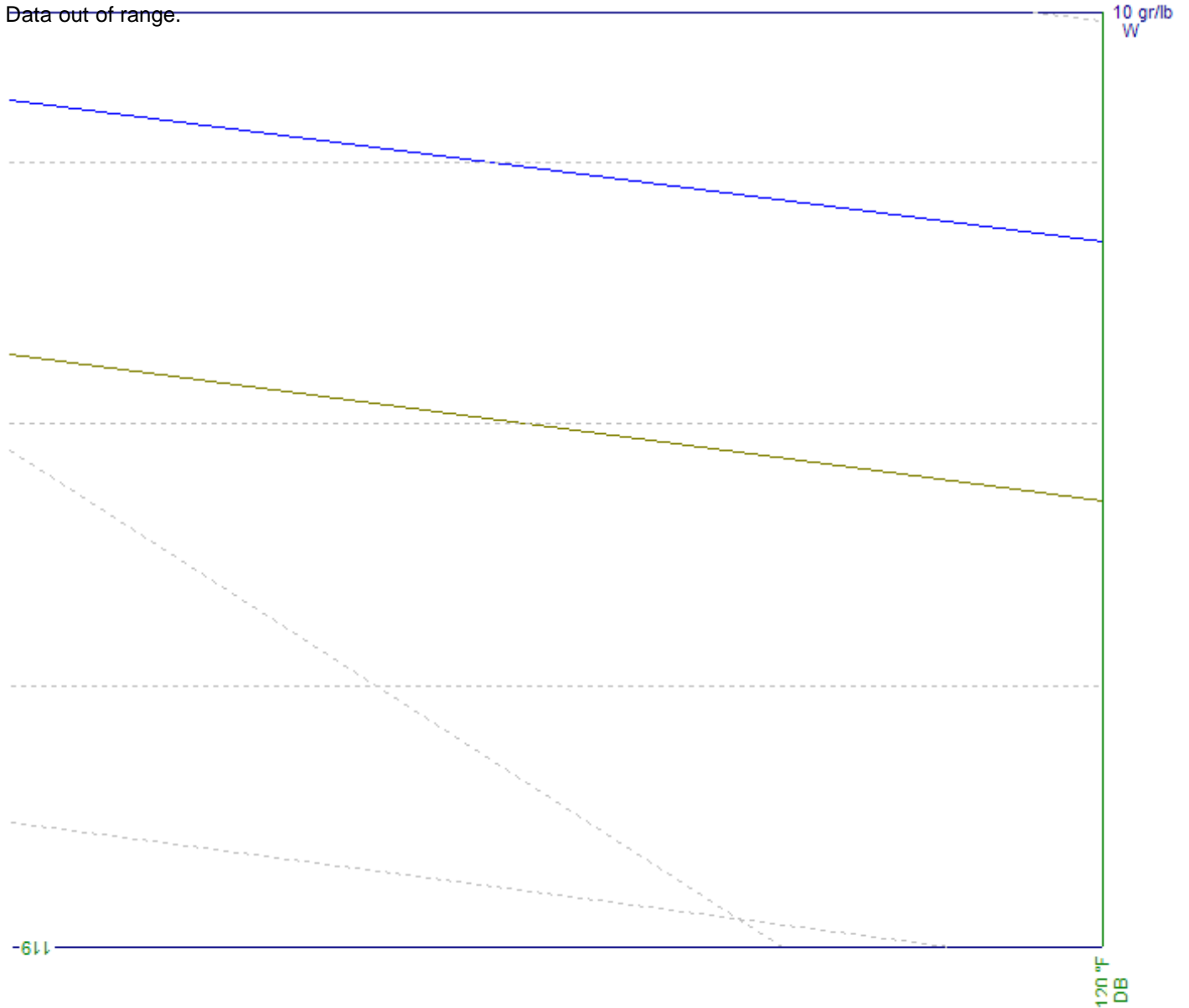
Definition: A system has adequate exposure diversity if the peak-hour glass load for the entire conditioned space does not exceed the average glass load for the entire conditioned space by more than 30 percent.



System 1 - Psychrometric Chart

ZC	Zone (Room) Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	DTF	Draw Through Fan Sensible Gain

One or more points or processes failed to be added to the chart:
Zone process could not be added.

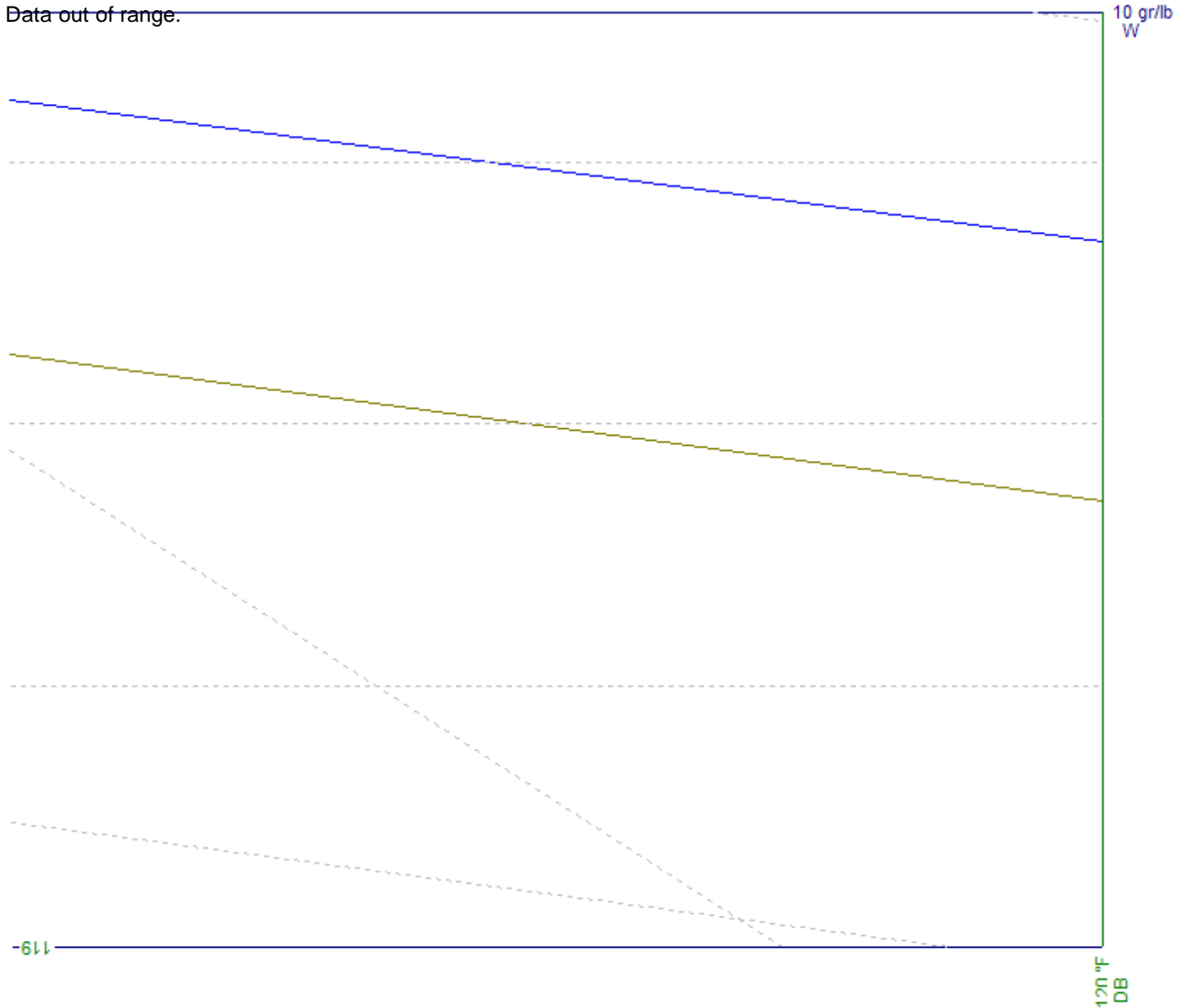




System 2 - Psychrometric Chart

ZC	Zone (Room) Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	DTF	Draw Through Fan Sensible Gain

One or more points or processes failed to be added to the chart:
Zone process could not be added.





Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	1189.8	33,842	0	16,232	16,232
11D: Door-Wood - Solid Core	462	14,232	0	4,685	4,685
12E-Osw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	4880.5	26,218	0	5,773	5,773
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	507.5	2,109	0	460	460
Stacked Logs: Wall-, Input for R22 Insulation value.	2725.2	9,784	0	1,648	1,648
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	3700	8,476	0	2,360	2,360
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	433	5,953	0	0	0
20P-19: Floor-Over open crawl space or garage, Passive, R-19 blanket insulation, any cover	180	711	0	90	90
Subtotals for structure:		101,325	0	31,248	31,248
People:	5		1,000	1,150	2,150
Equipment:			0	2,400	2,400
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 613, Summer CFM: 315		41,862	-7,552	5,443	-2,109
Ventilation: Winter CFM: 200, Summer CFM: 200		13,648	-4,794	3,455	-1,339
Total Building Load Totals:		156,835	-11,346	43,696	32,350

Check Figures

Total Building Supply CFM:	2,368	CFM Per Square ft.:	0.266
Square ft. of Room Area:	8,910	Square ft. Per Ton:	2,202
Volume (ft³) of Cond. Space:	99,483	Air Turnover Rate (per hour):	1.4

Building Loads

Total Heating Required Including Ventilation Air:	156,835 Btuh	156.835 MBH
Total Sensible Gain:	43,696 Btuh	135 %
Total Latent Gain:	-11,346 Btuh	-35 %
Total Cooling Required Including Ventilation Air:	32,350 Btuh	2.70 Tons (Based On Sensible + Latent)
		4.05 Tons (Based On 90% Sensible Capacity)

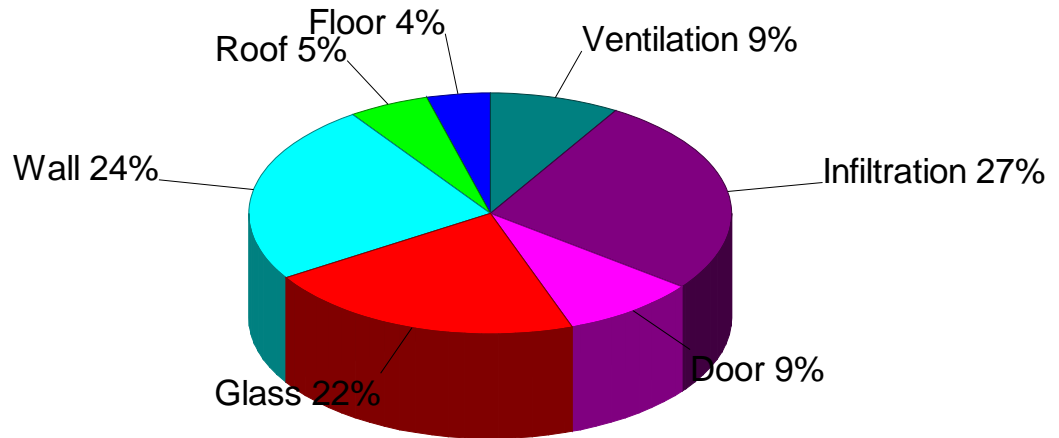
Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.

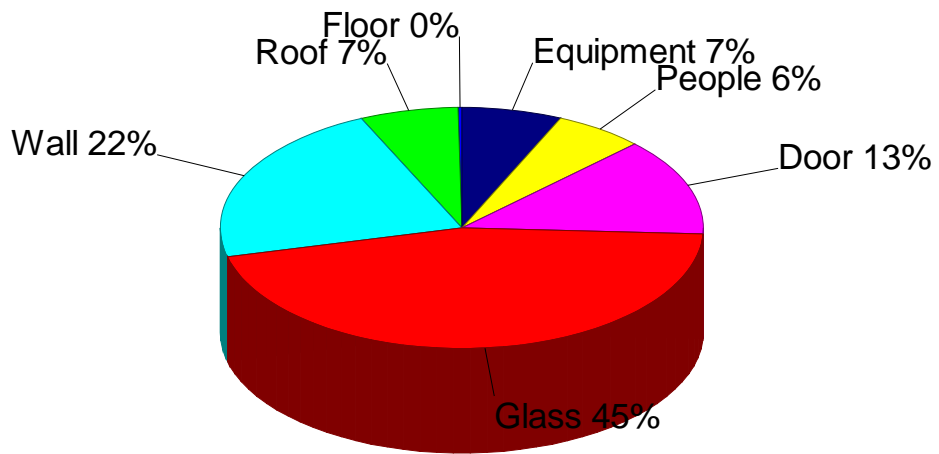


Building Pie Chart

Building Loss
156,835
Btuh

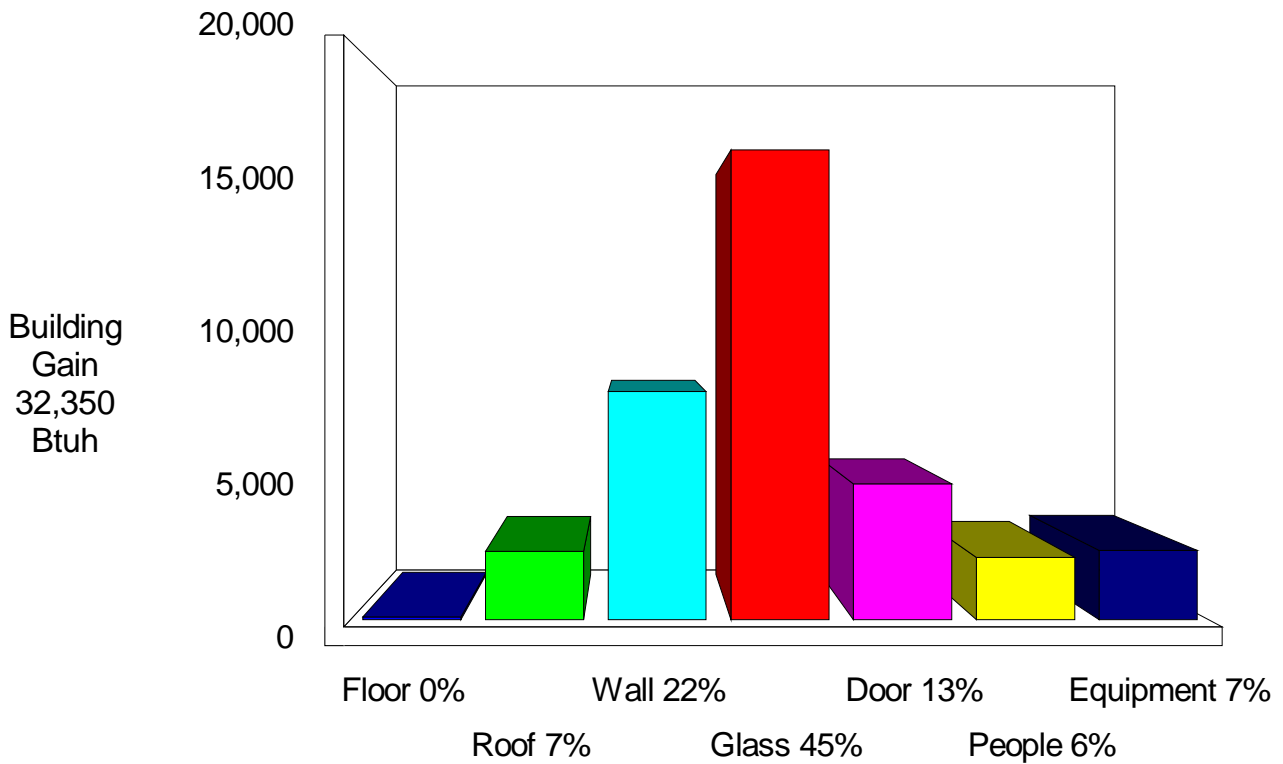
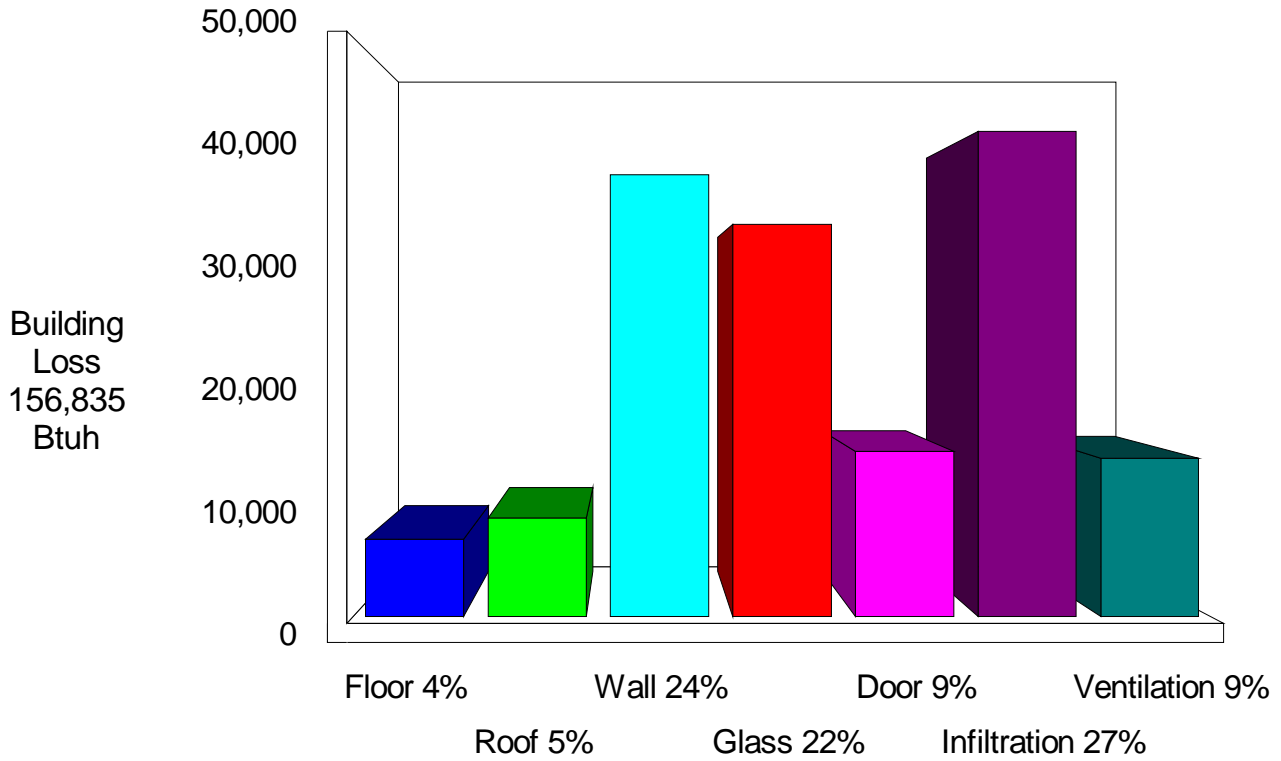


Building Gain
32,350
Btuh





Building Bar Graph





System 1 Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	840.8	23,916	0	11,067	11,067
11D: Door-Wood - Solid Core	226	6,962	0	2,292	2,292
12E-Osw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	3146	16,900	0	3,722	3,722
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	368.5	1,531	0	364	364
Stacked Logs: Wall-, Input for R22 Insulation value.	1498.4	5,379	0	907	907
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	1930	4,421	0	1,232	1,232
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	294	4,042	0	0	0
20P-19: Floor-Over open crawl space or garage, Passive, R-19 blanket insulation, any cover	180	711	0	90	90
Subtotals for structure:		63,862	0	19,674	19,674
People:	3		600	690	1,290
Equipment:			0	2,400	2,400
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 430, Summer CFM: 221		29,321	-5,289	3,813	-1,476
Ventilation: Winter CFM: 130, Summer CFM: 130		8,871	-3,116	2,246	-870
System 1 Load Totals:		102,054	-7,805	28,823	21,018

Check Figures

Supply CFM:	1,541	CFM Per Square ft.:	0.253
Square ft. of Room Area:	6,100	Square ft. Per Ton:	2,286
Volume (ft³) of Cond. Space:	69,680	Air Turnover Rate (per hour):	1.3

System Loads

Total Heating Required Including Ventilation Air:	102,054	Btuh	102.054	MBH
Total Sensible Gain:	28,823	Btuh	137	%
Total Latent Gain:	-7,805	Btuh	-37	%
Total Cooling Required Including Ventilation Air:	21,018	Btuh	1.75	Tons (Based On Sensible + Latent)
			2.67	Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
 All computed results are estimates as building use and weather may vary.
 Be sure to select a unit that meets both sensible and latent loads.



System 2 Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	349	9,926	0	5,165	5,165
11D: Door-Wood - Solid Core	236	7,270	0	2,393	2,393
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	1734.5	9,318	0	2,051	2,051
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	139	578	0	96	96
Stacked Logs: Wall-, Input for R22 Insulation value.	1226.8	4,405	0	741	741
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	1770	4,055	0	1,128	1,128
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	139	1,911	0	0	0
Subtotals for structure:		37,463	0	11,574	11,574
People:	2		400	460	860
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 184, Summer CFM: 94		12,541	-2,263	1,630	-633
Ventilation: Winter CFM: 70, Summer CFM: 70		4,777	-1,678	1,209	-469
System 2 Load Totals:		54,781	-3,541	14,873	11,332

Check Figures

Supply CFM:	827	CFM Per Square ft.:	0.294
Square ft. of Room Area:	2,810	Square ft. Per Ton:	2,040
Volume (ft³) of Cond. Space:	29,803	Air Turnover Rate (per hour):	1.7

System Loads

Total Heating Required Including Ventilation Air:	54,781	Btuh	54.781	MBH
Total Sensible Gain:	14,873	Btuh	131	%
Total Latent Gain:	-3,541	Btuh	-31	%
Total Cooling Required Including Ventilation Air:	11,332	Btuh	0.94	Tons (Based On Sensible + Latent)
			1.38	Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
 All computed results are estimates as building use and weather may vary.
 Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 1 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	25	711	0	238	238
11D: Door-Wood - Solid Core	164	5,052	0	1,663	1,663
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	601	3,229	0	711	711
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	79	328	0	55	55
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	79	1,086	0	0	0
Subtotals for structure:		10,406	0	2,813	2,813
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 61, Summer CFM: 32		4,191	-756	545	-211
System 1, Zone 1 Load Totals:		14,597	-756	3,358	2,602

Check Figures

Supply CFM:	241	CFM Per Square ft.:	0.331
Square ft. of Room Area:	730	Square ft. Per Ton:	2,332
Volume (ft ³) of Cond. Space:	8,030	Air Turnover Rate (per hour):	1.8

Zone Loads

Total Heating Required:	14,597 Btuh	14.597 MBH
Total Sensible Gain:	3,358 Btuh	129 %
Total Latent Gain:	-756 Btuh	-29 %
Total Cooling Required:	2,602 Btuh	0.22 Tons (Based On Sensible + Latent)
		0.31 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 2 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	16	455	0	227	227
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	346.5	1,862	0	409	409
Rim Joist-19: Wall-Frame, , Exterior rim/band joist between conditioned floors. R-19 insulation.	36.2	151	0	46	46
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	73	1,004	0	0	0
Subtotals for structure:		3,472	0	1,107	1,107
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 28, Summer CFM: 14		1,923	-347	250	-97
System 1, Zone 2 Load Totals:		5,395	-347	1,357	1,010

Check Figures

Supply CFM:	89	CFM Per Square ft.:	0.302
Square ft. of Room Area:	295	Square ft. Per Ton:	2,299
Volume (ft³) of Cond. Space:	3,245	Air Turnover Rate (per hour):	1.6

Zone Loads

Total Heating Required:	5,395 Btuh	5.395 MBH
Total Sensible Gain:	1,357 Btuh	134 %
Total Latent Gain:	-347 Btuh	-34 %
Total Cooling Required:	1,010 Btuh	0.08 Tons (Based On Sensible + Latent)
		0.13 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 3 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	191	5,432	0	2,101	2,101
11D: Door-Wood - Solid Core	20	616	0	203	203
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	863	4,635	0	1,021	1,021
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	115	478	0	97	97
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	142	1,952	0	0	0
Subtotals for structure:		13,113	0	4,811	4,811
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 84, Summer CFM: 43		5,734	-1,034	745	-289
System 1, Zone 3 Load Totals:		18,847	-1,034	5,556	4,522

Check Figures

Supply CFM:	312	CFM Per Square ft.:	0.222
Square ft. of Room Area:	1,405	Square ft. Per Ton:	2,764
Volume (ft³) of Cond. Space:	15,455	Air Turnover Rate (per hour):	1.2

Zone Loads

Total Heating Required:	18,847 Btuh	18.847 MBH
Total Sensible Gain:	5,556 Btuh	123 %
Total Latent Gain:	-1,034 Btuh	-23 %
Total Cooling Required:	4,522 Btuh	0.38 Tons (Based On Sensible + Latent)
		0.51 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 4 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	189.8	5,397	0	2,917	2,917
Stacked Logs: Wall-, Input for R22 Insulation value.	663	2,380	0	402	402
Rim Joist-19: Wall-Frame, , Exterior rim/band joist between conditioned floors. R-19 insulation.	94.8	393	0	120	120
Subtotals for structure:		8,170	0	5,232	5,232
People:	1		200	230	430
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 67, Summer CFM: 34		4,569	-824	594	-230
System 1, Zone 4 Load Totals:		12,739	-624	6,056	5,432

Check Figures

Supply CFM:	211	CFM Per Square ft.:	0.260
Square ft. of Room Area:	810	Square ft. Per Ton:	1,522
Volume (ft³) of Cond. Space:	8,100	Air Turnover Rate (per hour):	1.6

Zone Loads

Total Heating Required:	12,739 Btuh	12.739 MBH
Total Sensible Gain:	6,056 Btuh	111 %
Total Latent Gain:	-624 Btuh	-11 %
Total Cooling Required:	5,432 Btuh	0.45 Tons (Based On Sensible + Latent)
		0.53 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 5 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	213	6,058	0	2,756	2,756
11D: Door-Wood - Solid Core	42	1,294	0	426	426
Stacked Logs: Wall-, Input for R22 Insulation value.	716.5	2,572	0	433	433
Rim Joist-19: Wall-Frame, , Exterior rim/band joist between conditioned floors. R-19 insulation.	28.5	119	0	36	36
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	625	1,432	0	399	399
Subtotals for structure:		11,475	0	5,729	5,729
People:	1		200	230	430
Equipment:			0	2,400	2,400
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 71, Summer CFM: 36		4,823	-870	628	-242
System 1, Zone 5 Load Totals:		16,298	-670	8,987	8,317

Check Figures

Supply CFM:	270	CFM Per Square ft.:	0.244
Square ft. of Room Area:	1,106	Square ft. Per Ton:	1,421
Volume (ft³) of Cond. Space:	17,310	Air Turnover Rate (per hour):	0.9

Zone Loads

Total Heating Required:	16,298 Btuh	16.298 MBH
Total Sensible Gain:	8,987 Btuh	108 %
Total Latent Gain:	-670 Btuh	-8 %
Total Cooling Required:	8,317 Btuh	0.69 Tons (Based On Sensible + Latent)
		0.78 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 1, Zone 6 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	206	5,863	0	2,828	2,828
Stacked Logs: Wall-, Input for R22 Insulation value.	119	427	0	72	72
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	1335.5	7,174	0	1,581	1,581
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	15	62	0	10	10
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	1305	2,989	0	833	833
20P-19: Floor-Over open crawl space or garage, Passive, R-19 blanket insulation, any cover	180	711	0	90	90
Subtotals for structure:		17,226	0	8,151	8,151
People:	1		200	230	430
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 118, Summer CFM: 61		8,081	-1,458	1,051	-407
System 1, Zone 6 Load Totals:		25,307	-1,258	9,432	8,174

Check Figures

Supply CFM:	419	CFM Per Square ft.:	0.239
Square ft. of Room Area:	1,754	Square ft. Per Ton:	2,085
Volume (ft ³) of Cond. Space:	17,540	Air Turnover Rate (per hour):	1.4

Zone Loads

Total Heating Required:	25,307 Btuh	25.307 MBH
Total Sensible Gain:	9,432 Btuh	115 %
Total Latent Gain:	-1,258 Btuh	-15 %
Total Cooling Required:	8,174 Btuh	0.68 Tons (Based On Sensible + Latent)
		0.84 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 2, Zone 7 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	16	455	0	152	152
11D: Door-Wood - Solid Core	236	7,270	0	2,393	2,393
12E-0sw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	1138	6,113	0	1,346	1,346
Rim Joist-19: Wall-, Exterior rim/band joist between conditioned floors. R-19 insulation.	139	578	0	96	96
22D-15pl-c: Floor-Slab on grade, Vertical board insulation covers slab edge, turns under slab and extends 4' horizontally, carpet covering, R-15 insulation, passive, light dry soil	139	1,911	0	0	0
Subtotals for structure:		16,327	0	4,081	4,081
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 76, Summer CFM: 39		5,203	-939	676	-263
System 2, Zone 7 Load Totals:		21,530	-939	4,757	3,818

Check Figures

Supply CFM:	356	CFM Per Square ft.:	0.342
Square ft. of Room Area:	1,040	Square ft. Per Ton:	2,342
Volume (ft ³) of Cond. Space:	11,440	Air Turnover Rate (per hour):	1.9

Zone Loads

Total Heating Required:	21,530 Btuh	21.530 MBH
Total Sensible Gain:	4,757 Btuh	125 %
Total Latent Gain:	-939 Btuh	-25 %
Total Cooling Required:	3,818 Btuh	0.32 Tons (Based On Sensible + Latent)
		0.44 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 2, Zone 8 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	104	2,958	0	1,520	1,520
Stacked Logs: Wall-, Input for R22 Insulation value.	284.5	1,022	0	172	172
12E-Osw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	177	951	0	209	209
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	477	1,093	0	304	304
Subtotals for structure:		6,024	0	3,513	3,513
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 28, Summer CFM: 14		1,925	-347	250	-97
System 2, Zone 8 Load Totals:		7,949	-347	3,763	3,416

Check Figures

Supply CFM:	131	CFM Per Square ft.:	0.276
Square ft. of Room Area:	477	Square ft. Per Ton:	1,440
Volume (ft³) of Cond. Space:	4,770	Air Turnover Rate (per hour):	1.7

Zone Loads

Total Heating Required:	7,949 Btuh	7.949 MBH
Total Sensible Gain:	3,763 Btuh	110 %
Total Latent Gain:	-347 Btuh	-10 %
Total Cooling Required:	3,416 Btuh	0.28 Tons (Based On Sensible + Latent)
		0.33 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 2, Zone 9 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	108	3,071	0	1,552	1,552
12E-Osw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	124.5	669	0	147	147
Stacked Logs: Wall-, Input for R22 Insulation value.	710	2,549	0	429	429
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	703	1,611	0	448	448
Subtotals for structure:		7,900	0	4,200	4,200
People:	2		400	460	860
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 47, Summer CFM: 24		3,207	-578	417	-161
System 2, Zone 9 Load Totals:		11,107	-178	5,077	4,899

Check Figures

Supply CFM:	184	CFM Per Square ft.:	0.261
Square ft. of Room Area:	703	Square ft. Per Ton:	1,627
Volume (ft ³) of Cond. Space:	7,393	Air Turnover Rate (per hour):	1.5

Zone Loads

Total Heating Required:	11,107 Btuh	11.107 MBH
Total Sensible Gain:	5,077 Btuh	104 %
Total Latent Gain:	-178 Btuh	-4 %
Total Cooling Required:	4,899 Btuh	0.41 Tons (Based On Sensible + Latent)
		0.43 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



System 2, Zone 10 Summary Loads (Peak Load Procedure for Rooms)

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
WIN.36: Glazing-Window or Glass Door. , outdoor insect screen with 50% coverage, medium color blinds at 45° with 50% coverage, u-value 0.36, SHGC 0.34	121	3,442	0	1,941	1,941
Stacked Logs: Wall-, Input for R22 Insulation value.	232.3	834	0	140	140
12E-Osw: Wall-Frame, R-19 insulation in 2 x 6 stud cavity, no board insulation, siding finish, wood studs	295	1,585	0	349	349
18A-38: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-38 blanket or loose fill	590	1,351	0	376	376
Subtotals for structure:		7,212	0	4,299	4,299
People:	0		0	0	0
Equipment:			0	0	0
Lighting:	0			0	0
Ductwork:		0	0	0	0
Infiltration: Winter CFM: 32, Summer CFM: 17		2,206	-399	287	-112
System 2, Zone 10 Load Totals:		9,418	-399	4,586	4,187

Check Figures

Supply CFM:	156	CFM Per Square ft.:	0.264
Square ft. of Room Area:	590	Square ft. Per Ton:	1,466
Volume (ft ³) of Cond. Space:	6,200	Air Turnover Rate (per hour):	1.5

Zone Loads

Total Heating Required:	9,418 Btuh	9.418 MBH
Total Sensible Gain:	4,586 Btuh	110 %
Total Latent Gain:	-399 Btuh	-10 %
Total Cooling Required:	4,187 Btuh	0.35 Tons (Based On Sensible + Latent)
		0.40 Tons (Based On 90% Sensible Capacity)

Notes

Calculations are based on 8th edition of ACCA Manual J.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads.



Radiant Floor Report

Room Name	Radiant Floor Description [Heat Output, Spacing]	Room Area	Sens. Heat Loss	Tubing Length To Meet Load	Tubing Length To Fill Room	Floor Heat Output Btuh	Supplemental Heat Req'd
----- System 1 : -----							
----- Zone 1: -----							
21-Garage #1 / Storage	1/2" PEX [22,15]	730	14,597	531	542	14,893	-296
Zone 1 Total:		730	14,597	531	542	14,893	-296
----- Zone 2: -----							
3-Basement Bath	1/2" PEX [22,15]	110	1,731	63	72	1,981	-250
4-Basement Bedroom	1/2" PEX [22,15]	185	3,664	133	127	3,494	170
Zone 2 Total:		295	5,395	196	199	5,474	-79
----- Zone 3: -----							
1-Shop/Storage	1/2" PEX [22,15]	230	3,783	138	161	4,415	-632
2-Sauna	1/2" PEX [22,15]	55	830	30	33	906	-76
17-Basement Rec Room	1/2" PEX [22,12]	1,120	14,234	647	1,054	23,189	-8,955
Zone 3 Total:		1,405	18,847	815	1,248	28,510	-9,663
----- Zone 4: -----							
5-Master Bedroom	1/2" PEX [22,12]	490	8,875	403	447	9,828	-953
6-Master Bath	1/2" PEX [22,12]	320	3,864	176	285	6,275	-2,411
Zone 4 Total:		810	12,739	579	732	16,103	-3,364
----- Zone 5: -----							
7-Powder Room	1/2" PEX [22,12]	30	339	15	20	441	-102
8-Laundry	1/2" PEX [22,12]	115	508	23	95	2,080	-1,572
9-Kitchen	1/2" PEX [22,12]	336	6,826	310	300	6,607	219
16-Great Room	1/2" PEX [22,12]	625	8,625	392	576	12,672	-4,047
Zone 5 Total:		1,106	16,298	741	991	21,801	-5,503
----- Zone 6: -----							
10-Hallway	1/2" PEX [22,12]	629	8,539	388	580	12,756	-4,217
11-Main Level Rec Room	1/2" PEX [22,12]	1,125	16,768	762	1,059	23,296	-6,528
Zone 6 Total:		1,754	25,307	1,150	1,639	36,053	-10,746
System 1 Total:		6,100	93,183	4,012	5,350	122,833	-29,650
----- System 2 : -----							
----- Zone 7: -----							
22-Garage #2	1/2" PEX [22,12]	1,040	21,530	979	977	21,483	47
Zone 7 Total:		1,040	21,530	979	977	21,483	47
----- Zone 8: -----							
12-Bedroom 2	1/2" PEX [22,12]	412	6,979	317	372	8,193	-1,214
14-Bath 2	1/2" PEX [22,12]	65	970	44	50	1,097	-127
Zone 8 Total:		477	7,949	361	422	9,290	-1,341
----- Zone 9: -----							
13-Bedroom 3	1/2" PEX [22,12]	275	4,826	219	243	5,342	-516



Radiant Floor Report (cont'd)

Room Name	Radiant Floor Description [Heat Output, Spacing]	Room Area	Sens. Heat Loss	Tubing Length To Meet Load	Tubing Length To Fill Room	Floor Heat Output Btuh	Supplemental Heat Req'd
18-Bath 3	1/2" PEX [22,12]	65	149	7	50	1,097	-948
20-Upper Loft Left	1/2" PEX [22,12]	363	6,132	279	326	7,170	-1,038
Zone 9 Total:		703	11,107	505	619	13,609	-2,502
----- Zone 10: -----							
15-Bedroom 4	1/2" PEX [22,12]	230	3,980	181	201	4,415	-435
19-Bath 4	1/2" PEX [22,12]	60	899	41	46	1,001	-102
Zone 10 Total:		290	4,879	222	246	5,416	-537
System 2 Total:		2,510	45,465	2,067	2,264	49,798	-4,333
Building Total:		8,610	138,648	6,079	7,613	172,632	-33,984

Notes

Area values shown include only those rooms for which radiant floor properties have been entered.

Sensible heat loss values on this report do not include losses associated with ductwork, ventilation, winter humidification or hot water piping.

Tubing lengths include only the tubing that is part of the radiant floor panel itself and not the supply and return piping to and from the manifold. Tubing lengths are calculated from the Tubing Spacing input and an assumed installed coverage area that is based on a 6-inch offset from each wall around the perimeter of a rectangular room.

The Floor Heat Output Btuh values shown are calculated with the assumption that the tubing is installed to fill the room at the given spacing.

If the Supplemental Heat Required is negative, the radiant floor output exceeds the sensible loss of the room by the indicated amount, assuming that the tubing is installed to fill the room at the given spacing.



Building Rotation Report

All rotation degree values in this report are clockwise with respect to the project's original orientation.
Building orientation as entered (zero degrees rotation): Front door faces North

Individual Rooms

Rm. No.	Room Name	0° Rot. CFM	45° Rot. CFM	90° Rot. CFM	135° Rot. CFM	180° Rot. CFM	225° Rot. CFM	270° Rot. CFM	315° Rot. CFM	High Duct Size
System 1:										
Zone 1:										
21	Garage #1 / Storage	241	216	267	257	245	283	*297	254	2-7
Zone 2:										
3	Basement Bath	*29	12	13	13	13	14	14	13	1-3
4	Basement Bedroom	61	79	*90	69	46	64	89	82	1-6
Zone 3:										
1	Shop/Storage	63	75	115	107	96	124	*135	97	1-7
2	Sauna	*14	7	8	7	7	8	8	8	1-2
17	Basement Rec Room	235	350	583	556	483	647	*709	514	2-10
Zone 4:										
5	Master Bedroom	147	306	455	447	400	533	*566	424	1-12
6	Master Bath	64	39	48	61	64	67	71	*103	1-6
Zone 5:										
7	Powder Room	*6	3	3	3	3	3	3	3	1-2
8	Laundry	*8	5	5	5	5	5	5	5	1-2
9	Kitchen	113	328	486	452	405	540	*577	405	1-12
16	Great Room	143	251	329	341	322	382	*406	374	1-11
Zone 6:										
10	Hallway	141	286	*333	244	225	282	310	281	1-10
11	Main Level Rec Room	277	335	377	380	359	427	*432	342	3-7
System 2:										
Zone 7:										
22	Garage #2	*356	295	309	306	356	330	331	301	3-6
Zone 8:										
12	Bedroom 2	115	186	276	277	115	317	*335	257	1-10
14	Bath 2	16	12	13	28	16	26	26	*47	1-4
Zone 9:										
13	Bedroom 3	80	*236	232	166	80	104	110	200	1-9
18	Bath 3	2	2	2	2	2	*3	2	2	1-1
20	Upper Loft Left	101	110	114	112	101	208	*216	101	1-8
Zone 10:										
15	Bedroom 4	66	166	*173	150	66	95	81	155	1-8
19	Bath 4	15	62	*66	42	15	20	23	55	1-5
23	Upper Loft Right	75	87	89	121	75	*187	179	75	1-8

* Indicates highest CFM of all rotations.



Building Rotation Report (cont'd)

Whole Building

Rotation Degrees	Front door Faces	Supply CFM	Sensible Gain	Latent Gain	Net Tons	Recommended Tons
0°	North	2,368	43,696	*-11,346	2.70	4.05
45°	Northeast	2,824	52,250	-11,346	3.41	4.84
90°	East	3,299	60,449	-11,346	4.09	5.60
135°	Southeast	3,071	56,509	-11,346	3.76	5.23
180°	South	2,630	48,778	-11,346	3.12	4.52
225°	Southwest	3,370	61,671	-11,346	4.19	5.71
270°	West	*3,614	*65,885	-11,346	*4.54	*6.10
315°	Northwest	3,115	57,269	-11,346	3.83	5.30

* Indicates highest value of all rotations.

System 1

Rotation Degrees	Front door Faces	Supply CFM	Sensible Gain	Latent Gain	Net Tons	Recommended Tons
0°	North	1,541	28,823	*-7,805	1.75	2.67
45°	Northeast	1,887	34,847	-7,805	2.25	3.23
90°	East	2,328	42,458	-7,805	2.89	3.93
135°	Southeast	2,144	39,280	-7,805	2.62	3.64
180°	South	1,803	33,400	-7,805	2.13	3.09
225°	Southwest	2,368	43,156	-7,805	2.95	4.00
270°	West	*2,579	*46,807	-7,805	*3.25	*4.33
315°	Northwest	2,182	39,948	-7,805	2.68	3.70

* Indicates highest value of all rotations.

System 2

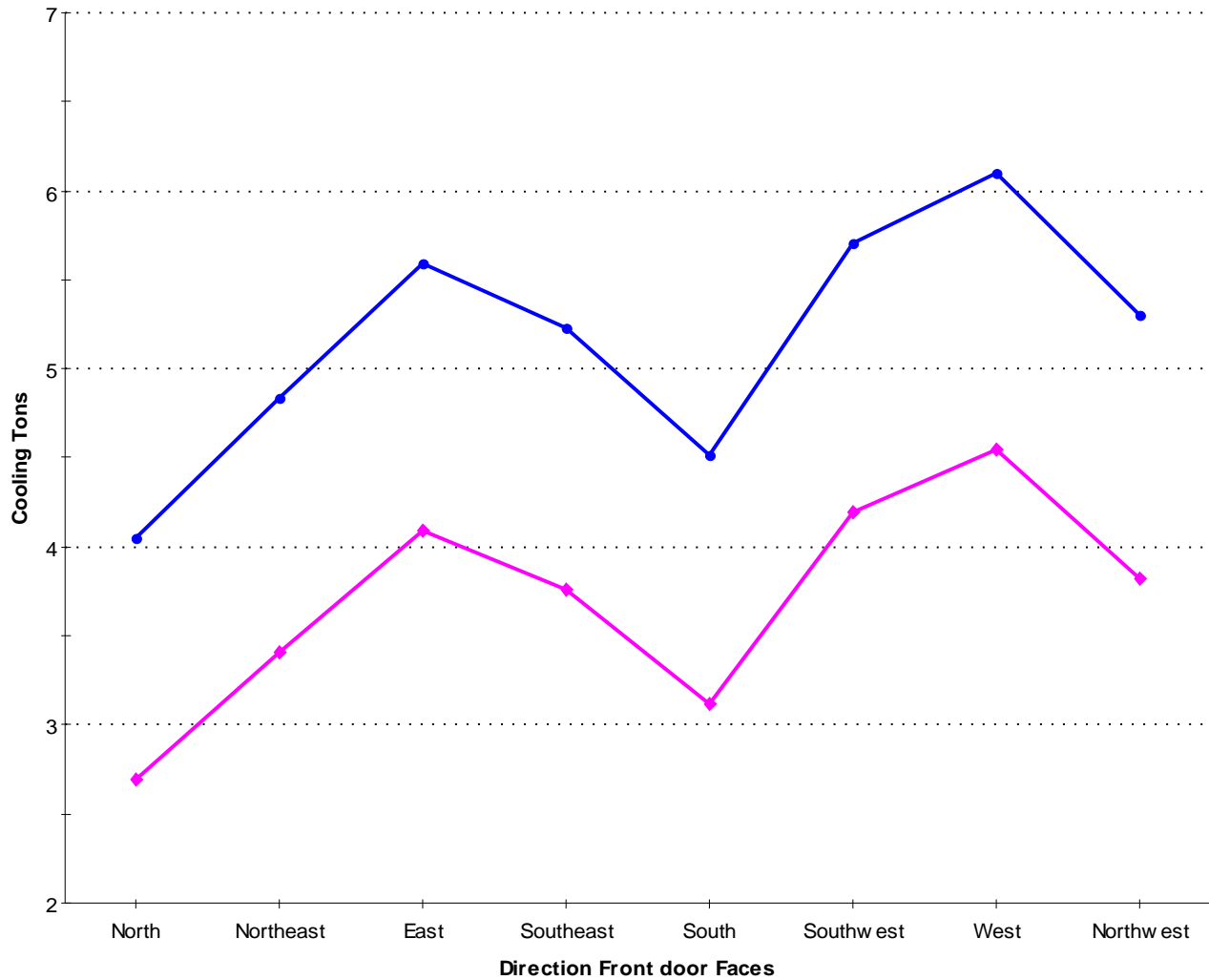
Rotation Degrees	Front door Faces	Supply CFM	Sensible Gain	Latent Gain	Net Tons	Recommended Tons
0°	North	827	14,873	*-3,541	0.94	1.38
45°	Northeast	937	17,403	-3,541	1.16	1.61
90°	East	971	17,991	-3,541	1.20	1.67
135°	Southeast	927	17,229	-3,541	1.14	1.60
180°	South	827	15,378	-3,541	0.99	1.42
225°	Southwest	1,002	18,514	-3,541	1.25	1.71
270°	West	*1,034	*19,079	-3,541	*1.29	*1.77
315°	Northwest	933	17,321	-3,541	1.15	1.60

* Indicates highest value of all rotations.



Building Rotation Report (cont'd)

Building Rotation Tonnage

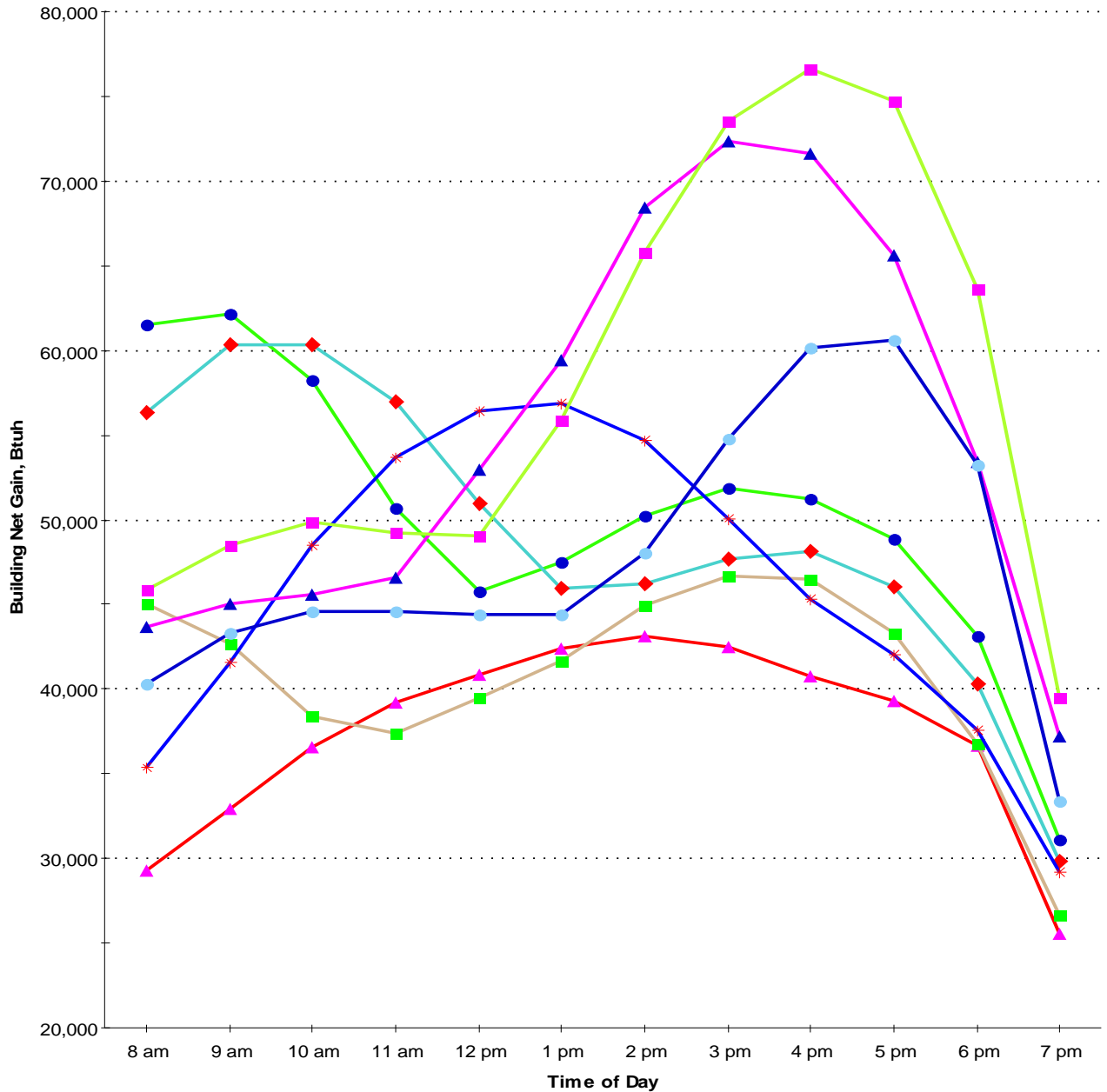


—●— Building Recommended Tonnage
—◆— Building Net Tonnage



Building Rotation Report (cont'd)

Building Rotation Hourly Net Gain



- ▲— Front door faces North
- Front door faces Northeast
- Front door faces East
- ◆— Front door faces Southeast
- *— Front door faces South
- ▲— Front door faces Southwest
- Front door faces West
- Front door faces Northwest