

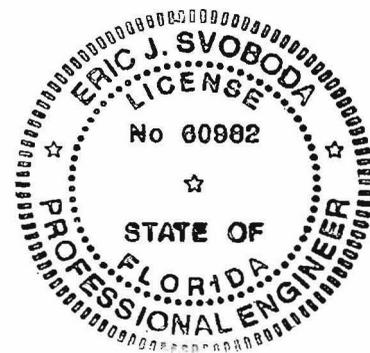
***Kauff's Towing
HVAC Load Analysis***

for

Kauff's Towing
8920 Glades Cut Off Road
Port St. Lucie, Florida

Elite Software

CHVAC COMMERCIAL
HVAC LOADS



Prepared By:

Eric J. Svoboda, PE
Fort Pierce Engineering, Inc.
315 South 7th Street
Fort Pierce, FL 34950
772-672-4636
Thursday, December 8, 2022



General Project Data Input

General Project Information

Project file name: Kauff's Towing Heat Load.CH8
 Project title: Kauff's Towing
 Designed by: Eric J. Svoboda, PE
 Project date: Monday, July 07, 2008
 Weather reference city: FORT PIERCE, FLORIDA, USA
 Client name: Kauff's Towing
 Client address: 8920 Glades Cut Off Road
 Client city: Port St. Lucie, Florida
 Company name: Fort Pierce Engineering, Inc.
 Company representative: Eric J. Svoboda, PE
 Company address: 315 South 7th Street
 Company city: Fort Pierce, FL 34950
 Company phone: 772-672-4636
 Company fax: 772-672-4637

Barometric pressure: 29.894 in.Hg.
 Altitude: 25 feet
 Latitude: 27 Degrees
 Mean daily temperature range: 15 Degrees
 Starting & ending time for HVAC load calculations: 7am - 10pm
 Number of unique rooms in this project: 16

Building Default Values

Calculations performed: Both heating and cooling loads
 Lighting requirements: 2.00 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: 0 %
 Room latent safety factor: 0 %
 Room heating safety factor: 0 %
 People diversity factor: 100 %
 Lighting profile number: 0
 Equipment profile number: 0
 People profile number: 0
 Building default ceiling height: 10.00 feet
 Building default wall height: 10.00 feet

Internal Operating Load Profiles (C = 100)

	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	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	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	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	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	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	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	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	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	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	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	95	80	50%	75	66.33	6
Winter	42			75		

Master Roofs

Roof No.	ASHRAE Roof#	Roof U-Fac	Dark Color	Susp. Ceil
1	1	0.050	No	No
Roof #1 Description: Metal Roof, R-20				

Master Walls

Wall No.	ASHRAE Group	Wall U-Fac	Wall Color
1	C	0.095	D
Wall #1 Description: Block wall, 8" sand & gravel, hollow core, siding exterior, interior finish, 1" extruded poly, R-5.0			

Master Partitions

Partition No.	Partition U-Factor	Cool T-D	Heat T-D
1	0.077	10	10
Partition #1 Description: Frame partition, wood/insulated metal framing, siding exterior, interior finish, R-11 batt insulation			

Master Glass

Glass No.	Summer U-Factor	Winter U-Factor	Glass Shd.Coef.	Interior Shading	Interior Shd.Coef
1	0.810	0.830	1.000	1	0.590
Glass #1 Description: Default Glass					



Building Summary Loads

Building peaks in August at 1pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	3,236	5,339	17.12	0	7,170	7,170	6.74
Wall	1,152	3,612	11.58	0	2,813	2,813	2.64
Glass	158	4,328	13.87	0	6,863	6,863	6.45
Floor Slab	131	2,680	8.59	0	0	0	0.00
Skin Loads		15,959	51.16	0	16,846	16,846	15.83
Lighting	6,472	0	0.00	0	22,083	22,083	20.74
Equipment	5,446	0	0.00	6,500	18,583	25,083	23.56
Pool Latent	0	0	0.00	0	0	0	0.00
People	31	0	0.00	6,200	7,750	13,950	13.10
Partition	1,290	993	3.18	0	993	993	0.93
Cool. Pret.	0	0	0.00	0	0	0	0.00
Heat. Pret.	0	0	0.00	0	0	0	0.00
Cool. Vent.	400	0	0.00	18,921	7,913	26,834	25.21
Heat. Vent.	400	14,243	45.66	0	0	0	0.00
Cool. Infil.	0	0	0.00	0	0	0	0.00
Heat. Infil.	0	0	0.00	0	0	0	0.00
Draw-Thru Fan	0	0	0.00	0	663	663	0.62
Blow-Thru Fan	0	0	0.00	0	0	0	0.00
Reserve Cap.	0	0	0.00	0	0	0	0.00
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
Building Totals		31,195	100.00	31,621	74,831	106,452	100.00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	14,243	45.66	18,921	7,913	26,834	25.21
Infiltration	0	0.00	0	0	0	0.00
Pretreated Air	0	0.00	0	0	0	0.00
Room Loads	16,952	54.34	12,700	66,256	78,956	74.17
Plenum Loads	0	0.00	0	0	0	0.00
Fan/Duct/Misc Loads	0	0.00	0	663	663	0.62
Building Totals	31,195	100.00	31,621	74,831	106,452	100.00

Check Figures

Total Building Supply Air (based on a 22° TD):	2,768 CFM
Total Building Vent. Air (14.45% of Supply):	400 CFM
Total Conditioned Air Space:	3,236 Sq.ft
Supply Air Per Unit Area:	0.8555 CFM/Sq.ft
Area Per Cooling Capacity:	364.8 Sq.ft/Ton
Cooling Capacity Per Area:	0.0027 Tons/Sq.ft
Heating Capacity Per Area:	9.64 Btuh/Sq.ft
Total Heating Required With Outside Air:	31,195 Btuh
Total Cooling Required With Outside Air:	8.87 Tons



Air Handler #1 - AHU 1 - 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	Lobby 8am August	651 5 6,510	3,406 158 0.24	13,469 558 0.86	2,500 0 0	Direct 85 69	Direct 85 77
2	Open Office 9am August	630 5 6,300	4,035 187 0.30	14,932 618 0.98	2,500 0 0	Direct 82 82	Direct 82 85
3	Office 6 9am August	169 2 1,690	2,111 98 0.58	4,304 178 1.05	900 0 0	Direct 22 43	Direct 22 25
4	I.T. 2pm August	49 1 490	135 6 0.13	1,601 66 1.35	200 0 0	Direct 6 3	Direct 6 9
12	Closet 2pm August	35 1 350	150 7 0.20	779 32 0.92	200 0 0	Direct 5 3	Direct 5 4
Room Peak Totals:		1,534	9,837	35,085	6,300		
Total Rooms: 5		14	456	1,453	0	200	200
Unique Rooms: 5		15,340	0.30	0.95	0	200	200



Air Handler #1 - AHU 1 - Total Load Summary

Air Handler Description: AHU 1 Constant Volume - Proportion
 Supply Air Fan: Draw-Thru with program estimated horsepower of 0.14 HP
 Fan Input: 0% motor and fan efficiency with 0 in. water across the fan
 Sensible Heat Ratio: 0.85 --- This system occurs 1 time(s) in the building. ---
 Air System Peak Time: 1pm in August.
 Outdoor Conditions: Clg: 93° DB, 80° WB, 133.75 grains, Htg: 42° DB
 Indoor Conditions: Clg: 75° DB, 50% RH, Htg: 75° DB

Because of the diversity in room, plenum and ventilation loads, the room sensible peak time in August at 9am is different from the total system peak time, hence the air system CFM was computed using a room sensible load of 34,783.

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

Room Space sensible loss:	9,837 Btuh		
Infiltration sensible loss:	0 Btuh	0 CFM	
Outside Air sensible loss:	7,122 Btuh	200 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
Total System sensible loss:			16,958 Btuh
Heating Supply Air: $9,837 / (.999 \times 1.08 \times 20) =$			
		456 CFM	
Winter Vent Outside Air (43.9% of supply) =			
		200 CFM	
Room space sensible gain:			
	33,826 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	348 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	0 Btuh		
Total sensible gain on supply side of coil:			34,174 Btuh
Cooling Supply Air: $35,131 / (.999 \times 1.1 \times 22) =$			
		1,453 CFM	
Summer Vent Outside Air (13.8% of supply) =			
		200 CFM	
Return duct sensible gain:			
	0 Btuh		
Return plenum sensible gain:			
	0 Btuh		
Outside air sensible gain:	3,956 Btuh	200 CFM	
Blow-thru fan sensible gain:	0 Btuh		
Total sensible gain on return side of coil:			3,956 Btuh
Total sensible gain on air handling system:			38,130 Btuh
Room space latent gain:			
	6,300 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	9,460 Btuh		
Total latent gain on air handling system:			15,760 Btuh
Total system sensible and latent gain:			53,891 Btuh

Check Figures

Total Air Handler Supply Air (based on a 22° TD):	1,453 CFM
Total Air Handler Vent. Air (13.76% of Supply):	200 CFM
Total Conditioned Air Space:	1,534 Sq.ft
Supply Air Per Unit Area:	0.9472 CFM/Sq.ft
Area Per Cooling Capacity:	341.6 Sq.ft/Ton
Cooling Capacity Per Area:	0.0029 Tons/Sq.ft
Heating Capacity Per Area:	11.05 Btuh/Sq.ft
Total Heating Required With Outside Air:	16,958 Btuh
Total Cooling Required With Outside Air:	4.49 Tons



Air Handler #2 - AHU 2 - 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
5	Office 1 2pm August	144 1 1,440	238 11 0.08	2,238 87 0.61	700 0 0	Direct 17 7	Direct 17 13
6	Office 2 10am August	192 2 1,920	1,230 57 0.30	4,347 170 0.88	900 0 0	Direct 23 35	Direct 23 26
7	Office 3 10am August	190 2 1,900	1,278 59 0.31	4,347 170 0.89	900 0 0	Direct 22 36	Direct 22 26
8	Corridor 2pm August	220 2 2,200	363 17 0.08	3,518 137 0.62	400 0 0	Direct 26 10	Direct 26 21
9	Men 2pm August	96 1 960	158 7 0.08	1,448 56 0.59	200 0 0	Direct 11 4	Direct 11 9
10	Women 2pm August	64 1 640	106 5 0.08	1,049 41 0.64	200 0 0	Direct 8 3	Direct 8 6
11	RR 2pm August	32 1 320	99 5 0.14	695 27 0.85	200 0 0	Direct 4 3	Direct 4 4
13	Office 4 2pm August	144 1 1,440	330 15 0.11	2,330 91 0.63	700 0 0	Direct 17 9	Direct 17 14
14	Office 5 2pm August	168 2 1,680	477 22 0.13	3,247 127 0.75	900 0 0	Direct 20 13	Direct 20 19
15	Break 10am August	192 2 1,920	1,521 70 0.37	6,052 236 1.23	900 0 0	Direct 23 43	Direct 23 36
16	Storage 3pm August	260 2 2,600	1,316 61 0.23	4,440 173 0.67	400 0 0	Direct 31 37	Direct 31 26
	Room Peak Totals:	1,702	7,115	33,710	6,400		
	Total Rooms: 11	17	330	1,315	0	200	200
	Unique Rooms: 11	17,020	0.19	0.77	0	200	200



Air Handler #2 - AHU 2 - Total Load Summary

Air Handler Description: AHU 2 Constant Volume - Proportion
 Supply Air Fan: Draw-Thru with program estimated horsepower of 0.12 HP
 Fan Input: 0% motor and fan efficiency with 0 in. water across the fan
 Sensible Heat Ratio: 0.84 --- This system occurs 1 time(s) in the building. ---
 Air System Peak Time: 1pm in August.
 Outdoor Conditions: Clg: 93° DB, 80° WB, 133.75 grains, Htg: 42° DB
 Indoor Conditions: Clg: 75° DB, 50% RH, Htg: 75° DB

Because of the diversity in room, plenum and ventilation loads, the room sensible peak time in August at 11am is different from the total system peak time, hence the air system CFM was computed using a room sensible load of 32,933.

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

Room Space sensible loss:	7,115 Btuh		
Infiltration sensible loss:	0 Btuh	0 CFM	
Outside Air sensible loss:	7,122 Btuh	200 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
Total System sensible loss:			14,237 Btuh
Heating Supply Air: $7,115 / (.999 \times 1.08 \times 20) =$		330 CFM	
Winter Vent Outside Air (60.7% of supply) =		200 CFM	
Room space sensible gain:	32,429 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	315 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	0 Btuh		
Total sensible gain on supply side of coil:			32,744 Btuh
Cooling Supply Air: $33,248 / (.999 \times 1.1 \times 23) =$		1,315 CFM	
Summer Vent Outside Air (15.2% of supply) =		200 CFM	
Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	3,956 Btuh	200 CFM	
Blow-thru fan sensible gain:	0 Btuh		
Total sensible gain on return side of coil:			3,956 Btuh
Total sensible gain on air handling system:			36,701 Btuh
Room space latent gain:	6,400 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	9,460 Btuh		
Total latent gain on air handling system:			15,860 Btuh
Total system sensible and latent gain:			52,561 Btuh

Check Figures

Total Air Handler Supply Air (based on a 23° TD):	1,315 CFM
Total Air Handler Vent. Air (15.21% of Supply):	200 CFM
Total Conditioned Air Space:	1,702 Sq.ft
Supply Air Per Unit Area:	0.7728 CFM/Sq.ft
Area Per Cooling Capacity:	388.6 Sq.ft/Ton
Cooling Capacity Per Area:	0.0026 Tons/Sq.ft
Heating Capacity Per Area:	8.36 Btuh/Sq.ft
Total Heating Required With Outside Air:	14,237 Btuh
Total Cooling Required With Outside Air:	4.38 Tons