

Air System Sizing Summary for PAVIMENTO TÉRREO

Project Name: TRT CAMPINAS
Prepared by: Arconet LTDA

01/11/2016
02:47

Air System Information

Air System Name **PAVIMENTO TÉRREO**
Equipment Class **PKG VERT**
Air System Type **SZCAV**

Number of zones **1**
Floor Area **797,3** m²
Location **Campinas, Brazil**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load **153,8** kW
Sensible coil load **118,6** kW
Coil L/s at Aug 1600 **10957** L/s
Max block L/s **10957** L/s
Sum of peak zone L/s **10957** L/s
Sensible heat ratio **0,771**
m²/kW **5,2**
W/m² **192,9**
Water flow @ 5,6 °K rise **N/A**

Load occurs at **Aug 1600**
OA DB / WB **32,9 / 24,3** °C
Entering DB / WB **25,5 / 19,3** °C
Leaving DB / WB **15,8 / 15,2** °C
Coil ADP **14,7** °C
Bypass Factor **0,100**
Resulting RH **58** %
Design supply temp. **14,4** °C
Zone T-stat Check **1 of 1** OK
Max zone temperature deviation **0,0** °K

Central Heating Coil Sizing Data

Max coil load **67,4** kW
Coil L/s at Des Htg **10957** L/s
Max coil L/s **10957** L/s
Water flow @ 11,1 °K drop **N/A**

Load occurs at **Des Htg**
W/m² **84,5**
Ent. DB / Lvg DB **19,6 / 25,1** °C

Supply Fan Sizing Data

Actual max L/s **10957** L/s
Standard L/s **10126** L/s
Actual max L/(s-m²) **13,74** L/(s-m²)

Fan motor BHP **0,00** BHP
Fan motor kW **0,00** kW
Fan static **0** Pa

Outdoor Ventilation Air Data

Design airflow L/s **1280** L/s
L/(s-m²) **1,61** L/(s-m²)

L/s/person **5,93** L/s/person

Zone Sizing Summary for PAVIMENTO TÉRREO

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 Equipment Class **PKG VERT**
 Air System Type **SZCAV**

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 Floor Area **797,3** m²
 Location **Campinas, Brazil**

Sizing Calculation Information

Calculation Months **Jan to Dec**
 Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
 Space L/s Sizing **Individual peak space loads**

Zone Sizing Data

Zone Name	Maximum Cooling Sensible (kW)	Design Airflow (L/s)	Minimum Airflow (L/s)	Time of Peak Load	Maximum Heating Load (kW)	Zone Floor Area (m ²)	Zone L/(s-m ²)
Zone 1	110,6	10957	10957	Aug 1600	49,0	797,3	13,74

Zone Terminal Sizing Data

No Zone Terminal Sizing Data required for this system.

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m ²)	Space L/(s-m ²)
Zone 1							
Centrolnt+SalaEspera	1	29,0	Jun 1600	2749	11,3	168,1	16,35
CentroMemória	1	58,2	Oct 1600	5522	23,9	341,3	16,18
Desenv+Reun+CMem+SegTer	1	28,3	Jul 1700	2687	13,8	287,9	9,33

Ventilation Sizing Summary for PAVIMENTO TÉRREO

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1. Summary

Ventilation Sizing Method **ASHRAE Std 62.1-2007**
 Design Condition **Heating operation**
 Occupant Diversity **1,000**
 Uncorrected Ventilation Airflow Rate **1219** L/s
 System Ventilation Efficiency **0,952**
 Design Ventilation Airflow Rate **1280** L/s

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Supply Air (L/s)	Floor Area (m ²)	Required Outdoor Air (L/(s·m ²))	Time Averaged Occupancy	Required Outdoor Air (L/s/person)	Air Distribution Effectiveness	Required Outdoor Air (L/s)	Uncorrected Outdoor Air (L/s)	Space Ventilation Efficiency
Zone 1										
Centrolnt+SalaEspera	1	2749	168,1	0,50	44,0	3,80	0,80	314	<i>251</i>	0,997
CentroMemória	1	5522	341,3	0,50	120,0	3,80	0,80	783	<i>627</i>	0,969
Desenv+Reun+CMem+SegTer	1	2687	287,9	0,50	52,0	3,80	0,80	427	<i>342</i>	0,952
Totals (incl. Space Multipliers)		10957							1219	0,952

Air System Design Load Summary for PAVIMENTO TÉRREO

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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1600			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 32,9 °C / 24,3 °C			HEATING OA DB / WB 8,6 °C / 3,9 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	156 m ²	29476	-	156 m ²	-	-
Wall Transmission	235 m ²	6838	-	235 m ²	7332	-
Roof Transmission	0 m ²	0	-	0 m ²	0	-
Window Transmission	156 m ²	7256	-	156 m ²	12170	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	797 m ²	8378	-	797 m ²	15549	-
Partitions	68 m ²	896	-	68 m ²	1662	-
Ceiling	473 m ²	5370	-	473 m ²	9968	-
Overhead Lighting	19933 W	16023	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	19880 W	18140	-	0	0	-
People	216	12985	16097	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	5% / 5%	5268	805	5%	2334	0
>> Total Zone Loads	-	110629	16901	-	49015	0
Zone Conditioning	-	106652	16901	-	49693	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	10957 L/s	0	-	10957 L/s	0	-
Ventilation Load	1280 L/s	11985	18287	1280 L/s	17714	0
Supply Fan Load	10957 L/s	0	-	10957 L/s	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	118637	35189	-	67408	0
Central Cooling Coil	-	118637	35195	-	0	0
Central Heating Coil	-	0	-	-	67408	-
>> Total Conditioning	-	118637	35195	-	67408	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

Zone Design Load Summary for PAVIMENTO TÉRREO

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Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1600			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 32,9 °C / 24,3 °C			HEATING OA DB / WB 8,6 °C / 3,9 °C		
	OCCUPIED T-STAT 23,9 °C			OCCUPIED T-STAT 21,1 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	156 m ²	29476	-	156 m ²	-	-
Wall Transmission	235 m ²	6838	-	235 m ²	7332	-
Roof Transmission	0 m ²	0	-	0 m ²	0	-
Window Transmission	156 m ²	7256	-	156 m ²	12170	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	797 m ²	8378	-	797 m ²	15549	-
Partitions	68 m ²	896	-	68 m ²	1662	-
Ceiling	473 m ²	5370	-	473 m ²	9968	-
Overhead Lighting	19933 W	16023	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	19880 W	18140	-	0	0	-
People	216	12985	16097	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	5% / 5%	5268	805	5%	2334	0
>> Total Zone Loads	-	110629	16901	-	49015	0

Space Design Load Summary for PAVIMENTO TERREO

Project Name: TRT CAMPINAS
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TABLE 1.1.A. COMPONENT LOADS FOR SPACE " Centrolnt+SalaEspera " IN ZONE " Zone 1 "						
DESIGN COOLING				DESIGN HEATING		
COOLING DATA AT Jun 1600 COOLING OA DB / WB 32,4 °C / 24,3 °C OCCUPIED T-STAT 23,9 °C				HEATING DATA AT DES HTG HEATING OA DB / WB 8,6 °C / 3,9 °C OCCUPIED T-STAT 21,1 °C		
SPACE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	51 m ²	9084	-	51 m ²	-	-
Wall Transmission	41 m ²	1261	-	41 m ²	1268	-
Roof Transmission	0 m ²	0	-	0 m ²	0	-
Window Transmission	51 m ²	2196	-	51 m ²	3979	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	168 m ²	1620	-	168 m ²	3278	-
Partitions	0 m ²	0	-	0 m ²	0	-
Ceiling	108 m ²	1125	-	108 m ²	2277	-
Overhead Lighting	4203 W	3378	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	6820 W	6223	-	0	0	-
People	44	2727	3480	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	5% / 5%	1381	174	5%	540	0
>> Total Zone Loads	-	28995	3654	-	11342	0

TABLE 1.1.B. ENVELOPE LOADS FOR SPACE " Centrolnt+SalaEspera " IN ZONE " Zone 1 "						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m ²)	(W/(m ² ·°K))	Coeff.	(W)	(W)	(W)
NW EXPOSURE						
WALL	15	2,496	-	428	-	481
WINDOW 1	20	6,235	0,963	861	4714	1560
NE EXPOSURE						
WALL	25	2,496	-	833	-	787
WINDOW 2	31	6,235	0,963	1335	4370	2418

Space Design Load Summary for PAVIMENTO TÉRREO

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TABLE 1.2.A. COMPONENT LOADS FOR SPACE " CentroMemória " IN ZONE " Zone 1 "						
DESIGN COOLING				DESIGN HEATING		
COOLING DATA AT Oct 1600 COOLING OA DB / WB 30,7 °C / 23,2 °C OCCUPIED T-STAT 23,9 °C				HEATING DATA AT DES HTG HEATING OA DB / WB 8,6 °C / 3,9 °C OCCUPIED T-STAT 21,1 °C		
SPACE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	94 m ²	25942	-	94 m ²	-	-
Wall Transmission	103 m ²	3188	-	103 m ²	3210	-
Roof Transmission	0 m ²	0	-	0 m ²	0	-
Window Transmission	94 m ²	3070	-	94 m ²	7333	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	341 m ²	2400	-	341 m ²	6656	-
Partitions	0 m ²	0	-	0 m ²	0	-
Ceiling	264 m ²	2008	-	264 m ²	5568	-
Overhead Lighting	8533 W	6859	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	5000 W	4562	-	0	0	-
People	120	7438	9492	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	5% / 5%	2773	475	5%	1138	0
>> Total Zone Loads	-	58241	9967	-	23906	0

TABLE 1.2.B. ENVELOPE LOADS FOR SPACE " CentroMemória " IN ZONE " Zone 1 "						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m ²)	(W/(m ² ·°K))	Coeff.	(W)	(W)	(W)
SW EXPOSURE						
WALL	77	2,496	-	2835	-	2408
WINDOW 1	86	6,235	0,963	2809	25129	6709
NW EXPOSURE						
WALL	26	2,496	-	353	-	803
WINDOW 2	8	6,235	0,963	261	813	624

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TABLE 1.3.A. COMPONENT LOADS FOR SPACE " Desenv+Reun+CMem+SegTer " IN ZONE " Zone 1 "						
DESIGN COOLING				DESIGN HEATING		
COOLING DATA AT Jul 1700 COOLING OA DB / WB 32,2 °C / 24,2 °C OCCUPIED T-STAT 23,9 °C				HEATING DATA AT DES HTG HEATING OA DB / WB 8,6 °C / 3,9 °C OCCUPIED T-STAT 21,1 °C		
SPACE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	11 m ²	2510	-	11 m ²	-	-
Wall Transmission	91 m ²	3049	-	91 m ²	2854	-
Roof Transmission	0 m ²	0	-	0 m ²	0	-
Window Transmission	11 m ²	487	-	11 m ²	858	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	288 m ²	2861	-	288 m ²	5615	-
Partitions	68 m ²	847	-	68 m ²	1662	-
Ceiling	101 m ²	1082	-	101 m ²	2123	-
Overhead Lighting	7198 W	5878	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	8060 W	7401	-	0	0	-
People	52	2879	3124	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	5% / 5%	1350	156	5%	656	0
>> Total Zone Loads	-	28343	3280	-	13768	0

TABLE 1.3.B. ENVELOPE LOADS FOR SPACE " Desenv+Reun+CMem+SegTer " IN ZONE " Zone 1 "						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m ²)	(W/(m ² ·°K))	Coeff.	(W)	(W)	(W)
NE EXPOSURE						
WALL	82	2,496	-	2718	-	2548
NW EXPOSURE						
WALL	10	2,496	-	331	-	306
WINDOW 1	11	6,235	0,963	487	2510	858

System Psychrometrics for PAVIMENTO TÉRREO

Project Name: TRT CAMPINAS
 Prepared by: THERM LUCCA CLIMATIZAÇÃO LTDA

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August DESIGN COOLING DAY, 1600

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	32,9	0,01726	1280	400	11985	18287
Vent - Return Mixing	Outlet	25,5	0,01263	10957	1315	-	-
Central Cooling Coil	Outlet	15,8	0,01145	10957	1315	118637	35195
Central Heating Coil	Outlet	15,8	0,01145	10957	1315	0	-
Supply Fan	Outlet	15,8	0,01145	10957	1315	0	-
Cold Supply Duct	Outlet	15,8	0,01145	10957	1315	-	-
Zone Air	-	24,5	0,01201	10957	1436	106652	16901
Return Plenum	Outlet	24,5	0,01201	10957	1436	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,116 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2723,8 W/(L/s)

Site Altitude = 661,0 m

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Zone 1	110629	Cooling	106652	24,5	10957	1436	0	0

System Psychrometrics for PAVIMENTO TÉRREO

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WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	8,6	0,00350	1280	400	-17714	0
Vent - Return Mixing	Outlet	19,6	0,00350	10957	470	-	-
Central Cooling Coil	Outlet	19,6	0,00350	10957	470	0	0
Central Heating Coil	Outlet	25,1	0,00350	10957	470	67408	-
Supply Fan	Outlet	25,1	0,00350	10957	470	0	-
Cold Supply Duct	Outlet	25,1	0,00350	10957	470	-	-
Zone Air	-	21,0	0,00350	10957	480	-49693	0
Return Plenum	Outlet	21,0	0,00350	10957	480	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,116 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2723,8 W/(L/s)

Site Altitude = 661,0 m

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Zone 1	-49015	Heating	-49693	21,0	10957	480	0	0

Location: Campinas, Brazil
Altitude: 661,0 m.
Data for: August DESIGN COOLING DAY, 1600

