

Project Summary

Location and Weather	
Project	Thesis
Address	JL. Raya Medan Tenggara Medan, 20228 North Sumatera, Indonesia
Calculation Time	Wednesday, May 20, 2015 1:44 AM
Report Type	Standard
Latitude	4°
Longitude	99°
Summer Dry Bulb	34 °C
Summer Wet Bulb	26 °C
Winter Dry Bulb	21 °C
Mean Daily Range	11 °C

Building Summary

Inputs	
Building Type	Single Family
Area (m ²)	299.14
Volume (m ³)	697.45
Calculated Results	
Peak Cooling Total Load (W)	15,059
Peak Cooling Month and Hour	June 4:00 PM
Peak Cooling Sensible Load (W)	10,112
Peak Cooling Latent Load (W)	4,947
Maximum Cooling Capacity (W)	15,170
Peak Cooling Airflow (L/s)	573.6
Peak Heating Load (W)	-3,727
Peak Heating Airflow (L/s)	295.4
Checksums	
Cooling Load Density (W/m ²)	50.34
Cooling Flow Density (L/(s·m ²))	1.92
Cooling Flow / Load (L/(s·kW))	38.09
Cooling Area / Load (m ² /kW)	19.87
Heating Load Density (W/m ²)	-12.46
Heating Flow Density (L/(s·m ²))	0.99

Zone Summary - Default

Inputs	
Area (m ²)	50.33
Volume (m ³)	115.87
Cooling Setpoint	25 °C
Heating Setpoint	21 °C
Supply Air Temperature	15 °C
Number of People	9
Infiltration (L/s)	6.4
Air Volume Calculation Type	Split System(s) with Mechanical Ventilation with Cooling
Relative Humidity	55.00% (User Specified)
Psychrometrics	
Psychrometric Message	None
Cooling Coil Entering Dry-Bulb Temperature	34 °C
Cooling Coil Entering Wet-Bulb Temperature	26 °C
Cooling Coil Leaving Dry-Bulb Temperature	13 °C
Cooling Coil Leaving Wet-Bulb Temperature	13 °C
Mixed Air Dry-Bulb Temperature	34 °C
Calculated Results	
Peak Cooling Load (W)	2,850
Peak Cooling Month and Hour	June 5:00 AM
Peak Cooling Sensible Load (W)	1,388
Peak Cooling Latent Load (W)	1,462
Peak Cooling Airflow (L/s)	71.5
Peak Heating Load (W)	-1,298
Peak Heating Airflow (L/s)	71.5
Peak Ventilation Airflow (L/s)	71.5
Checksums	
Cooling Load Density (W/m ²)	56.63
Cooling Flow Density (L/(s·m ²))	1.42
Cooling Flow / Load (L/(s·kW))	25.07
Cooling Area / Load (m ² /kW)	17.66
Heating Load Density (W/m ²)	-25.79
Heating Flow Density (L/(s·m ²))	1.42
Ventilation Density (L/(s·m ²))	1.42
Ventilation / Person (L/s)	7.9

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	5	0.18%	-2	-0.20%
Window	-2	-0.08%	0	-0.01%
Door	13	0.47%	-3	-0.25%
Roof	3	0.10%	0	-0.01%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	148	5.19%	-2	-0.17%
Ventilation	1,394	48.90%	-23	-1.87%
Lighting	66	2.31%	-66	-5.32%
Power	146	5.12%	-146	-11.82%
People	1,055	37.02%	-1,055	-85.37%
Plenum	0	0.00%		
Fan Heat	23	0.79%		
Reheat	0	0.00%		
Total	2,850	100%	-1,298	100%

Default Spaces

Space Name	Area (m ²)	Volume (m ³)	Peak Cooling Load (W)	Cooling Airflow (L/s)	Peak Heating Load (W)	Heating Airflow (L/s)
1 Bathroom 1	6.16	14.97	145	7.2	-118	8.7
3 Kitchen	31.60	70.47	958	47.7	-871	44.9
5 Bathroom 3	7.79	18.88	178	8.9	-165	11.1
10 Bathroom 2	4.78	11.55	153	7.6	-122	6.8

Zone Summary - Mechanical HVAC Zone

Inputs	
Area (m ²)	248.81
Volume (m ³)	581.58
Cooling Setpoint	25 °C
Heating Setpoint	21 °C
Supply Air Temperature	16 °C
Number of People	19
Infiltration (L/s)	22.8
Air Volume Calculation Type	Split System(s) with Mechanical Ventilation with Cooling
Relative Humidity	55.00% (User Specified)
Psychrometrics	
Psychrometric Message	None
Cooling Coil Entering Dry-Bulb Temperature	31 °C
Cooling Coil Entering Wet-Bulb Temperature	23 °C
Cooling Coil Leaving Dry-Bulb Temperature	16 °C
Cooling Coil Leaving Wet-Bulb Temperature	17 °C
Mixed Air Dry-Bulb Temperature	31 °C
Calculated Results	
Peak Cooling Load (W)	12,320
Peak Cooling Month and Hour	June 4:00 PM
Peak Cooling Sensible Load (W)	8,626
Peak Cooling Latent Load (W)	3,694
Peak Cooling Airflow (L/s)	502.1
Peak Heating Load (W)	-2,429
Peak Heating Airflow (L/s)	223.9
Peak Ventilation Airflow (L/s)	223.9
Checksums	
Cooling Load Density (W/m ²)	49.52
Cooling Flow Density (L/(s·m ²))	2.02
Cooling Flow / Load (L/(s·kW))	40.76
Cooling Area / Load (m ² /kW)	20.20
Heating Load Density (W/m ²)	-9.76
Heating Flow Density (L/(s·m ²))	0.90
Ventilation Density (L/(s·m ²))	0.90
Ventilation / Person (L/s)	11.8

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	363	2.95%	-7	-0.34%
Window	3,303	26.81%	-15	-0.70%
Door	1,252	10.16%	-29	-1.35%
Roof	12	0.10%	0	-0.01%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	530	4.30%	-7	-0.34%
Ventilation	4,367	35.45%	-73	-3.35%
Lighting	262	2.13%	-262	-12.12%
Power	878	7.12%	-878	-40.54%
People	1,157	9.39%	-1,157	-53.43%
Plenum	0	0.00%		
Fan Heat	195	1.59%		
Reheat	0	0.00%		
Total	12,320	100%	-2,429	100%

Mechanical HVAC Zone Spaces

Space Name	Area (m ²)	Volume (m ³)	Peak Cooling Load (W)	Cooling Airflow (L/s)	Peak Heating Load (W)	Heating Airflow (L/s)
2 Bedroom 1	21.13	47.29	554	35.8	-152	19.0
4 Bedroom 4	18.53	41.41	343	22.2	-308	16.7
6 Bedroom 5	18.60	41.66	486	31.5	-122	16.7
7 Bedroom 3	14.22	31.83	420	27.2	-122	12.8
8 Hall	139.93	340.07	4,240	274.5	-985	125.9
9 Bedroom 2	14.13	31.62	320	20.7	-203	12.7
11 LivingRoom	22.28	47.68	1,393	90.2	-465	20.0

Space Summary - 1 Bathroom 1

Inputs	
Area (m ²)	6.16
Volume (m ³)	14.97
Wall Area (m ²)	12.23
Roof Area (m ²)	0.00
Door Area (m ²)	3.38
Partition Area (m ²)	0.00
Window Area (m ²)	0.00
Skylight Area (m ²)	0.00
Lighting Load (W)	30
Power Load (W)	66
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	1.2
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	145
Peak Cooling Sensible Load (W)	85
Peak Cooling Latent Load (W)	60
Peak Cooling Airflow (L/s)	7.2
Peak Heating Load (W)	-118
Peak Heating Airflow (L/s)	8.7

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	0	0.31%	-1	-0.44%
Window	0	0.00%	0	0.00%
Door	0	0.06%	0	-0.17%
Roof	0	0.00%	0	0.00%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	27	19.01%	0	-0.33%
Lighting	8	5.59%	-8	-7.00%
Power	18	12.36%	-18	-15.48%
People	91	62.66%	-91	-78.46%
Plenum	0	0.00%		
Total	145	100%	-118	100%

Space Summary - 3 Kitchen

Inputs	
Area (m ²)	31.60
Volume (m ³)	70.47
Wall Area (m ²)	34.53
Roof Area (m ²)	0.01
Door Area (m ²)	5.55
Partition Area (m ²)	0.00
Window Area (m ²)	0.42
Skylight Area (m ²)	0.00
Lighting Load (W)	100
Power Load (W)	340
Number of People	7
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	3.3
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	958
Peak Cooling Sensible Load (W)	570
Peak Cooling Latent Load (W)	387
Peak Cooling Airflow (L/s)	47.7
Peak Heating Load (W)	-871
Peak Heating Airflow (L/s)	44.9

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	3	0.35%	-1	-0.14%
Window	-2	-0.24%	0	-0.02%
Door	14	1.42%	-3	-0.33%
Roof	0	0.00%	0	0.00%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	78	8.10%	-1	-0.13%
Lighting	27	2.81%	-27	-3.13%
Power	92	9.57%	-92	-10.66%
People	747	77.97%	-747	-86.82%
Plenum	0	0.00%		
Total	958	100%	-871	100%

Space Summary - 5 Bathroom 3

Inputs	
Area (m ²)	7.79
Volume (m ³)	18.88
Wall Area (m ²)	5.71
Roof Area (m ²)	0.36
Door Area (m ²)	1.54
Partition Area (m ²)	0.00
Window Area (m ²)	0.00
Skylight Area (m ²)	0.00
Lighting Load (W)	84
Power Load (W)	84
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	0.6
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	178
Peak Cooling Sensible Load (W)	116
Peak Cooling Latent Load (W)	62
Peak Cooling Airflow (L/s)	8.9
Peak Heating Load (W)	-165
Peak Heating Airflow (L/s)	11.1

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	0	-0.19%	0	-0.14%
Window	0	0.00%	0	0.00%
Door	0	0.00%	0	0.00%
Roof	1	0.79%	0	-0.03%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	13	7.20%	0	-0.11%
Lighting	23	12.70%	-23	-13.81%
Power	23	12.70%	-23	-13.81%
People	119	66.81%	-119	-72.66%
Plenum	0	0.00%		
Total	178	100%	-165	100%

Space Summary - 10 Bathroom 2

Inputs	
Area (m ²)	4.78
Volume (m ³)	11.55
Wall Area (m ²)	13.39
Roof Area (m ²)	0.44
Door Area (m ²)	1.54
Partition Area (m ²)	0.00
Window Area (m ²)	0.00
Skylight Area (m ²)	0.00
Lighting Load (W)	30
Power Load (W)	51
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	1.3
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	153
Peak Cooling Sensible Load (W)	88
Peak Cooling Latent Load (W)	65
Peak Cooling Airflow (L/s)	7.6
Peak Heating Load (W)	-122
Peak Heating Airflow (L/s)	6.8

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	2	1.01%	0	-0.40%
Window	0	0.00%	0	0.00%
Door	0	-0.15%	0	-0.05%
Roof	1	0.88%	0	-0.10%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	30	19.63%	0	-0.35%
Lighting	8	5.27%	-8	-6.77%
Power	14	9.05%	-14	-11.61%
People	99	64.31%	-99	-82.52%
Plenum	0	0.00%		
Total	153	100%	-122	100%

Space Summary - 2 Bedroom 1

Inputs	
Area (m ²)	21.13
Volume (m ³)	47.29
Wall Area (m ²)	14.14
Roof Area (m ²)	0.00
Door Area (m ²)	17.57
Partition Area (m ²)	0.00
Window Area (m ²)	0.00
Skylight Area (m ²)	0.00
Lighting Load (W)	60
Power Load (W)	200
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	1.4
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	554
Peak Cooling Sensible Load (W)	502
Peak Cooling Latent Load (W)	52
Peak Cooling Airflow (L/s)	35.8
Peak Heating Load (W)	-152
Peak Heating Airflow (L/s)	19.0

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	1	0.18%	0	-0.02%
Window	0	0.00%	0	0.00%
Door	380	68.54%	-10	-7.95%
Roof	0	0.00%	0	0.00%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	32	5.74%	0	-0.34%
Lighting	18	3.26%	-18	-13.82%
Power	60	10.86%	-60	-46.08%
People	63	11.41%	-63	-48.41%
Plenum	0	0.00%		
Total	554	100%	-152	100%

Space Summary - 4 Bedroom 4

Inputs	
Area (m ²)	18.53
Volume (m ³)	41.41
Wall Area (m ²)	9.76
Roof Area (m ²)	0.34
Door Area (m ²)	1.61
Partition Area (m ²)	0.00
Window Area (m ²)	0.01
Skylight Area (m ²)	0.00
Lighting Load (W)	100
Power Load (W)	500
Number of People	2
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	0.9
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	343
Peak Cooling Sensible Load (W)	269
Peak Cooling Latent Load (W)	74
Peak Cooling Airflow (L/s)	22.2
Peak Heating Load (W)	-308
Peak Heating Airflow (L/s)	16.7

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	12	3.52%	0	-0.14%
Window	0	0.08%	0	0.00%
Door	0	0.00%	0	0.00%
Roof	2	0.65%	0	-0.02%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	22	6.39%	0	-0.10%
Lighting	30	8.79%	-30	-9.86%
Power	151	43.95%	-151	-49.31%
People	126	36.61%	-126	-41.08%
Plenum	0	0.00%		
Total	343	100%	-308	100%

Space Summary - 6 Bedroom 5

Inputs	
Area (m ²)	18.60
Volume (m ³)	41.66
Wall Area (m ²)	27.76
Roof Area (m ²)	0.22
Door Area (m ²)	1.55
Partition Area (m ²)	0.00
Window Area (m ²)	2.95
Skylight Area (m ²)	0.00
Lighting Load (W)	60
Power Load (W)	100
Number of People	2
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	2.7
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	486
Peak Cooling Sensible Load (W)	411
Peak Cooling Latent Load (W)	75
Peak Cooling Airflow (L/s)	31.5
Peak Heating Load (W)	-122
Peak Heating Airflow (L/s)	16.7

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	48	9.79%	-1	-0.95%
Window	258	53.03%	-3	-2.56%
Door	0	0.00%	0	0.00%
Roof	1	0.30%	0	-0.03%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	62	12.83%	-1	-0.77%
Lighting	18	3.72%	-18	-16.12%
Power	30	6.19%	-30	-26.87%
People	69	14.14%	-69	-61.33%
Plenum	0	0.00%		
Total	486	100%	-122	100%

Space Summary - 7 Bedroom 3

Inputs	
Area (m ²)	14.22
Volume (m ³)	31.83
Wall Area (m ²)	35.71
Roof Area (m ²)	0.28
Door Area (m ²)	3.09
Partition Area (m ²)	0.00
Window Area (m ²)	0.51
Skylight Area (m ²)	0.00
Lighting Load (W)	40
Power Load (W)	153
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	3.4
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	420
Peak Cooling Sensible Load (W)	336
Peak Cooling Latent Load (W)	84
Peak Cooling Airflow (L/s)	27.2
Peak Heating Load (W)	-122
Peak Heating Airflow (L/s)	12.8

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	65	15.57%	-1	-1.07%
Window	26	6.21%	0	-0.18%
Door	129	30.66%	-2	-1.67%
Roof	2	0.45%	0	-0.03%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	80	19.10%	-1	-0.99%
Lighting	12	2.87%	-12	-10.67%
Power	46	11.00%	-46	-40.83%
People	59	14.13%	-59	-52.45%
Plenum	0	0.00%		
Total	420	100%	-122	100%

Space Summary - 8 Hall

Inputs	
Area (m ²)	139.93
Volume (m ³)	340.07
Wall Area (m ²)	107.83
Roof Area (m ²)	0.65
Door Area (m ²)	29.79
Partition Area (m ²)	0.00
Window Area (m ²)	11.36
Skylight Area (m ²)	0.00
Lighting Load (W)	400
Power Load (W)	1,506
Number of People	7
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	10.4
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	4,240
Peak Cooling Sensible Load (W)	3,894
Peak Cooling Latent Load (W)	346
Peak Cooling Airflow (L/s)	274.5
Peak Heating Load (W)	-985
Peak Heating Airflow (L/s)	125.9

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	159	3.74%	-3	-0.33%
Window	2,208	52.08%	-10	-1.12%
Door	674	15.89%	-14	-1.48%
Roof	3	0.06%	0	-0.01%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	242	5.71%	-3	-0.36%
Lighting	121	2.85%	-121	-13.07%
Power	455	10.72%	-455	-49.21%
People	379	8.94%	-379	-41.04%
Plenum	0	0.00%		
Total	4,240	100%	-985	100%

Space Summary - 9 Bedroom 2

Inputs	
Area (m ²)	14.13
Volume (m ³)	31.62
Wall Area (m ²)	18.41
Roof Area (m ²)	0.53
Door Area (m ²)	1.55
Partition Area (m ²)	0.00
Window Area (m ²)	0.49
Skylight Area (m ²)	0.00
Lighting Load (W)	60
Power Load (W)	400
Number of People	1
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	1.8
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	320
Peak Cooling Sensible Load (W)	262
Peak Cooling Latent Load (W)	58
Peak Cooling Airflow (L/s)	20.7
Peak Heating Load (W)	-203
Peak Heating Airflow (L/s)	12.7

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	48	14.87%	-1	-0.39%
Window	26	8.22%	0	-0.10%
Door	0	0.00%	0	0.00%
Roof	4	1.11%	0	-0.04%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	41	12.91%	-1	-0.29%
Lighting	18	5.65%	-18	-9.06%
Power	121	37.67%	-121	-60.40%
People	63	19.56%	-63	-31.36%
Plenum	0	0.00%		
Total	320	100%	-203	100%

Space Summary - 11 LivingRoom

Inputs	
Area (m ²)	22.28
Volume (m ³)	47.68
Wall Area (m ²)	22.11
Roof Area (m ²)	0.00
Door Area (m ²)	4.28
Partition Area (m ²)	0.00
Window Area (m ²)	2.57
Skylight Area (m ²)	0.00
Lighting Load (W)	150
Power Load (W)	50
Number of People	7
Sensible Heat Gain / Person (W)	73
Latent Heat Gain / Person (W)	59
Infiltration Airflow (L/s)	2.1
Space Type	Single Family (inherited from building type)
Calculated Results	
Peak Cooling Load (W)	1,393
Peak Cooling Sensible Load (W)	1,172
Peak Cooling Latent Load (W)	221
Peak Cooling Airflow (L/s)	90.2
Peak Heating Load (W)	-465
Peak Heating Airflow (L/s)	20.0

Components	Cooling		Heating	
	Loads (W)	Percentage of Total	Loads (W)	Percentage of Total
Wall	31	2.20%	-1	-0.15%
Window	784	56.29%	-2	-0.35%
Door	70	5.03%	-3	-0.73%
Roof	0	0.00%	0	0.00%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	50	3.57%	-1	-0.15%
Lighting	45	3.25%	-45	-10.01%
Power	15	1.08%	-15	-3.34%
People	398	28.58%	-398	-88.04%
Plenum	0	0.00%		
Total	1,393	100%	-465	100%