

RTU-1 SIZING SUMMARY

Air System Information
 Air System Name: RTU-1
 Equipment Class: PKG ROOF
 Air System Type: SZCAV
 Number of zones: 1
 Floor Area: 1517.0 ft²
 Location: Portland, Maine

Sizing Calculation Information
 Calculation Months: Jan to Dec
 Sizing Data: Calculated
 Zone CFM Sizing: Peak zone sensible load
 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 Aug 1500	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 %
RTTon	255.5	Design supply temp	55.0 °F
BTU/(hr·ft ²)	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·ft ²)	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/m ²	1.54 CFM/m ²	Fan static	2.00 in wg

Outdoor Ventilation Air Data

Design airflow CFM	417 CFM	CFM/person	20.63 CFM/person
CFM/m ²	0.28 CFM/m ²		

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

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/m ²	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	0.0	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 (ft ²)
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 (ft ²)	Space CFM/m ²
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)	Space Floor Area (ft ²)	Area Outdoor Air Rate (CFM/ft ²)	Average Occupancy (Pe)	People Outdoor Rate (CFM/person)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Ev2)
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						417	334	1.000

RTU-2 SIZING SUMMARY

Air System Information
 Air System Name: RTU-2
 Equipment Class: PKG ROOF
 Air System Type: SZCAV
 Number of zones: 1
 Floor Area: 2934.0 ft²
 Location: Portland, Maine

Sizing Calculation Information
 Calculation Months: Jan to Dec
 Sizing Data: Calculated
 Zone CFM Sizing: Peak zone sensible load
 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	50.6 °F
Sum of peak zone CFM	2295 CFM	Bypass Factor	0.100
Sensible heat ratio	0.739	Resulting RH	46 %
RTTon	410.5	Design supply temp	55.0 °F
BTU/(hr·ft ²)	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	82.1 MBH	Load occurs at	Des Htg
Coil CFM at Des Htg	2295 CFM	BTU/(hr·ft ²)	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	1.28 BHP
Standard CFM	2290 CFM	Fan motor kW	1.00 kW
Actual max CFM/m ²	0.78 CFM/m ²	Fan static	2.00 in wg

Outdoor Ventilation Air Data

Design airflow CFM	791 CFM	CFM/person	22.59 CFM/person
CFM/m ²	0.27 CFM/m ²		

Air System Information
 Air System Name: RTU-2
 Equipment Class: PKG ROOF
 Air System Type: SZCAV
 Number of zones: 1
 Floor Area: 2934.0 ft²
 Location: Portland, Maine

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

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/m ²	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	0.0	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 (ft ²)
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 (ft ²)	Space CFM/m ²
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)	Space Floor Area (ft ²)	Area Outdoor Air Rate (CFM/ft ²)	Average Occupancy (Pe)	People Outdoor Rate (CFM/person)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Ev2)
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						791	615	0.777

RTU-3 SIZING SUMMARY

Air System Information
 Air System Name: RTU-3
 Equipment Class: PKG ROOF
 Air System Type: SZCAV
 Number of zones: 1
 Floor Area: 2070.0 ft²
 Location: Portland, Maine

Sizing Calculation Information
 Calculation Months: Jan to Dec
 Sizing Data: Calculated
 Zone CFM Sizing: Peak zone sensible load
 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 %
RTTon	377.1	Design supply temp	55.0 °F
BTU/(hr·ft ²)	31.6	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·ft ²)	28.2
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/m ²	0.91 CFM/m ²	Fan static	2.00 in wg

Outdoor Ventilation Air Data

Design airflow CFM	488 CFM	CFM/person	18.04 CFM/person
CFM/m ²	0.24 CFM/m ²		

Air System Information
 Air System Name: RTU-3
 Equipment Class: PKG ROOF
 Air System Type: SZCAV
 Number of zones: 1
 Floor Area: 2070.0 ft²
 Location: Portland, Maine

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

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (CFM)	Minimum Supply Airflow (CFM)	Zone CFM/m ²	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	0.0	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 (ft ²)
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 (ft ²)	Space CFM/m ²
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): 488 CFM

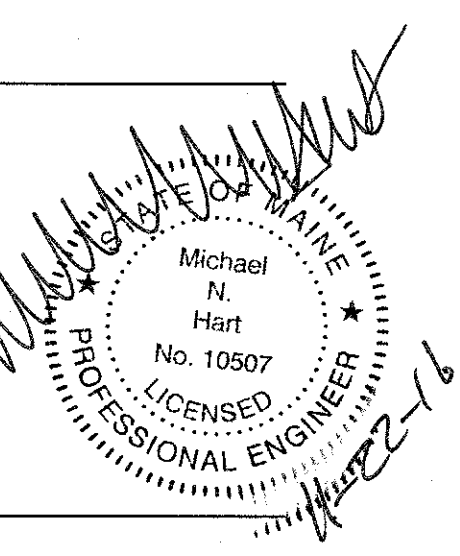
2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (ft ²)	Area Outdoor Air Rate (CFM/ft ²)	Average Occupancy (Pe)	People Outdoor Rate (CFM/person)	Air Distribution Effectiveness (Ez)	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM)	Space Ventilation Efficiency (Ev2)
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	455	0.915



EEA Consulting Engineers
 6615 Vaughn Ranch Road, Suite 200
 Austin, Texas 78738-2314 USA
 512.744.4400 main 512.744.4444 fax
 www.eea.com

State of Registration: MAINE
 Firm Registration No. N/A
 EEA Project No. 201605558
 DRAWN BY: ARC
 CHECKED BY: BKK



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-003