Air System Sizing Summary for ECOGRAFO

Project Name: UMI SAN RAFAEL TUNJA 01/10/2024
Prepared by: TERMICA 02:59p. m.

Air System Information

Air System Name	**ECOGRAFO**		Number of zones	**1**
Equipment Class	**SPLT AHU**		Floor Area	**324.0** ft²
Air System Type	**SZCAV**		Location	**Tunja, Colombia**

Sizing Calculation Information

Calculation Months	**Jan to Dec**	Zone CFM Sizing	**Sum of space airflow rates**
Sizing Data	**Calculated**	Space CFM Sizing	**Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load	**0.1**	Tons	Load occurs at	**Aug 1500**	
Total coil load	**1.1**	MBH	OA DB / WB	**64.4 / 56.0**	°F
Sensible coil load	**1.1**	MBH	Entering DB / WB	**69.0 / 59.7**	°F
Coil CFM at Aug 1500	**395**	CFM	Leaving DB / WB	**65.3 / 58.6**	°F
Max block CFM	**395**	CFM	Coil ADP	**64.8**	°F
Sum of peak zone CFM	**395**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**61**	%
CFM/Ton	**4154.4**		Design supply temp.	**62.0**	°F
ft²/Ton	**3409.4**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**3.5**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**395**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**281**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.22**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**177**	CFM	CFM/person	**25.29**	CFM/person
CFM/ft²	**0.55**	CFM/ft²			

Zone Sizing Summary for ECOGRAFO

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Air System Information

Air System Name ..... **ECOGRAFO**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **324.0** ft²
Location ..... **Tunja, Colombia**

Sizing Calculation Information

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

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/ft²	Reheat Coil Load (MBH)	Reheat Coil Water gpm @ 20.0 °F	Zone Htg Unit Coil Load (MBH)	Zone Htg Unit Water gpm @ 20.0 °F	Mixing Box Fan Airflow (CFM)
Zone 1	395	395	1.22	0.0	-	0.0	-	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (MBH)	Time of Peak Sensible Cooling Load	Zone Heating Load (MBH)	Zone Floor Area (ft²)
Zone 1	3.0	Aug 1500	3.4	324.0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Peak Sensible Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
P1 ECOGRAFO	1	3.0	Aug 1500	395	3.4	324.0	1.22

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 64.4 °F / 56.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 36.0 °F / 29.2 °F		
ZONE LOADS	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**	**Details**	**Sensible (BTU/hr)**	**Latent (BTU/hr)**
Window & Skylight Solar Loads	10 ft²	184	-	10 ft²	-	-
Wall Transmission	128 ft²	-591	-	128 ft²	1147	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	10 ft²	-114	-	10 ft²	305	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	420 ft²	-1769	-	420 ft²	1945	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	486 W	1658	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	500 W	1706	-	0	0	-
People	7	1960	1890	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**3036**	**1890**	**-**	**3397**	**0**
Zone Conditioning	-	2280	1890	-	-848	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	395 CFM	0	-	395 CFM	0	-
Ventilation Load	177 CFM	-1140	-1891	177 CFM	850	0
Supply Fan Load	395 CFM	0	-	395 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**1140**	**-1**	**-**	**3**	**0**
Central Cooling Coil	-	1140	0	-	0	0
>> Total Conditioning	**-**	**1140**	**0**	**-**	**0**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

TABLE 1.1.A. Component Loads For Space "P1 ECOGRAFO" In Zone "Zone 1"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 64.4 °F / 56.0 °F OCCUPIED T-STAT 72.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 36.0 °F / 29.2 °F OCCUPIED T-STAT 65.0 °F		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	**Details**	**(BTU/hr)**	**(BTU/hr)**	**Details**	**(BTU/hr)**	**(BTU/hr)**
Window & Skylight Solar Loads	10 ft²	184	-	10 ft²	-	-
Wall Transmission	128 ft²	-591	-	128 ft²	1147	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	10 ft²	-114	-	10 ft²	305	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	0 ft²	0	-	0 ft²	0	-
Partitions	420 ft²	-1769	-	420 ft²	1945	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	486 W	1658	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	500 W	1706	-	0	0	-
People	7	1960	1890	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**3036**	**1890**	**-**	**3397**	**0**

TABLE 1.1.B. Envelope Loads For Space "P1 ECOGRAFO" In Zone "Zone 1"						
				COOLING	COOLING	HEATING
	Area	U-Value	Shade	TRANS	SOLAR	TRANS
	(ft²)	(BTU/(hr·ft²·°F))	Coeff.	(BTU/hr)	(BTU/hr)	(BTU/hr)
SSW EXPOSURE						
WALL	128	0.309	-	-591	-	1147
WINDOW 1	10	1.093	0.733	-114	184	305

August DESIGN COOLING DAY, 1500

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	64.4	0.01154	177	400	-1140	-1891
Vent - Return Mixing	Outlet	69.0	0.01328	395	727	-	-
Central Cooling Coil	Outlet	65.3	0.01328	395	727	1140	0
Supply Fan	Outlet	65.3	0.01328	395	727	0	-
Cold Supply Duct	Outlet	65.3	0.01328	395	727	-	-
Zone Air	-	72.8	0.01470	395	993	2280	1890
Return Plenum	Outlet	72.8	0.01470	395	993	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 0.769 BTU/(hr-CFM-F)
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 3379.3 BTU/(hr-CFM)
Site Altitude = 9104.3 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	3036	Cooling	2280	72.8	395	993	0	0

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°F)	Specific Humidity (lb/lb)	Airflow (CFM)	CO2 Level (ppm)	Sensible Heat (BTU/hr)	Latent Heat (BTU/hr)
Ventilation Air	Inlet	36.0	0.00314	177	400	-850	0
Vent - Return Mixing	Outlet	39.4	0.00314	395	411	-	-
Central Cooling Coil	Outlet	39.4	0.00314	395	411	0	0
Supply Fan	Outlet	39.4	0.00314	395	411	0	-
Cold Supply Duct	Outlet	39.5	0.00314	395	411	-	-
Zone Air	-	42.2	0.00314	395	420	848	0
Return Plenum	Outlet	42.2	0.00314	395	420	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 0.769 BTU/(hr-CFM-F)
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 3379.3 BTU/(hr-CFM)
Site Altitude = 9104.3 ft

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (BTU/hr)	T-stat Mode	Zone Cond (BTU/hr)	Zone Temp (°F)	Zone Airflow (CFM)	CO2 Level (ppm)	Terminal Heating Coil (BTU/hr)	Zone Heating Unit (BTU/hr)
Zone 1	-3397	Deadband	848	42.2	395	420	0	0