

Manual N Calculations
HVAC Load Calculations

July 22, 2022

Project Name: Business Facility for Mark Lane

Project Address: Baya Avenue
Lake City, FL 32025
Columbia County

Software: Carrier HAP v5.10

HAP is a multi-function tool supporting peak load calculation and system sizing for commercial buildings of any size. Peak loads are calculated with the ASHRAE Transfer Function Method. Required airflow rates and equipment capacities are derived based on the specified system type. Calculations use a full 8,760 hour-by-hour simulation approach.

HAP complies with ASHRAE Standard 183

Air System Sizing Summary for Split-System

Project Name: Lane Lake City
Prepared by: FloridaEnergyCalcs.com

07/22/2022
06:35AM

Air System Information

Air System Name **Split-System**
Equipment Class **SPLT AHU**
Air System Type **SZCAV**

Number of zones **1**
Floor Area **600.0** ft²
Location **Jacksonville IAP, Florida**

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**

Central Cooling Coil Sizing Data

Total coil load **2.0** Tons
Total coil load **23.9** MBH
Sensible coil load **23.0** MBH
Coil CFM at Sep 1400 **1105** CFM
Max block CFM **1105** CFM
Sum of peak zone CFM **1105** CFM
Sensible heat ratio **0.960**
CFM/Ton **553.5**
ft²/Ton **300.7**
BTU/(hr-ft²) **39.9**
Water flow @ 10.0 °F rise **N/A**

Load occurs at **Sep 1400**
OA DB / WB **91.5 / 75.9** °F
Entering DB / WB **75.7 / 62.7** °F
Leaving DB / WB **56.4 / 55.2** °F
Coil ADP **54.3** °F
Bypass Factor **0.100**
Resulting RH **48** %
Design supply temp. **56.0** °F
Zone T-stat Check **1 of 1** OK
Max zone temperature deviation **0.0** °F

Central Heating Coil Sizing Data

Max coil load **20.3** MBH
Coil CFM at Des Htg **1105** CFM
Max coil CFM **1105** CFM
Water flow @ 20.0 °F drop **N/A**

Load occurs at **Des Htg**
BTU/(hr-ft²) **33.9**
Ent. DB / Lvg DB **67.5 / 84.5** °F

Supply Fan Sizing Data

Actual max CFM **1105** CFM
Standard CFM **1103** CFM
Actual max CFM/ft² **1.84** CFM/ft²

Fan motor BHP **0.91** BHP
Fan motor kW **0.72** kW
Fan static **3.00** in wg

Outdoor Ventilation Air Data

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

CFM/person **0.00** CFM/person

Zone Sizing Summary for Split-System

Project Name: Lane Lake City
Prepared by: FloridaEnergyCalcs.com

07/22/2022
06:35AM

Air System Information

Air System Name **Split-System**
Equipment Class **SPLT AHU**
Air System Type **SZCAV**

Number of zones **1**
Floor Area **600.0** ft²
Location **Jacksonville IAP, Florida**

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/ft 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)
Split-System	1105	1105	1.84	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)
Split-System	21.0	Sep 1400	22.9	600.0

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/ft ²
Split-System							
Breakroom	1	7.2	Aug 1500	375	10.9	143.0	2.62
Office	1	4.3	Sep 1400	211	5.0	134.0	1.57
Reception	1	8.6	Oct 1300	419	4.6	248.0	1.69
Restroom	1	2.0	Jul 1500	99	2.5	75.0	1.33

Split-System Input Data

Project Name: Lane Lake City
Prepared by: FloridaEnergyCalcs.com

07/22/2022
06:36AM

1. General Details:

Air System Name Split-System
Equipment Type Split AHU
Air System Type Single Zone CAV
Number of zones 1

2. Ventilation System Components:

Ventilation Air Data:

Airflow Control Constant Ventilation Airflow
Ventilation Sizing Method Sum of Space OA Airflows
Unocc. Damper Position Closed
Damper Leak Rate 0 %
Outdoor Air CO2 Level 400 ppm

Central Cooling Data:

Supply Air Temperature 56.0 °F
Coil Bypass Factor 0.100
Cooling Source Air-Cooled DX
Schedule JFMAMJJASOND
Capacity Control Cycled or Staged Capacity - Fan On

Central Heating Data:

Supply Temperature 95.0 °F
Heating Source Electric Resistance
Schedule JFMAMJJASOND
Capacity Control Cycled or Staged Capacity - Fan On

Supply Fan Data:

Fan Type Forward Curved
Configuration Draw-thru
Fan Performance 3.00 in wg
Overall Efficiency 54 %
Fan Control 1-speed fan, cooling and heating

Duct System Data:

Supply Duct Data:

Duct Heat Gain 0 %
Duct Leakage 0 %

Return Duct or Plenum Data:

Return Air Via Ducted Return

3. Zone Components:

Space Assignments:

Zone 1: Split-System	
Breakroom	x1
Office	x1
Reception	x1
Restroom	x1

Thermostats and Zone Data:

Zone	Cooling T-Stat Occ. (°F)	Cooling T-Stat Unocc. (°F)	Heating T-Stat Occ. (°F)	Heating T-Stat Unocc. (°F)	T-Stat Throttling Range (°F)	Diversity Factor (%)	Direct Exhaust Airflow (CFM)	Direct Exhaust Fan (kW)
1	75.0	75.0	68.0	68.0	1.00	100	0.0	0.0

Thermostat Schedule Fan/Thermostat Schedule
Unoccupied Cooling is Available

Supply Terminals Data:

Zone	Terminal Type	Air Distribution	Air Distribution Effectiveness Specification	Air Distribution Effectiveness	Minimum Airflow	Fan Performance	Fan Efficiency	Design Supply Temp.
1	Diffuser (no reheat)	Ceiling supply / ceiling return	Not Used	-	0.00 CFM/person	-	-	-

Split-System Input Data

Project Name: Lane Lake City
Prepared by: FloridaEnergyCalcs.com

07/22/2022
06:36AM

Zone Heating Units:

Zone Unit Heat Source **Electric Resistance**
Zone Heating Unit Schedule **JFMAMJJASOND**

4. Sizing Data (Computer-Generated):

System Sizing Data:

Sizing Data:

Cooling Supply Temperature **56.0** °F
Supply Fan Airflow **1104.5** CFM
Ventilation Airflow **0.0** CFM
Heating Supply Temperature **95.0** °F

Hydronic Sizing Specifications:

Chilled Water Delta-T **10.0** °F
Hot Water Delta-T **20.0** °F

Safety Factors:

Cooling Sensible **15** %
Cooling Latent **15** %
Heating **0** %

Zone Sizing Data:

Zone Airflow Sizing Method **Sum of space airflow rates**
Space Airflow Sizing Method **Individual peak space loads**

Zone	Supply Airflow (CFM)	Zone Htg Unit (MBH)	Reheat Coil (MBH)	- (CFM)
1	1104.5	-	-	

5. Equipment Data

Central Cooling Unit - Air-Cooled DX

Estimated Maximum Load **23.9** MBH
Design OAT **95.0** °F
Equipment Sizing **Auto-Sized**
Capacity Oversizing Factor **0** %
ARI Performance Rating **11.000** EER
DX System Configuration **1-stage compression, 1 circuit**
Conventional Cutoff OAT **55.0** °F
Low Temperature Operation **Used**
Low Temperature Cutoff OAT **0.0** °F

Space Input Data

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:36AM

Breakroom

1. General Details:

Floor Area 143.0 ft²
Avg. Ceiling Height 10.0 ft
Building Weight 70.0 lb/ft²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 CFM/person
OA Requirement 2 0.00 CFM/ft²
Space Usage Defaults .. ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type Recessed (Unvented)
Wattage 1.10 W/ft²
Ballast Multiplier 1.00
Schedule Lights

2.4. People:

Occupancy 2.0 People
Activity Level Seated at Rest
Sensible 230.0 BTU/hr/person
Latent 120.0 BTU/hr/person
Schedule People

2.2. Task Lighting:

Wattage 0.00 W/ft²
Schedule None

2.5. Miscellaneous Loads:

Sensible 0 BTU/hr
Schedule None
Latent 0 BTU/hr
Schedule None

2.3. Electrical Equipment:

Wattage 0.3 Watts
Schedule Lights

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (ft ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
N	240.0	0	0	1
S	352.0	0	0	0
E	592.0	0	0	0

3.1. Construction Types for Exposure N

Wall Type Metal Bldg Walls
Door Type 14' Roll up door

3.2. Construction Types for Exposure S

Wall Type Metal Bldg Walls

3.3. Construction Types for Exposure E

Wall Type Metal Bldg Walls

4. Roofs, Skylights:

Exp.	Roof Gross Area (ft ²)	Roof Slope (deg.)	Skylight Qty.
H	143.0	0	0

4.1. Construction Types for Exposure H

Roof Type Metal Bldg Roof

5. Infiltration:

Design Cooling 0.00 ACH
Design Heating 0.00 CFM
Energy Analysis 0.00 CFM
Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 143.0 ft²
Total Floor U-Value 0.333 BTU/(hr·ft²·°F)
Exposed Perimeter 140.0 ft
Edge Insulation R-Value 0.00 (hr·ft²·°F)/BTU

7. Partitions:

(No partition data).

Space Input Data

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:36AM

Office

1. General Details:

Floor Area 134.0 ft²
Avg. Ceiling Height 10.0 ft
Building Weight 70.0 lb/ft²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 CFM/person
OA Requirement 2 0.00 CFM/ft²
Space Usage Defaults .. ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type Recessed (Unvented)
Wattage 1.10 W/ft²
Ballast Multiplier 1.00
Schedule Lights

2.4. People:

Occupancy 1.0 Person
Activity Level Seated at Rest
Sensible 230.0 BTU/hr/person
Latent 120.0 BTU/hr/person
Schedule People

2.2. Task Lighting:

Wattage 0.00 W/ft²
Schedule None

2.5. Miscellaneous Loads:

Sensible 0 BTU/hr
Schedule None
Latent 0 BTU/hr
Schedule None

2.3. Electrical Equipment:

Wattage 0.3 Watts
Schedule Lights

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (ft ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
S	60.0	1	0	0

3.1. Construction Types for Exposure S

Wall Type Metal Bldg Walls
1st Window Type 4x6 Window

4. Roofs, Skylights:

Exp.	Roof Gross Area (ft ²)	Roof Slope (deg.)	Skylight Qty.
H	133.0	0	0

4.1. Construction Types for Exposure H

Roof Type Metal Bldg Roof

5. Infiltration:

Design Cooling 0.00 ACH
Design Heating 0.00 CFM/ft²
Energy Analysis 0.00 CFM

Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 133.0 ft²
Total Floor U-Value 0.333 BTU/(hr·ft²·°F)
Exposed Perimeter 140.0 ft
Edge Insulation R-Value 0.00 (hr·ft²·°F)/BTU

7. Partitions:

7.1. 1st Partition Details:

Partition Type Wall Partition
Area 200.0 ft²
U-Value 0.500 BTU/(hr·ft²·°F)
Uncondit. Space Max Temp 95.0 °F
Ambient at Space Max Temp 95.0 °F
Uncondit. Space Min Temp 35.0 °F
Ambient at Space Min Temp 55.0 °F

7.2. 2nd Partition Details:

(No partition data).

Space Input Data

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:36AM

Reception

1. General Details:

Floor Area 248.0 ft²
Avg. Ceiling Height 10.0 ft
Building Weight 70.0 lb/ft²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 CFM/person
OA Requirement 2 0.00 CFM/ft²
Space Usage Defaults .. ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type Recessed (Unvented)
Wattage 1.10 W/ft²
Ballast Multiplier 1.00
Schedule Lights

2.4. People:

Occupancy 2.0 People
Activity Level Seated at Rest
Sensible 230.0 BTU/hr/person
Latent 120.0 BTU/hr/person
Schedule People

2.2. Task Lighting:

Wattage 0.00 W/ft²
Schedule None

2.5. Miscellaneous Loads:

Sensible 0 BTU/hr
Schedule None
Latent 0 BTU/hr
Schedule None

2.3. Electrical Equipment:

Wattage 0.3 Watts
Schedule Lights

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (ft ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
E	200.0	1	0	0
S	352.0	1	0	1

3.1. Construction Types for Exposure E

Wall Type Metal Bldg Walls
1st Window Type 4x6 Window

3.2. Construction Types for Exposure S

Wall Type Metal Bldg Walls
1st Window Type 4x6 Window
Door Type 3x7 Door

4. Roofs, Skylights:

Exp.	Roof Gross Area (ft ²)	Roof Slope (deg.)	Skylight Qty.
H	248.0	0	0

4.1. Construction Types for Exposure H

Roof Type Metal Bldg Roof

5. Infiltration:

Design Cooling 0.00 ACH
Design Heating 0.00 ACH
Energy Analysis 0.00 CFM
Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 248.0 ft²
Total Floor U-Value 0.333 BTU/(hr·ft²·°F)
Exposed Perimeter 140.0 ft
Edge Insulation R-Value 0.00 (hr·ft²·°F)/BTU

7. Partitions:

(No partition data).

Space Input Data

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:36AM

Restroom

1. General Details:

Floor Area 75.0 ft²
Avg. Ceiling Height 10.0 ft
Building Weight 70.0 lb/ft²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 CFM/person
OA Requirement 2 0.00 CFM/ft²
Space Usage Defaults .. ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type Recessed (Unvented)
Wattage 1.10 W/ft²
Ballast Multiplier 1.00
Schedule Lights

2.4. People:

Occupancy 2.0 People
Activity Level Seated at Rest
Sensible 230.0 BTU/hr/person
Latent 120.0 BTU/hr/person
Schedule People

2.2. Task Lighting:

Wattage 0.00 W/ft²
Schedule None

2.5. Miscellaneous Loads:

Sensible 0 BTU/hr
Schedule None
Latent 0 BTU/hr
Schedule None

2.3. Electrical Equipment:

Wattage 0.3 Watts
Schedule Lights

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (ft ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
N	60.0	0	0	0

3.1. Construction Types for Exposure N

Wall Type Metal Bldg Walls

4. Roofs, Skylights:

Exp.	Roof Gross Area (ft ²)	Roof Slope (deg.)	Skylight Qty.
H	75.0	0	0

4.1. Construction Types for Exposure H

Roof Type Metal Bldg Roof

5. Infiltration:

Design Cooling 0.00 ACH
Design Heating 0.00 CFM/ft²
Energy Analysis 0.00 CFM
Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 75.0 ft²
Total Floor U-Value 0.333 BTU/(hr·ft²·°F)
Exposed Perimeter 140.0 ft
Edge Insulation R-Value 0.00 (hr·ft²·°F)/BTU

7. Partitions:

7.1. 1st Partition Details:

Partition Type Wall Partition
Area 100.0 ft²
U-Value 0.500 BTU/(hr·ft²·°F)
Uncondit. Space Max Temp 95.0 °F
Ambient at Space Max Temp 95.0 °F
Uncondit. Space Min Temp 35.0 °F
Ambient at Space Min Temp 55.0 °F

7.2. 2nd Partition Details:

(No partition data).

Wall Constructions

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:36AM

Metal Bldg Walls

Wall Details

Outside Surface Color **Medium**
Absorptivity **0.675**
Overall U-Value **0.069** BTU/(hr·ft²·°F)

Wall Layers Details (Inside to Outside)

Layers	Thickness in	Density lb/ft ³	Specific Ht. BTU / (lb·°F)	R-Value (hr·ft ² ·°F)/BTU	Weight lb/ft ²
Inside surface resistance	0.000	0.0	0.00	0.68500	0.0
5/8-in gypsum board	0.625	50.0	0.26	0.56004	2.6
R-13 batt insulation	4.000	0.5	0.20	12.82051	0.2
Metal Bldg Siding	0.034	489.0	0.12	0.00011	1.4
Outside surface resistance	0.000	0.0	0.00	0.33300	0.0
Totals	4.659	-		14.39866	4.1

Window Constructions

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:37AM

4x6 Window

Window Details:

Detailed Input	No	
Height	6.00	ft
Width	4.00	ft
Overall U-Value	0.588	BTU/(hr·ft ² ·°F)
Overall Shade Coefficient	0.811	

Door Constructions

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:37AM

3x7 Door

Door Details:

Gross Area **20.0** ft²
Door U-Value **0.300** BTU/(hr·ft²·°F)

Glass Details:

Glass Area **17.0** ft²
Glass U-Value **0.580** BTU/(hr·ft²·°F)
Glass Shade Coefficient **0.880**
Glass Shaded All Day? **No**

Roof Constructions

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:37AM

Metal Bldg Roof

Roof Details

Outside Surface Color **Dark**
Absorptivity **0.900**
Overall U-Value **0.049** BTU/(hr·ft²·°F)

Roof Layers Details (Inside to Outside)

Layers	Thickness in	Density lb/ft ³	Specific Ht. BTU / (lb·°F)	R-Value (hr·ft ² ·°F)/BTU	Weight lb/ft ²
Inside surface resistance	0.000	0.0	0.00	0.68500	0.0
Steel deck	0.034	489.0	0.12	0.00011	1.4
R-19 batt insulation	6.000	0.5	0.20	19.23077	0.3
Metal Roof	0.034	489.0	0.12	0.00011	1.4
Outside surface resistance	0.000	0.0	0.00	0.33300	0.0
Totals	6.067	-		20.24898	3.0

Design Weather Parameters & MSHGs

Lane Lake City
FloridaEnergyCalcs.com

07/22/2022
06:37AM

Design Parameters:

City Name **Jacksonville IAP**
 Location **Florida**
 Latitude **30.5** Deg.
 Longitude **81.7** Deg.
 Elevation **30.0** ft
 Summer Design Dry-Bulb **94.0** °F
 Summer Coincident Wet-Bulb **77.0** °F
 Summer Daily Range **17.8** °F
 Winter Design Dry-Bulb **29.0** °F
 Winter Design Wet-Bulb **24.4** °F
 Atmospheric Clearness Number **0.90**
 Average Ground Reflectance **0.20**
 Soil Conductivity **0.800** BTU/(hr·ft·°F)
 Local Time Zone (GMT +/- N hours) **5.0** hours
 Consider Daylight Savings Time **No**
 Simulation Weather Data **N/A**
 Current Data is **2001 ASHRAE Handbook**
 Design Cooling Months **January to December**

Design Day Maximum Solar Heat Gains

(The MSHG values are expressed in BTU/(hr·ft²))

Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S
January	21.8	21.8	29.5	95.1	162.7	208.0	225.4	223.2	219.1
February	25.1	25.1	63.9	135.4	185.2	220.3	221.2	205.4	194.0
March	28.8	34.0	101.2	166.9	205.2	213.7	202.3	171.2	152.0
April	32.2	73.6	134.5	180.9	204.2	196.4	165.2	121.2	96.4
May	35.4	101.3	154.9	186.4	197.0	178.3	134.7	83.3	60.5
June	43.9	110.9	159.4	187.9	192.5	168.6	121.5	69.1	49.8
July	36.3	100.6	150.2	185.7	193.8	173.1	132.1	81.1	59.0
August	33.7	72.8	129.6	176.6	197.2	188.1	159.7	116.9	93.2
September	29.7	32.5	95.0	156.4	195.9	205.6	194.5	166.2	148.2
October	25.8	25.8	58.8	130.0	183.5	208.3	216.2	200.6	188.2
November	22.0	22.0	24.9	99.3	157.1	203.2	223.0	221.9	215.5
December	20.3	20.3	20.3	82.8	148.5	199.7	221.8	226.7	224.8
Month	SSW	SW	WSW	W	WNW	NW	NNW	HOR	Mult
January	224.8	225.4	207.8	157.7	100.6	26.7	21.8	165.3	1.00
February	206.8	223.6	215.8	190.1	136.2	57.2	25.1	200.7	1.00
March	171.3	202.3	214.7	206.1	165.6	99.6	34.3	231.2	1.00
April	121.4	165.8	194.9	204.4	182.7	133.3	73.4	246.2	1.00
May	83.8	136.1	177.1	198.1	189.4	152.6	100.7	250.2	1.00
June	69.2	121.9	168.4	192.8	188.7	158.5	110.8	249.4	1.00
July	80.9	131.5	173.7	193.4	184.5	151.4	101.0	246.8	1.00
August	117.0	159.7	187.9	197.2	176.7	129.9	72.7	241.1	1.00
September	165.6	193.9	206.5	192.1	157.9	98.4	30.1	223.4	1.00
October	198.9	213.7	212.7	181.6	126.0	63.2	25.8	196.2	1.00
November	221.1	223.2	202.8	161.3	92.5	29.5	22.0	163.7	1.00
December	226.4	223.4	198.9	150.4	78.5	20.3	20.3	149.7	1.00

Mult. = User-defined solar multiplier factor.