

# HVAC Load Calculations

## Cascade Christian Jr. High Phase 2 - Lobby

815 21<sup>st</sup> St. SE

Puyallup WA 98372

ASEI Job No. #####

April 27, 2020

THE APPROVED CONSTRUCTION PLANS,  
DOCUMENTS AND ALL ENGINEERING MUST  
BE POSTED ON THE JOB AT ALL  
INSPECTIONS IN A VISIBLE AND READILY  
ACCESSIBLE LOCATION.

FULL SIZED LEDGIBLE COLOR PLANS ARE  
REQUIRED TO BE PROVIDED BY THE  
PERMITEE ON SITE FOR INSPECTION

Prepared by:

**Air Systems  
Engineering Inc.**

**COMFORT  
SYSTEMS USA®**

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# Section 1

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# Section 2

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# Air System Sizing Summary for Lobby Unit North

Project Name: 3912 - Cascade Christian Phase 2 Lobby  
 Prepared by: Air Systems Engineering Inc

04/24/2020  
 11:25AM

## Air System Information

Air System Name ..... <b>Lobby Unit North</b>	Number of zones ..... <b>1</b>
Equipment Class ..... <b>UNDEF</b>	Floor Area ..... <b>984.0</b> ft <sup>2</sup>
Air System Type ..... <b>SZCAV</b>	Location ..... <b>Tacoma, Washington</b>

## Sizing Calculation Information

Calculation Months ..... <b>Jan to Dec</b>	Zone CFM Sizing ..... <b>Sum of space airflow rates</b>
Sizing Data ..... <b>Calculated</b>	Space CFM Sizing ..... <b>Individual peak space loads</b>

## Central Cooling Coil Sizing Data

Total coil load ..... <b>1.9</b> Tons	Load occurs at ..... <b>Jul 1500</b>
Total coil load ..... <b>22.2</b> MBH	OA DB / WB ..... <b>86.0 / 65.0</b> °F
Sensible coil load ..... <b>22.2</b> MBH	Entering DB / WB ..... <b>77.6 / 63.4</b> °F
Coil CFM at Jul 1500 ..... <b>1303</b> CFM	Leaving DB / WB ..... <b>61.6 / 57.7</b> °F
Max block CFM ..... <b>1303</b> CFM	Coil ADP ..... <b>59.8</b> °F
Sum of peak zone CFM ..... <b>1303</b> CFM	Bypass Factor ..... <b>0.100</b>
Sensible heat ratio ..... <b>1.000</b>	Resulting RH ..... <b>50</b> %
CFM/Ton ..... <b>703.0</b>	Design supply temp. .... <b>58.0</b> °F
ft <sup>2</sup> /Ton ..... <b>531.0</b>	Zone T-stat Check ..... <b>1 of 1</b> OK
BTU/(hr-ft <sup>2</sup> ) ..... <b>22.6</b>	Max zone temperature deviation ..... <b>0.0</b> °F
Water flow @ 10.0 °F rise ..... <b>4.45</b> gpm	

## Central Heating Coil Sizing Data

Max coil load ..... <b>37.1</b> MBH	Load occurs at ..... <b>Des Htg</b>
Coil CFM at Des Htg ..... <b>1303</b> CFM	BTU/(hr-ft <sup>2</sup> ) ..... <b>37.7</b>
Max coil CFM ..... <b>1303</b> CFM	Ent. DB / Lvg DB ..... <b>63.4 / 90.0</b> °F
Water flow @ 20.0 °F drop ..... <b>3.71</b> gpm	

## Supply Fan Sizing Data

Actual max CFM ..... <b>1303</b> CFM	Fan motor BHP ..... <b>0.00</b> BHP
Standard CFM ..... <b>1288</b> CFM	Fan motor kW ..... <b>0.00</b> kW
Actual max CFM/ft <sup>2</sup> ..... <b>1.32</b> CFM/ft <sup>2</sup>	Fan static ..... <b>0.00</b> in wg

## Outdoor Ventilation Air Data

Design airflow CFM ..... <b>375</b> CFM	CFM/person ..... <b>37.50</b> CFM/person
CFM/ft <sup>2</sup> ..... <b>0.38</b> CFM/ft <sup>2</sup>	

B-20-0306



## Air System Design Load Summary for Lobby Unit North

Project Name: 3912 - Cascade Christian Phase 2 Lobby  
 Prepared by: Air Systems Engineering Inc

04/24/2020  
 11:25AM

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 86.0 °F / 65.0 °F			HEATING OA DB / WB 19.0 °F / 14.8 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	735 ft²	8096	-	735 ft²	-	-
Wall Transmission	1838 ft²	2773	-	1838 ft²	4152	-
Roof Transmission	984 ft²	1676	-	984 ft²	1310	-
Window Transmission	735 ft²	1945	-	735 ft²	14793	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	200 ft²	836	-	200 ft²	6360	-
Floor Transmission	984 ft²	0	-	984 ft²	1951	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	984 W	2991	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	984 W	3194	-	0	0	-
People	10	1963	2050	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>23475</b>	<b>2050</b>	-	<b>28566</b>	<b>0</b>
Zone Conditioning	-	20270	2050	-	26740	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	1303 CFM	0	-	1303 CFM	0	-
Ventilation Load	375 CFM	1967	-2051	375 CFM	10370	0
Supply Fan Load	1303 CFM	0	-	1303 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
<b>&gt;&gt; Total System Loads</b>	-	<b>22238</b>	<b>-1</b>	-	<b>37110</b>	<b>0</b>
Central Cooling Coil	-	22238	0	-	0	0
Central Heating Coil	-	0	-	-	37110	-
<b>&gt;&gt; Total Conditioning</b>	-	<b>22238</b>	<b>0</b>	-	<b>37110</b>	<b>0</b>
<b>Key:</b>	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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# Air System Sizing Summary for Lobby Unit South

Project Name: 3912 - Cascade Christian Phase 2 Lobby  
 Prepared by: Air Systems Engineering Inc

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## Air System Information

Air System Name ..... <b>Lobby Unit South</b>	Number of zones ..... <b>1</b>
Equipment Class ..... <b>UNDEF</b>	Floor Area ..... <b>3924.0</b> ft <sup>2</sup>
Air System Type ..... <b>SZCAV</b>	Location ..... <b>Tacoma, Washington</b>

## Sizing Calculation Information

Calculation Months ..... <b>Jan to Dec</b>	Zone CFM Sizing ..... <b>Sum of space airflow rates</b>
Sizing Data ..... <b>Calculated</b>	Space CFM Sizing ..... <b>Individual peak space loads</b>

## Central Cooling Coil Sizing Data

Total coil load ..... <b>1.6</b> Tons	Load occurs at ..... <b>Jul 1500</b>
Total coil load ..... <b>19.0</b> MBH	OA DB / WB ..... <b>86.0 / 65.0</b> °F
Sensible coil load ..... <b>19.0</b> MBH	Entering DB / WB ..... <b>77.7 / 63.7</b> °F
Coil CFM at Jul 1500 ..... <b>1140</b> CFM	Leaving DB / WB ..... <b>62.1 / 58.2</b> °F
Max block CFM ..... <b>1140</b> CFM	Coil ADP ..... <b>60.3</b> °F
Sum of peak zone CFM ..... <b>1140</b> CFM	Bypass Factor ..... <b>0.100</b>
Sensible heat ratio ..... <b>1.000</b>	Resulting RH ..... <b>52</b> %
CFM/Ton ..... <b>721.2</b>	Design supply temp. .... <b>58.0</b> °F
ft <sup>2</sup> /Ton ..... <b>2483.2</b>	Zone T-stat Check ..... <b>1 of 1</b> OK
BTU/(hr-ft <sup>2</sup> ) ..... <b>4.8</b>	Max zone temperature deviation ..... <b>0.0</b> °F
Water flow @ 10.0 °F rise ..... <b>3.79</b> gpm	

## Central Heating Coil Sizing Data

Max coil load ..... <b>19.2</b> MBH	Load occurs at ..... <b>Des Htg</b>
Coil CFM at Des Htg ..... <b>1140</b> CFM	BTU/(hr-ft <sup>2</sup> ) ..... <b>4.9</b>
Max coil CFM ..... <b>1140</b> CFM	Ent. DB / Lvg DB ..... <b>62.8 / 78.6</b> °F
Water flow @ 20.0 °F drop ..... <b>1.92</b> gpm	

## Supply Fan Sizing Data

Actual max CFM ..... <b>1140</b> CFM	Fan motor BHP ..... <b>0.00</b> BHP
Standard CFM ..... <b>1127</b> CFM	Fan motor kW ..... <b>0.00</b> kW
Actual max CFM/ft <sup>2</sup> ..... <b>0.29</b> CFM/ft <sup>2</sup>	Fan static ..... <b>0.00</b> in wg

## Outdoor Ventilation Air Data

Design airflow CFM ..... <b>375</b> CFM	CFM/person ..... <b>28.85</b> CFM/person
CFM/ft <sup>2</sup> ..... <b>0.10</b> CFM/ft <sup>2</sup>	

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## Air System Design Load Summary for Lobby Unit South

Project Name: 3912 - Cascade Christian Phase 2 Lobby  
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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 86.0 °F / 65.0 °F			HEATING OA DB / WB 19.0 °F / 14.8 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2162 ft²	4029	-	2162 ft²	4886	-
Roof Transmission	1962 ft²	3341	-	1962 ft²	2612	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	1962 ft²	0	-	1962 ft²	2288	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1962 W	5964	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1284 W	4168	-	0	0	-
People	13	2552	2665	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
<b>&gt;&gt; Total Zone Loads</b>	-	<b>20053</b>	<b>2665</b>	-	<b>9785</b>	<b>0</b>
Zone Conditioning	-	16965	2665	-	8709	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	1140 CFM	0	-	1140 CFM	0	-
Ventilation Load	375 CFM	1997	-2666	375 CFM	10503	0
Supply Fan Load	1140 CFM	0	-	1140 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
<b>&gt;&gt; Total System Loads</b>	-	<b>18963</b>	<b>-1</b>	-	<b>19211</b>	<b>0</b>
Central Cooling Coil	-	18963	0	-	0	0
Central Heating Coil	-	0	-	-	19211	-
<b>&gt;&gt; Total Conditioning</b>	-	<b>18963</b>	<b>0</b>	-	<b>19211</b>	<b>0</b>
<b>Key:</b>	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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# Section 3

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Section 3**Internal Loads Summary (people, miscellaneous, electrical)**

Location	Cooling Load (Btuh)										Notes	
	Occupant				Miscellaneous		Lighting					
	Area (SF)	Occupancy	OA	Occupant Type (ASHRAE Fundamentals Chapter 18)	Sensible (Btu/hr/person)	Latent (Btu/hr/person)	Sensible (Btu/hr)	Latent (Btu/hr)	Sensible (Btu/hr)	Latent (Btu/hr)		(W/SF)
<b>111 Lobby</b>	984	9.84	375	Office Work	245	205	<b>2410.8</b>	<b>2017.2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1w/sf</b>
<b>111 Lobby 1st Flr</b>	1284	12.84	375	Office Work	245	205	<b>3145.8</b>	<b>2632.2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1w/sf</b>
<b>111 Corridor</b>	54	0	5	Office Work	245	205	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	
<b>112 Men</b>	282	0	0	Office Work	245	205	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	
<b>113 Women</b>	342	0	0	Office Work	245	205	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	

# Section 4

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### Section 4 Outside Air Ventilation

Zone Name / Space Name	Floor Area (ft²)		Density	Outdoor Air	Outdoor Air	Exhaust	Maximum	Outdoor Air	Effectiveness Assumption	Exhaust	Outdoor Air	Actual Exhaust Air (CFM)	Actual Outdoor Air (CFM)	Notes
		IMC-2015 Classification	(#/1000SF)	(CFM/person)	(CFM/ft²)	(CFM/SF)	Occupants	(CFM)	(Ez)	(CFM)	(CFM)			
111 Lobby	984	Main entry lobbies	10	5	0.06	0	10	108	1	0	108.24	0	375	
111 Lobby 1st Flr	1284	Main entry lobbies	10	5	0.06	0	13	141	1	0	141.24	0	375	
111 Corridor	54	Corridor	0	0	0.06	0	0	3	1	0	3.24	0	5	
112 Men	282	Public Restroom	0	0	0	50cfm/fixture	0	0	1	300	0	300	0	
113 Women	342	Public Restroom	0	0	0	50cfm/fixture	0	0	1	450	0	450	0	