Phippsburg & Milner - Equipment List
5/13/2024

https://www.engineersedge.com/calculators/heat_gain_from_electric_motors_15678.htm

Equations

1. Motor Heat "q em = 2545 x P (1.0 - Em / Em) x F um x F lm"
2. VFD Heat: H = P (1/N) H = Heat Loss (kW), P = Power kW, N = Efficiency assume 95%)
3. Transformer Heat Heq = PeqK1K2 (W) Heq = Heat (Watts), Peq = Power Consumption (W), K1 = Load coefficient, K2 - running time coefficient
4. Tables -

Resources

Equation 4 Equipment outside of stream ASHRAE Fundamentals - Electric Motors F30.4
https://www.engineeringtoolbox.com/variable-frequency-drives-d_656.html
https://www.eng-tips.com/viewthread.cfm?qid=88449
https://www.engineeringtoolbox.com/heat-gain-equipment-d_1668.html

Premium

Equipment	Function / Name	Location	Voltage	VFD	P - (HP)	E - (Efficiency)	F um (Motor Use Factor)	F lm (Motor load Factor)	q (Btu) Heat	Heat in building	VFD (H Heat) kW	Btu conversion	SCFM	dT	BTU	
General Purpose Area																
B-0301		General Purpose Area	460/3P	No	3	92%	1	1	691.1	691.1				24.1	80	1735.2
P-0301		Tank - 0301		No	0.5	92%	1	1	110.7							
P-0302		Tank - 0301		No	0.5	92%	1	1	110.7							
B-3901		General Purpose Area		No	3	92%	1	1	691.1	691.1				24.1	80	1735.2
B-0901		General Purpose Area		No	3	92%	1	1	691.1	691.1				36.2	60	
H-7911	Heater		460/3P	No	5 kW							17,060.00				
H-7912	Heater		460/3P	No	5 kW							17,060.00				
B-0501		Aeration Tank 0501		Yes	20	94%	1	1	3,480.34		0.90	3,054.42				Assume 6% of kVA Rating for VFDs
B-0502		Aeration Tank 0501		Yes	20	94%	1	1	3,480.34		0.90	3,054.42				
B-3901		General Purpose Area		No	3	92%	1	1	663.9	663.91						
B-0601		General Purpose Area		No	3	92%	1	1	663.9	663.91						
B-0602		General Purpose Area		No	3	92%	1	1	663.9	663.91						
P-0701		General Purpose Area		Yes	0.75	92%	1	1	172.8	172.8	0.03	114.54				
P-0702		General Purpose Area		Yes	0.75	92%	1	1	172.8	172.8	0.03	114.54				
P-0704		General Purpose Area		Yes	0.75	92%	1	1	172.8	172.8	0.03	114.54				
P-0705		General Purpose Area		Yes	0.75	92%	1	1	172.8	172.8	0.03	114.54				
P-801		General Purpose Area		Yes	0.5	92%	1	1	115.2	115.2	0.02	76.36				
P-802		General Purpose Area		Yes	0.5	92%	1	1	115.2	115.2	0.02	76.36				
P-7911	Pressuurized Water Pump	General Purpose Area		No	1	92%	1	1	230.4	230.4						
F-7911	Fan Motor	General Purpose Area		No	0.33	92%	1	1	76.0	76.0						
P-0901		Tank -0901		No	0.75	92%	1	1	166.0							
P-0902		Tank -0901		No	0.75	92%	1	1	166.0							
TNK-0501		Tank 0501		No	0.75	92%	1	1	172.8							
TNK-0502		Tank 0501		No	0.75	92%	1	1	172.8							
TNK-0901		Sludge Holding Tank		No	0.5	92%	1	1	115.2							
TNK-0902		Sludge Holding Tank		No	0.5	92%	1	1	115.2							
Hazardous CL1 DIV2 Area																
H-7921	Heater			No	5 kW							17,060.00				
SCR - 0201		Hazardous Area		No	0.5	92%	1	1	115.2	115.2						
B-0601		Hazardous Area		No	3	92%	1	1	691.1	691.1				407.7	78	
B-0602		Hazardous Area		No	3	92%	1	1	691.1	691.1				407.7	78	
B-0201		Hazardous Area		No	0.5	92%	1	1	115.2	115.2						
B-0202		Hazardous Area		No	0.5	92%	1	1	115.2	115.2						
Total																
Hazardous CL1 DIV1 Area																
P-0301		Equalization Tank		No	0.5	92%	1	1	115.2							
P-0302		Equalization Tank		No	0.5	92%	1	1	115.2							
Electrical Service Area																
MPP	Main Disconnect panel	General Purpose Area	200 A						204.72	204.72						
MCP	Motor Control Panel + PLC	General Purpose Area							204.72	204.72						
T0729A	Step Down Transformer	General Purpose Area	240/480 to 120/240	15 kVA			Assuming 5% Heat Generation	1	2559.0	2559.0						
VFDs		General Purpose Area							6,719.73	6,719.73						
Total																
Btu - Heat Gain from Equipment - General Purpose Area			Diversity due to redundancy 50%						**25,028.73**	**14,980.89**						
										7,490.44						
Btu - Heat Gain from Equipment - Hazardous Area			Diversity due to redundancy 50%							**1727.7**						
										863.8						
Tons									2.1							
CFM									834.3							

Entire container is insulated w/ 3" spray foam insulation = R-21 Closed Cell Spray Foam

Assumption
All liquids are room temperature. - No insulation on the pipes,
Building fan up to 4,000 CFM based on 24" propeller and 1/3 HP.

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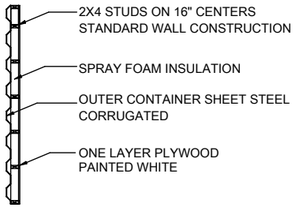
10/10/2024

ISO CONTAINER WALL CONSTRUCTION



Civil Construction Notes:

- Install grating between building fans and outside louvers.
- Thermal insulation on walls and ceiling, Spray Foam
- Door color to be: White
- Exterior color to be: White
- Interior floor to be: Marine Grade Plywood
- Interior floor to be painted: Gator Guard
- Exterior floor to be insulated with 3" of Spray Foam.

Mechanical Notes:

- Locate cooling thermostat in the warmest location at ceiling level.
- Locate heating thermostat at floor level.
- Maximum width for shipping is 102". This includes all connections that protrude through the sides of the enclosure.

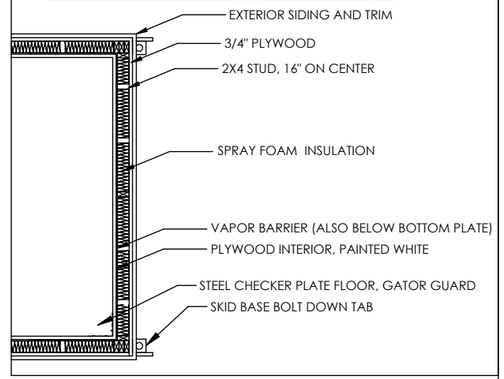
Commissioning Notes:

- Fan and louver hoods need to be installed on site. System cannot ship with hoods attached.
- Some flow meters will be shipped with unions in the process piping loosened to ensure meters are not damaged during shipment.
- Building need to be shimmed on site with 1/2"t x 3"w steel flat bar to allow doors to open freely.
- Please have shimming material ready during building installation.
- newterra recommends pad be at least 12" larger than enclosure in all directions. Local codes may require alternate dimensions.

newterra Standard System Labels:

- Flow direction labels
- Air line labels
- Water line labels
- Air/Water line labels
- Hot surface labels (lines >=140°F)
- Hearing protection labels
- Warning label: This machine is automatically controlled
- Arc flash warning label

WOOD FRAMED BUILDING WALL CONSTRUCTION



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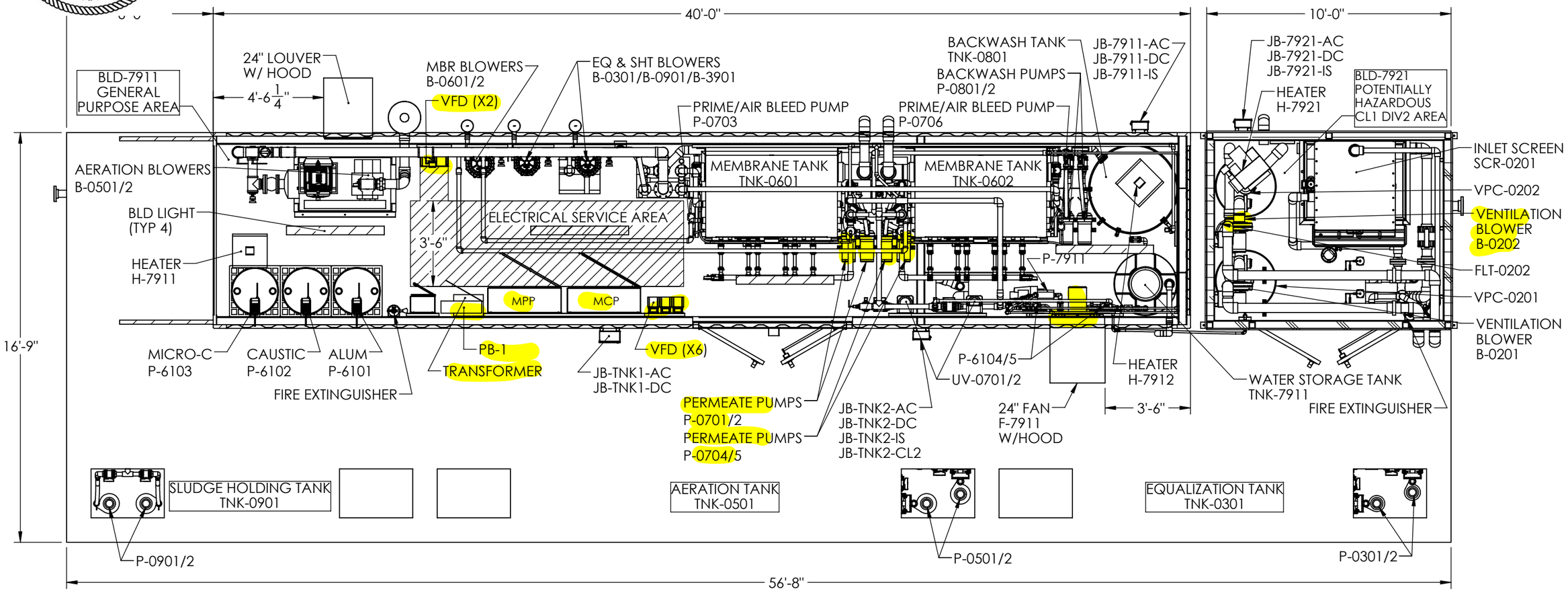
PROFESSIONAL ENGINEERING STAMP IS LIMITED TO THE HIGHLIGHTED EQUIPMENT BEING IDENTIFIED FOR HEAT LOSS / GAIN CALCULATIONS ONLY



System Weight:

newterra can provide upon request an estimated weight of the system. Although every effort is made to ensure this estimate is representative of the final system weight, newterra cannot guarantee this weight and it is the responsibility of the client to ensure adequately sized equipment is utilized for offloading and final placement of the system. A final system weight will be available at time of loading at newterra and will be provided at time of shipment.

newterra

STATUS: For Review					DRAWING TITLE: System Layout
LEVEL: B-03	REVISED BY: dg	REVISED ON: May 29/23	APPROVED BY:	APPROVED ON:	PROJECT TITLE: Community of Phippsburg
CUSTOMER: AquaWorks					DRAWING NUMBER:
					PROJECT NUMBER: 2207814
					DRAWN BY: OM
					DATE: Jun 12, 2023
					SHEET 2 OF 8

Air System Sizing Summary for Milner Heat Loss/Gain
(Large Container)

Project: 24054 - PHIPPSBURG | 05/14/2024
Prepared by: DMCE | 11:37 AM

Air System Information

Air System Name	**Milner Heat Loss/Gain**	Number of zones	**1**
Equipment Class	**UNDEF**	Floor Area	**400.0** sqft
Air System Type	**SZCAV**	Location	**Yampa Valley Regional, CO, USA**

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Peak zone sensible load**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**1.2**	Tons	Peak coil load occurs at	**September 15:00**	
Total coil load	**14.5**	MBH	OA DB / WB	**82.0 / 53.2**	F
Sensible coil load	**14.0**	MBH	Entering DB / WB	**75.0 / 54.8**	F
Coil CFM at peak load	**951**	CFM	Leaving DB / WB	**57.9 / 48.2**	F
Sum of peak zone CFM	**951**	CFM	Resulting RH	**30**	%
Sensible heat ratio	**0.965**		Design supply temp.	**58.0**	F
CFM/Ton	**789.0**		Zone T-stat Check	**1 of 1**	OK
sqft/Ton	**332.0**		Max zone temperature deviation	**0.0**	F
BTU/(hr sqft)	**36.1**				
Water flow @ 10.0 F rise	**2.89**	gpm			

Central Heating Coil Sizing Data

Max coil load	**9.8**	MBH	Load occurs at	**Design Heating**	
Coil CFM at Design Heating	**951**	CFM	BTU/(hr sqft)	**24.4**	
Max coil CFM	**951**	CFM	Ent. DB / Lvg DB	**69.5 / 81.6**	F
Water flow @ 20.0 F drop	**0.98**	gpm			

Supply Fan Sizing Data

Design CFM	**951**	CFM	Fan motor BHP	**0.52**	BHP
Design CFM/sqft	**2.38**	CFM/sqft	Fan motor kW	**0.41**	kW
			Fan total static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**7**	CFM	CFM/person	**5.00**	CFM/person
CFM/sqft	**0.02**	CFM/sqft			

REVIEWED FOR CODE COMPLIANCE

10/10/2024

Zone Sizing Summary for Milner Heat Loss/Gain

(Large Container)

Project: 24054 - PHIPPSBURG 05/14/2024
Prepared by: DMCE 11:37 AM

Air System Information

Air System Name ..... **Milner Heat Loss/Gain**
Equipment Class ..... **UNDEF**
Air System Type ..... **SZCAV**
Number of zones **1**
Floor Area ..... **400.0** sqft
Location ..... **Yampa Valley Regional, CO, USA**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**
Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/sqft	Reheat Coil Capacity (MBH)	Reheat Coil Water gpm @ 20.0 F	Zone Htg Unit Coil Capacity (MBH)	Zone Htg Unit Water gpm @ 20.0 F	Mixing Box Fan Airflow (CFM)
Z01	951	951	2.38	0.0	0.00	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (sqft)
Z01	13.7	September 15:00	9.8	400.0

Space Loads and Airflows

Zone Name / Space Name	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (sqft)	Space CFM/sqft
Z01						
Z01	13.7	September 15:00	951	9.8	400.0	2.38

Air System Heat Balance Summary for Milner Heat Loss/Gain
(Large Container)

Project: 24054 - PHIPPSBURG
Prepared by: DMCE

05/14/2024
11:37 AM

Table 1. System Loads

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 82.0 F / 53.2 F			OA DB / WB -5.7 F / -7.1 F		
COMPONENT LOADS	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Zone Conditioning	-	13625	543	-	10014	0
Plenum Load	-	0	0	-	0	0
Return Fan Load	951 CFM	0	-	951 CFM	0	-
Ventilation Load	7 CFM	39	-63	7 CFM	427	0
Supply Fan Load	951 CFM	1410	-	951 CFM	-1410	-
Zone Fan Coil Fans Load	-	0	-	-	0	-
>> Total System Loads	**-**	**15073**	**480**	**-**	**9031**	**0**
Central Cooling Coil	-	13960	499	-	0	0
Central Heating Coil	-	0	-	-	9758	-
>> Total Conditioning	**-**	**13960**	**499**	**-**	**9758**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Zone Heat Balance Loads

	DESIGN COOLING - SEPTEMBER 15:00			DESIGN HEATING		
	OA DB / WB 82.0 F / 53.2 F			OA DB / WB -5.7 F / -7.1 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	903 sqft	3330	-	903 sqft	2921	-
Roof Convection	400 sqft	1897	-	400 sqft	1820	-
Window Convection	47 sqft	404	-	47 sqft	1036	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	400 sqft	1585	-	400 sqft	4045	-
Interior Wall Convection	0 sqft	0	-	0 sqft	0	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	328 W	711	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	2200 W	5630	-	0 W	0	-
People Convection	1	118	607	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**13675**	**607**	**-**	**9821**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.

Air System Sizing Summary for Milner Heat Loss/Gain
(Small Container)

Project: 24054 - PHIPPSBURG CONTAINER 2
Prepared by: DMCE
05/14/2024
1:00 PM

Air System Information

Air System Name	**Milner Heat Loss/Gain**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**98.8**	sqft
Air System Type	**SZCAV**		Location	**Yampa Valley Regional, CO, USA**	

Sizing Calculation Information

Calculation Months	**Jan to Dec**		Zone CFM Sizing	**Peak zone sensible load**	
Sizing Data	**Calculated**		Space CFM Sizing	**Individual peak space loads**	

Central Cooling Coil Sizing Data

Total coil load	**0.3**	Tons	Peak coil load occurs at	**August 16:00**	
Total coil load	**3.1**	MBH	OA DB / WB	**88.0 / 56.2**	F
Sensible coil load	**3.0**	MBH	Entering DB / WB	**75.1 / 55.4**	F
Coil CFM at peak load	**202**	CFM	Leaving DB / WB	**58.0 / 48.8**	F
Sum of peak zone CFM	**202**	CFM	Resulting RH	**32**	%
Sensible heat ratio	**0.957**		Design supply temp.	**58.0**	F
CFM/Ton	**780.0**		Zone T-stat Check	**1 of 1**	OK
sqft/Ton	**381.2**		Max zone temperature deviation	**0.0**	F
BTU/(hr sqft)	**31.5**				
Water flow @ 10.0 F rise	**0.62**	gpm			

Central Heating Coil Sizing Data

Max coil load	**2.7**	MBH	Load occurs at	**Design Heating**	
Coil CFM at Design Heating	**202**	CFM	BTU/(hr sqft)	**27.4**	
Max coil CFM	**202**	CFM	Ent. DB / Lvg DB	**69.4 / 85.1**	F
Water flow @ 20.0 F drop	**0.27**	gpm			

Supply Fan Sizing Data

Design CFM	**202**	CFM	Fan motor BHP	**0.11**	BHP
Design CFM/sqft	**2.05**	CFM/sqft	Fan motor kW	**0.09**	kW
			Fan total static	**2.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**2**	CFM	CFM/person	**5.00**	CFM/person
CFM/sqft	**0.02**	CFM/sqft			

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10/10/2024

Zone Sizing Summary for Milner Heat Loss/Gain

(Small Container)

Project: 24054 - PHIPPSBURG CONTAINER 2 05/14/2024

Prepared by: DMCE 1:00 PM

Air System Information

Air System Name ..... **Milner Heat Loss/Gain**
Equipment Class ..... **UNDEF**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **98.8** sqft
Location ..... **Yampa Valley Regional, CO, USA**

Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/sqft	Reheat Coil Capacity (MBH)	Reheat Coil Water gpm @ 20.0 F	Zone Htg Unit Coil Capacity (MBH)	Zone Htg Unit Water gpm @ 20.0 F	Mixing Box Fan Airflow (CFM)
Z01	202	202	2.05	0.0	0.00	0.0	0.00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (sqft)
Z01	2.9	August 16:00	2.7	98.8

Space Loads and Airflows

Zone Name / Space Name	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (sqft)	Space CFM/sqft
Z01						
Z01	2.9	August 16:00	202	2.7	98.8	2.05

Air System Heat Balance Summary for Milner Heat Loss/Gain
(Small Container)

Project: 24054 - PHIPPSBURG CONTAINER 2 — 05/14/2024
Prepared by: DMCE — 1:00 PM

Table 1. System Loads

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 88.0 F / 56.2 F			OA DB / WB -5.7 F / -7.1 F		
COMPONENT LOADS	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Zone Conditioning	-	2900	144	-	2723	0
Plenum Load	-	0	0	-	0	0
Return Fan Load	202 CFM	0	-	202 CFM	0	-
Ventilation Load	2 CFM	18	-14	2 CFM	105	0
Supply Fan Load	202 CFM	300	-	202 CFM	-300	-
Zone Fan Coil Fans Load	-	0	-	-	0	-
>> Total System Loads	**-**	**3218**	**129**	**-**	**2528**	**0**
Central Cooling Coil	-	2976	134	-	0	0
Central Heating Coil	-	0	-	-	2702	-
>> Total Conditioning	**-**	**2976**	**134**	**-**	**2702**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Table 2. Zone Heat Balance Loads

	DESIGN COOLING - AUGUST 16:00			DESIGN HEATING		
	OA DB / WB 88.0 F / 56.2 F			OA DB / WB -5.7 F / -7.1 F		
Zone Heat Balance Component	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**	**Details**	**Sensible [BTU/hr]**	**Latent [BTU/hr]**
Exterior Wall Convection	378 sqft	874	-	378 sqft	1128	-
Roof Convection	99 sqft	310	-	99 sqft	404	-
Window Convection	0 sqft	0	-	0 sqft	0	-
Skylight Convection	0 sqft	0	-	0 sqft	0	-
Door Convection	0 sqft	0	-	0 sqft	0	-
Floor Convection	99 sqft	128	-	99 sqft	1179	-
Interior Wall Convection	0 sqft	0	-	0 sqft	0	-
Ceiling Convection	0 sqft	0	-	0 sqft	0	-
Overhead Lighting Convection	81 W	176	-	0 W	0	-
Task Lighting Convection	0 W	0	-	0 W	0	-
Electric Equipment Convection	543 W	1390	-	0 W	0	-
People Convection	0	29	150	0	0	0
Infiltration	0 CFM	0	0	0 CFM	0	0
Miscellaneous Equipment	-	0	0	-	0	0
Air Internal Energy Change	-	0		-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**2908**	**150**	**-**	**2711**	**0**
Key:	**Positive values are cooling loads Negative values are heating loads**			**Positive values are heating loads Negative values are cooling loads**		

Note 1: Surface convection line items show the combined effects of conductive heat gain to the surface and radiative heat gains absorbed at the surface which are then convected to room air.

Note 2: Lighting, equipment, and people line items include only the direct convective heat gain from the heat source to the room air. The radiative portion of the heat gain is first absorbed by surfaces in the room and then later convected from the surface to the air. Therefore the effect of the radiative portion of the heat gain is found in the surface convection line items.

Note 3: Solar heat gain is absorbed by surfaces in the room, re-radiated to other surfaces, and finally convected from the surfaces to room air. Therefore, the effect of solar heat gain is found in the surface convection line items.