Institución Educativa 26 de Marzo
HVAC Load Analysis

for

Probci

Responsable:
Dir. Ingeniería.

Prepared By:

Jair Cuesta
JAG Ingeniería & Refrigeración S.A.S
Calle 87 No. 42B1 - 203
Barranquilla, Atlántico

viernes, 10 de mayo de 2024

General Project Data Input

General Project Information

Project file name:	Institución Educativa 26 de Marzo - Barrancabermeja - Tercer piso.CH8
Project title:	Institución Educativa 26 de Marzo
Project city, state, ZIP:	Barrancabermeja, Santander
Designed by:	César Nucci
Project date:	miércoles, 10 de abril de 2024
Weather reference city:	BARRANCABERMEJA, COLOMBIA
Client name:	Probci
Company name:	JAG Ingeniería & Refrigeración S.A.S
Company representative:	Jair Cuesta
Company address:	Calle 87 No. 42B1 - 203
Company city:	Barranquilla, Atlántico

Barometric pressure:	29,477	in.Hg.
Altitude:	413	feet
Latitude:	7	Degrees
Mean daily temperature range:	18	Degrees
Starting & ending time for HVAC load calculations:	7am - 6pm	
Number of unique rooms in this project:	4	

Building Default Values

Calculations performed:	Cooling loads only	
Lighting requirements:	0,00	Watts per square foot
Equipment requirements:	1,50	Watts per square foot
People sensible load multiplier:	0	Btuh per person
People latent load multiplier:	0	Btuh per person
Room sensible safety factor:	10	%
Room latent safety factor:	10	%
Room heating safety factor:	10	%
People diversity factor:	100	%
Lighting profile number:	2	
Equipment profile number:	3	
People profile number:	1	
Building default ceiling height:	12,00	feet
Building default wall height:	12,00	feet

Internal Operating Load Profiles (C = 100)

	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	hr 24
1	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0
2	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0
3	0	0	0	0	0	0	C	C	C	C	C	C	C	C	C	C	C	C	0	0	0	0	0	0
4	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
5	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
7	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
8	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
9	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
10	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

General Project Data Input (cont'd)

Building-Level Design Conditions

Design Month	Outdoor Dry Bulb	Outdoor Wet Bulb	Indoor Rel.Hum	Indoor Dry Bulb	Grains Diff	In/Outdoor Correction
January	96	85	50%	73	107,36	7
February	96	85	50%	73	107,36	7
March	96	85	50%	73	107,36	7
April	96	85	50%	73	107,36	7
May	96	85	50%	73	107,36	7
June	96	85	50%	73	107,36	7
July	96	85	50%	73	107,36	7
August	96	85	50%	73	107,36	7
September	96	85	50%	73	107,36	7
October	96	85	50%	73	107,36	7
November	96	85	50%	73	107,36	7
December	96	85	50%	73	107,36	7
Winter	0			0		

Master Roofs

Roof No.	ASHRAE Roof#	Roof U-Fac	Dark Color	Susp. Ceil
1	6	0,092	No	Yes

Master Walls

Wall No.	ASHRAE Group	Wall U-Fac	Wall Color
1	E	0,290	D
2	C	0,150	D

Master Partitions

Partition No.	Partition U-Factor	Cool T-D	Heat T-D
1	0,290	0	0
2	0,290	5	0
3	0,290	10	0
4	0,290	15	0

Master Glass

Glass No.	Summer U-Factor	Winter U-Factor	Glass Shd.Coef.	Interior Shading	Interior Shd.Coef
1	1,144	1,100	0,950	2	0,000

Master Shading Devices

Shade No.	Dist Horiz Overh Projects	Dist Beyond Right W.Edge	Dist Beyond Left W.Edge	Dist Overh Above Wind	Dist Right Fin Proj	Dist R-Fin Beyond W.Edge	Ht Of Right Fin	Dist Left Fin Proj	Dist L-Fin Beyond W.Edge	Ht Of Left Fin
1	13,75	0,00	27,50	10,00	6,85	0,00	12,00	18,25	27,50	12,00
2	13,75	10,35	17,75	10,00	6,85	10,35	12,00	18,25	17,75	12,00
3	13,75	20,15	7,35	10,00	6,85	20,15	12,00	18,25	7,35	12,00

Building Summary Loads

Building peaks in December at 4pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	6.301	0	0,00	0	16.419	16.419	4,83
Wall	2.609	0	0,00	0	27.755	27.755	8,16
Glass	545	0	0,00	0	47.207	47.207	13,88
Floor Slab	0	0	0,00	0	0	0	0,00
Skin Loads		0	0,00	0	91.381	91.381	26,87
Lighting	6.301	0	0,00	0	30.687	30.687	9,02
Equipment	10.786	0	0,00	1.694	40.483	42.177	12,40
Pool Latent	0	0	0,00	0	0	0	0,00
People	164	0	0,00	30.882	38.602	69.484	20,43
Partition	5.241	0	0,00	0	16.278	16.278	4,79
Cool. Pret.	0	0	0,00	0	0	0	0,00
Heat. Pret.	0	0	0,00	0	0	0	0,00
Cool. Vent.	0	0	0,00	0	0	0	0,00
Heat. Vent.	0	0	0,00	0	0	0	0,00
Cool. Infil.	820	0	0,00	65.383	21.942	87.325	25,67
Heat. Infil.	0	0	0,00	0	0	0	0,00
Draw-Thru Fan	0	0	0,00	0	2.806	2.806	0,82
Blow-Thru Fan	0	0	0,00	0	0	0	0,00
Reserve Cap.	0	0	0,00	0	0	0	0,00
Reheat Cap.	0	0	0,00	0	0	0	0,00
Supply Duct	0	0	0,00	0	0	0	0,00
Return Duct	0	0	0,00	0	0	0	0,00
Misc. Supply	0	0	0,00	0	0	0	0,00
Misc. Return	0	0	0,00	0	0	0	0,00
Building Totals		0	0,00	97.958	242.179	340.137	100,00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	0	0,00	0	0	0	0,00
Infiltration	0	0,00	65.383	21.942	87.325	25,67
Pretreated Air	0	0,00	0	0	0	0,00
Room Loads	0	0,00	32.576	217.431	250.006	73,50
Plenum Loads	0	0,00	0	0	0	0,00
Fan/Duct/Misc Loads	0	0,00	0	2.806	2.806	0,82
Building Totals	0	0,00	97.958	242.179	340.137	100,00

Check Figures

Total Building Supply Air (based on a 20° TD):	11.887	CFM
Total Building Vent. Air (0,00% of Supply):	0	CFM
Total Conditioned Air Space:	6.301	Sq.ft
Supply Air Per Unit Area:	1,8867	CFM/Sq.ft
Area Per Cooling Capacity:	222,3	Sq.ft/Ton
Cooling Capacity Per Area:	0,0045	Tons/Sq.ft
Heating Capacity Per Area:	0,00	Btuh/Sq.ft
Total Heating Required With Outside Air:	0	Btuh
Total Cooling Required With Outside Air:	28,34	Tons

Air Handler #1 - UMA Laboratorio 2 - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
1	Laboratorio 2	2.269	0	86.182	28.080	None	None
	4pm December	45	0	4.020	0	0	0
		27.222	0,00	1,77	0	0	0
	Room Peak Totals:	2.269	0	86.182	28.080		
	Total Rooms: 1	45	0	4.020	0	0	0
	Unique Rooms: 1	27.222	0,00	1,77	0	0	0

Air Handler #1 - UMA Laboratorio 2 - Total Load Summary

Air Handler Description:	UMA Laboratorio 2 Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0,38 HP
Fan Input:	0% motor and fan efficiency with 0 in. water across the fan
Sensible Heat Ratio:	0,75

--- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	4pm in December.
Outdoor Conditions:	Clg: 95° DB, 85° WB, 169,58 grains
Indoor Conditions:	Clg: 73° DB, 50% RH

Summer: Exhaust controls outside air, ----- Winter: Exhaust controls outside air.

Room Space sensible loss:	0 Btuh		
Infiltration sensible loss:	0 Btuh	0 CFM	
Outside Air sensible loss:	0 Btuh	0 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
Total System sensible loss:			0 Btuh
Heating Supply Air: 0 / (,985 X 1,08 X 0) =		0 CFM	
Winter Vent Outside Air (0,0% of supply) =		0 CFM	
Room space sensible gain:	80.108 Btuh		
Infiltration sensible gain:	6.074 Btuh		
Draw-thru fan sensible gain:	949 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	0 Btuh		
Total sensible gain on supply side of coil:			87.131 Btuh
Cooling Supply Air: 87.131 / (,985 X 1,1 X 20) =		4.020 CFM	
Summer Vent Outside Air (0,0% of supply) =		0 CFM	
Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	0 Btuh	0 CFM	
Blow-thru fan sensible gain:	0 Btuh		
Total sensible gain on return side of coil:			0 Btuh
Total sensible gain on air handling system:			87.131 Btuh
Room space latent gain:	9.982 Btuh		
Infiltration latent gain:	18.098 Btuh		
Outside air latent gain:	0 Btuh		
Total latent gain on air handling system:			28.080 Btuh
Total system sensible and latent gain:			115.211 Btuh

Check Figures

Total Air Handler Supply Air (based on a 20° TD):	4.020 CFM
Total Air Handler Vent. Air (0,00% of Supply):	0 CFM
Total Conditioned Air Space:	2.269 Sq.ft
Supply Air Per Unit Area:	1,7721 CFM/Sq.ft
Area Per Cooling Capacity:	236,3 Sq.ft/Ton
Cooling Capacity Per Area:	0,0042 Tons/Sq.ft
Heating Capacity Per Area:	0,00 Btuh/Sq.ft
Total Heating Required With Outside Air:	0 Btuh
Total Cooling Required With Outside Air:	9,60 Tons

Air Handler #2 - UMA Biblioteca - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
2	Biblioteca	2.047	0	66.083	40.730	None	None
	5pm October	65	0	3.083	0	0	0
		24.564	0,00	1,51	0	0	0
	Room Peak Totals:	2.047	0	66.083	40.730		
	Total Rooms: 1	65	0	3.083	0	0	0
	Unique Rooms: 1	24.564	0,00	1,51	0	0	0

Air Handler #2 - UMA Biblioteca - Total Load Summary

Air Handler Description:	UMA Biblioteca Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0,29 HP
Fan Input:	0% motor and fan efficiency with 0 in. water across the fan
Sensible Heat Ratio:	0,62

--- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	5pm in October.
Outdoor Conditions:	Clg: 94° DB, 85° WB, 171,68 grains
Indoor Conditions:	Clg: 73° DB, 50% RH

Summer: Exhaust controls outside air, ----- Winter: Exhaust controls outside air.

Room Space sensible loss:	0	Btuh		
Infiltration sensible loss:	0	Btuh	0	CFM
Outside Air sensible loss:	0	Btuh	0	CFM
Supply Duct sensible loss:	0	Btuh		
Return Duct sensible loss:	0	Btuh		
Return Plenum sensible loss:	0	Btuh		
Total System sensible loss:				0 Btuh
Heating Supply Air: 0 / (,985 X 1,08 X 0) =			0	CFM
Winter Vent Outside Air (0,0% of supply) =			0	CFM
Room space sensible gain:	57.870	Btuh		
Infiltration sensible gain:	8.213	Btuh		
Draw-thru fan sensible gain:	728	Btuh		
Supply duct sensible gain:	0	Btuh		
Reserve sensible gain:	0	Btuh		
Total sensible gain on supply side of coil:				66.810 Btuh
Cooling Supply Air: 66.810 / (,985 X 1,1 X 20) =			3.083	CFM
Summer Vent Outside Air (0,0% of supply) =			0	CFM
Return duct sensible gain:	0	Btuh		
Return plenum sensible gain:	0	Btuh		
Outside air sensible gain:	0	Btuh	0	CFM
Blow-thru fan sensible gain:	0	Btuh		
Total sensible gain on return side of coil:				0 Btuh
Total sensible gain on air handling system:				66.810 Btuh
Room space latent gain:	14.300	Btuh		
Infiltration latent gain:	26.430	Btuh		
Outside air latent gain:	0	Btuh		
Total latent gain on air handling system:				40.730 Btuh
Total system sensible and latent gain:				107.541 Btuh

Check Figures

Total Air Handler Supply Air (based on a 20° TD):	3.083	CFM
Total Air Handler Vent. Air (0,00% of Supply):	0	CFM
Total Conditioned Air Space:	2.047	Sq.ft
Supply Air Per Unit Area:	1,5059	CFM/Sq.ft
Area Per Cooling Capacity:	228,4	Sq.ft/Ton
Cooling Capacity Per Area:	0,0044	Tons/Sq.ft
Heating Capacity Per Area:	0,00	Btuh/Sq.ft
Total Heating Required With Outside Air:	0	Btuh
Total Cooling Required With Outside Air:	8,96	Tons

Air Handler #3 - UMA Salón de Profesores - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
3	Salón de Profesores	1.177	0	62.000	10.905	None	None
	10am March	24	0	2.892	0	0	0
		14.124	0,00	2,46	0	0	0
	Room Peak Totals:	1.177	0	62.000	10.905		
	Total Rooms: 1	24	0	2.892	0	0	0
	Unique Rooms: 1	14.124	0,00	2,46	0	0	0

Air Handler #3 - UMA Salón de Profesores - Total Load Summary

Air Handler Description:	UMA Salón de Profesores Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0,27 HP
Fan Input:	0% motor and fan efficiency with 0 in. water across the fan
Sensible Heat Ratio:	0,85

--- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	10am in March.
Outdoor Conditions:	Clg: 86° DB, 83° WB, 167,51 grains
Indoor Conditions:	Clg: 73° DB, 50% RH

Summer: Exhaust controls outside air, ----- Winter: Exhaust controls outside air.

Room Space sensible loss:	0	Btuh		
Infiltration sensible loss:	0	Btuh	0	CFM
Outside Air sensible loss:	0	Btuh	0	CFM
Supply Duct sensible loss:	0	Btuh		
Return Duct sensible loss:	0	Btuh		
Return Plenum sensible loss:	0	Btuh		
Total System sensible loss:				0 Btuh
Heating Supply Air: 0 / (,985 X 1,08 X 0) =			0	CFM
Winter Vent Outside Air (0,0% of supply) =			0	CFM
Room space sensible gain:	60.187	Btuh		
Infiltration sensible gain:	1.813	Btuh		
Draw-thru fan sensible gain:	683	Btuh		
Supply duct sensible gain:	0	Btuh		
Reserve sensible gain:	0	Btuh		
Total sensible gain on supply side of coil:				62.682 Btuh
Cooling Supply Air: 62.682 / (,985 X 1,1 X 20) =			2.892	CFM
Summer Vent Outside Air (0,0% of supply) =			0	CFM
Return duct sensible gain:	0	Btuh		
Return plenum sensible gain:	0	Btuh		
Outside air sensible gain:	0	Btuh	0	CFM
Blow-thru fan sensible gain:	0	Btuh		
Total sensible gain on return side of coil:				0 Btuh
Total sensible gain on air handling system:				62.682 Btuh
Room space latent gain:	1.694	Btuh		
Infiltration latent gain:	9.211	Btuh		
Outside air latent gain:	0	Btuh		
Total latent gain on air handling system:				10.905 Btuh
Total system sensible and latent gain:				73.587 Btuh

Check Figures

Total Air Handler Supply Air (based on a 20° TD):	2.892	CFM
Total Air Handler Vent. Air (0,00% of Supply):	0	CFM
Total Conditioned Air Space:	1.177	Sq.ft
Supply Air Per Unit Area:	2,4572	CFM/Sq.ft
Area Per Cooling Capacity:	191,9	Sq.ft/Ton
Cooling Capacity Per Area:	0,0052	Tons/Sq.ft
Heating Capacity Per Area:	0,00	Btuh/Sq.ft
Total Heating Required With Outside Air:	0	Btuh
Total Cooling Required With Outside Air:	6,13	Tons

Air Handler #4 - UMA Salón Especial - Summary Loads

Rm No	Description Room Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
4	Salón Especial	808	0	40.567	18.467	None	None
	3pm June	30	0	1.892	0	0	0
		9.696	0,00	2,34	0	0	0
	Room Peak Totals:	808	0	40.567	18.467		
	Total Rooms: 1	30	0	1.892	0	0	0
	Unique Rooms: 1	9.696	0,00	2,34	0	0	0

Air Handler #4 - UMA Salón Especial - Total Load Summary

Air Handler Description:	UMA Salón Especial Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0,18 HP
Fan Input:	0% motor and fan efficiency with 0 in. water across the fan
Sensible Heat Ratio:	0,69

--- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	3pm in June.
Outdoor Conditions:	Clg: 96° DB, 85° WB, 168,68 grains
Indoor Conditions:	Clg: 73° DB, 50% RH

Summer: Exhaust controls outside air, ----- Winter: Exhaust controls outside air.

Room Space sensible loss:	0 Btuh		
Infiltration sensible loss:	0 Btuh	0 CFM	
Outside Air sensible loss:	0 Btuh	0 CFM	
Supply Duct sensible loss:	0 Btuh		
Return Duct sensible loss:	0 Btuh		
Return Plenum sensible loss:	0 Btuh		
Total System sensible loss:			0 Btuh
Heating Supply Air: 0 / (,985 X 1,08 X 0) =		0 CFM	
Winter Vent Outside Air (0,0% of supply) =		0 CFM	
Room space sensible gain:	36.454 Btuh		
Infiltration sensible gain:	4.113 Btuh		
Draw-thru fan sensible gain:	447 Btuh		
Supply duct sensible gain:	0 Btuh		
Reserve sensible gain:	0 Btuh		
Total sensible gain on supply side of coil:			41.014 Btuh
Cooling Supply Air: 41.014 / (,985 X 1,1 X 20) =		1.892 CFM	
Summer Vent Outside Air (0,0% of supply) =		0 CFM	
Return duct sensible gain:	0 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	0 Btuh	0 CFM	
Blow-thru fan sensible gain:	0 Btuh		
Total sensible gain on return side of coil:			0 Btuh
Total sensible gain on air handling system:			41.014 Btuh
Room space latent gain:	6.600 Btuh		
Infiltration latent gain:	11.867 Btuh		
Outside air latent gain:	0 Btuh		
Total latent gain on air handling system:			18.467 Btuh
Total system sensible and latent gain:			59.481 Btuh

Check Figures

Total Air Handler Supply Air (based on a 20° TD):	1.892 CFM
Total Air Handler Vent. Air (0,00% of Supply):	0 CFM
Total Conditioned Air Space:	808 Sq.ft
Supply Air Per Unit Area:	2,3418 CFM/Sq.ft
Area Per Cooling Capacity:	163,0 Sq.ft/Ton
Cooling Capacity Per Area:	0,0061 Tons/Sq.ft
Heating Capacity Per Area:	0,00 Btuh/Sq.ft
Total Heating Required With Outside Air:	0 Btuh
Total Cooling Required With Outside Air:	4,96 Tons

Room Detailed Loads (At Room Peak Times)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Room 1-Laboratorio 2 peaks (sensible) in December at 4pm, Air Handler 1 (UMA Laboratorio 2), Zone 0, 71,5 x 31,8, Construction Type: 10 (Medium)								
Roof-1-6-Susp.C-L	2.269	0,50	25,8	0,092	5.374		0,000	0
Wall-7-111-E-D	857	1	41,7	0,290	10.357		0,000	0
Wall-8-201-E-D	233	1	47,1	0,290	3.187		0,000	0
Partition-1-3	857,4		10/0	0,290	2.486		0,000	0
Partition-2-3	50,4		10/0	0,290	146		0,000	0
Partition door-3-3	35,4		10/0	0,290	103		0,000	0
Partition-4-2	198,6		5/0	0,290	288		0,000	0
Partition-5-3	72,6		10/0	0,290	211		0,000	0
Partition door-6-3	35,4		10/0	0,290	103		0,000	0
Gls-201°-1-90-Tran	49,3	1,000	21	1,144	1.183		0,000	0
0%S-1-NS-Solar	49,3	0,950	175	0,580	4.745			
Gls-201°-1-90-Tran	49,3	1,000	21	1,144	1.183		0,000	0
0%S-2-NS-Solar	49,3	0,950	175	0,580	4.745			
Gls-201°-1-90-Tran	35,0	1,000	21	1,144	840		0,000	0
29%S-3-NS-Solar	35,0	0,950	175	0,580	3.369			
SGls-201°-1-90-Tran	14,3	1,000	21	1,144	343		0,000	0
29%S-3-NS-Solar	14,3	0,950	37	0,740	372			
Lights-Prof=2	2.269	1,000			10.837			
Equipment-Prof=3	3.403	1,000			11.611	0		
People-Prof=1	45,4	1,000			11.343	9.074		
Cool. Infil.CFM/person	227				5.522	16.453		
Heat. Infil.AC/hr	0						0,000	0
Sub-total					78.347	25.527		0
Safety factors:					+10%	+10%		+10%
					---	---		---
Total w/ safety factors:					86.182	28.080		0

Lighting Cooling Loads

Item Name	Quantity	Quantity Type	Special Allowance Factor	Space Fraction	Occur-rences	Usage Factor	Load (Btuh)
Laboratory	1,4	watts/sq.ft.	1	1	1	1	10.837
Miscellaneous Lighting	-906,9521	watts	1	0	1	1	0
Total							10.837

Room 2-Biblioteca peaks (sensible) in October at 5pm, Air Handler 2 (UMA Biblioteca), Zone 0, 2.047,0 x 1,0, Construction Type: 10 (Medium)								
Roof-1-6-Susp.C-L	2.047	0,50	30,6	0,092	5.756		0,000	0
Wall-8-111-C-D	797	1	36,0	0,150	4.306		0,000	0
Partition-1-3	88,2		10/0	0,290	256		0,000	0
Partition-2-3	79,8		10/0	0,290	231		0,000	0
Partition-3-3	582		10/0	0,290	1.688		0,000	0
Partition-4-3	79,8		10/0	0,290	231		0,000	0
Partition-5-3	147,6		10/0	0,290	428		0,000	0
Partition door-6-3	67,8		10/0	0,290	197		0,000	0
Partition-7-3	288		10/0	0,290	835		0,000	0
Partition-9-3	130,2		10/0	0,290	378		0,000	0
Partition-10-3	88,2		10/0	0,290	256		0,000	0
Partition-11-3	186		10/0	0,290	539		0,000	0
Lights-Prof=2	2.047	1,000			8.382			
Equipment-Prof=3	3.774	1,000			12.877	0		
People-Prof=1	65,0	1,000			16.250	13.000		
Cool. Infil.CFM/person	325				7.467	24.028		

Room Detailed Loads (At Room Peak Times) (cont'd)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Heat. Infil.AC/hr	0						0,000	0
Sub-total					60.075	37.028		0
Safety factors:					+10%	+10%		+10%
Total w/ safety factors:					66.083	40.730		0

Equipment Cooling Loads

Item Name	Nominal Output Sensible	Quantity Type Sensible	Nominal Output Latent	Quantity Type Latent	Sensible Load (Btuh)	Latent Load (Btuh)
Desktop computer, Manufacturer A (model C) 2.3 GHz processor, 3 GB RAM	97	watts	0	watts	6.620	0
Flat-panel monitor, Manufacturer X (model A) 30 in. screen	90	watts	0	watts	6.142	0
Multifunction (copy, print, scan): Medium, desktop type	135	watts	0	Btuh	115	0
Total					12.877	0

Lighting Cooling Loads

Item Name	Quantity	Quantity Type	Special Allowance Factor	Space Fraction	Occur-rences	Usage Factor	Load (Btuh)
Library, Reading area	1,2	watts/sq.ft.	1	1	1	1	8.382
Miscellaneous Lighting	-409,4001	watts	1	0	1	1	0
Total							8.382

Room 3-Salón de Profesores peaks (sensible) in March at 10am, Air Handler 3 (UMA Salón de Profesores), Zone 0, 1.177,0 x 1,0, Construction Type: 10 (Medium)

Roof-1-6-Susp.C-L	1.177	0,50	11,0	0,092	1.191		0,000	0
Wall-10-111-E-D	20	1	28,2	0,290	165		0,000	0
Wall-15-111-E-D	157	1	28,2	0,290	1.288		0,000	0
Partition-1-3	499,8		10/0	0,290	1.449		0,000	0
Partition-2-3	87		10/0	0,290	252		0,000	0
Partition-3-3	70,2		10/0	0,290	204		0,000	0
Partition-4-3	35,99999		10/0	0,290	104		0,000	0
Partition door-5-3	35,4		10/0	0,290	103		0,000	0
Partition-6-3	70,2		10/0	0,290	204		0,000	0
Partition-7-3	131,4		10/0	0,290	381		0,000	0
Partition door-8-3	35,4		10/0	0,290	103		0,000	0
Partition door-9-3	35,4		10/0	0,290	103		0,000	0
Partition-11-3	30,6		10/0	0,290	89		0,000	0
Partition door-12-3	35,4		10/0	0,290	103		0,000	0
Partition-13-3	55,8		10/0	0,290	162		0,000	0
Partition-14-3	66		10/0	0,290	191		0,000	0
Partition-16-3	342		10/0	0,290	992		0,000	0
Partition door-17-3	35,4		10/0	0,290	103		0,000	0
Gls-111°-1-90-Tran	92,1	1,000	11	1,144	1.159		0,000	0
0%S-0-NS-Solar	92,1	0,950	241	0,537	11.331			
Gls-111°-1-90-Tran	162,5	1,000	11	1,144	2.045		0,000	0
0%S-0-NS-Solar	162,5	0,950	241	0,537	19.996			
Lights-Prof=2	1.177	1,000			4.819			
Equipment-Prof=3	2.397	1,000			8.179	1.540		

Room Detailed Loads (At Room Peak Times) (cont'd)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Cool. Infil.CFM/person	118				1.648	8.373		
Heat. Infil.AC/hr	0						0,000	0
Sub-total					56.363	9.913		0
Safety factors:					+10%	+10%		+10%
Total w/ safety factors:					62.000	10.905		0

Equipment Cooling Loads

Item Name	Nominal Output Sensible	Quantity Type Sensible	Nominal Output Latent	Quantity Type Latent	Sensible Load (Btuh)	Latent Load (Btuh)
Microwave Oven (Residential Type)	601	watts	0	watts	308	0
Refrigerator	879	watts	0	watts	1.500	0
TV	215	watts	0	watts	367	0
Coffee maker, 10 cups	1.050	watts	1.540	Btuh	3.583	1.540
Water cooler, 32 qt/h	350	watts	0	Btuh	1.194	0
Laptop computer, Manufacturer 1						
2.0 GHz processor, 2 GB RAM, 17 in. screen	36	watts	0	watts	1.228	0
Total					8.179	1.540

Lighting Cooling Loads

Item Name	Quantity	Quantity Type	Special Allowance Factor	Space Fraction	Occur-rences	Usage Factor	Load (Btuh)
Lounge/recreation	1,2	watts/sq.ft.	1	1	1	1	4.819
Miscellaneous Lighting	-235,4	watts	1	0	1	1	0
Total							4.819

Room 4-Salón Especial peaks (sensible) in June at 3pm, Air Handler 4 (UMA Salón Especial), Zone 0, 25,5 x 31,8, Construction Type: 10 (Medium)

Roof-1-6-Susp.C-L	808	0,50	23,8	0,092	1.770		0,000	0
Wall-2-21-E-D	239	1	34,1	0,290	2.359		0,000	0
Wall-3-111-E-D	305	1	38,1	0,290	3.379		0,000	0
Partition-1-3	305,4		10/0	0,290	886		0,000	0
Partition-4-3	202,2		10/0	0,290	586		0,000	0
Partition-5-2	42,6		5/0	0,290	62		0,000	0
Partition door-6-2	35,4		5/0	0,290	51		0,000	0
Partition-7-3	66,6		10/0	0,290	193		0,000	0
Partition door-8-3	35,4		10/0	0,290	103		0,000	0
Gls-21°-1-90-Tran	142,3	1,000	21	1,144	3.419		0,000	0
0%S-0-NS-Solar	142,3	0,950	95	0,377	4.837			
Lights-Prof=2	808	1,000			3.860			
Equipment-Prof=3	1.212	1,000			4.136	0		
People-Prof=1	30,0	1,000			7.500	6.000		
Cool. Infil.CFM/person	150				3.739	10.789		
Heat. Infil.AC/hr	0						0,000	0
Sub-total					36.879	16.789		0
Safety factors:					+10%	+10%		+10%
Total w/ safety factors:					40.567	18.467		0

Room Detailed Loads (At Room Peak Times) (cont'd)

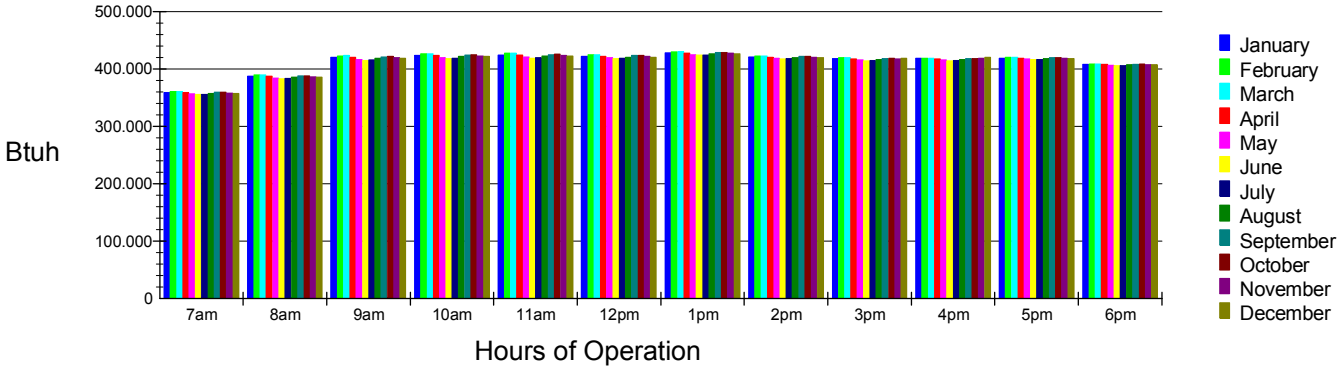
Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss

Lighting Cooling Loads

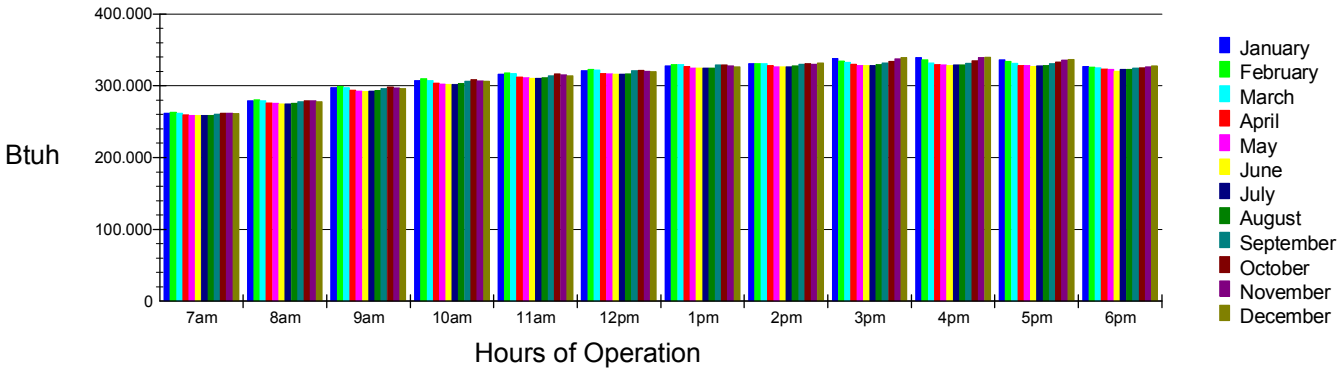
Item Name	Quantity	Quantity Type	Special Allowance Factor	Space Fraction	Occur-rences	Usage Factor	Load (Btuh)
	1,4	watts/sq.ft.	1	1	1	1	3.860
Classroom/lecture/training Miscellaneous Lighting	-323,2526	watts	1	0	1	1	0
Total							3.860

Building Profile Graphs

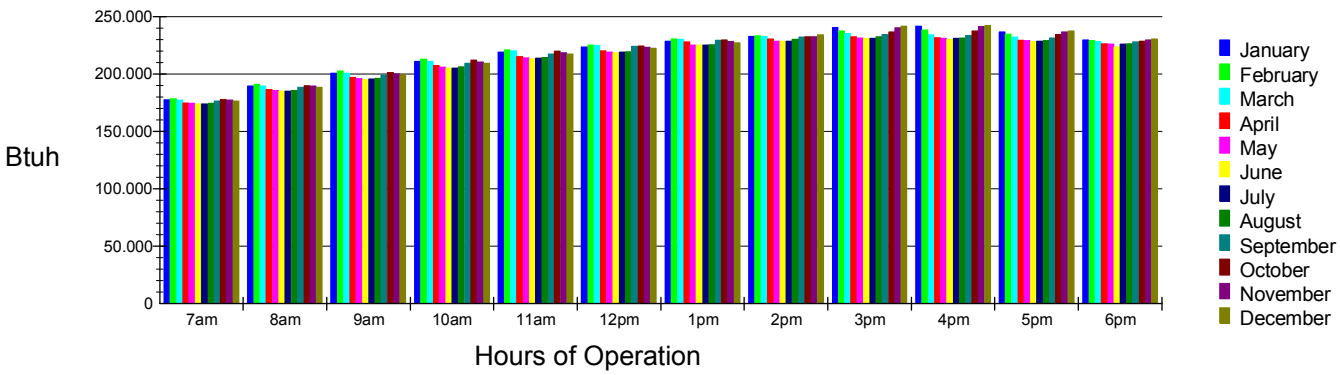
Building Adjusted Load



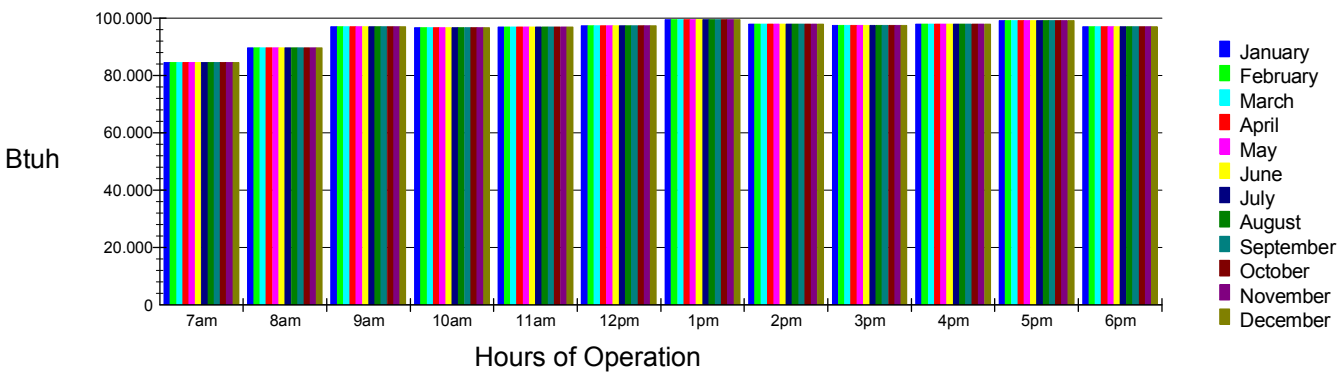
Building Net Load



Building Sensible Load



Building Latent Load



Air System #1 (UMA Laboratorio 2) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		50,771		53,000	
Draw-Thru Fan			949	0,218	44
Misc Load on Supply Side	0	0,000	0	0,000	0
Supply Air Duct			0	0,000	0
Room Loads	28.080	10,426	86.182	19,782	3.976
Sensible Reserve			0	0,000	0
Room Condition	28.080	61,197	87.131	73,000	4.020
Return Air Duct			0	0,000	
Return Air Plenum			0	0,000	
Misc Load on Return Side	0	0,000	0	0,000	
Vent Air 0 CFM	0	0,000	0	0,000	
Blow-Thru Fan			0	0,000	
Entering Coil Condition	28.080	61,197	87.131	73,000	4.020

General Psychrometric Equations Used In Analysis:

PR = (Barometric pressure of site / Standard ASHRAE pressure of 29,921)
TSH = PR x 1,10 x CFM x (DB entering - DB leaving)
TLH = PR x 0,68 x CFM x (Grains entering - Grains leaving)
GTH = PR x 4,50 x CFM x (Enthalpy entering - Enthalpy leaving)

TSH	=	0,985	x	1,10	x	4.020	x (73,0	-	53,0	) =	87.131	Btuh
TLH	=	0,985	x	0,68	x	4.020	x (61,2	-	50,8	) =	28.080	Btuh
SUM	=										115.210	Btuh
GTH	=	0,985	x	4,50	x	4.020	x (27,1	-	20,6	) =	115.725	Btuh
Total System Load										=	115.211	Btuh

Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	115.725	/ (	10,00	x	500	)	=	23,1 GPM
Heating GPM =	0	/ (	0,00	x	500	)	=	0,0 GPM
Steam Req. =	0	/	970				=	0,0 lb./hr

Entering Cooling Coil Conditions

Dry bulb temperature:	73,00	
Wet bulb temperature:	60,81	
Relative humidity:	49,91	
Enthalpy:	27,08	Btu/lbm

Entering Heating Coil Conditions

Dry bulb temperature:	,00

Leaving Cooling Coil Conditions

Dry bulb temperature:	53,00	
Wet bulb temperature:	50,37	
Relative humidity:	83,89	
Enthalpy:	20,59	Btu/lbm

Leaving Heating Coil Conditions

Dry bulb temperature:	,00

Air System #2 (UMA Biblioteca) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		41,377		53,000	
Draw-Thru Fan			728	0,218	34
Misc Load on Supply Side	0	0,000	0	0,000	0
Supply Air Duct			0	0,000	0
Room Loads	40.730	19,724	66.083	19,782	3.049
Sensible Reserve			0	0,000	0
Room Condition	40.730	61,101	66.810	73,000	3.083
Return Air Duct			0	0,000	
Return Air Plenum			0	0,000	
Misc Load on Return Side	0	0,000	0	0,000	
Vent Air 0 CFM	0	0,000	0	0,000	
Blow-Thru Fan			0	0,000	
Entering Coil Condition	40.730	61,101	66.810	73,000	3.083

General Psychrometric Equations Used In Analysis:

PR = (Barometric pressure of site / Standard ASHRAE pressure of 29,921)
TSH = PR x 1,10 x CFM x (DB entering - DB leaving)
TLH = PR x 0,68 x CFM x (Grains entering - Grains leaving)
GTH = PR x 4,50 x CFM x (Enthalpy entering - Enthalpy leaving)

TSH	=	0,985	x	1,10	x	3.083	x (	73,0	-	53,0	) =	66.810 Btuh
TLH	=	0,985	x	0,68	x	3.083	x (	61,1	-	41,4	) =	40.730 Btuh
SUM	=											107.541 Btuh
GTH	=	0,985	x	4,50	x	3.083	x (	27,1	-	19,1	) =	108.423 Btuh
Total System Load											=	107.541 Btuh

Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	108.423	/ (	10,00	x	500	)	= 21,7 GPM
Heating GPM =	0	/ (	0,00	x	500	)	= 0,0 GPM
Steam Req. =	0	/	970				= 0,0 lb./hr

Entering Cooling Coil Conditions

Dry bulb temperature:	73,00
Wet bulb temperature:	60,79
Relative humidity:	49,83
Enthalpy:	27,07 Btu/lbm

Entering Heating Coil Conditions

Dry bulb temperature:	,00

Leaving Cooling Coil Conditions

Dry bulb temperature:	53,00
Wet bulb temperature:	47,73
Relative humidity:	68,51
Enthalpy:	19,13 Btu/lbm

Leaving Heating Coil Conditions

Dry bulb temperature:	,00

Air System #3 (UMA Salón de Profesores) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		55,621		53,000	
Draw-Thru Fan			683	0,218	31
Misc Load on Supply Side	0	0,000	0	0,000	0
Supply Air Duct			0	0,000	0
Room Loads	10.905	5,628	62.000	19,782	2.861
Sensible Reserve			0	0,000	0
Room Condition	10.905	61,250	62.682	73,000	2.892
Return Air Duct			0	0,000	
Return Air Plenum			0	0,000	
Misc Load on Return Side	0	0,000	0	0,000	
Vent Air 0 CFM	0	0,000	0	0,000	
Blow-Thru Fan			0	0,000	
Entering Coil Condition	10.905	61,250	62.682	73,000	2.892

General Psychrometric Equations Used In Analysis:

PR = (Barometric pressure of site / Standard ASHRAE pressure of 29,921)
TSH = PR x 1,10 x CFM x (DB entering - DB leaving)
TLH = PR x 0,68 x CFM x (Grains entering - Grains leaving)
GTH = PR x 4,50 x CFM x (Enthalpy entering - Enthalpy leaving)

TSH	=	0,985	x	1,10	x	2.892	x (	73,0	-	53,0	) =	62.682 Btuh
TLH	=	0,985	x	0,68	x	2.892	x (	61,2	-	55,6	) =	10.905 Btuh
SUM	=											73.587 Btuh
GTH	=	0,985	x	4,50	x	2.892	x (	27,1	-	21,3	) =	73.721 Btuh
Total System Load											=	73.587 Btuh

Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	73.721	/ (	10,00	x	500	) =	14,7 GPM
Heating GPM =	0	/ (	0,00	x	500	) =	0,0 GPM
Steam Req. =	0	/	970			=	0,0 lb./hr

Entering Cooling Coil Conditions

Dry bulb temperature:	73,00	
Wet bulb temperature:	60,83	
Relative humidity:	49,96	
Enthalpy:	27,09	Btu/lbm

Entering Heating Coil Conditions

Dry bulb temperature:	,00

Leaving Cooling Coil Conditions

Dry bulb temperature:	53,00	
Wet bulb temperature:	51,68	
Relative humidity:	91,80	
Enthalpy:	21,34	Btu/lbm

Leaving Heating Coil Conditions

Dry bulb temperature:	,00

Air System #4 (UMA Salón Especial) Psychrometric Analysis

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		46,585		53,000	
Draw-Thru Fan			447	0,218	21
Misc Load on Supply Side	0	0,000	0	0,000	0
Supply Air Duct			0	0,000	0
Room Loads	18.467	14,568	40.567	19,783	1.872
Sensible Reserve			0	0,000	0
Room Condition	18.467	61,154	41.014	73,000	1.892
Return Air Duct			0	0,000	
Return Air Plenum			0	0,000	
Misc Load on Return Side	0	0,000	0	0,000	
Vent Air 0 CFM	0	0,000	0	0,000	
Blow-Thru Fan			0	0,000	
Entering Coil Condition	18.467	61,154	41.014	73,000	1.892

General Psychrometric Equations Used In Analysis:

PR = (Barometric pressure of site / Standard ASHRAE pressure of 29,921)
TSH = PR x 1,10 x CFM x (DB entering - DB leaving)
TLH = PR x 0,68 x CFM x (Grains entering - Grains leaving)
GTH = PR x 4,50 x CFM x (Enthalpy entering - Enthalpy leaving)

TSH	=	0,985	x	1,10	x	1.892	x (	73,0	-	53,0	) =	41.012 Btuh
TLH	=	0,985	x	0,68	x	1.892	x (	61,2	-	46,6	) =	18.467 Btuh
SUM	=											59.480 Btuh
GTH	=	0,985	x	4,50	x	1.892	x (	27,1	-	19,9	) =	59.856 Btuh
Total System Load											=	59.481 Btuh

Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM =	59.856	/ (	10,00	x	500	) =	12,0 GPM
Heating GPM =	0	/ (	0,00	x	500	) =	0,0 GPM
Steam Req. =	0	/	970			=	0,0 lb./hr

Entering Cooling Coil Conditions

Dry bulb temperature:	73,00	
Wet bulb temperature:	60,80	
Relative humidity:	49,87	
Enthalpy:	27,07	Btu/lbm

Entering Heating Coil Conditions

Dry bulb temperature:	,00

Leaving Cooling Coil Conditions

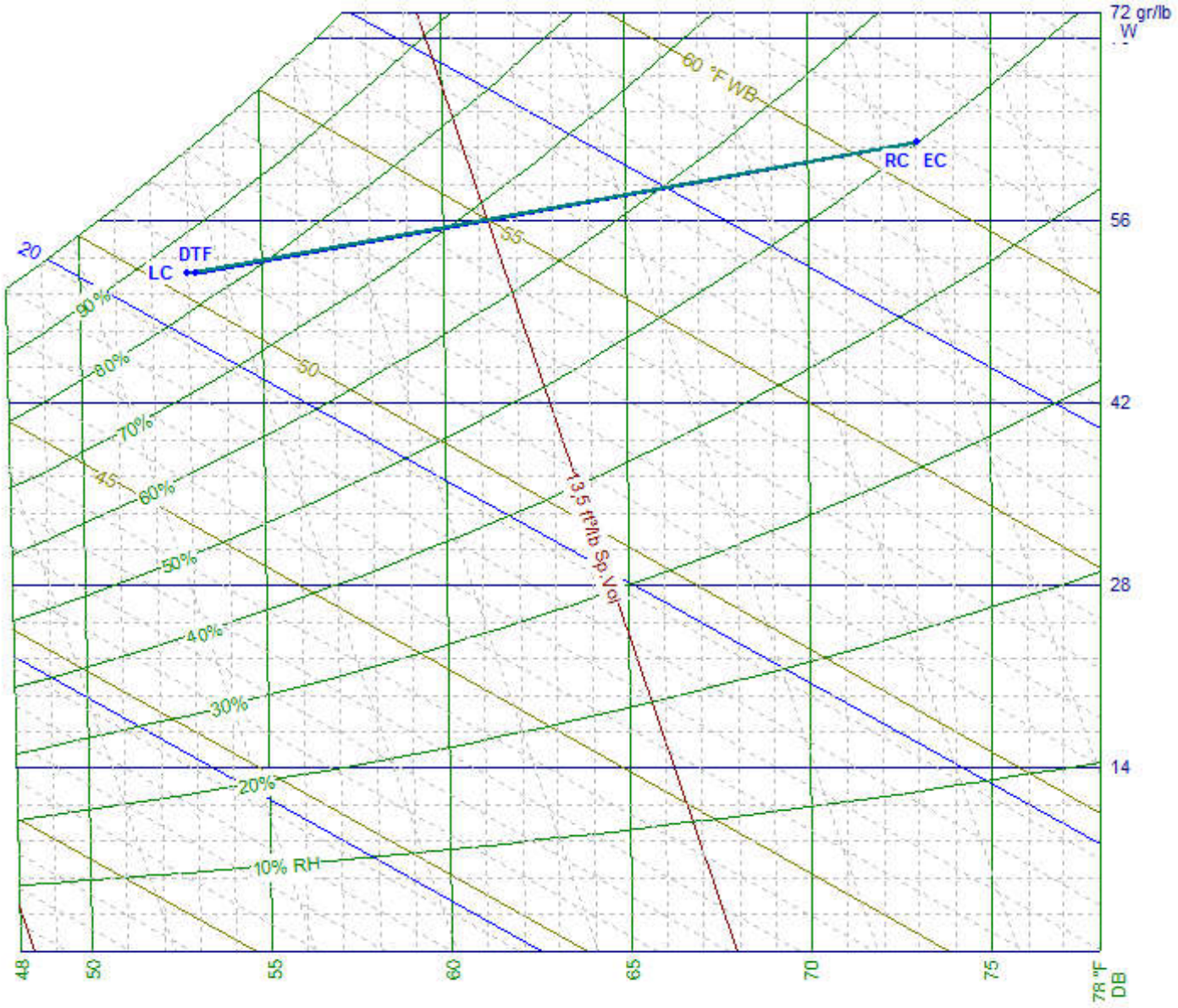
Dry bulb temperature:	53,00	
Wet bulb temperature:	49,21	
Relative humidity:	77,02	
Enthalpy:	19,94	Btu/lbm

Leaving Heating Coil Conditions

Dry bulb temperature:	,00

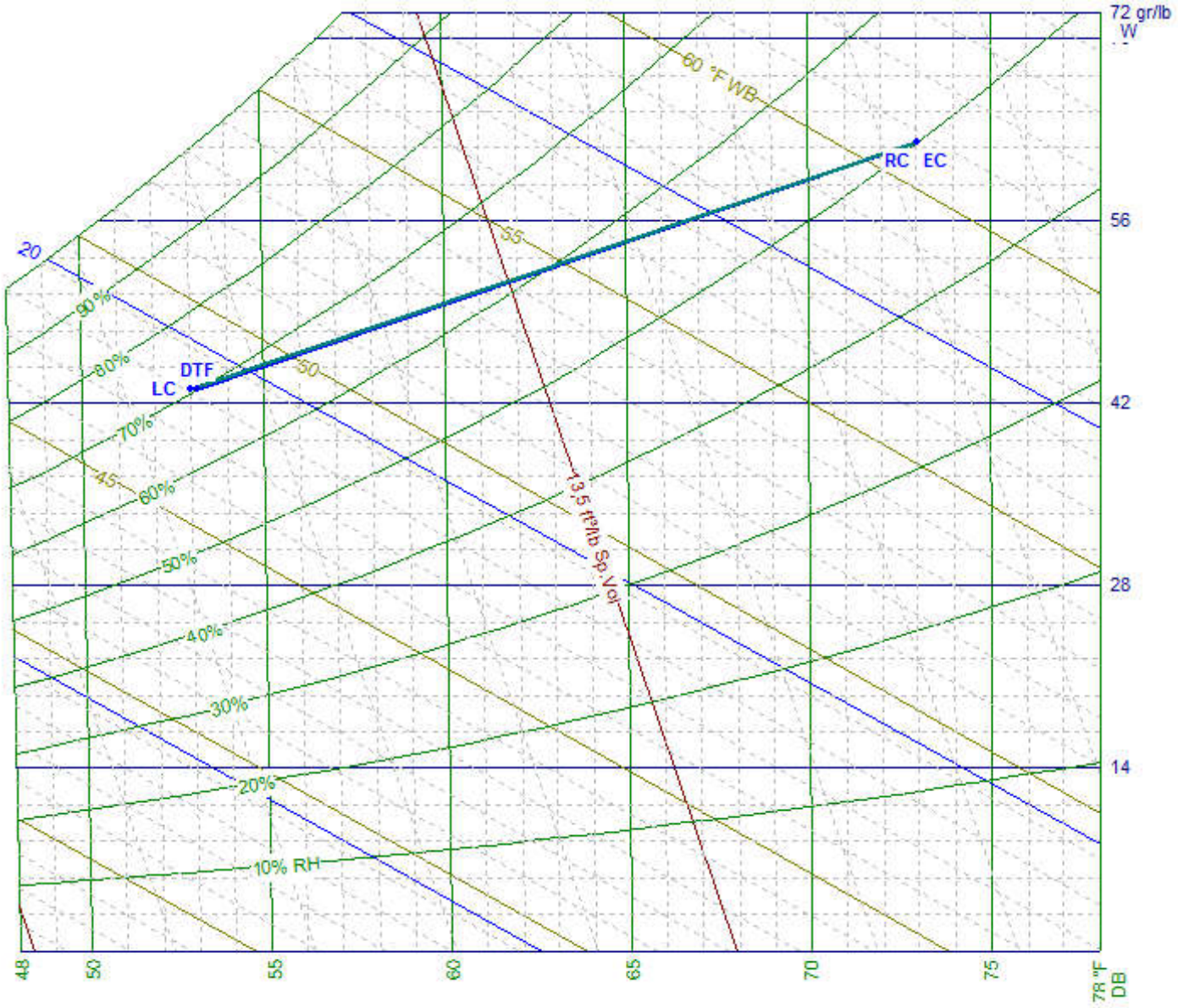
Air System #1 (UMA Laboratorio 2) Psychrometric Chart

RC	Room Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	RD	Return Duct Temperature Rise
DTF	Draw Through Fan Sensible Gain	BTF	Blow Through Fan Sensible Gain
RE	Reserve or Reheat Sensible Gain	PL	Return Air Plenum Sensible Gain
SM	Supply Side Miscellaneous Sensible Gain	MR	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition
MIX	Mixed Air Condition	RML	Return Miscellaneous Latent Gain



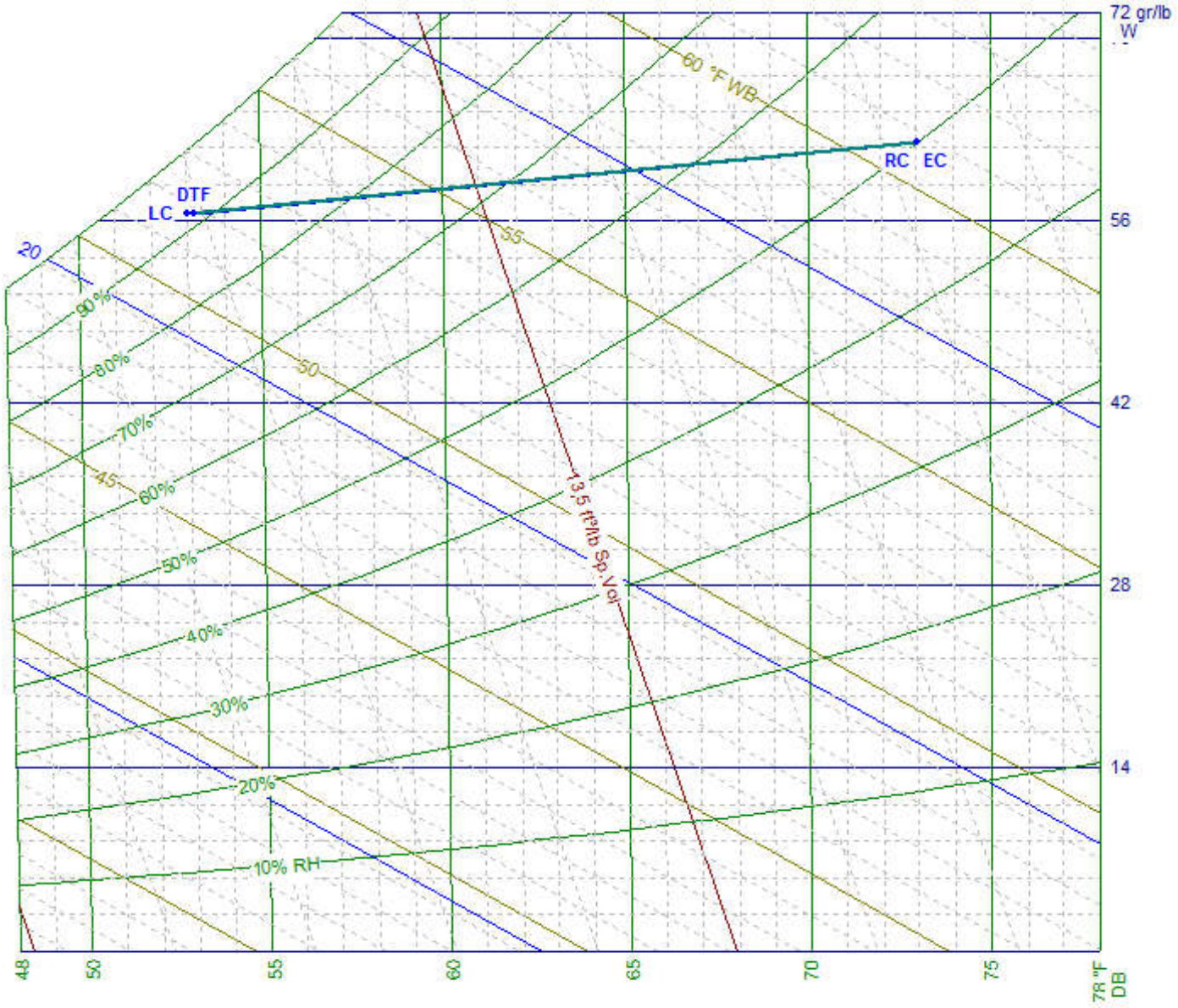
Air System #2 (UMA Biblioteca) Psychrometric Chart

RC	Room Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	RD	Return Duct Temperature Rise
DTF	Draw Through Fan Sensible Gain	BTF	Blow Through Fan Sensible Gain
RE	Reserve or Reheat Sensible Gain	PL	Return Air Plenum Sensible Gain
SM	Supply Side Miscellaneous Sensible Gain	MR	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition
MIX	Mixed Air Condition	RML	Return Miscellaneous Latent Gain



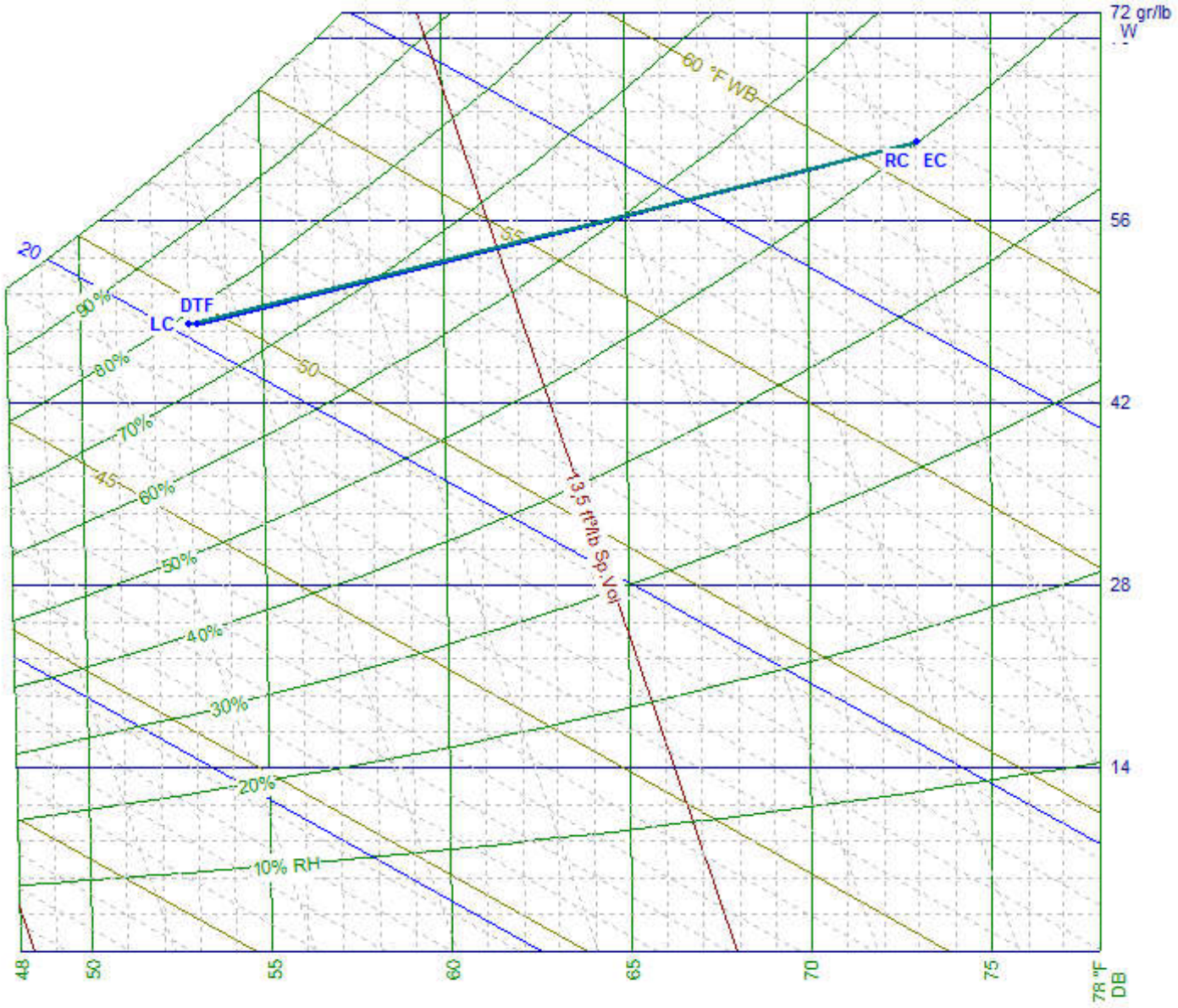
Air System #3 (UMA Salón de Profesores) Psychrometric Chart

RC	Room Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	RD	Return Duct Temperature Rise
DTF	Draw Through Fan Sensible Gain	BTF	Blow Through Fan Sensible Gain
RE	Reserve or Reheat Sensible Gain	PL	Return Air Plenum Sensible Gain
SM	Supply Side Miscellaneous Sensible Gain	MR	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition
MIX	Mixed Air Condition	RML	Return Miscellaneous Latent Gain



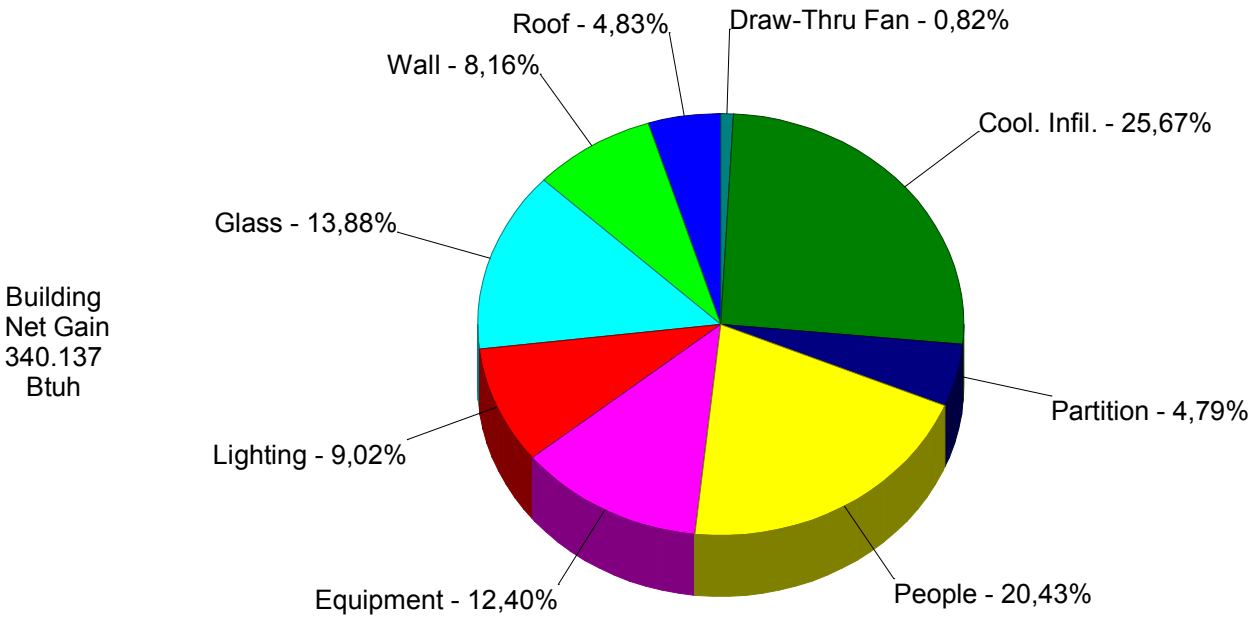
Air System #4 (UMA Salón Especial) Psychrometric Chart

RC	Room Condition	OC	Outdoor Condition
LC	Leaving Coil Condition	EC	Entering Coil Condition
SD	Supply Duct Temperature Rise	RD	Return Duct Temperature Rise
DTF	Draw Through Fan Sensible Gain	BTF	Blow Through Fan Sensible Gain
RE	Reserve or Reheat Sensible Gain	PL	Return Air Plenum Sensible Gain
SM	Supply Side Miscellaneous Sensible Gain	MR	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition
MIX	Mixed Air Condition	RML	Return Miscellaneous Latent Gain



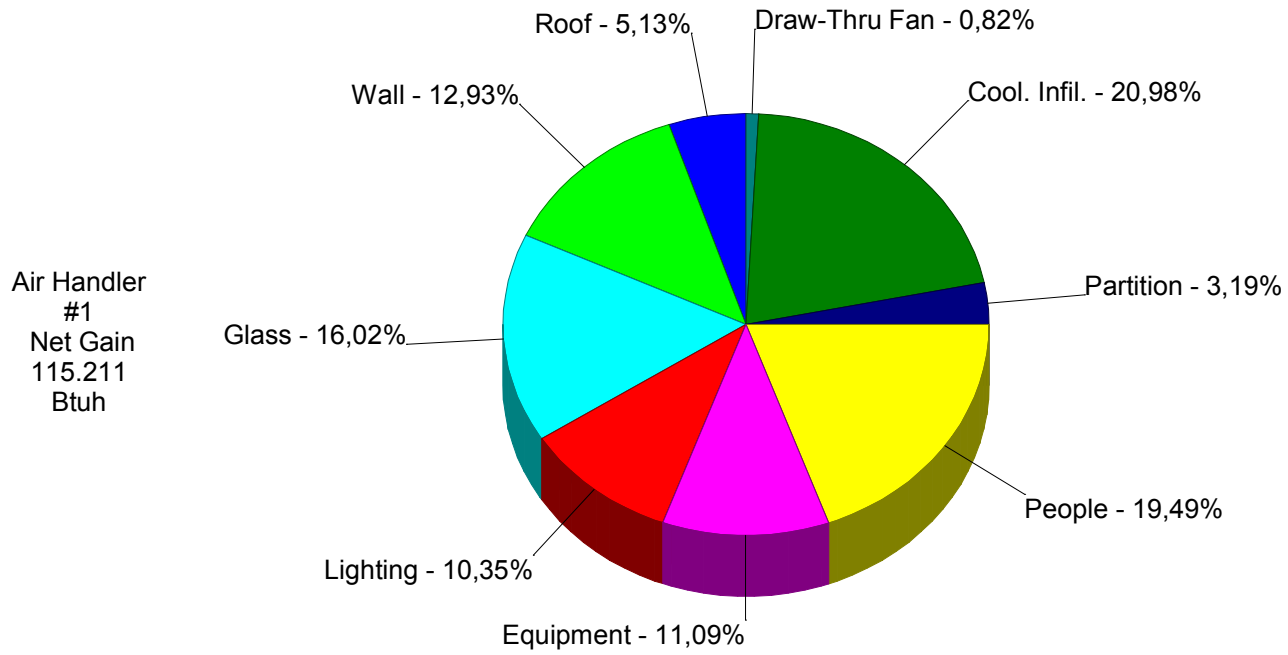
Building Pie Charts

Building peaks in December at 4pm.



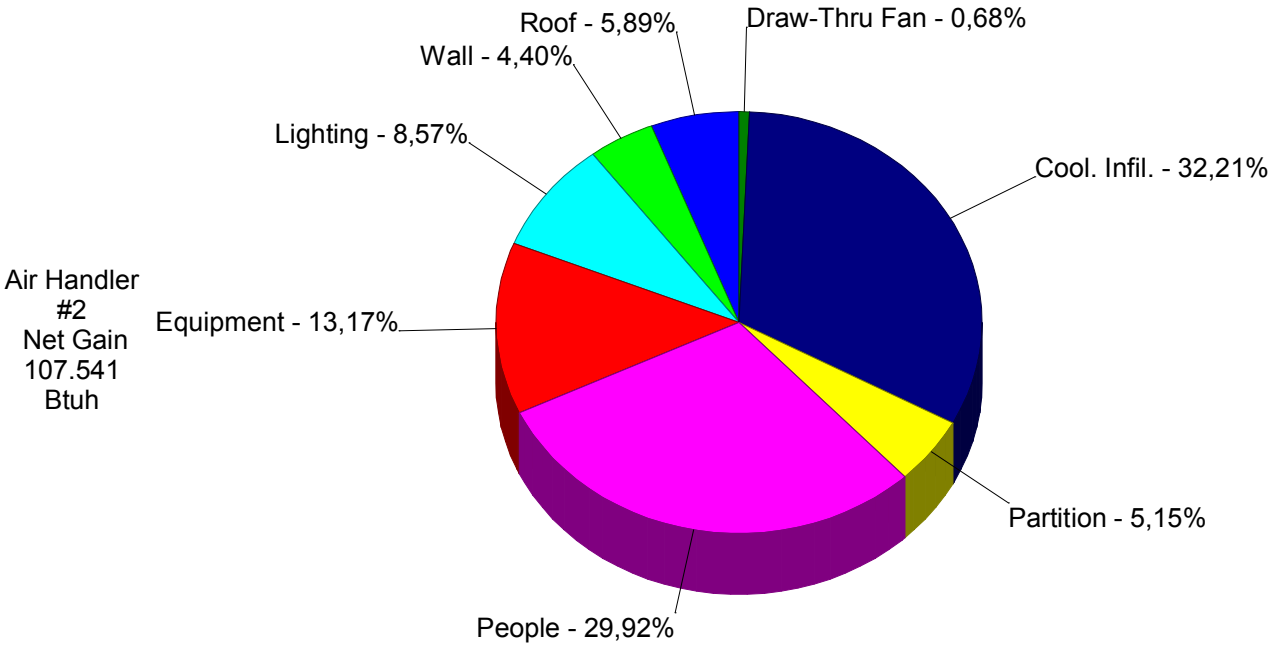
Air Handler #1 - UMA Laboratorio 2 - Pie Charts

Air Handler #1 peaks in December at 4pm.



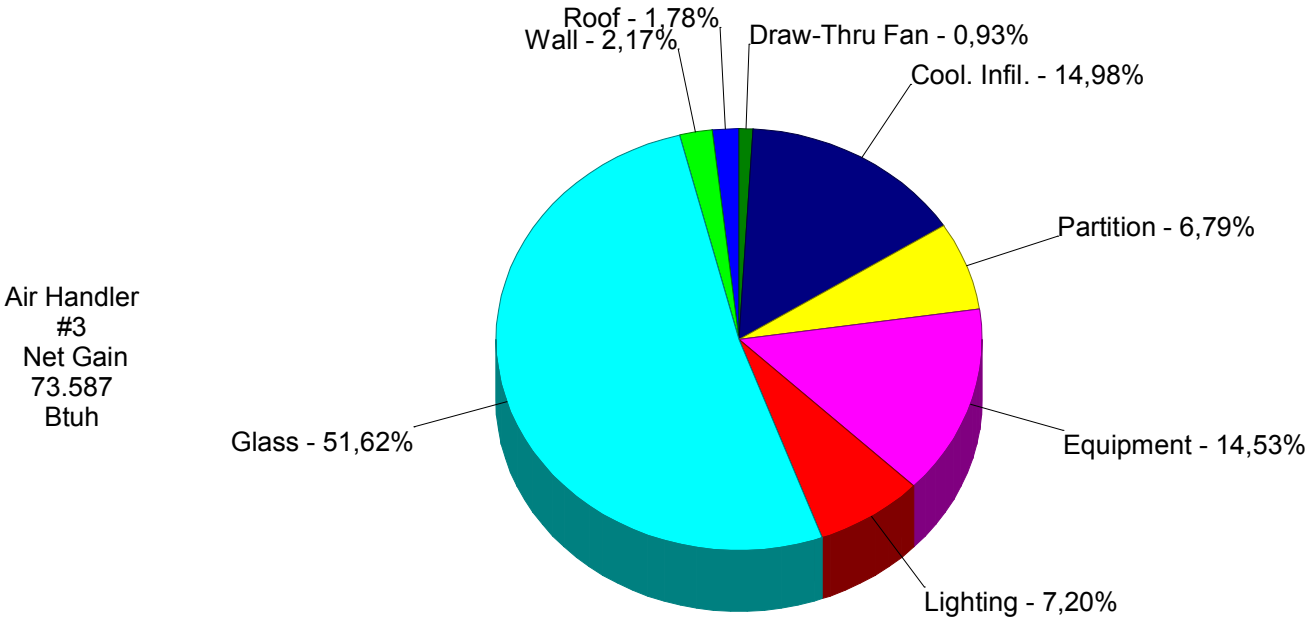
Air Handler #2 - UMA Biblioteca - Pie Charts

Air Handler #2 peaks in October at 5pm.



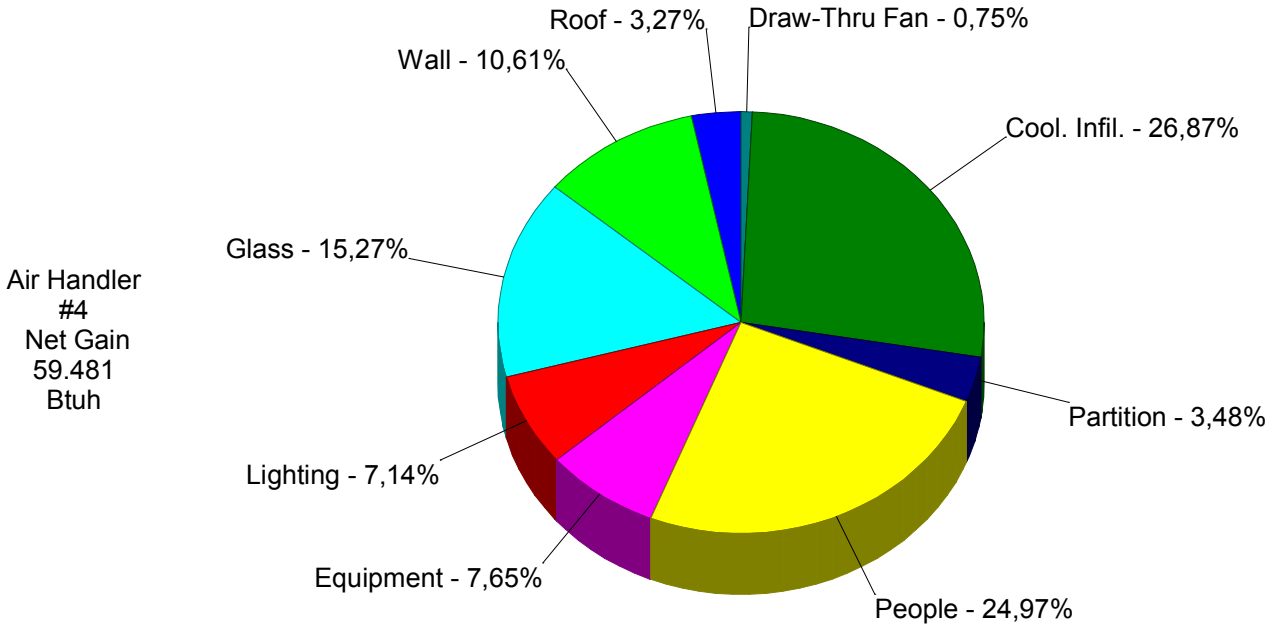
Air Handler #3 - UMA Salón de Profesores - Pie Charts

Air Handler #3 peaks in March at 10am.



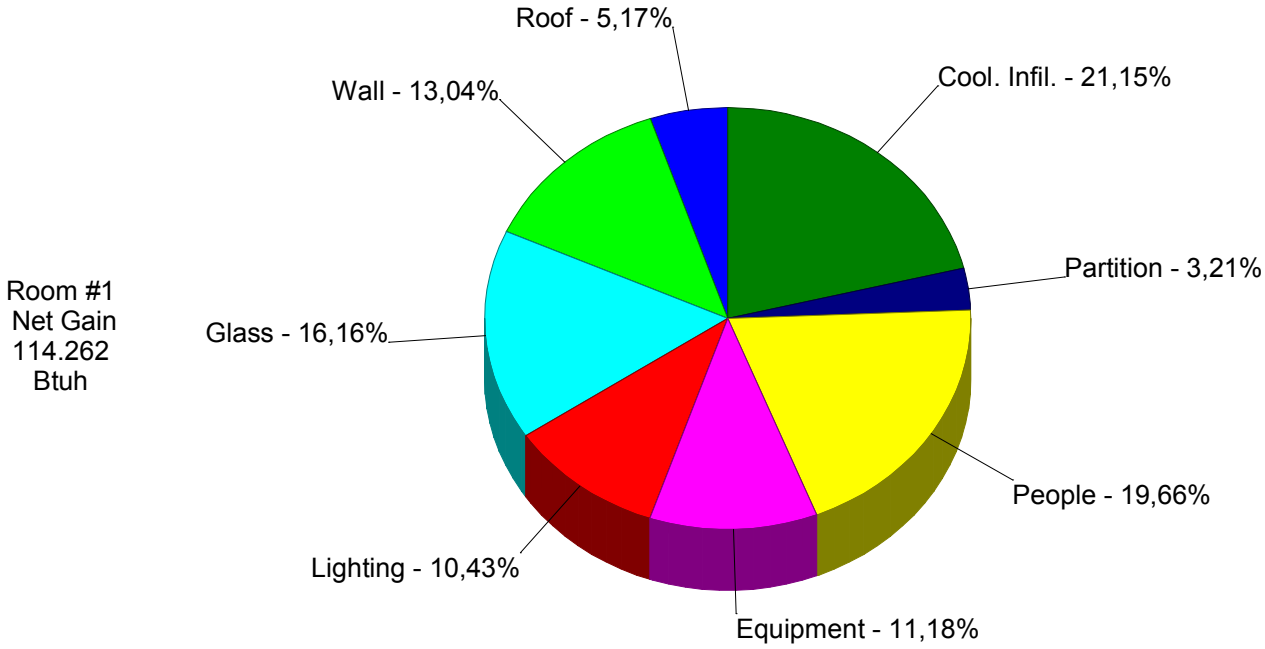
Air Handler #4 - UMA Salón Especial - Pie Charts

Air Handler #4 peaks in June at 3pm.



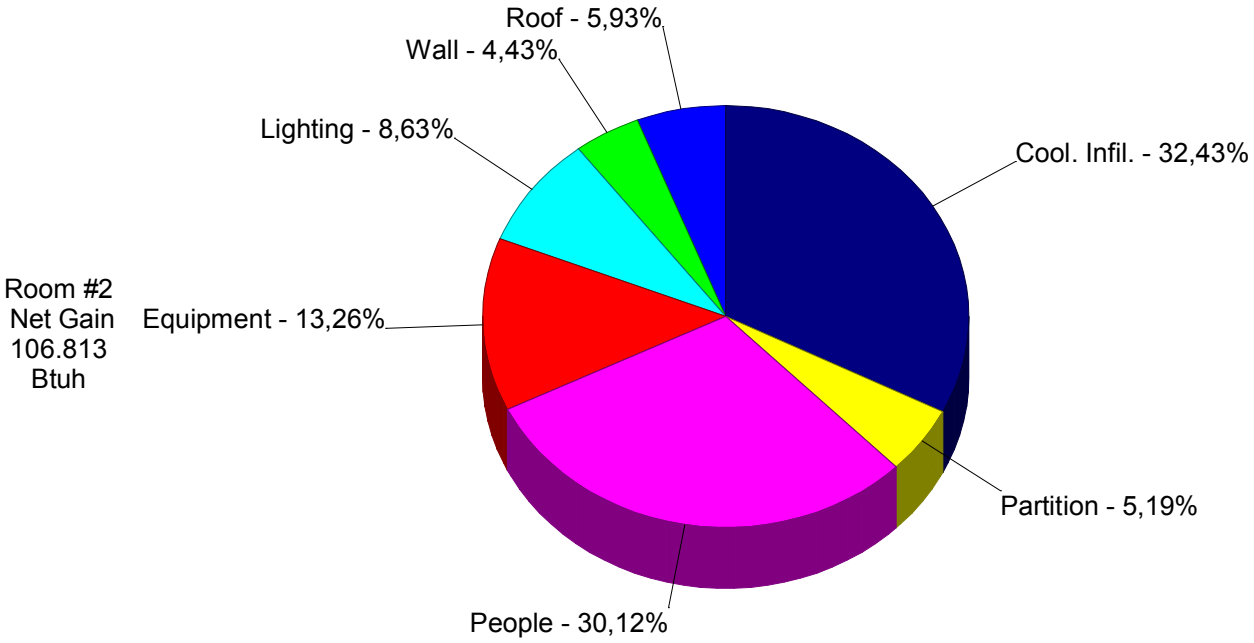
Room #1 - Laboratorio 2 - Pie Charts

Room #1 peaks in December at 4pm



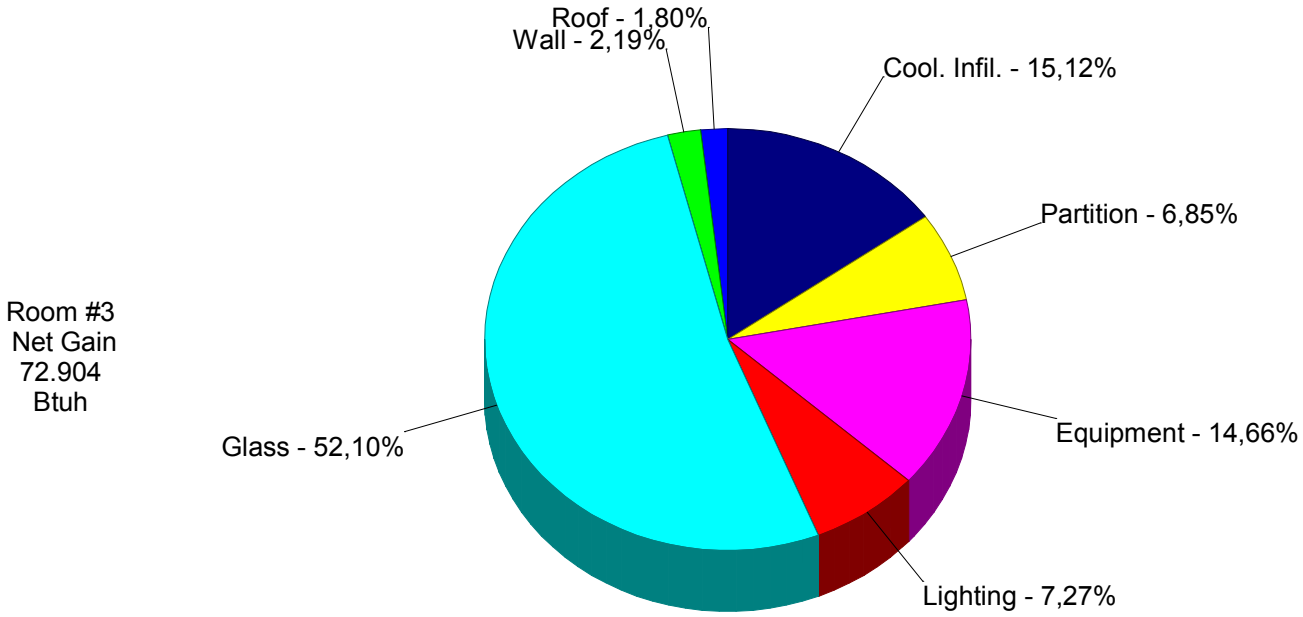
Room #2 - Biblioteca - Pie Charts

Room #2 peaks in October at 5pm



Room #3 - Salón de Profesores - Pie Charts

Room #3 peaks in March at 10am



Room #4 - Salón Especial - Pie Charts

Room #4 peaks in June at 3pm

