

***State Bank Of Southern Utah Gunnison  
HVAC Load Analysis***

for

NWL Architects  
163 West 1600 South, Suite 1  
St. George, UT 84770



**CHVAC** COMMERCIAL  
HVAC LOADS

Prepared By:

Van Boerum & Frank Associates, Inc.  
230 North 1680 East, Building V  
St. George, UT 84790  
435-674-4800  
Monday, June 07, 2021



## General Project Data Input

### General Project Information

Project file name: State Bank of Southern Utah Gunnison Branch Loads.CH8  
 Project title: State Bank Of Southern Utah Gunnison  
 Designed by: Van Boerum & Frank Associates, Inc.  
 Project date: Thursday, April 29, 2021  
 Weather reference city: GUNNISON, UTAH, USA  
 Client name: NWL Architects  
 Client address: 163 West 1600 South, Suite 1  
 Client city: St. George, UT 84770  
 Client phone: 435-656-2883  
 Company name: Van Boerum & Frank Associates, Inc.  
 Company address: 230 North 1680 East, Building V  
 Company city: St. George, UT 84790  
 Company phone: 435-674-4800  
 Company website: www.vbfa.com

Barometric pressure: 24.761 in.Hg.  
 Altitude: 5145 feet  
 Latitude: 39 Degrees  
 Mean daily temperature range: 34 Degrees  
 Starting & ending time for HVAC load calculations: 7am - 6pm  
 Number of unique rooms in this project: 26

### Building Default Values

Calculations performed: Both heating and cooling loads  
 Lighting requirements: 1.10 Watts per square foot  
 Equipment requirements: 1.00 Watts per square foot  
 People sensible load multiplier: 250 Btuh per person  
 People latent load multiplier: 200 Btuh per person  
 Room sensible safety factor: 10 %  
 Room latent safety factor: 10 %  
 Room heating safety factor: 10 %  
 People diversity factor: 100 %  
 Lighting profile number: 0  
 Equipment profile number: 0  
 People profile number: 0  
 Building default ceiling height: 20.00 feet  
 Building default wall height: 16.50 feet

### Internal Operating Load Profiles (C = 100)

	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr	hr
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
3	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
5	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
6	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
7	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
8	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
9	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
10	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	



## General Project Data Input (cont'd)

### Building-Level Design Conditions

Design Month	Outdoor Dry Bulb	Outdoor Wet Bulb	Indoor Rel.Hum	Indoor Dry Bulb	Grains Diff	In/Outdoor Correction
August	93	65	30%	75	20.35	-6
Winter	-2			72		

### Master Roofs

Roof No.	CTS Type	Roof U-Fac	Absorpt.	h(Outside)	Emit.	Delta R
1	12	0.036	0.68	4.00	1.00	20.00
Roof #1 Description: Membrane, Sheathing, R-10 plus R-15 Insulation Boards, Metal Deck						

### Master Walls

Wall No.	CTS Type	Wall U-Fac	Absorpt.	h(Outside)	Emit.	Delta R
1	13	0.070	0.68	4.00	1.00	0.00
Wall #1 Description: Brick, R-5 Insulation Board, Sheathing, R-11 Batt Insulation, Gyp Board						

### Master Partitions

Partition No.	Partition U-Factor	Cool T-D	Heat T-D
1	0.100	20	20

### Master Glass

Glass No.	Summer U-Factor	Winter U-Factor	SHGC Normal	SHGC 40°	SHGC 50°	SHGC 60°	SHGC 70°	SHGC 80°	SHGC Hemis.
1	0.350	0.350	0.44	0.42	0.4	0.35	0.27	0.14	0.37



## Building Summary Loads

Building peaks in August at 3pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	8,330	24,410	10.53	0	13,363	13,363	5.36
Wall	4,954	28,228	12.17	0	2,611	2,611	1.05
Glass	1,909	54,402	23.46	0	82,983	82,983	33.27
Floor Slab	394	16,036	6.92	0	0	0	0.00
<b>Skin Loads</b>		<b>123,075</b>	<b>53.08</b>	<b>0</b>	<b>98,957</b>	<b>98,957</b>	<b>39.68</b>
Lighting	9,460	0	0.00	0	35,507	35,507	14.24
Equipment	3,786	0	0.00	0	14,210	14,210	5.70
Pool Latent	0	0	0.00	0	0	0	0.00
People	36	0	0.00	7,920	9,900	17,820	7.15
Partition	0	0	0.00	0	0	0	0.00
Cool. Pret.	0	0	0.00	0	0	0	0.00
Heat. Pret.	0	0	0.00	0	0	0	0.00
Cool. Vent.	726	0	0.00	8,322	11,902	20,224	8.11
Heat. Vent.	726	48,041	20.72	0	0	0	0.00
Cool. Infil.	0	0	0.00	0	0	0	0.00
Heat. Infil.	835	60,741	26.20	0	0	0	0.00
Draw-Thru Fan	0	0	0.00	0	0	0	0.00
Blow-Thru Fan	0	0	0.00	0	2,708	2,708	1.09
Reserve Cap.	0	0	0.00	0	59,969	59,969	24.05
Reheat Cap.	0	0	0.00	0	0	0	0.00
Supply Duct	0	0	0.00	0	0	0	0.00
Return Duct	0	0	0.00	0	0	0	0.00
Misc. Supply	0	0	0.00	0	0	0	0.00
Misc. Return	0	0	0.00	0	0	0	0.00
<b>Building Totals</b>		<b>231,857</b>	<b>100.00</b>	<b>16,242</b>	<b>233,154</b>	<b>249,396</b>	<b>100.00</b>

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	48,041	20.72	8,322	11,902	20,224	8.11
Infiltration	60,741	26.20	0	0	0	0.00
Pretreated Air	0	0.00	0	0	0	0.00
Room Loads	123,075	53.08	7,920	218,544	226,464	90.80
Plenum Loads	0	0.00	0	0	0	0.00
Fan/Duct/Misc Loads	0	0.00	0	2,708	2,708	1.09
<b>Building Totals</b>	<b>231,857</b>	<b>100.00</b>	<b>16,242</b>	<b>233,154</b>	<b>249,396</b>	<b>100.00</b>

### Check Figures

Total Building Supply Air (based on a 22° TD):	12,292 CFM
Total Building Vent. Air (5.91% of Supply):	726 CFM
Total Conditioned Air Space:	8,600 Sq.ft
Supply Air Per Unit Area:	1.4294 CFM/Sq.ft
Area Per Cooling Capacity:	413.8 Sq.ft/Ton
Cooling Capacity Per Area:	0.0024 Tons/Sq.ft
Heating Capacity Per Area:	26.96 Btuh/Sq.ft
Total Heating Required With Outside Air:	231,857 Btuh
Total Cooling Required With Outside Air:	20.78 Tons



**Air Handler #1 - AH-1 Data - Summary Loads**

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
1	Data 1pm August	112 0 2,240	5,464 266 2.37	5,362 294 2.63	0 0 0	0.12/ft <sup>2</sup> 13 13	0.12/ft <sup>2</sup> 13 13
	Room Peak Totals:	112	5,464	5,362	0		
	Total Rooms: 1	0	266	294	0	13	13
	Unique Rooms: 1	2,240	2.37	2.63	0	13	13



## Air Handler #1 - AH-1 Data - Total Load Summary

Air Handler Description: AH-1 Data Constant Volume - Sum of Peaks  
 Supply Air Fan: Blow-Thru with program estimated horsepower of 0.03 HP  
 Fan Input: 75% motor and fan efficiency with 0.5 in. water across the fan  
 Sensible Heat Ratio: 1.00 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 1pm in August.  
 Outdoor Conditions: Clg: 89° DB, 65° WB, 73.02 grains, Htg: -2° DB  
 Indoor Conditions: Clg: 75° DB, 30% RH, Htg: 72° DB

Summer: Ventilation controls outside air, ---- Winter: Ventilation controls outside air.

Room Space sensible loss:	4,650 Btuh		
Infiltration sensible loss:	815 Btuh	11 CFM	
Outside Air sensible loss:	889 Btuh	13 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
<b>Total System sensible loss:</b>			<b>6,353 Btuh</b>

Heating Supply Air: 5,464 / (.828 X 1.08 X 23) =	266 CFM
Winter Vent Outside Air (5.1% of supply) =	13 CFM

Room space sensible gain:	5,362 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	0 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	0 Btuh		
<b>Total sensible gain on supply side of coil:</b>			<b>5,362 Btuh</b>

Cooling Supply Air: 5,362 / (.828 X 1.1 X 20) =	294 CFM
Summer Vent Outside Air (4.6% of supply) =	13 CFM

Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	171 Btuh	13 CFM	
Blow-thru fan sensible gain:	65 Btuh		
<b>Total sensible gain on return side of coil:</b>			<b>236 Btuh</b>
<b>Total sensible gain on air handling system:</b>			<b>5,598 Btuh</b>

Room space latent gain:	0 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	202 Btuh		
<b>Total latent gain on air handling system:</b>			<b>202 Btuh</b>
<b>Total system sensible and latent gain:</b>			<b>5,800 Btuh</b>

### Check Figures

Total Air Handler Supply Air (based on a 20° TD):	294 CFM
Total Air Handler Vent. Air (4.56% of Supply):	13 CFM
Total Conditioned Air Space:	112 Sq.ft
Supply Air Per Unit Area:	2.6294 CFM/Sq.ft
Area Per Cooling Capacity:	231.7 Sq.ft/Ton
Cooling Capacity Per Area:	0.0043 Tons/Sq.ft
Heating Capacity Per Area:	56.73 Btuh/Sq.ft
Total Heating Required With Outside Air:	6,353 Btuh
Total Cooling Required With Outside Air:	0.48 Tons



### Air Handler #2 - AH-2 West Side - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
3	Mech/Elec 4pm August	161 0 2,657	5,490 267 1.66	5,994 303 1.88	0 0 0	0.12/ft <sup>2</sup> 19 18	0.12/ft <sup>2</sup> 19 15
4	Storage 4pm August	105 0 1,733	308 15 0.14	606 31 0.29	0 0 0	None 13 1	None 13 2
5	Office 4pm August	160 1 1,840	4,792 233 1.46	6,553 331 2.07	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 16	5/P, 0.06/ft <sup>2</sup> 15 16
6	Entry 4pm August	92 0 1,104	4,996 243 2.64	11,089 560 6.09	0 0 0	None 6 17	None 6 28
7	Office 4pm August	162 1 1,863	4,867 237 1.46	6,622 334 2.06	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 16	5/P, 0.06/ft <sup>2</sup> 15 17
8	Office 4pm August	161 1 1,852	4,272 208 1.29	6,539 330 2.05	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 14	5/P, 0.06/ft <sup>2</sup> 15 16
9	Restroom 6pm August	146 0 1,485	4,317 210 1.44	1,342 68 0.46	0 0 0	None 9 14	None 9 3
10	Restroom 4pm August	146 0 1,485	428 21 0.14	843 43 0.29	0 0 0	None 9 1	None 9 2
Room Peak Totals:		1,133	29,469	39,588	660		
Total Rooms: 8		3	1,434	1,999	0	99	99
Unique Rooms: 8		14,017	1.27	1.76	0	99	99



## Air Handler #2 - AH-2 West Side - Total Load Summary

Air Handler Description: AH-2 West Side Constant Volume - Sum of Peaks  
 Supply Air Fan: Blow-Thru with program estimated horsepower of 0.21 HP  
 Fan Input: 75% motor and fan efficiency with 0.5 in. water across the fan  
 Sensible Heat Ratio: 0.98 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 4pm in August.  
 Outdoor Conditions: Clg: 92° DB, 65° WB, 68.67 grains, Htg: -2° DB  
 Indoor Conditions: Clg: 75° DB, 30% RH, Htg: 72° DB

Summer: Ventilation controls outside air, ----- Winter: Ventilation controls outside air.

Room Space sensible loss:	23,052 Btuh		
Infiltration sensible loss:	6,417 Btuh	88 CFM	
Outside Air sensible loss:	6,544 Btuh	99 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
<b>Total System sensible loss:</b>			<b>36,012 Btuh</b>

Heating Supply Air: $29,469 / (.828 \times 1.08 \times 23) =$		1,434 CFM	
Winter Vent Outside Air (6.9% of supply) =		99 CFM	

Room space sensible gain:	39,321 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	0 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	2,544 Btuh		
<b>Total sensible gain on supply side of coil:</b>			<b>41,864 Btuh</b>

Cooling Supply Air: $41,864 / (.828 \times 1.1 \times 23) =$		1,999 CFM	
Summer Vent Outside Air (4.9% of supply) =		99 CFM	

Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	1,531 Btuh	99 CFM	
Blow-thru fan sensible gain:	440 Btuh		
<b>Total sensible gain on return side of coil:</b>			<b>1,972 Btuh</b>
<b>Total sensible gain on air handling system:</b>			<b>43,836 Btuh</b>

Room space latent gain:	660 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	1,223 Btuh		
<b>Total latent gain on air handling system:</b>			<b>1,883 Btuh</b>
<b>Total system sensible and latent gain:</b>			<b>45,718 Btuh</b>

### Check Figures

Total Air Handler Supply Air (based on a 23° TD):		1,999 CFM	
Total Air Handler Vent. Air (4.95% of Supply):		99 CFM	
Total Conditioned Air Space:		1,133 Sq.ft	
Supply Air Per Unit Area:		1.7648 CFM/Sq.ft	
Area Per Cooling Capacity:		297.4 Sq.ft/Ton	
Cooling Capacity Per Area:		0.0034 Tons/Sq.ft	
Heating Capacity Per Area:		31.79 Btuh/Sq.ft	
Total Heating Required With Outside Air:		36,012 Btuh	
Total Cooling Required With Outside Air:		3.81 Tons	





### Air Handler #3 - AH-3 North Side - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
11	Custodian/Storage 6pm August	128 0 2,112	4,926 240 1.87	1,262 65 0.51	0 0 0	None 15 18	None 15 6
12	Break Room 2pm August	267 2 3,071	7,938 386 1.45	5,043 261 0.98	440 0 0	5/P, 0.06/ft <sup>2</sup> 26 29	5/P, 0.06/ft <sup>2</sup> 26 22
13	Office 3pm August	158 1 1,817	4,265 207 1.31	2,681 139 0.88	220 0 0	5/P, 0.06/ft <sup>2</sup> 14 16	5/P, 0.06/ft <sup>2</sup> 14 12
14	Office 3pm August	158 1 1,817	4,589 223 1.41	2,726 141 0.89	220 0 0	5/P, 0.06/ft <sup>2</sup> 14 17	5/P, 0.06/ft <sup>2</sup> 14 12
15	Conference Room 9am August	427 12 5,124	20,695 1,007 2.36	21,310 1,104 2.59	2,640 0 0	5/P, 0.06/ft <sup>2</sup> 86 76	5/P, 0.06/ft <sup>2</sup> 86 94
16	Work Room 8am August	169 1 1,690	4,044 197 1.16	5,578 289 1.71	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 15	5/P, 0.06/ft <sup>2</sup> 15 25
	Room Peak Totals:	1,307	46,455	38,600	3,740		
	Total Rooms: 6	17	2,260	2,000	0	171	171
	Unique Rooms: 6	15,631	1.73	1.53	0	171	171



### Air Handler #3 - AH-3 North Side - Total Load Summary

Air Handler Description: AH-3 North Side Constant Volume - Sum of Peaks  
 Supply Air Fan: Blow-Thru with program estimated horsepower of 0.21 HP  
 Fan Input: 75% motor and fan efficiency with 0.5 in. water across the fan  
 Sensible Heat Ratio: 0.92 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 9am in August.  
 Outdoor Conditions: Clg: 69° DB, 60° WB, 77.24 grains, Htg: -2° DB  
 Indoor Conditions: Clg: 75° DB, 30% RH, Htg: 72° DB

Summer: Ventilation controls outside air, ---- Winter: Ventilation controls outside air.

Room Space sensible loss:	36,947 Btuh	
Infiltration sensible loss:	9,509 Btuh	131 CFM
Outside Air sensible loss:	11,316 Btuh	171 CFM
Supply Duct sensible loss:	0 Btuh	
Return Duct sensible loss:	0 Btuh	
Return Plenum sensible loss:	0 Btuh	
Total System sensible loss:		57,772 Btuh

Heating Supply Air: $46,455 / (.828 \times 1.08 \times 23) =$	2,260 CFM
Winter Vent Outside Air (7.6% of supply) =	171 CFM

Room space sensible gain:	34,328 Btuh	
Infiltration sensible gain:	0 Btuh	
Draw-thru fan sensible gain:	0 Btuh	
Supply duct sensible gain:	0 Btuh	
Reserve sensible gain:	7,537 Btuh	
Total sensible gain on supply side of coil:		41,864 Btuh

Cooling Supply Air: $41,864 / (.828 \times 1.1 \times 23) =$	2,000 CFM
Summer Vent Outside Air (8.6% of supply) =	171 CFM

Return duct sensible gain:	0 Btuh	
Return plenum sensible gain:	0 Btuh	
Outside air sensible gain:	-935 Btuh	171 CFM
Blow-thru fan sensible gain:	440 Btuh	
Total sensible gain on return side of coil:		-494 Btuh
Total sensible gain on air handling system:		41,370 Btuh

Room space latent gain:	3,740 Btuh	
Infiltration latent gain:	0 Btuh	
Outside air latent gain:	3,132 Btuh	
Total latent gain on air handling system:		6,872 Btuh
Total system sensible and latent gain:		48,242 Btuh

#### Check Figures

Total Air Handler Supply Air (based on a 23° TD):	2,000 CFM
Total Air Handler Vent. Air (8.56% of Supply):	171 CFM
Total Conditioned Air Space:	1,307 Sq.ft
Supply Air Per Unit Area:	1.5298 CFM/Sq.ft
Area Per Cooling Capacity:	325.1 Sq.ft/Ton
Cooling Capacity Per Area:	0.0031 Tons/Sq.ft
Heating Capacity Per Area:	44.20 Btuh/Sq.ft
Total Heating Required With Outside Air:	57,772 Btuh
Total Cooling Required With Outside Air:	4.02 Tons



**Air Handler #4 - AH-4 East Side - Summary Loads**

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
17	Office 8am August	165 1 1,898	4,763 232 1.40	5,448 308 1.87	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 13	5/P, 0.06/ft <sup>2</sup> 15 12
18	Office 8am August	164 1 1,886	5,046 245 1.50	5,432 307 1.87	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 14	5/P, 0.06/ft <sup>2</sup> 15 12
19	Entry 8am August	98 0 1,176	4,535 221 2.25	8,170 462 4.71	0 0 0	None 6 13	None 6 18
20	Office 8am August	161 1 1,637	5,072 247 1.53	5,412 306 1.90	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 14	5/P, 0.06/ft <sup>2</sup> 15 12
21	Office 8am August	161 1 1,637	4,272 208 1.29	5,462 309 1.92	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 12	5/P, 0.06/ft <sup>2</sup> 15 12
22	Office 8am August	161 1 1,637	4,549 221 1.37	5,447 308 1.91	220 0 0	5/P, 0.06/ft <sup>2</sup> 15 13	5/P, 0.06/ft <sup>2</sup> 15 12
	Room Peak Totals:	910	28,237	35,371	1,100		
	Total Rooms: 6	5	1,374	1,999	0	80	80
	Unique Rooms: 6	9,872	1.51	2.20	0	80	80



## Air Handler #4 - AH-4 East Side - Total Load Summary

Air Handler Description: AH-4 East Side Constant Volume - Sum of Peaks  
 Supply Air Fan: Blow-Thru with program estimated horsepower of 0.21 HP  
 Fan Input: 75% motor and fan efficiency with 0.5 in. water across the fan  
 Sensible Heat Ratio: 0.97 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 8am in August.  
 Outdoor Conditions: Clg: 64° DB, 59° WB, 81.01 grains, Htg: -2° DB  
 Indoor Conditions: Clg: 75° DB, 30% RH, Htg: 72° DB

Summer: Ventilation controls outside air, ----- Winter: Ventilation controls outside air.

Room Space sensible loss:	21,617 Btuh		
Infiltration sensible loss:	6,620 Btuh	91 CFM	
Outside Air sensible loss:	5,265 Btuh	80 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
<b>Total System sensible loss:</b>			<b>33,502 Btuh</b>

Heating Supply Air: $28,237 / (.828 \times 1.08 \times 23) =$		1,374 CFM	
Winter Vent Outside Air (5.8% of supply) =		80 CFM	

Room space sensible gain:	35,371 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	0 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	1,029 Btuh		
<b>Total sensible gain on supply side of coil:</b>			<b>36,400 Btuh</b>

Cooling Supply Air: $36,400 / (.828 \times 1.1 \times 20) =$		1,999 CFM	
Summer Vent Outside Air (4.0% of supply) =		80 CFM	

Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	-797 Btuh	80 CFM	
Blow-thru fan sensible gain:	440 Btuh		
Total sensible gain on return side of coil:			-357 Btuh
<b>Total sensible gain on air handling system:</b>			<b>36,043 Btuh</b>

Room space latent gain:	1,100 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	1,596 Btuh		
<b>Total latent gain on air handling system:</b>			<b>2,696 Btuh</b>
<b>Total system sensible and latent gain:</b>			<b>38,739 Btuh</b>

### Check Figures

Total Air Handler Supply Air (based on a 20° TD):		1,999 CFM	
Total Air Handler Vent. Air (3.98% of Supply):		80 CFM	
Total Conditioned Air Space:		910 Sq.ft	
Supply Air Per Unit Area:		2.1970 CFM/Sq.ft	
Area Per Cooling Capacity:		281.9 Sq.ft/Ton	
Cooling Capacity Per Area:		0.0035 Tons/Sq.ft	
Heating Capacity Per Area:		36.82 Btuh/Sq.ft	
Total Heating Required With Outside Air:		33,502 Btuh	
Total Cooling Required With Outside Air:		3.23 Tons	



**Air Handler #6 - AH-6 Banking Floor - Summary Loads**

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
2	Work Area 1pm August	157 1 1,597	3,896 190 1.21	3,736 291 1.85	220 0 0	5/P, 0.06/ft <sup>2</sup> 14 19	5/P, 0.06/ft <sup>2</sup> 14 18
24	Night Drop/Cash 6pm August	118 0 1,200	4,246 207 1.75	1,205 94 0.79	0 0 0	5/P, 0.06/ft <sup>2</sup> 7 21	5/P, 0.06/ft <sup>2</sup> 7 6
25	Banking Floor, Sitting/Waiting 1pm August	3,882 6 46,584	46,519 2,263 0.58	55,482 4,315 1.11	1,320 0 0	5/P, 0.06/ft <sup>2</sup> 263 228	5/P, 0.06/ft <sup>2</sup> 263 261
26	Banking Floor Teller 1pm August	981 4 9,977	19,530 950 0.97	16,725 1,301 1.33	880 0 0	5/P, 0.06/ft <sup>2</sup> 79 96	5/P, 0.06/ft <sup>2</sup> 79 79
	Room Peak Totals:	5,138	74,191	77,149	2,420		
	Total Rooms: 4	11	3,609	6,000	0	363	363
	Unique Rooms: 4	59,358	0.70	1.17	0	363	363



## Air Handler #6 - AH-6 Banking Floor - Total Load Summary

Air Handler Description: AH-6 Banking Floor Constant Volume - Sum of Peaks  
 Supply Air Fan: Blow-Thru with program estimated horsepower of 0.63 HP  
 Fan Input: 75% motor and fan efficiency with 0.5 in. water across the fan  
 Sensible Heat Ratio: 0.98 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time: 1pm in August.  
 Outdoor Conditions: Clg: 89° DB, 65° WB, 73.02 grains, Htg: -2° DB  
 Indoor Conditions: Clg: 75° DB, 30% RH, Htg: 72° DB

Summer: Ventilation controls outside air, ----- Winter: Ventilation controls outside air.

Room Space sensible loss:	36,811 Btuh		
Infiltration sensible loss:	37,380 Btuh	514 CFM	
Outside Air sensible loss:	24,027 Btuh	363 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
<b>Total System sensible loss:</b>			<b>98,218 Btuh</b>

Heating Supply Air: $74,191 / (.828 \times 1.08 \times 23) =$		3,609 CFM	
Winter Vent Outside Air (10.1% of supply) =		363 CFM	

Room space sensible gain:	76,756 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	0 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	48,860 Btuh		
<b>Total sensible gain on supply side of coil:</b>			<b>125,616 Btuh</b>

Cooling Supply Air: $125,616 / (.828 \times 1.1 \times 23) =$		6,000 CFM	
Summer Vent Outside Air (6.1% of supply) =		363 CFM	

Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	4,630 Btuh	363 CFM	
Blow-thru fan sensible gain:	1,322 Btuh		
<b>Total sensible gain on return side of coil:</b>			<b>5,952 Btuh</b>
<b>Total sensible gain on air handling system:</b>			<b>131,568 Btuh</b>

Room space latent gain:	2,420 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	5,472 Btuh		
<b>Total latent gain on air handling system:</b>			<b>7,892 Btuh</b>
<b>Total system sensible and latent gain:</b>			<b>139,460 Btuh</b>

### Check Figures

Total Air Handler Supply Air (based on a 23° TD):		6,000 CFM	
Total Air Handler Vent. Air (6.06% of Supply):		363 CFM	
Total Conditioned Air Space:		5,138 Sq.ft	
Supply Air Per Unit Area:		1.1677 CFM/Sq.ft	
Area Per Cooling Capacity:		442.1 Sq.ft/Ton	
Cooling Capacity Per Area:		0.0023 Tons/Sq.ft	
Heating Capacity Per Area:		19.12 Btuh/Sq.ft	
<b>Total Heating Required With Outside Air:</b>		<b>98,218 Btuh</b>	
<b>Total Cooling Required With Outside Air:</b>		<b>11.62 Tons</b>	



## Air System #1 (AH-1 Data) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		46.675		55.000	
Draw-Thru Fan			0	0.000	0
Misc Load on Supply Side	0	0.000	0	0.000	0
Supply Air Duct			0	0.000	0
Room Loads	0	0.000	5,362	20.000	294
Sensible Reserve			0	0.000	0
Room Condition	0	46.675	5,362	75.000	294
Return Air Duct			0	0.000	
Return Air Plenum			0	0.000	
Misc Load on Return Side	0	0.000	0	0.000	
Vent Air 13 CFM	202	1.222	171	0.639	
Blow-Thru Fan			65	0.242	
Entering Coil Condition	202	47.896	5,598	75.881	294

### General Psychrometric Equations Used In Analysis:

$PR = (\text{Barometric pressure of site} / \text{Standard ASHRAE pressure of } 29.921)$   
 $TSH = PR \times 1.10 \times CFM \times (DB \text{ entering} - DB \text{ leaving})$   
 $TLH = PR \times 0.68 \times CFM \times (\text{Grains entering} - \text{Grains leaving})$   
 $GTH = PR \times 4.50 \times CFM \times (\text{Enthalpy entering} - \text{Enthalpy leaving})$

TSH =	0.828	x	1.10	x	294	x (	75.9	-	55.0	) =	5,598	Btuh
TLH =	0.828	x	0.68	x	294	x (	47.9	-	46.7	) =	202	Btuh
SUM =											-----	
GTH =	0.828	x	4.50	x	294	x (	25.7	-	20.4	) =	5,773	Btuh
Total System Load										=	5,800	Btuh

### Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	5,773	/ (	0.00	x	500	) =	0.0	GPM
Heating GPM =	6,353	/ (	0.00	x	500	) =	0.0	GPM
Steam Req. =	6,353	/	970	=	6.5	lb./hr		

#### Entering Cooling Coil Conditions

Dry bulb temperature: 75.88  
 Wet bulb temperature: 55.73  
 Relative humidity: 29.90  
 Enthalpy: 25.70 Btu/lbm

#### Entering Heating Coil Conditions

Dry bulb temperature: 68.26

#### Leaving Cooling Coil Conditions

Dry bulb temperature: 55.00  
 Wet bulb temperature: 47.44  
 Relative humidity: 60.26  
 Enthalpy: 20.44 Btu/lbm

#### Leaving Heating Coil Conditions

Dry bulb temperature: 95.00



## Air System #2 (AH-2 West Side) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		46.088		52.000	
Draw-Thru Fan			0	0.000	0
Misc Load on Supply Side	0	0.000	0	0.000	0
Supply Air Duct			0	0.000	0
Room Loads	660	0.587	39,321	21.603	1,878
Sensible Reserve			2,544	1.397	121
Room Condition	660	46.675	41,864	75.000	1,999
Return Air Duct			0	0.000	
Return Air Plenum			0	0.000	
Misc Load on Return Side	0	0.000	0	0.000	
Vent Air 99 CFM	1,223	1.087	1,531	0.841	
Blow-Thru Fan			440	0.242	
Entering Coil Condition	1,883	47.761	43,836	76.083	1,999

### General Psychrometric Equations Used In Analysis:

$PR = (\text{Barometric pressure of site} / \text{Standard ASHRAE pressure of } 29.921)$   
 $TSH = PR \times 1.10 \times CFM \times (DB \text{ entering} - DB \text{ leaving})$   
 $TLH = PR \times 0.68 \times CFM \times (\text{Grains entering} - \text{Grains leaving})$   
 $GTH = PR \times 4.50 \times CFM \times (\text{Enthalpy entering} - \text{Enthalpy leaving})$

TSH =	0.828	x	1.10	x	1,999	x (	76.1	-	52.0	) =	43,836	Btuh	
TLH =	0.828	x	0.68	x	1,999	x (	47.8	-	46.1	) =	1,883	Btuh	
SUM =											-----		
GTH =	0.828	x	4.50	x	1,999	x (	25.7	-	19.6	) =	45,512	Btuh	
Total System Load											=	45,718	Btuh

### Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	45,512 / (	0.00	x	500	) =	0.0	GPM
Heating GPM =	36,012 / (	0.00	x	500	) =	0.0	GPM
Steam Req. =	36,012 /	970			=	37.1	lb./hr

### Entering Cooling Coil Conditions

Dry bulb temperature: 76.08  
 Wet bulb temperature: 55.78  
 Relative humidity: 29.61  
 Enthalpy: 25.73 Btu/lbm

### Entering Heating Coil Conditions

Dry bulb temperature: 66.89

### Leaving Cooling Coil Conditions

Dry bulb temperature: 52.00  
 Wet bulb temperature: 46.02  
 Relative humidity: 66.43  
 Enthalpy: 19.62 Btu/lbm

### Leaving Heating Coil Conditions

Dry bulb temperature: 95.00





### Air System #3 (AH-3 North Side) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		43.351		52.000	
Draw-Thru Fan			0	0.000	0
Misc Load on Supply Side	0	0.000	0	0.000	0
Supply Air Duct			0	0.000	0
Room Loads	3,740	3.324	34,328	18.859	1,640
Sensible Reserve			7,537	4.141	360
Room Condition	3,740	46.675	41,864	75.000	2,000
Return Air Duct			0	0.000	
Return Air Plenum			0	0.000	
Misc Load on Return Side	0	0.000	0	0.000	
Vent Air 171 CFM	3,132	2.783	-935	-0.513	
Blow-Thru Fan			440	0.242	
Entering Coil Condition	6,872	49.458	41,370	74.729	2,000

#### General Psychrometric Equations Used In Analysis:

PR	=	(Barometric pressure of site / Standard ASHRAE pressure of 29.921)	
TSH	=	PR x 1.10 x CFM x (DB entering - DB leaving)	
TLH	=	PR x 0.68 x CFM x (Grains entering - Grains leaving)	
GTH	=	PR x 4.50 x CFM x (Enthalpy entering - Enthalpy leaving)	
TSH	=	0.828 x 1.10 x 2,000 x ( 74.7 - 52.0 ) =	41,370 Btuh
TLH	=	0.828 x 0.68 x 2,000 x ( 49.5 - 43.4 ) =	6,872 Btuh
-----			
SUM	=		48,242 Btuh
GTH	=	0.828 x 4.50 x 2,000 x ( 25.7 - 19.2 ) =	48,193 Btuh
Total System Load	=		48,242 Btuh

#### Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM	=	48,193 / ( 0.00 x 500 )	=	0.0 GPM
Heating GPM	=	57,772 / ( 0.00 x 500 )	=	0.0 GPM
Steam Req.	=	57,772 / 970	=	59.6 lb./hr

#### Entering Cooling Coil Conditions

Dry bulb temperature:	74.73
Wet bulb temperature:	55.67
Relative humidity:	32.06
Enthalpy:	25.67 Btu/lbm

#### Entering Heating Coil Conditions

Dry bulb temperature:	66.40
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#### Leaving Cooling Coil Conditions

Dry bulb temperature:	52.00
Wet bulb temperature:	45.28
Relative humidity:	62.50
Enthalpy:	19.20 Btu/lbm

#### Leaving Heating Coil Conditions

Dry bulb temperature:	95.00
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## Air System #4 (AH-4 East Side) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		45.697		55.000	
Draw-Thru Fan			0	0.000	0
Misc Load on Supply Side	0	0.000	0	0.000	0
Supply Air Duct			0	0.000	0
Room Loads	1,100	0.978	35,371	19.435	1,943
Sensible Reserve			1,029	0.565	57
Room Condition	1,100	46.675	36,400	75.000	1,999
Return Air Duct			0	0.000	
Return Air Plenum			0	0.000	
Misc Load on Return Side	0	0.000	0	0.000	
Vent Air 80 CFM	1,596	1.419	-797	-0.438	
Blow-Thru Fan			440	0.242	
Entering Coil Condition	2,696	48.093	36,043	74.804	1,999

### General Psychrometric Equations Used In Analysis:

$PR = (\text{Barometric pressure of site} / \text{Standard ASHRAE pressure of } 29.921)$   
 $TSH = PR \times 1.10 \times \text{CFM} \times (\text{DB entering} - \text{DB leaving})$   
 $TLH = PR \times 0.68 \times \text{CFM} \times (\text{Grains entering} - \text{Grains leaving})$   
 $GTH = PR \times 4.50 \times \text{CFM} \times (\text{Enthalpy entering} - \text{Enthalpy leaving})$

TSH =	0.828	x	1.10	x	1,999	x (	74.8	-	55.0	) =	36,043	Btuh
TLH =	0.828	x	0.68	x	1,999	x (	48.1	-	45.7	) =	2,696	Btuh
SUM =											-----	
GTH =	0.828	x	4.50	x	1,999	x (	25.5	-	20.3	) =	38,739	Btuh
Total System Load										=	38,739	Btuh

### Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	38,605	/ (	0.00	x	500	) =	0.0	GPM
Heating GPM =	33,502	/ (	0.00	x	500	) =	0.0	GPM
Steam Req. =	33,502	/	970			=	34.5	lb./hr

### Entering Cooling Coil Conditions

Dry bulb temperature: 74.80  
 Wet bulb temperature: 55.39  
 Relative humidity: 31.10  
 Enthalpy: 25.47 Btu/lbm

### Entering Heating Coil Conditions

Dry bulb temperature: 67.71

### Leaving Cooling Coil Conditions

Dry bulb temperature: 55.00  
 Wet bulb temperature: 47.18  
 Relative humidity: 59.00  
 Enthalpy: 20.29 Btu/lbm

### Leaving Heating Coil Conditions

Dry bulb temperature: 95.00



## Air System #6 (AH-6 Banking Floor) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		45.958		52.000	
Draw-Thru Fan			0	0.000	0
Misc Load on Supply Side	0	0.000	0	0.000	0
Supply Air Duct			0	0.000	0
Room Loads	2,420	0.717	76,756	14.054	3,666
Sensible Reserve			48,860	8.946	2,334
Room Condition	2,420	46.675	125,616	75.000	6,000
Return Air Duct			0	0.000	
Return Air Plenum			0	0.000	
Misc Load on Return Side	0	0.000	0	0.000	
Vent Air 363 CFM	5,472	1.621	4,630	0.848	
Blow-Thru Fan			1,322	0.242	
Entering Coil Condition	7,892	48.295	131,568	76.090	6,000

### General Psychrometric Equations Used In Analysis:

$PR = (\text{Barometric pressure of site} / \text{Standard ASHRAE pressure of } 29.921)$   
 $TSH = PR \times 1.10 \times CFM \times (DB \text{ entering} - DB \text{ leaving})$   
 $TLH = PR \times 0.68 \times CFM \times (\text{Grains entering} - \text{Grains leaving})$   
 $GTH = PR \times 4.50 \times CFM \times (\text{Enthalpy entering} - \text{Enthalpy leaving})$

TSH	=	0.828	x	1.10	x	6,000	x	(	76.1	-	52.0	)=	131,568	Btuh	
TLH	=	0.828	x	0.68	x	6,000	x	(	48.3	-	46.0	)=	7,892	Btuh	
SUM	=												-----		
GTH	=	0.828	x	4.50	x	6,000	x	(	25.8	-	19.6	)=	138,914	Btuh	
Total System Load													=	139,460	Btuh

### Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM	=	138,914	/	(	0.00	x	500	)	=	0.0	GPM
Heating GPM	=	98,218	/	(	0.00	x	500	)	=	0.0	GPM
Steam Req.	=	98,218	/	970					=	101.3	lb./hr

### Entering Cooling Coil Conditions

Dry bulb temperature: 76.09  
 Wet bulb temperature: 55.89  
 Relative humidity: 29.92  
 Enthalpy: 25.82 Btu/lbm

### Entering Heating Coil Conditions

Dry bulb temperature: 64.55

### Leaving Cooling Coil Conditions

Dry bulb temperature: 52.00  
 Wet bulb temperature: 45.99  
 Relative humidity: 66.24  
 Enthalpy: 19.60 Btu/lbm

### Leaving Heating Coil Conditions

Dry bulb temperature: 95.00