RTU-4 SIZING SUMMARY

Air System Information

Air System Name	RTU-4	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	1002.0 ft²
Air System Type	SZCAV	Location	Portland, Maine

Sizing Calculation Information

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

Central Cooling Coil Sizing Data

Total coil load	3.2	Tons	Load occurs at	Aug 1500	
Total coil load	38.5	MBH	OA DB / WB	86.0 / 71.0	°F
Sensible coil load	33.3	MBH	Entering DB / WB	77.0 / 62.7	°F
Coil CFM at Aug 1500	1321	CFM	Leaving DB / WB	53.6 / 52.3	°F
Max block CFM	1321	CFM	Coil ADP	51.0	°F
Sum of peak zone CFM	1321	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.866		Resulting RH	44	%
ft²/Ton	312.7		Design supply temp.	55.0	°F
BTU/(hr ft²)	38.4		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	N/A		Max zone temperature deviation	0.4	°F

Central Heating Coil Sizing Data

Max coil load	30.8	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1321	CFM	BTU/(hr ft²)	30.7	
Max coil CFM	1321	CFM	Ent. DB / Lvg DB	57.1 / 78.7	°F
Water flow @ 20.0 °F drop	N/A				

Supply Fan Sizing Data

Actual max CFM	1321	CFM	Fan motor BHP	0.72	BHP
Standard CFM	1318	CFM	Fan motor kW	0.57	kW
Actual max CFM/ft²	1.32	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	197	CFM	CFM/person	52.60	CFM/person
CFM/ft²	0.20	CFM/ft²			

Air System Information

Air System Name	RTU-4	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	1002.0 ft²
Air System Type	SZCAV	Location	Portland, Maine

Sizing Calculation Information

Calculation Months	Jan to Dec	Zone CFM Sizing	Peak zone sensible load
Sizing Data	Calculated	Space CFM Sizing	Coincident 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	1321	1321	1.32	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	27.1	Aug 1500	17.7	1002.0

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							
CORR.	1	1.7	Aug 1500	82	1.4	218.0	0.38
EMPLOYEE	1	12.1	Aug 1500	589	9.9	350.0	1.68
OFFICE	1	8.7	Aug 1500	423	1.6	70.0	6.04
RESTROOMS	1	4.7	Aug 1500	228	4.9	364.0	0.63

1. Summary

Ventilation Sizing Method	ASHRAE Std 62.1-2010	
Design Condition	Heating operation	
Occupant Diversity (Di)	1.000	
Uncorrected Outdoor Air Intake (Vou)	139	CFM
System Ventilation Efficiency (Ev)	0.705	
Outdoor Air Intake (Vot)	197	CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Supply Air (CFM) (Vpz2)	Space Floor Area (ft²) (Az)	Area Outdoor Air Rate (CFM/ft²) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
Zone 1										
CORR.	1	82	218.0	0.12	0.0	7.50	0.80	33	26	0.705
EMPLOYEE	1	589	350.0	0.12	1.8	7.50	0.80	69	55	0.988
OFFICE	1	423	70.0	0.06	2.0	5.00	0.80	18	14	1.063
RESTROOMS	1	228	364.0	0.12	0.0	7.50	0.80	55	44	0.866
Totals (incl. Space Multipliers)		**1321**							**139**	**0.705**

RTU-5 SIZING SUMMARY

Air System Information

Air System Name	RTU-5	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	3027.0 ft²
Air System Type	SZCAV	Location	Portland, Maine

Sizing Calculation Information

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

Central Cooling Coil Sizing Data

Total coil load	3.2	Tons	Load occurs at	Jul 1500	
Total coil load	38.3	MBH	OA DB / WB	86.0 / 71.0	°F
Sensible coil load	24.4	MBH	Entering DB / WB	84.2 / 69.5	°F
Coil CFM at Jul 1500	741	CFM	Leaving DB / WB	53.6 / 52.5	°F
Max block CFM	741	CFM	Coil ADP	50.2	°F
Sum of peak zone CFM	741	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.638		Resulting RH	46	%
ft²/Ton	948.5		Design supply temp.	55.0	°F
BTU/(hr ft²)	12.7		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	N/A		Max zone temperature deviation	1.8	°F

Central Heating Coil Sizing Data

Max coil load	44.5	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	741	CFM	BTU/(hr ft²)	14.7	
Max coil CFM	741	CFM	Ent. DB / Lvg DB	10.9 / 66.6	°F
Water flow @ 20.0 °F drop	N/A				

Supply Fan Sizing Data

Actual max CFM	741	CFM	Fan motor BHP	0.41	BHP
Standard CFM	740	CFM	Fan motor kW	0.32	kW
Actual max CFM/ft²	0.24	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	596	CFM	CFM/person	39.38	CFM/person
CFM/ft²	0.20	CFM/ft²			

Air System Information

Air System Name	RTU-5	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	3027.0 ft²
Air System Type	SZCAV	Location	Portland, Maine

Sizing Calculation Information

Calculation Months	Jan to Dec	Zone CFM Sizing	Peak zone sensible load
Sizing Data	Calculated	Space CFM Sizing	Coincident 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	741	741	0.24	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	15.2	Jan 1900	0.0	3027.0

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							
STOCKROOM	1	15.2	Jan 1900	741	0.0	3027.0	0.24

1. Summary

Ventilation Sizing Method	ASHRAE Std 62.1-2010	
Design Condition	Heating operation	
Occupant Diversity (Di)	1.000	
Uncorrected Outdoor Air Intake (Vou)	477	CFM
System Ventilation Efficiency (Ev)	1.000	
Outdoor Air Intake (Vot)	596	CFM

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Supply Air (CFM) (Vpz)	Space Floor Area (ft²) (Az)	Area Outdoor Air Rate (CFM/ft²) (Ra)	Time Averaged Occupancy (Occupants) (Pz)	People Outdoor Air Rate (CFM/person) (Rp)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM) (Voz)	Breathing Zone Outdoor Air (CFM) (Vbz)	Space Ventilation Efficiency (Evz)
Zone 1										
STOCKROOM	1	741	3027.0	0.12	15.1	7.50	0.80	596	477	1.000
Totals (incl. Space Multipliers)		**741**							**477**	**1.000**

AIR DESIGN LOAD SUMMARY

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 86.0 °F / 71.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB -3.0 °F / -4.3 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	1491 ft²	52851	-	1491 ft²	-	-
Wall Transmission	3518 ft²	5598	-	3518 ft²	22351	-
Roof Transmission	7523 ft²	13094	-	7523 ft²	15519	-
Window Transmission	1491 ft²	3740	-	1491 ft²	30698	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	126 ft²	2075	-	126 ft²	6319	-
Floor Transmission	3027 ft²	0	-	3027 ft²	0	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	0 W	0	-	0	0	-
Task Lighting	10760 W	33509	-	0	0	-
Electric Equipment	2638 W	8687	-	0	0	-
People	102	17652	20348	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	6000	0	-	0	0
Safety Factor	20% / 0%	28639	0	30%	22466	0
>> Total Zone Loads	-	171836	20348	-	97353	0
Zone Conditioning	-	188620	20348	-	96411	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	8474 CFM	0	-	8474 CFM	0	-
Ventilation Load	4871 CFM	54290	97518	4871 CFM	370500	0
Supply Fan Load	8474 CFM	12564	-	8474 CFM	-12564	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	255473	117866	-	454348	0
Central Cooling Coil	-	255473	117867	-	0	0
Central Heating Coil	-	0	-	-	454348	-
>> Total Conditioning	-	255473	117867	-	454348	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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State of Registration MAINE
Firm Registration No. N/A
EEA Project No. 20166538

DRAWN BY: ARC
CHECKED BY: BKK

Digitally Signed
STATE OF MAINE
Michael N. Hart
No. 10507
LICENSED PROFESSIONAL ENGINEER
Michael N Hart, PE (ME)
2017.03.08 15:37:34-06'00'

west elm
Downtown Portland
164 Middle Street
Portland, ME 04101
PROJECT #006-160335.00

ISSUED / REVISED	DATE
PRELIMINARY SET	09/08/16
LL COORDINATION SET	11/08/16
LL/PERMIT SET	11/21/16

HVAC CALCULATIONS

M-004