

Air System Sizing Summary for AC-1

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

Air System Information

Air System Name: **AC-1**
Air System Type: **Single Zone CAV**

Number of zones: **1**
Floor Area: **2140.2** sqft
Location: **Miami, Florida**

Sizing Calculation Information

Calculation Months: **Aug to Aug**

Calculation method: **Transfer Function Method**

Central Cooling Coil Sizing Data

Total coil load: **4.6** Tons
Total coil load: **54.7** MBH
Sensible coil load: **48.4** MBH
Coil airflow: **2000** CFM
Sensible heat ratio: **0.886**
Area per unit load: **469.8** sqft/Ton
Load per unit area: **25.5** BTU/(hr-sqft)

Load occurs at: **Aug 1600**
OA DB / WB: **90.7/76.9** F
Entering DB / WB: **76.8/62.7** F
Leaving DB / WB: **54.4/53.1** F
Coil ADP: **51.9** F
Bypass Factor: **0.100**
Resulting RH: **47** %
Design supply temp: **53.9** F

Central Heating Coil Sizing Data

Max coil load: **25.3** MBH
Coil airflow: **2000** CFM
Load per unit area: **11.8** BTU/(hr-sqft)

Load occurs at: **Des Htg**
Ent DB / Lvg DB: **68.3/80.0** F

Supply Fan Sizing Data

Actual max airflow: **2000** CFM
Standard airflow: **1999** CFM
Actual max airflow per unit area: **0.93** CFM/sqft

Fan motor BHP: **0.29** BHP
Fan motor kW: **0.22** kW
Fan static: **0.50** in wg

Outdoor Ventilation Air Data

Design airflow: **120** CFM
Airflow per unit floor area: **0.06** CFM/sqft

Airflow per person: **20.00** CFM/person

Space Sizing Data

Space Name	Maximum Cooling Sensible MBH	Design Airflow CFM	Time of Peak Load	Maximum Heating Load MBH	Space Floor Area sqft	Space CFM/sqft
01-GUEST ENTRY	4.4	201	Aug 1700	2.3	427.8	0.47
02-MEDIA ROOM	11.2	519	Aug 1600	6.5	364.3	1.42
03-BAR	4.3	199	Aug 1600	2.4	252.2	0.79
04-DINING	10.1	465	Aug 1600	6.2	352.9	1.32
05-FAMILY ROOM	5.0	233	Aug 1400	2.7	325.0	0.72
06-KITCHEN	8.6	399	Aug 1700	3.8	418.0	0.95
Zone	43.3	2000	Aug 1600	24.0	2140.2	0.93

Note: Table contains data for all spaces controlled by a single thermostat:

Space sizing basis: **Peak space load**
Zone sizing basis: **Peak zone load**

System Design Load Summary for AC-1

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

	DESIGN COOLING			DESIGN HEATING		
	Aug 1600 OA DB / WB 90.7 F / 76.9 F			Design Heating Day OA DB / WB 46 F / 38.6 F		
Zone Loads based on TFM	Details	Sensible BTU/hr	Latent BTU/hr	Details	Sensible BTU/hr	Latent BTU/hr
Window and Skylight Solar Loads	764 sqft	17765	-	764 sqft	-	-
Wall Transmission	1066 sqft	2987	-	1066 sqft	2992	-
Roof Transmission	1210 sqft	0	-	1210 sqft	871	-
Window Transmission	764 sqft	10664	-	764 sqft	17225	-
Skylight Transmission	0 sqft	0	-	0 sqft	0	-
Door Loads	54 sqft	1929	-	54 sqft	1080	-
Floor Transmission	2140 sqft	310	-	2140 sqft	1801	-
Partitions/Ceilings	0 sqft	0	-	0 sqft	0	-
Overhead Lighting	1394 W	2378	-	0 W	0	-
Electric Equipment	1284 W	4381	-	0 W	0	-
People	6	1380	720	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	1500	750	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>>Total Zone Loads	-	43293	1470	-	23969	0
Thermostat and Pulldown Adjustment	-	-754	0	-	-955	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	100%	879	-	0	0	-
Plenum Lighting Load	50%	2378	-	0	0	-
Ventilation Load	120 CFM	1905	4758	120 CFM	3067	0
Supply Fan Load	2000 CFM	741	-	2000 CFM	-741	-
>> Total System Loads	-	48442	6228	-	25340	0
Central Cooling Coil	-	48442	6230	-	0	0
Central Heating Coil	-	0	-	-	25340	-
>> Total Coil Loads	-	48442	6230	-	25340	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

System Input Data

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:18AM

General Details:

Air System Name:.....AC-1
Air System Type:.....Single Zone CAV
Number of zones:.....1
System Startup:.....6
Duration of Operation:.....24

Central Cooling Coil Data:

Used?:.....YES
Supply Air Temperature:.....2000.0 F
Coil Bypass Factor:.....0.100

Central Heating Coil Data:

Used?:.....YES
Supply Temperature:.....110.0 F

Supply Fan Data:

Configuration:.....Draw-thru
Fan Performance:.....0.50 in wg

Ceiling Return Air Plenum Data:

Return Air Via:.....Return Air Plenum
Roof Heat Gain to Plenum:.....100
Lighting Heat Gain to Plenum:.....50
Wall Heat Gain to Plenum:.....0

Zones Included:

Zone Names
01-GUEST ENTRY

Thermostats Data:

Cooling T-stat: Occ:.....74.0 F
Cooling T-stat: Unocc:.....85.0 F
Heating T-stat: Occ:.....70.0 F
Heating T-stat: Unocc:.....60.0 F

Safety Factors:

Cooling Sensible Safety Factor:.....0 %
Cooling Latent Safety Factor:.....0 %
Heating Safety Factor:.....0 %

Air System Sizing Summary for AC-2

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

Air System Information

Air System Name: **AC-2**
Air System Type: **Single Zone CAV**

Number of zones: **1**
Floor Area: **2205.0** sqft
Location: **Miami, Florida**

Sizing Calculation Information

Calculation Months: **Aug to Aug**

Calculation method: **Transfer Function Method**

Central Cooling Coil Sizing Data

Total coil load: **4.0** Tons
Total coil load: **48.4** MBH
Sensible coil load: **43.4** MBH
Coil airflow: **2000** CFM
Sensible heat ratio: **0.897**
Area per unit load: **546.3** sqft/Ton
Load per unit area: **22.0** BTU/(hr-sqft)

Load occurs at: **Aug 1600**
OA DB / WB: **90.7/76.9** F
Entering DB / WB: **75.4/62.5** F
Leaving DB / WB: **55.3/54.1** F
Coil ADP: **53.1** F
Bypass Factor: **0.100**
Resulting RH: **.48** %
Design supply temp: **54.9** F

Central Heating Coil Sizing Data

Max coil load: **21.9** MBH
Coil airflow: **2000** CFM
Load per unit area: **9.9** BTU/(hr-sqft)

Load occurs at: **Des Htg**
Ent DB / Lvg DB: **68.3/78.5** F

Supply Fan Sizing Data

Actual max airflow: **2000** CFM
Standard airflow: **1999** CFM
Actual max airflow per unit area: **0.91** CFM/sqft

Fan motor BHP: **0.29** BHP
Fan motor kW: **0.22** kW
Fan static: **0.50** in wg

Outdoor Ventilation Air Data

Design airflow: **120** CFM
Airflow per unit floor area: **0.05** CFM/sqft

Airflow per person: **40.00** CFM/person

Space Sizing Data

Space Name	Maximum Cooling Sensible MBH	Design Airflow CFM	Time of Peak Load	Maximum Heating Load MBH	Space Floor Area sqft	Space CFM/sqft
07-PANTRY/STORAGE	3.9	190	Aug 1400	1.7	318.4	0.60
08-STAIR	5.4	264	Aug 1400	2.6	360.0	0.73
09-BEDROOM 1	18.5	900	Aug 1600	9.8	750.0	1.20
10-HALL	4.1	197	Aug 1400	2.4	211.5	0.93
11-LAUNDRY	3.1	149	Aug 1700	1.4	195.6	0.76
12-BEDROOM 2	6.5	313	Aug 1600	2.6	369.5	0.85
Zone	41.2	2000	Aug 1600	20.4	2205.0	0.91

Note: Table contains data for all spaces controlled by a single thermostat:

Space sizing basis: **Peak space load**
Zone sizing basis: **Peak zone load**

System Design Load Summary for AC-2

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

	DESIGN COOLING			DESIGN HEATING		
	Aug 1600 OA DB / WB 90.7 F / 76.9 F			Design Heating Day OA DB / WB 46 F / 38.6 F		
Zone Loads based on TFM	Details	Sensible BTU/hr	Latent BTU/hr	Details	Sensible BTU/hr	Latent BTU/hr
Window and Skylight Solar Loads	560 sqft	11870	-	560 sqft	-	-
Wall Transmission	1243 sqft	3516	-	1243 sqft	3489	-
Roof Transmission	1527 sqft	1109	-	1527 sqft	1099	-
Window Transmission	560 sqft	7827	-	560 sqft	12643	-
Skylight Transmission	0 sqft	0	-	0 sqft	0	-
Door Loads	108 sqft	2895	-	108 sqft	2160	-
Floor Transmission	2205 sqft	0	-	2205 sqft	998	-
Partitions/Ceilings	0 sqft	0	-	0 sqft	0	-
Overhead Lighting	2127 W	7256	-	0 W	0	-
Electric Equipment	1764 W	6019	-	0 W	0	-
People	3	690	360	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>>Total Zone Loads	-	41182	360	-	20389	0
Thermostat and Pulldown Adjustment	-	-583	0	-	-799	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Ventilation Load	120 CFM	2100	4627	120 CFM	3074	0
Supply Fan Load	2000 CFM	741	-	2000 CFM	-741	-
>> Total System Loads	-	43441	4987	-	21922	0
Central Cooling Coil	-	43441	4994	-	0	0
Central Heating Coil	-	0	-	-	21922	-
>> Total Coil Loads	-	43441	4994	-	21922	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

System Input Data

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:18AM

General Details:

Air System Name:.....AC-2
Air System Type:.....Single Zone CAV
Number of zones:.....1
System Startup:.....6
Duration of Operation:.....24

Central Cooling Coil Data:

Used?:.....YES
Supply Air Temperature:.....2000.0 F
Coil Bypass Factor:.....0.100

Central Heating Coil Data:

Used?:.....YES
Supply Temperature:.....110.0 F

Supply Fan Data:

Configuration:.....Draw-thru
Fan Performance:.....0.50 in wg

Ceiling Return Air Plenum Data:

Return Air Via:.....Ducted Return

Zones Included:

Zone Names
07-PANTRY/STORAGE

Thermostats Data:

Cooling T-stat: Occ:.....74.0 F
Cooling T-stat: Unocc:.....85.0 F
Heating T-stat: Occ:.....70.0 F
Heating T-stat: Unocc:.....60.0 F

Safety Factors:

Cooling Sensible Safety Factor:.....0 %
Cooling Latent Safety Factor:.....0 %
Heating Safety Factor:.....0 %

Air System Sizing Summary for AC-3

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

Air System Information

Air System Name: AC-3
Air System Type: Single Zone CAV

Number of zones: 1
Floor Area: 1597.6 sqft
Location: Miami, Florida

Sizing Calculation Information

Calculation Months: Aug to Aug

Calculation method: Transfer Function Method

Central Cooling Coil Sizing Data

Total coil load: 2.7 Tons
Total coil load: 32.4 MBH
Sensible coil load: 28.9 MBH
Coil airflow: 1400 CFM
Sensible heat ratio: 0.892
Area per unit load: 591.2 sqft/Ton
Load per unit area: 20.3 BTU/(hr-sqft)

Load occurs at: Aug 1600
OA DB / WB: 90.7/76.9 F
Entering DB / WB: 75.4/63.1 F
Leaving DB / WB: 56.3/55.1 F
Coil ADP: 54.1 F
Bypass Factor: 0.100
Resulting RH: 50 %
Design supply temp: 56.0 F

Central Heating Coil Sizing Data

Max coil load: 14.8 MBH
Coil airflow: 1400 CFM
Load per unit area: 9.2 BTU/(hr-sqft)

Load occurs at: Des Htg
Ent DB / Lvg DB: 68.4/78.2 F

Supply Fan Sizing Data

Actual max airflow: 1400 CFM
Standard airflow: 1399 CFM
Actual max airflow per unit area: 0.88 CFM/sqft

Fan motor BHP: 0.20 BHP
Fan motor kW: 0.15 kW
Fan static: 0.50 in wg

Outdoor Ventilation Air Data

Design airflow: 85 CFM
Airflow per unit floor area: 0.05 CFM/sqft

Airflow per person: 28.33 CFM/person

Space Sizing Data

Space Name	Maximum Cooling Sensible MBH	Design Airflow CFM	Time of Peak Load	Maximum Heating Load MBH	Space Floor Area sqft	Space CFM/sqft
01-LOUNGE	5.4	277	Aug 1600	2.5	352.7	0.79
05-HALL	5.8	299	Aug 1700	3.0	210.0	1.42
02-BEDROOM 3	4.5	233	Aug 1400	2.1	318.5	0.73
03-BEDROOM 4	4.6	236	Aug 1400	2.1	329.0	0.72
04-BEDROOM 5	7.1	365	Aug 1600	3.7	387.4	0.94
Zone	27.2	1400	Aug 1600	13.3	1597.6	0.88

Note: Table contains data for all spaces controlled by a single thermostat:

Space sizing basis: Peak space load

Zone sizing basis: Peak zone load

System Design Load Summary for AC-3

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

	DESIGN COOLING			DESIGN HEATING		
	Aug 1600 OA DB / WB 90.7 F / 76.9 F			Design Heating Day OA DB / WB 46 F / 38.6 F		
Zone Loads based on TFM	Details	Sensible BTU/hr	Latent BTU/hr	Details	Sensible BTU/hr	Latent BTU/hr
Window and Skylight Solar Loads	224 sqft	5456	-	224 sqft	-	-
Wall Transmission	1392 sqft	4017	-	1392 sqft	3907	-
Roof Transmission	1598 sqft	1161	-	1598 sqft	1151	-
Window Transmission	224 sqft	3122	-	224 sqft	5042	-
Skylight Transmission	0 sqft	0	-	0 sqft	0	-
Door Loads	162 sqft	4342	-	162 sqft	3240	-
Floor Transmission	0 sqft	0	-	0 sqft	0	-
Partitions/Ceilings	0 sqft	0	-	0 sqft	0	-
Overhead Lighting	1278 W	4361	-	0 W	0	-
Electric Equipment	1198 W	4088	-	0 W	0	-
People	3	690	360	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>>Total Zone Loads	-	27237	360	-	13340	0
Thermostat and Pulldown Adjustment	-	-310	0	-	-254	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Ventilation Load	85 CFM	1491	3132	85 CFM	2192	0
Supply Fan Load	1400 CFM	519	-	1400 CFM	-519	-
>> Total System Loads	-	28936	3492	-	14759	0
Central Cooling Coil	-	28936	3493	-	0	0
Central Heating Coil	-	0	-	-	14759	-
>> Total Coil Loads	-	28936	3493	-	14759	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

System Input Data

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:18AM

General Details:

Air System Name:.....AC-3
Air System Type:.....Single Zone CAV
Number of zones:.....1
System Startup:.....6
Duration of Operation:.....24

Central Cooling Coil Data:

Used?:.....YES
Supply Air Temperature:.....1400.0 F
Coil Bypass Factor:.....0.100

Central Heating Coil Data:

Used?:.....YES
Supply Temperature:.....110.0 F

Supply Fan Data:

Configuration:.....Draw-thru
Fan Performance:.....0.50 in wg

Ceiling Return Air Plenum Data:

Return Air Via:.....Ducted Return

Zones Included:

Zone Names
01-LOUNGE

Thermostats Data:

Cooling T-stat: Occ:.....74.0 F
Cooling T-stat: Unocc:.....85.0 F
Heating T-stat: Occ:.....70.0 F
Heating T-stat: Unocc:.....60.0 F

Safety Factors:

Cooling Sensible Safety Factor:.....0 %
Cooling Latent Safety Factor:.....0 %
Heating Safety Factor:.....0 %

Air System Sizing Summary for AC-4

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

Air System Information

Air System Name: AC-4
Air System Type: Single Zone CAV

Number of zones: 1
Floor Area: 83.6 sqft
Location: Miami, Florida

Sizing Calculation Information

Calculation Months: Aug to Aug

Calculation method: Transfer Function Method

Central Cooling Coil Sizing Data

Total coil load: 0.7 Tons
Total coil load: 8.3 MBH
Sensible coil load: 6.5 MBH
Coil airflow: 230 CFM
Sensible heat ratio: 0.783
Area per unit load: 120.7 sqft/Ton
Load per unit area: 99.4 BTU/(hr-sqft)

Load occurs at: Aug 1500
OA DB / WB: 91.0/77.0 F
Entering DB / WB: 74.8/61.1 F
Leaving DB / WB: 48.6/47.4 F
Coil ADP: 45.7 F
Bypass Factor: 0.100
Resulting RH: 45 %
Design supply temp: 48.3 F

Central Heating Coil Sizing Data

Max coil load: 2.1 MBH
Coil airflow: 230 CFM
Load per unit area: 25.7 BTU/(hr-sqft)

Load occurs at: Des Htg
Ent DB / Lvg DB: 69.3/77.9 F

Supply Fan Sizing Data

Actual max airflow: 230 CFM
Standard airflow: 230 CFM
Actual max airflow per unit area: 2.75 CFM/sqft

Fan motor BHP: 0.03 BHP
Fan motor kW: 0.02 kW
Fan static: 0.50 in wg

Outdoor Ventilation Air Data

Design airflow: 5 CFM
Airflow per unit floor area: 0.06 CFM/sqft

Airflow per person: 0.00 CFM/person

Space Sizing Data

Space Name	Maximum Cooling Sensible MBH	Design Airflow CFM	Time of Peak Load	Maximum Heating Load MBH	Space Floor Area sqft	Space CFM/sqft
01-STORAGE	4.5	163	Aug 1500	1.1	38.0	4.30
02-W/C	1.9	69	Aug 1100	1.1	45.6	1.50
Zone	6.4	230	Aug 1400	2.1	83.6	2.75

Note: Table contains data for all spaces controlled by a single thermostat:

Space sizing basis: Peak space load

Zone sizing basis: Peak zone load

System Design Load Summary for AC-4

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:17AM

	DESIGN COOLING			DESIGN HEATING		
	Aug 1500 OA DB / WB 91 F / 77 F			Design Heating Day OA DB / WB 46 F / 38.6 F		
Zone Loads based on TFM	Details	Sensible BTU/hr	Latent BTU/hr	Details	Sensible BTU/hr	Latent BTU/hr
Window and Skylight Solar Loads	0 sqft	0	-	0 sqft	-	-
Wall Transmission	190 sqft	492	-	190 sqft	534	-
Roof Transmission	84 sqft	59	-	84 sqft	60	-
Window Transmission	0 sqft	0	-	0 sqft	0	-
Skylight Transmission	0 sqft	0	-	0 sqft	0	-
Door Loads	72 sqft	2129	-	72 sqft	1440	-
Floor Transmission	84 sqft	0	-	84 sqft	111	-
Partitions/Ceilings	0 sqft	0	-	0 sqft	0	-
Overhead Lighting	100 W	342	-	0 W	0	-
Electric Equipment	100 W	342	-	0 W	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	3000	1600	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>>Total Zone Loads	-	6365	1600	-	2145	0
Thermostat and Pulldown Adjustment	-	-34	0	-	-41	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Ventilation Load	5 CFM	89	205	5 CFM	128	0
Supply Fan Load	230 CFM	85	-	230 CFM	-85	-
>> Total System Loads	-	6505	1805	-	2147	0
Central Cooling Coil	-	6505	1806	-	0	0
Central Heating Coil	-	0	-	-	2147	-
>> Total Coil Loads	-	6505	1806	-	2147	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

System Input Data

Project Name: 22-1008 CASTRO RESIDENCE
Prepared by: ARPE Engineering, Inc.

06/16/2023
10:18AM

General Details:

Air System Name:.....AC-4
Air System Type:.....Single Zone CAV
Number of zones:.....1
System Startup:.....6
Duration of Operation:.....24

Central Cooling Coil Data:

Used?:.....YES
Supply Air Temperature:.....230.0 F
Coil Bypass Factor:.....0.100

Central Heating Coil Data:

Used?:.....YES
Supply Temperature:.....110.0 F

Supply Fan Data:

Configuration:.....Draw-thru
Fan Performance:.....0.50 in wg

Ceiling Return Air Plenum Data:

Return Air Via:.....Ducted Return

Zones Included:

Zone Names
01-STORAGE

Thermostats Data:

Cooling T-stat: Occ:.....74.0 F
Cooling T-stat: Unocc:.....85.0 F
Heating T-stat: Occ:.....70.0 F
Heating T-stat: Unocc:.....60.0 F

Safety Factors:

Cooling Sensible Safety Factor:.....0 %
Cooling Latent Safety Factor:.....0 %
Heating Safety Factor:.....0 %