Air System Sizing Summary for Kitchen

Project Name: 2024-023 International Village
Prepared by: Middlebrook Engineering, LLC

05/03/2024
05:18PM

PRCNC20241090

Air System Information

Air System Name	**Kitchen**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**2392.0**	ft²
Air System Type	**SZCAV**		Location	**Tacoma, Washington**	

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	**4.0**	Tons	Load occurs at	**Jul 1400**	
Total coil load	**48.4**	MBH	OA DB / WB	**85.3 / 64.8**	°F
Sensible coil load	**48.4**	MBH	Entering DB / WB	**76.1 / 63.1**	°F
Coil CFM at Jul 1400	**2692**	CFM	Leaving DB / WB	**59.3 / 57.0**	°F
Max block CFM	**2692**	CFM	Coil ADP	**57.4**	°F
Sum of peak zone CFM	**2692**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**49**	%
CFM/Ton	**667.0**		Design supply temp.	**58.0**	°F
ft²/Ton	**592.8**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**20.2**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**9.69**	gpm			

Central Heating Coil Sizing Data

Max coil load	**19.8**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**2692**	CFM	BTU/(hr·ft²)	**8.3**	
Max coil CFM	**2692**	CFM	Ent. DB / Lvg DB	**69.6 / 76.5**	°F
Water flow @ 20.0 °F drop	**1.99**	gpm			

Supply Fan Sizing Data

Actual max CFM	**2692**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**2661**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**1.13**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**0**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.00**	CFM/ft²			

Zone Sizing Summary for Kitchen

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Air System Information

Air System Name ..... **Kitchen**
Equipment Class ..... **UNDEF**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **2392.0** ft²
Location ..... **Tacoma, Washington**

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	2692	2692	1.13	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 (ft²)
Zone 1	48.8	Jul 1400	20.5	2392.0

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							
Kitchen Area	1	48.8	Jul 1400	2692	20.5	2392.0	1.13

Air System Design Load Summary for Kitchen

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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1400 COOLING OA DB / WB 85.3 °F / 64.8 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 18.0 °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	700 ft²	1200	-	700 ft²	3783	-
Roof Transmission	2392 ft²	4507	-	2392 ft²	3330	-
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	2392 ft²	0	-	2392 ft²	2898	-
Partitions	545 ft²	0	-	545 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	2392 W	8161	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2392 W	8161	-	0	0	-
People	4	980	820	0	0	0
Infiltration	-	2087	-840	-	10512	0
Miscellaneous	-	23750	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**48847**	**-20**	**-**	**20523**	**0**
Zone Conditioning	-	48424	-20	-	19848	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	2692 CFM	0	-	2692 CFM	0	-
Ventilation Load	0 CFM	0	0	0 CFM	0	0
Supply Fan Load	2692 CFM	0	-	2692 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**48424**	**-20**	**-**	**19848**	**0**
Central Cooling Coil	-	48424	0	-	0	0
Central Heating Coil	-	0	-	-	19848	-
>> Total Conditioning	**-**	**48424**	**0**	**-**	**19848**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		

Air System Sizing Summary for Office

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Air System Information

Air System Name	**Office**		Number of zones	**1**	
Equipment Class	**UNDEF**		Floor Area	**150.0**	ft²
Air System Type	**SZCAV**		Location	**Tacoma, Washington**	

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	**Jun 1400**	
Total coil load	**1.8**	MBH	OA DB / WB	**84.3 / 64.8**	°F
Sensible coil load	**1.6**	MBH	Entering DB / WB	**76.3 / 63.5**	°F
Coil CFM at Jun 1400	**79**	CFM	Leaving DB / WB	**57.0 / 55.8**	°F
Max block CFM	**79**	CFM	Coil ADP	**54.9**	°F
Sum of peak zone CFM	**79**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**0.914**		Resulting RH	**50**	%
CFM/Ton	**534.9**		Design supply temp.	**55.0**	°F
ft²/Ton	**1018.3**		Zone T-stat Check	**1 of 1**	OK
BTU/(hr·ft²)	**11.8**		Max zone temperature deviation	**0.0**	°F
Water flow @ 10.0 °F rise	**0.35**	gpm			

Central Heating Coil Sizing Data

Max coil load	**0.8**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**79**	CFM	BTU/(hr·ft²)	**5.4**	
Max coil CFM	**79**	CFM	Ent. DB / Lvg DB	**69.3 / 78.8**	°F
Water flow @ 20.0 °F drop	**0.08**	gpm			

Supply Fan Sizing Data

Actual max CFM	**79**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**78**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**0.53**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**0**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.00**	CFM/ft²			

Zone Sizing Summary for Office

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Air System Information

Air System Name ..... **Office**
Equipment Class ..... **UNDEF**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **150.0** ft²
Location ..... **Tacoma, Washington**

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	79	79	0.53	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 (ft²)
Zone 1	1.7	Jul 1400	0.9	150.0

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							
OFFICE	1	1.7	Jul 1400	79	0.9	150.0	0.53

Air System Design Load Summary for Office

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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 1400 COOLING OA DB / WB 84.3 °F / 64.8 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 18.0 °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	0 ft²	0	-	0 ft²	0	-
Roof Transmission	150 ft²	288	-	150 ft²	209	-
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	150 ft²	0	-	150 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	150 W	512	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	150 W	512	-	0	0	-
People	1	245	205	0	0	0
Infiltration	-	118	-54	-	659	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	**-**	**1675**	**151**	**-**	**868**	**0**
Zone Conditioning	-	1616	151	-	807	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	79 CFM	0	-	79 CFM	0	-
Ventilation Load	0 CFM	0	0	0 CFM	0	0
Supply Fan Load	79 CFM	0	-	79 CFM	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	**-**	**1616**	**151**	**-**	**807**	**0**
Central Cooling Coil	-	1616	151	-	0	0
Central Heating Coil	-	0	-	-	807	-
>> Total Conditioning	**-**	**1616**	**151**	**-**	**807**	**0**
Key:	**Positive values are clg loads Negative values are htg loads**			**Positive values are htg loads Negative values are clg loads**		