REPUBLIC OF INDONESIA

MINISTRY OF COMMUNICATIONS
DIRECTORATE GENERAL OF LAND TRANSPORT
AND INLAND WATERWAYS

TENDER DOCUMENTS
FOR
NEW RAILWAY LINE FOR CENGKARENG AIRPORT CONSTRUCTION PROJECT

STRUCTURAL CALCULATION SHEETS

PACKAGE I CIVIL AND ARCHITECTURAL WORK

10 of 11

AUGUST 1984

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)

STRUCTURAL CALCULATION SHEETS

CONTENTS

§§ 15. CALCULATION OF MECHANICAL FOR AIRPORT TERMINAL STATION, KOTA INTAN STATION AND SIGNAL CABINS

PAGE

AIR CONDITIONING AND VENTILATION

A. DESIGN CONDITIONS

AIR CONDITIONING :

	DB C°	WB C°	RH %	X kg/kg
Outdoor	32.5	27.0	65	0.0203
Indoor	26	18.8	50	0.0105
	Δt 6.5			Δx 0.0093

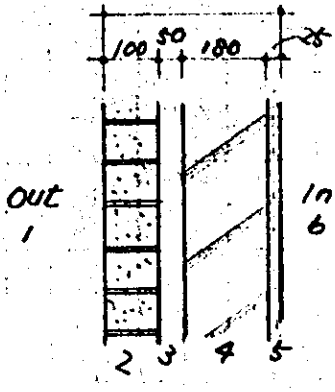
VENTILATION :

	Air Changes (times/Hr)
Lavatory (for Staff)	15
Lavatory (for passenger)	20
Machanical Room	10
Power Room	15
Kitchen	30
Ablution Room	10
Musholla	15
Maintenance & Janitor's Room	10
Porter's Room	10
Signal Telcom Device Room	10
Storage	10

B. AIR CONDITIONING COOLING LOAD

1. Coefficients of Transmission (K) of Walls & Roofs

"K" of Walls



Construction	t	λ	R
1. Outside Air	-	-	0.025
2. Bricke	0.1	0.53	0.188
3. Air space	-	-	0.18
4. Concrete	0.18	1.4	0.128
5. plaster	0.025	0.53	0.047
6. Inside Air	-	-	0.125

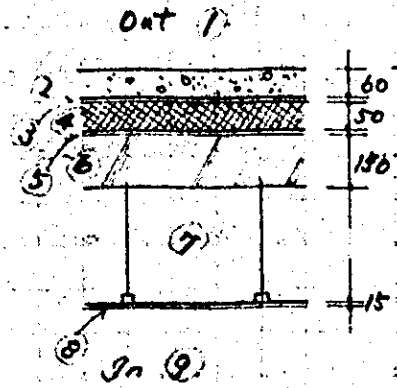
Total R = 0.693

$K = 1/0.693 \doteqdot 1.45$ ----→ Wall Group C (P=26.9) *

* Refer, Table 6 of ASHRAE FUNDAMENTALS (81)

"K" of Roofs

Roof Type - 1

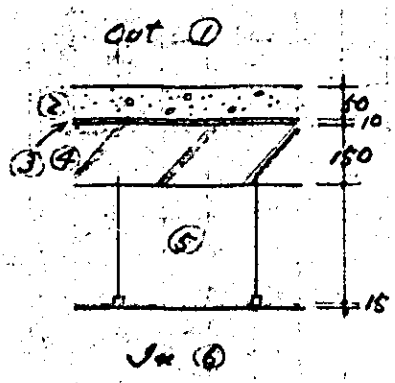


Construction	t	λ	R
1. Outside Air	-	-	0.025
2. Mortal	0.06	1.2	0.05
3. Aspalt & Roofing 5.	0.015	0.12	0.125
4. Insulation	0.05	0.035	1.428
6. Concrete	0.15	1.4	0.107
7. Air space	-	-	0.2
8. Ceiling Board	0.015	0.06	0.25
9. Inside Air	-	-	0.125

Total R = 2.31

$K = 1/2.31 \fallingdotseq 0.44$ Roof NO. 12 (ASHRAE)

Roof Type - 2



Construction	t	λ	R
1. Outside Air	-	-	0.025
2. Mortal	0.05	1.2	0.041
3. Aspalt & Roofing	0.01	0.12	0.083
4. Concrete	0.15	1.4	0.107
5. Air space	-	-	0.2
6. Inside Air	-	-	0.125

$K = 1/0.581 \fallingdotseq 0.86$ Roof NO. 3 (ASHRAE) Total R = 0.581

"K"-Value of Partition Wall, Floor & Others

partition Wall : K = 2.5 (Concrete or Brick, plaster)

Floor K = 2.0 (Concrete, Terrazzo)

Door (outside) K = 2.7 (Steel-Flush type)

Glass of Window K = 5.5 (Single 5~6 mmt)

2. Rates Heat Gain from Occupants of Conditioned Spaces

Typical Application	Degree of Activity	SH (kcal/Hr.)	LH (kcal/Hr.)
Offices (1)	Seated, Very Light Work, Writing	58	48
" (2)	Seated, Light Work, Typing	65	65
Others	Light Bench-Work	87	110

3. Cooling Load Temperature Differences (CLTD)

CLTDcorr of Roofs {ASHRAE HANDBOOK (1981), CHAPTER 26}

$\{(CLTD + LM) \times K + (25.5 - TR) + (TO - 29.4)\} \times f$

Description	15:00	17:00	19:00
Roof TYPE-1 CLTD (Table 5) LM (" 9) K=1, 25.5-TR = -0.5 TO-29.4 = 3.1 f = 1	16 -0.5 -0.5 3.1 18.1 19 °C	18 -0.5 -0.5 3.1 20.1 21 °C	19 -0.5 -0.5 3.1 21.1 22 °C
Roof TYPE-2 CLTD (Table 5) LM (" 9) K=1, 25.5-TR = -0.5 TO-29.4 = 3.1 f = 0.5	31 -0.5 -0.5 3.1 33.1 ×0.5 (17 °C)	36 -0.5 -0.5 3.1 38.1 ×0.5 18.5 °C	39 -0.5 -0.5 3.1 36.1 ×0.5 18.5 °C

CLTDcorr of Wall {ASHRAE HANDBOOK (1981), CHAPTER 26}

CLTDcorr = (CLTD + LM)K + (25.5 − TR) + (TO − 29.4)

where CLTD ~ Table 7, LM = Table 9, K = 1

TR = 26°C, TO = 32.5°C ; Wall Group NO. C

Time / Orientation	15:00	17:00	19:00
N	(7) °C	(8) °C	(10) °C
E	(18) "	(19) "	(18) "
S	(17) "	(20) "	(22) "
W	(10) "	(12) "	(14) "

CLTDcorr & Solar Heat Gain of Glass

CLTDcorr = CLTD + (25.5 − TR) + (TO − 29.4) ..... from Table 10

15:00 ~ (10.6°C), 17:00 ~ (9.6°C), 19:00 ~ (8.6°C)

Solar Heat Gain (SC × SHGT × CLF)

where SC = 0.78, SHGT ~ Table 11, CLF ~ Table 13 & 14

Time / Orientation	15:00	17:00	19:00
N	(64) Kcal/m²	(63) Kcal/m²	(51) Kcal/m²
E	(167) "	(133) "	(98) "
S	(159) "	(119) "	(85) "
W	(230) "	(322) "	(236) "

AIRPORT TERMINAL STATION

Story: STATION BLDG. Rm. Temp.(s) °C ... No. 1

Rm. Name: (S) VIP WAITING Rm.(W) 4 m x L 6.3 m = Area 25.2 m², H 2.5 m, Volume 63 m³

Orientation	Wall	K	Area m²	Δ t(deg) 15:00	Δ t(deg) 17:00	Δ t(deg) 19:00	S.H. kcal/h SH_1	S.H. kcal/h SH_2	S.H. kcal/h SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
W=N	Outside W.	1.45	6.1	7	8	10	62	71	89			
S=N	"	1.45	15.8	7	8	10	161	184	230			
	"											
	"											
W=N	Window	5.5	3.9	10.6	9.6	8.6	228	206	185			
	"											
	"											
	"											
	Partition W.	2.5	10	6.5/2	3.25	3.25	82	82	82			
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
W=N			3.9	64	63	51	250	246	199	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			KW								
	Fluorescent lamp	20 W/m²	0.5 KW		1000 Kcal/m²		510	510	510			
	Meter 0.08KW - 0.37KW			KW						Supply Air Temp. Difference deg		
	0.37KW - 1.5KW			KW								
										Latent Heat		
	Gas equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person 25.1 x 0.3 ≒ 8 (Person)			8 x 58			464	464	464	8 x 48		384
	Infiltration 63 x 0.5 ≒ 32 m³/h			x 6.5 deg x 0.28			59	59	59	715 x, Δx		225
	Heat gain Sub, Total						1,616	(1,822)	1,819	0.0098		(609)
	Heat gain Grand Total						2,426	(2,431)	2,428	O.A. 25		m³/h Person
				Factor 1.1			2670	2,680	2680	200		m³/h
	Sensible Heat Rate SHR							0.75				m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

M-8

Story STATION BLDG. Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) % No. 2

Rm. Name ⑥ STATION MASTER Rm.(W) 5 m x L 3.7 m = Area 18.5 m², H 2.5 m = Volume 46.3 m³

Heat Gain (Summer)										Heat Loss (Winter)		
Orientation	Wall	K	Area	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Δ t deg	Factor	Heat loss kcal/h
W=N	Outside w.	1.45	10.8	7	8	10	110	126	157			
	"											
	"											
	"											
W=N	Window	5.5	1.7	10.6	9.6	8.6	100	90	81			
	"											
	"											
	"											
	Parti-tion w	2.5	10	3.25	3.25	3.25	82	82	82			
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration c/h		
	Area (m²) Factor	m²								m³/h		
W=N		1.68	64	63	51	108.	106	86		m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		KW									
	Fluorescent lamp 20	W/m²	0.37 KW				370	370	370			
	Meter 0.09KW - 0.37KW		KW									
	0.37KW - 1.5KW		KW							Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas equip. the other.											
	Internal Heat (Equipment) Sub. Total											
	Person			2 x 58			116	116	116	2 x 48		96
	Infiltration 46.3 x 0.5 = 23 m³/h			x 6.5 deg x 0.28			42	42	42	7.15 x Δx		162
	Heat gain Sub. Total						928	932	934	0.0098		1258
	Heat gain Grand Total			Factor 1.1			1,136	1,190	1,192	O.A. 25		m³/h Person
							1,310	1,310	1,320	50		m³/h
	Sensible Heat Rate SHR								0.78			m³/h.m²
	Required Air Volume = SH / 0.28 x Δ t =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

M-9

Story STATION BLDG. Rm. Temp.(s) °C(w) °C R.H.(s) %(w) % No. 3

Rm. Name (7) STATION OFFICE-1 Rm.(W) 5 m x L 9.3 m = Area 46.5 m², H 2.5 m = Volume 116.3 m³

Orientation	Wall	K	Area m²	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
E=N	Outside W.	1.85	9.5	7	8	10	97	111	138			
	"											
	"											
	"											
E=N	Window	5.5	3.0	10.6	9.6	8.6	175	159	142			
	"											
	"											
	"											
	Partition W	2.5	18.8	3.25	3.25	3.25	153	153	153			
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration c/h		m³/h
	Area (m²)	Factor	m²							m³/h x deg x		
E=N			3.0	64	63	51	192	189	153			
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			KW								
	Fluorescent lamp 20	W/m²	0.93 KW				930	930	930			
	Meter 0.09KW - 0.37KW			KW						Supply Air Temp. Difference ° deg		
	0.37KW - 1.5KW			KW								
										Latent Heat		
	Gas equip. the other.		0.5 KW x 860 Kcal/KW				430	430	430			
	Internal Heat (Equipment) Sub. Total											
	Person			8 x 58			464	464	464	8 x 48		384
	Infiltration 116.3 x 0.8 = 93 m³/h			x 6.5 deg x 0.28			170	170	170	7:15 Δx		652
	Heat gain Sub. Total						(2611)	2606	2580	0.0019		(1036)
	Heat gain Grand Total					1.1	(3647) 4020	3642	3616	O.A. 25 200		m³/h Person m³/h
	Sensible Heat Rate SHR											m³/h.m² m³/h
	Required Air Volume = SH / 0.29 x Δt =								m³/h	Air change		

AIRPORT TERMINAL STATION

M-10

Story _____ Rm. Temp.(s) _____ °C(w) _____ °C, R.H.(s) _____ %(w) _____ % No. 4

Rm. Name 8) ⑧ TICKET Rm.(w) 6.6 m x L 4.5 m = Area 29.7 m², H 2.5 m = Volume 74.3 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
E=N	Outside w.	1.85	13.5	7	8	10						
S=N	"	1.85	7.4	7	8	10	279	318	398			
W=N	"	1.85	6.5	7	8	10						
	"											
E=N	Window	5.5	3.0	10.6	9.6	8.6	403	365	327			
S=N	"	5.5	3.9	10.6	9.6	8.6						
	"											
	"											
	Partition W	2.5	10	3.25	3.25	3.25	82	82	82			
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											

	Heat gain Sub. Total									Sub. Total	
	Solar Gain-Glass									Infiltration c/h	m³/h
	Area (m²)	Factor	m²							m³/h x deg x	
E=N			3.0	64	63	51	442	435	352		
S=N			3.9	64	63	51					
										Sub. T.	
										Factor	
	Sub. Total									Heat Loss C. Total	
	Internal Heat (Equipment)										
	Incandescent lamp			KW							
	Fluorescent lamp 20	w/m²	0.6 KW				600	600	600		
	Meter 0.09KW - 0.37KW			KW						Supply Air Temp. Difference ° deg	
	0.37KW - 1.5KW			KW							
										Latent Heat	
	Gas equip. the other. 0.5 KW x 860 kcal/Hr						430	430	430		
	Internal Heat (Equipment) Sub. Total										
	Person			4 x 65			260	260	260	4 x 65	260
	Infiltration 74.3 x 1 x 75 m³/h			x 6.5 deg x 0.28			137	137	137	7.5x Δx	526
	Heat gain Sub. Total						(2,833)	2,827	2,586	0.00AP	(786)
	Heat gain Grand Total					1.1	(3,919)	3,913	3,372	O.A. 25	m³/h Person
							3,770	3,760	3,710	100	m³/h
	Sensible Heat Rate SHR						0.77				m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h		m³/h
										Air change	

AIRPORT TERMINAL STATION

M-11

Story STATION BLDG. Rm. Temp.(s) °C(w) °C. R.H.(s) %(w) % No. 5

Rm. No. (26) MEETING Rm.(W) 5.4 m x L 9 m = Area 48.6 m², H 2.5 m = Volume 121.5 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
N	Outside t.	1.85	21.	7	8	10 →	351	901	501			
E:N	"	1.85	13.5	7	8	10						
	"											
	"											
N	Window	5.3	1.6	10.6	9.6	8.6	98	85	76			
	"											
	"											
	"											
	Partition	2.5	13.5	3.25	3.25	3.25	110	110	110			
	"											
	Window											
	"											
	Floor	2.0	48.6	3.25	3.25	3.25	316	316	316			
	"											
	Roof	0.86	48.6	17	19.5	18.5	711	816	774			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
N			1.6	64	63	51	103.	101	82	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			KW								
	Fluorescent lamp 20	W/m	0.98	KW			980	980	980			
	Meter 0.09KW ~ 0.37KW			KW						Supply Air Temp. Difference ° deg		
	0.37KW ~ 1.5KW			KW								
										Latent Heat		
	Gas equip.											
	the other.											
	Internal Heat (Equipment) Sub. Total											
	Person 48.6 x 0.3 = 15			16 x 48			870	870	870	15 x 48		720
	Infiltration 121.5 x 0.5 = 61 m³/h			x 6.5 deg x 0.28			112	112	112	715x, Δx		428
	Heat gain, Sub. Total						3,647	3,791	(3821)	0.2CM		(1148)
	Heat gain Grand Total			Factor 1.1			4,795	4,939	(4969)	O.A. 25		m³/h Person
							5,280	5,440	5,470.	375		m³/h
	Sensible Heat Rate SHR								0.77			m³/h.m²
	Required Air Volume = SH / 0.28 x Δt =								m³/h	Air change		m³/h

AIRPORT TERMINAL STATION

M-12

Story STATION BLDG. Rm. Temp.(s) °C(w) °C. R.H.(s) %(w) % No. 6

Rm. Name (27) POWER INSPECTION Rm.(W) 5.3 m x L 7.8 m = Area 41.4 m² H 2.5 m = Volume 103.5 m³

Heat Gain (Summer)										Heat Loss (Winter)		
Orientation	Wall	K	Area	Δ t(deg)			S.H. kcal/h			Δt	Factor	Heat loss
			m²	15:00	17:00	19:00	SH_1	SH_2	SH_3	deg		kcal/h
E=N	Outside t.	1.45	9.2	7	8	10	94	107	134			
	"											
	"											
	"											
E=N	Window	5.5	1.6	10.6	9.6	8.6	94	85	76			
	"											
	"											
	"											
	Partition W	2.5	13.3	3.25	3.25	3.25	109	109	109			
	"											
	Window											
	"											
	Floor	2.0	41.4	3.25	3.25	3.25	270	270	270			
	"											
	Roof	0.86	41.4	17	19.5	20.5	606	695	659			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration c/h		
	Area (m²) Factor		m²									m³/h
E=N			1.6	69	63	51	103	101	82	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			Kw								
	Fluorescent lamp 20	w/m²	0.83	Kw			830	830	830			
	Meter 0.09KW - 0.37KW			Kw								
	0.37KW - 1.5KW			Kw						Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas equip. the other. 0.5 x 860						430	430	430			
	Internal Heat (Equipment) Sub. Total											
	Person			4 x 58			232	232	232	4 x 48		192
	Infiltration 103.6 x 0.5 = 52 m³/h			x 6.5 deg x 0.28			95	95	95	7.5x Δx		366
	Heat gain Sub. Total						2,363	2,954	2,917	0.0048		558
	Heat gain Grand Total						3,420	3,511	3,474	O.A. 25		m³/h Person
							3,770	3,870	3,830	100		m³/h
	Sensible Heat Rate SHR							0.84				m³/h.m²
	Required Air Volume = SH / 0.28 x Δ t =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

M-13

Story STATION BLDG Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) % No. 7

Rm. Name (28) SIGNAL TELCOM Rm.(W) 5 m x L 7.8 m = Area 39 m², H 2.5 m = Volume 97.5 m³

Orientation	Wall	K	Area m²	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δ t deg	Factor	Heat loss kcal/h
E=N	Outside W.	1.85	7.3	7	8	10	75	85	106			
	"											
	"											
	"											
E=N	Window	5.5	5.2	10.6	9.6	8.6	308	275	246			
	"											
	"											
	"											
	Partition W	2.5	12.5	3.25	3.25	3.25	102	102	102			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	39	17	19.5	18.5	571	655	621			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration c/h		
	Area (m²) Factor	m²								m³/h		
E=N		1.6	6.4	6.3	5.1	103	101	82		m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp -		KV									
	Fluorescent lamp 20	W/m²	0.78 KV				780	780	780			
	Meter 0.09KW - 0.37KW		KV							Supply Air Temp. Difference ° dcg		
	0.37KW - 1.5KW		KV									
										Latent Heat		
	Gas equip. the other	1.5×860					1290	1290	1290			
	Internal Heat (Equipment) Sub. Total											
	Person		4 x 65 x				260	260	260	4 x 65 x		260
	Infiltration 39×0.5 = 20 m³/h		x 6.5 deg x 0.28				37	37	37	7.5	Δx	181
	Heat gain Sub. Total						3522	(3.585)	3.524	0.0098		(401)
	Heat gain Grand Total						3.923	(3.986)	3.925	O.A.		m³/h Person
							8.320	(8.390)	8.320			m³/h
	Sensible Heat Rate SHR							0.9				m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

M-14

Story: STATION BLDG Rm. Temp.(g) °C(w) °C, R.H.(g) %(w) % No. 8

Rm. Name: QU REST Rm.(W) 6.8 m x L 7.8 m = Area 53 m², H 2.5 m = Volume 132.8 m³

Orientation	Wall	K	Area	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δ t deg	Factor	Heat loss kcal/h
			m²									
E=N	Outside E.	1.45	5.2	7	8	10	706	807	1.008			
S=N	"	1.45	17.2	7	8	10						
	"											
	"											
E=N	Window	5.5	0.8	10.6	7.6	8.6	181	164	147			
S=N	"	5.5	2.3	10.6	9.6	8.6						
	"											
	"											
	Partition X	2.5	17	3.25	3.25	3.25	139	139	139			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	53.1	17	19.5	18.5	777	891	845			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
E=N			0.8	69	63	51	199	196	159	m³/h x deg x		
S=N			2.3	69	63	51						
										Sub. T.		
										Factor		
	Sub. Total											
	Internal Heat (Equipment)									Heat Loss G. Total		
	Incandescent lamp			KW								
	Fluorescent lamp 20	W/m²	1.07	KW			1,070	1,070	1.070			
	Meter 0.09KW - 0.37KW			KW								
	0.37KW - 1.5KW			KW						Supply Air Temp. Difference = deg		
										Latent Heat		
	Gas equip. the other 0.5 x 860						430	430	430			
	Internal Heat (Equipment) Sub. Total											
	Person 53.1 x 0.2 = 11			11 x 58			638	638	638	11 x 48		528
	Infiltration 132.8 x 0.5 = 67 m³/h			x 6.5 deg x 0.28			122	122	122	715x Δx		470
	Heat gain Sub. Total						4162	4.457	(4.558)	0.0098		(998)
	Heat gain Grand Total					1.1	5.260	5.955	(5.556)	O.A. 25		m³/h Person
							5.790	6,010	(6120)			m³/h
	Sensible Heat Rate SHR								0.82			m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

M-15

Story STATION BLDG. Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) - No. 9

Rm. Name DINING Rm.(W) 32 m x 1.9 m = Area 32.8 m², H 2.5 m = Volume 81 m³

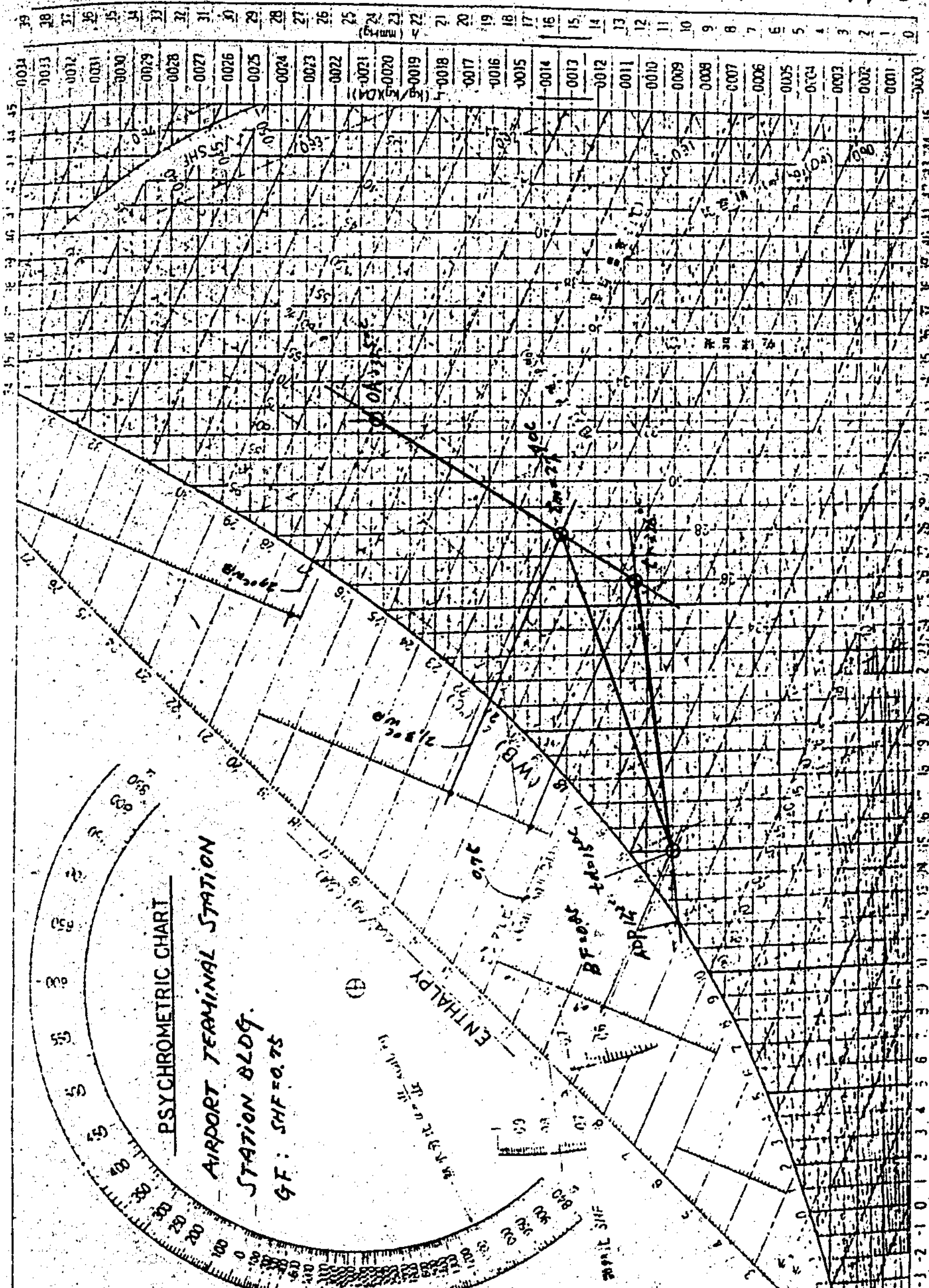
Orientation	Wall	K	Area m²	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δ t deg	Factor	Heat loss kcal/h
E=N	Outside W.	1.75	4.5	7	8	10						
S=N	"	1.45	9.0	7	8	10	350	400	499			
W=N	"	1.45	20.9	7	8	10						
	"											
W=N	Window	5.5	1.6	10.6	9.6	8.6	94	85	76			
	"											
	"											
	"											
	Parti-tion W	2.5	16.5	3.25	3.25	3.25	135	135	135			
	"											
	Window											
	"											
	Floor	2.0	6.5	3.25	3.25	3.25	43	43	43			
	"											
	Roof	0.66	32.8	17	19.5	18.5	477	544	546			
	"											
	Heat gain Sub. Total									Sub. Total		

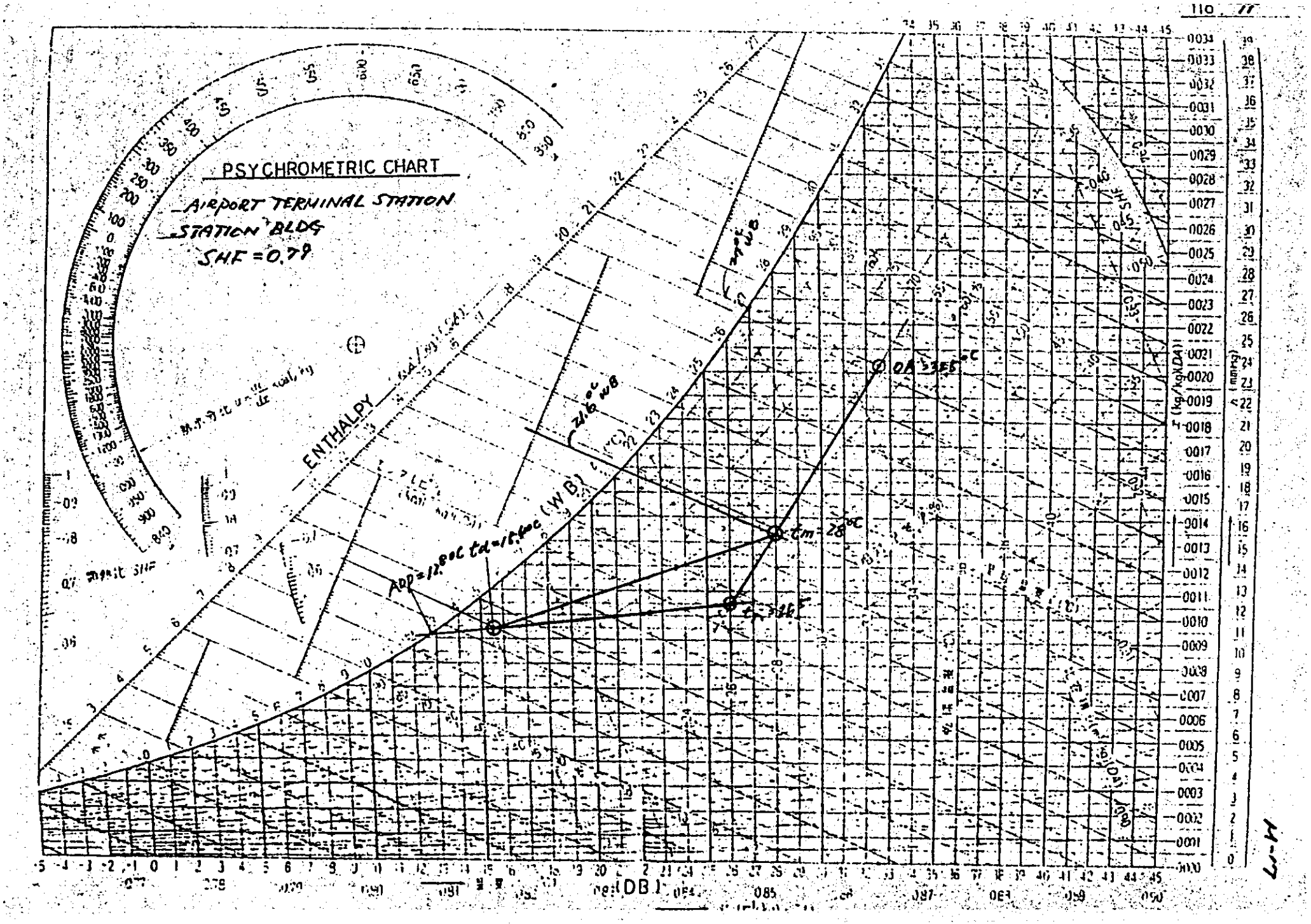
Solar Gain-Glass

Area (m²)	Factor	m²							Infiltration	c/h m³/h
		1.6	64	63	51	103	101	82	m³/h x deg x	
									Sub. Y.	
									Factor	
Sub. Total										

								Heat Loss G. Total
Internal Heat (Equipment)								
Incandescent lamp -		Kw						
Fluorescent lamp 20	W/m²	0.65 Kw			650	650	650	
Meter 0.09Kw - 0.37Kw		Kw						
0.37Kw - 1.5Kw		Kw						Supply Air Temp. Difference ° deg
								Latent Heat
Gas equip. the other. 0.5 x 860					430	430	430	
Internal Heat (Equipment) Sub. Total								
Person 32.8 x 0.3 = 10			. 10 x 55		550	550	550	10 x 88 = 880
Infiltration 81 x 1 = 81 m³/h			x 6.5 deg x 0.28		148	148	148	7.5x Δx 568
Heat gain Sub. Total					3,007	3,116	(3,159)	0.0058 (1,086)
Heat gain Grand Total					4035	4,164	(4,187)	O.A. 25 m³/h Person
					4420	4560	4610	250 m³/h
Sensible Heat Rate SHR							0.75	m³/h.m²
Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =							m³/h	m³/h
								Air change

M-16


PSYCHROMETRIC CHART
AIRPORT TERMINAL STATION
STATION BLDG.
GF : SHF=0.75
ENTHALPY
(DB)
(WB)
SHF
ADP
BF=0.05


PSYCHROMETRIC CHART
AIRPORT TERMINAL STATION
STATION BLDG
SHF = 0.79
ENTHALPY
DB
OA 35°C
Adp = 12.8°C td = 11.6°C (WB)
tm = 28°C

H-7

LIST OF COOLING LOAD FOR AIRPORT TERMINAL STATION

STATION BLDG.

NAME OF ROOM	Cooling Load KCAL/HT SH	LH	TH	SA m^3/HT	OA m^3/HT	OA KCAL/HT	Grand TH KCAL/HT	RA m^3/HT	Remarks
1F									
⑤ VIP WAITING	1522 2010	609 670	2431 (2,680)	297 700	8P 200				AD-200×2
⑥ STATION MASTER	939 1030	268 290	1192 (1,320)	400	2P 60				AD-200×1
⑦ STATION OFFICE-1	2611 2830	1036 1146	3647 (4020)	1.000	8P 200				AD-250×1 AD-200×1
⑧, ⑨ TICKET	2,633 2,900	756 570	3,419 (3.770)	1,000	4P 100				AD-200×1 SL-165×1000~2
Sub Total	8820	2970	(11,790)	(3100)	550			2550	R/G=300×600
2F									
㉖ MEETING	3821 4210	1148 1270	4,968 (5480)	1500	16P 380				AD-300×2
㉗ POWER INSPECTION	2954 3250	557 620	3511 (3.870)	1,100	4P 100				AD-250×2
㉘ SIGNAL TELECOM	3585 3950	401 450	3986 (4400)	1400	4P 100				AD-300×1 AD-200×1
㉙ DINING	3,159 3480	1028 1140	4187 (4620)	1200	10P 250				SL-300×1000 ~2
Sub Total	14590	3480	(15370)	(6,700)	630			4,470	Return Duct 800×350 H W R/G=1000×800
Grand Total	23710	6450	(30,160)	(8300)	(1360)	(12190)	(42350)		

Required Air Volume $= \frac{SH}{0.28 \times \Delta t} = \frac{23,710}{0.28 \times (26-16.4)} \div 7,990\ (m^3/HT)$ (8,300 (m³/HT) --- O.K

SHF = 0.79

Selection of Air-con. ※ G.TH = 42,350 (Kcal/HR) Safety Factor 1.5% 42,350 × 1.25 ≒ 49,400 (Kcal/HR) ≒ 16 RT → PAC-1) -- O.K

㉙ REST	4888 6,920	998 1100	5556 (6120)		11P 280	2480	18.600		WAC-2 4300 Kcal/HR × 2 SETS

VENTILATION LIST OF AIRPORT TERMINAL STATION

No. M-19

NAME OF ROOM	Calculation of Air Volume Exhaust Air of Room	m^3/Hr	Remarks
STATION BLDG.			
⑤ VIP LAVATORY (IF)	2.5×1.9×2.5 = 11.9 (m^3) 11.9×10 ≒ 200 (m^3/Hr)	200	(CEF-1½) NO.1½×1900 m^3/Hr ×40 mmAq×0.75 KW
⑧ PANTRY ⑨ OF TICKET/RM.	1.5×1.9×2.5 = 7.2 (m^3) 7.2×10 ≒ 100 (m^3/Hr)	100	
⑩ STAFF LAVATORY	3.8×3.6×2.5 = 34.2 (m^3) 34.2×15 ≒ 600 (m^3/Hr)	600	(CEF-2) NO.2×3600 m^3/Hr ×35 mmAq×1.5 KW
⑪ MECHANICAL	5.3×4.5×3.3 = 78.7 (m^3) 78.7×10 ≒ 800 (m^3/Hr)	800	
⑫ POWER	5.3×4.5×3.3 = 78.7 (m^3) 78.7×15 ≒ 1200 (m^3/Hr)	1200	
⑬ MEINTENANCE & JANITOR'S	3.8×5.6×3.3 = 72.9 (m^3) 72.9×10 ≒ 800 (m^3/Hr)	800	
TELECOM	2.0×3.8×3.3 = 25.1 (m^3) 25.1×10 ≒ 300 (m^3/Hr)	300	
㉛ KITCHEN (QF)	5×3.6×2.5 = 45 (m^3) 45×30 = 1400 (m^3/Hr)	1400	(WEF-500) 1600 m^3/Hr×15 mmAq ×0.3 KW×1φ
㉜ STAFF LAVATORY	3.8×3.6×2.5 = 34.2 (m^3) 34.2×15 ≒ 600 (m^3/Hr)	600	
			500×1.1 = 550 (m^3/Hr)
㉝ ABLUTION (RF)	(3.6×3.6 + 3.8×1.8×½)×2.5 = 72.9 (m^3) 72.9×10 ≒ 500 (m^3/Hr).	500	(WEF-30) ×550 m^3/Hr×8 mmAq ×0.05 KW×1φ
㉞ MUSHOLLA	6.3×6.3×2.5 = 99.3 (m^3) 99.3×15 = 1500 (m^3/Hr)	1490	1490×1.1 = 1700 (m^3/Hr) =850 (m^3/Hr) × 2 sets
			(WEF-250) 850 m^3/Hr×8 mmAq ×0.1 KW×1φ ~2 sets

AIRPORT TERMINAL STATION

M-20

Story: BOOKING BLDG. Rm. Temp.(s) °C(w) °C. R.H.(s) %(w) % No. 1

Rm. Name: (16) TICKETS SALES-2 Rm.(W) 6 m x L 7 m = Area 62 m² H 2.5 m = Volume 155 m³

Heat Gain (Summer)										Heat Loss (Winter)		
Orientation	Wall	K	Area	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Δ t deg	Factor	Heat loss kcal/h
N	Outside t.	1.45	13.4	7	8	10						
W=N	"	1.45	17.5	7	8	10	402	460	575			
S=N	"	1.45	8.7	7	8	10						
	"											
N	Window	5.5	1.6	10.6	9.6	8.6	461	418	374			
S=N	"	5.5	6.3	10.6	9.6	8.6						
	"											
	"											
	Partition W											
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	62	17	19.5	18.5	907	1040	987			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m^2) Factor		m^2									m^3/h
N			1.6	64	69	51	506	498	403	m^3/h x deg x		
S=N			6.3	64	69	51						
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			KW								
	Fluorescent lamp 20	W/m²	1.24	KW	1000 Kcal/KW		1,240	1,240	1,240			
	Meter 0.09KW - 0.37KW			KW						Supply Air Temp. Difference e deg		
	0.37KW - 1.5KW			KW								
										Latent Heat		
	Gas equip. the other 0.5×860						430	430	430			
	Internal Heat (Equipment) Sub. Total											
	Person			4 x 65			260	260	260	4 x 65		260
	Infiltration 155 x 1 = 155 m^3/h			x 65 deg x 0.28			283	283	283	7.5x Δx		1,087
	Heat gain Sub. Total						4989	4629	4552	0.0098		(1,347)
	Heat gain Grand Total			Factor 1.1			5,816	5,976	5,899	O.A. 4		m^3/h Person
							6420	6580	6490	100		m^3/h
	Sensible Heat Rate SHR							0.77				$m^3/h.m^2$
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m^3/h			m^3/h
										Air change		

AIRPORT TERMINAL STATION

M-21

Story BOOKING BLDG. Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) % No. 2

Rm. Name (A) STATION OFFICE-2 Rm.(W) 3.6 m x L 5 m = Area 18 m², H 2.5 m = Volume 45 m³

Orientation	Wall	K	Area m²	Δt(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
N	Outside t.	1.85	8.6	7	8	10	88	100	125			
	"											
	"											
	"											
N	Window	5.5	3.9	10.6	9.6	8.6	228	206	185			
	"											
	"											
	"											
	Partition W	2.5	9.	4.5/2	3.25	3.5	74	74	74			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	18	17	19.5	18.5	267	302	287			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
N			3.9	64	63	51	250.	246	199.	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			Kw								
	Fluorescent lamp 20	W/m²	0.26 Kw				360	360	360			
	Heter 0.09Kw - 0.37Kw			Kw						Supply Air Temp. Difference ° deg		
	0.37Kw - 1.5Kw			Kw								
										Latent Heat		
	Gas equip.											
	the other											
	Internal Heat (Equipment) Sub. Total											
	Person		2 x 58				116	116	116	2 x 48		96
	Infiltration 45x0.5 ≒ 23 m³/h		x 6.5 deg x 0.28				42	42	42	715x, Δx		162
	Heat gain Sub. Total						1,422	(1,446)	1,388	0.0098		(258)
	Heat gain Grand Total						1,680	(1,704)	1,646	O.A. 25		m³/h Person
							1850	1,880	1820	50		m³/h
	Sensible Heat Rate SHR							0.85				m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			c³/h
										Air change		

M-22

AIRPORT TERMINAL STATION

Story BOOKING BLDG. Rm. Temp.(s) °C(w) °C. R.H.(s) %(w) % No. 3

Rm. Name (2) BUS TICKET Rm.(w) 3.5 m x L 6.5 m = Area 22.8 m² H 2.5 m = Volume 57 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH1	SH2	SH3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
S=N	Outside t.	1.45	12	7	8	10	122	170	174			
	"											
	"											
	"											
E=W	Window	5.5	4.3	10.6	9.6	8.6	251	228	204			
	"											
	"											
	"											
	Partition W											
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	22.8	17	17.5	18.5	337	383	263			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²) Factor	m²										m³/h
S=N		9.3	6.2	6.3	5.1	276	271	220		m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		KW									
	Fluorescent lamp 20	W/m²	0.76 KW				460	460	460			
	Meter 0.09KW - 0.37KW		KW							Supply Air Temp. Difference ° deg		
	0.37KW - 1.5KW		KW									
										Latent Heat		
	Gas equip. the other 0.5 x 860						430	430	430			
	Internal Heat (Equipment) Sub. Total											
	Person	3 x 65					195	195	195	3 x 65		195
	Infiltration 57 x 1 = 57 m³/h	x 6.5 deg x 0.28					104	104	104	7.5x Δx		400
	Heat gain Sub. Total						2,172	(2,207)	2,050	(2,095)		(595)
							2,767	(2,802)	2,685	O.A. 25		m³/h Person
	Heat gain Grand Total						3,050	3,090	2,910	25		m³/h
	Sensible Heat Rate SHR							0.72				m³/h.m²
	Required Air Volume = SH / 0.28 x Δt =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

Story BOOKING BLDG. Rm. Temp.(s) °C(w) °C. R.H.(s) %(w) % **M-23**

Rm. Name ⑱ SECURITY Rm.(W) 3.5 m x L 3.6 m = Area 12.6 m², H m = Volume 31.5 m³ No. 4

Orien-tation	Wall	K	Area m²	Δt(deg) 15:00	17:00	19:00	S.H. kcal/h SH$_1$	SH$_2$	SH$_3$	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
E=N	Outside W.	1.85	7.2 / 7	7	8	10	165	188	235			
S=N	"	1.85	9									
	"											
	"											
S=N	Window	5.5	1.6	10.6	9.6	8.6	94	85	76			
	"											
	"											
	"											
	Partition W	2.5	9.1	3.25	3.25	3.25	74	74	74			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.86	12.6	17	19.5	18.5	185	212	201			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S=N			1.6	64	63	51	103	101	82	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			kW								
	Fluorescent lamp	20	W/m²	0.26 kW			260	260	260			
	Meter 0.09KW - 0.37KW			kW						Supply Air Temp. Difference ° deg		
	0.37KW - 1.5KW			kW								
										Latent Heat		
	Gas equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person			4 x 58 x			232	232	232	4 x 48 x		192
	Infiltration 31.5x1	32 m³/h		x 6.5 deg x 0.28			59	59	59	7.5x, Δx, 0.0028		225
	Heat gain Sub. Total						1,172	1,211	(1,219)			(417)
	Heat gain Grand Total						1,589 / 1,750	1,628 / 1,800	(1,636) / 1,800	O.A. 4		m³/h Person
	Sensible Heat Rate SHR								0.75	100		m³/h
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h.m² m³/h
										Air change		

LIST OF COOLING LOAD FOR AIRPORT TERMINAL STATION

NAME OF ROOM	Cooling Load KCal/HT SH	LH	TH	SA m³/HT	OA m³/HT	OA KCal/HT	Grand TH KCal/HT	RA m³/HT	Remarks
BOOKING BLDG. ... 2 BLDG.									(59) = Q m³/hr
(45) STATION OFFICE-2	1,446 (1,600)	258 (290	1,704	÷3.02 600	2P 50			550	AD-250×1 (Q=600)
(46) TICKET SALES-2	4629 5100	1347 1,490	5976	1700	4P 100			1600	AD-300×1 (700) SL-165×1000 (500×2) ~2
(47) BUS TICKET	2211 2490	595 660	2806	900	3P 80			820	AD-250×1 (500) AD-200×1 (400)
(48) SECURITY	1219 1350	417 460	1,636	500	4P 100			400	AD-250 (500)
TOTAL	(10490)	(2900)	13,390	(3700)	330	×2,880 2,920	(16,310)	(3470)	

SHF = 0.78

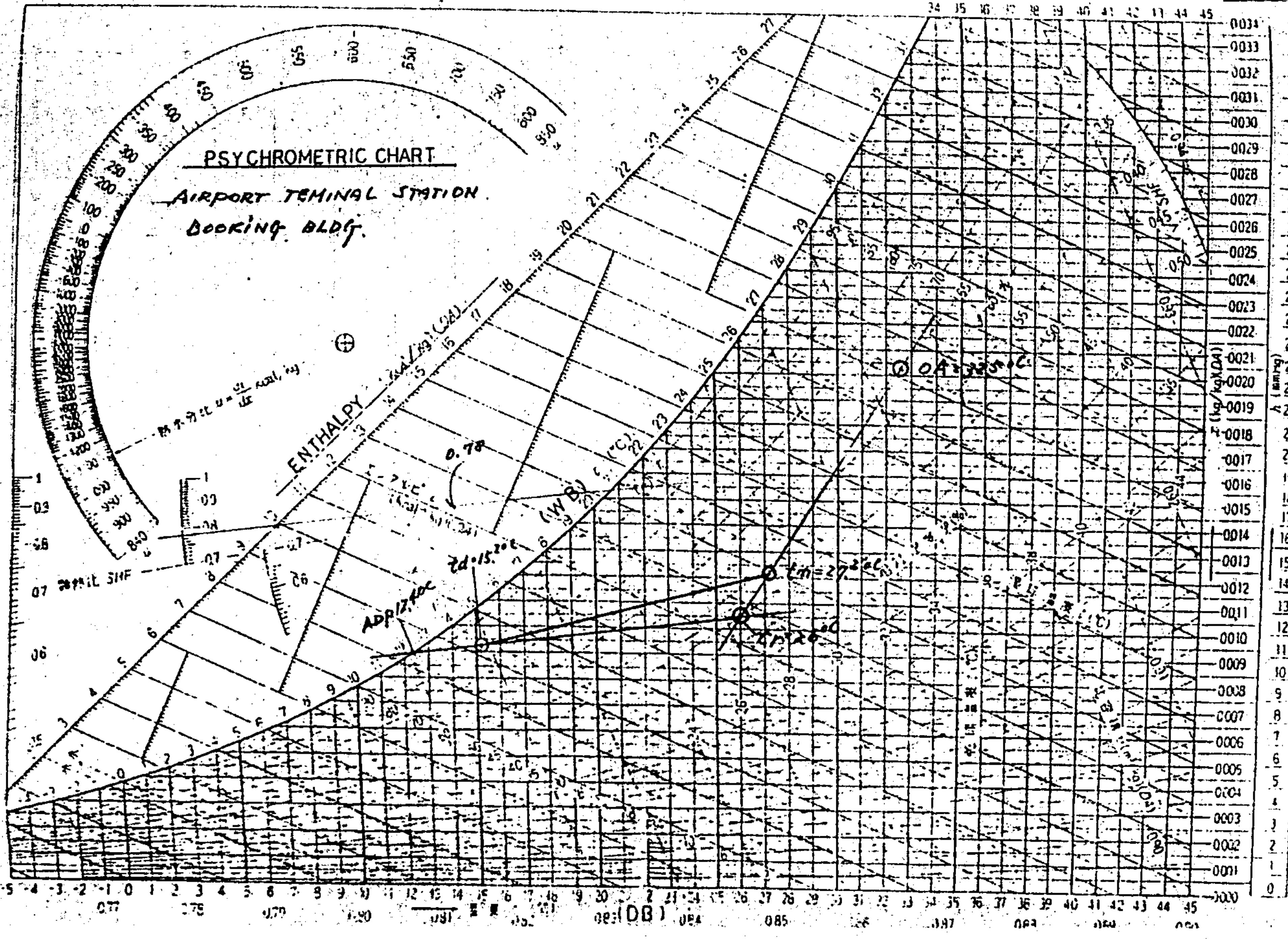
Required Air Volume $= \dfrac{SH}{0.28 \times \Delta t} = \dfrac{10{,}490}{0.28 \times (26-15.2)} = 3{,}480$ (m³/hr) < 3,700 m³/hr O.K

(written under the formula: 302)

Selection of AIR-Con. Safety Factor 10%
G.TH = 16,310 Kcal/hr, 16310 × 1.1 ≒ 18,000 (Kcal/hr) → AC-2

"AC-2" Packaged Indoor Unit : Comp. 6.0 RT × 5.5 KW
Fan 3,700 m³/hr × 0.75 KW × 3φ

Condensing Outdoor Unit : Fan 0.36 KW × 3φ


PSYCHROMETRIC CHART
AIRPORT TEMINAL STATION
BOOKING BLDG.
ENTHALPY
(WB)
(DB)
SHF
OA=33.5°C
tm=27.2°C
RA=26°C
td=15.2°C
APP 12.4°C
0.78

VENTILATION LIST OF AIRPORT TERMINAL STATION.

BOOKING BLDG.

No. 7

NAME OF ROOM	Calculation of Air Volume		Remarks
	Exhaust Air of Room	m^3/HR	
69 PORTER	2.5×7×2.5 = 43.5 43.5×10 ≒ 500	500	
90 LAVATORY-1	3.0×5×2.5 = 37.5 37.5×20 ≒ 800	800	
91 LAVATORY-2	3.5×7×2.5 = 61.3 61.3×20 ≒ 1,300	1300	(CEF-2/2) 5600 m^3/HR × 96 mmAq
92 LAVATORY-3	3×7×2.5 = 52.5 52.5×20 = 1,100	1100	× 2.2 KW × 3φ
92 LAVATORY-4	4×7×2.5 = 70 70×20 ≒ 1400	1400	
65 STORAGE-1	3×2×3.3 = 19.8 19.8×10 ≒ 200	200	
66 STORAGE-2	3.5×2×3.3 = 23.1 23.1×10 ≒ 300	300	
64 TRAIN CONTROL	5×3.5×3.3 = 57.8 57.8×10 ≒ 600	600	(WEF-300) 300φ × 600 m^3/HR × 6 mmAq × 0.05 KW × 1φ

AIRPORT TERMINAL STATION

11-27

Story SIGNAL CABIN Rm. Temp.(s) °C(w) °C R.H.(s) %(w) % No.

Rm. Name (A) SIGNAL CONTROL Rm.(W) 5.4 m × 16.8 m = Area 16.8 m² H 2.9 m = Volume 143 m³

Orientation	Wall	K	Area	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
		AK	m²									
N	Outside w.	3.4	6.6	7 × 1.3	8 × 1.3	10 × 1.4	175	200	250			
E	"	3.4	7.2	18 "	19 "	18 "	540	570	540			
S	"	3.4	6.0	17 "	20 "	22 "	425	500	550			
W	"	3.4	0.96	10 "	12 "	14 "	80	98	56			
N	Window	5.5	18.36	10.6	9.6	8.6						
E	"	5.5	26.52	10.6	9.6	8.6						
S	"	5.5	0.85	10.6	9.6	8.6	2786	2987	2228			
W	"	5.5	1.36	10.6	9.6	8.6						
	Partition w.	2.5	19.5	6.5/2	6.5/2	6.5/2	159	159	159			
	"											
	Window											
	"											
	Floor	2.0	38.8	6.5/2	6.5/2	6.5/2	240	240	240			
	"											
	Roof	0.56 × 0.83	38.8	33.1	38.1	36.1	370	1001	949			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
N	6	0.56	3.4	69	63	51	218	195	174	m³/h × deg ×		
E	7.2	0.56	4.1	167	133	98	685	546	402			
S	6	0.56	3.4	159	119	85	524	405	289	Sub. T.		
W	0.96	0.56	0.6	230	322	236	138	194	142	Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			- KW								
	Fluorescent lamp 20 W/m²		0.74	KW			240	240	240			
	Meter 0.09KW - 0.37KW			KW								
	0.37KW - 1.5KW			KW						Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas-equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person			- 3 × 58			174	174	174	3 × 58		174
	Infiltration 143 × 0.5 = 72 m³/h			× 6.5 deg × 0.28			132	132	132	7.15 × ΔX		505
	Heat gain Sub. Total						7604	7611	7025	0.0088		679
	Heat gain Grand Total						8455	8260	7674	O.A. 25		m³/h Person
							9310	9090	8450	75		m³/h
	Sensible Heat Ratio SHR											m³/h.m²
	Required Air Volume = SH / 0.28 × Δt =								m³/h			m³/h
										Air change		

AIRPORT TERMINAL STATION

Story SIGNAL CABIN Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) % 14-25 No.

Rm. Name ⑤ INSPECTORS' Rm.(W) 5 m x L 6 m = Area 30 m², H 3.9 m = Volume 117 m³

Orientation	Wall	K	Area m²	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δ t deg	Factor	Heat loss kcal/h
N	Outside W.	3.2	15.0	7×1.3	8×1.3	10×1.3	537	560	624			
S	"	3.2	13.5	17 "	20 "	22 "	955	1.124	1.236			
W	"	3.2	21.9	10 "	12 "	14 "	911	1093	1276			
	"											
S	Window	5.5	1.5	10.6	9.6	8.6	175	125	175			
W	"	5.5	1.5	10.6	9.6	8.6						
	"											
	"											
	Partition W.	2.5	23.8	3.25	3.25	3.25	191	191	191			
	"											
	Window											
	"											
	Floor	2.0	30	3.25	3.25	3.25	195	195	195			
	"											
	Roof	0.86×0.83	30	33.1	35.1	36.1	709	816	774			
	"											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S	1.5	0.56	0.84	154	119	85	130.	100	72	m³/h x deg x		
W	1.5	0.56	0.84	230	322	236	194	271	199			
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			KW								
	Fluorescent lamp 20	W/m²	0.6	KW			600	600	600			
	Meter 0.09KW - 0.37KW			Kw								
	0.37KW - 1.5KW			KW						Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person			.3 x 58			174	174	174	3 x 48		144
	Infiltration 117×0.5 = 59 m³/h			x 6.8 deg x 0.28			108	108	108	7.5 x	Δx	404
	Heat gain Sub. Total						4.779	5.275	5624	0.0098		548
	Heat gain Grand Total						5.237	5.533	6.182	O.A. 25		m³/h Person
							5890	6920	6.810	75		m³/h
	Sensible Heat Rate SHR											m³/h.m²
	Required Air Volume = SH / 0.29 x Δ t								m³/h			m³/h
										Air change		

No. M-29

LIST OF COOLING LOAD FOR AIRPORT TERMINAL STATION

SINGNAL CABIN

NAME OF ROOM	Cooling Load KCal/HT			SA	OA		Grand TH	RA	Remarks
	SH	LH	TH	m^3/HT	m^3/HT	KCal/HT	KCal/HT	m^3/HT	
① SIGNAL CONTROL	7806 ×1.1 8590	649 〃 720	8455 〃 (9310)		31 75	1 (670)	(9980)		UAC-1 5000 Kcal/hr ~2 sets
② INSPECTORS	5622 ×1.1 6.190	558 〃 620	6512 〃 (6810)		31 75	(670)	(7480)		UAC-2 4000 Kcal/hr ~2 sets

VENTILATION LIST OF AIRPORT TERMINAL STATION

No. M-30

NAME OF ROOM	Calculation of Air Volume		Remarks
	Exhaust Air of Room	m^3/HR	
SIGNAL CABIN (A)			※ with EAG of WEF
① SIGNAL DEVICE	8.0×4.0×4.3 = 137.6 (m^3) 137.6×10 ≒ 1400 (m^3/HR)	1400 23	WEF-350 … 2 sets 700 m^3/HR × 8 mmAq × 0.1 KW × 1φ ※
② POWER	4.5×2.8×4.3 = 59.2 (m^3) 54.2×15 ≒ 600 (m^3/HR)	600 10	WEF-350 … 1 set ※
③ LAVATORY	2.8×3.5×4.3 = 42.2 (m^3) 42.2×15 ≒ 700 (m^3/HR)	700 11.7	WEF-350 … 1 set ※
⑤ REST	3.0×2.5×3.0 = 22.5 (m^3) 22.5×10 ≒ 300 (m^3/HR)	300 5	WEF-300 … 1 set 300 m^3/HR × 8 mmAq × 0.05 KW × 1φ ※
⑥ DRESSING	2.0×2.5×3.0 = 15 (m^3) 15×10 ≒ 200 (m^3/HR)	200 2.4	WEF-300 · 1 set ※
PANTRY	2.2×2.5×3.0 = 16.5 (m^3) 16.5×15 ≒ 300 (m^3/HR)	300 5	PEF-200 - 1 set 300 m^3/HR × 10 mmAq × 0.075 KW × 1φ

VENTILATION LIST OF SIGNAL CABIN (B)

No. M-31

NAME OF ROOM	Calculation of Air Volume		Remarks
	Exhaust Air of Room	m^3/Hr	
RELAY EQUIPMENT ROOM	$7.0 \times 4.0 \times 4.3 = 120.4\ (m^3)$ $120.4 \times 10 \doteqdot 1300\ (m^3/Hr)$ $(21.7\ m^3/min)$	1,300	WEF-400
TOILET & WAREHOUSE	$2.0 \times 3.0 \times 3.0 = 18\ (m^3)$ $18 \times 15 \doteqdot 300\ (m^3/Hr)$ $(5\ m^3/min)$	300	WEF-250
SIGNAL HANDLING REST ROOM	$4.0 \times 4.0 \times 3.8 = 60.8\ (m^3)$ $60.8 \times 10 \doteqdot 700\ (m^3/Hr)$ $(11.7\ m^3/min)$	700	WEF-350
BED REST ROOM	$3.0 \times 4.0 \times 3.8 = 45.6\ (m^3)$ $45.6 \times 10 \doteqdot 500\ (m^3/Hr)$ $(8.3\ m^3/min)$	500	WEF-300

KOTA INTAN STATION

14-32

Story 1E Rm. Temp. (z) 26 °C(w) °C R.H.(z) 50 %(w) % No. 1

Rm. Name ② STATION OFFICE Rm.(W) m x L m = Area 80.5 m² H m = Volume 322.5 m³

Orientation	Wall	K	Area m²	Δt(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
S	Outside E.	1.85	30	17	20	22	740	870	957			
W=N	"	1.85	58.8	7	8	10	597	683	853			
"	"											
"	"											
W=N	Window	5.5	7.2	10.6	9.6	8.6	420	381	391			
"	"											
"	"											
"	"											
N	Parti-tion W	2.5	96	6.5/2	6.5/2	6.5/2	749	749	749			
"	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.99	53	19	21	22	960	509	532			
	"											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration c/h		
	Area (m²)	Factor	m²									m³/h
W=N			7.2	64	63	51	461	454	368	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		KW									
	Fluorescent lamp 805 40 W/m		1.6 KW	1000 kcal/kw			1600	1600	1600			
	Meter 0.09KW - 0.37KW		KW									
	0.37KW - 1.5KW		KW							Supply Air Temp. Difference ° deg		
	Other		1.6 kW	860			1290	1290	1290	Latent Heat		
	Gas equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person			12 x 65 x			780	780	780	12 x 65 x		780
	Infiltration 322.5 m³/h			x 65 deg x 0.28			715	715	715	715 x 4.5 / 0.0993		2610
	Heat gain Sub. Total						7807	8026	8150			3390
	Heat gain Grand Total			Factor 1.1			11,197 / 12,320	11,416 / 12,560	11,570 / 12,730	O.A. 25 300		m³/h Perso m³/h m³/h, m² m³/h
	Sensible Heat Rate SHR						0.7	0.7	0.7			
	Required Air Volume = SH / 0.28 x Δt =								m³/h	Air change		

KOTA INTAN STATION

N-33

Story 2F Rm. Temp. (s) °C(w) °C. R.H. (s) %(w) % No. 2

Rm. Name 03 DINING Rm. (W) 10.2 m x L 5 m = Area 51 m², H 2.3 m = Volume 117 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH1	SH2	SH3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
S	Outside W.	1.45	9.3	17	20	22	230	270	297			
E	"	1.45	20.8	18	19	18	543	574	543			
	"											
S	Window	5.5	2.2	10.6	9.6	8.6	183	175	157			
E	"	5.5	1.1	10.6	9.6	8.6						
	"											
	"											
N	Partition W.	2.5	11.5	6.5/2	3.25	3.25	94	94	94			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.44	57	19	21	22	427	472	494			
	"											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S			2.2	154	119	85	339	262	187	m³/h x deg x		
E			1.1	167	133	98	184	147	108			
										Sub. T.		
	Sub. Total									Factor		
	Internal Heat (Equipment)									Heat Loss G. Total		
	Incandescent lamp			KW								
	Fluorescent lamp	51	20w/m²	1.1 KW	1.000 Kcal/KW		1.100	1.100	1.100			
	Motor 0.09KV - 0.37KW			KW								
	0.37KV - 1.5KW			KW						Supply Air Temp. Difference deg		
	Other			3 KW	860		2580	2580	2580	Latent Heat		
	Gas equip. the other											
	Internal Heat (Equipment) Sub. Total											
	Person			15 x 58			870	870	870	15 x 48		720
	Infiltration 30 m³/HR: 795 m³/h			x 6.5 deg x 0.28			1355	1355	1355	715 x 42		5,204
	Heat gain Sub. Total						7915	7872	7785	0.0088		(5,924)
	Heat gain Grand Total						(13,849)	13,806	13,719	O.A.		m³/h Person
				Faktor 1.1			15,240	15,190	15,100			m³/h
	Sensible Heat Rate SHR						0.58					m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h
										Air change		

KOTA INTAN STATION

M-34

Story 1F Rm. Temp.(s) °C(u) °C R.H.(s) %(u) No. 3

Rm. Name 9. STATION MASTER Rm.(V) 5 m x L 5 m = Area 25 m² H 2.5 m = Volume 62.5 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
S	Outside t.	1.45	10.3	17	20	22	254	299	329			
	"											
	"											
	"											
S	Window	5.5	2.2	7.2	10.6	8.6	88	129	105			
	"											
	"											
	"											
	Partition											
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain Glass									Infiltration		c/h
	Area (m²) Factor		m²									m³/h
S			2.2	1154	1119	85	385	298	213	m³/h x deg x		
										Sub. T.		
	Sub. Total									Factor		
	Internal Heat (Equipment)									Heat Loss G. Total		
	Incandescent lamp			kW								
	Fluorescent lamp 20	W/m²	0.5	kW	1000		500	500	500			
	Motor 0.09KW - 0.37KW			kW								
	0.37KW - 1.5KW			kW						Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas equip.											
	the other											
	Internal Heat (Equipment) Sub. Total											
	Person			2 x 58			116	116	116	2 x 48		96
	Infiltration 62.5 x 0.5 = 32 m³/h			x 6.5 deg x 0.28			59	59	59	7.5 x 30		225
	Heat gain Sub. Total						(1402)	1401	1322			(321)
	Heat gain Grand Total			Factor 1.1			(1223) 1722	1722	1643	Q.A. 25		m³/h Person
							1900	1900	1810	50		m³/h
	Sensible Heat Rate SHR						0.82	0.82				m³/h.m²
	Required Air Volume = SH / (0.28 x Δt) =								m³/h			m³/h
										Air change		

KOTA INTAN STATION

M-35

Story 1F Rm. Temp.(s) °C(w) °C R.H.(s) %(w) = No. 8

Rm. Name Co. MEETING Rm.(W) 5 m x L 5 m = Area 25 m² H 2.5 m = Volume 62.5 m³

Orientation	Wall	K	Area m²	Δt (deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt deg	Factor	Heat loss kcal/h
E-N	Outside t.	1.55	25	7	8	10	244	290	363			
	"											
	"											
	"											
	Window											
	"											
	"											
	"											
N	Parti-tion w.	2.5	12.5	3.25	3.25	3.25	102	102	102			
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.44	25	19	21	22	214	237	248			
	"											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
										m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		W/m²	W								
	Fluorescent lamp 20	W/m²	0.05 kW	1,000			560	500	500			
	Motor 0.09kW - 0.37kW		kW							Supply Air Temp. Difference x deg		
	0.37kW - 1.5kW		kW									
										Latent Heat		
	Gas equip.											
	Che. other											
	Internal Heat (Equipment) Sub. Total											
	Person 25 m² x 0.06 kW/m² = 13 Persons			13 x 58			754	754	754	13 x 48		624
	Infiltration	32 m³/h		1.65 deg x 0.28			49	59	69	7.5 x ΔX deg		325
	Heat gain Sub. Total						1803	1972	2026			949
	Heat gain Grand Total			Heater 1.1			2732	2791	2575	O.A.		m³/h Person
							2010	2640	2730			m³/h
	Sensible Heat Rate SHR								0.70			m³/h.m²
	Required Air Volume = SH / 0.28 Δt								m³/h			m³/h
										Air change		

KOTA SINTAN STATION

M-36

Story 1/F Rm. Temp.(s) °C(w) °C R.H.(s) %(w) ° ho. 5

Rm. Name SECURITY Rm.(W) 3.8 m x L 5.0 m = Area 19 m² H 2.5 m = Volume 47.5 m³

Orientation	Wall	K	Area	Δt(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat Loss (Winter) Δt	Factor	Heat loss kcal/h
			m²							Rfg		
S	Outside t.	1.45	11.9	17	20.	22	282	231	164			
E=N	"	1.45	7.5	7	8	10	77	87	109			
"	"											
"	"											
S	Window	5.5	1.1	10.6	9.1	8.6	65	59	52			
	"											
	"											
	"											
	Parti-tion											
	"											
	Window											
	"											
	Floor											
	"											
	Roof	0.44	19	19	21	22	159	176	184			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain-Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S			1.1	154	119	85	170.	131	94.	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss C. Total		
	Internal Heat (Equipment)											
	Incandescent lamp			W								
	Fluorescent lamp 20	W/m²	0.38	kW	1680		380	380	380			
	Meter 0.08kW - 0.37kW			kW								
	0.37kW - 1.5kW			kW						Supply Air Temp. Difference deg		
										Latent heat		
	Gas equip.											
	the other											
	Internal Heat (Equipment) Sub. Total											
	Person			4 x 58			232	232	232	4 x 48		192
	Infiltration 47.5 x 0.5 = 24 m³/h			x 6.5 deg x 0.28			44	44	44	Trans. ΔX		169
	Heat gain Sub. Total						1409	1440	(1359)			(361)
	Heat gain Grand Total			Factor 1.1			1270	1601	(1820)	O.A.		m³/h Person
							1950	1990	2010			m³/h
	Sensible Heat Rate SHR								0.8			m³/h.m²
	Required Air Volume = SH / 0.28 x Δt =								m³/h			m³/h
										Air change		

KOTA INTAN STATION

M-37

Story 2/F Rm. Temp.(s) °C(w) °C; F.H.(s) %(w) Σ No. 6

Rm. Name COMPUTER Rm.(W) 5 m x L 7.2 m = Area 36 m² H 2.5 m = Volume 90 m³

Orientation	Wall	K	Area m²	Δt(deg) 15:00	17:00	19:00	S.H. kcal/h SH_1	SH_2	SH_3	Heat loss Δt	Factor	Heat loss kcal/h
	Heat Gain (Summer)									**Heat Loss (Winter)**		
S	Outside t.	1.85	10.3	17	20	22	254	296	329			
W	"	1.85	16.3	10	12	14	227	265	291			
	"											
	"											
S	Window	5.5	2.2	10.6	9.6	8.6	129	117	105			
	"											
	"											
	"											
	Partition	1.25	31.3	8.25	8.25	8.25	255	255	262			
	"											
	Window											
	"											
	Floor	1.0	36	8.25	8.25	8.25	234	234	234			
	"											
	Roof	0.94	38	19	21	22	301	333	349			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S			2.2	155	119	95	339	262	187	m³/h x deg x		
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		Kw									
	Fluorescent lamp 20	W/m²	0.72 Kw	1000			720	720	720			
	Heater 0.09Kw - 0.37Kw		Kw									
	0.37Kw - 1.5Kw		Kw							Supply Air Temp. Difference ° deg		
										Latent Heat		
	Gas equip.											
	Ele. other		1.6kw x860				860	860	860			
	Internal Heat (Equipment) Sub. Total											
	Person 36m² x 0.3 P/m² = 11 Person			11 x 50 x 0.5			541	511	511	11 x 50 x 0.5		423
	Infiltration 90 x 0.5 = 45 m³/h			x 65 deg x 0.28			82	82	82	7.5 x 0.5 x 0.28		316
	Heat gain Sub. Total						3922	3957	3963			739
	Heat gain Grand Total						4661	4696	4702	O.A.		m³/h Person
							5040	5170	5180			m³/h
	Sensible Heat Rate SHR								0.84			m³/h.m²
	Required Air Volume = SH / 0.28 Δt =								m³/h			m³/h
										Air change		

KOTA INTAN STATION

M-38

Story 2F   Rm. Temp.(s) °C(w) °C, R.H.(s) %(w) %   No. 7

Rm. Name 129 TRAIN CONTROL   Rm.(W) 3.6 m x L 4.7 m = Area 17 m², H 2.5 m = Volume 42.3 m³

Heat Gain (Summer)										Heat Loss (Winter)		
Orientation	Wall	K	Area	Δt(deg)			S.H. kcal/h			Δt	Factor	Heat loss
			m²	15:00	17:00	19:00	SH_1	SH_2	SH_3	deg		kcal/h
S	Outside w.	1.45	10.2	17	20	22	252	296	326			
E=N	"	1.45	7.4	7	8	10	76	86	108			
N	"	1.45	11.8	7	8	10	120	137	172			
	"											
S	Window	5.5	1.62	10.6	9.6	8.6	189	172	154			
E=N	"	5.5	1.62									
	"											
	"											
	Partition											
	"											
	Window											
	"											
	Floor	2.0	17	3.25	3.25	[illegible]	111	111	111			
	"											
	Roof	0.86	17	17	19.5	18.5	249	286	271			
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain Glass									Infiltration		c/h
	Area (m²)	Factor	m²									m³/h
S			1.62	154	119	85	250	193	138	m³/h x deg x		
E=N		0.22	1.62	69	63	51	23	23	19			
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal heat (Equipment)											
	Incandescent lamp		KW									
	Fluorescent lamp 20	W/m²	0.34 KW	1000			340	340	340			
	Meter 0.09KW - 0.37KW		KW							Supply Air Temp. Difference deg		
	0.37KW - 1.5KW		KW									
	Other		0.5KW	860			430	430	430	Latent heat		
	Gas equip.											
	The other											
	Internal Heat (Equipment) Sub. Total											
	Person			3 x 65			195	195	195	3 x 65		195
	Infiltration 42.3 x 1.0 = 43 m³/h			x 6.5 deg x 0.28			79	79	79	7.5 x 4.2		302
	Heat gain Sub. Total						2,314	2,348	2,343	6,480		497
	Heat gain Grand Total						2,811	2,855	2,870	O.A.		m³/h Person
							3,100	3,130	3,130			m³/h
	Sensible Heat Rate SHR						0.82	0.83	0.83			m³/h.m²
	Required Air Volume = $\frac{SH}{0.28 \times \Delta t}$ =								m³/h			m³/h
										Air change		

KOTA INTAN STATION

M-39

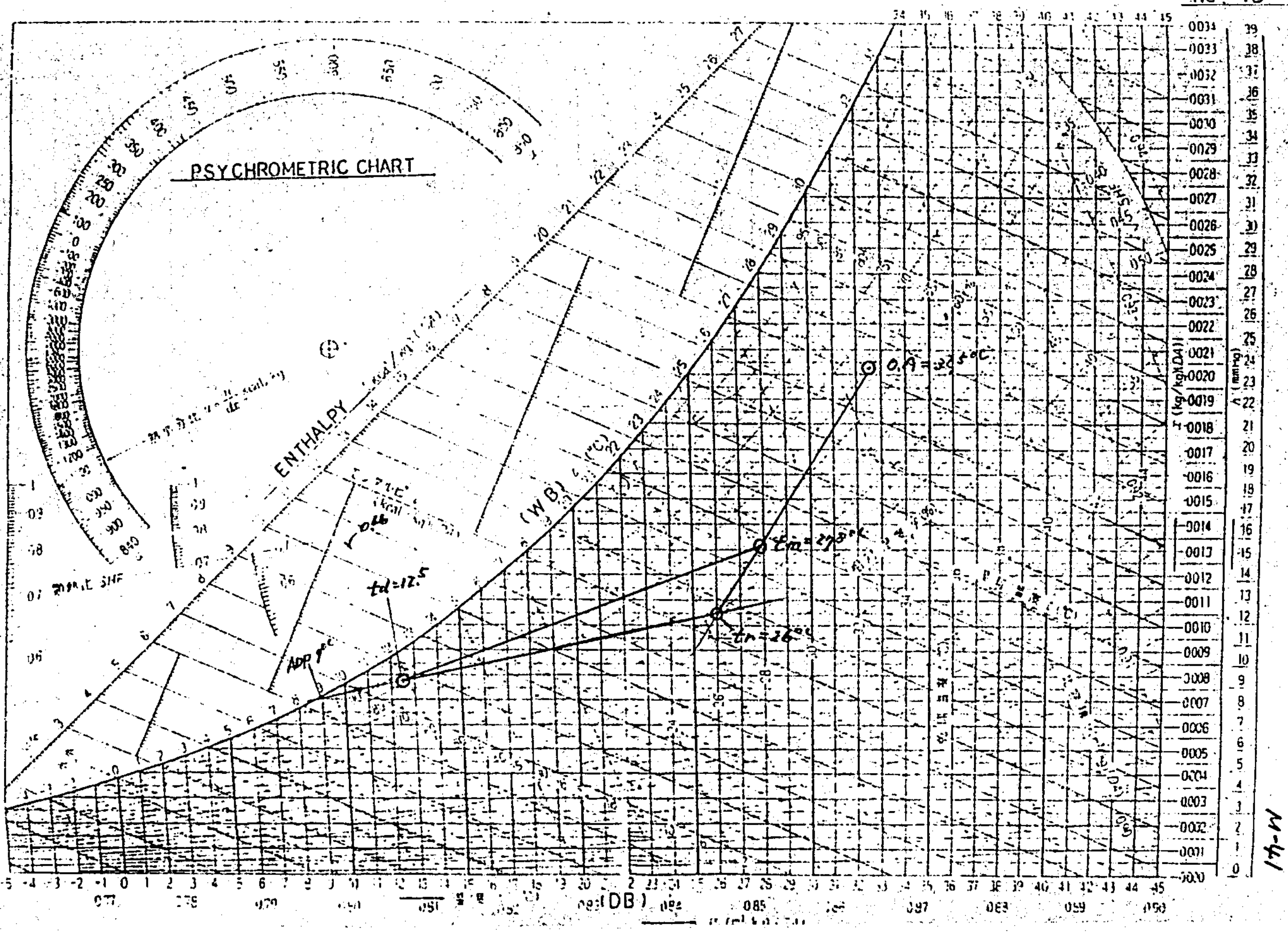
Story 2F (30) SIGNAL Rm. Temp.(s) °C(w) °C R.H.(s) %(w) % No. 8

Rm. Name TELECOM Rm.(V) 3.6 m x L 4.7 m = Area 17 m² H 2.6 m = Volume 44.3 m³

Orientation	Wall	K	Area m²	Δ t(deg) 15:00	17:00	19:00	S.H. kcal/h SH1	SH2	SH3	Heat Loss (Winter) Δ t deg	Factor	Heat loss kcal/h
	Heat Gain (Summer)											
S	Outside t.				Same of		TRAIN CONTROL					
W=N	"						OFFICE					
N	"											
	"											
S	Window											
W=N	"											
	"											
	"											
	Partition											
	"											
	Window											
	"											
	Floor											
	"											
	Roof											
	"											
	Heat gain Sub. Total									Sub. Total		
	Solar Gain Glass									Infiltration c/h		
	Area(m²) Factor m²											m³/h
S										m³/h x deg x		
W=N												
										Sub. T.		
										Factor		
	Sub. Total									Heat Loss G. Total		
	Internal Heat (Equipment)											
	Incandescent lamp		KW									
	Fluorescent lamp		KW									
	Motor 0.09KW - 0.37KW		KW							Supply Air Temp. Difference ° deg		
	0.37KW - 1.5KW		KW									
										Latent Heat		
	Gas equip.											
	the other											
	Internal Heat (Equipment) Sub. Total											
	Person		x							x		
			x							x		
	Infiltration m³/h		x deg x 0.28							7:15 Δ t		
	Heat gain Sub. Total						2314	(2348)	2343			(497)
	Heat gain Grand Total						2811	(2845)	2840	O.A.		m³/h Person
	Heat gain Grand Total						3,100	(3130)	3,130			m³/h
	Sensible Heat Rate SHR						0.92	0.89	0.89			m³/h.m²
	Required Air Volume = SH / 0.28 x Δ t =								m³/h			m³/h
	Required Air Volume =									Air change		

LIST OF COOLING LOAD FOR KOTA INTAN STATION

NAME OF ROOM	Cooling Load KCal/HT SH	LH	TH	SA m^3/Hr	OA m^3/HT	KCal/HT	Grand TH KCal/HT	RA m^3/HT	Remarks
5 STATION OFFICE	8180 9.000	3390 3.730	11570 12730	2400	4P 300			1.770	AD-300 x2
6 DINING	7.915 8.710	5934 6530	13849 15240	2900	15P 380			2.020	AD-350 x2 AD-200 x1
9 STATION MASTER	1402 1550	321 360	1723 1910	500	2P 50			450	AD-250 x1
10 MEETING	2026 2230	849 940	2875 3170	600	13P 330			270	AD-250 x1
11 SECURTY	1459 1610	361 1000	1820 2010	500	4P 100			400	AD-200 x1
	23100	11946	35060	6400	1160	1'=5.83 10,250	45310	4910	
SHF = 0.66									
Required Air Volume	$= \frac{SW}{0.24 \times \Delta T} = \frac{23.100}{0.28(26-12.5)} = 6.120^{(m^3/HR)} < 6400^{(m^3/HR)}$ ... OK								
Selection of Air-Con.	Safety Factor 5% on GTH $45,310 \times 1.05 = 48,000^{(Kcal/HR)}$ → "AC-1"								See/W-18 page
	packeged Indoor Unit : Comp. 16 Ri Fan 6400 m^3/HR								ditto
	Condensing Outdoor Unit : Fan								ditto
8 REST	3963	739	4702 x1.1 5180		11P 275	1'=8.83 2430	2610 x1.05 3000		WAC-2 4000 Kcal/HR 2SETS
29 TRAIN CONTROL	2348	497	2845 x1.1 3130		3P 75	1'=8.67 670	3500 x1.05 4000		WAC-2 4000 Kcal/HR 1SET
28 SIGNAL TELECOM	2348	497	2845 3130		3P 75	670	4000		WAC-2 4000 Kcal/HR 1SET


PSYCHROMETRIC CHART
ENTHALPY
(WB)
(DB)
O.A=32.5°C
tm=27.8°C
tr=26°C
td=12.5
ADP 9°C
SHF
x (kg/kg(DA))
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VENTILATION LIST OF KOTA INTAN STATION

No. M-42

NAME OF ROOM	Calculation of Air Volume		Remarks
	Exhaust Air of Room	m^3/HR	
(3) PASSENGERS LAVATORY (W)	4.6×5×2.3 = 55 (m^3) 55×20 = 1100 (m^3/Hr)	1100 (15.4) *	HS-450×450
(4) DITTO (M)	5.2×5×2.3 = 60 (m^3) 60×20 = 1200 (m^3/Hr)	1200 (17) *	HS-450×450
(5) PORTER	5.2×5×2.3 = 60 (m^3) 60×10 = 600 (m^3/Hr)	600 (10)	WEF-300
(6) MAINTENANCE & JANITORS'	5×8.9×2.3 = 102 (m^3) 102×10 = 1100 (m^3/Hr)	1100 (18.9)	WEF-400
(12) STAFF LAVATORY	5×4×2.5 = 50 (m^3) 50×15 = 800 (m^3/Hr)	800 (13.4)	WEF-350
(13) STAFF LOCKER	5×4×2.5 = 50 (m^3) 50×10 = 500 (m^3/Hr)	500 (8.4)	WEF-300
(14) STORAGE-1	4.6×4.3×2.5 = 68 (m^3) 68×10 = 700 (m^3/Hr)	700 (11.7)	WEF-350
(15) STORAGE-2	108 (m^3) 108×10 = 1100 (m^3/Hr)	1100 (18.4)	WEF-400
(16) POWER	5.5×4.3×3.3 = 78 (m^3) 78×15 = 1200 (m^3/Hr)	1200 (20)	WEF-400
(17) MECHANICAL	108 (m^3) 108×10 = 1100 (m^3/Hr)	1100 (18.4)	WEF-400
(18) SIGNAL TELLOME DIVICE	6.3×7.5×2.2 = 104 (m^3) 104×15 = 1600 (m^3/Hr)	1600 (26.7)	WEF-500
(19) STORAGE-3	3×6.3×3.3 = 62 (m^3) 62×10 = 700 (m^3/Hr)	700 (11.7)	WEF-350
(24) KITCHIN	3×3.6×3.3 = 25 (m^3) 25×30 = 800 (m^3/Hr)	800 (13.4)	WEF-350
(25) LELUTION	5×3×2.3 = 34.5 (m^3) 34.5×10 = 400 (m^3/Hr)	400 (6.7)	WEF-300
(26) MUSHOLA	6×5×2.3 = 92 (m^3) 92×15 = 1400 (m^3/Hr)	1400 (23.4)	WEF-400
(RE) LAVATORY	3.6×3×2.3 = 27.9 (m^3) 27.9×20 = 500	500 *	HS-300×300
③+④+(26) = 3800 m^3/Hr (*) CEF-2 No. 2×3,800 m^3/Hr × 15 KW × 3 ϕ			

LIST OF PLUMBING FIXTURES

MARK	DISCRIPTION	WATER SUPPLY (F.U.)	SEWAGE (F.U.)
WC-1	Asian-type Water Closet	5	4
WC-2	European-type (wash down) w/Flush Valve	10	8
UR-1	Floor Standing Uhinal 380×380×920, w/Flush Valve	5	4
~~UR-2~~	~~Wall Hung 360×350×600 w/Flush Valve~~	5	4
LV-1	Wall Hung Lavatory 500×400. w/Faucet	2	1
LV-2	Round Lavatory (Counter-top) φ400 w/Faucet	2	1
SK-1	Service Sink 560×450×530 w/Faucet	3	2.5
F-1	Faucet (1/2), Wall-type	2	1
F-2	Faucet (3/4), Wall-type	3	2
F-3	Faucet (3/4): For Landscape	3	-
KS-2	Kitchen Sanic	4	3
FD-1	Floor Drain	-	0.5
FD-2	"	-	1
KS-1	Kitchen Sink	4	3

LIST OF PLUMBING EQUIPMENTS

SITE : AIRPORT TERMINAL STATION (1)

NAME OF ROOM & BLDG.	FIXTURE NAME	FIXTURE NO.	WATER SUPPLY FU @	WATER SUPPLY FU TOTAL	WATER SUPPLY ℓ/min	WATER SUPPLY FRICTION	WATER SUPPLY PIPE ϕ	SEWAGE FU @	SEWAGE FU TOTAL	SEWAGE ℓ/min	SEWAGE GRADE	SEWAGE PIPE ϕ
TERMINAL BLDG.						30 mmAq/m						
2F ABLUTION	F-1	4	5	20				4	16			
	FD-1	1	-	-				0.5	0.5			
(ABLUTION SINK)	SK-2	1	4	4				3	3			
				29	60		40A		19.5			50
2F STAFF LAVATORY	W-1	1	5	5				4	4			
E KITCHIN	UP-1	3	5	15				4	12			
	LV-1	2	2	4				1	2			
	SK-2	1	3	3				2.5	2.5			
	FD-1	3	-	-				0.5	1.5			
(COOLER DRAIN)	FD-1	1	-	-				0.5	0.5			
				27	70		40A		22.5			75
3F STAFF LATORY	WC-1	1	5	5				4	4			
	UR-1	3	5	15				4	12			
	LV-1	2	2	4				1	2			

LIST OF PLUMBING EQUIPMENTS

SITE : AIRPORT TERMINAL STATION(2)

NAME OF ROOM & BLDG.	FIXTURE		WATER SUPPLY					SEWAGE				
	NAME	NO.	FU @	FU TOTAL	ℓ/min	FRIC-TION	PIPE Φ	FU @	FU TOTAL	ℓ/min	GRADE	PIPE Φ
	FD-1	2	-					0.5	1			
				24	60		40A		19			25
VIP LAVATORY	UC-2	1	10	10				8	8			
	LV-2	1	2	2				1	1			
	FD-1	1	-	-				0.5	0.5			
STATION OFFICE PANTRY	SK-1	1	3	3				2.5	2.5			
				15	70		32A		12			75

JICA

LIST OF PLUMBING EQUIPMENTS

SITE : AIRPORT TERMINAL STATION (3)

NAME OF ROOM & BLDG.	FIXTURE NAME	FIXTURE NO.	WATER SUPPLY FU @	WATER SUPPLY FU TOTAL	WATER SUPPLY ℓ/min	WATER SUPPLY FRICTION	WATER SUPPLY PIPE φ	SEWAGE FU @	SEWAGE FU TOTAL	SEWAGE ℓ/min	SEWAGE GRADE	SEWAGE PIPE φ
BOOKING OFFICE (2)												
LAVATORY 3E4	WC-1	4	5	20				4	16			
	WC-2	2	10	20				8	8			
	UR-1	5	5	25				4	20			
	LV-1	5	2	10				1	5			
	SK-1	2	3	6				2.5	5			
	FD-1	4	--	--				0.5	2			
				81	150		50A		56			100
LAVATORY 1E2	WC-1	2	5	10				4	8			
	WC-2	2	10	10				8	16			
	UR-1	3	5	15				4	12			
	LV-1	4	2	8				1	4			
	SK-1	1	3	3				2.5	2.5			
	FD-1	4	-	-				0.5	2			
				56	120		50A		49.5			100

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LIST OF PLUMBING EQUIPMENTS

SITE : AIRPORT TERMINAL STATION (9)

NAME OF ROOM & BLDG.	FIXTURE		WATER SUPPLY					SEWAGE				
	NAME	No.	FU @	FU TOTAL	ℓ/min	FRIC-TION	PIPE Φ	FU @	FU TOTAL	ℓ/min	GRADE	PIPE Φ
BOOKING OFFICE (2)												
LAVATORY 3 & 4	WC-1	4	5	20					4	16		
	WC-2	2	10	20					8	16		
	UR-1	5	5	25					4	20		
	LV-1	5	2	10					1	5		
	SK-1	2	3	6					2.5	5		
	FD-1	4	—	—					0.5	2		
				(81)	150		50A			(64)		100
LAVOTORY 1 & 2	WC-1	2	5	10					4	8		
	WC-2	2	10	20					8	16		
	UR-1	3	5	15					4	12		
	LV-1	4	2	8					1	4		
	SK-1	1	3	3					2.5	2.5		
	FD-1	4	—	—					0.5	2		
				(46)	120		50A			(44.5)		100

LIST OF PLUMBING EQUIPMENTS

SITE : AIRPORT TERMINAL STATION (S)

NAME OF ROOM & BLDG.	FIXTURE		WATER SUPPLY					SEWAGE				
	NAME	NO.	FU @	FU TOTAL	ℓ/min	FRICTION	PIPE Φ	FU @	FU TOTAL	ℓ/min	GRADE	PIPE Φ
SIGNAL CABIN												
TOILET	WC-1	1	5	~				4	4			
	LV-1	1	2	2				1	1			
				(7)	25		25A		(5)			
TRASH	F-1	1	2	2				1	-			
				(2)	5		15A					
Grand Total				373	(780) 420	mmAq/m 30	80A		287		1/50 ~ 1/100	150

ELEVATED STORAGE TANK (EST) 10/2 = 9 (m³) → Tank Capacity (12 m³)
420 ℓ/min × 0.7 ≒ 300 ℓ/min = 18 m³/Hr, Tank Size ... 2.0W × 3.0M × 2.0MH (FRP)

WATER RESERVOIR (WR) RESERVOIR ..... 3.0m × 3.0m × 2.0mH (FRP)
9 m³ × 2 = 18 m³

LIFT WATER PUMP (LWP) ; Centrifugal Type
LWP-1 : 65×50Φ × 500 ℓ/min × 24 mH × 3.7kw × 3Φ

LIST OF PLUMBING EQUIPMENTS

SITE : KOTA INTAN STATION (1)

	NAME OF ROOM & BLDG.	FIXTURE NAME	FIXTURE No.	WATER SUPPLY FU @	WATER SUPPLY FU TOTAL	WATER SUPPLY ℓ/min	WATER SUPPLY FRICTION	WATER SUPPLY PIPE φ	SEWAGE FU @	SEWAGE FU TOTAL	SEWAGE ℓ/min	SEWAGE GRADE	SEWAGE PIPE φ
2F	LAVATORY & ABLUTION	WC-1	1	5	5				4	4			
		UR-1	2	5	10				4	8			
		LV-1	2	2	4				1	2			
		SK-1	1	3	3				2.5	2.5			
		FD-1	3	-	-				0.5	1.5			
	(ABLUTION)	F-2	4	3	12				2	8			
					(34)	80				(26)		1/50	100
2F	KITCHIN	SK-2	1	4	4				3	3			
		FD-1	2	-	-				0.5	1			
					4	12				4			50
1F	PASSENGERS LAVATORY (M)	WC-1	5	5	25				4	20			
	LAVATORY (W)	UR-1	3	5	15				4	12			
		LV-1	6	2	12				1	6			
		SK-1	1	3	3				2.5	2.5			
		FD-1	4	-	-				0.5	2.			

LIST OF PLUMBING EQUIPMENTS

SITE : KOTA INTAN STATION (2)

NAME OF ROOM & BLDG.	FIXTURE NAME	FIXTURE NO.	WATER SUPPLY FU @	WATER SUPPLY FU TOTAL	WATER SUPPLY ℓ/min	WATER SUPPLY FRIC-TION	WATER SUPPLY PIPE Ø	SEWAGE FU @	SEWAGE FU TOTAL	SEWAGE ℓ/min	SEWAGE GRADE	SEWAGE PIPE Ø
				(55	120		50A		(42.5)			100
STATION OFFICE PANTRY	SK-1	1	3	3				2.5	2.5			
				3	10		20A		2.5			50
STAFF LAVATORY	WC-1	2	5	10				4	8			
	UR-1	3	5	15				4	12			
	LV-1	2	2	4				1	2			
	SK-1	1	3	3				2.5	2.5			
	FD-1	2	-	-				0.5	1			
				(32	85		50A		25.5			100
Grand Total				128	(307) 190	mmAq/m 30	65A		100.5			100

EST ELEVATED STORAGE TANK — 9.7/2 = 5 (m³) → Tank Capacity (6 m³)
190 ℓ/min × 0.85 ÷ 9.7 m³/hr — Tank Size ---- (2.0m × 2.0m × 1.0m H (FRP))

WR WATER RESERVOIR — RESERVOIR → (2.0m × 3.0m × 2.0m H (FRP)) 12 m³
5 m³ × 2 = 10 m³

LWP LIFT PUMP (Centrifugal Type) LWP-2
WATER 50×40A × 200 ℓ/min × 29 mH × 2.2kW × 3φ

SELECTION OF SEPTIC-TANK & PERCORATION PIPE

FOR KOTA INTAN STATION

1. SEPTIC-TANK

SOIL : NO. OF FU = 64, $Q_0 = 130$ ℓ/min

SIZE OF SEPTIK-TANK

WHERE $Q_1 = (Q_0 \times 60 \times 2) \times \frac{1}{1,000} \fallingdotseq 15.6\ (m^3)$

$Q_2 = Q_1 \times 1.2 \fallingdotseq 18.8\ (\ell)$

$2,400^{W} \times 6,000^{L} \times 1,700^{H}$ (EFFECTIVE $1,300^{H}$)

2. LENGTH OF PERCORATION PIPE (L)

WHERE $Q_1 + Q_3 = 15.6 + 7.8 = 23.4\ (m^3)$

$L = 23.4 \times 83^2 \div 60 \fallingdotseq 33\ (m) \cdots 100^{\phi}$

No.....

§§ 16. LIGHT INTENSITIES (LUX)

TABLE OF CONTENTS

NEW RAILWAY FOR CENGKARENG AIRPORT / INDONESIA

LIGHTING AREA	LUX	X	Y	FIXTURE NO.	NO.(Calc)	NO	LUX(Calc)	REMARKS
[1] TERMINAL BUILDING								
Concouse	200	13.0	13.0	M2, ML400#1	5.2	6	229	
Locker space								
Information counter	150	8.0	2.5	I3, IL100#1	8.3	9	162	
Passenger waiting & cafe.	300	6.2	3.8	F3, FL40#2	3.9	4	305	
VIP waiting room	100	2.4	1.7	F2, FL40#1	0.7	1	148	Water proof
VIP lavatory	300	4.8	3.4	F3, FL40#2	2.7	3	330	
Station master room	300	9.0	4.8	F3, FL40#2	6.2	8	390	
Station office 1	300	6.4	2.2	F3, FL40#2	2.9	3	307	
Ticket sales 1	300	6.4	2.2	F3, FL40#2	2.9	3	307	
Ticket check	100	3.6	3.5	F2, FL40#1	2.1	2	96	Water proof
Staff lavatory	200	5.2	4.3	F3, FL40#2	2.5	3	241	
Mechanical room	200	6.8	2.3	F3, FL40#2	2.2	3	277	
Power room	300	5.5	3.6	F3, FL40#2	3.3	3	272	
Maintenance & janitors	300	3.6	1.8	F3, FL40#2	1.3	1	223	
Telecom office	100	1.3	12.6	I3, IL100#1	5.4	6	111	
Corridor (1FL)								
Meeting room	300	9.0	5.2	F3, FL40#2	6.7	7	315	
Power inspection room	300	7.5	5.1	F3, FL40#2	5.4	6	330	
Signal telecom room	300	7.5	4.8	F3, FL40#2	5.1	6	351	
Restroom	150	7.5	6.4	F3, FL40#2	3.4	4	176	
Dining room	200	9.2	3.5	F3, FL40#2	3.3	4	242	
Kitchen	300	4.0	3.5	F3, FL40#2	2.3	3	384	
Staff lavatory	100	3.7	3.5	F2, FL40#1	1.6	2	123	Water proof
Corridor (2FL)	100	1.4	20.0	I3, IL100#1	9.3	10	108	
Ablution room	100	4.4	3.6	F1, FL40#1	2.8	3	107	Water proof
Musholla	100	5.2	5.2	I4, IL40#5	7.1	8	85	
Corridor (3FL)	100	2.1	3.5	I3, IL100#1	2.4	2	82	
Corridor (OUT DOOR)	50	5.0	80.0	N2, NL250#1	5.7	10	52	Water proof
					0.0			

NEW RAILWAY FOR CENGKARENG AIRPORT / INDONESIA

LIGHTING AREA	LUX	X	Y	FIXTURE NO.	NO.(Calc)	NO.	LUX(Calc)	REMARKS
[2] BOOKING OFFICE								
Train control office	300	4.8	3.3	F3, FL40#2	2.6	3	340	
Station office 2	300	4.8	3.3	F3, FL40#2	2.6	3	340	
Ticket sales 2	300	5.8	6.8	F3, FL40#2	5.6	6	320	
Bus ticket sales	300	3.3	3.3	F3, FL40#2	2.3	2	265	
Waiting room	150	2.8	3.3	F3, FL40#2	1.0	1	156	
Security	300	3.3	3.3	F3, FL40#2	2.3	2	265	
Porter	200	6.8	2.3	F3, FL40#2	2.2	3	277	
Lavatory 1	100	4.8	2.8	F2, FL40#1	1.7	2	119	Water proof
Lavatory 2	100	4.8	3.3	F2, FL40#1	2.0	2	101	Water proof
Lavatory 3	100	6.8	2.8	F2, FL40#1	2.4	2	126	Water proof
Lavatory 4	100	6.8	3.8	F2, FL40#1	2.9	3	104	Water proof
Storage 1	50	3.3	1.8	F2, FL40#1	0.5	1	102	
Storage 2	50	2.8	1.8	F2, FL40#1	0.4	1	120	
Train platform	100	8.0	100.0	F6, FL110#1	43.4	48	110	Water proof
Bus platform	100	8.0	100.0	F6, FL110#1	43.4	48	110	Water proof

NEW RAILWAY FOR CENGKARENG AIRPORT / INDONESIA

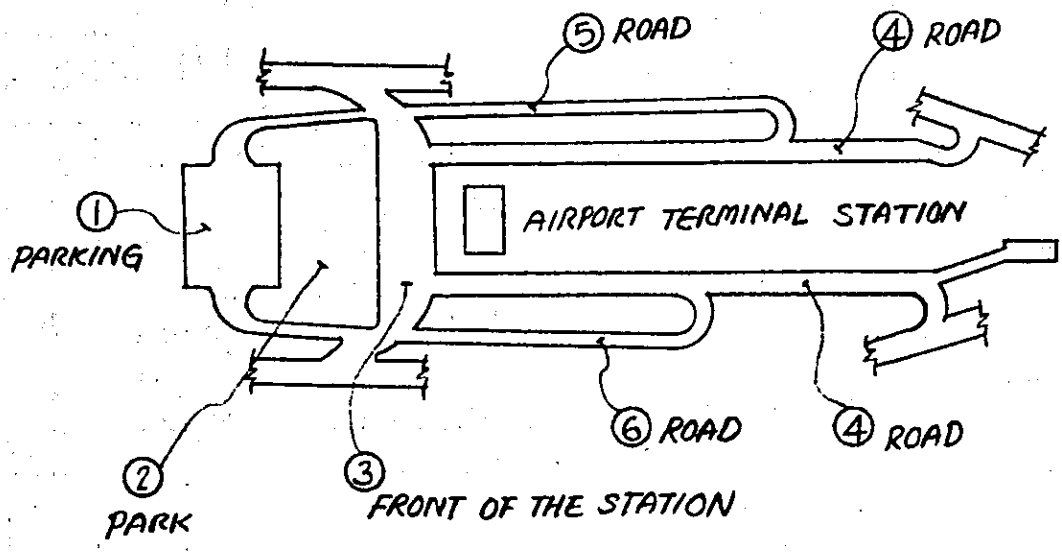
LIGHTING AREA	LUX	X	Y	FIXTURE NO.	NO.(Calc)	NO.	LUX(Calc)	REMARKS
							0	
[3] SIGNAL CABIN (TYPE-1)								
Signal device room	200	8.0	4.0	F2, FL40*1	9.5	10	211	
Power room	200	3.7	2.7	F2, FL40*1	3.9	4	205	
Lavatory	100	2.5	2.7	F1, FL40*1	1.1	1	90	water proof
Signal control room	300	6.8	5.4	F3, FL40*2	5.6	6	319	
Rest room	150	3.0	2.4	F3, FL40*2	0.7	1	200	
Pantry	150	2.4	2.0	F1, FL40*1	1.2	1	127	
Dressing room	150	2.4	2.0	F1, FL40*1	1.0	1	150	
Inspection room	300	6.0	5.9	F3, FL40*2	5.4	6	331	
Corridor (1FL)	100	1.0	7.0	I3, IL100*1	2.3	3	130	
Corridor (2FL)	100	1.0	5.0	I3, IL100*1	1.7	2	121	

NEW RAILWAY FOR CENGKARENG AIRPORT / INDONESIA

LIGHTING AREA	LUX	X	Y	FIXTURE NO.	NO.(Calc)	NO.	LUX(Calc)	REMARKS
[4] SIGNAL CABIN (TYPE-2)								
Relay equipment room	200	6.9	3.9	F2, FL40*1	8.9	10	225	
Lavatory	100	1.7	0.9	F1, FL40*1	0.3	1	395	[illegible] proof
Signal handling room	300	3.9	3.9	F3, FL40*2	2.5	3	354	
Rest room	150	2.9	3.9	F3, FL40*2	1.2	1	128	

LIGHTING AREA	LUX	X	Y	FIXTURE NO.	NO.(Calc)	NO.	LUX(Calc)	REMARKS
[5] KOTA INTAN STATION								
Concouse	200	9.5	11.0	M1, ML300*1	3.7	4	218	
Passenger waiting & cafe	150	5.5	5.0	I3, IL100*1	8.5	9	160	
Passengers lavatory (W)	100	4.6	4.8	F2, FL40*1	2.5	4	167	Water proof
Passengers lavatory (M)	100	4.9	4.8	F2, FL40*1	2.6	4	153	Water proof
Porter	200	5.0	4.7	F3, FL40*2	2.4	3	249	
Maintenance & janitors	300	8.5	4.8	F4, FL40*2	5.8	6	310	
Station office	300	5.0	11.0	M1, ML300*1	3.0	4	394	
	300	5.0	5.0	F3, FL40*2	3.8	4	312	
Ticket check								
Station master room	300	4.7	4.8	F3, FL40*2	3.5	4	346	
Meeting room	300	4.8	5.0	F3, FL40*2	3.7	4	325	
Security	300	4.8	3.6	F3, FL40*2	2.9	3	311	
Staff lavatory	100	5.0	4.0	F2, FL40*1	2.5	3	120	Water proof
Staff locker room	200	5.0	4.0	F3, FL40*2	2.5	3	240	
Storage 1	50	4.6	4.0	F2, FL40*1	1.5	2	66	
Storage 2	50	5.0	3.8	F2, FL40*1	1.2	2	84	
Power room	200	5.4	4.1	F4, FL40*2	3.7	4	218	
Mechanical room	200	5.0	3.8	F4, FL40*2	2.4	3	252	
Signal telecom device Rm.	200	7.4	6.0	F4, FL40*2	4.6	6	264	
Storage 3	50	3.0	6.0	F2, FL40*1	1.5	2	67	
Corridor 1	100	6.0	40.0	F5, FL110*1	10.3	12	116	
Corridor 2	100	2.5	40.0	F6, FL110*1	6.5	7	108	
Coverd service area 1	200	7.0	5.0	F4, FL40*2	4.1	4	196	Water proof
Coverd service area 2	200	7.0	5.0	F4, FL40*2	4.1	4	196	Water proof
Dining room	200	5.0	7.0	F3, FL40*2	3.3	4	241	
Kitchen	300	3.5	3.0	F3, FL40*2	2.2	2	275	
Corridor (out door)	50	1.8	50.0	N1, NL150*1	2.5	4	79	Water proof
Ablution room	100	4.6	2.9	F1, FL40*1	2.4	3	127	Water proof
Musholla	100	7.7	4.6	I4, IL40*5	7.5	6	79	
Rest room	150	6.9	5.0	F3, FL40*2	2.5	3	183	
Lavatory	100	2.9	3.5	F3, FL40*2	0.8	1	119	Water proof
Corridor	100	1.3	3.0	I3, IL100*1	1.3	2	155	
Platform	100	6.5	90.0	F6, FL110*1	31.8	50	157	Water proof
Train control office	300	4.4	3.4	F3, FL40*2	2.5	3	360	
Signal telecom office	300	4.4	3.4	F3, FL40*2	2.5	3	360	
					0.0		0	
Shops	100	30.0	4.3	F4, FL40*2	12.2	12	98	Water proof
Loading yard	100	30.0	4.3	F4, FL40*2	12.2	12	98	Water proof

[6] AIRPORT TERMINAL STATION
STATION PLAZA



① PARKING

10 LUX. 50M×50M HL 250W 8 Nos.

② PARK

10 LUX 25M×75M HL 250W×2 3 Nos.

③ FRONT OF THE STATION

50 LUX 20M×60M HL 700W×6 1 No.

④ ROAD

10 LUX 8M × 210M HL 250W 6 Nos.

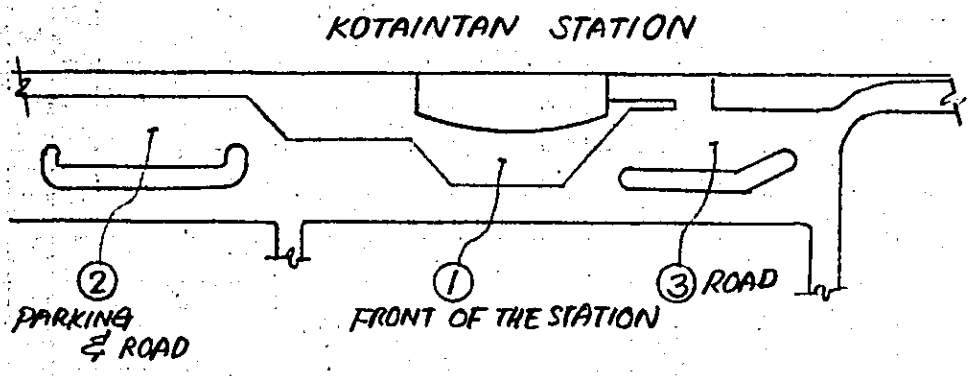
⑤ ROAD

10 LUX 4M × 150M HL 250W 2 Nos.

⑥ ROAD

10 LUX 4M × 130M HL 250W 2 Nos.

[7] KOTAINTAN STATION
STATION PLAZA



① FRONT OF THE STATION

50LUX	80M x 30M	HL 700W x 6	2 Nos.

② PARKING AND ROAD

10 LUX	75M x 35M	HL 250W	7 Nos.

③ ROAD

10 LUX	60M x 30M	HL 250W	5 Nos.