VENTILATION AND AIR CONDITIONING

DESIGN CALCULATION COVER SHEET

Project	Detailed Design on Port Reactivation Project in La Union Province	**Project Code**	JC1N004/2N001
Section	**4D-Ventilation & Air-Conditioning**	Calc. File No.	
Sub-Section	**4D03-Maintenance & Repair Shop**	Calc. Index No.	

Subject: Air Conditioning Design Calculation

Calculation Objective:

To calculate the Thermal Load in each area, in order to determine the number and capacity of Mini Split Units in each area.

References, Calculation Notes and Comments

Thermal load are calculated by computer based analisys.

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	M. Garcia	Feb/14/2002	4	H. Mori	AUG/13/02	[signature]	14 Aug 02	
A	[signature]			[signature]				
B								
C								

FN : Calculation_Cover_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D-VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-MAINTENANCE &REPAIR S	Page No. 01	Rev.

Design Conditions:

References/ Notes

Thermic load calculation chart for air-conditioning is based in UIT ARI Standard 530-56.

Parameters are obtained from ASHRAE Tables

ABBREVIATIONS:

DB:	Dry Bulb Temperature
WB:	Wet Bulb Temperature
%HR:	Relative humidity
gr./lb.:	Grains/pound of dry air (Specific humidity)
N Total:	North Wall Area
E Total:	East Wall Area
S Total:	South Wall Area
O Total:	West Wall Area
N Glass:	North Windows
E Glass:	East Windows
S Glass:	South Windows
O Glass:	West Windows
CFM/person	Cubic feet per minute/person
CFM/Sq Ft	Cubic feet per minute/square feet
N Factor:	Sensible factor North
E Factor:	Sensible factor East
S Factor:	Sensible factor South
O Factor:	Sensible factor West
Wall Factor:	Heat Gain factor through walls
Partition Factor:	Heat Gain factor through partitions
Ceiling Factor:	Heat Gain factor through ceiling
False ceiling Factor:	Heat Gain factor through false ceiling
Floor Factor:	Heat Gain factor through floor
People Sensible Heat:	People sensible heat gain
People Latent Heat:	People latent heat gain
Light Watts:	Heat produced by lights
Motor HP:	Heat produced by motors
Appliances:	Heat produced by electrical appliances
dif. Db:	Dry Bulb difference between inside and outside air
dif. Gr/lb:	Specific Humidity difference between inside and outside air

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D-VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-MAINTENANCE &REPAIR S	Page No. 02	Rev.

References/ Notes

Offices

Project: PUERTO LA UNION — Number:

Made by: M. Garcia

Design Conditions

Conditions	DB	WB	%RH	DP	GR/LB	Enthalpy	Latitude	14° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area: 387.30 Sq. Ft. — 9.84 Ceiling Heigh = — 3,811.06 Cu.Ft.

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	107.58	0.60		36.02		2,325.25	
Glass (S)	0.00	0.60		72.68		0.00	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	2,325.25	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	107.58	1.04	15.50			1,734.25	
Glass (S)	0.00	1.04	15.50			0.00	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	1,734.25	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	193.65	0.34	18.00			1,185.15	
Wall (S)	193.65	0.34	18.00			1,185.15	
Wall (E)	193.65	0.34	18.00			1,185.15	
Wall (O)	193.65	0.34	18.00			1,185.15	
Ceiling	387.30	0.14	18.00			976.00	
						0.00	
					Subtotal	5,716.58	

Transmission Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D-VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-MAINTENANCE &REPAIR S	Page No. 03	Rev.

References/ Notes

Internal Sensible Heat

ITEM	Description	Quantity	Factor	= BTUH	Cooling	Heating
People		4.00	205.00		820.00	
People			195.00		0.00	
Lights	Fluorescent	400.00	4.35		1,740.00	
Lights	Incandescent		3.40		0.00	
Motors	Less than 3HP		3,600.00		0.00	
Motors	More than 3HP		3,000.00		0.00	
			3.40		0.00	
				Subtotal	12,036.09	
				F.S. 5%	616.80	
				Total	12,952.90	

Internal latent Heat

ITEM	Description	Quantity	Factor	= BTUH	Cooling
People		4.00	205.00		820.00
People			205.00		0.00
Appliances		100.00	3.40		340.00
Steam			1,050.00		0.00
					0.00
				Sub-Total Latent Heat	1,160.00
				F.S. 25%	29.00
				Total latent Heat	1,189.00

Ventilation and infiltration

Number of people		4.00	x	7.50	cfm x person	30.00	CFM CA	
Room Volume		3,811.06	60 min			63.52	CFM CA	
Sesnible	63.52	CFM CA	x	18.00	delta T	x 1.08 =	1,234.78	
Latent	63.52	CFM CA	x	62.00	GR/LB	x 0.68 =	2,677.90	

Load Summary

1. Sensible	12,952.90	BTUH
2. Latent	1,189.00	BTUH
3. Total Heat	14,141.90	BTUH
4. External Heat	3,912.68	BTUH
5. Great Heat Total	18,054.58	BTUH
6. A/C Tons	1.50	TONS
7. Sensible heat factor SHF	0.92	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	1,332.60	CFM

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D-VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-MAINTENANCE &REPAIR S	Page No. 04	Rev.

References/ Notes

Area	Qty	TONS
Offices	3	4.51
TOTAL		4.51

		Prepared by	Checked by	
		M. Garcia	July/23/2002	H. Mori	Aug/13/02

DESIGN CALCULATION COVER SHEET

Project	Detailed Design on Port Reactivation Project in La Union Province	**Project Code**	JC1N004/2N001
Section	**4D- Ventilation & Air-Conditioning**	Calc. File No.	
Sub-Section	**4D04- Container Gate**	Calc. Index No.	

Subject: Air Conditioning Design Calculation

Calculation Objective:

To calculate the Thermal Load in each area, in order to determine the number and capacity of Mini Split Units in each area.

References, Calculation Notes and Comments

Calculations are based on ASHRAE Standards.

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	M. Garcia	Feb/14/2002	8	H. Mori	Aug/13/02	VD PT	14 Aug 02	
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FN : Calculation_Cover_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 01	Rev.

References/ Notes

Design Conditions:

Thermic load calculation chart for air-conditioning is based in UIT ARI Standard 530-56.

Parameters are obtained from ASHRAE Tables

ABBREVIATIONS:

DB:	Dry Bulb Temperature
WB:	Wet Bulb Temperature
%HR:	Relative humidity
gr./lb.:	Grains/pound of dry air (Specific humidity)
N Total:	North Wall Area
E Total:	East Wall Area
S Total:	South Wall Area
O Total:	West Wall Area
N Glass:	North Windows
E Glass:	East Windows
S Glass:	South Windows
O Glass:	West Windows
CFM/person	Cubic feet per minute/person
CFM/Sq Ft	Cubic feet per minute/square feet
N Factor:	Sensible factor North
E Factor:	Sensible factor East
S Factor:	Sensible factor South
O Factor:	Sensible factor West
Wall Factor:	Heat Gain factor through walls
Partition Factor:	Heat Gain factor through partitions
Ceiling Factor:	Heat Gain factor through ceiling
False ceiling Factor:	Heat Gain factor through false ceiling
Floor Factor:	Heat Gain factor through floor
People Sensible Heat:	People sensible heat gain
People Latent Heat:	People latent heat gain
Light Watts:	Heat produced by lights
Motor HP:	Heat produced by motors
Appliances:	Heat produced by electrical appliances
dif. Db:	Dry Bulb difference between inside and outside air
dif. Gr/lb:	Specific Humidity difference between inside and outside air

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	August 13 2002

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 02	Rev.

References/ Notes

Weigh Bridge Office

Project	PUERTO LA UNION	Number	
Made by	M. Garcia		

Design Conditions

Conditions	DB	WB	%RH	DP	GR/LB	Enthalpy	Latitude	14° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area 190.42 Sq Ft 9.84 Ceiling Height = 1,873.77 Cu.ft

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	0.60		36.02		0.00	
Glass (S)	12.26	0.60		72.66		534.81	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	534.81	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	1.04	16.50			0.00	
Glass (S)	12.26	1.04	16.50			197.70	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	197.70	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	95.21	0.04	18.00			582.70	
Wall (S)	95.21	0.04	18.00			582.70	
Wall (E)	193.65	0.04	18.00			1,185.16	
Wall (O)	193.65	0.04	18.00			1,185.16	
Ceiling	190.42	0.14	18.00			479.87	
						0.00	
					Subtotal	4,015.55	

Transmision Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

		Prepared by		Checked by	
		M. Garcia	July/23/2002	H. Mori	August 13 2002

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 03	Rev.

References/ Notes

Weigh Bridge Office

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	200.00	4.35			870.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		6,028.06	
				F.S. 5%		301.40	
				Total		6,329.47	

Internal latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	
People		2.00	205.00			410.00	
People			205.00			0.00	
Appliances		200.00	3.40			680.00	
Steam			1,050.00			0.00	
						0.00	
				Sub-Total Latent Heat		1,090.00	
				F.S. 2.5%		27.25	
				Total Latent Heat		1,117.25	

Ventilation and infiltration

Number of people		2.00	x	7.50	cfm x person	15.00	CFM CA
Room Volume		1,873.77	60 min			31.23	CFM CA
Sensible	31.23	CFM CA	x	18.00	delta T	x 1.08 =	607.10
Latent	31.23	CFM CA	x	62.00	GR/LB	x 0.68 =	1,316.64

Load Summary

1. Sensible	6,329.47	BTUH
2. Latent	1,117.25	BTUH
3. Total Heat	7,446.72	BTUH
4. External Heat	1,923.74	BTUH
5. Great Heat Total	9,370.45	BTUH
6. A/C Tons	0.78	TONS
7. Sensible heat factor	SHF 0.85	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	651.18	CFM

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	August 13 2002

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 04	Rev.

References/ Notes

Gate Office

Project: PUERTO LA UNION — Number:

Made by: M. Garcia

Design Conditions

Conditions	DB	WB	%RH	DP	GRAIN	Enthalpy	Latitude 14° N
Exterior	90.00	78.00			126.00		Temp. Range 20 °F
Interior	72.00		55.00		94.00		Peak Load
Difference	18.00				62.00		

Area: 84.72 Sq. Ft. × 9.84 Ceiling Height = 833.67 Cu. Ft.

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coefficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	25.82	0.60		36.02		558.06	
Glass (S)	12.91	0.60		72.68		562.96	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	1,121.02	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	25.82	1.04	15.50			416.22	
Glass (S)	12.91	1.04	15.50			208.11	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	624.33	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	121.03	0.34	18.00			740.72	
Wall (S)	121.03	0.34	18.00			740.72	
Wall (E)	67.78	0.34	18.00			414.80	
Wall (O)	67.78	0.34	18.00			414.80	
Ceiling	84.72	0.14	18.00			213.50	
						0.00	
					Subtotal	2,524.53	

Transmission Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	August 13 2002

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 05	Rev.

References/ Notes

Gate Office

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	100.00	4.35			435.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		5,114.88	
				F.S. 5%		255.74	
				Total		5,370.63	

Internal latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling
People		2.00	205.00			410.00
People			205.00			0.00
Appliances		100.00	3.40			340.00
Steam			1,050.00			0.00
						0.00
				Sub-Total Latent Heat		750.00
				F.S. 2.5%		18.75
				Total Latent Heat		768.75

Ventilation and infiltration

Number of people		2.00	x	7.50	cfm x person	15.00	CFM CA	
Room Volume		833.67	60 min			13.89	CFM CA	
Sensible	15.00	CFM CA	x	18.00	delta T	x 1.08 =	291.60	
Latent	15.00	CFM CA	x	62.00	GR/LB	x 0.68 =	632.40	

Load Summary

1. Sensible	5,370.63	BTUH	
2. Latent	768.75	BTUH	
3. Total Heat	6,139.38	BTUH	
4. External Heat	924.00	BTUH	
5. Great Heat Total	7,063.38	BTUH	
6. A/C Tons	0.59	TONS	
7. Sensible heat factor	SHF	0.87	
8. Dry Bulb inside Temperature	72.00	°F	
9. Dry bulb supply air temperature	63.00	°F	
10. Supply Air temperature Gain	9.00	Delta T	
Total Air Supply (CFM)	552.53	CFM	

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	August 13 2002

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 06	Rev.

References/ Notes

Duty Staff Room

Project	PUERTO LA UNION	Number	
Made by	M. Garcia		

Design Conditions

Conditions	DB	WB	%RH	DP	GR.H	Enthalpy	Latitude	14° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area 190.42 Sq.Ft. 9.84 Ceiling Height = 1,873.77 Cu.ft

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coefficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	0.60	36.02			0.00	
Glass (S)	12.26	0.60	72.68			534.81	
Glass (E)	0.00	0.60	216.45			0.00	
Glass (O)	0.00	0.60	216.45			0.00	
					Sub Total	534.81	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	1.04	15.50			0.00	
Glass (S)	12.26	1.04	15.50			197.70	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	197.70	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	95.21	0.34	18.00			582.70	
Wall (S)	95.21	0.34	18.00			582.70	
Wall (E)	193.65	0.34	18.00			1,185.15	
Wall (O)	193.65	0.34	18.00			1,185.15	
Ceiling	190.42	0.14	18.00			479.87	
						0.00	
					Subtotal	4,015.55	

Transmission Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

		Prepared by		Checked by	
		M. Garcia	July/23/2002	H. Mori	August 13 2002

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 07	Rev.

References/ Notes

Duty Staff Room

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	200.00	4.36			870.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		6,028.06	
				F.S.-5%		301.40	
				Total		6,329.47	

Internal latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling
People		2.00	205.00			410.00
People			205.00			0.00
Appliances		200.00	3.40			680.00
Steam			1,050.00			0.00
						0.00
				Sub-Total Latent Heat		1,090.00
				F.S. 2.5%		27.25
				Total Latent Heat		1,117.25

Ventilation and infiltration

Number of people		2.00	x	7.50	cfm x person	15.00	CFM CA	
Room Volume		1,873.77	60 min			31.23	CFM CA	
Sensible	31.23	CFM CA	x	18.00	delta T	x 1.08 =	607.10	
Latent	31.23	CFM CA	x	62.00	GR/LB	x 0.68 =	1,316.64	

Load Summary

1. Sensible	6,329.47	BTUH
2. Latent	1,117.25	BTUH
3. Total Heat	7,446.72	BTUH
4. External Heat	1,923.74	BTUH
5. Great Heat Total	9,370.45	BTUH
6. A/C Tons	0.78	TONS
7. Sensible heat factor	SHF 0.85	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	651.18	CFM

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	August 13 2002

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CONTAINER GATE	Page No. 08	Rev.

References/ Notes

Summary

Area	Qty.	TONS
Weigh Bridge Office	2	4.34
Gate Office	4	2.36
Duty Staff Room	2	4.34
TOTAL		11.04

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	August 13 2002

FN: Calculation_Sheet

DESIGN CALCULATION COVER SHEET

Project	Detailed Design on Port Reactivation Project in La Union Province	**Project Code**	JC1N004/2N001
Section	**4D- Ventilation & Air-Conditioning**	Calc. File No.	
Sub-Section	**Container Freight Station**	Calc. Index No.	

Subject: Air Conditioning Design Calculation

Calculation Objective:

To calculate the Thermal Load in each area, in order to determine the number Multi Split Units in each area.

References, Calculation Notes and Comments

Calculation are based on ASHRAE Standards

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	M. Garcia	Feb/14/2002	4	H. Mori	Aug/13/02		14 Aug 02	
A								
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FN : Calculation_Cover_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-C.F.S.	Page No. 01	Rev.

References/ Notes

Design Conditions:

Thermic load calculation chart for air-conditioning is based in UIT ARI Standard 530-56.

Parameters are obtained from ASHRAE Tables

ABBREVIATIONS:

DB:	Dry Bulb Temperature
WB:	Wet Bulb Temperature
%HR:	Relative humidity
gr./lb.:	Grains/pound of dry air (Specific humidity)
N Total:	North Wall Area
E Total:	East Wall Area
S Total:	South Wall Area
O Total:	West Wall Area
N Glass:	North Windows
E Glass:	East Windows
S Glass:	South Windows
O Glass:	West Windows
CFM/person	Cubic feet per minute/person
CFM/Sq Ft	Cubic feet per minute/square feet
N Factor:	Sensible factor North
E Factor:	Sensible factor East
S Factor:	Sensible factor South
O Factor:	Sensible factor West
Wall Factor:	Heat Gain factor through walls
Partition Factor:	Heat Gain factor through partitions
Ceiling Factor:	Heat Gain factor through ceiling
False ceiling Factor:	Heat Gain factor through false ceiling
Floor Factor:	Heat Gain factor through floor
People Sensible Heat:	People sensible heat gain
People Latent Heat:	People latent heat gain
Light Watts:	Heat produced by lights
Motor HP:	Heat produced by motors
Appliances:	Heat produced by electrical appliances
dif. Db:	Dry Bulb difference between inside and outside air
dif. Gr/lb:	Specific Humidity difference between inside and outside air

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-C.F.S.	Page No. 02	Rev.

References/ Notes

Offices

Project	PUERTO LA UNION	Number	
Made by	M. Garcia		

Design Conditions

Conditions	DB	WB	%RH	DP	GR/LB	Enthalpy	Latitude	14° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area 605.16 Sq. Ft. 9.84 Ceiling Heigh = 5,954.77 Cu. Ft.

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	0.60	36.02			0.00	
Glass (S)	12.91	0.60	72.68			562.96	
Glass (E)	0.00	0.60	216.45			0.00	
Glass (O)	0.00	0.60	216.45			0.00	
					Sub Total	562.96	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	1.04	15.50			0.00	
Glass (S)	12.91	1.04	15.50			208.11	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	208.11	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq Temperature	=	BTUH	Cooling	Heating
Wall (N)	242.06	0.34	18.00			1,481.43	
Wall (S)	242.06	0.34	18.00			1,481.43	
Wall (E)	240.45	0.34	18.00			1,471.56	
Wall (O)	240.45	0.34	18.00			1,471.56	
Ceiling	605.16	0.14	18.00			1,525.00	
						0.00	
					Subtotal	7,430.98	

Transmision Heat Gains

ITEM	Net Area	U Factor	Eq Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

		Prepared by		Checked by	
		M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-C.F.S.	Page No. 03	Rev.

References/ Notes

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		8.00	205.00			1,640.00	
People			195.00			0.00	
Lights	Fluorecent	600.00	4.35			2,610.00	
Lights	Incandecent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		12,452.04	
				F.S. 5%		622.60	
				Total		13,074.65	

Internal Latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling
People		8.00	205.00			1,640.00
People			205.00			0.00
Appliances		600.00	3.40			2,040.00
Steam			6,050.00			0.00
						0.00
				Sub-Total Latent Heat		3,680.00
				F.S. 2.5%		92.00
				Total latent Heat		3,772.00

Ventilation and infiltration

Number of people		8.00	x	7.50	cfm x person	60.00	CFM CA	
Room Volume		5,954.77	60 min			99.25	CFM CA	
Sesnible	99.25	CFM CA	x	18.00	delta T	x 1.08 =	1,929.35	
Latent	99.25	CFM CA	x	62.00	GR/LB	x 0.68 =	4,184.22	

Load Summary

1. Sensible	13,074.65	BTUH
2. Latent	9,772.00	BTUH
3. Total Heat	16,846.65	BTUH
4. External Heat	6,113.57	BTUH
5. Great Heat Total	22,960.21	BTUH
6. A/C Tons	1.91	TONS
7. Sensible heat factor	0.78	SHF
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	1,345.13	CFM

		Prepared by		Checked by	
		M. Garcia	July/23/2002	H. Mori	Aug/18/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-C.F.S.	Page No. 04	Rev.

References/ Notes

Area	Qty	TONS
Offices	4	7.65
TOTAL		7.65

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	Aug/13/02

DESIGN CALCULATION COVER SHEET

Project	Detailed Design on Port Reactivation Project in La Union Province	**Project Code**	JC1N004/2N001
Section	**4D- Ventilation & Air-Conditioning**	Calc. File No.	
Sub-Section	**4D05- Cargo Gate**	Calc. Index No.	

Subject: Air Conditioning Design Calculation

Calculation Objective:

To calculate the Thermal Load in each area, in order to determine the number and capacity of Mini Split Units in each area.

References, Calculation Notes and Comments

Calculations are based on ASHRAE Standards.

Rev	Prepared		No. of	Checked		Reviewed		Superseded
	by	Date	Pages	by	Date	by	Date	by Calc No.
O	M. Garcia	Feb/14/2002	8	H. Mori	Aug/13/02		14 Aug 02	
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FN : Calculation_Cover_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 01	Rev.

References/ Notes

Design Conditions:

Thermic load calculation chart for air-conditioning is based in UIT ARI Standard 530-56.

Parameters are obtained from ASHRAE Tables

ABBREVIATIONS:

DB:	Dry Bulb Temperature
WB:	Wet Bulb Temperature
%HR:	Relative humidity
gr./lb.:	Grains/pound of dry air (Specific humidity)
N Total:	North Wall Area
E Total:	East Wall Area
S Total:	South Wall Area
O Total:	West Wall Area
N Glass:	North Windows
E Glass:	East Windows
S Glass:	South Windows
O Glass:	West Windows
CFM/person	Cubic feet per minute/person
CFM/Sq Ft	Cubic feet per minute/square feet
N Factor:	Sensible factor North
E Factor:	Sensible factor East
S Factor:	Sensible factor South
O Factor:	Sensible factor West
Wall Factor:	Heat Gain factor through walls
Partition Factor:	Heat Gain factor through partitions
Ceiling Factor:	Heat Gain factor through ceiling
False ceiling Factor:	Heat Gain factor through false ceiling
Floor Factor:	Heat Gain factor through floor
People Sensible Heat:	People sensible heat gain
People Latent Heat:	People latent heat gain
Light Watts:	Heat produced by lights
Motor HP:	Heat produced by motors
Appliances:	Heat produced by electrical appliances
dif. Db:	Dry Bulb difference between inside and outside air
dif. Gr/lb:	Specific Humidity difference between inside and outside air

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 02	Rev.

References/ Notes

Weigh Bridge Office

Project: PUERTO LA UNION — Number:

Made by: M. Garcia

Design Conditions

Conditions	DB	WB	%RH	DP	GR/LB	Enthalpy	Latitude	14° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area: 190.42 Sq.Ft — 9.84 Ceiling Height = 1,873.77 Cu.ft

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	0.60		36.02		0.00	
Glass (S)	12.26	0.60		72.68		534.84	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	534.84	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	1.04	15.50			0.00	
Glass (S)	12.26	1.04	15.50			197.70	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	197.70	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	95.21	0.04	16.00			582.70	
Wall (S)	95.21	0.04	16.00			582.70	
Wall (E)	193.65	0.04	16.00			1,185.15	
Wall (O)	193.65	0.04	16.00			1,185.16	
Ceiling	190.42	0.14	16.00			479.87	
						0.00	
					Subtotal	4,015.56	

Transmision Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 03	Rev.

References/ Notes

Weigh Bridge Office

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	200.00	4.35			870.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		9,000.00			0.00	
			3.40			0.00	
				Subtotal		6,028.06	
				F.S. 5%		301.40	
				Total		6,329.47	

Internal latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling
People		2.00	205.00			410.00
People			205.00			0.00
Appliances		200.00	3.40			680.00
Steam			1,090.00			0.00
						0.00
				Sub-Total Latent Heat		1,090.00
				F.S. 2.5%		27.25
				Total Latent Heat		1,117.25

Ventilation and infiltration

Number of people		2.00	x	7.50	cfm x person		15.00	CFM CA
Room Volume		1,873.77	60 min				31.23	CFM CA
Sensible	31.23	CFM CA	x	18.00	delta T	x 1.08 =	607.10	
Latent	31.23	CFM CA	x	62.00	GR/LB	x 0.68 =	1,316.63	

Load Summary

1. Sensible	6,329.47	BTUH
2. Latent	1,117.25	BTUH
3. Total Heat	7,446.72	BTUH
4. External Heat	1,923.74	BTUH
5. Great Heat Total	9,370.46	BTUH
6. A/C Tons	0.78	TONS
7. Sensible heat factor	SHF 0.85	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	651.18	CFM

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 04	Rev.

References/ Notes

Gate Office

Project	PUERTO LA UNION	Number	
Made by	M. Garcia		

Design Conditions

Conditions	DB	WB	%RH	DP	GR/LB	Enthalpy	Latitude	11° N
Exterior	90.00	78.00			126.00		Temp. Range	20 °F
Interior	72.00		55.00		64.00		Peak Load	
Difference	18.00				62.00			

Area 84.72 Sq.-Ft. 9.84 Ceiling Height = 833.67 Cu.-Ft.

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	25.82	0.60		36.02		558.06	
Glass (S)	12.91	0.60		72.68		562.96	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	1,121.02	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	25.82	1.04	15.50			416.22	
Glass (S)	12.91	1.04	15.50			208.11	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	624.33	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	121.03	0.34	18.00			740.72	
Wall (S)	121.03	0.34	18.00			740.72	
Wall (E)	67.76	0.34	18.00			414.80	
Wall (O)	67.78	0.34	18.00			414.80	
Ceiling	84.72	0.14	18.00			213.50	
						0.00	
					Subtotal	2,524.53	

Transmision Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Celling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

		Prepared by		Checked by	
		M. Garcia	July/23/2002	H. Mori	Aug/13/02

FN: Calculation_Sheet

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 05	Rev.

References/ Notes

Gate Office

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	100.00	4.35			435.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		5,114.88	
				F.S. 5%		255.74	
				Total		5,370.63	

Internal Latent Heat

ITEM	Description	Quantity	Factor	=	BTUH	Cooling
People		2.00	205.00			410.00
People			205.00			0.00
Appliances		100.00	3.40			340.00
Steam			1,050.00			0.00
						0.00
				Sub-Total Latent Heat		750.00
				F.S. 2.5%		18.75
				Total Latent Heat		768.75

Ventilation and Infiltration

Number of people		2.00	x	7.50	cfm x person	15.00	CFM CA	
Room Volume		833.67	60 min			13.89	CFM CA	
Sensible	15.00 CFM CA		x	18.00	delta T	x 1.08 =	291.60	
Latent	15.00 CFM CA		x	62.00	GR/LB	x 0.68 =	632.40	

Load Summary

1. Sensible	5,370.63	BTUH
2. Latent	768.75	BTUH
3. Total Heat	6,139.38	BTUH
4. External Heat	924.00	BTUH
5. Great Heat Total	7,063.38	BTUH
6. A/C Tons	0.59	TONS
7. Sensible heat factor	SHF 0.87	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	552.53	CFM

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 06	Rev.

References/ Notes

Duty Staff Room

Project: PUERTO LA UNION — Number:

Made by: M. Garcia

Design Conditions

Conditions	DB	WB	%RH	DP	GR.LB	Enthalpy	Latitude 14° N
Exterior	90.00	78.00			126.00		Temp. Range 20 °F
Interior	72.00		55.00		64.00		Peak Load
Difference	18.00				62.00		

Area: 190.42 Sq.Ft. — 9.84 Ceiling Height = 1,873.77 Cu.ft

Glass, Direct sunlight

ITEM	Area (Sq. ft)	Shadow Coeficient	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	0.60		36.02		0.00	
Glass (S)	12.26	0.60		72.65		534.81	
Glass (E)	0.00	0.60		216.45		0.00	
Glass (O)	0.00	0.60		216.45		0.00	
					Sub Total	534.81	

Gain through windows

ITEM	Area (Sq. ft)	U Factor	Gain	=	BTUH	Cooling	Heating
Glass (N)	0.00	1.04	15.50			0.00	
Glass (S)	12.26	1.04	15.50			197.70	
Glass (E)	0.00	1.04	13.20			0.00	
Glass (O)	0.00	1.04	21.00			0.00	
					Subtotal	197.70	

Gain through walls and ceiling

ITEM	Wall Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Wall (N)	95.21	0.04	18.00			582.70	
Wall (S)	95.21	0.04	18.00			582.70	
Wall (E)	193.65	0.04	18.00			1,185.15	
Wall (O)	193.65	0.04	18.00			1,185.15	
Ceiling	190.42	0.14	18.00			479.87	
						0.00	
					Subtotal	4,015.55	

Transmision Heat Gains

ITEM	Net Area	U Factor	Eq. Temperature	=	BTUH	Cooling	Heating
Divisions						0.00	
Ceiling						0.00	
Floor						0.00	
					Subtotal	0.00	

Internal Sensible Heat

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 07	Rev.

References/ Notes

Duty Staff Room

ITEM	Description	Quantity	Factor	=	BTUH	Cooling	Heating
People		2.00	205.00			410.00	
People			195.00			0.00	
Lights	Fluorescent	200.00	1.35			270.00	
Lights	Incandescent		3.40			0.00	
Motors	Less than 3HP		3,600.00			0.00	
Motors	More than 3HP		3,000.00			0.00	
			3.40			0.00	
				Subtotal		6,028.06	
				F.S. 5%		301.40	
				Total		6,329.47	

Internal latent Heat

ITEM	Description	Quantity	Factor	=	BTU	Cooling
People		2.00	205.00			410.00
People			205.00			0.00
Appliances		200.00	3.40			680.00
Steam			1,050.00			0.00
						0.00
				Sub-Total Latent Heat		1,090.00
				F.S. 2.5%		27.25
				Total Latent Heat		1,117.25

Ventilation and infiltration

Number of people		2.00	x	7.50	cfm x person	15.00	CFM CA	
Room Volume		1,873.77	60 min			31.23	CFM CA	
Sensible	31.23	CFM CA	x	18.00	delta T	x 1.08 =	607.10	
Latent	31.23	CFM CA	x	62.00	GR/LB	x 0.68 =	1,316.64	

Load Summary

1. Sensible	6,329.47	BTUH
2. Latent	1,117.25	BTUH
3. Total Heat	7,446.72	BTUH
4. External Heat	1,923.74	BTUH
5. Great Heat Total	9,370.45	BTUH
6. A/C Tons	0.78	TONS
7. Sensible heat factor	SHF 0.85	
8. Dry Bulb inside Temperature	72.00	°F
9. Dry bulb supply air temperature	63.00	°F
10. Supply Air temperature Gain	9.00	Delta T
Total Air Supply (CFM)	651.18	CFM

Prepared by		Checked by	
M. Garcia	July/23/2002	H. Mori	Aug/13/02

Project	Detailed Design on Port Reactivation Project in La Union	Calc. File No.	
Section	4D- VENTILATION AND AIR-CONDITIONING	Calc. Index No.	
Subject	THERMAL LOAD CALCULATION-CARGO GATE	Page No. 08	Rev.

References/ Notes

Summary

Area	Qty.	TONS
Weigh Bridge Office	2	4.34
Gate Office	4	2.36
Duty Staff Room	2	4.34
TOTAL		**11.04**

	Prepared by		Checked by	
	M. Garcia	July/23/2002	H. Mori	Aug/13/02

FN: Calculation_Sheet