UNIVERSITY BLDG

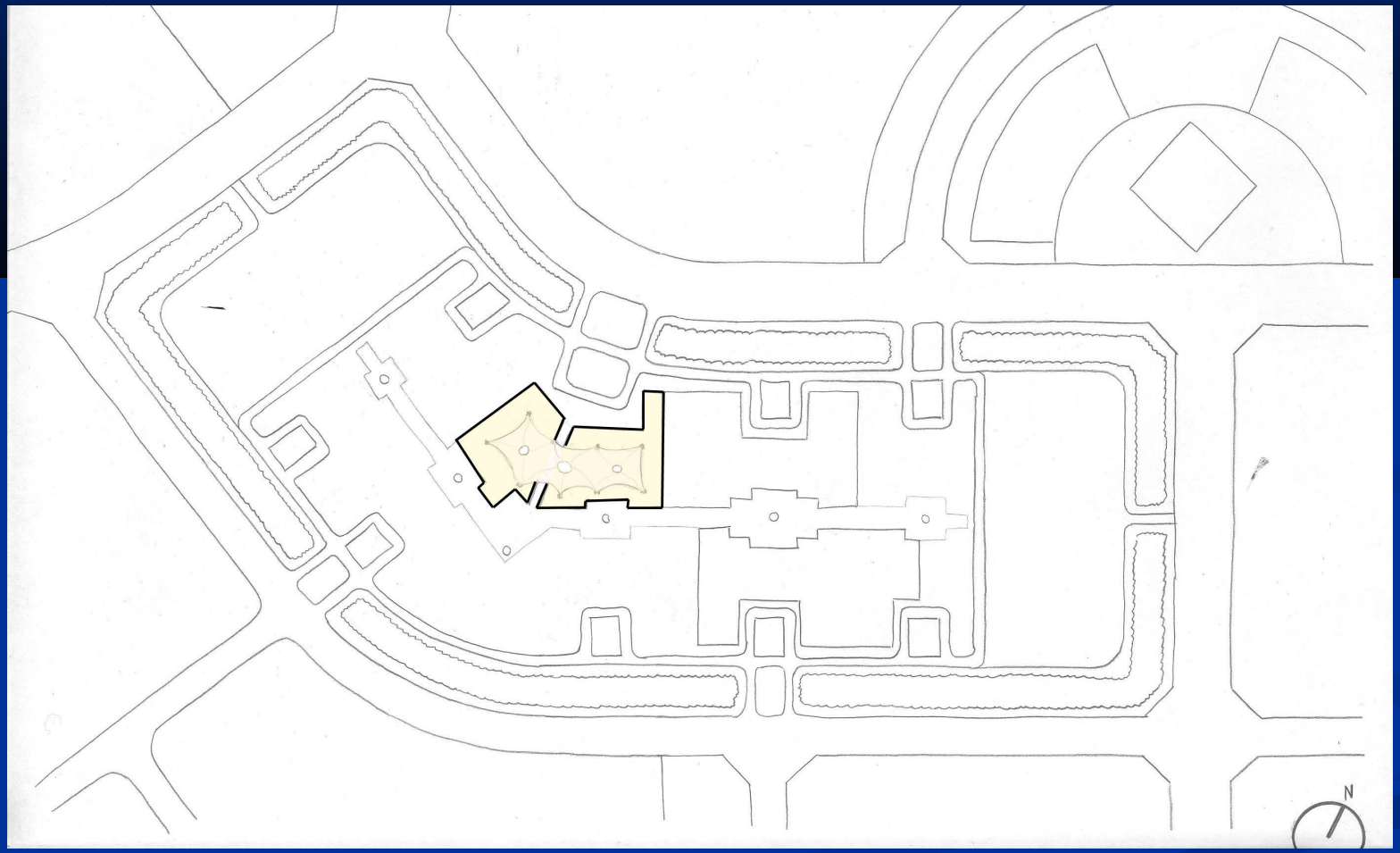
AL GHUIR UNIVERSITY [DUBAI, UNITED ARAB EMIRATES]

IPRO 323, GROUP THREE

UNIVERSITY BLDG

- Administrative Heart of the University
- “Orientation” point for entry to the University Campus
- Offices, Conference, Auditorium
- Estimated 120,000 Sq. Ft.

AL GHUIR UNIVERSITY

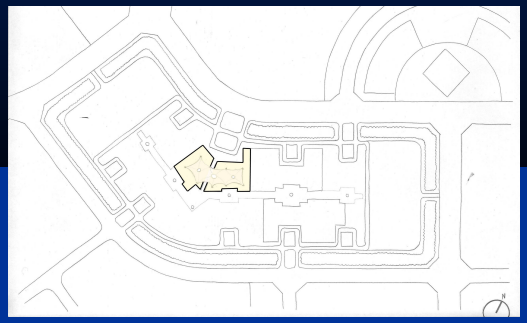


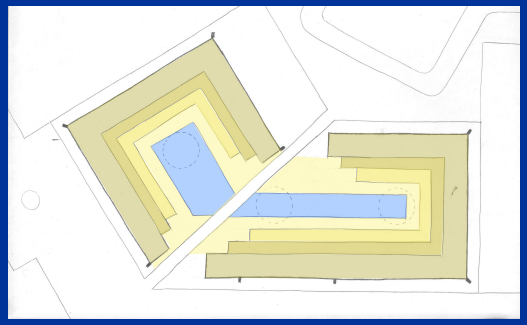
INTRO STRATEGY BUILDING CALCULATIONS

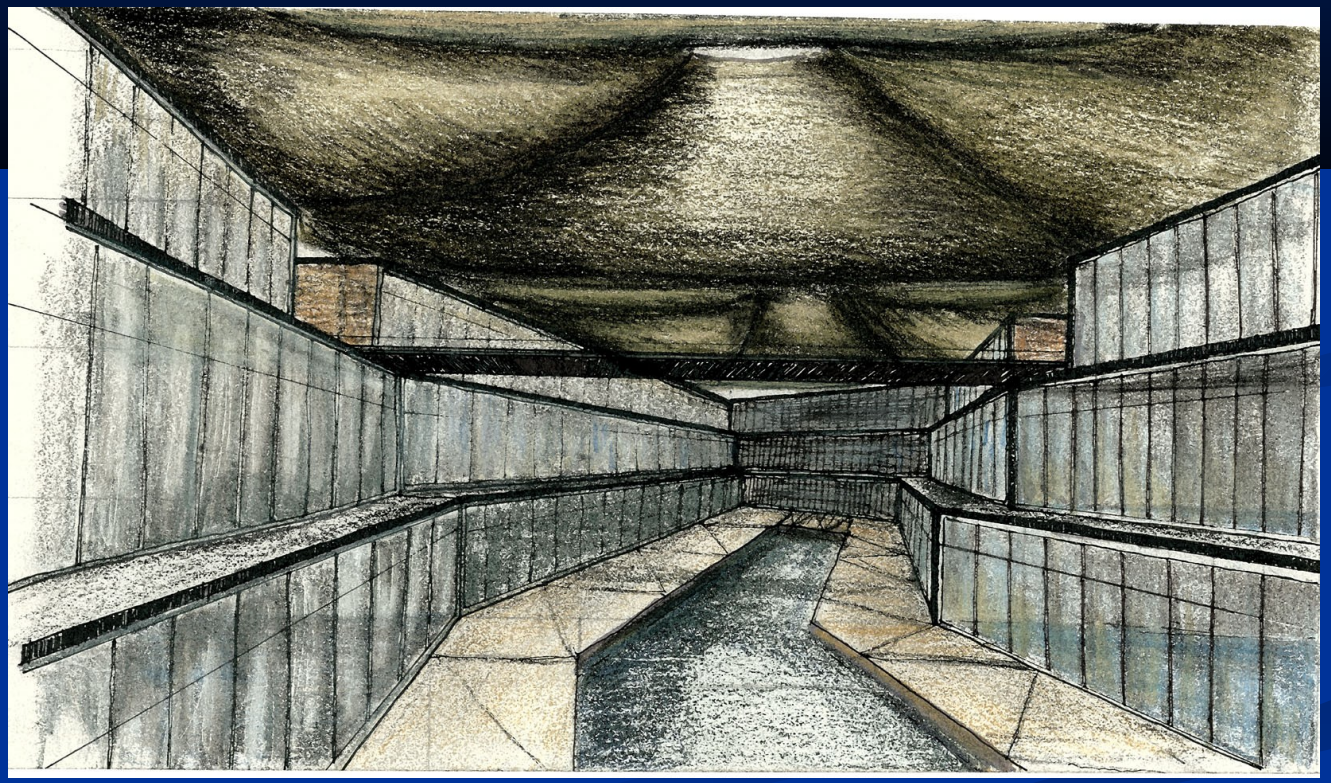
ARCHITECTURAL STRATEGY

- Cooling and ventilation provided with considerably less energy demands vs. traditional strategies
  - Ground Source Heat Pumps
  - Earth Tubes
  - Photovoltaic Arrays
- Submerge building's program into ground
- Aesthetics both contextually appropriate and unique

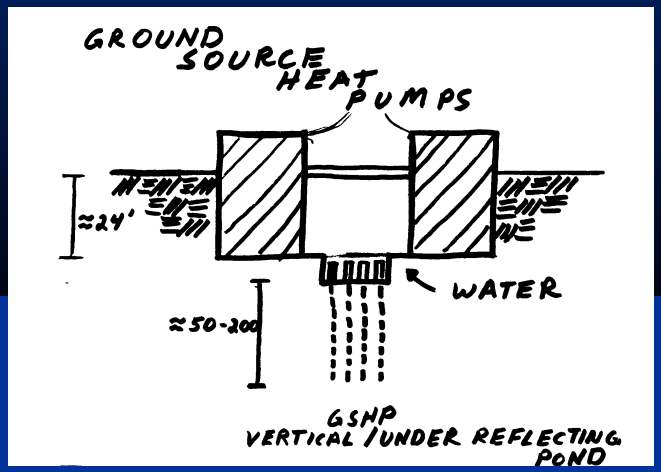
UNIVERSITY BUILDING

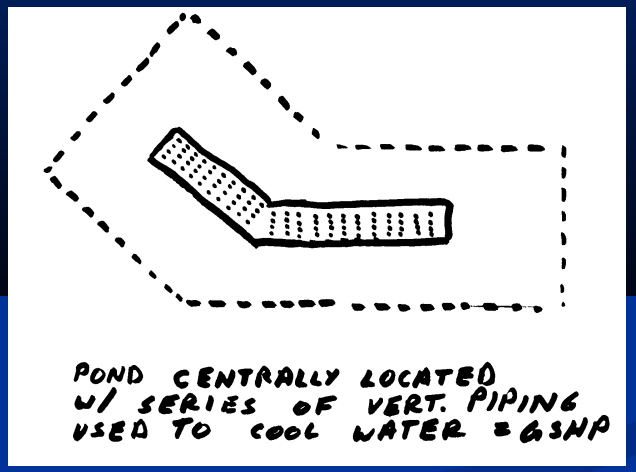


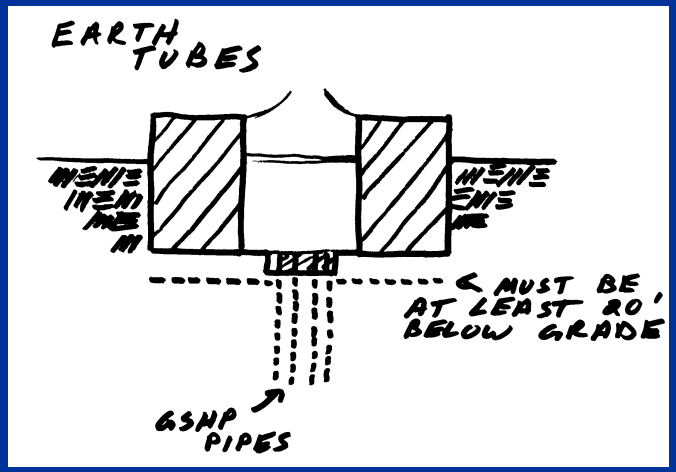


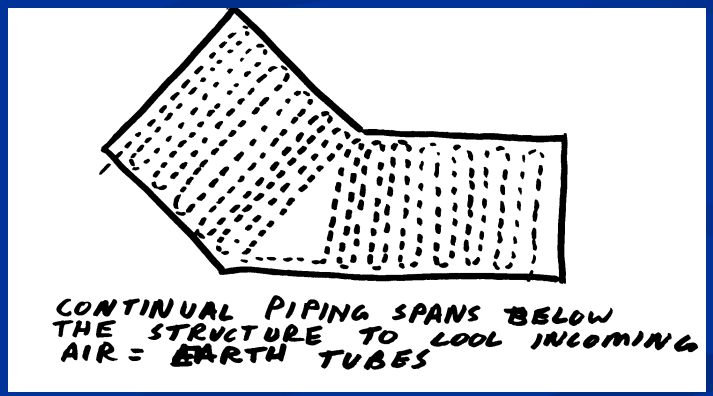


UNIVERSITY BUILDING

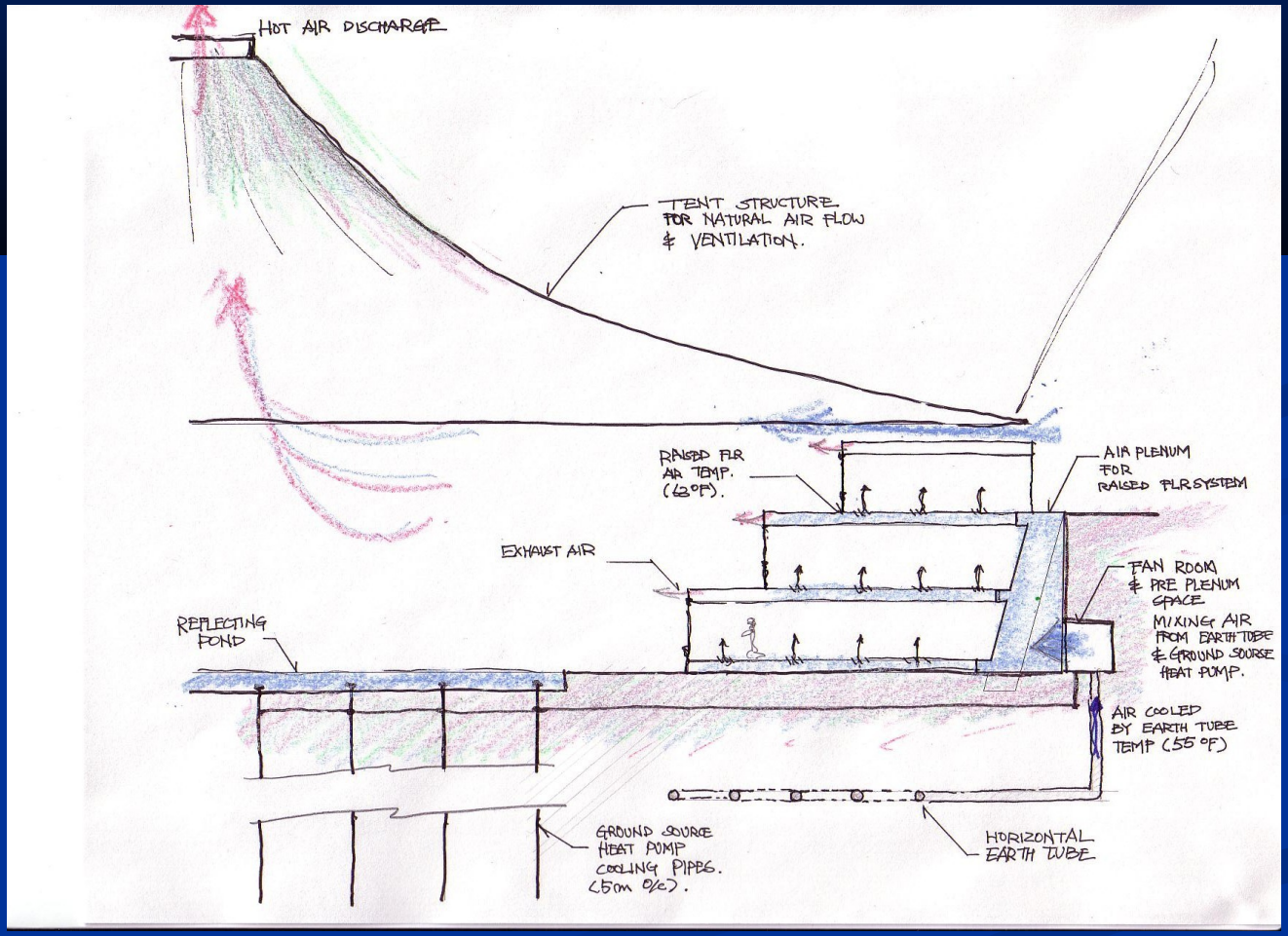




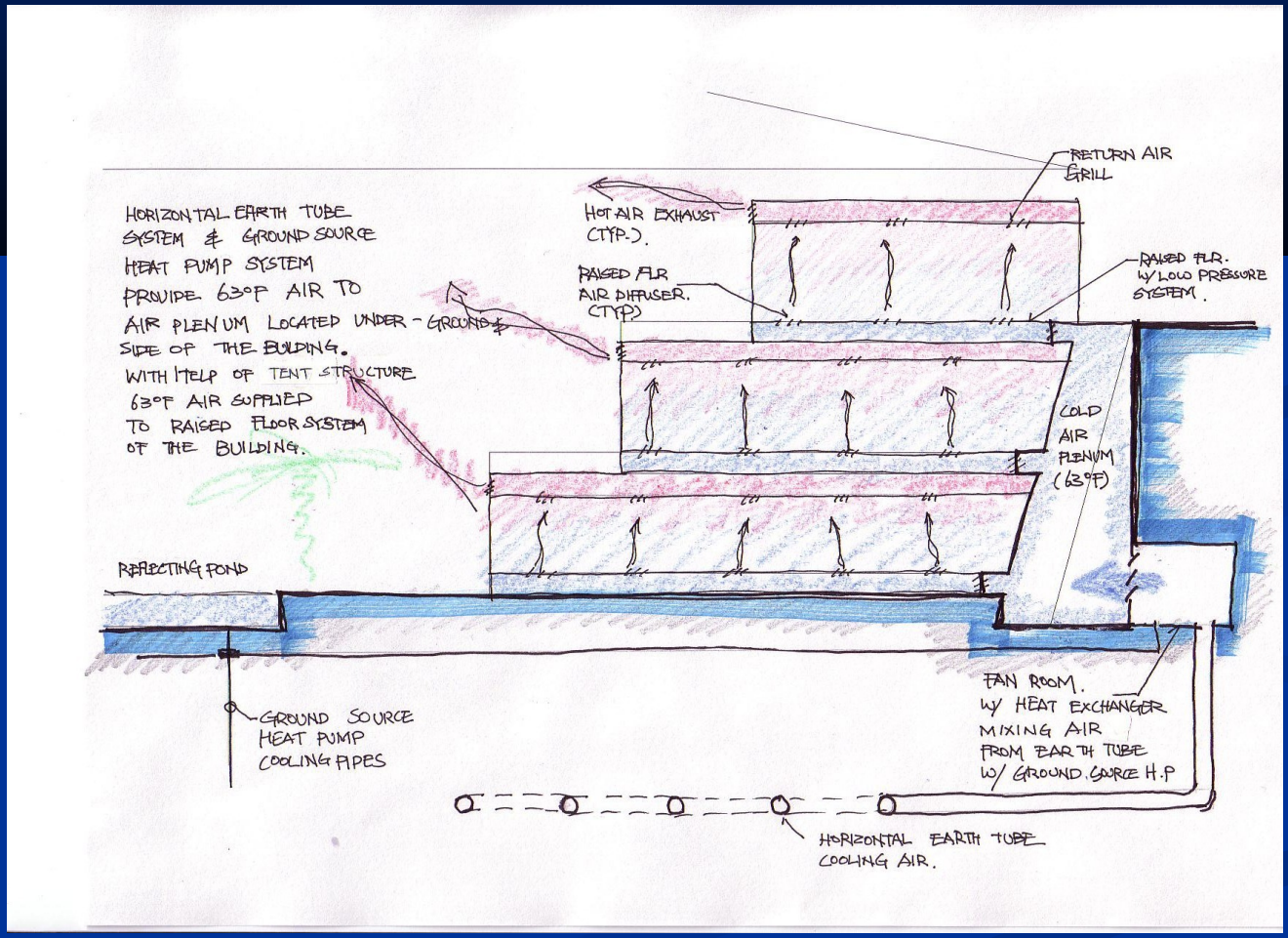




UNIVERSITY BUILDING



UNIVERSITY BUILDING



IPRO - AGU

Location	Dubai, UAE
Building owner	AGU
Program user	Jin Lee
Company	Group 3
Comments	

By	CCJM ENGINEERS
Dataset name	C:\CDS\TRACE700\PROJECTS\DUBAITRC.T
Calculation time	09:57 AM on 12/01/2003
TRACE® 700 verson	4.0

Location	Dubai, United Arab Emirates	
Latitude	25.0	deg
Longitude	-56.0	deg
Time Zone	-4	
Elevation	50	ft
Barometric Pressure	29.9	in. Hg

Air Density	0.0759	lb/cu ft
Air Specific Heat	0.2444	Btu/lb·°F
Density-Specific Heat Product	1.1132	Btu/h·cfm·°F
Latent Heat Factor	4,900.3	Btu·min/h·cu ft
Enthalpy Factor	4.5542	lb·min/hr·cu ft

Summer Design Dry Bulb	113	°F
Summer Design Wet Bulb	79	°F
Winter Design Dry Bulb	41	°F
Summer Clearness Number	0.90	
Winter Clearness Number	0.90	
Summer Ground Reflectance	0.20	
Winter Ground Reflectance	0.20	

Design Simulation Period	January - December
Cooling Load Methodology	TETD-TA1
Heating Load Methodology	UATD

TRANE

TRACE 700

System Checksums
By CCJM ENGINEERS

System - 001

Bypass VAV with Reheat (30% Min Flow Default)

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 9 / 15
Outside Air: OADB/WB/HR: 112 / 80 / 104

	Space Sens. + Lat. Btu/h	Plenum Sensible Btu/h	Plenum Latent Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads					
Skylite Solar	0	0		0	0.00
Skylite Cond	0	0		0	0.00
Roof Cond	0	61,366		61,366	2.10
Glass Solar	288,000	0		288,000	9.85
Glass Cond	15,840	0		15,840	0.54
Wall Cond	24,554	6,608		31,162	1.07
Partition	0			0	0.00
Exposed Floor	0			0	0.00
Infiltration	483,521			483,521	16.54
Sub Total ==>	811,915	67,975		879,890	30.10
Internal Loads					
Lights	40,956	163,824		204,780	7.01
People	245,455			245,455	8.40
Misc	614,340	0	0	614,340	21.02
Sub Total ==>	900,751	163,824	0	1,064,575	36.42
Ceiling Load	71,525	-71,525		0	0.00
Outside Air	0	0	0	879,129	30.06
Sup. Fan Heat				134,824	4.61
Ret. Fan Heat		0		0	0.00
Duct Heat Pkup		0		0	0.00
OV/UNDR Sizing	0			0	0.00
Exhaust Heat		-35,409	0	-35,409	-1.21
Terminal Bypass		0	0	0	0.00
Grand Total ==>	1,784,191	124,864	0	2,923,008	100.00

CLG SPACE PEAK

Mo/Hr: 9 / 16
OADB: 111

	Space Sensible Btu/h	Percent Of Total (%)
	0	0.00
	0	0.00
	0	0.00
	295,200	20.36
	16,560	1.14
	24,630	1.70
	0	0.00
	0	0.00
	239,787	16.54
	576,177	39.75
	40,956	2.83
	136,364	9.41
	614,340	42.38
	791,660	54.61
	81,720	5.64
	0	0.00
		0.00
		0.00
		0.00
	0	0.00
		0.00
	1,449,557	100.00

HEATING COIL PEAK

Mo/Hr: 13 / 1
OADB: 41

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
	0	0	0.00
	0	0	0.00
	0	-47,953	5.20
	0	0	0.00
	-13,860	-13,860	1.50
	-20,462	-26,133	2.84
	0	0	0.00
	0	0	0.00
	-180,341	-180,341	19.56
	-214,663	-268,288	29.11
	0	0	0.00
	0	0	0.00
	0	0	0.00
	0	0	0.00
	-30,702	0	0.00
	0	-327,893	35.57
		0	0.00
		0	0.00
		0	0.00
	-340,786	-340,786	36.97
		15,199	-1.65
		0	0.00
	-585,151	-921,768	100.00

TEMPERATURES

	Clg	Htg
SADB	55.0	95.0
Plenum	76.9	67.2
Return	76.9	67.2
Ret/OA	82.7	62.8
Fn MtrTD	0.2	0.0
Fn BldTD	0.4	0.0
Fn Frict	1.3	0.0

AIRFLOWS

	Cooling	Heating
Vent	10,909	10,909
Infil	6,000	6,000
Supply	65,005	19,501
Min/fm	19,501	19,501
Return	71,005	71,005
Exhaust	16,909	16,909
Rm Exh	0	0
Auxil	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	16.8	55.9
cfm/ft²	0.54	0.16
cfm/ton	222.12	
ft²/ton	410.04	
Btu/hr·ft²	29.27	-13.81
No. People	545	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airfl cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	292.7	3,511.8	2,730.9	65,005	82.7	63.4	56.4	53.1	43.4	28.3
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	292.7	3,511.8								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	120,000		
Part	0		
ExFlr	0		
Roof	40,000	0	0
Wall	28,800	7,200	25

HEATING COIL SELECTION

	Capacity MBh	Coil Airfl cfm	Ent °F	Lvg °F
Main Htg	-1,045.0	19,501	46.9	95.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-147.4	10,909	41.0	53.1
Reheat	-458.9	19,501	55.0	68.0
Humidif	-465.2	16,909	11.8	51.1
Opt Vent	0.0	0	0.0	0.0
Total	-1,657.6			

Project Name: IPRO - AGU
Dataset Name:C:\CDS\TRACE700\PROJECTS\DUBAITRC.TRC

TRACE® 700 v4.0 calculated at 09:57 AM on 12/01/2003
Alternative - 1 System Checksums report Page 1 of 1

System Checksums

By CCJM ENGINEERS

System - 001

Bypass VAV with Reheat (30% Min Flow Default)

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 9 / 15
Outside Air: OADB/WB/HR: 112 / 80 / 104

	Space Sens. + Lat. Btu/h	Plenum Sensible Btu/h	Plenum Latent Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads					
Skylite Solar	0	0		0	0.00
Skylite Cond	0	0		0	0.00
Roof Cond	0	61,403		61,403	2.30
Glass Solar	96,000	0		96,000	3.59
Glass Cond	5,280	0		5,280	0.20
Wall Cond	8,185	2,204		10,389	0.39
Partition	0			0	0.00
Exposed Floor	0			0	0.00
Infiltration	480,170			480,170	17.97
Sub Total ==>	589,634	63,607		653,242	24.45
Internal Loads					
Lights	40,956	163,824		204,780	7.66
People	245,455			245,455	9.19
Misc	614,340	0	0	614,340	22.99
Sub Total ==>	900,751	163,824	0	1,064,575	39.85
Ceiling Load	70,759	-70,759		0	0.00
Outside Air	0	0	0	873,036	32.68
Sup. Fan Heat				115,807	4.33
Ret. Fan Heat		0		0	0.00
Duct Heat Pkup		0		0	0.00
OV/UNDR Sizing	0			0	0.00
Exhaust Heat		-35,030	0	-35,030	-1.31
Terminal Bypass		0	0	0	0.00
Grand Total ==>	1,561,144	121,643	0	2,671,629	100.00

CLG SPACE PEAK

Mo/Hr: 8 / 16
OADB: 114

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0.00
Skylite Cond	0	0.00
Roof Cond	0	0.00
Glass Solar	88,800	7.16
Glass Cond	6,000	0.48
Wall Cond	9,271	0.75
Partition	0	0.00
Exposed Floor	0	0.00
Infiltration	257,153	20.73
Sub Total ==>	361,224	29.12
Internal Loads		
Lights	40,956	3.30
People	136,364	10.99
Misc	614,340	49.52
Sub Total ==>	791,660	63.82
Ceiling Load	87,587	7.06
Outside Air	0	0.00
Sup. Fan Heat		0.00
Ret. Fan Heat		0.00
Duct Heat Pkup		0.00
OV/UNDR Sizing	0	0.00
Exhaust Heat		0.00
Terminal Bypass		0.00
Grand Total ==>	1,240,471	100.00

HEATING COIL PEAK

Mo/Hr: 13 / 1
OADB: 41

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-47,990	5.74
Glass Solar	0	0	0.00
Glass Cond	-4,620	-4,620	0.55
Wall Cond	-6,821	-8,713	1.04
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	-180,341	-180,341	21.56
Sub Total ==>	-191,782	-241,664	28.89
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-29,939	0	0.00
Outside Air	0	-327,893	39.20
Sup. Fan Heat		0	0.00
Ret. Fan Heat		0	0.00
Duct Heat Pkup		0	0.00
OV/UNDR Sizing	-281,749	-281,749	33.68
Exhaust Heat		14,822	-1.77
Terminal Bypass		0	0.00
Grand Total ==>	-503,471	-836,485	100.00

TEMPERATURES

	Clg	Htg
SADB	55.0	95.0
Plenum	76.9	67.2
Return	76.9	67.2
Ret/OA	83.7	62.1
Fn MtrTD	0.2	0.0
Fn BldTD	0.4	0.0
Fn Frict	1.3	0.0

AIRFLOWS

	Cooling	Heating
Vent	10,909	10,909
Infil	6,000	6,000
Supply	55,835	16,751
Mincfm	16,751	16,751
Return	61,835	61,835
Exhaust	16,909	16,909
Rm Exh	0	0
Auxil	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	19.5	65.1
cfm/ft²	0.47	0.14
cfm/ton	210.87	
ft²/ton	453.20	
Btu/hr-ft²	26.48	-12.58
No. People	545	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airfl cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	264.8	3,177.4	2,405.9	55,835	83.7	64.1	58.6	53.1	43.3	26.0
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	264.8	3,177.4								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	120,000		
Part	0		
ExFlr	0		
Roof	40,000	0	0
Wall	9,600	2,400	25

HEATING COIL SELECTION

	Capacity MBh	Coil Airfl cfm	Ent °F	Lvg °F
Main Htg	-897.6	16,751	46.9	95.0
Aux Htg	0.0	0	0.0	0.0
Preheat	-147.4	10,909	41.0	53.1
Reheat	-394.1	16,751	55.0	68.0
Humidif	-465.2	16,909	11.8	51.1
Opt Vent	0.0	0	0.0	0.0
Total	-1,510.2			

Project Name: IPRO - AGU
Dataset Name:C:\CDS\TRACE700\PROJECTS\DUBAI02TRC.TRC

TRACE® 700 v4.0 calculated at 10:15 AM on 12/01/2003
Alternative - 1 System Checksums report Page 1 of 1

ENERGY CALCULATIONS

- Conclusions