

TABLE A4.2

INTERNAL ZONE AND ROOF DATA PRINT-OUT

INTERNAL ZONE DATA													
ZONE	Roof H.T.C W/m ² C	Roof Area m ²	Roof Surf R m ² C/W	Roof Absorp Coeff	Roof Decre Fact	Roof Lag Hours	Int W H.T.C W/m ² C	Int W Area m ²	Floor H.T.C W/m ² C	Floor Area m ²	Zone Height metres	Zone Infil AC/h	
NORTH ZONE	1.50	42.0	0.40	70	60	4.0	2.00	13.0	1.50	42.00	3.00	2.000	
SOUTH ZONE	1.50	42.0	0.40	70	40	4.0	2.00	13.0	1.50	42.00	3.00	2.000	

ZONE	Number of People	Person Sens Load Watts	Person Latent Load Watts	Person Start Hour	Person End Hour	Person GMT	Light Load W/m ²	Light Start Hour	Light End Hour	Light GMT	Machine Sens Load Watts	Machine Latent Load Watts	Machine Start Hour	Machine End Hour	Machine GMT
NORTH ZONE	40	75.0	62.0	13.00	24.00	24.00	25.0	15.00	24.00	24.00	0.0	0.0	0.00	0.00	0.00
SOUTH ZONE	40	75.0	62.0	7.00	24.00	24.00	25.0	15.00	24.00	24.00	0.0	0.0	0.00	0.00	0.00

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INTERNAL ZONE DATA													
ZONE	Roof H.T.C W/m ² C	Roof Area m ²	Roof Surf R m ² C/W	Roof Absorp Coeff	Roof Decre Fact	Roof Lag Hours	Int W H.T.C W/m ² C	Int W Area m ²	Floor H.T.C W/m ² C	Floor Area m ²	Floor Height metres	Zone Infil AC/h	Zone
NORTH ZONE	1.50	42.0	0.40	70	60	4.0	2.00	13.0	1.50	42.00	3.00	2.000	
SOUTH ZONE	1.50	42.0	0.40	70	40	4.0	2.00	13.0	1.50	42.00	3.00	2.000	

ZONE	Number of People	Person Latent Load Watts	Person Sensible Load Watts	Person Start Hour	Person End Hour	Light Latent Load W/m ²	Light Sensible Load W/m ²	Light Start Hour	Light End Hour	Machine Latent Load Watts	Machine Sensible Load Watts	Machine Start Hour	Machine End Hour	Machine GMT
NORTH ZONE	40	25.0	62.0	13.00	24.00	25.0	25.0	15.00	24.00	0.0	0.0	0.00	0.00	
SOUTH ZONE	40	25.0	62.0	7.00	24.00	25.0	25.0	15.00	24.00	0.0	0.0	0.00	0.00	

TABLE A4.3

GLASS DATA PRINT-OUT

GLASS DATA PRINTOUT									

	H.T.C W/m ² C	Length x Height m x m	number windows	lag hours	shading coeff	overhang m	recess m	optional area m ²	orient deg S

Zone : NORTH ZONE									
NORTH	0.0	0.0x 0.0	0.0	0.0	0.00	0.0	0.0	0.0	270.0
WEST	5.6	3.1x 2.4	1.0	1.0	.65	0.0	0.0	0.0	360.0

Zone : SOUTH ZONE									
WEST	5.6	3.1x 2.4	1.0	1.0	.65	0.0	0.0	0.0	360.0
SOUTH	5.6	6.7x 2.4	1.0	1.0	.65	0.0	0.0	0.0	90.0

TABLE A4.4

WALL DATA PRINT-OUT

WALL DATA PRINTOUT							

	H.T.C W/m ² C	area m ²	decre factor	lag hours	extern resis	absorp coeff	orient deg S

Zone : NORTH ZONE							

NORTH	2.0	29.0	40	4.0	050	.60	270.0
WEST	2.0	5.3	40	4.0	050	.60	360.0

Zone : SOUTH ZONE							

WEST	2.0	5.3	40	4.0	050	.60	360.0
SOUTH	2.0	13.0	40	4.0	050	.60	90.0

The following tables list the building's peak loads for December as calculated by the building program.

TABLE A4.5 NORTH ZONES BUILDING LOADS

***** AIR - CONDITIONING LOADS PROGRAM BY A da Silva *****

A J DA SILVA
PROJECT REPORT
WITWATERSRAND UNIVERSITY

PROJECT NAME : MSC PSY PROGRAM
PROJECT LOC. : WITS UNIVERSITY
PROJECT NO. : MSC

***** DECEMBER'S PROJECT ZONE LOAD CALCULATION *****

ZONE : NORTH ZONE
MONTH : DECEMBER
PEAK HOUR : 17 GMT

SOLAR GAIN - GLASS		SENSIBLE LOAD
-----		-----
NORTH	SOLAR GLASS	0.0 W
WEST	SOLAR GLASS	3679.1 W

SOLAR GAIN - WALLS AND ROOF		

NORTH	WALL IN SUN	265.1 W
WEST	WALL IN SUN	91.8 W
ROOF		1330.0 W

TRANSMISSION GAIN		

NORTH	GLASS	0.0 W
WEST	GLASS	401.2 W
PARTITION		156.0 W
FLOOR		0.0 W

INTERNAL HEAT			

PEOPLE	40X	75	3000.0 W
LIGHTS	25X	42	1050.0 W
MACHINES			0.0 W
INFILTRATION			802.9 W

TOTAL SENSIBLE	-----	10776.1 W
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LATENT LOAD			

PEOPLE	40X	62	2480.0 W
MACHINES			0.0 W
INFILTRATION			1006.4 W

TOTAL LATENT	-----	3486.4 W
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TABLE A4.6SOUTH ZONES BUILDING LOADS

ZONE : SOUTH ZONE
MONTH : DECEMBER
PEAK HOUR : 17 GMT

SOLAR GAIN - GLASS		SENSIBLE LOAD	
-----		-----	
WEST	SOLAR GLASS	3679.1	W
SOUTH	SOLAR GLASS	2426.7	W

SOLAR GAIN - WALLS AND ROOF		-----	
-----		-----	
WEST	WALL IN SUN	91.8	W
SOUTH	WALL IN SUN	121.2	W
ROOF		916.3	W

TRANSMISSION GAIN		-----	
-----		-----	
WEST	GLASS	401.2	W
SOUTH	GLASS	867.1	W
PARTITION		156.0	W
FLOOR		0.0	W

INTERNAL HEAT		-----	
-----		-----	
PEOPLE	40X 75	3000.0	W
LIGHTS	25X 42	1050.0	W
MACHINES		0.0	W
INFILTRATION		802.9	W

TOTAL SENSIBLE	-----
	13512.4 W

LATENT LOAD		-----	
-----		-----	
PEOPLE	40X 52	2480.0	W
MACHINES		0.0	W
INFILTRATION		1006.4	W

TOTAL LATENT	-----
	3486.4 W

The following graphs are representatives of the building loads as calculated by the Building Program.

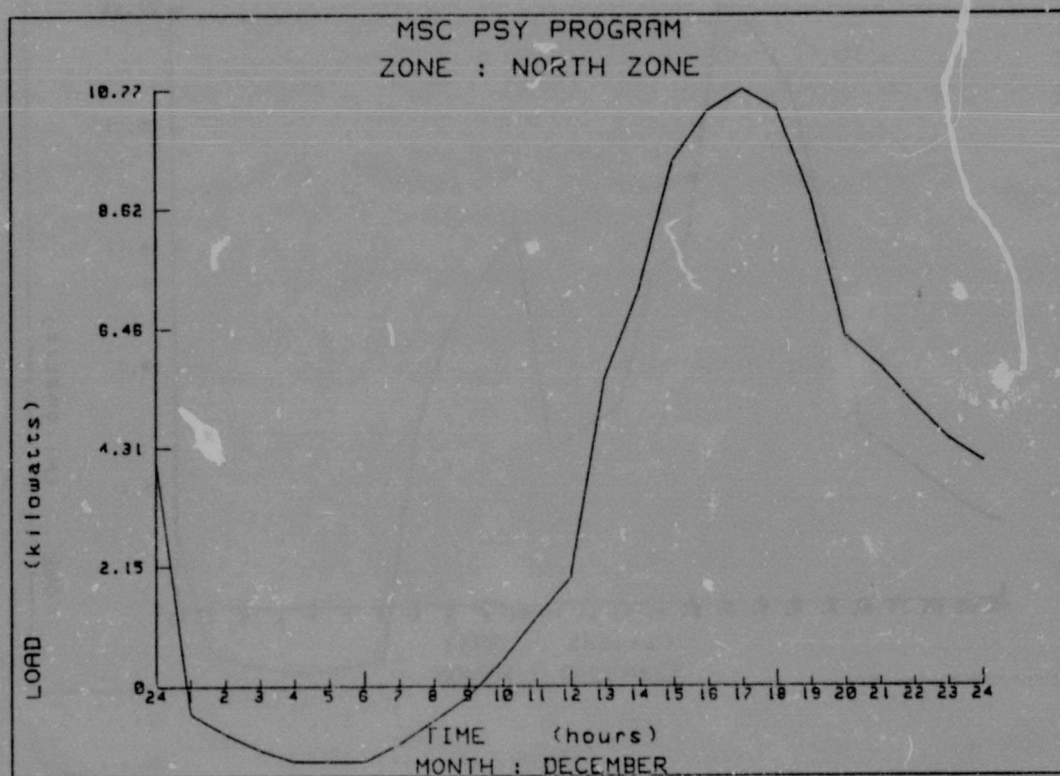


Figure A4.1 - Graph of North Zones Sensible Load

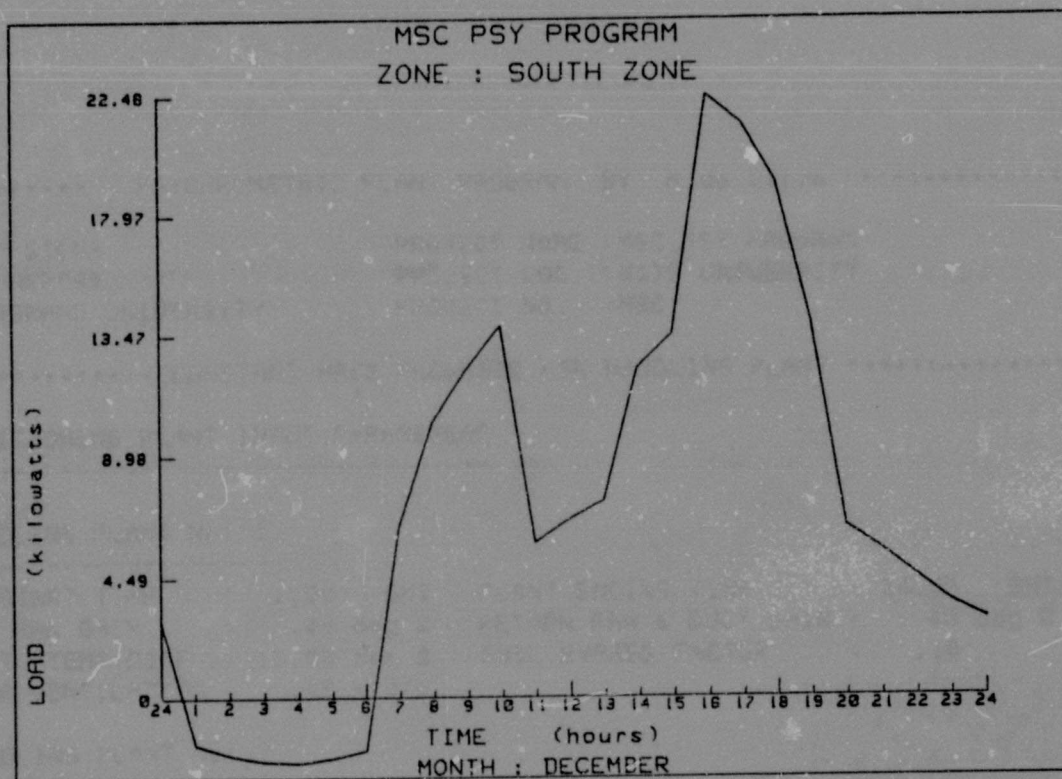


Figure A4.2 - Graph of South Zones Sensible Load

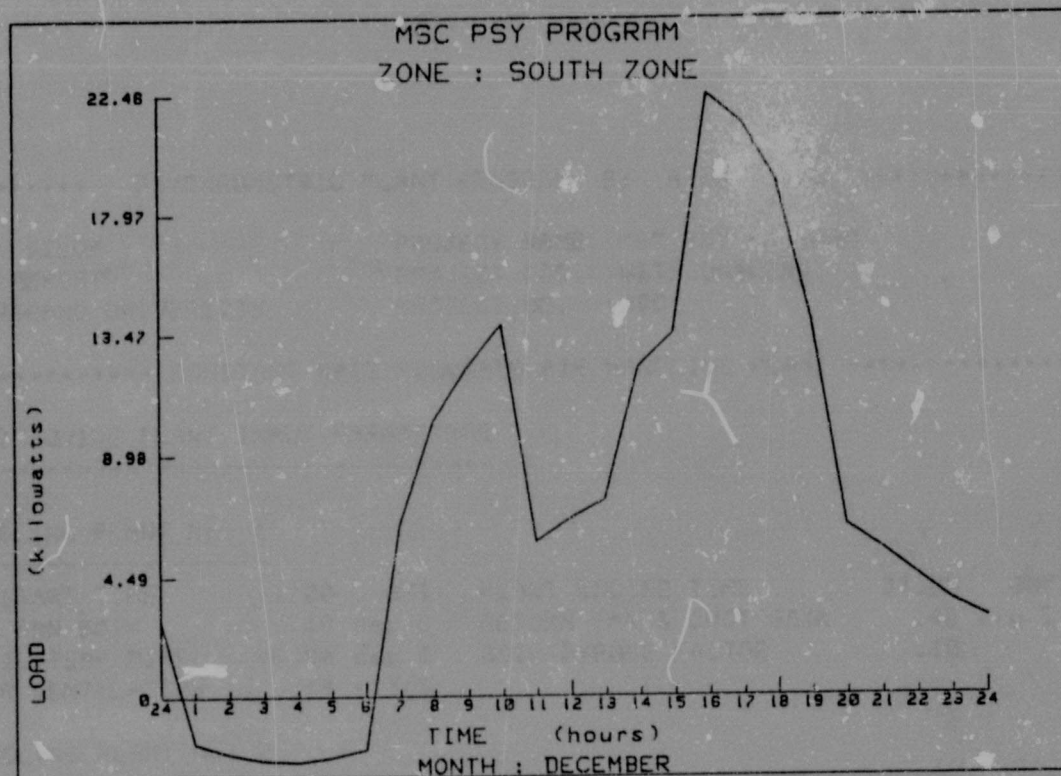


Figure A4.2 - Graph of South Zones Sensible Load

APPENDIX 5 : PROGRAM POETS INPUT DATA AND RESULTS

The following tables list the input data and psychrometric results of program POET.

TABLE A5.1 PLANT INPUT PARAMETERS

***** PSYCHROMETRIC PLANT PROGRAM BY A da Silva *****

A J DA SILVA	PROJECT NAME : MSC PSY PROGRAM
PROJECT REPORT	PROJECT LOC. : WITS UNIVERSITY
WITWATERSRAND UNIVERSITY	PROJECT NO. : MSC

***** CONSTANT MASS FLOWRATE AIR HANDLING PLANT *****

AIRCONDITIONING PLANT INPUT PARAMETERS

AIR HANDLING PLANT No: 1

PLANT START TIME	: 1.00 GMT	PLANT ENDING TIME	: 24.00 GMT
SUPPLY FAN GAIN	: .48 deg C	RETURN FAN & DUCT GAIN	: .48 deg C
MAX COIL TEMP DIFF	: 16.00 deg C	COIL BYPASS FACTOR	: .10
OUTDOOR VENTILATION	: .48 m ³ /S		

AIR HANDLING PLANT No: 2

PLANT START TIME	: 1.00 GMT	PLANT ENDING TIME	: 24.00 GMT
SUPPLY FAN GAIN	: .48 deg C	RETURN FAN & DUCT GAIN	: .48 deg C
MAX COIL TEMP DIFF	: 16.00 deg C	COIL BYPASS FACTOR	: .10
OUTDOOR VENTILATION	: .48 m ³ /S		

TABLE A5.2PLANT 1 DESIGN PARAMETERS

COOLING PARAMETERS FOR PLANT 1

DESIGN MONTH	DECEMBER
DESIGN TIME	16.00 GMT
FAN AIR VOLUME	.892 m ³ /s (.894 kg/s)
FAN SUPPLY TEMPERATURE	10.4 C
FAN RETURN TEMPERATURE	22.5 C
APPARATUS DEW POINT TEMP	8.0 C
COIL ON TEMPERATURES	27.9 db C/18.8 wb C
COIL OFF TEMPERATURES	10.0db C/ 9.3wb C
REFRIGERATION CAPACITY	25.7 kW (7.3 tons)

TABLE A5.3PLANT 2 DESIGN PARAMETERS

COOLING PARAMETERS FOR PLANT 2

DESIGN MONTH	DECEMBER
DESIGN TIME	16.00 GMT
FAN AIR VOLUME	1.162 m ³ /s (1.165 kg/s)
FAN SUPPLY TEMPERATURE	11.0 C
FAN RETURN TEMPERATURE	22.5 C
APPARATUS DEW POINT TEMP	8.8 C
COIL ON TEMPERATURES	26.7 db C/18.0 wb C
COIL OFF TEMPERATURES	10.6db C/ 9.9wb C
REFRIGERATION CAPACITY	28.5 kW (8.1 tons)

TABLE A5.4

PLANT 1 PARTIAL LOAD PARAMETERS

PLANTS PARTIAL LOAD PERFORMANCE															
PLANT No. 1															
AHP TIME (GHT)	SEN LOAD (kW)	LAT LOAD (kW)	FRIG LOAD (kW)	PREHEAT LOAD (kW)	REHEAT LOAD (kW)	TEMP ON COIL (db/wb)	TEMP OFF COIL (db/wb)	TEMP DOORS (deg C)	SUPPLY VOLUME FLOW (m ³ /S)	SUPPLY MASS FLOW (kg/S)	ENTH COIL (on/off) (kJ/kg)	ENTH RET AIR (kJ/kg)	ENTH DOORS (kJ/kg)	ROOM RETURN STATE (C/2)	HUMID LOAD (kW)
DECEMBER															
1.00	-5	1.0	0.0	0.0	0.0	10.0	10.7	6.3	22.6	11.2	24.2	44.2	47.3	7.5	0.0
2.00	-8	1.0	0.0	10.5	0.0	9.8	9.6	5.6	23.0	14.9	22.7	44.6	47.3	5.2	9.9
3.00	-1.1	1.0	0.0	10.8	1.1	9.2	5.4	23.3	15.0	0.0	22.2	44.9	47.3	4.4	10.0
4.00	-1.3	1.0	0.0	10.5	1.3	9.6	5.6	23.5	15.1	0.0	22.7	45.1	47.3	5.2	9.9
5.00	-1.3	1.0	0.0	0.0	10.9	10.6	6.3	23.5	15.3	2.3	24.2	45.2	47.3	7.5	9.9
6.00	-1.3	1.0	0.0	0.0	9.4	12.3	7.3	23.5	15.5	5.0	26.6	45.2	47.3	11.4	9.9
7.00	-1.0	1.0	0.0	0.0	7.2	14.5	8.7	23.2	15.7	8.5	30.0	44.8	47.3	16.6	9.9
8.00	-6	1.0	0.0	0.0	4.7	16.9	10.3	22.7	16.1	12.6	34.0	44.3	47.3	23.4	9.9
9.00	-2	1.0	0.0	0.0	2.0	19.4	12.1	22.2	16.6	16.9	38.7	43.8	47.3	31.4	9.9
10.00	5	1.0	0.0	0.0	2.0	21.9	13.9	22.4	14.7	21.3	43.8	43.8	47.3	40.4	2.0
11.00	1.2	1.0	25.7	0.0	9.1	24.0	15.5	10.0	9.3	25.4	48.9	31.3	47.3	49.9	0.0
12.00	1.9	1.0	25.7	0.0	8.4	25.8	16.9	10.0	9.3	28.9	53.6	31.3	47.3	59.2	0.0
13.00	5.6	3.5	25.7	0.0	3.2	27.9	18.8	10.0	9.3	31.6	57.6	31.3	47.3	67.1	0.0
14.00	7.1	3.5	25.7	0.0	0.0	28.2	19.0	10.0	9.3	33.3	61.2	31.3	47.3	72.5	0.0
15.00	9.5	3.5	25.7	0.0	-0.0	27.9	18.8	10.0	9.3	33.3	60.2	31.3	47.3	74.4	0.0
16.00	10.4	3.5	25.7	0.0	0.0	27.9	18.8	10.0	9.3	33.3	60.2	31.3	47.3	72.5	0.0
17.00	10.8	3.5	25.7	0.0	0.0	27.9	18.8	10.0	9.3	33.3	57.6	31.3	47.3	72.5	0.0
18.00	16.4	3.5	25.7	0.0	0.0	25.8	16.9	10.0	9.3	26.9	53.6	31.3	47.3	67.1	0.0
19.00	18.8	3.5	25.7	0.0	1.5	24.0	15.5	10.0	9.3	25.4	48.9	31.3	47.3	59.2	0.0
20.00	8.8	3.5	25.7	0.0	4.0	21.9	13.9	10.0	9.3	21.3	43.8	31.3	47.3	40.4	0.0
21.00	6.3	3.5	25.7	0.0	4.6	19.5	12.1	10.0	9.3	17.0	38.9	31.3	47.3	31.4	0.0
22.00	5.8	3.5	25.7	0.0	5.2	17.0	10.5	10.0	9.3	12.6	34.3	31.3	47.3	23.4	0.0
23.00	4.5	3.5	25.7	0.0	10.6	14.7	8.9	27.0	13.6	8.5	30.4	48.7	47.3	16.6	0.0
24.00	4.1	3.5	0.0	6.0	12.1	12.6	7.5	26.5	13.0	5.0	27.1	48.2	47.3	11.4	0.0
TOTALS	83.5	53.9	308.8	31.8	144.2	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4

TABLE A5.5

PLANT 2 PARTIAL LOAD PARAMETERS

PLANTS PARTIAL LOAD PERFORMANCE																
PLANT No : 2																
AHP TIME	SEN LOAD	LAT LOAD	FRIG LOAD	PREHEAT LOAD	REHEAT LOAD	TEMP ON COIL	TEMP OFF COIL	TEMP DOORS	SUPPLY VOLUME	SUPPLY FLOW	ENTH COIL	ENTH RET	ENTH DOORS	ROOM RETURN	ROOM STATE	ROOM LOAD
(GMT)	(kW)	(kW)	(kW)	(kW)	(kW)	(deg C)	(deg C)	(deg C)	(m ³ /S)	(kg/S)	(kJ/kg)	(kJ/kg)	(kJ/kg)	(C/2)	(C/2)	(kW)
DECEMBER																
1.00	-2.0	1.0	0.0	0.0	11.3	13.4/8.6	23.7/12.6	2.3	1.162	1.140	29.7/46.2	47.3	7.5	22.0/34		0.0
2.00	-2.4	1.0	0.0	0.0	12.6	12.6/8.1	24.1/12.6	6	1.162	1.139	28.5/46.6	47.3	5.2	22.0/33		0.0
3.00	-2.6	1.0	0.0	0.0	13.2	12.3/8.0	24.3/12.6	0.0	1.162	1.138	28.1/46.8	47.3	4.4	22.0/33		0.0
4.00	-2.7	1.0	0.0	0.0	12.9	12.6/8.1	24.3/12.7	6	1.162	1.138	28.5/46.9	47.3	5.2	22.0/33		0.0
5.00	-2.5	1.0	0.0	0.0	11.8	13.4/8.6	24.2/12.8	2.3	1.162	1.139	29.7/46.7	47.3	7.5	22.0/34		0.0
6.00	-2.2	1.0	0.0	0.0	10.0	14.7/9.4	23.9/12.9	5.0	1.162	1.139	31.6/46.5	47.3	11.4	22.0/35		0.0
7.00	3.4	3.5	0.0	0.0	9.3	16.5/10.5	24.9/13.6	8.5	1.162	1.165	34.4/47.5	47.3	16.4	22.0/41		0.0
8.00	4.7	3.5	0.0	0.0	9.3	16.5/11.6	19.8/12.9	12.6	1.162	1.165	27.5/47.5	47.3	23.4	23.0/42		3.8
9.00	5.4	3.5	28.5	0.0	6.9	22.0/12.9	10.6/9.9	16.9	1.162	1.165	41.0/32.8	47.3	31.4	21.9/50		0.0
10.00	5.9	3.5	28.5	0.0	6.3	23.7/15.4	10.6/9.9	25.4	1.162	1.165	48.6/32.8	47.3	49.9	21.9/50		0.0
11.00	6.5	3.5	28.5	0.0	5.4	25.0/16.5	10.6/9.9	28.9	1.162	1.165	52.3/32.8	47.3	59.2	21.9/50		0.0
12.00	7.4	3.5	28.5	0.0	4.7	26.0/17.4	10.6/9.9	31.6	1.162	1.165	55.3/32.8	47.3	67.1	21.9/50		0.0
13.00	8.1	3.5	28.5	0.0	3.2	26.7/18.0	10.6/9.9	33.3	1.162	1.165	57.3/32.8	47.3	72.5	21.9/50		0.0
14.00	9.6	3.5	28.5	0.0	1.0	26.9/18.2	10.6/9.9	33.9	1.162	1.165	58.0/32.8	47.3	74.4	21.9/50		0.0
15.00	11.0	3.5	28.5	0.0	0.0	26.7/18.0	10.6/9.9	33.3	1.162	1.165	57.3/32.8	47.3	72.5	22.0/50		0.0
16.00	12.9	3.5	28.5	0.0	0.0	26.0/17.4	10.6/9.9	31.6	1.162	1.165	55.3/32.8	47.3	67.1	22.6/48		0.0
17.00	13.5	3.5	28.5	0.0	0.0	25.0/16.5	10.6/9.9	28.9	1.162	1.165	52.3/32.8	47.3	59.2	22.3/49		0.0
18.00	13.2	3.5	28.5	0.0	2.1	23.7/15.4	10.6/9.9	25.4	1.162	1.165	48.6/32.8	47.3	49.9	24.9/50		0.0
19.00	16.6	3.5	28.5	0.0	6.9	22.0/14.2	10.6/9.9	21.3	1.162	1.165	44.8/32.8	47.3	40.4	21.9/50		0.0
20.00	5.9	3.5	28.5	0.0	7.7	20.2/12.9	10.6/9.9	17.0	1.162	1.165	41.0/32.8	47.3	31.4	21.9/50		0.0
21.00	5.1	3.5	28.5	0.0	7.7	18.3/11.6	18.8/12.9	12.6	1.162	1.165	37.5/32.8	47.3	23.4	22.3/45		3.8
22.00	4.2	3.5	0.0	0.0	9.2	16.5/10.5	24.8/14.6	8.5	1.162	1.165	34.4/47.4	47.3	16.4	22.0/46		3.8
23.00	5.3	3.5	0.0	0.0	10.5	14.9/9.5	24.3/14.1	5.0	1.162	1.165	31.9/46.8	47.3	11.4	22.0/46		3.8
24.00	2.7	3.5	0.0	0.0												
TOTALS	120.1	68.8	367.9	9.0	169.1	kW-h										

TABLE A5.6

DESIGN HEATING AND HUMIDIFICATION LOADS
FOR PLANTS 1 AND 2

HEATING PARAMETERS FOR PLANT 1

MAXIMUM REHEAT LOAD	12.1 kW
MAXIMUM PREHEAT LOAD	10.8 kW
MAXIMUM HUMIDIFIER LOAD	10.0 kW

HEATING PARAMETERS FOR PLANT 2

MAXIMUM REHEAT LOAD	13.2 kW
MAXIMUM PREHEAT LOAD	0.0 kW
MAXIMUM HUMIDIFIER LOAD	3.8 kW

Author Da Silva A J

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