RTU-1 SIZING SUMMARY

Air System Information

Air System Name	RTU-1	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	1517.0 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	5.9	Tons	Load occurs at	Jul 1600	
Total coil load	71.2	MBH	OA DB / WB	85.4 / 70.8	°F
Sensible coil load	58.5	MBH	Entering DB / WB	76.9 / 63.2	°F
Coil CFM at Jul 1600	2336	CFM	Leaving DB / WB	53.6 / 52.4	°F
Max block CFM	2336	CFM	Coil ADP	51.0	°F
Sum of peak zone CFM	2336	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.821		Resulting RH	46	%
ft²/Ton	255.5		Design supply temp.	55.0	°F
BTU/(hr·ft²)	47.0		Zone T-stat Check	1 of 1	OK
Water flow @ 10.0 °F rise	N/A		Max zone temperature deviation	0.0	°F

Central Heating Coil Sizing Data

Max coil load	62.1	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	2336	CFM	BTU/(hr·ft²)	40.9	
Max coil CFM	2336	CFM	Ent. DB / Lvg DB	54.7 / 79.3	°F
Water flow @ 20.0 °F drop	N/A				

Supply Fan Sizing Data

Actual max CFM	2336	CFM	Fan motor BHP	1.28	BHP
Standard CFM	2331	CFM	Fan motor kW	1.02	kW
Actual max CFM/ft²	1.54	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	417	CFM	CFM/person	20.63	CFM/person
CFM/ft²	0.28	CFM/ft²			

Air System Information

Air System Name	RTU-1	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	1517.0 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	2336	2336	1.54	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	47.8	Jul 1600	35.0	1517.0

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							
SALES (1)	1	47.8	Jul 1600	2336	35.0	1517.0	1.54

1. Summary

Ventilation Sizing Method	ASHRAE Std 62.1-2010	
Design Condition	Heating operation	
Occupant Diversity (D)	1.000	
Uncorrected Outdoor Air Intake (Vou)	334	CFM
System Ventilation Efficiency (Ev)	1.000	
Outdoor Air Intake (Vot)	417	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										
SALES (1)	1	2336	1517.0	0.12	20.2	7.50	0.80	417	*334*	1.000
Totals (incl. Space Multipliers)		2336						334		1.000

RTU-2 SIZING SUMMARY

Air System Information

Air System Name	RTU-2	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	2934.0 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	7.1	Tons	Load occurs at	Aug 1500	
Total coil load	85.7	MBH	OA DB / WB	86.0 / 71.0	°F
Sensible coil load	63.3	MBH	Entering DB / WB	79.2 / 65.3	°F
Coil CFM at Aug 1500	2295	CFM	Leaving DB / WB	53.6 / 52.4	°F
Max block CFM	2295	CFM	Coil ADP	50.8	°F
Sum of peak zone CFM	2295	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.739		Resulting RH	46	%
ft²/Ton	410.8		Design supply temp.	55.0	°F
BTU/(hr·ft²)	29.2		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	N/A		Max zone temperature deviation	0.6	°F

Central Heating Coil Sizing Data

Max coil load	92.1	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	2295	CFM	BTU/(hr·ft²)	28.0	
Max coil CFM	2295	CFM	Ent. DB / Lvg DB	43.3 / 76.4	°F
Water flow @ 20.0 °F drop	N/A				

Supply Fan Sizing Data

Actual max CFM	2295	CFM	Fan motor BHP	1.26	BHP
Standard CFM	2290	CFM	Fan motor kW	1.00	kW
Actual max CFM/ft²	0.78	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	791	CFM	CFM/person	22.59	CFM/person
CFM/ft²	0.27	CFM/ft²			

Air System Information

Air System Name	RTU-2	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	2934.0 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	2295	2295	0.78	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	47.0	Aug 1600	25.6	2934.0

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							
SALES (2)	1	13.9	Aug 1600	678	7.8	823.0	0.82
SALES (3)	1	8.1	Aug 1600	396	1.9	707.0	0.56
SALES (4)	1	22.4	Aug 1600	1093	10.7	1097.0	1.00
EXIT CORR.	1	2.6	Aug 1600	128	5.2	307.0	0.42

1. Summary

Ventilation Sizing Method	ASHRAE Std 62.1-2010	
Design Condition	Heating operation	
Occupant Diversity (D)	1.000	
Uncorrected Outdoor Air Intake (Vou)	615	CFM
System Ventilation Efficiency (Ev)	0.777	
Outdoor Air Intake (Vot)	791	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										
SALES (2)	1	678	823.0	0.12	11.0	7.50	0.80	226	*181*	0.934
SALES (3)	1	396	707.0	0.12	9.4	7.50	0.80	194	*156*	0.777
SALES (4)	1	1093	1097.0	0.12	14.6	7.50	0.80	302	*241*	0.992
EXIT CORR.	1	128	307.0	0.12	0.0	7.50	0.80	46	*37*	0.908
Totals (incl. Space Multipliers)		2295						615		0.777

RTU-3 SIZING SUMMARY

Air System Information

Air System Name	RTU-3	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	2070.0 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	5.5	Tons	Load occurs at	Aug 1500	
Total coil load	65.9	MBH	OA DB / WB	86.0 / 71.0	°F
Sensible coil load	50.6	MBH	Entering DB / WB	78.4 / 64.5	°F
Coil CFM at Aug 1500	1894	CFM	Leaving DB / WB	53.6 / 52.4	°F
Max block CFM	1894	CFM	Coil ADP	50.9	°F
Sum of peak zone CFM	1894	CFM	Bypass Factor	0.100	
Sensible heat ratio	0.768		Resulting RH	46	%
ft²/Ton	377.1		Design supply temp.	55.0	°F
BTU/(hr·ft²)	31.8		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	N/A		Max zone temperature deviation	0.7	°F

Central Heating Coil Sizing Data

Max coil load	54.3	MBH	Load occurs at	Des Htg	
Coil CFM at Des Htg	1894	CFM	BTU/(hr·ft²)	26.2	
Max coil CFM	1894	CFM	Ent. DB / Lvg DB	49.2 / 75.8	°F
Water flow @ 20.0 °F drop	N/A				

Supply Fan Sizing Data

Actual max CFM	1894	CFM	Fan motor BHP	1.04	BHP
Standard CFM	1890	CFM	Fan motor kW	0.82	kW
Actual max CFM/ft²	0.91	CFM/ft²	Fan static	2.00	in wg

Outdoor Ventilation Air Data

Design airflow CFM	498	CFM	CFM/person	18.04	CFM/person
CFM/ft²	0.24	CFM/ft²			

Air System Information

Air System Name	RTU-3	Number of zones	1
Equipment Class	PKG ROOF	Floor Area	2070.0 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	1894	1894	0.91	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	38.8	Aug 1500	19.1	2070.0

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							
SALES (5)	1	22.0	Aug 1500	1074	10.7	1099.0	0.98
SALES (6)	1	16.8	Aug 1500	820	8.4	971.0	0.84

1. Summary

Ventilation Sizing Method	ASHRAE Std 62.1-2010	
Design Condition	Heating operation	
Occupant Diversity (D)	1.000	
Uncorrected Outdoor Air Intake (Vou)	455	CFM
System Ventilation Efficiency (Ev)	0.915	
Outdoor Air Intake (Vot)	498	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										
SALES (5)	1	1074	1099.0	0.12	14.7	7.50	0.80	302	*242*	0.959
SALES (6)	1	820	971.0	0.12	12.9	7.50	0.80	267	*214*	0.915
Totals (incl. Space Multipliers)		1894							455	0.915

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

DRAWN BY: ARC
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STATE OF MAINE
Michael N. Hart
No. 10507
LICENSED PROFESSIONAL ENGINEER
Michael N Hart, PE (ME)
2017.03.08 15:37:12-06'00'

west elm
Dowtown 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-003