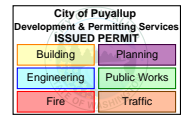


PRCA20240398



***Freezer Expansion
HVAC Load Analysis***

for

CPFD

Prepared By:

Pawel Szczurko
AWB Engineers
1942 Northwood Drive
Salisbury, MD
410-742-7299
Friday, March 08, 2024



General Project Data Input

General Project Information

Project file name: 221205 Load Calc_.CH8
 Project title: Freezer Expansion
 Project city, state, ZIP: PUYALLUP, WA
 Designed by: Pawel Szczurko
 Project date: Thursday, January 18, 2024
 Weather reference city: TACOMA, WASHINGTON, USA
 Client name: CPFD
 Company name: AWB Engineers
 Company representative: Pawel Szczurko
 Company address: 1942 Northwood Drive
 Company city: Salisbury, MD
 Company phone: 410-742-7299
 Company fax: 410 742-0273
 Company e-mail address: pszczurko@awbengineers.com

Barometric pressure: 29.491 in.Hg.
 Altitude: 400 feet
 Latitude: 47 Degrees
 Mean daily temperature range: 26 Degrees
 Starting & ending time for HVAC load calculations: 1am - 12am
 Number of unique rooms in this project: 1

Building Default Values

Calculations performed: Both heating and cooling loads
 Lighting requirements: 1.00 Watts per square foot
 Equipment requirements: 1.50 Watts per square foot
 People sensible load multiplier: 250 Btuh per person
 People latent load multiplier: 200 Btuh per person
 Room sensible safety factor: 5 %
 Room latent safety factor: 5 %
 Room heating safety factor: 5 %
 People diversity factor: 100 %
 Lighting profile number: 0
 Equipment profile number: 0
 People profile number: 0
 Building default ceiling height: 32.00 feet
 Building default wall height: 32.00 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	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C	C	C	C	C	C	
3	0	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	C	0	
4	0	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	C	C	0	0	0	
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	89	67	55%	75	-7.06	-6
June	84	64	55%	75	-13.92	-11
July	89	67	55%	75	-7.06	-6
September	79	62	55%	75	-15.32	-16
Winter	20			70		

Master Roofs

Roof No.	ASHRAE Roof#	Roof U-Fac	Dark Color	Susp. Ceil
1	1	0.019	Yes	Yes
Roof #1 Description: Pitched roof, asphalt shingles with 5/16" plywood, no ceiling below				

Master Partitions

Partition No.	Partition U-Factor	Cool T-D	Heat T-D
1	0.019	85	85
Partition #1 Description: Metal partition, interior finish, R-19 batt insulation			

Master Shading Devices

Shade No.	Dist Horiz Overh Projects	Dist Beyond Right W.Edge	Dist Beyond Left W.Edge	Dist Overh Above Wind	Dist Right Fin Proj	Dist R-Fin Beyond W.Edge	Ht Of Right Fin	Dist Left Fin Proj	Dist L-Fin Beyond W.Edge	Ht Of Left Fin
1	23.00	10.00	10.00	8.00	5.00	5.00	14.00	5.00	5.00	14.00



Building Envelope Report

Envelope Report Using Summer U-Factors

Material Types		Gross Area	Glass Area	Net Area	-U-Factor	Area x U-Factor	Average U-Factor
Roof	1	740.0	0.0	740.0	0.019	14.060	0.019
Tot.Roof		740.0	0.0	740.0	N/A	14.060	0.019
Totals				740.0		14.060	0.019

Wall Direction	Wall Area	Glass Area	Wall Net Area	Wall Avg U-Factor	Glass Avg U-Factor	Glass Avg Shd.Coeff
N	0.0	0.0	0.0	0.000	0.000	0.000
NE	0.0	0.0	0.0	0.000	0.000	0.000
E	0.0	0.0	0.0	0.000	0.000	0.000
SE	0.0	0.0	0.0	0.000	0.000	0.000
S	0.0	0.0	0.0	0.000	0.000	0.000
SW	0.0	0.0	0.0	0.000	0.000	0.000
W	0.0	0.0	0.0	0.000	0.000	0.000
NW	0.0	0.0	0.0	0.000	0.000	0.000
Totals	0.0	0.0	0.0	0.000	0.000	0.000



Building Summary Loads

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	740	738	1.09	0	0	0	0.00
Wall	0	0	0.00	0	0	0	0.00
Glass	0	0	0.00	0	0	0	0.00
Floor Slab	20	766	1.13	0	0	0	0.00
Skin Loads		1,505	2.22	0	0	0	0.00
Lighting	0	0	0.00	0	0	0	0.00
Equipment	0	0	0.00	0	0	0	0.00
Pool Latent	0	0	0.00	0	0	0	0.00
People	0	0	0.00	0	0	0	0.00
Partition	1,710	2,900	4.29	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.	0	0	0.00	0	0	0	0.00
Heat. Vent.	800	42,579	62.93	0	0	0	0.00
Cool. Infil.	0	0	0.00	0	0	0	0.00
Heat. Infil.	370	20,678	30.56	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	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		67,661	100.00	0	0	0	0.00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	42,579	62.93	0	0	0	0.00
Infiltration	20,678	30.56	0	0	0	0.00
Pretreated Air	0	0.00	0	0	0	0.00
Room Loads	4,404	6.51	0	0	0	0.00
Plenum Loads	0	0.00	0	0	0	0.00
Fan/Duct/Misc Loads	0	0.00	0	0	0	0.00
Building Totals	67,661	100.00	0	0	0	0.00

Check Figures

Total Building Supply Air (based on a 25° TD): 943 CFM
 Total Building Vent. Air (84.88% of Supply): 800 CFM

Total Conditioned Air Space: 740 Sq.ft
 Supply Air Per Unit Area: 1.2737 CFM/Sq.ft
 Area Per Cooling Capacity: 0.0 Sq.ft/Ton
 Cooling Capacity Per Area: 0.0000 Tons/Sq.ft
 Heating Capacity Per Area: 91.43 Btuh/Sq.ft

Total Heating Required With Outside Air: 67,661 Btuh
 Total Cooling Required With Outside Air: 0.00 Tons



Air Handler #1 - Battery Charging - Summary Loads

Rm No	Description Room Peak Time Zn No., Flr No.	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	Battery Charging	740	25,082	0	0	None	None
	-	0	943	0	800	0	0
	Zn 1, Flr 1	22,200	1.27	0.00	800	800	0
Runout duct size: 6 in. dia, Diffusers: 7, CFM/runout: 135, Velocity: 685.7 ft/min, Pressure drop: 0.274 in.wg./100ft							
	Room Peak Totals:	740	25,082	0	0		
	Total Rooms: 1	0	943	0	800	0	0
	Unique Rooms: 1	22,200	1.27	0.00	800	800	0
Main trunk duct size: 17 in. h x 10in. w, Velocity: 798.4 ft/min, Pressure drop: 0.098 in.wg./100ft							

**Air Handler #1 - Battery Charging - Total Load Summary**

Air Handler Description: Battery Charging Constant Volume - Sum of Peaks
 Supply Air Fan: Draw-Thru with program estimated horsepower of 0.00 HP
 Fan Input: 55% motor and fan efficiency with 3.36 in. water across the fan
 Outdoor Conditions: 20° DB (System is Heating Only)
 Indoor Conditions: 70° DB

Winter: Exhaust controls outside air.

Room Space sensible loss:	4,404 Btuh	
Infiltration sensible loss:	20,678 Btuh	370 CFM
Outside Air sensible loss:	42,579 Btuh	800 CFM
Supply Duct sensible loss:	0 Btuh	
Return Duct sensible loss:	0 Btuh	
Return Plenum sensible loss:	0 Btuh	
Total System sensible loss:		67,661 Btuh

Heating Supply Air: $25,082 / (.986 \times 1.08 \times 25) =$	943 CFM
Winter Vent Outside Air (84.9% of supply) =	800 CFM

Room space sensible gain:	0 Btuh	
Infiltration sensible gain:	0 Btuh	
Draw-thru fan sensible gain:	0 Btuh	
Supply duct sensible gain:	0 Btuh	
Reserve sensible gain:	0 Btuh	
Total sensible gain on supply side of coil:		0 Btuh

Cooling Supply Air: $0 / (.986 \times 1.1 \times 0) =$	0 CFM
Summer Vent Outside Air (0.0% of supply) =	0 CFM

Return duct sensible gain:	0 Btuh	
Return plenum sensible gain:	0 Btuh	
Outside air sensible gain:	0 Btuh	0 CFM
Blow-thru fan sensible gain:	0 Btuh	
Total sensible gain on return side of coil:		0 Btuh
Total sensible gain on air handling system:		0 Btuh

Room space latent gain:	0 Btuh	
Infiltration latent gain:	0 Btuh	
Outside air latent gain:	0 Btuh	
Total latent gain on air handling system:		0 Btuh
Total system sensible and latent gain:		0 Btuh

Check Figures

Total Air Handler Supply Air (based on a 25° TD):	943 CFM
Total Air Handler Vent. Air (84.88% of Supply):	800 CFM

Total Conditioned Air Space:	740 Sq.ft
Supply Air Per Unit Area:	1.2737 CFM/Sq.ft
Area Per Cooling Capacity:	0.0 Sq.ft/Ton
Cooling Capacity Per Area:	0.0000 Tons/Sq.ft
Heating Capacity Per Area:	91.43 Btuh/Sq.ft

Total Heating Required With Outside Air:	67,661 Btuh
Total Cooling Required With Outside Air:	0.00 Tons



Room Detailed Loads (At Zone Peak Times)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Room 1-Battery Charging - Air Handler 1 (Battery Charging), Zone 1.								
Roof-1-1-Susp.C-D	740	1.00	-39.5	0.019	0		0.950	703
Partition-1-1	1710		85/85	0.019	0		1.615	2,762
Floor slab	20						36.500	730
Cool. Infil.AC/hr	0				0	0		
Heat. Infil.AC/hr	370						53.224	19,693
Sub-total					0	0		23,888
Safety factors:					+5%	+5%		+5%
					-----	-----		-----
Total w/ safety factors:					0	0		25,082



Load Preview

Scope	Peak Time	Area	Volume	Sensible Gain	Latent Gain	Net Gain	Net Tons	Sensible Loss	Cooling Supply Airflow	Heating Supply Airflow
Building	September 12am	740	22,200	0	0	0	0.00	67,661	943	943
System 1	September 12am	740	22,200	0	0	0	0.00	67,661	0	943
Zone 1	(None) 12am	740	22,200	0	0	0		25,082	0	943
1-Battery Charging	September 12am	740	22,200	0	0	0		25,082	0	943



Load Preview (cont'd)

Scope	Duct Size
Building	
System 1	17 in. h x 10in. w
Zone 1	17 in. h x 10in. w
1-Battery Charging	7--6 in. dia