Infonavit
HVAC Load Analysis

for

Infonavit
AV.JUAREZ MANZANA 44-A
TORREON COAHUILA

Elite Software

CHVAC Commercial HVAC Loads

Prepared By:

Jamm
Alta Tecnologia

lunes, 19 de junio de 2017

General Project Data Input

General Project Information

Project file name:	C:\Users\ALFRED\Desktop\ANTEPROYECTO A.A. INFONAVIT TORREON 160617\MEMORIA DE CALCULO\SALA DE JUNTAS - 22.CHV
Project title:	Infonavit
Project address:	AV.JUAREZ MANZANA 44-A
Project city, state, ZIP:	TORREON COAHUILA
Designed by:	Jamm
Project date:	Mayo 2017
Weather reference city:	TORREON, COAHUILA, MEXICO
Client name:	Infonavit
Client address:	AV.JUAREZ MANZANA 44-A
Client city:	TORREON COAHUILA
Company name:	Alta Tecnologia
Company representative:	Jamm

Barometric pressure:	29.921	in.Hg.
Altitude:	0	feet
Latitude:	25	Degrees
Mean daily temperature range:	18	Degrees
Starting & ending time for HVAC load calculations:	8am - 11pm	
Number of unique zones in this project:	1	

Building Default Values

Calculations performed:	Both heating and cooling loads	
Lighting requirements:	2.00	Watts per square foot
Equipment requirements:	2.00	Watts per square foot
People sensible load multiplier:	250	Btuh per person
People latent load multiplier:	250	Btuh per person
Zone sensible safety factor:	5	%
Zone latent safety factor:	5	%
Zone heating safety factor:	5	%
People diversity factor:	100	%
Lighting profile number:	0	
Equipment profile number:	0	
People profile number:	0	
Building default ceiling height:	9.00	feet
Building default wall height:	9.00	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	C	C	C	C	C	C	C	C	C	C	70	70	70	C	C	C	C	C	C	C	C	C	C	C
2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
3	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
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
August	95	73	50%	75	19.11	4
Winter	25			75		

Master Roofs

Roof No.	ASHRAE Roof#	Roof U-Fac	Dark Color	Susp. Ceil
1	9	0.320	Sí	Sí

Roof #1 Description: Flat roof, 2" heavy weight concrete deck with no insulation, suspended ceiling below with no insulation

Master Walls

Wall No.	ASHRAE Group	Wall U-Fac	Wall Color
1	E	0.046	D
2	G	0.062	L
3	G	0.032	L

Master Partitions

Partition No.	Partition U-Factor	Cool T-D	Heat T-D
1	0.196	25	25

Partition #1 Description: Block partition, 4" sand & gravel, hollow core, siding exterior, interior finish

2	0.275	25	25

Partition #2 Description: Brick partition, 8" thick, face & common, interior finish

Master Glass

Glass No.	Summer U-Factor	Winter U-Factor	Glass Shd.Coef.	Interior Shading	Interior Shd.Coef
1	1.040	1.100	0.880	2	0.640

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	2.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00
2	2.00	1.00	1.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00

Building Summary Loads

Building peaks in August at 6pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	644	10,813	37.15	0	9,056	9,056	30.49
Wall	0	0	0.00	0	0	0	0.00
Glass	8	233	0.80	0	220	220	0.74
Floor Slab	0	0	0.00	0	0	0	0.00
Skin Loads		11,046	37.95	0	9,276	9,276	31.23
Lighting	80	0	0.00	0	287	287	0.96
Equipment	805	0	0.00	0	2,882	2,882	9.70
People	10	0	0.00	2,625	2,625	5,250	17.67
Partition	127	924	3.17	0	924	924	3.11
Cool. Pret.	0	0	0.00	0	0	0	0.00
Heat. Pret.	0	0	0.00	0	0	0	0.00
Cool. Vent.	280	0	0.00	4,334	4,936	9,270	31.21
Heat. Vent.	280	15,144	52.03	0	0	0	0.00
Cool. Infil.	0	0	0.00	0	0	0	0.00
Heat. Infil.	0	0	0.00	0	0	0	0.00
Draw-Thru Fan	0	0	0.00	0	773	773	2.60
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	1,330	4.57	0	798	798	2.69
Return Duct	0	665	2.28	0	245	245	0.82
Misc. Supply	0	0	0.00	0	0	0	0.00
Misc. Return	0	0	0.00	0	0	0	0.00
Building Totals		29,109	100.00	6,959	22,746	29,705	100.00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	15,144	52.03	4,334	4,936	9,270	31.21
Infiltration	0	0.00	0	0	0	0.00
Pretreated Air	0	0.00	0	0	0	0.00
Zone Loads	11,970	41.12	2,625	15,994	18,619	62.68
Plenum Loads	0	0.00	0	0	0	0.00
Fan & Duct Loads	1,995	6.85	0	1,816	1,816	6.11
Building Totals	29,109	100.00	6,959	22,746	29,705	100.00

Check Figures

Total Building Supply Air (based on a 22° TD):	726	CFM
Total Building Vent. Air (38.64% of Supply):	280	CFM
Total Conditioned Air Space:	402	Sq.ft
Supply Air Per Unit Area:	1.8043	CFM/Sq.ft
Area Per Cooling Capacity:	162.5	Sq.ft/Ton
Cooling Capacity Per Area:	0.0062	Tons/Sq.ft
Heating Capacity Per Area:	72.36	Btuh/Sq.ft
Total Heating Required With Outside Air:	29,109	Btuh
Total Cooling Required With Outside Air:	2.48	Tons

Air Handler #1 - Sala De Juntas - Summary Loads

Zn No	Description Zone 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	Sala Dejuntas	402	11,970	15,994	2,625	20/P, 0.2/ft²	20/P, 0.2/ft²
	8pm August	10	616	726	0	280	280
		3,620	1.53	1.80	0	280	280
Runout duct size: 6 in. dia, Diffusers: 6, CFM/runout: 121, Velocity: 616.1 ft/min, Pressure drop: 0.243 in.wg./100ft							
	Zone Peak Totals:	402	11,970	15,994	2,625		
	Total Zones: 1	10	616	726	0	280	280
	Unique Zones: 1	3,620	1.53	1.80	0	280	280
Main trunk duct size: 14 in. h x 12in. w, Velocity: 678.9 ft/min, Pressure drop: 0.068 in.wg./100ft							

Air Handler #1 - Sala De Juntas - Total Load Summary

Air Handler Description:	Sala De Juntas Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0.30 HP
Fan Input:	75% motor and fan efficiency with 2 in. water across the fan
Sensible Heat Ratio:	0.87 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	6pm in August.
Outdoor Conditions:	Clg: 91° DB, 72° WB, 84.75 grains, Htg: 25° DB
Indoor Conditions:	Clg: 75° DB, 50% RH, Htg: 75° DB

Because of the diversity in zone, plenum and ventilation loads, the zone sensible peak time in August at 8pm is different from the total system peak time, hence the air system CFM was computed using a zone sensible load of 15,994.

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

Zone Space sensible loss:	11,970	Btuh			
Infiltration sensible loss:	0	Btuh	0	CFM	
Outside Air sensible loss:	15,144	Btuh	280	CFM	
Supply Duct sensible loss:	1,330	Btuh			
Return Duct sensible loss:	665	Btuh			
Return Plenum sensible loss:	0	Btuh			
Total System sensible loss:					29,109 Btuh
Heating Supply Air: 13,300 / (1.000 X 1.08 X 20) =			616	CFM	
Winter Vent Outside Air (45.5% of supply) =			280	CFM	
Zone space sensible gain:	15,994	Btuh			
Infiltration sensible gain:	0	Btuh			
Draw-thru fan sensible gain:	773	Btuh			
Supply duct sensible gain:	798	Btuh			
Reserve sensible gain:	0	Btuh			
Total sensible gain on supply side of coil:					17,565 Btuh
Cooling Supply Air: 17,565 / (1.000 X 1.1 X 22) =			726	CFM	
Summer Vent Outside Air (38.6% of supply) =			280	CFM	
Return duct sensible gain:	245	Btuh			
Return plenum sensible gain:	0	Btuh			
Outside air sensible gain:	4,936	Btuh	280	CFM	
Blow-thru fan sensible gain:	0	Btuh			
Total sensible gain on return side of coil:					5,181 Btuh
Total sensible gain on air handling system:					22,746 Btuh
Zone space latent gain:	2,625	Btuh			
Infiltration latent gain:	0	Btuh			
Outside air latent gain:	4,334	Btuh			
Total latent gain on air handling system:					6,959 Btuh
Total system sensible and latent gain:					29,705 Btuh

Check Figures

Total Air Handler Supply Air (based on a 22° TD):	726	CFM
Total Air Handler Vent. Air (38.64% of Supply):	280	CFM
Total Conditioned Air Space:	402	Sq.ft
Supply Air Per Unit Area:	1.8043	CFM/Sq.ft
Area Per Cooling Capacity:	162.5	Sq.ft/Ton
Cooling Capacity Per Area:	0.0062	Tons/Sq.ft
Heating Capacity Per Area:	72.36	Btuh/Sq.ft
Total Heating Required With Outside Air:	29,109	Btuh
Total Cooling Required With Outside Air:	2.48	Tons

Zone Detailed Loads (At Zone Peak Times)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Zone 1-Sala Dejuntas peaks (sensible) in August at 8pm, Air Handler 1 (Sala De Juntas), Group 0, 402.3 x 1.0, Construction Type: 1 (Light)								
Roof-1-9-Susp.C-D	644	1.00	41.9	0.320	8,624		16.000	10,298
Partition-1-2	127		25/25	0.275	880		6.930	880
Gls-P-1-1-Tran	8.0	1.000	12	1.040	210		27.720	222
0%S-0-NS-Solar	8.0	0.880	0	0.000	0			
Lights-Prof=0	80	1.000			273			
Equipment-Prof=0	805	1.000			2,745	0		
People-Prof=1	10.0	1.000			2,500	2,500		
Sub-total					15,232	2,500		11,400
Safety factors:					+5%	+5%		+5%
Total w/ safety factors:					15,994	2,625		11,970

Air System #1 (Sala De Juntas) Psychrometric Analysis (G)

System Load Analysis	Latent	Grains	Sensible	Temp	CFM
Leaving Coil Condition		59.322		53.000	
Draw-Thru Fan			773	0.968	32
Misc Load on Supply Side			0	0.000	0
Supply Air Duct			798	1.000	33
Zone Loads	2,625	5.319	15,994	20.033	661
Sensible Reserve			0	0.000	0
Zone Condition	2,625	64.641	17,565	75.000	726
Return Air Duct			245	0.500	
Return Air Plenum			0	0.000	
Misc Load on Return Side			0	0.000	
Vent Air 280 CFM	4,334	6.610	4,936	5.989	
Blow-Thru Fan			0	0.000	
Entering Coil Condition	6,959	71.251	22,746	81.489	726

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	=	1.000	x	1.10	x	726	x (	81.489	-	53.000	) =	22,745	Btuh
TLH	=	1.000	x	0.68	x	726	x (	71.251	-	59.322	) =	5,887	Btuh
SUM	=											28,632	Btuh
GTH	=	1.000	x	4.50	x	726	x (	30.727	-	21.913	) =	28,789	Btuh
Total System Load											=	29,705	Btuh

Chilled and Hot Water Flow Rates and Steam Requirement

Cooling GPM	=	28,789	/ (	0.00	x	500	)	=	0.0 GPM
Heating GPM	=	29,109	/ (	0.00	x	500	)	=	0.0 GPM
Steam Req.	=	29,109	/	970				=	30.0 lb./hr

Entering Cooling Coil Conditions

Dry bulb temperature:	81.49	
Wet bulb temperature:	66.09	
Relative humidity:	44.44	
Enthalpy:	30.73	Btu/lbm

Entering Heating Coil Conditions

Dry bulb temperature:	51.68

Leaving Cooling Coil Conditions

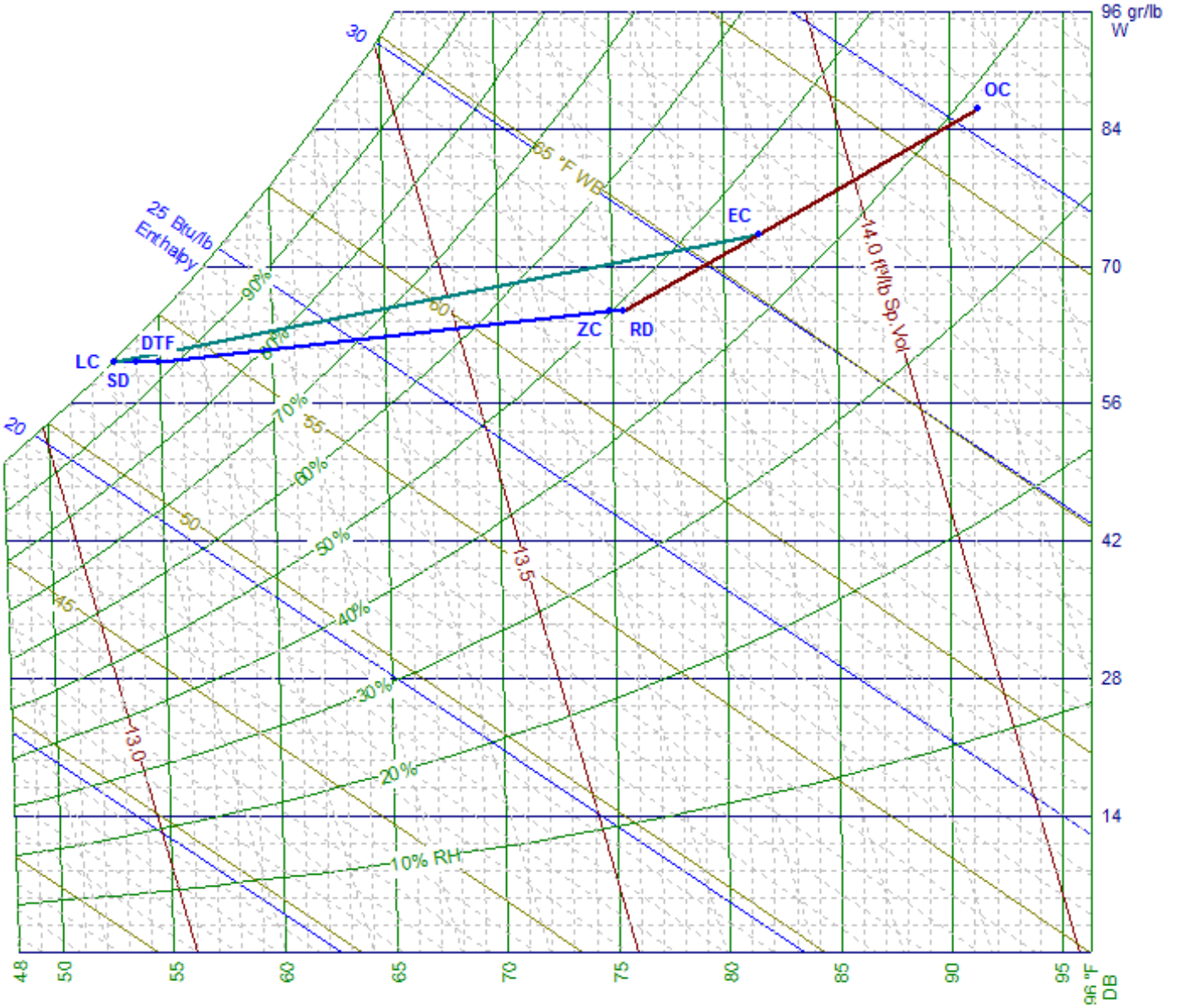
Dry bulb temperature:	53.00	
Wet bulb temperature:	52.89	
Relative humidity:	99.28	
Enthalpy:	21.91	Btu/lbm

Leaving Heating Coil Conditions

Dry bulb temperature:	95.00

Air System #1 (Sala De Juntas) Psychrometric Chart

ZC	Zone 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	RM	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition



Air System #1 (Sala De Juntas) Psychrometric Chart (G)

ZC	Zone 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	RM	Return Side Miscellaneous Gain
PRE	Pretreated Air Condition	HRV	Heat Recovery Ventilator Condition