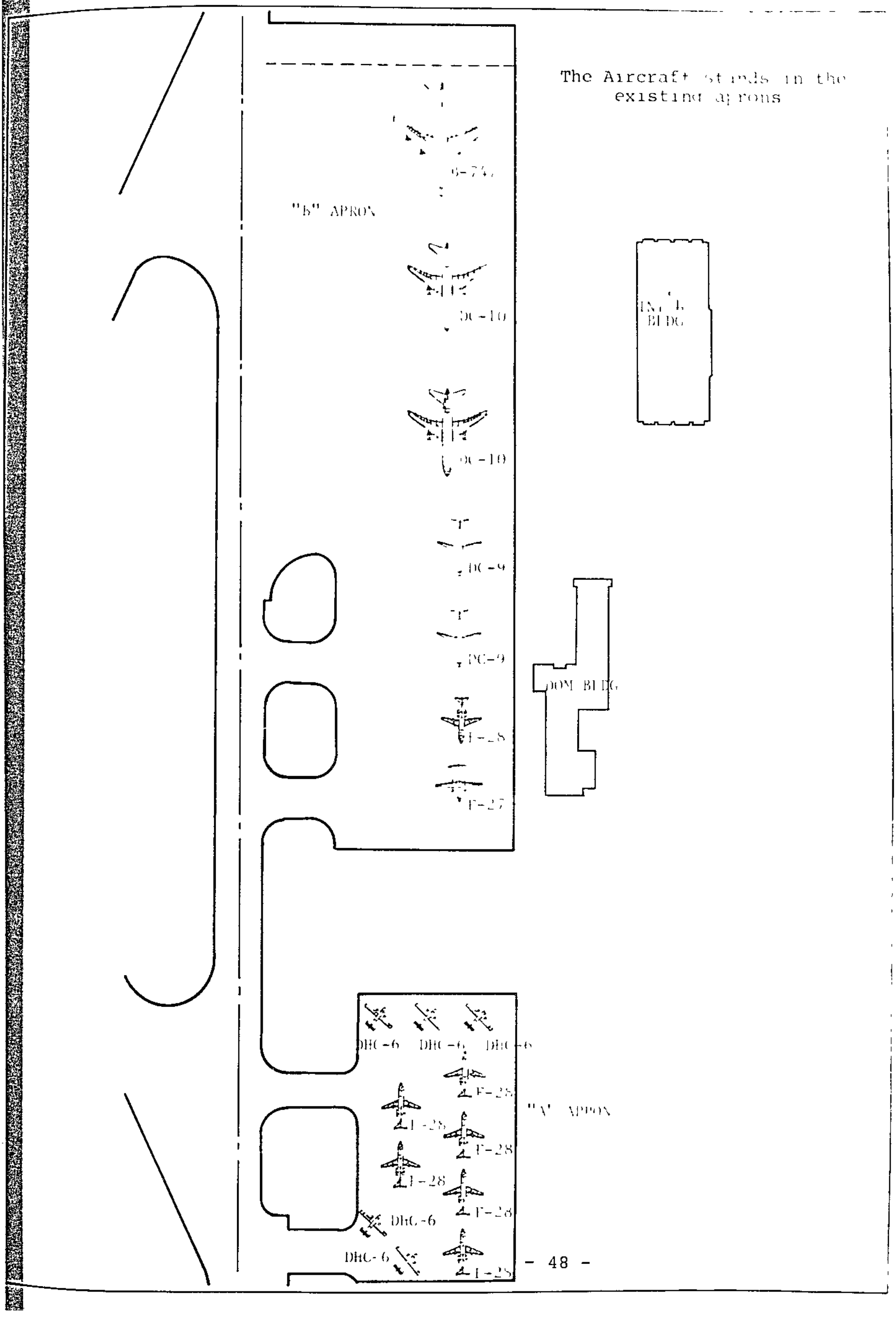
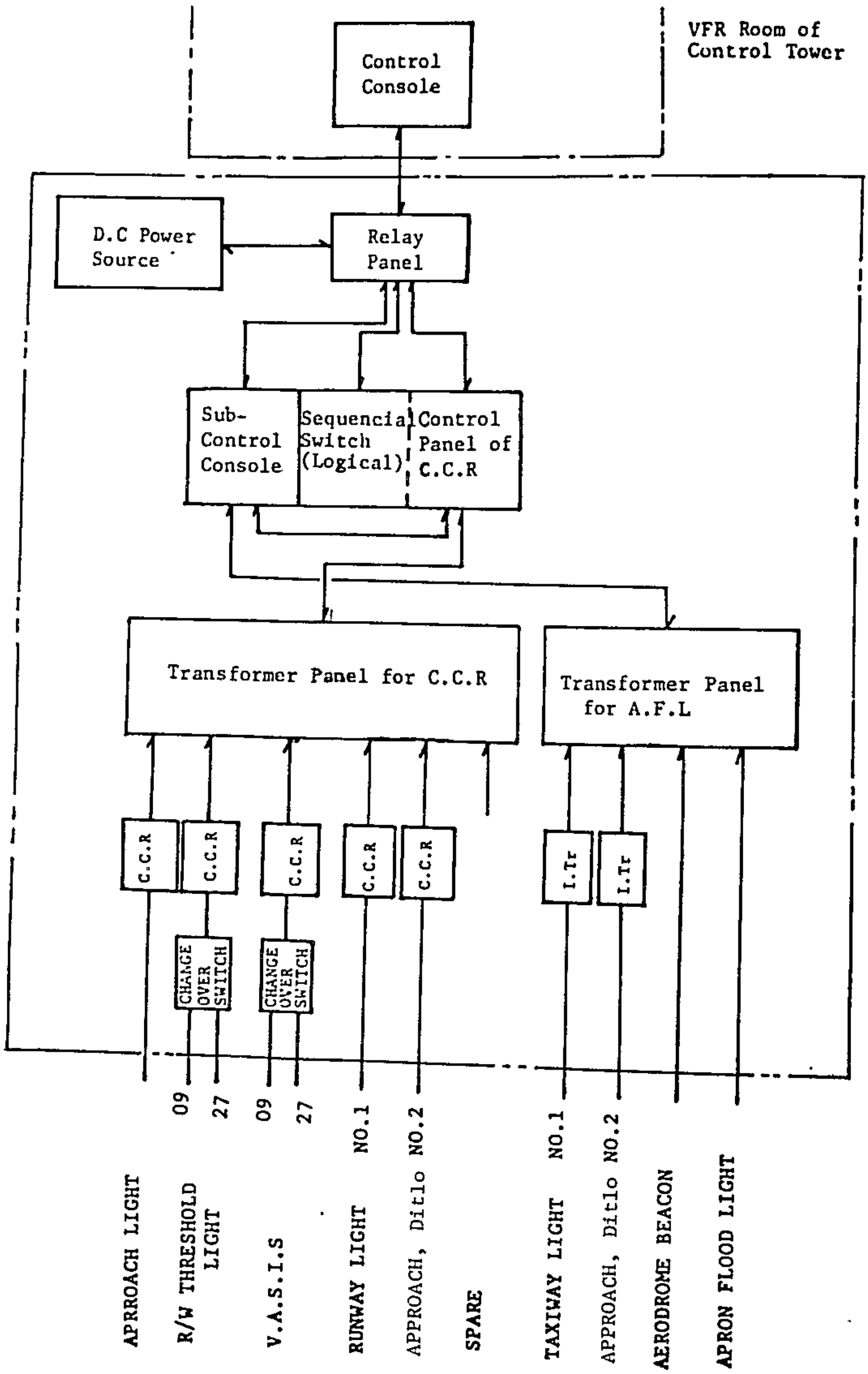
APPENDIX TO CHAPTER 6

The Aircraft stands in the existing aprons



CONTROL DIAGRAM OF AIRFIELD LIGHTING



EXISTING EQUIPMENT LIST
OF
AIR NAVIGATIONAL AIDS

EQUIPMENT	TYPE / MAKER	SET	FREQUENCY	IDENTIFI CATION	P O W E R		ANTENNA TYPE	COVERING RANGE	REMARKS
					CONSUMP	OUT PUT			
NDF TRANSMITTER	G 91	2	230 KHZ	O R	9.5 KVA	2.8 KW	VERTICAL	300 NML	
VOR TRANSMITTER	SEL KL 200 RD	2	115.5 MHZ	DPS	7 KVA	200 Watt	Combination	200 NML	
DMF TRANSPONDER	RYC 7004 7506 RAYTHEON	2	102 X	DPS	1.4 KVA	800 Watt	Discone	100 NML	
ILS TRANSMITTER	LS 371								
a. Localizer	LS 371 TCSF	2	110.3 MHZ	IDPS	2.4 KW	20 Watt	Par. Refl	S.18 NML	
b. Glide Path	LS 371 TCSF	2	335 MHZ	-	2.4 KW	D10W/CL.1W	Dipol Ref	10 NML	
c. Marker Beacon	N318/52 NARDEUX	2	75 MHZ	-	90 VA	2 Watt	Colinear Dipole		
DME TRANSPONDER	RYC 7004 7515 RAYTHION	2	40 X	DPS	1.4 KVA	800 Watt	Discone	40 NML	
RADAR SET					NOM 7 KW				
a. PSR	THOSON TVT	2	2750/2850-MHZ			500 KW	Scurse - System	90 NML	
b. SSR	THOMSON TVT	2	1030/1060-MHZ			2.5 KW	Rotating Dipole		
D.VOR TRANSMITTER	RAYTHION RYC - 7004	2	116.2 MHZ	BLI	1.4 KVA	100 KW	Combination	200 NML	

EXISTING EQUIPMENT LIST
OF
AIR TRAFFIC INFORMATION SERVICE

EQUIPMENT	MAKER/TYPE	FREQUENCY	SET	POWER OUT PUT	ANTENNA TYPE	INSTALLATION TIME	LOCATION	USE FOR	REMARKS
Tran mitter	SU. 007	186.2 Mz	1	70 watt	Dipole	1981	Beacon room	A T I S	
Becorder/Repro-duser	ASSMAN FAG . 100	-	1	-	-	1981	Radar monitor	- " -	
Remote Control	FI A	-	1	-	-	1981	Tower	- " -	
Scanning Monitor Receiver	SY - 200	-	1	-	-	-	E Q R	Monitor ATIS	

EXISTING EQUIPMENT LIST
OF
AIR TELECOMMUNICATION SYSTEM

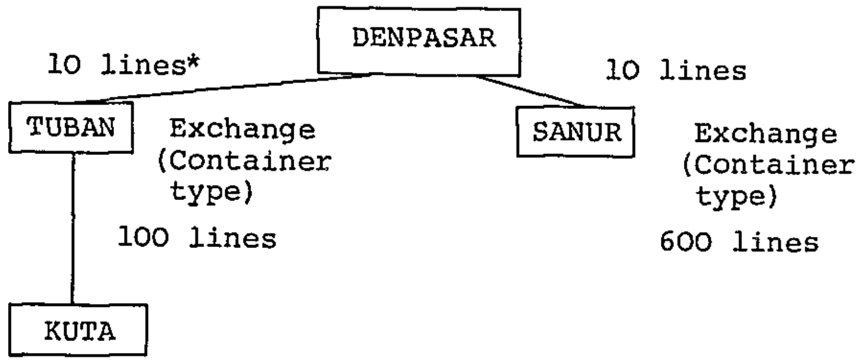
EQUIPMENT	TYPE / MAKER	FREQUENCY	SET	POWER OUT PUT	LOCATION	ANTENNA TYPE	INSTALLATION TIME	USED FOR	REMARKS
M. W A R A	Tx. SIEMENS	5673	1	5 / 10 Kw	Tuban	Gate Antenna	1969	HF Ground to Air	
	Philip	3868 13228	1	1 Kw	- " -	- " -	1978	- " -	
	Rx. RFC	-	2	-)	Kuta	Omni	1978	- " -	
	TELEFUNKEN	-	2	)					
R. D A R A	Tx. SIEMENS	8819	2	3 / 5 Kw	Tuban	Gate Antenna	1969	HF - " -	
	Rx :R F C	-	2	-)	Kuta	Omni	1978		
	TELEFUNKEN		2	)			1969		
ACC WAST	Tx. THOMSON	119.3	2	100 Watt	Surabaya	Dipole	1980	VHF - " -	
		120.7	2	100 "	Kintamani	- " -	1980	- " -	
	Rx. THOMSON	-	2	-	-	-	1980	-	
ACC EAST	Tx. RHOMSON	128.3	2	100 Watt	Kintamani	Dipole	1980	VHF - " -	
	R / S	128.3	2	70 "	Tuban	- " -	1969	- " -	
	Rx.THOMSON	-	2	-	Kintamani	- " -	1980	- " -	
	R / S	-	2	-	Tuban	- " -	1980	- " -	
A.P.P	Tx. R / S	119.7	2	70 Watt	- " -	- " -	1969	VHF - " -	
A.D.C	Tx. R / S	118.1	2	70 Watt	- " -	- " -	1969	- " -	
	Rx. R / S	118.1	2	-	- " -	- " -	1969	- " -	
	Becket	118.1	1	-	- " -	- " -	1969	- " -	
Emergency	R / S	128.5	1	70 Watt	- " -	- " -	1969	- " -	
Beack Up 119.3 Sby	R / S	119.3	1	70 Watt	- " -	- " -	1969	VHF - " -	
S.S.B	CODAN	7425	1	100 Watt	Tuban/Com	- " -	1975	P.T.T N.T.B.	
	INTI TR.125	7400	1	125 "	" /ACC	- " -	1978	PTT, Semarang Sby. Solo	

EXISTING EQUIPMENT LIST
OF
AIR TELECOMMUNICATION SYSTEM

Direct Speech Lombok	Tx. R.F.C Rx. R.F.C	1354 143.0	1 1	50 Watt -	Tuban/ACC "	Dipole	1975	Point to pont Lombok
Telecar	YAESU	UHF	4	10 Watt	Tuban/PPKP	z Dipole	1980	Com.inter tower-Mobil PKPPK
Link	PYE	385.5 391.5	2 2	5 Watt -	Kintamani/ Tuban	Directive Yagi	1978	Link frequency Kintamani
	Tx.THOMSON	416.6 418.4	2 2	5 Watt	Kintamani/ Tuban	"	1980	Link Tuban Kintamani
	Rx.THOMSON	432.75 435.7	2 2	5 Watt	Kintamani/ Tuban	Yagi	1980	- " -
Service link	Tx. PYE THOMSON	420.5 425.5	1 1	5 Watt -	Kintamani/	Yagi		Com.Tuban-Kin-tamani
AMC(Apron Movement commnication)	Tx/Rx PYE	410 MHz	1	5 Watt	Tuban	Dipole	1980	Apron Service
Walky Talky	MOTOROOLA	152.630 152.630	5	-	SATPAN 2 TOWER 1 EQ.ROOM 2	-	1980	Sequrity

Telephone System

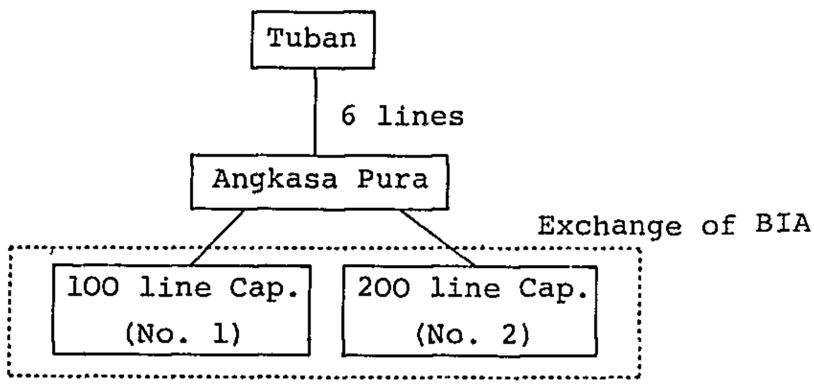
The current telephone network around Denpasar City is outlined below.



*The 300-line cable is used for the Tuban-Denpasar section. At present, 10 lines are used for communication between Denpasar and Tuban, and balance for the internal lines of Tuban.

At present, the number of telephone lines of Denpasar City total 5000 and these are fully used. There is a plan to establish 200 lines for internal city use and 600 lines for the Kuta Area by mid 1983.

The current telephone network of the airport is outlined below.



The line capacity between Tuban and Angkasa Pura is expected to increase to a total of 12 circuits in 1983.

In the airport, two types of Telephone Exchanges are used at present. One of them has 100 line capacity and the other has 200 line capacity. For the No.1 exchange, 47 out of the 100 lines are occupied and for the No. 2 exchange, 91 out of the 200 lines are occupied although loaded capacity is 100 lines.

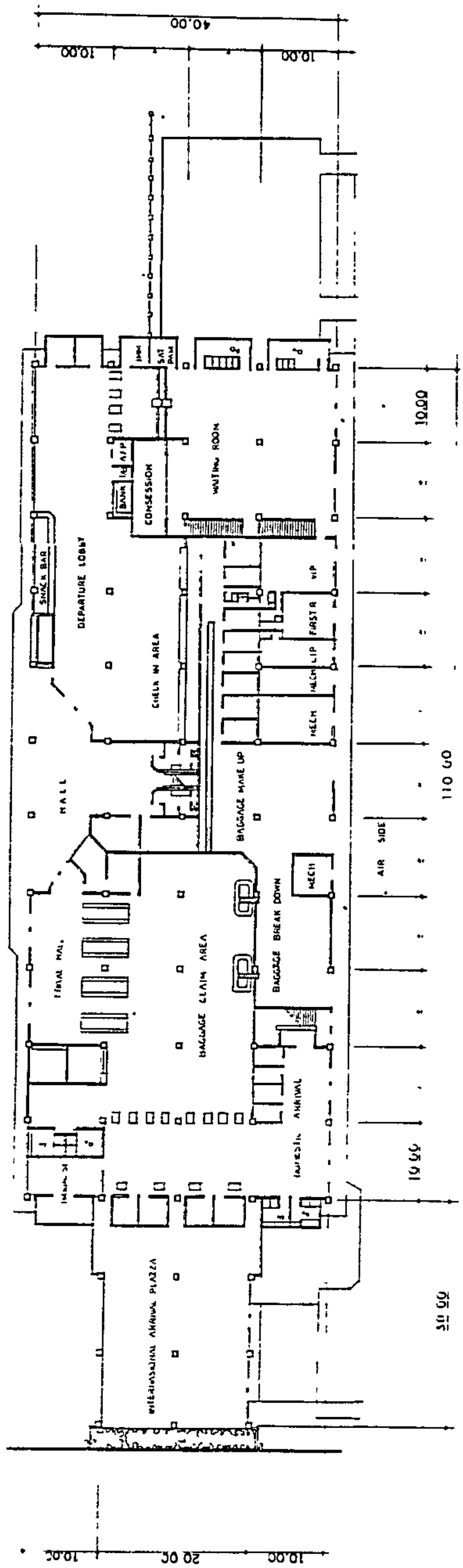
In addition to the above line capacity, 18 lines are reserved for direct telephone use, 6 lines between Angkasa Pura and Denpasar, and 10 lines for direct calls to Kuta.

EXISTING EQUIPMENT LIST OF AIRFIELD LIGHTING SYSTEM

EQUIPMENT	CAPACITY	MAKER / TYPE	INSTALLATION TIME	LOCATION	REMARKS
Run Way Light	18.865 Watt	Siemen SHF-21d-1	1969	Airport	Bi Direction 2700 M
Taxi Way Light	5.880 Watt	Merk Siemen RF - 10N	1969	Airport	
VASI System	19.220 Watt	Merk AEG AWF.600H	1975	Airport	3 bar system
Threshold light	5.840 Watt	Merk Siemen type SHF-21d-1	1969	Airport	
Threshold light Flush mounted	7.500 Watt	Merk Siemen type FS.252	1978	Airport	
REILS	240 Watt	Merk Siemen type VDC 60	1978	Airport	
Approach light	19.725 Watt	Merk Siemen type AHF 27d-2	1978	Airport	Run Way 27 Cat-1
Sequence Flasser	2.520 Watt	Merk Siemen type VDC 60	1978	Airport	
Rotating Beacon	2.000 Watt	Merk Siemen type DDS-101	1969	Airport	
Obstruction light	800 watt	Merk Siemen type HF-10N	1976	Airport	
Landing Tee	880 Watt	Type LW/a	1969	Airport	
Wind Sock	240 Watt	Merk Siemens type LM/m	1969	Airport	
Sirene	8.400 Watt	Merk Siemens type S5KB10	1969	Airport	
Appron Flood light	28.000 Watt	Merk USA type AL-41			
Ground Traffic Light	400 Watt		1969	Airport	

EXISTING EQUIPMENT LIST OF POWER SUPPLY & GENERATOR SYSTEM

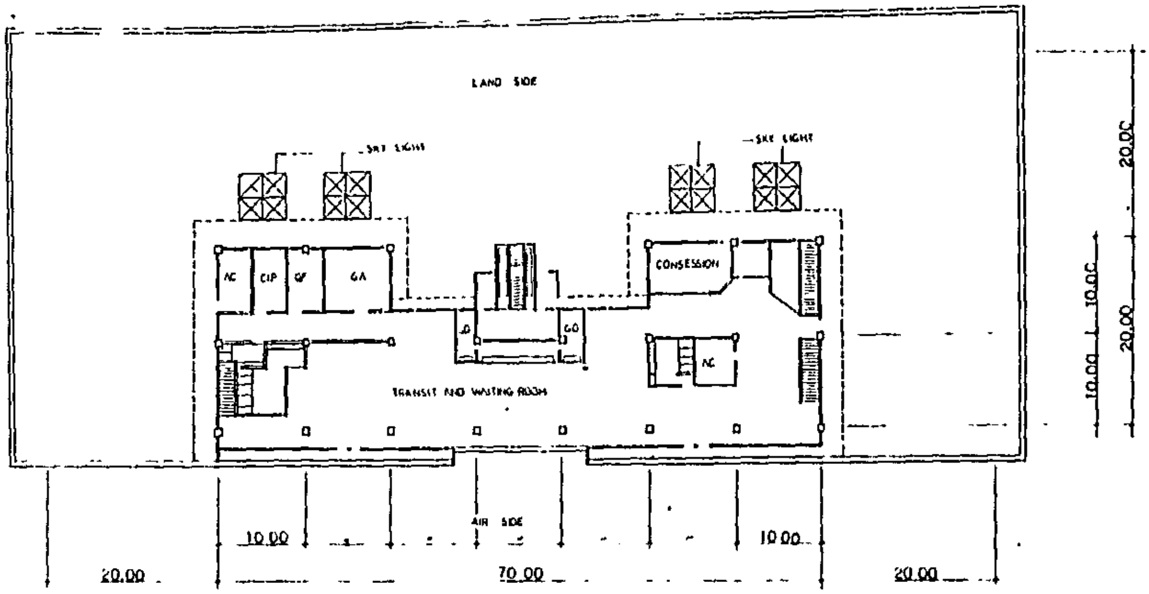
EQUIPMENT	CAPACITY	MAKER / TYPE	INSTALLATION TIME	LOCATION	REMARKS
Main Power Supply	1250 KVA 20KV/6KV.	-	1978	Airport	Supply from PLN (Goverment Electric firm)
Automatic stand by genarating set	2 X 850 KVA 220/380V.	Merk DEUTZ West Germany. type BA8M (Auto - 10 second)	1978	Airport	
Manual stand by generating set	3 X 360 KVA 220/380V.	Merk DEUTZ West Germany. type W8V 17,5/22	1965	Airport	
Automatic stand by generating set	2 X 30 KVA 220/380V.	Merk MAN West Germany. type D.0022 M (Auto - 10 second)	1965	Reciever Station	
Automatic stand by generating set	1 X 16 KVA 220/380V.	Merk MAN West Germany. type D.0022 M (Auto - 10 second)	1965	V.O.R. Station	
Power generating set	3 X 16 KVA 220/380V.	Merk MAN West Germany. type D.0022 M	1965	Repeater Station	
Automatic stand by genarating set	1 X 80 KVA 220/380V.	Merk MAN West Germany. type D.0846 HME	1976	Radar Head	
Power Transformer	2 X 1250 KVA 6000/400V.	Merk AEG. West Germany. type OF - 12.54	1965	Airport	
Power Transformer	3 X 500 KVA 6000/400V.	Merk AEG. West Germany. type OF - 504	1965	Airport	
Power Transformer	2 X 250 KVA 6000/400V.	Merk AEG. West Germany type OF - 254	1965	Airport	



1ST. FLOOR PLAN

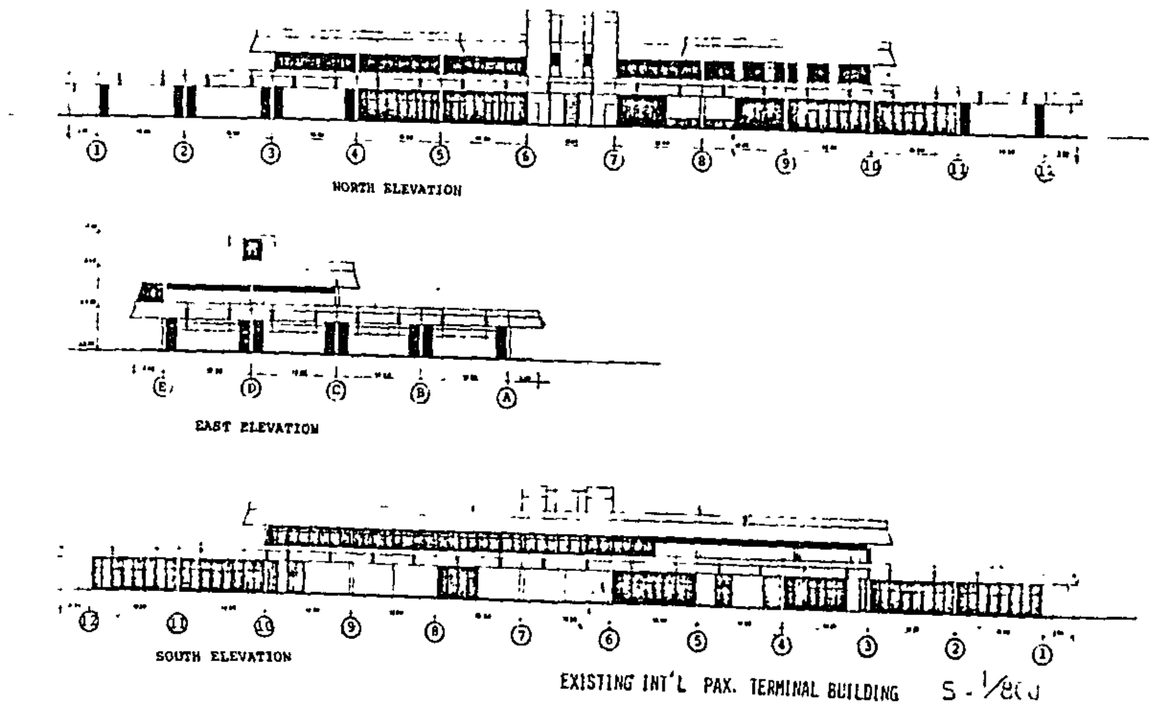
INT'L PAX TERMINAL BLDG S=1/800

1981 RENOVATION PLAN PLANNED BY BIA

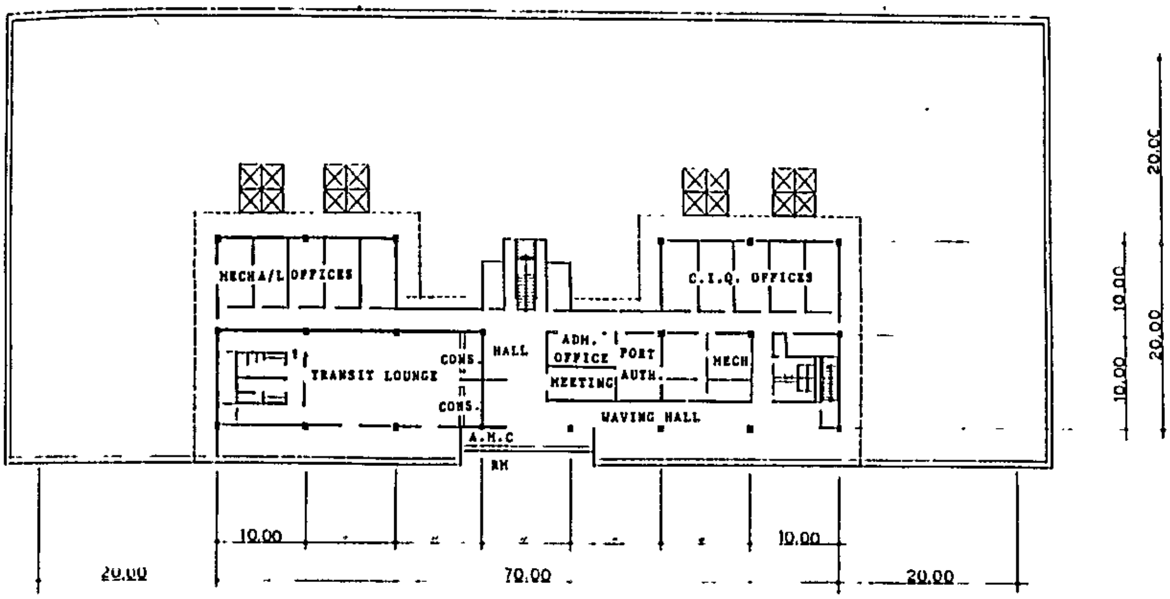


2ND. FLOOR PLAN

INT L PAX TERMINAL BLDG S=1/200
1981 RENOVATION PLAN PLANNED BY BIA

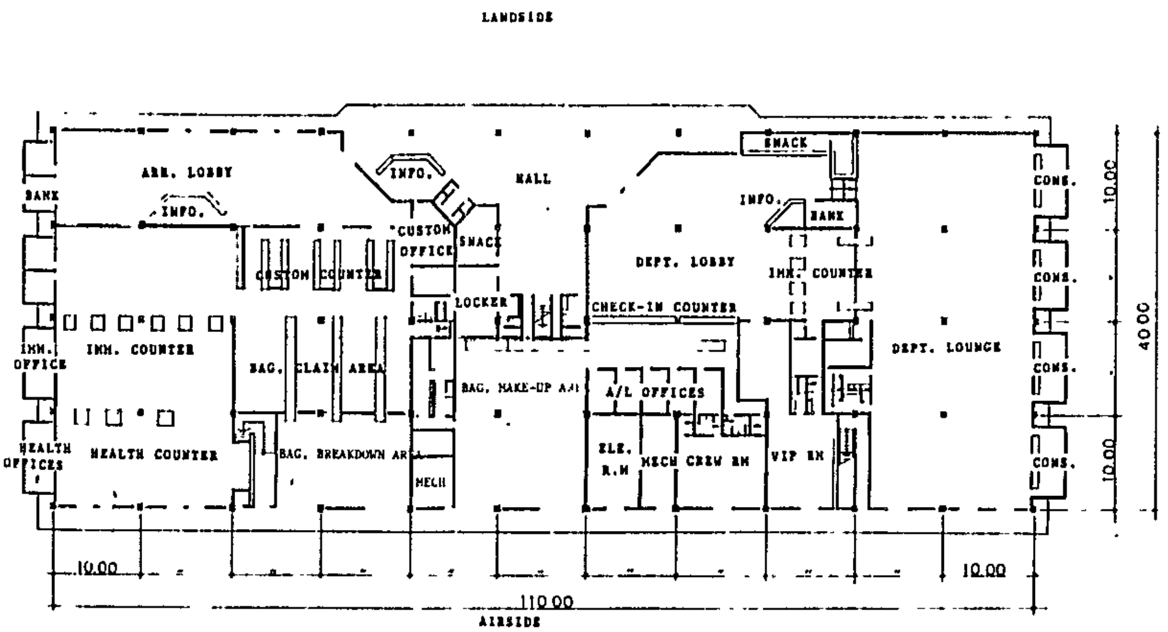


EXISTING INT'L PAX. TERMINAL BUILDING S - 1/800



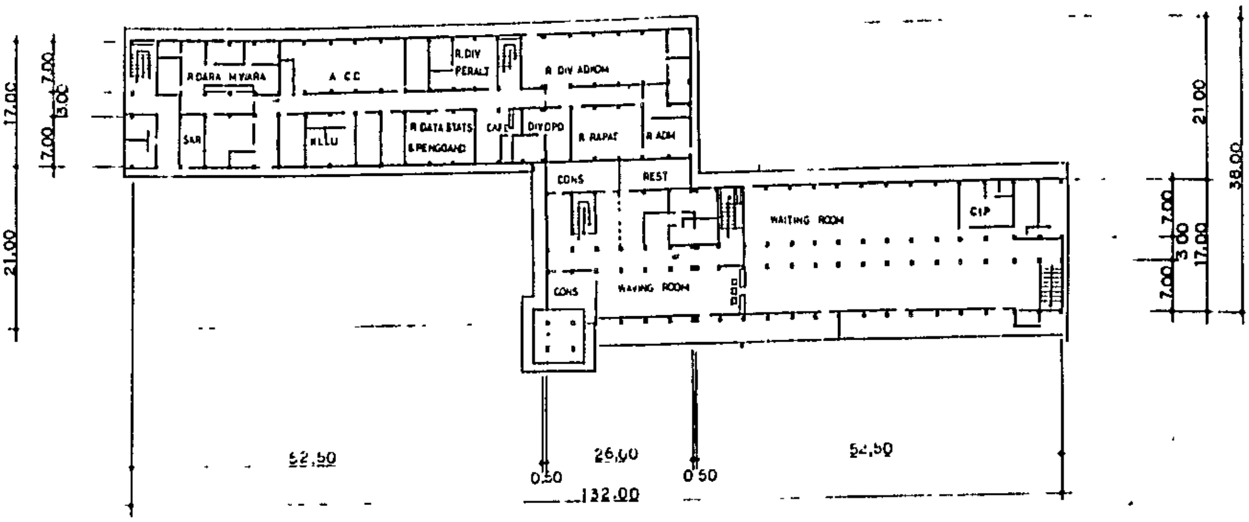
2ND. FLOOR PLAN

INT'L PAX TERMINAL BLDG S=1/500
1981 EXISTING PLAN



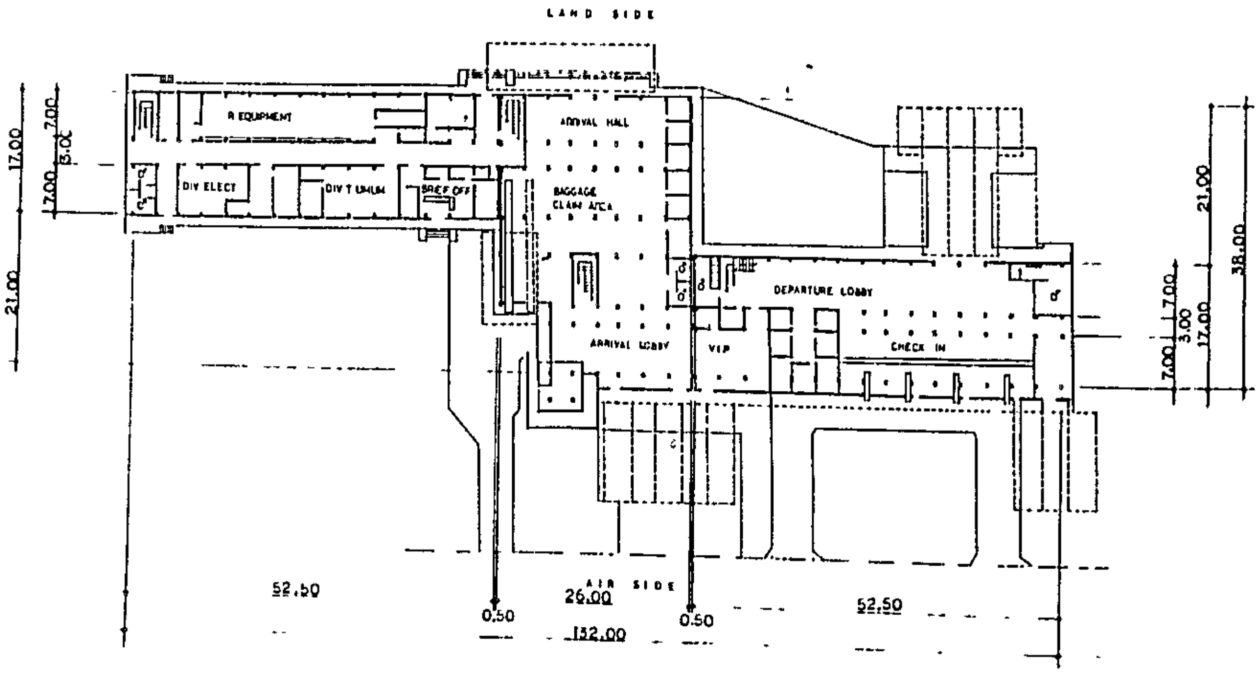
1ST. FLOOR PLAN

INT'L PAX TERMINAL BLDG S=1/800
1981 EXISTING PLAN



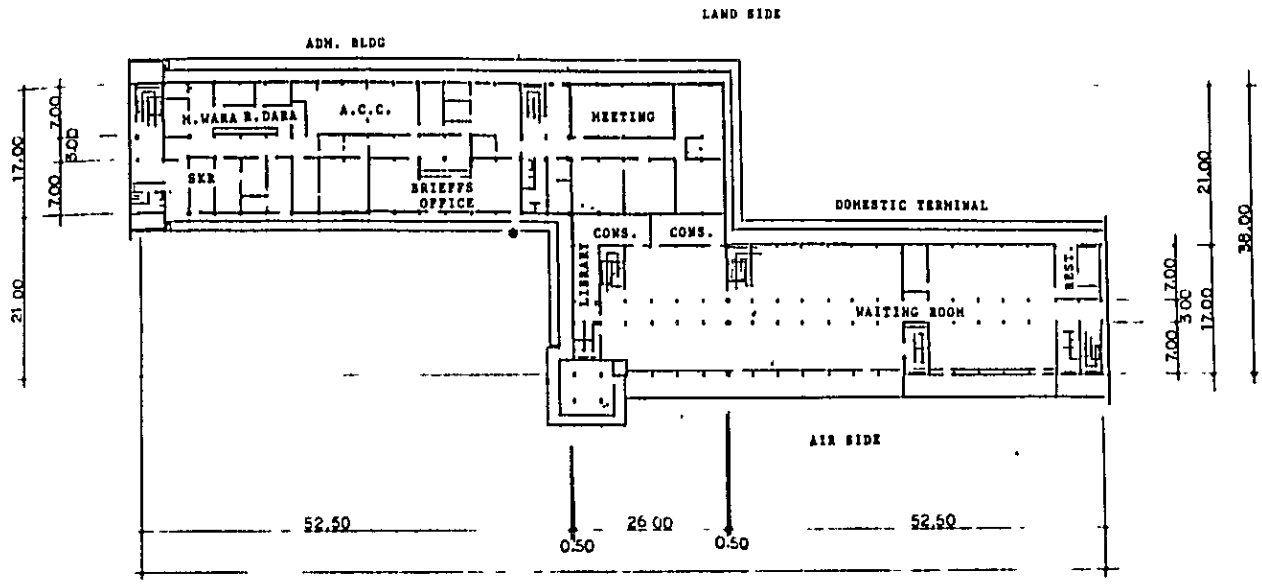
2ND. FLOOR PLAN

DOM PAX TERMINAL BLDG S=1/10
1981 RENOVATION PLAN PLANNED BY BIA



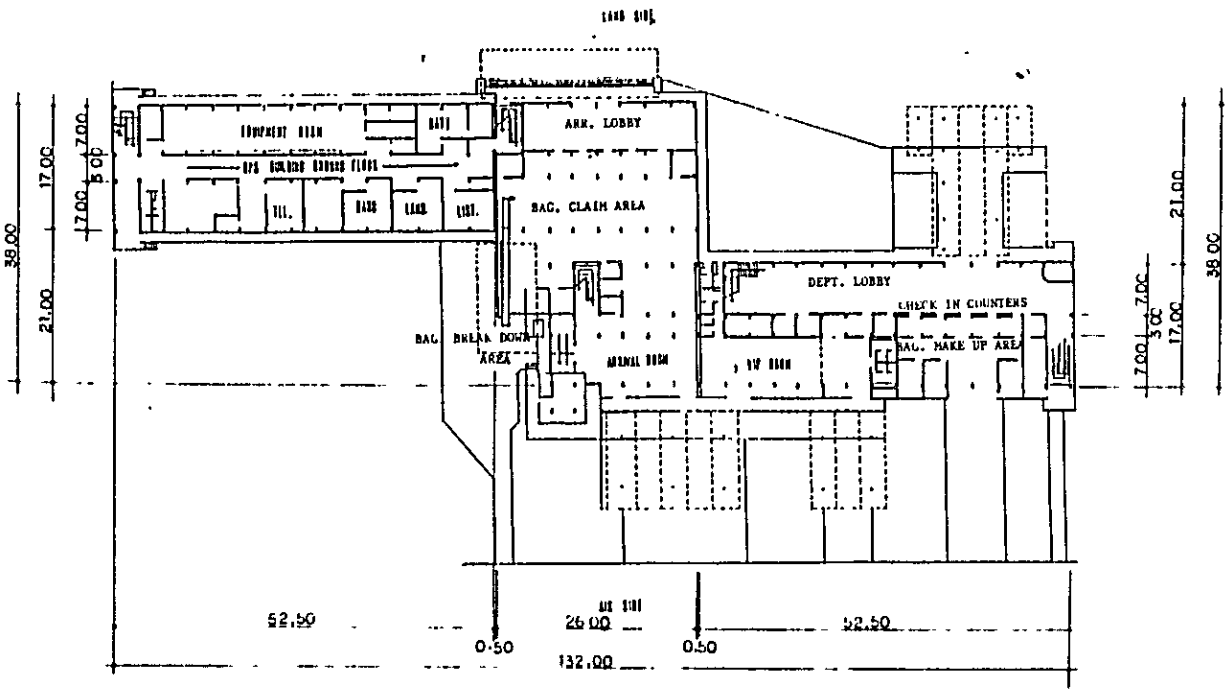
1ST. FLOOR PLAN

DOM PAX TERMINAL BLDG S=1/1000
1981 RENOVATION PLAN PLANNED BY BIA



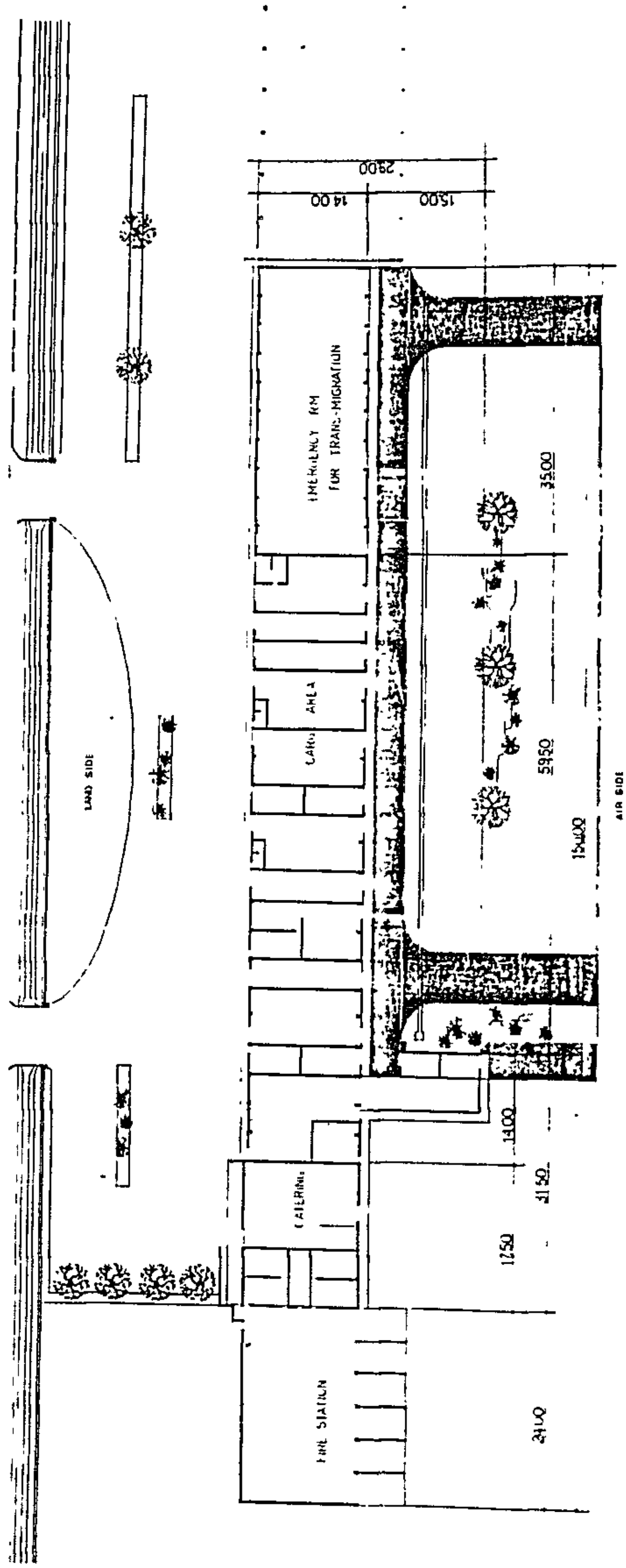
2ND. FLOOR PLAN

DOM PAX TERMINAL BLDG S=1/100
1981 EXISTING PLAN



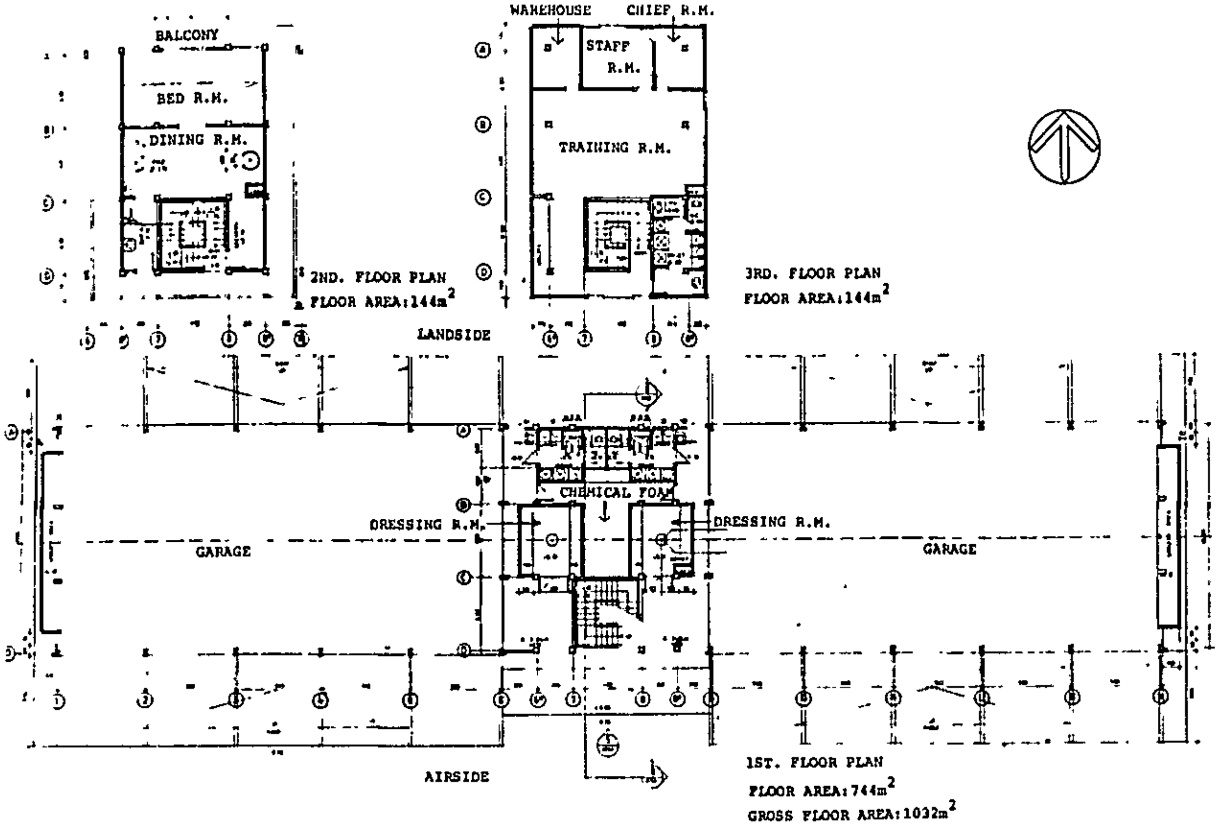
1ST. FLOOR PLAN

DOM PAX TERMINAL BLDG S=1/100
1981 EXISTING PLAN



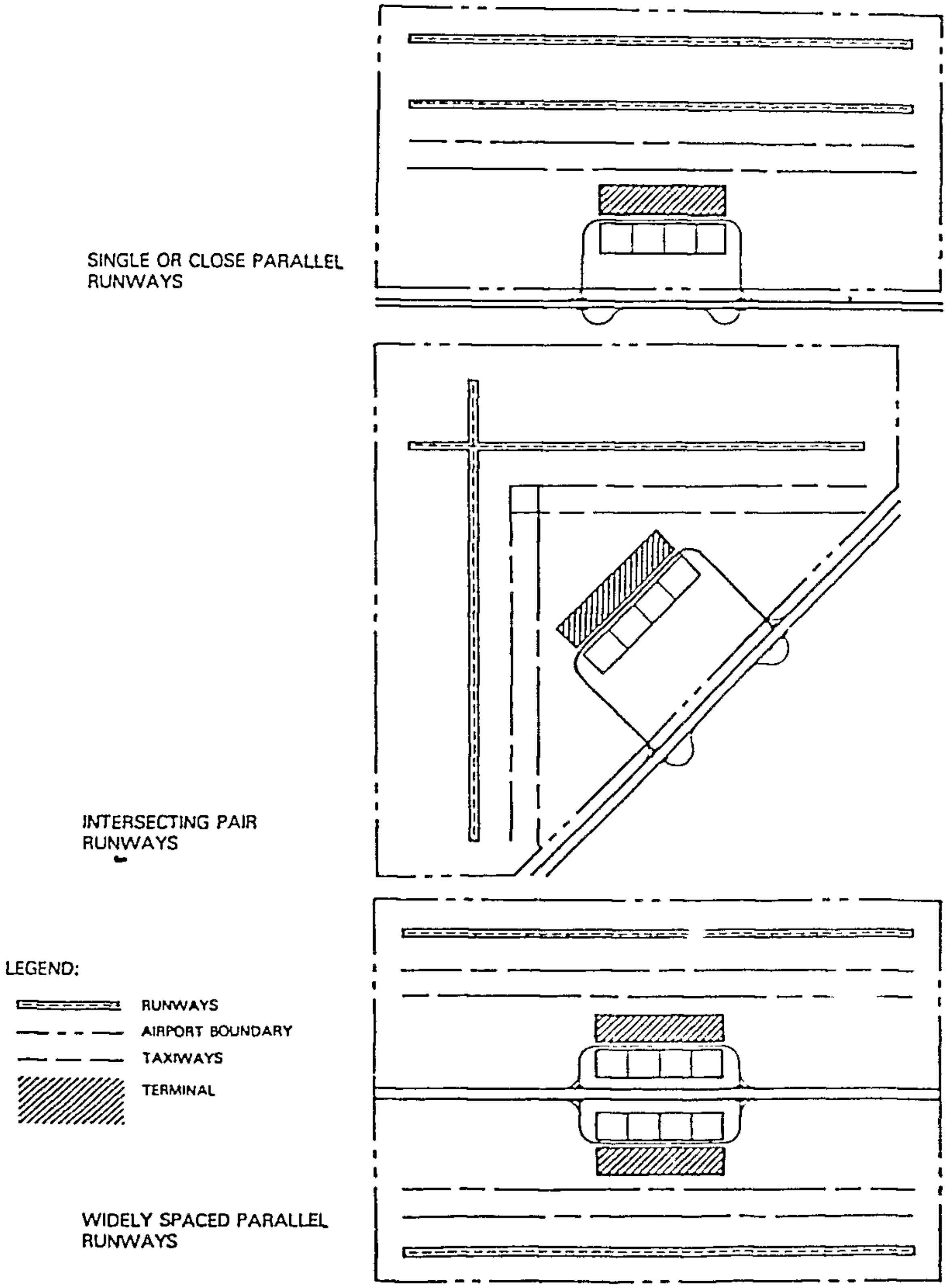
1ST. FLOOR PLAN

EXISTING CARGO TERMINAL BLDG S=1/800



NEW FIRE STATION BLDG.
S=1/400

APPENDIX TO CHAPTER 7



FUNDAMENTAL LAYOUT OF TERMINAL AREA

IATA: Airport Terminals Reference Manual
6th. Edition ATRM 1.2.2

APPENDIX TO CHAPTER 9

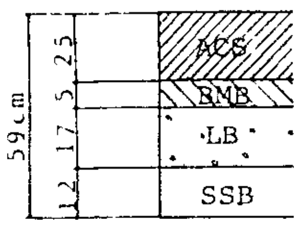
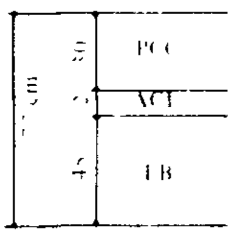
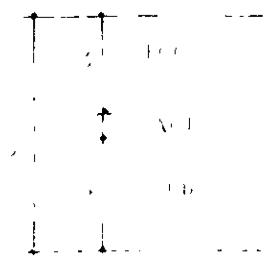
Evaluation of Existing Pavement Structures

No significant defects of the pavement have been observed at this moment although B747 and DC-10 class heavy aircraft loads have been applied since 1977. The heavy aircraft load repetitions expected in the future, however, may cause damage to the pavement structure.

Based on this point of view, this section evaluates the existing runway and apron pavements and whether it would be appropriate to overlay them to accommodate the aircraft load repetitions expected during the design life of the pavement.

(1) Characteristics of the existing pavements.
Characteristics of the existing pavement structures of BIA are summarized as shown in Table 1 below.

TABLE 1 CHARACTERISTICS OF EXISTING PAVEMENT (Typical)

Location	Runway intermediate	Runway ends	Apron
Subgrade bearing capacity	CBR 9%	CBR 9% (K=5 kg/cu.cm)	CBR 9% (k=5 kg/cu.cm)
Flexural strength of PCC slab		50 kg/sq.cm	50 kg/sq.cm
Pavement structure			

Note:
ACS: Asphalt Concrete Surfacing
BMB: Bitumen Macadam Base
LB: Limestone Base
SSB: Sand Subbase
PCC: Pontland Cement Concrete Slab
ACL: Asphalt Concrete Leveling Course

(2) Evaluation of Existing Rigid Runway Pavement by LCN Method

i) Characteristics of existing pavement:

* LCN of existing pavement = 60
* Thickness of PCC slab = 30 cm
* Modulus of subgrade reaction

  No data about the subgrade reaction is available. However, as a approximate value, subgrade reaction is read off from Fig. 1 as $8 kg/cm^3$.

* Flexural stress of PCC slab = 25 kg/cm^2
* Young's modulus for concrete = 350,000 kg/cm^2
* Poison's ratio for concrete = 0.15

* $$\ell = \left(\frac{Eh^3}{12(1 - u^2)\ k} \right)^{1/4} = \left(\frac{350,000 \times 30^2}{12(1 - 0.15^2) \times 8} \right)^{1/4}$$

$$= 100.2 \text{ cm}$$

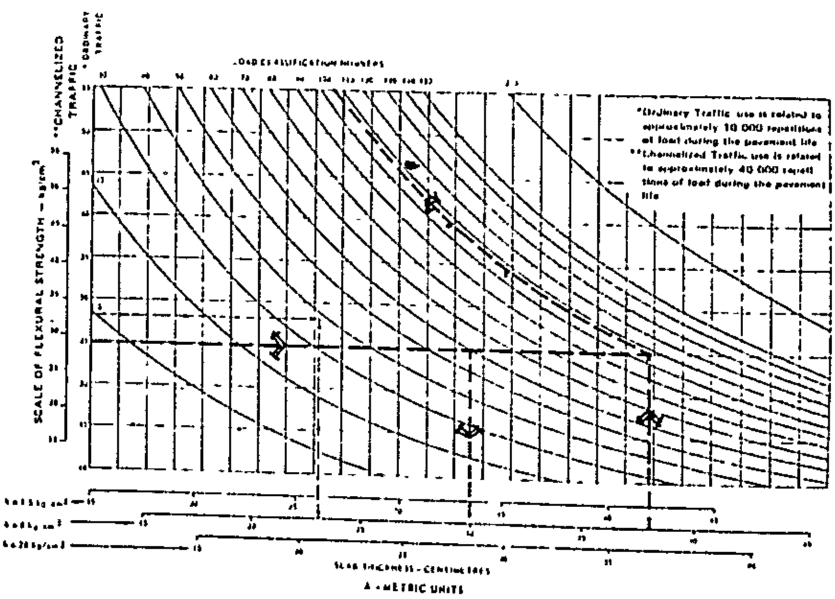


Fig. 1 Design Chart for Rigid Pavement

ii) Characteristics of aircraft:

* Type of aircraft: B-747-200B
* Take-off load on each main leg(W) = 82,500kg
* Wheel arrangement on each main leg:
  Dual tandem
* Wheel track (S) = 111.8 cm
* Wheel base (St) = 147.3 cm
* Tire pressure (p) = 14.4 kg/cm^2
* Contact area of each main leg (A) = W/p
  = 82,500/14.4
  = 5,729 cm^2

iii) Obtain the inputs for Fig. 2

S/ = 111.8/100.2 = 1.12

St/ = 147.3/100.2 = 1.47

and A/ ^{2} = 5,729/100.2^2 = 0.57

Using above inputs, Reduction factor (RF) is read off as 3.1 from Fig. 2

iv) ESWL = W/RF = 82,500/3.1 = 26,600 kg

v) Input ESWL and tire pressure for Fig. 3

LCN of the aircraft can be read off as 95.

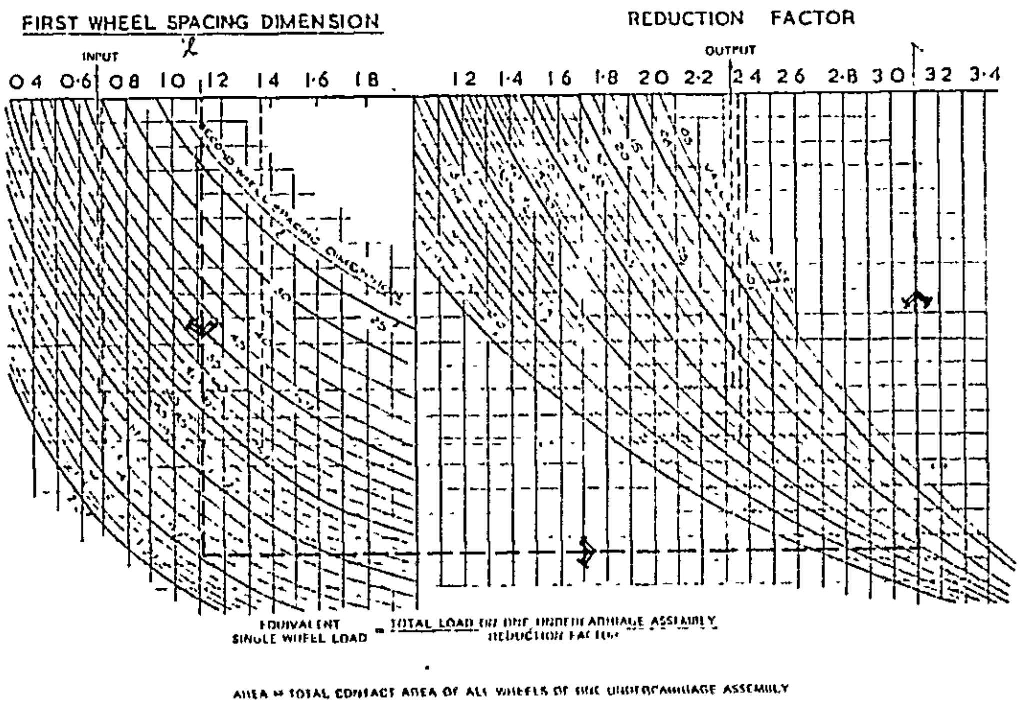


Fig.2 Equivalent single wheel load assessment curves - rigid pavements - dual tandem undercarriages

vi) Required overlay thickness
From Fig. 3 , 9 cm of bituminous surfacing is seen to increase the LCN of the rigid pavement to just 35.

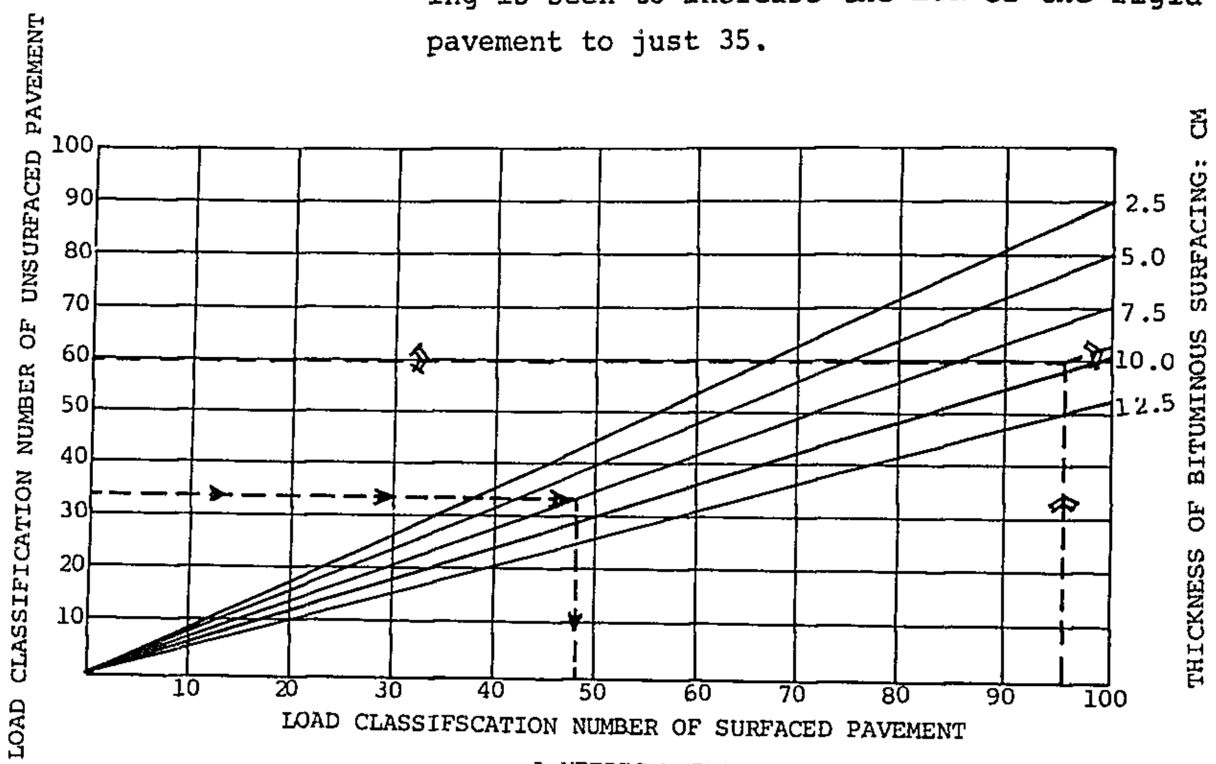


FIG. 3 Chart to show the effect upon the LCN of surfacing a rigid pavement

(3) Evaluation of existing rigid apron pavement by LCN method characteristics of existing pavement of PCC slab with 38 cm thick and subgrade reaction factor k = 8 kg/cm^3 secure LCN 105 as determined from Fig. 1, and is sufficient for aircraft specified as LCN 95.

(4) Evaluation of existing flexible runway pavement by LCN method

i) Characteristics of existing pavement:
* LCN of existing pavement = 60
* Overall thickness of pavement = 83 cm
* Subgrade CBR = 9%

ii) Characteristics of the aircraft:
Same as ii) of (2) above.

iii) Obtain the reduction factor (RF)
Enter S 111.8 cm
St 148.3 cm
A 5729 cm^2 for Fig. 4
RF is read off as 3.15.

iv) ESWL = W/RF = 82,500/3.15 26190 kg

v) Input ESWL and tire pressure for Fig. 5
LCN of the aircraft is 95.
Accordingly, the existing flexible pavement is evaluated as to be required to increase its LCN value 60 to 95 by overlay work.

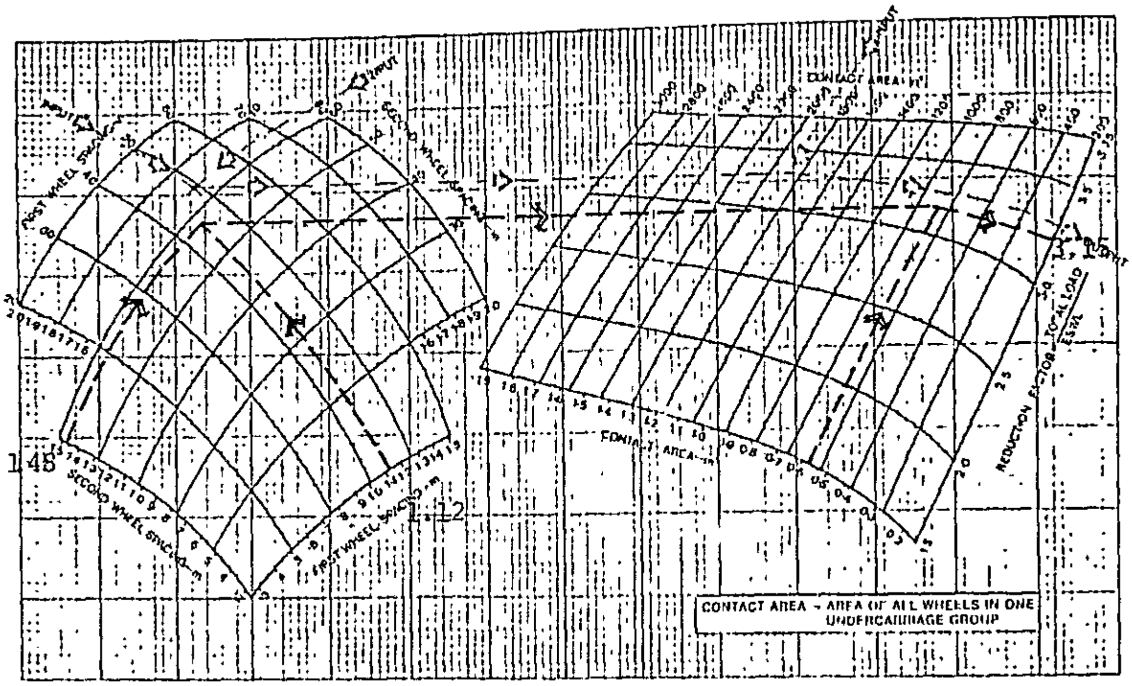
vi) Overlay thickness
Concerning the overlay thickness, there is no clear description in the LCN method from which a definite overlay thickness can be determined.

(5) Evaluation of existing pavement by JCAB method

i) Required pavement structures
The required pavement structures for critical area determined based on the design method of the Corps of Engineers for flexible pavement and the method of the PCA (Portland Cement Association, USA) for rigid pavement are summarized in Table 2 , under the design conditions listed below:

Design conditions:

Design aircraft:	B-747
Repetition of design load:	10,000 times
Subgrade conditions:	CBR 9% or
	K=5 kg/cu.cm.



EXAMPLE: DUAL TANDEM WHEEL AIRCRAFT WHEEL SPACING 64in x 49in (1 626m x 1 245m)
C/C. CONTACT AREA OF DUAL TANDEM WHEELS 1900in² (1 226m²)
REDUCTION FACTOR = 3 3

Figure 4 Equivalent single wheel load assessment curves - Rigid pavements: dual tandem wheel undercarriage

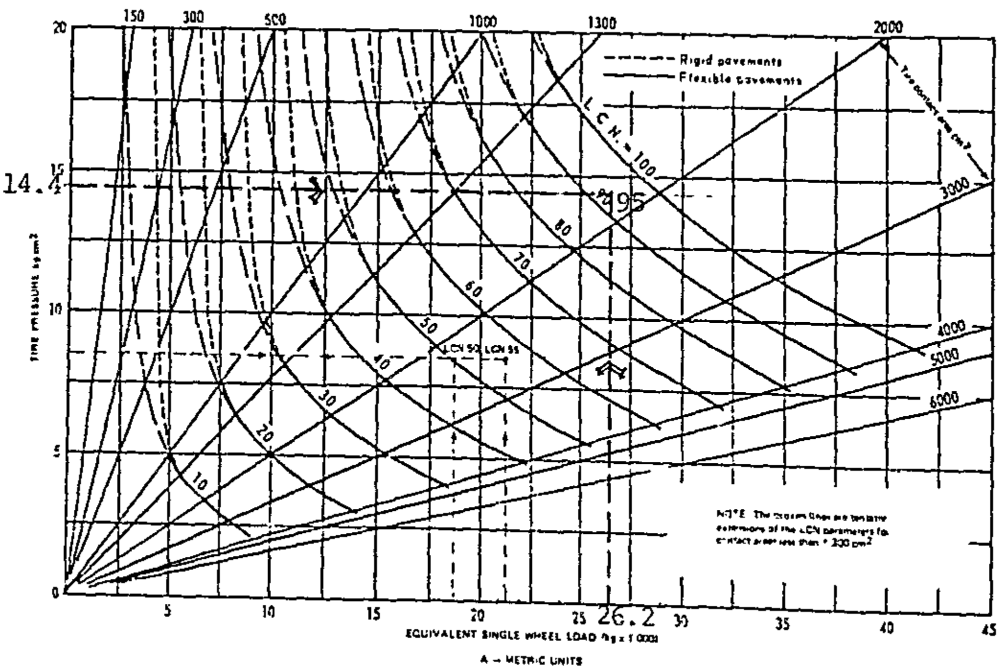
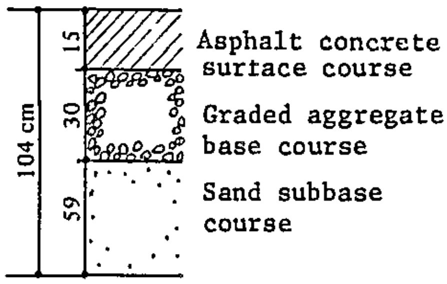
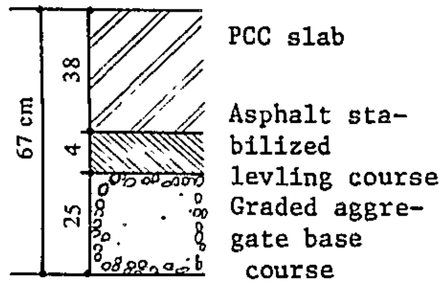


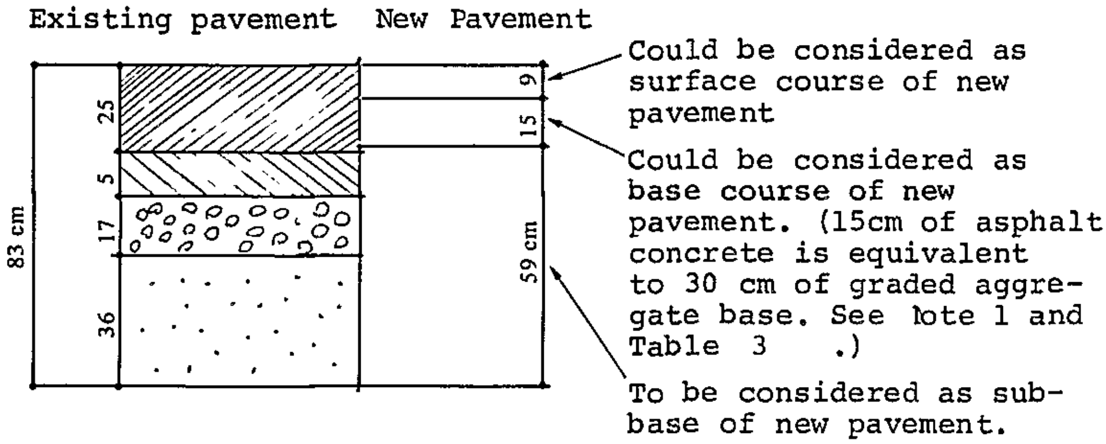
Fig. 5 LOAD CLASSIFICATION NUMBERS

TABLE 2 REQUIRED PAVEMENT STRUCTURE

Type of pavement	Flexible pavement	Rigid pavement
Pavement Structure		

ii) Evaluation of existing runway flexible pavement

Each component of the existing pavement structures of flexible runway pavement is evaluated as follows:



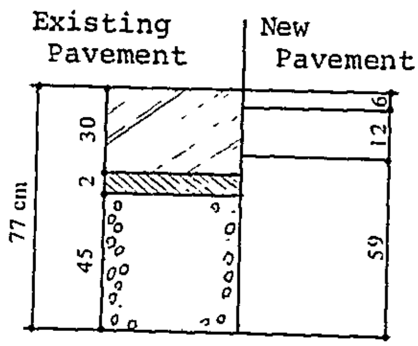
Based on the above analysis, it can be said that the existing flexible runway pavement structure is not sufficient for the 10,000 design load repetitions and at least 6 cm (15 - 9 cm) of flexible overlay will be required.

Note 1. According to the structural design standard of pavement by JCAB, the equivalency conversion factor of asphalt concrete materials to be graded for aggregate base is defined as 2.0 as shown in Table 3

TABLE 3 CONVERSION FACTOR FOR OVERLAY DESIGN

Materials of existing pavement structure	Conversion factor to base material of new pavement
Asphalt concrete surface course	2.0
PCC concrete slab	2.5
Graded aggregate base course	1.0

iii) Evaluation of existing rigid runway pavement
Each component of existing rigid runway pavement structure is also evaluated as follows:



Could be considered as surface course of new pavement.

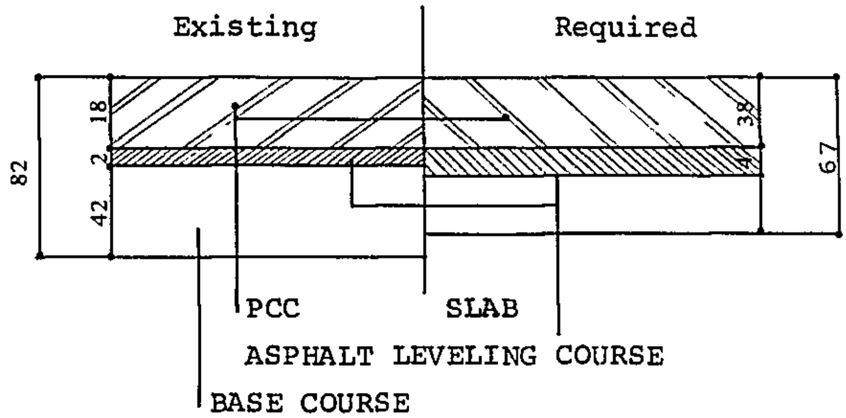
Could be considered as base course of new pavement (12 cm of PCC xlab is equivalent to 30 cm of graded aggregate base, See Table 3 .)

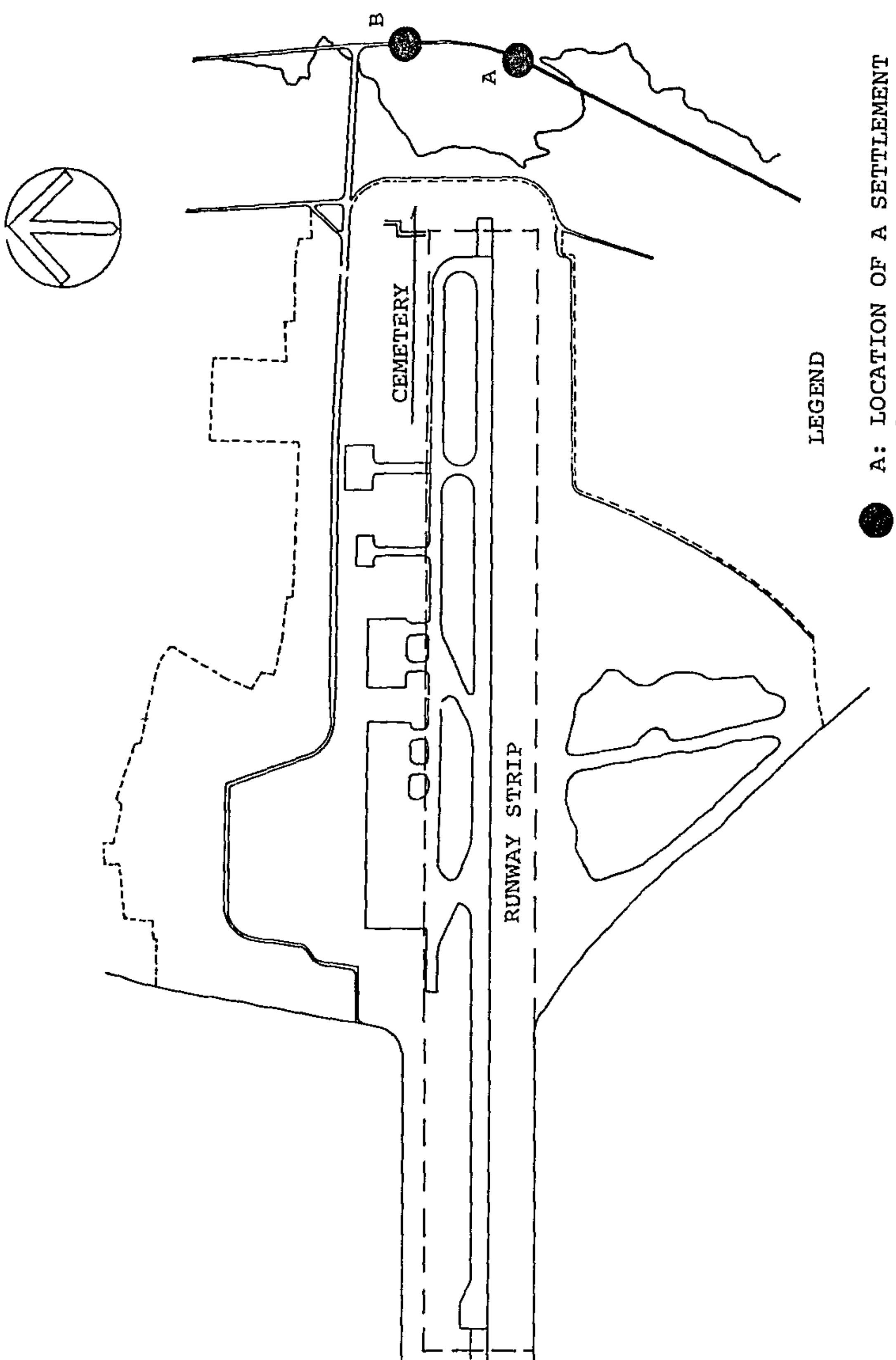
To be considered as subbase of new pavement.

According to the above analysis, it can be said that the existing rigid pavement structure of runway is not sufficient for the 10,000 design load repetitions, and at least 9.0 cm (15 - 6.0 cm) of flexible overlay will be required.

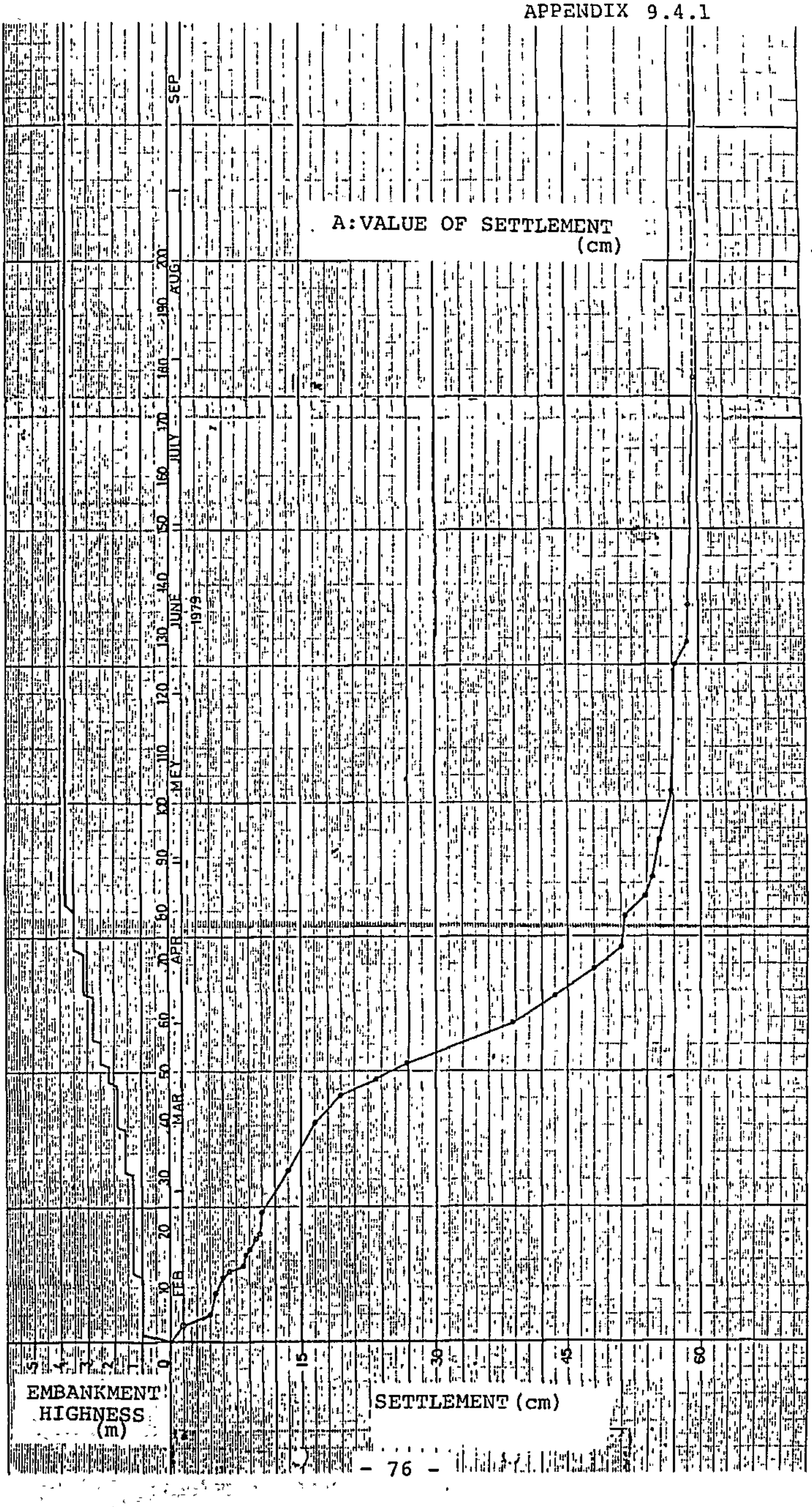
iv) Evaluation of existing rigid apron pavement
Based on the comparison between the existing and required rigid pavement structures in Fig. 6 below, it can be said that the existing rigid pavement structure for apron is sufficient for the 10,000 design load repetitions.

Fig. 6 Comparison of Rigid Pavement

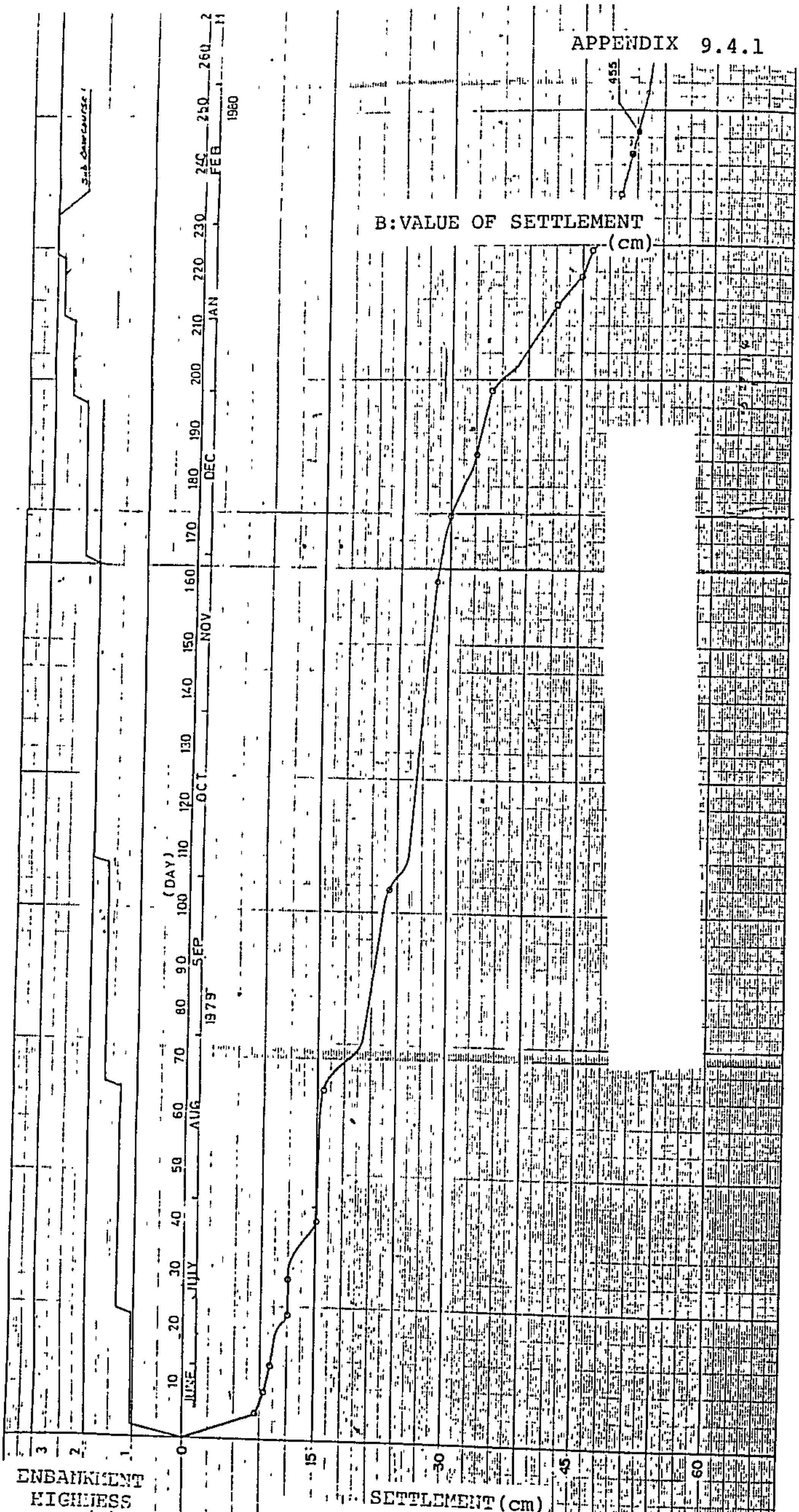




Data for Consolidation Settlement due to Embankment


A:VALUE OF SETTLEMENT
(cm)
SEP
AUG
JULY
JUNE
1979
MEY
APR
MAR
FEB
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
15
30
45
60
EMBANKMENT
HIGHNESS
(m)
SETTLEMENT (cm)

APPENDIX 9.4.1



Evaluation of Existing Storm Water Drainage System

Fig. A shows the existing storm water drainage system at BIA. The open ditch drainage system forapron , auto-parking and north-east side area of the new fire fighting station are functioning efficiently; however, the drainage system for the area of the landing strip is not functional due to the lack of proper surface water collecting devices although the underground piping networks are installed. It is recommended, therefore,to prepare an adequate surface water collecting system for the said area.

The capacity of drainage pipe installed on the north side edge of the apron is not sufficient for the expansion of apron and passenger terminal building, and therefore, a new pipe line parallel with the existing line will be required.

The drainage pipeline installed along the west side edge of the apron shall be relocated or demolished since a new parallel taxiway will be constructed on the existing drainage pipeline. The open channel installed parallel with the north side of existing parallel taxiway shall also be relocated for the same reason.

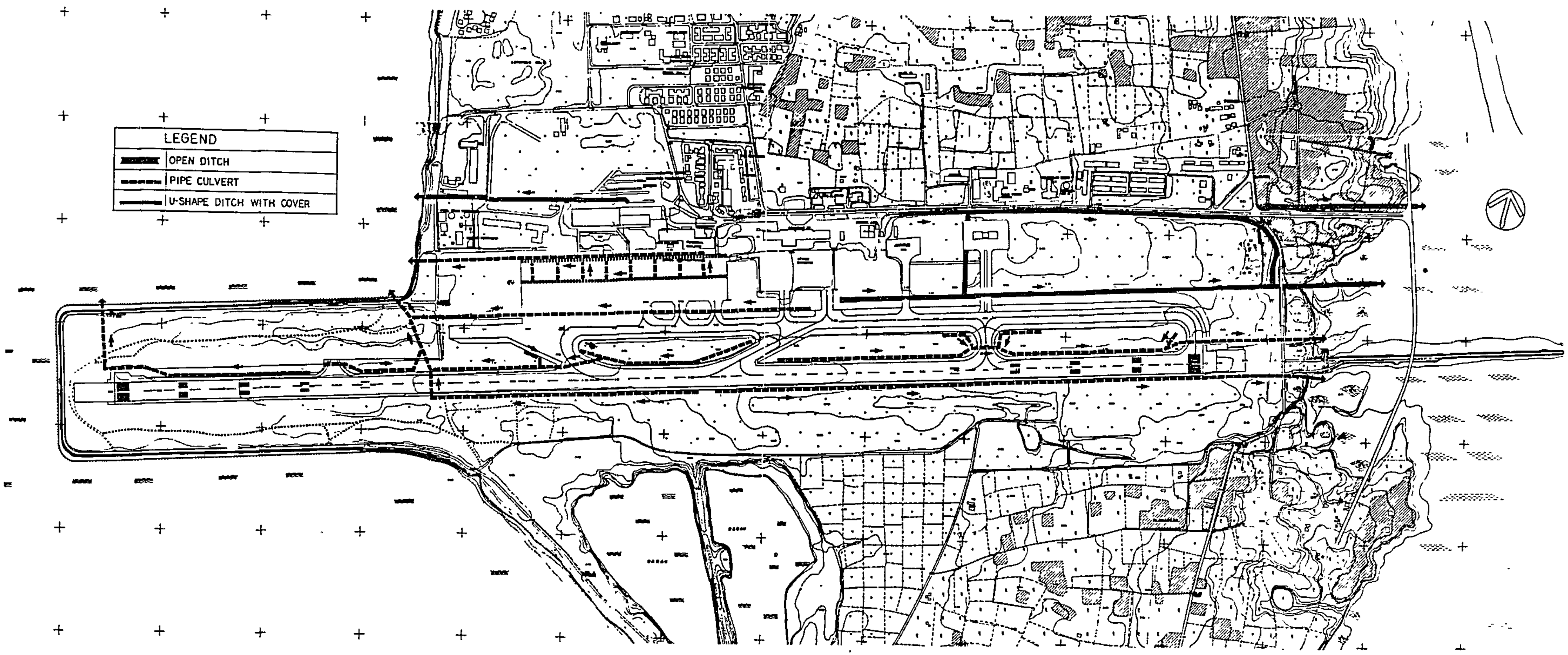


Fig. A EXISTING STORM WATER DRAINAGE SYSTEM

S=1:10000

Design criteria for storm water drainage system
The planning criteria employed for the stormwater drainage facilities requirement are summarized as as follows :

(a) Runoff estimation
The design peak rate of stormwater runoff is estimated by using the following Rational formula.

$$Q = 1/360 \times C \times I \times A$$

Where, Q : Peak rate of runoff in cu.m/sec
C : Runoff coefficient
I : Rainall intensity in mm/hr during the assumed design storm with a rainfall duration of t minutes.
A : Tributary area in ha.

(b) Runoff coefficients : C
Pavement area : 0.95
Building roof : 0.90
Sodding area : 0.40

(c) Rainfall intensity
The rainfall conditions of BIA is as follows :
The mean annual precipitation amounts to 1832mm. A distinct rainy season continues from November to March with daily precipitation ranging 75 mm to 330 mm as a maximum.
A maximum rainfall expected once 5 years is generally recommended for estimating runoff for airport stormwater drainage system design.
From the data of maximum daily rainfall precipitation in annum (1974 - 1981) obtained from BIA meteorological observatory, the maximum daily rainfall intensity is estimated as 200 mm/day for 5 yeras frequency. The rainfall intensity for the period of concentration required for the surface runoff to flow is estimated by the following formula and as shown in Fig. 9.3.2 .

$$It = \frac{R24}{24}\left(\frac{24}{t}\right)^{2/3}$$

Where, It : Intensity of rainfall for t time period (mm/hr)

R24: Maximum daily rainfall intensity (mm/day)

t : Duration of rainfall (hr.)

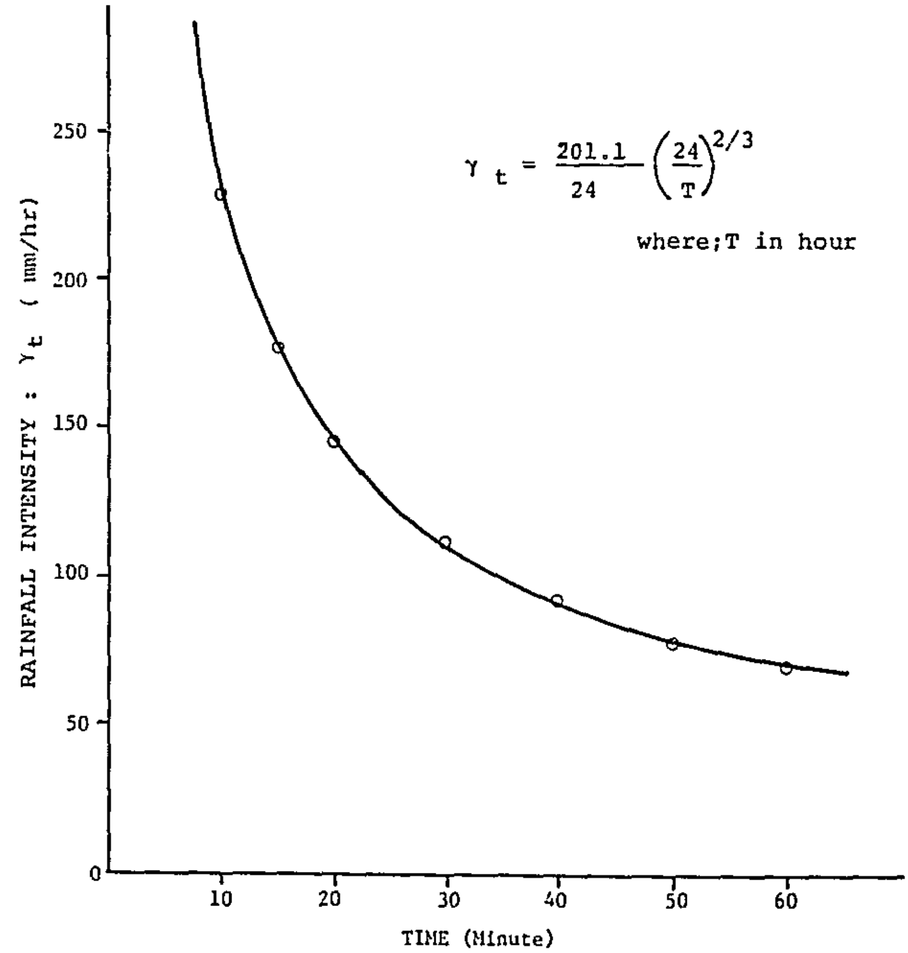
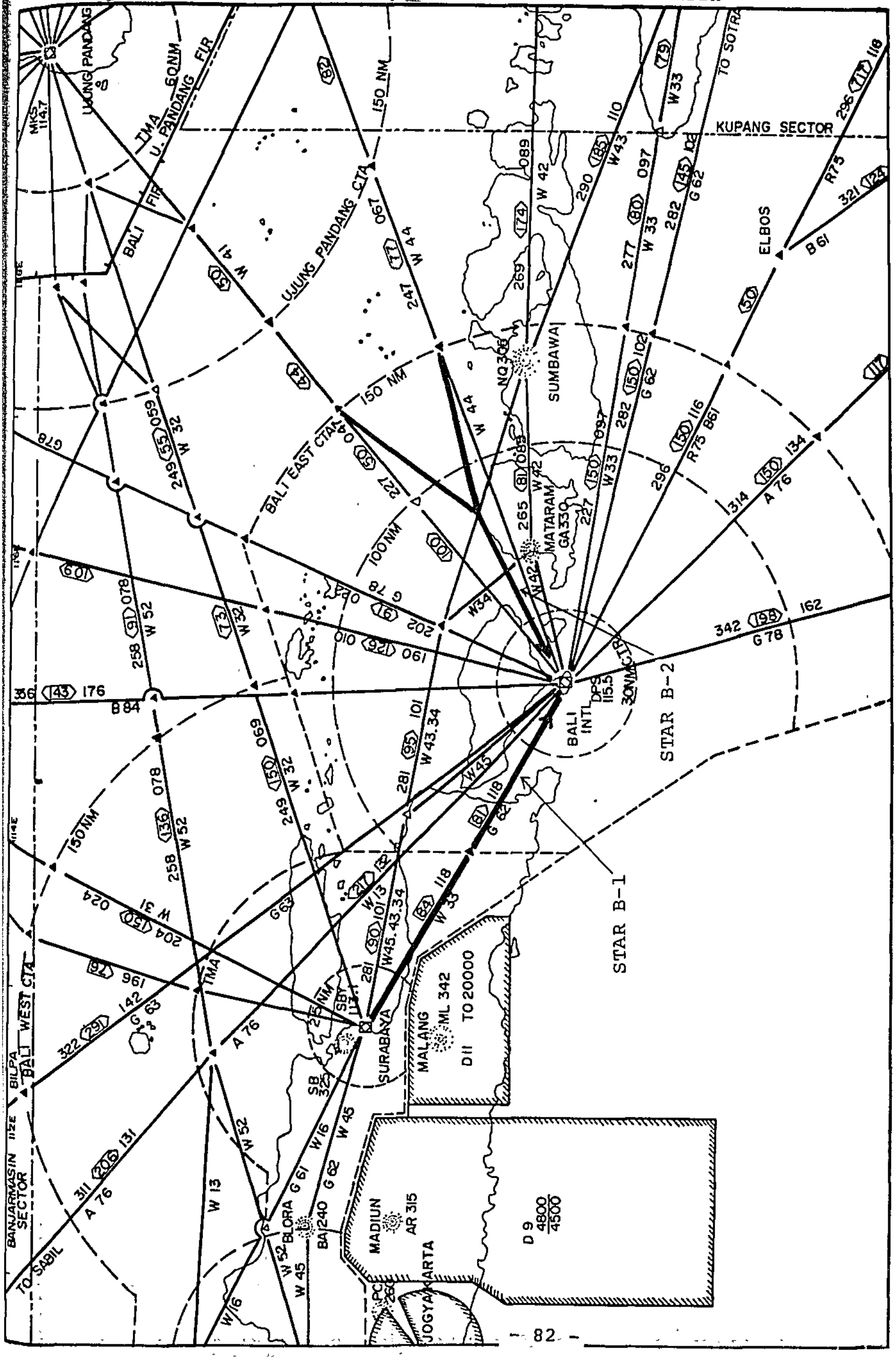
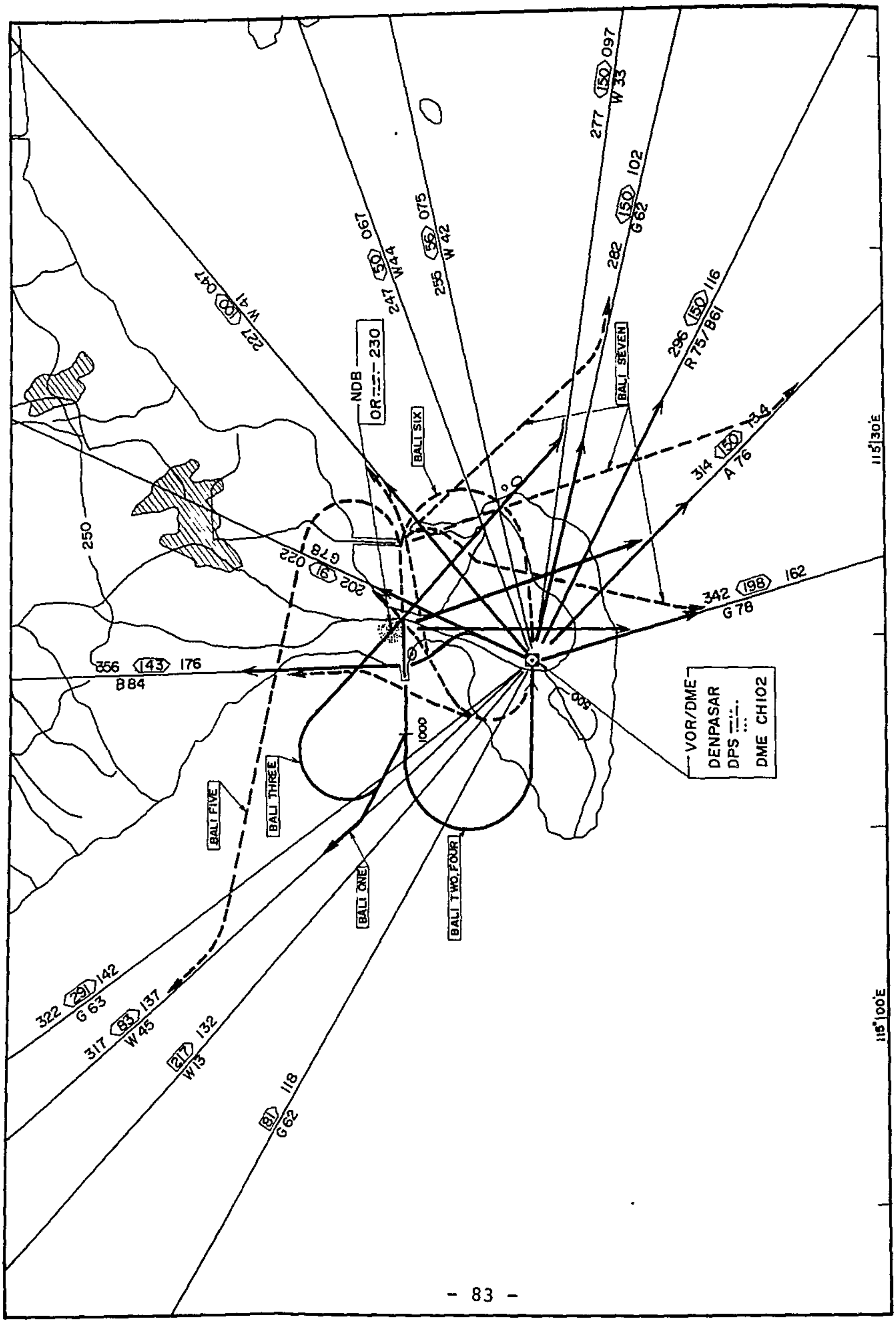


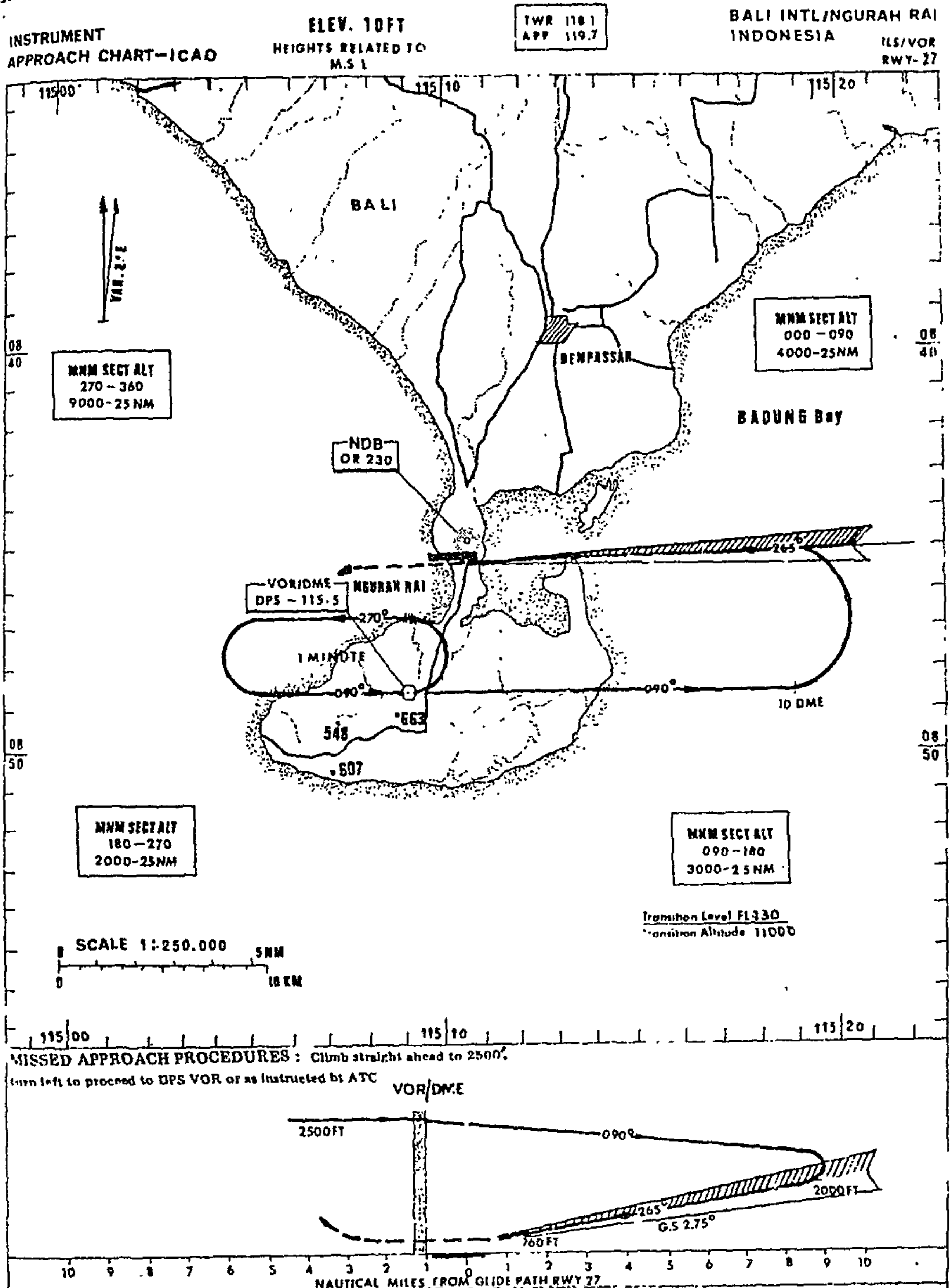
Fig.9.3.5 Rainfall intensity curve


KUPANG SECTOR
TO SOTRA
ELBOS
SUMBAWA
MATARAM
BALI INTL
DPS 115.5
STAR B-2
STAR B-1
BALI EAST CTA
UJUNG PANDANG CTA
BALI WEST CTA
SURABAYA
MALANG
MADIUN
BLORA
JOGYAKARTA
BANJARMASIN SECTOR
TO SABIL
BILPA
150 NM
100 NM

THE CURRENT SID AT BALI INT'L AIRPORT



THE CURRENT IAP AT BALI INTL AIEPORT



CEILING AND VISIBILITY MINIMA		
STR-IN	DAY : 300 – 3/4	NIGHT : 300 – 3/4
CIRCLING	DAY : 800 – 1 1/2	NIGHT : 800 – 1 1/2

TIME TO THE RWY FROM -DISTANCE NM

90 KT		120 KT		150 KT		180 KT		210 KT	
MIN	SEC	MIN	SEC	MIN	SEC	MIN	SEC	MIN	SEC

Directorate General of Air Communications, Indonesia.

30 Dec 77

APPENDIX 9.5.3

THE CURRENT IAP AT BALI INTL AIRPORT

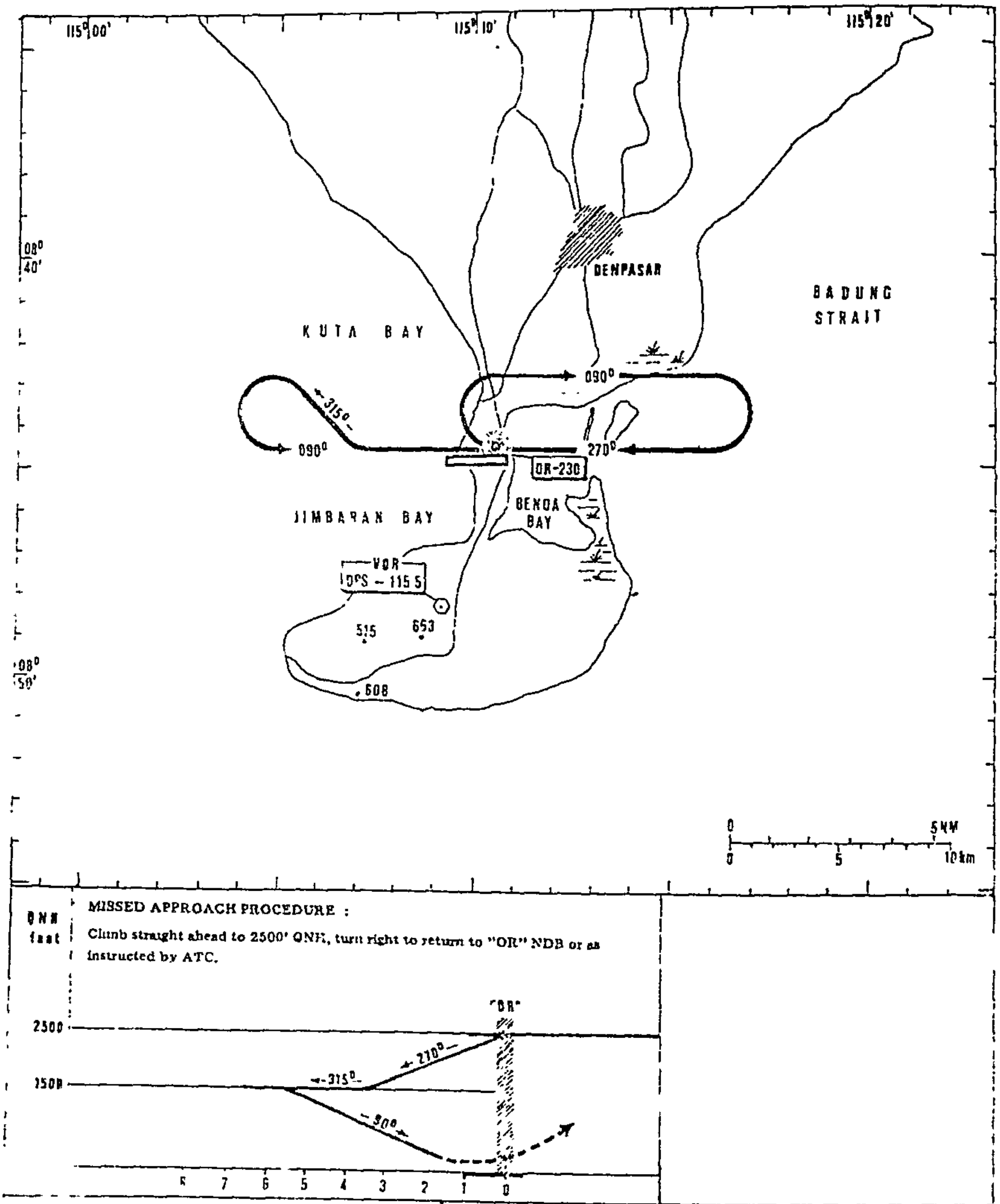
INSTRUMENT
APPROACH CHART - ICAO

ELEV. 10 FT
HEIGHTS RELATED
TO MEAN SEA LEVEL

TWR : 118.1
APP : 119.7

BALI INTL/NGURAH RAI
INDONESIA

NDB
RWY 09



CEILING AND VISIBILITY MINIMA			TIME TO THR RWY FROM DISTANCE NM				
TAKE OFF	DAY	NIGHT	90 KT	120 KT	150 KT	180 KT	210 KT
LANDING	DAY	NIGHT	MIN SEC	MIN SEC	MIN SEC	MIN SEC	MIN SEC

Directorate General of Air Communications, Indonesia

17 Jun 76

THE CURRENT IAP AT BALI INTL AIRPORT

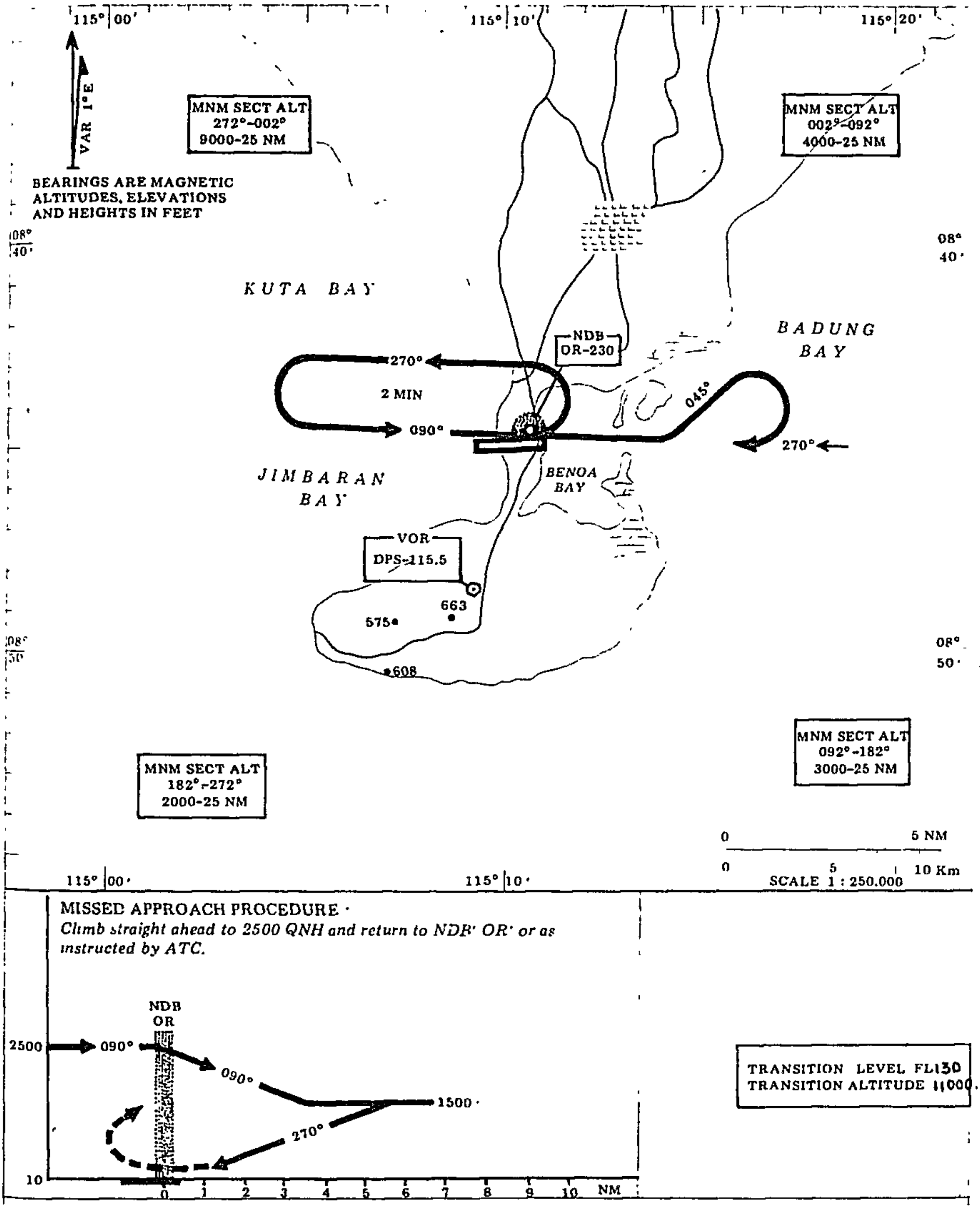
INSTRUMENT
APPROACH CHART - ICAO

ELEV. 10 FT
HEIGHTS RELATED
TO AERODROME ELEV.

TWR : 118.1
APP : 119.7

BALI INTL/NGURAH RAI
INDONESIA

NDB
RWY 27

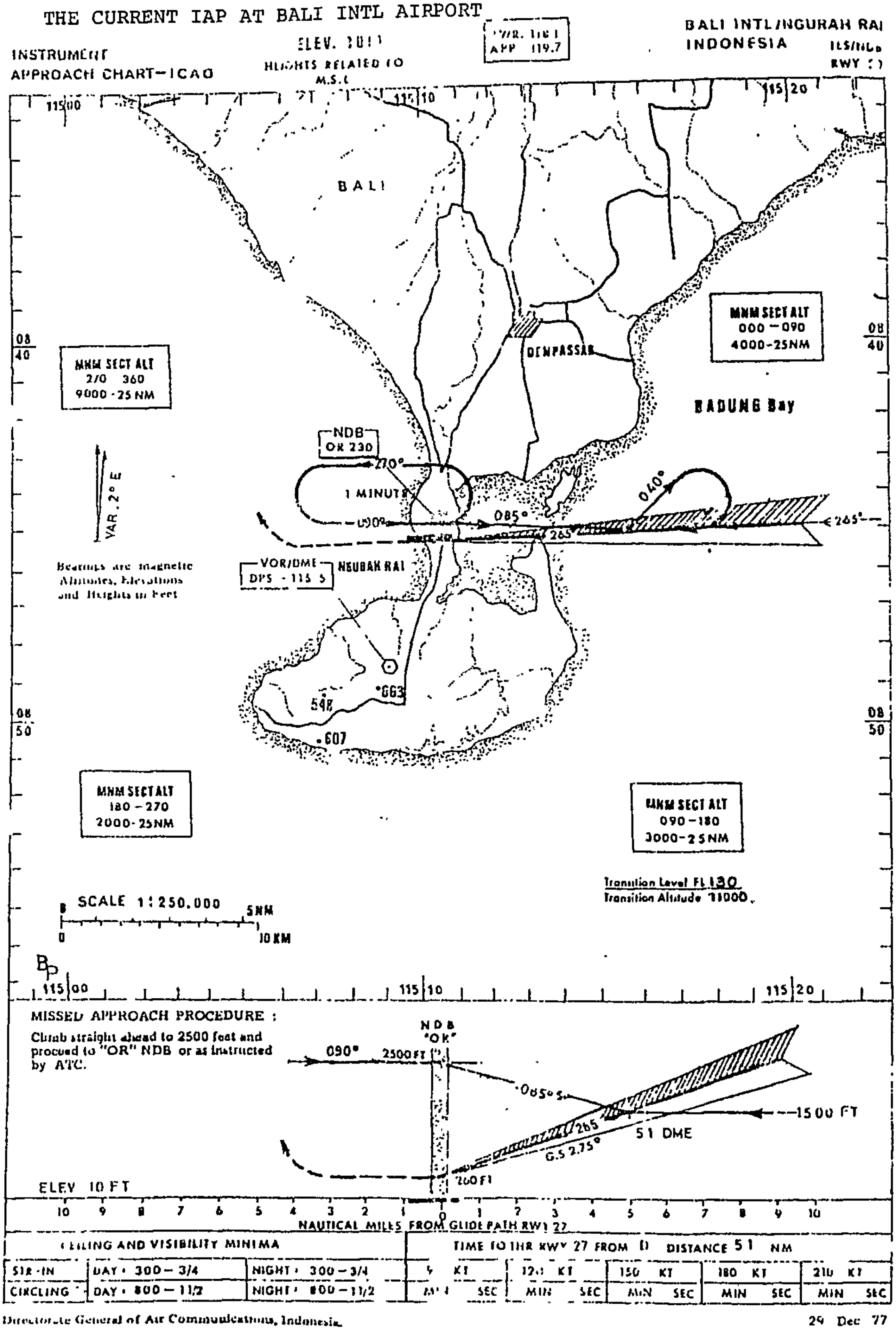


CEILING AND VISIBILITY MINIMA			TIME TO THR RWY FROM DISTANCE NM				
TAKE OFF	DAY	NIGHT	90 KT	120 KT	150 KT	180 KT	210 KT
LANDING	DAY	NIGHT	MIN SEC	MIN SEC	MIN SEC	MIN SEC	MIN SEC

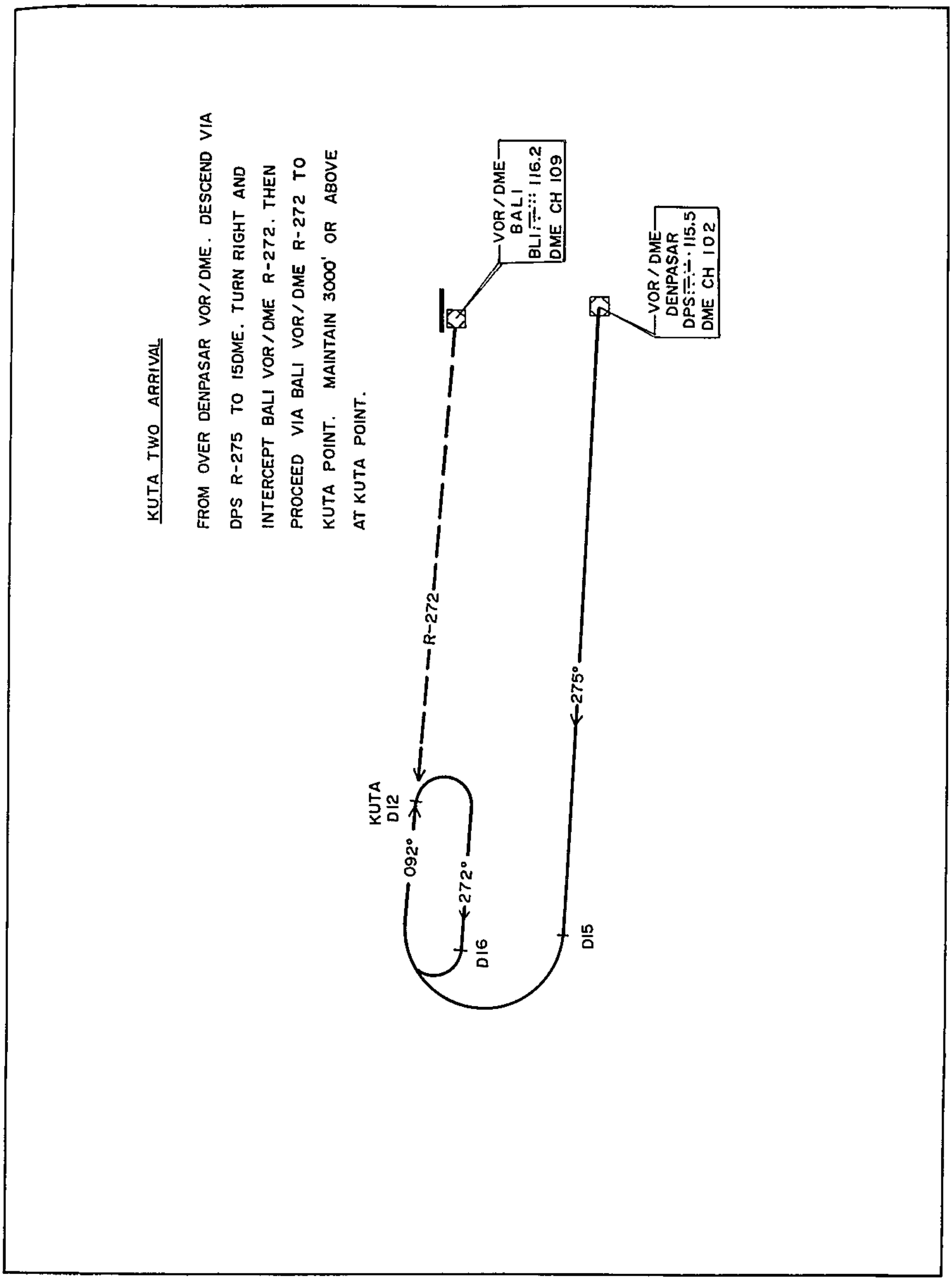
Directorate General of Air Communications, Indonesia 27 Feb '75

APPENDIX 9.5.3

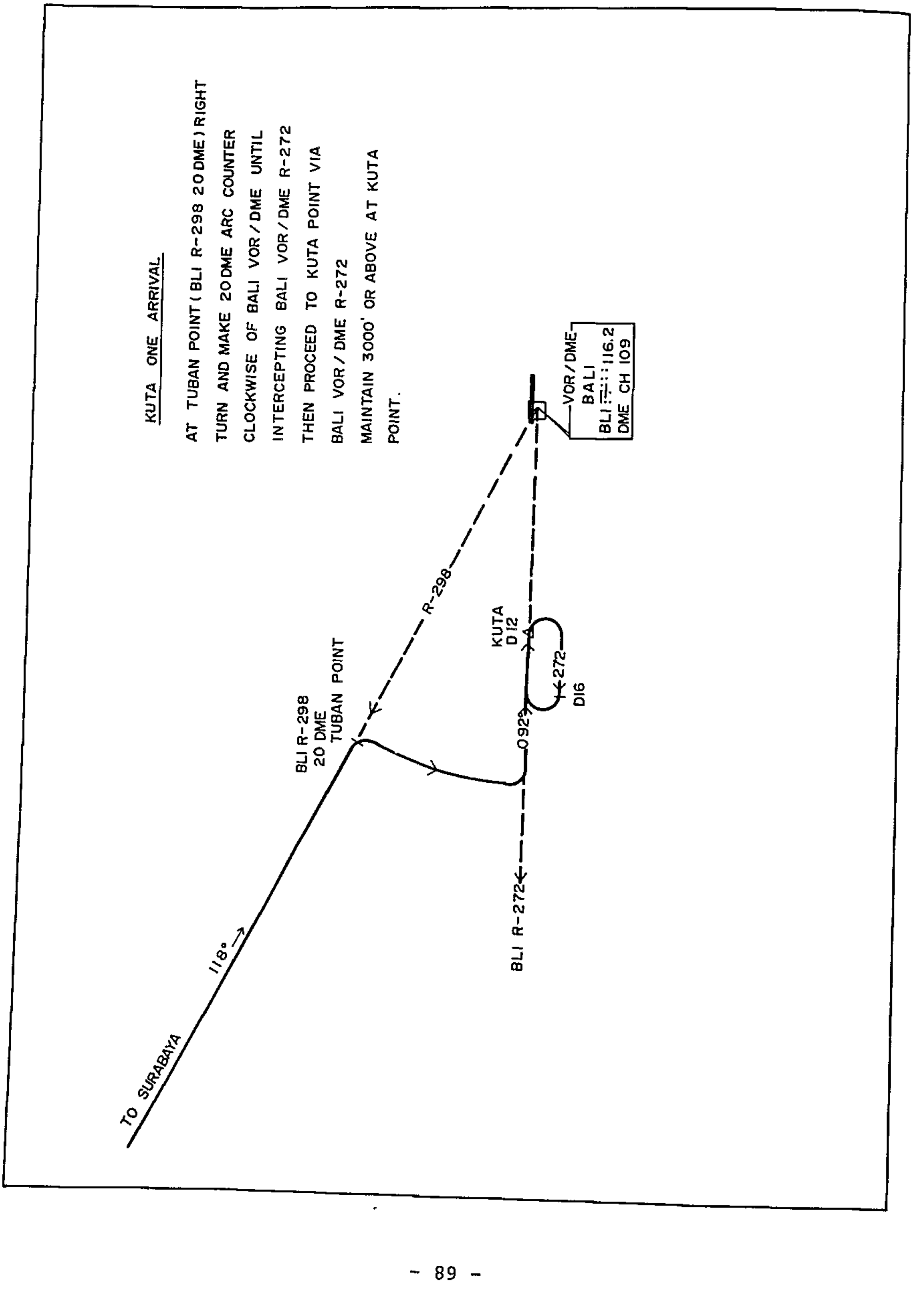
THE CURRENT IAP AT BALI INTL AIRPORT



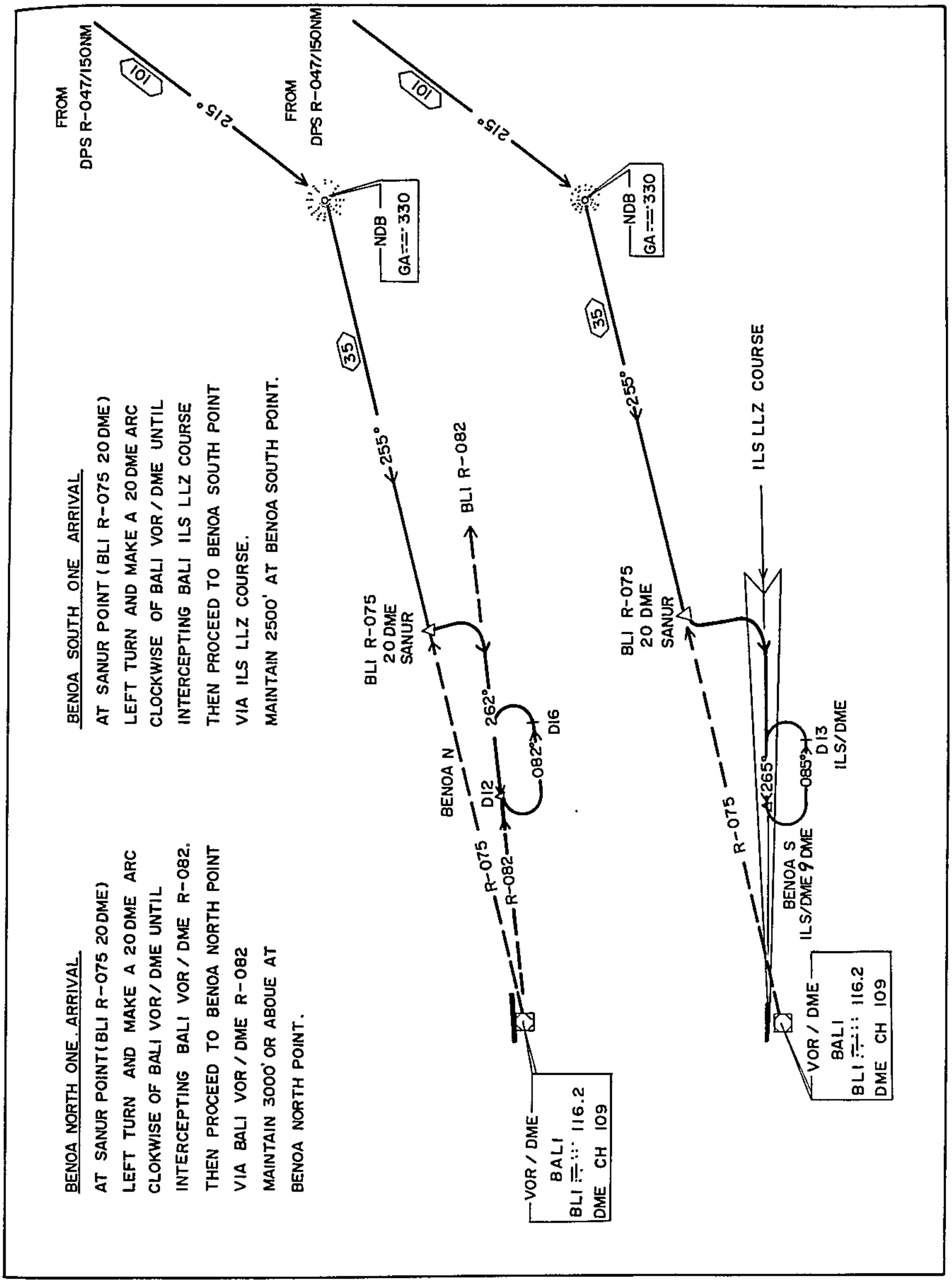
ONE OF THE RECOMMENDED STAR FOR BALI INT'L AIRPORT



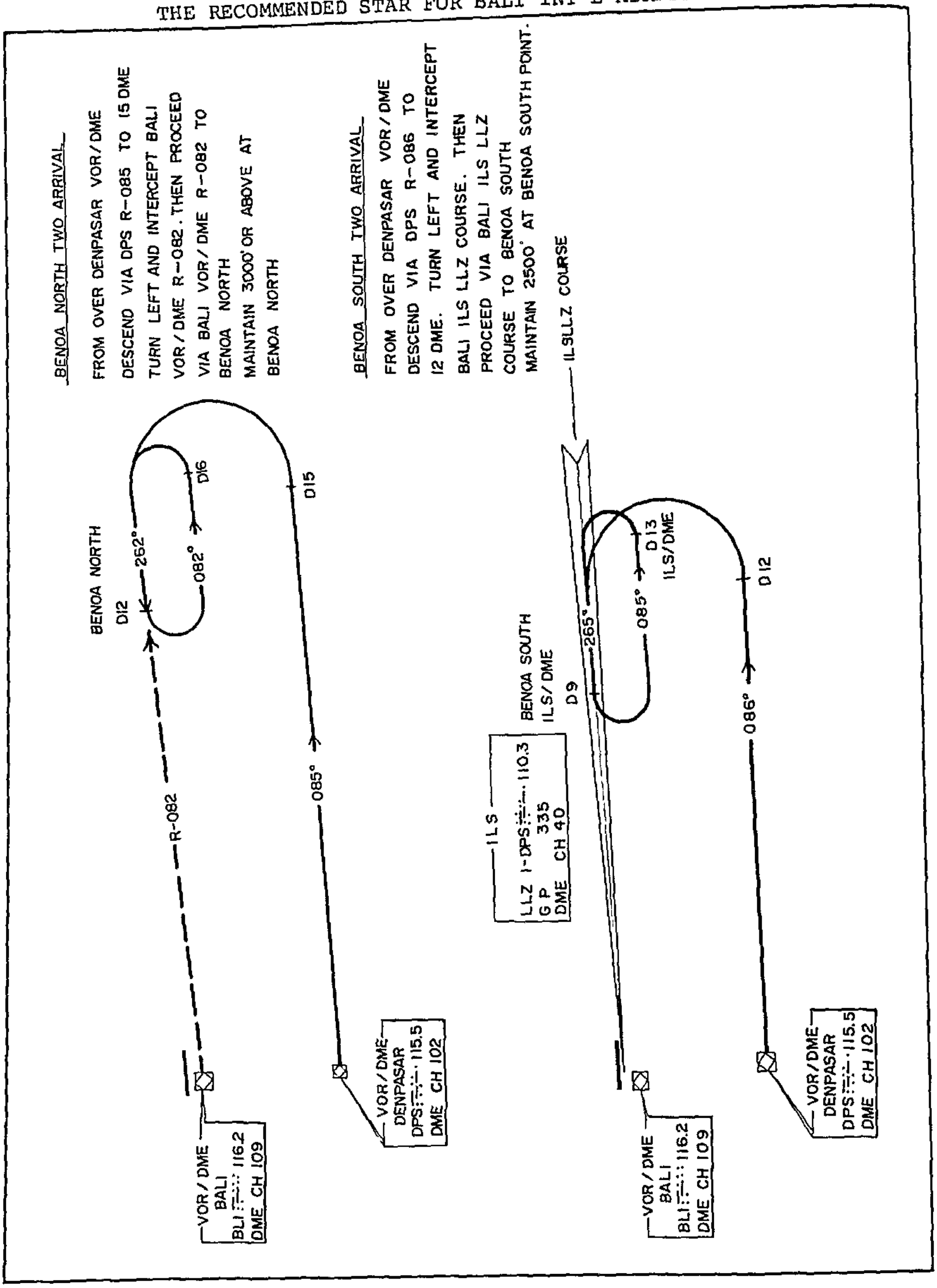
ONE OF THE RECOMMENDED STAR FOR BALI INT'L AIRPORT



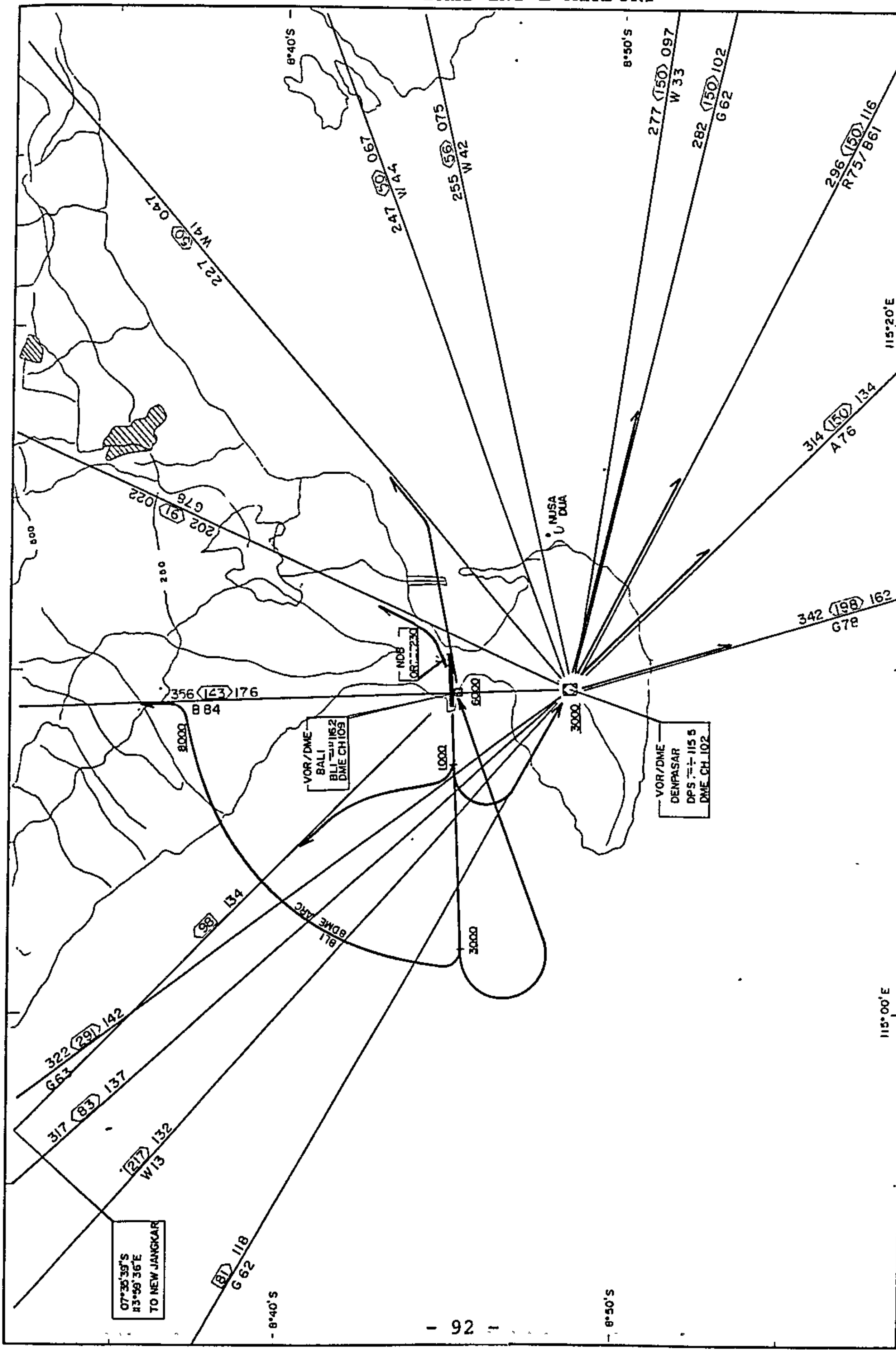
THE RECOMMENDED STAR FOR BALI INT'L AIRPORT



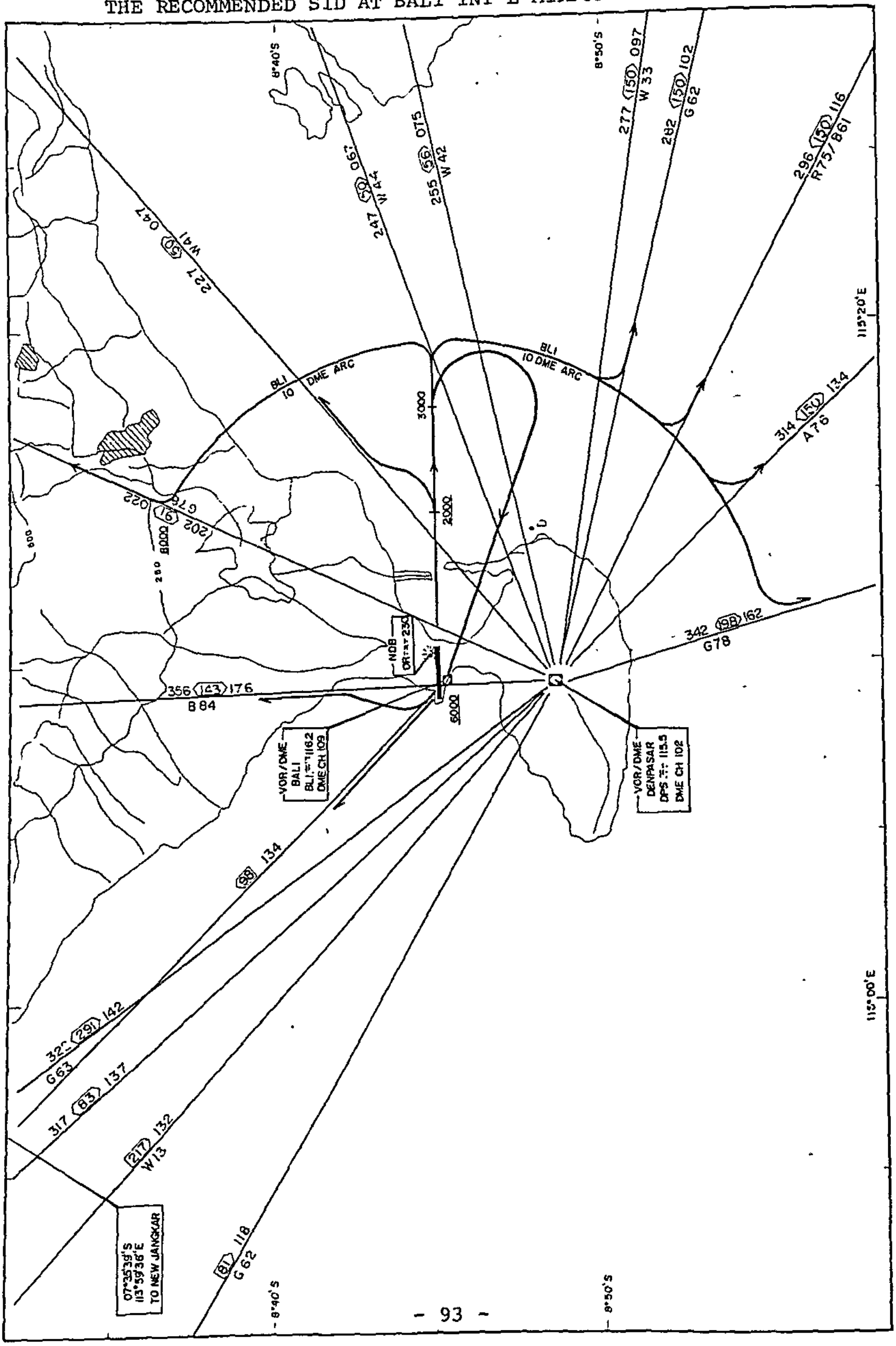
THE RECOMMENDED STAR FOR BALI INT'L AIRPORT



THE RECOMMENDED SID AT BALI INT'L AIRPORT

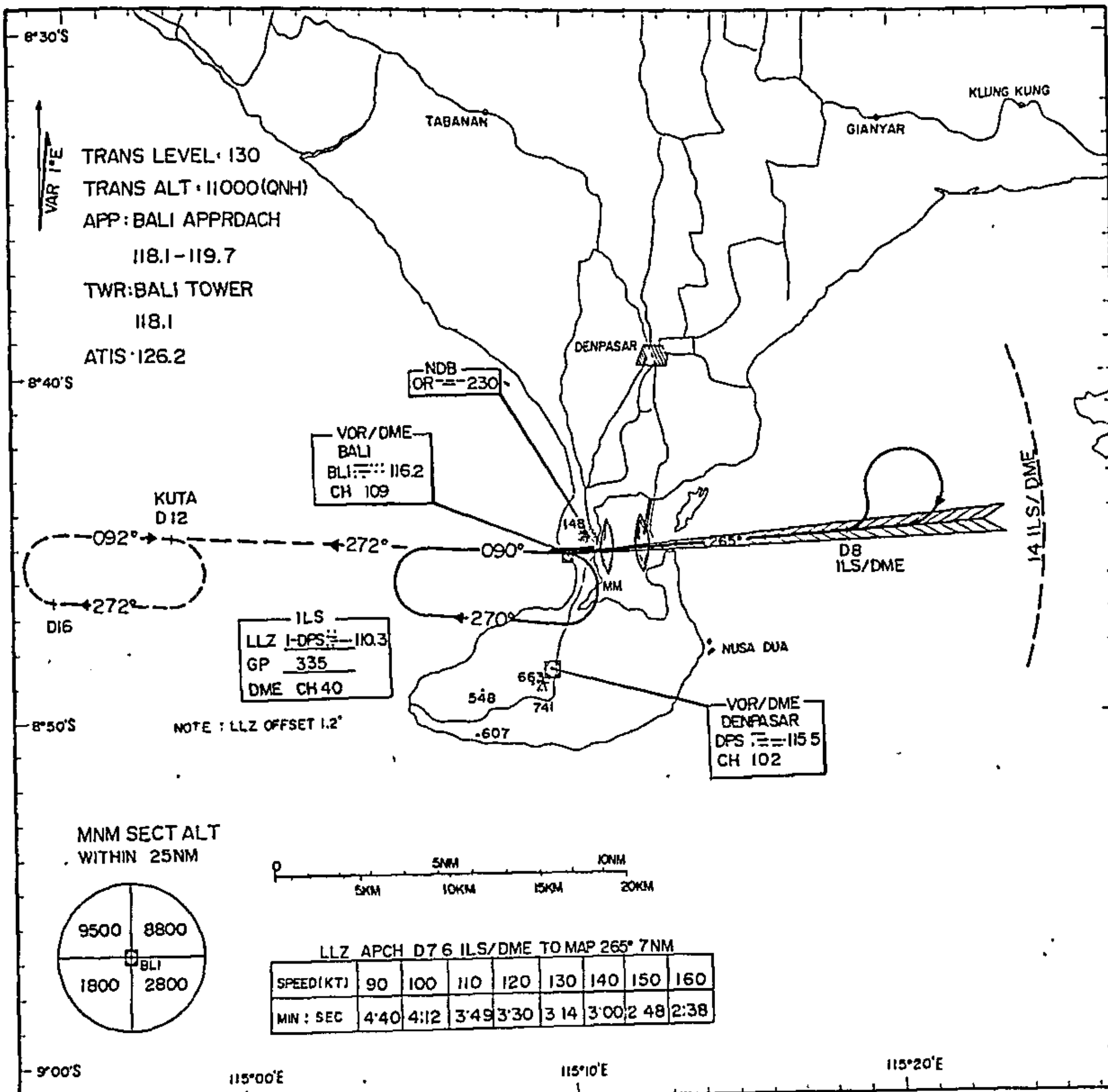


THE RECOMMENDED SID AT BALI INT'L AIRPORT



ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

INSTRUMENT APPROACH CHART-ICAO | AERODROME ELEV 10 FT | BALI INTL / NGURAH RAI INDONESIA | VOR/ILS A RWY 27

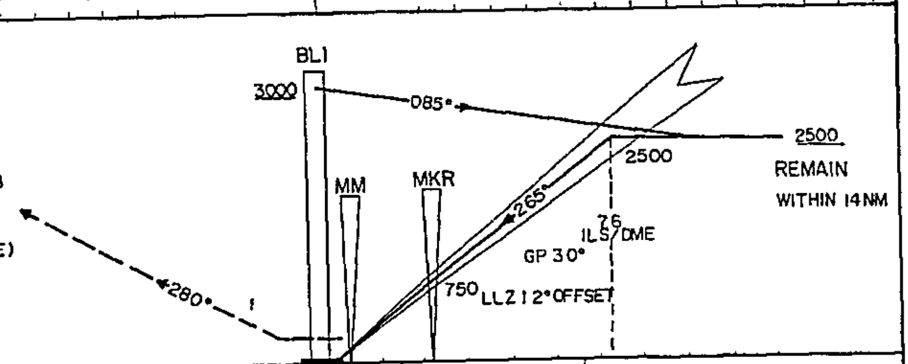


LLZ APCH D7.6 ILS/DME TO MAP 265° 7NM

SPEED (KT)	90	100	110	120	130	140	150	160
MIN : SEC	4'40	4'12	3'49	3'30	3 14	3'00	2 48	2:38

MISSED APPROACH

AT DH CLIMB TO 500'
THEN RIGHT TURN CLIMB
TO 3000 ON R-272
TO KUTA (R-272 / 12 DME)
AND HOLD.
CONTACT ATC.

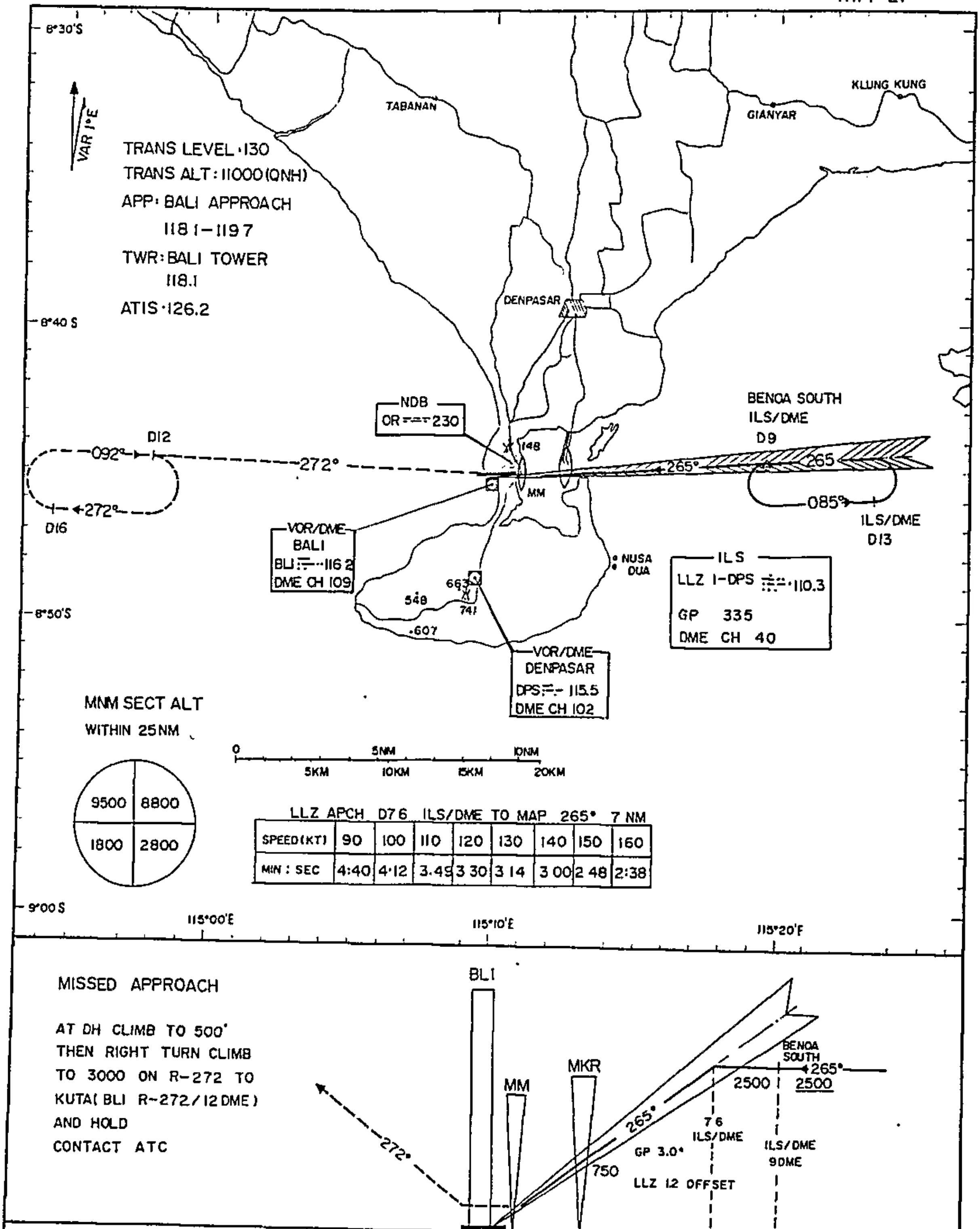


STA TO RWY 27

	ILS DH 260' ALS AVBL	ILS DH 260' ALS OUT	MM OUT DH 260' ALS AVBL	MM OUT DH 260' ALS OUT	GP OUT MDA 320' ALS AVBL	GP OUT MDA 320' ALS OUT	CIRCLING
	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	MDA-VIS
A							460'-1900M
B	1000M	1200M	1000M	1200M	1200M	1400M	520'-2800M
C							1160'-3700M
D	1200M		1200M			1600M	1160'-4600M

ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

INSTRUMENT APPROACH CHART–ICAO	AERODROME ELEV 10 FT	BALI INTL/NGURAH RAI INDONESIA	VOR/ILS B RWY 27



LLZ APCH D7.6 ILS/DME TO MAP 265° 7 NM

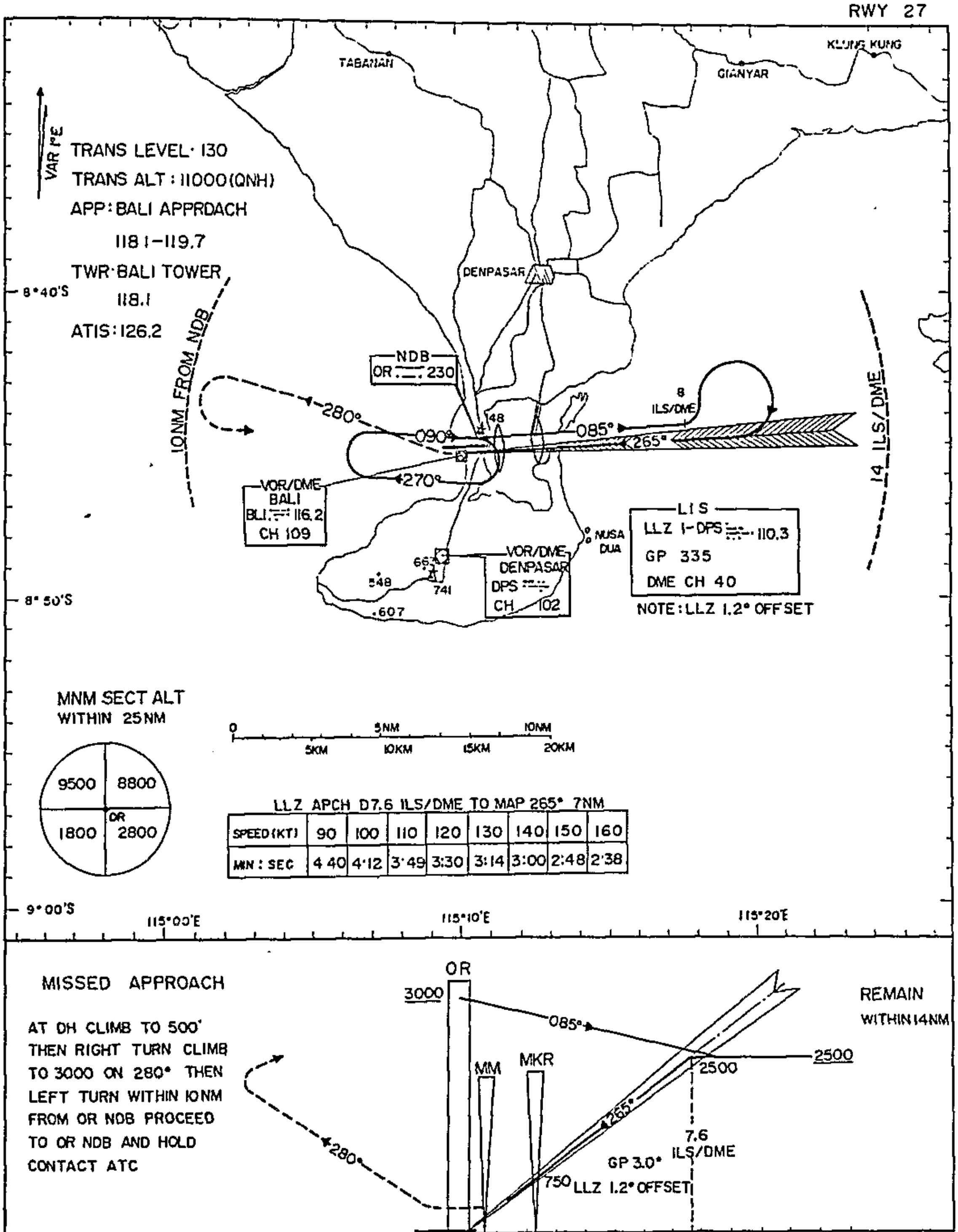
SPEED (KT)	90	100	110	120	130	140	150	160
MIN : SEC	4:40	4:12	3.49	3 30	3 14	3 00	2 48	2:38

STA TO RWY 27

<table>
<tr><th rowspan="3"></th><th colspan="2">ILS DH 260'</th><th colspan="2">MM OUT DH 260'</th><th colspan="2">GP OUT MDA 320'</th><th rowspan="2">CIRCLING</th></tr>
<tr><th>ALS AVBL</th><th>ALS OUT</th><th>ALS AVBL</th><th>ALS OUT</th><th>ALS AVBL</th><th>ALS OUT</th></tr>
<tr><th>RVR OR VIS</th><th>RVR OR VIS</th><th>RVR OR VIS</th><th>RVR OR VIS</th><th>RVR OR VIS</th><th>RVR OR VIS</th><th>MDA – VIS</th></tr>
<tr><td>A</td><td rowspan="3">1000M</td><td rowspan="4">1200M</td><td rowspan="3">1000M</td><td rowspan="4">1200M</td><td rowspan="4">1200M</td><td rowspan="3">1400M</td><td>460' – 1900M</td></tr>
<tr><td>B</td><td>520' – 2800M</td></tr>
<tr><td>C</td><td>1160' – 3700M</td></tr>
<tr><td>D</td><td>1200M</td><td>1200M</td><td>1600M</td><td>1160' – 4600M</td></tr>
</table>

ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

INSTRUMENT APPROACH CHART-ICAO | AERODROME ELEV 10FT | BALI INTL / NGURAH RAI INDONESIA | ADF / ILS RWY 27



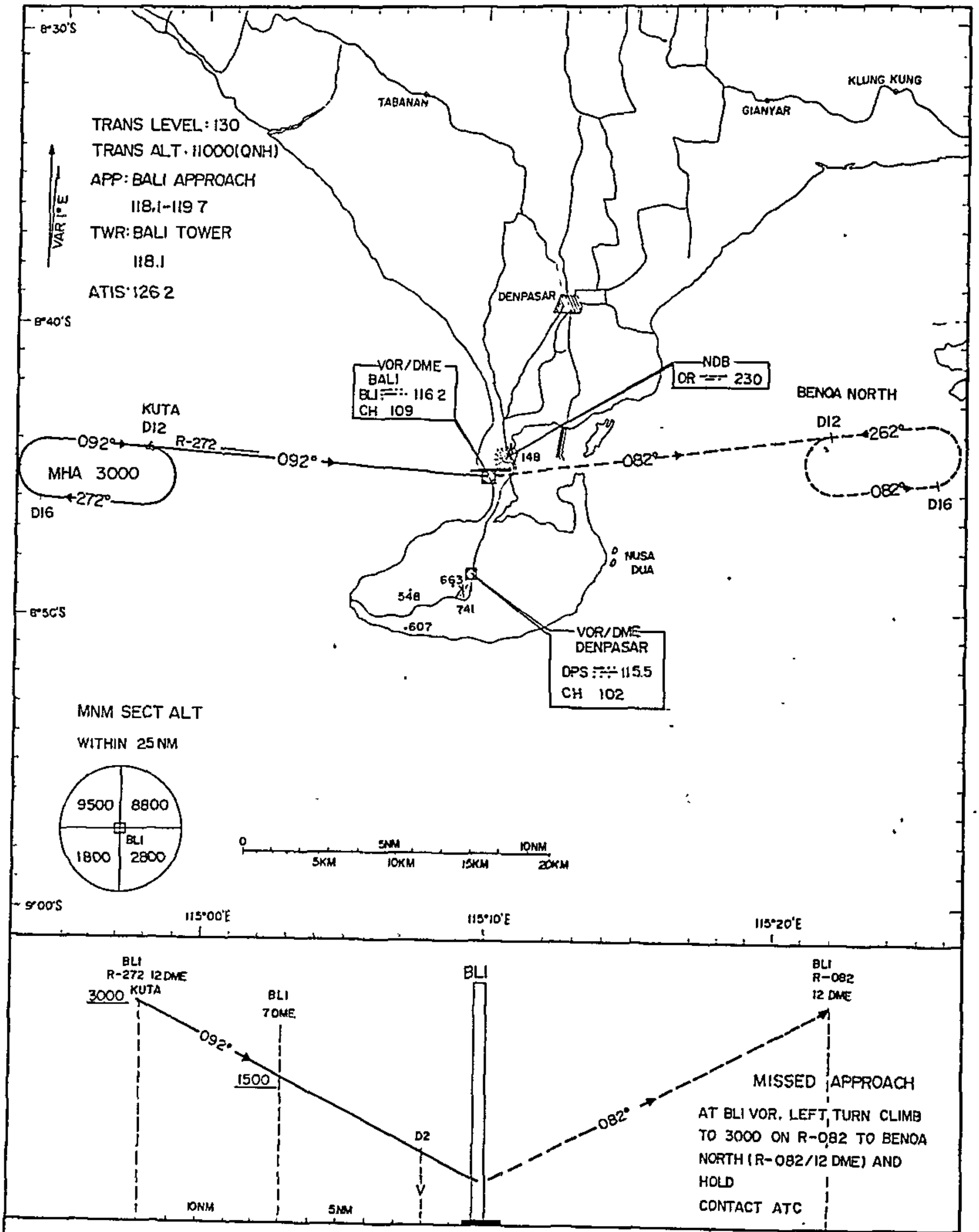
SPEED (KT)	90	100	110	120	130	140	150	160
MIN : SEC	4 40	4:12	3:49	3:30	3:14	3:00	2:48	2:38

STA TO RWY 27

	ILS DH 260'		MM OUT DH 260'		GP OUT MDA 320'		CIRCLING
	ALS AVBL	ALS OUT	ALS AVBL	ALS OUT	ALS AVBL	ALS OUT	
	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	RVR OR VIS	MDA – VIS
A	1000M	1200M	1000M	1200M	1200M	1400M	460' – 1900M
B							520' – 2800M
C							1160' – 3700M
D	1200M		1200M			1600M	1160' – 4600M

ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

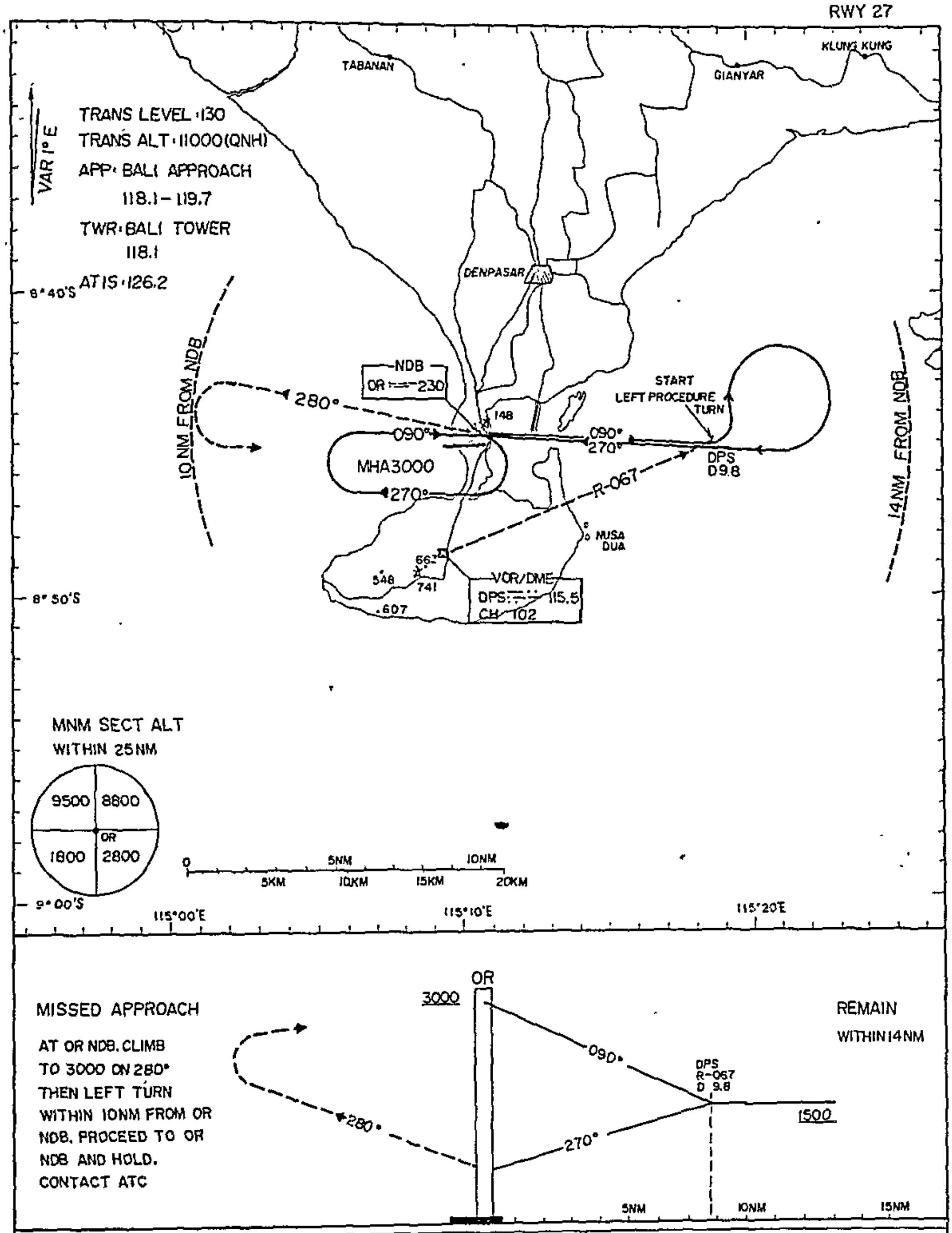
INSTRUMENT APPROACH CHART – ICAO	AERODROME ELEV 10 FT	BALI INTL / NGURAH RAI INDONESIA VOR/DME RWY 09



	STA TO RWY 09 MDA 460'	CIRCLING MDA – VIS
A	VIS RVR 1600M	460' – 1900M
B		520' – 2800M
C		1160' – 3700M
D	VIS 2600M	1160' – 4600M

ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

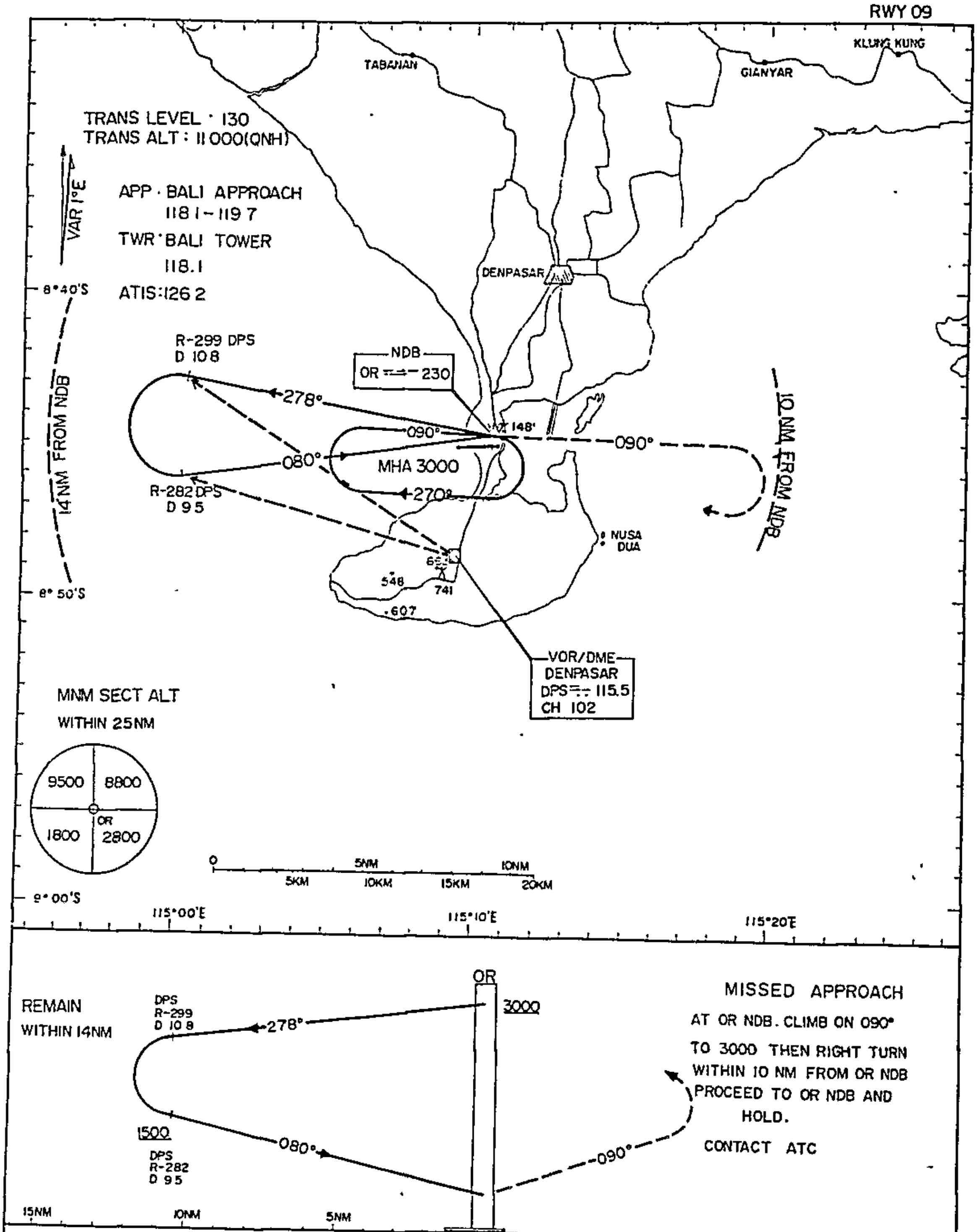
INSTRUMENT APPROACH CHART - ICAO	AERODROME ELEV 10FT	BALI INTL/NGURAH RAI INDONESIA	ADF RWY 27



	STA TO RWY 27 MDA 460'		CIRCLING
	ALS AVBL	ALS OUT	MDA - VIS
A	VIS 1800M	VIS 2600M	460' - 1900M
B			520' - 2800M
C			1160' - 3700M
D			1160' - 4600M

ONE OF THE RECOMMENDED IAP AT BALI INT'L AIRPORT

INSTRUMENT APPROACH CHART—ICAO | AERODROME ELEV 10 FT | BALI INTL / NGURAH RAI INDONESIA | ADF RWY 09

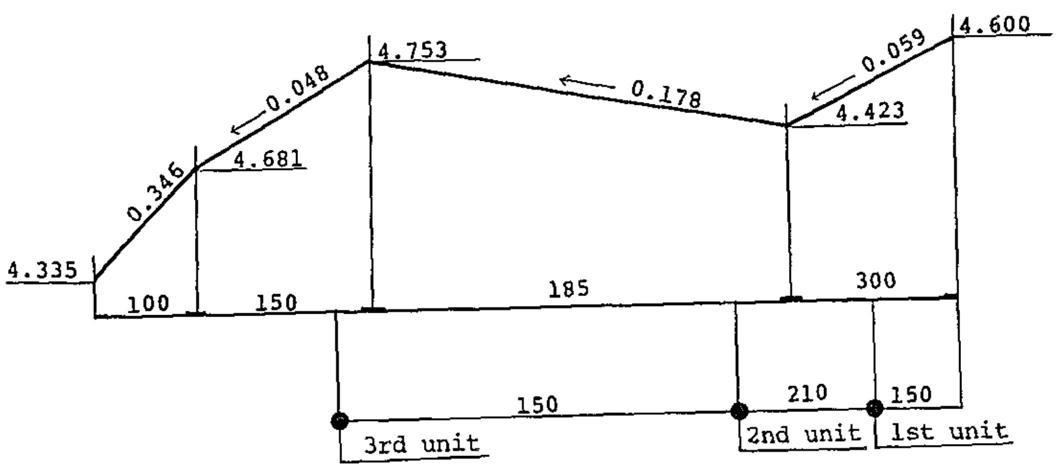


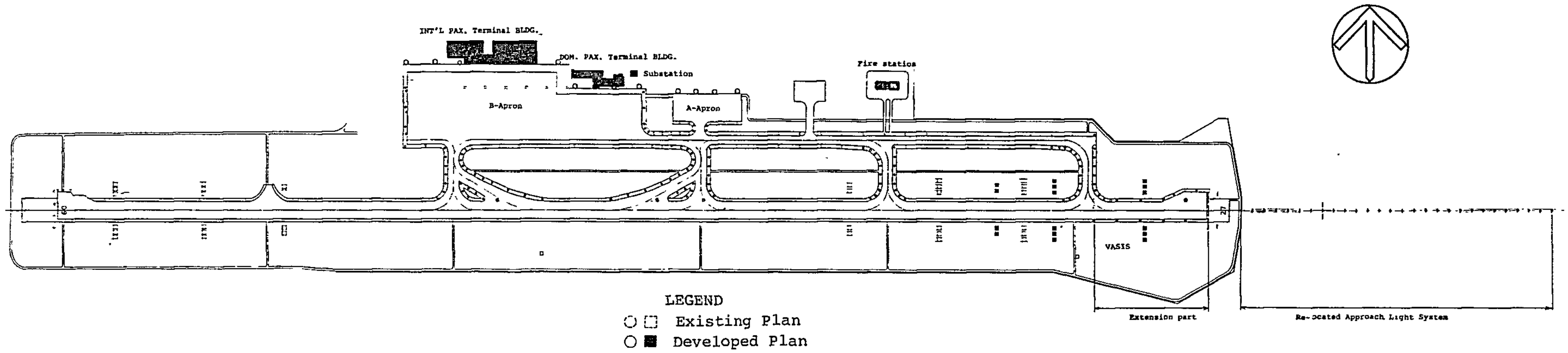
	STA TO RWY 09 MDA 460'	CIRCLING MDA – VIS
A	RVR VIS 1600M	460' – 1900M
B		520' – 2800M
C		1160' – 3700M
D	VIS 2600M	1160' – 4600M

THE RELOCATION OF THE V.A.S.I's UNIT.

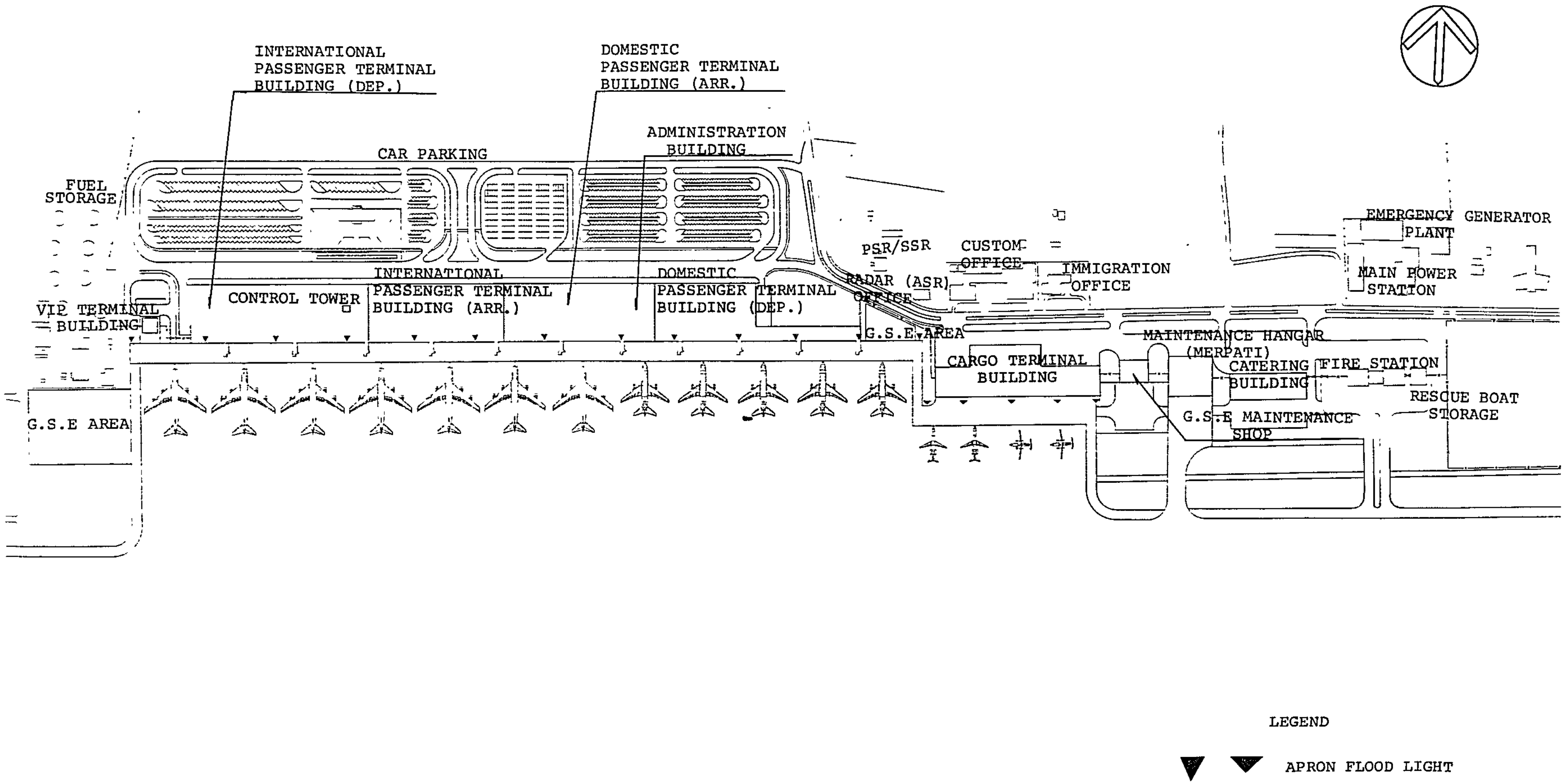
To relocate the Visual Approach Slope Indicatór System, it is necessary to confirm with the profile of the runway slope for the 300m expanded condition.
The design condition are as follows,

- System : 3- Bar
- Glide Slope : 3°
- Runway Profile : Shown drawing below,





LAYOUT PLAN OF AIRFIELD LIGHTING SYSTEM OF THE SHORT TERM PLAN S=1:10,000



LAYOUT OF FLOOD LIGHT (2010)

S= 1:4,000

Boarding Bridge Installation

BIA is an international airport which is the main eastern gate way for Indonesia, and it is the second largest international airport in Indonesia based on the annual passenger volume in 1981. Moreover, annual passenger volumes are forecast to be about 2.4 million by the year 1990.

It is strongly recommended, therefore, that boarding bridges be installed in order to handle a large number of passengers safely and smoothly within a short time period.

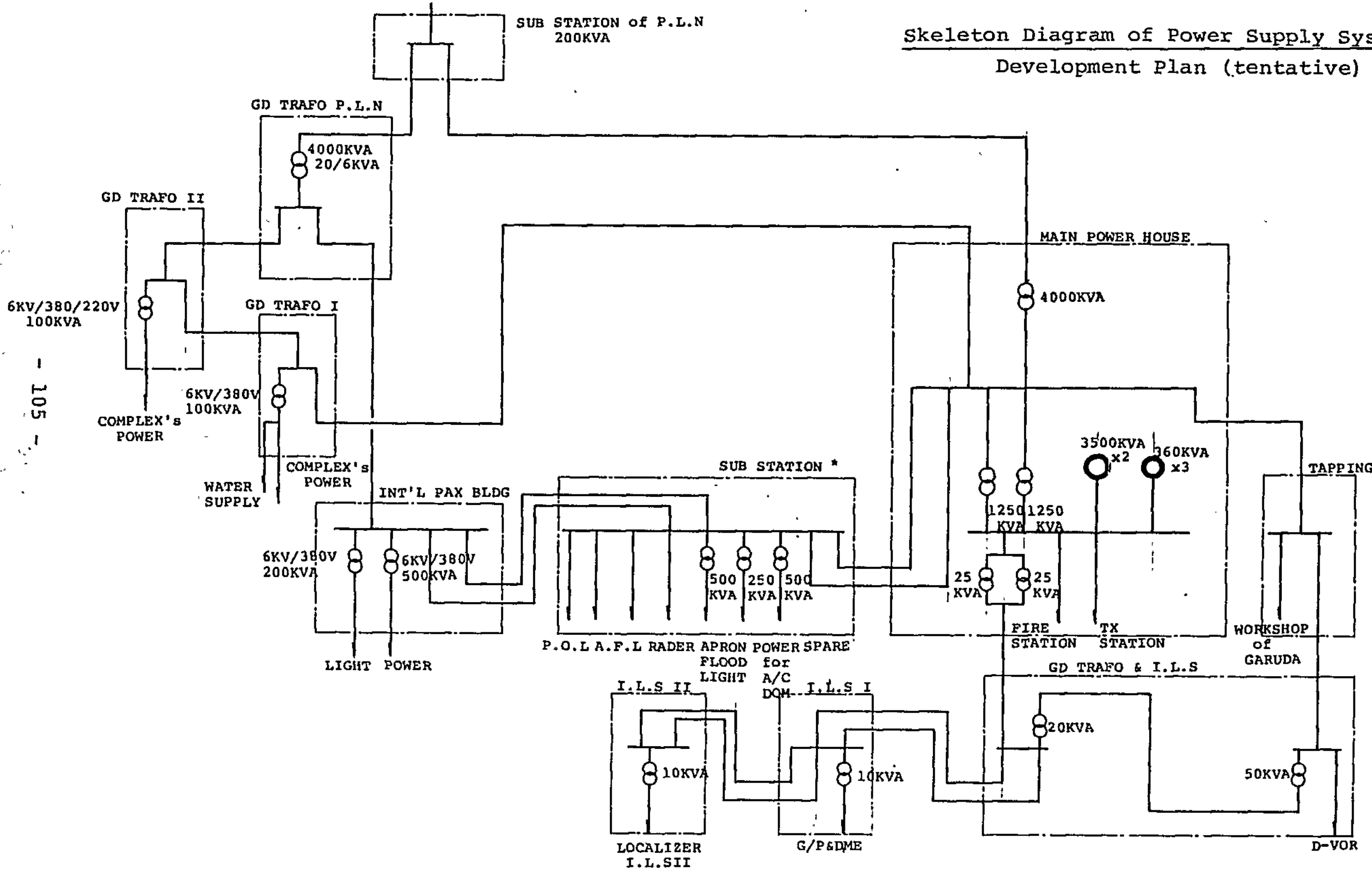
With regard to the location of a traditional Bali ceremonial garden, BIA is able to express a warm welcome to all the tourist at the ceremonial garden in front of International passenger terminal building on the landside instead of the airside. The ceremonial garden located on the landside is more suitable than on the airside considering passenger safety control.

The results of a comparative study made for the two cases (i.e. Boarding bridge installed and not-installed) is shown in Table.

COMPARISON BETWEEN TWO CASES : (1) BOARDING BRIDGE INSTALLED AND (2) NOT INSTALLED

Cases / Study Items	With Boarding Bridge	Without Boarding Bridge
1. Terminal Concept 1 1/2 levels	Compatible	Not compatible
2. Ground Service Equipment Maneuvering Efficiency	Advantageous	Disadvantageous
3. Pax. handling efficiency 1) Confort 2) Safety 3) Mass handling capacity 4) Time control	 Advantageous Ditto Ditto Ditto	 Disadvantageous Ditto Ditto Ditto
4. The ceremony garden	Not to be located at apron	To be located at apron
Evaluation Summary	Recommendable	Not recommendable

Skeleton Diagram of Power Supply System
Development Plan (tentative)



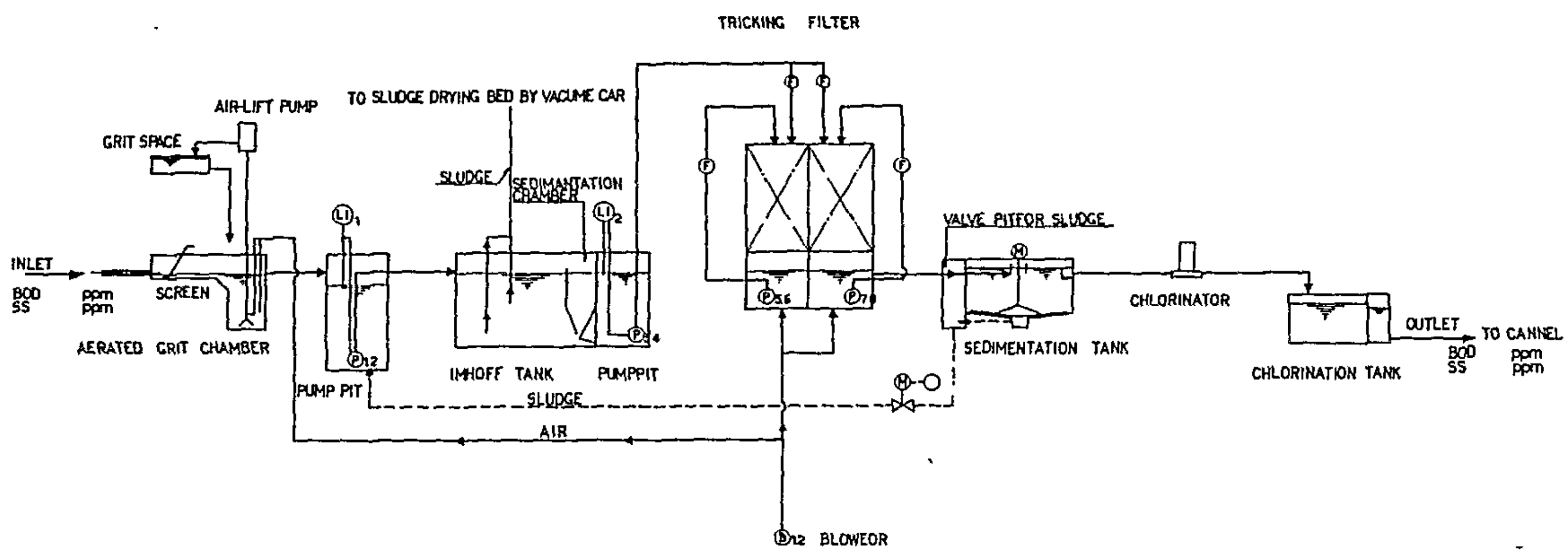
* Short Term Plan : expansion of substation

Middle Term Plan : New Substation in Dom PAX Bldg.

Standard of Water Quality

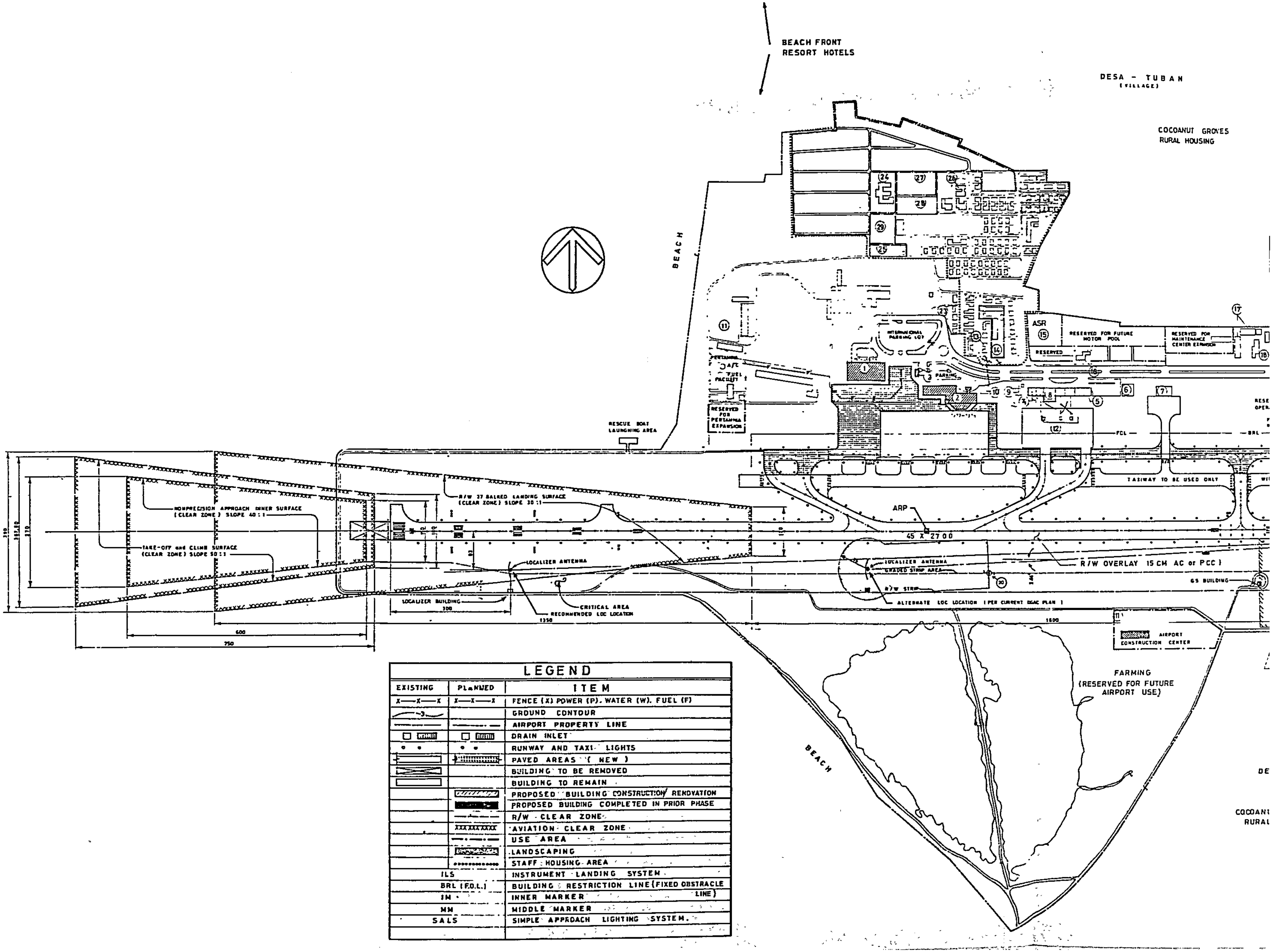
ITEMS	INDONESIA	WHO
Coliform group	Negative/100mℓ	Over a year less than MPN 10
No. of bacteria	Less than 100/1mℓ	-
Odor Taste	Clear, with no taste or odor	- -
Color Impurity	Not more than 1mg/ℓ	- -
Evaporated residue	Less than 1,000 ppm soluble substances	-
pH value	6.5 ∿ 9.0	7.0 ∿ 8.5 (6.5 ∿ 9.2)
Total hardness	5 ∿ 10pH	100 ∿ 500 ppm*
Amount of $KMnO_4$ consumed Cℓ	Less than 10 ppm 250 ppm	10 ppm 200 (400) ppm
H_2SO_4	250 ppm	200 (400) ppm
Ammonia nitrogen Nitrite nitrogen	None allowed None allowed (excluding deep wells)	0.5 ppm -
Nitrate nitrogen Fe	20 ppm 0.2 ppm	40 (80) ppm** 0.3 (1.0) ppm
Mn F	0.1 ppm 1 ∿ 1.5 ppm	0.1 (0.5) ppm 1.0 (1.5) ppm
Pb As	0.05 ppm 0.05 ppm	0.1 ppm 0.2 ppm
Selenium Cr	- -	0.05 ppm 0.05 ppm
Cu Zn	3.0 ppm 5.0 ppm	1.0 ppm 5.0 (15.0) ppm
Phenol Cyanogen	- -	0.001 (0.002) ppm 0.01 ppm
Hg Ba	- -	- -
Cd Anionic active agent	- -	- -
Radioactivity	-	α-rays 10^{-9} μc/mℓ β-rays 10^{-8} μc/mℓ
Organic phosphorus	-	-
Free available chlorine	-	-
Mg	125 ppm	50 (150) ppm
Ca	-	75 (200) ppm
Remarks	Temperature: lower than air temperature Erosive carbonic acid: none allowed H_2S: none allowed	( ) is for unavoidable cases * as $CaCO_3$ ** as NO_3

SCHEMATIC DIAGRAM



SYMBOL	EXPLANATION
P1,2	RAW SEWAGE PUMP
P3,4	LIFTING PUMP
P5,6	CIRCULATING PUMP
P7,8	CIRCULATING PUMP
F	FLOW METER
LI	LEVEL INDICATOR
B1,2	BLOWER
M	CLARIFIER
M-O	MOTOR VALVE CONTROLED BY TIMER

SEWAGE TREATMENT SYSTEM
as Reference only



LEGEND

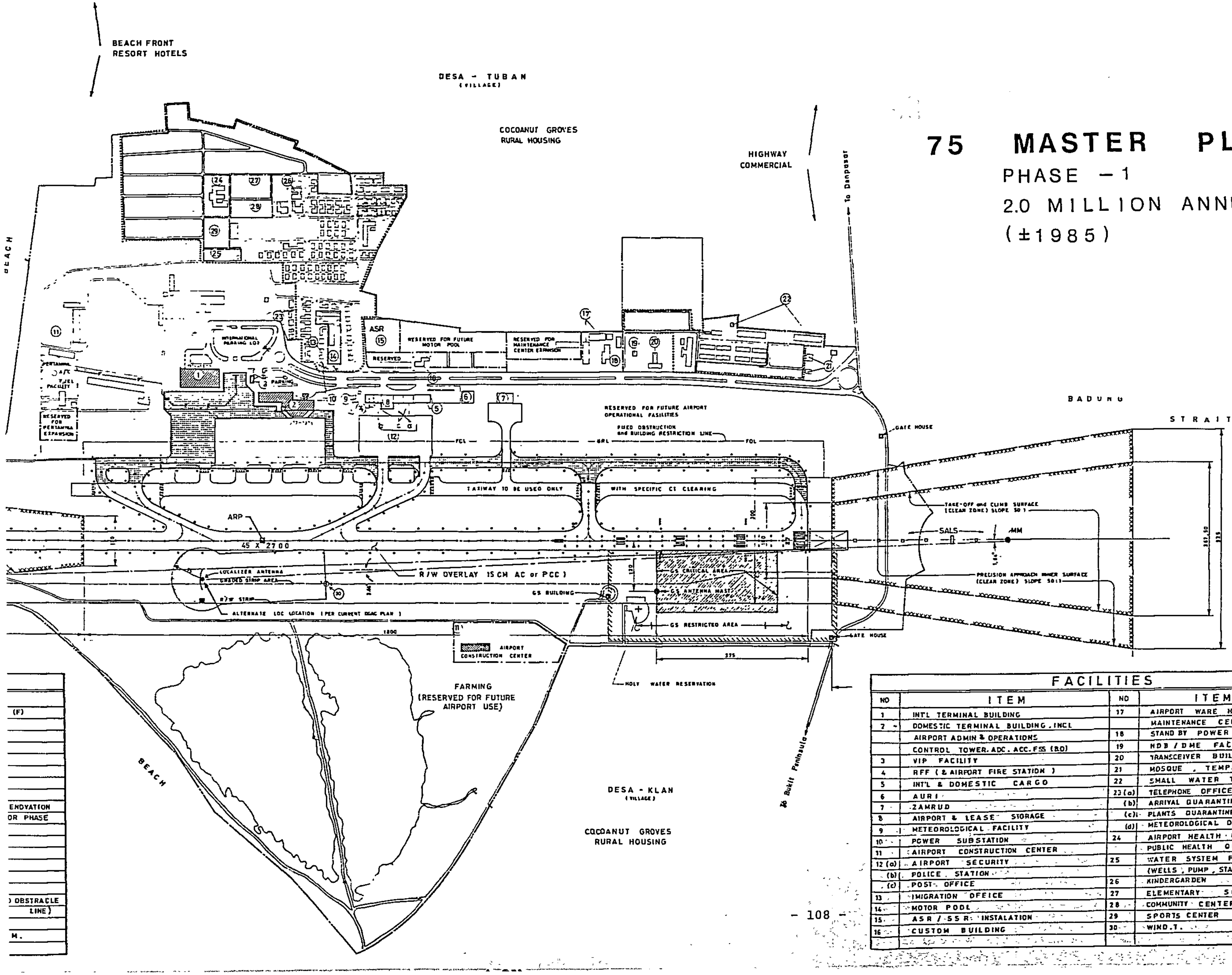
EXISTING	PLANNED	ITEM
X—X—X	X—X—X	FENCE (X) POWER (P), WATER (W), FUEL (F)
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		DRAIN INLET
		RUNWAY AND TAXI LIGHTS
		PAVED AREAS (NEW)
		BUILDING TO BE REMOVED
		BUILDING TO REMAIN
		PROPOSED BUILDING CONSTRUCTION/ RENOVATION
		PROPOSED BUILDING COMPLETED IN PRIOR PHASE
		R/W CLEAR ZONE
	XXXXXXXXXX	AVIATION CLEAR ZONE
		USE AREA
		LANDSCAPING
		STAFF HOUSING AREA
ILS		INSTRUMENT LANDING SYSTEM
BRL (F.O.L.)		BUILDING RESTRICTION LINE (FIXED OBSTRACLE LINE)
IM		INNER MARKER
MM		MIDDLE MARKER
SALS		SIMPLE APPROACH LIGHTING SYSTEM.

75 MASTER PLAN

PHASE -1

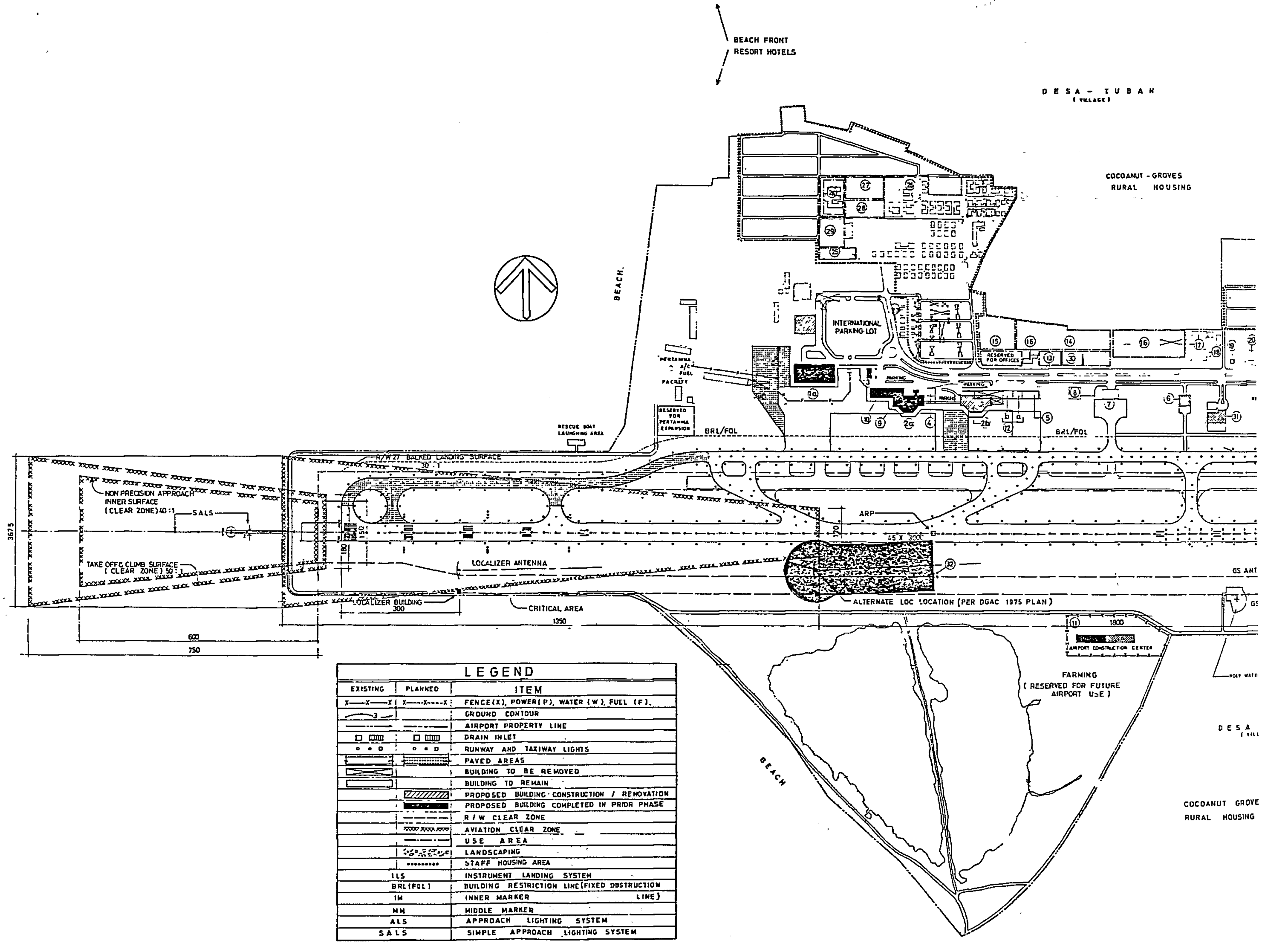
2.0 MILLION ANNUAL PAX

(±1985)



FACILITIES

NO	ITEM	NO	ITEM
1	INT'L TERMINAL BUILDING	17	AIRPORT WARE HOUSES &
2	DOMESTIC TERMINAL BUILDING, INCL		MAINTENANCE CENTER
	AIRPORT ADMIN & OPERATIONS	18	STAND BY POWER STATION
	CONTROL TOWER. ADC. ACC. FSS (BO)	19	NDB / DME FACILITY
3	VIP FACILITY	20	TRANSCEIVER BUILDING
4	RFF (& AIRPORT FIRE STATION)	21	MOSQUE, TEMPLE, CHAPEL
5	INT'L & DOMESTIC CARGO	22	SMALL WATER TOWERS
6	AURI	23 (a)	TELEPHONE OFFICE
7	ZAMRUD	(b)	ARRIVAL QUARANTINE
8	AIRPORT & LEASE STORAGE	(c)	PLANTS QUARANTINE
9	METEOROLOGICAL FACILITY	(d)	METEOROLOGICAL OFFICE
10	POWER SUBSTATION	24	AIRPORT HEALTH CENTER &
11	AIRPORT CONSTRUCTION CENTER		PUBLIC HEALTH QUARANTINE
12 (a)	AIRPORT SECURITY	25	WATER SYSTEM FACILITY
(b)	POLICE STATION		(WELLS, PUMP, STATION, STORAGE)
(c)	POST OFFICE	26	KINDERGARDEN
13	IMIGRATION OFFICE	27	ELEMENTARY SCHOOL
14	MOTOR POOL	28	COMMUNITY CENTER
15	ASR / SSR INSTALATION	29	SPORTS CENTER
16	CUSTOM BUILDING	30	WIND.T.



LEGEND

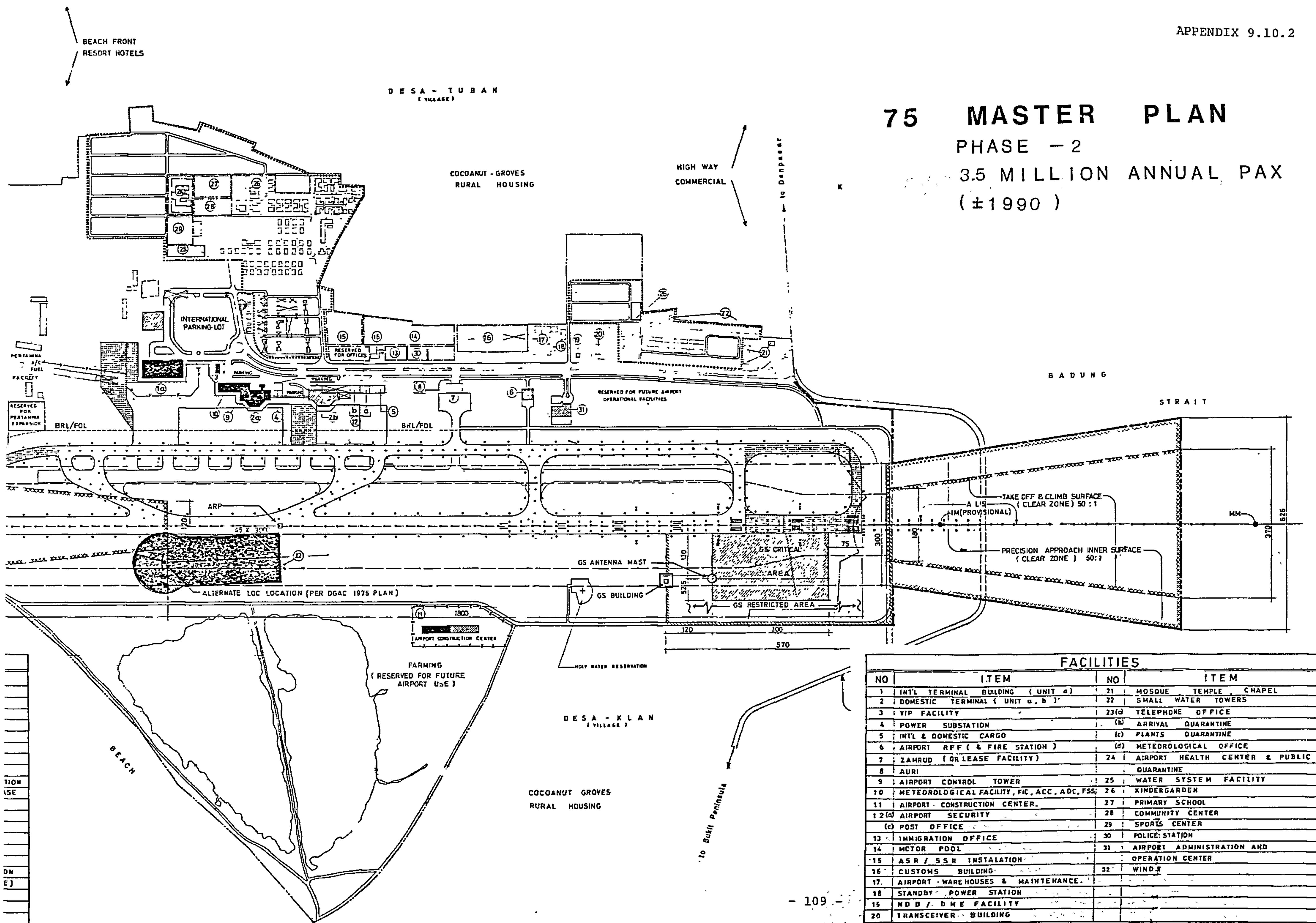
EXISTING	PLANNED	ITEM
		FENCE (X), POWER (P), WATER (W), FUEL (F).
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		DRAIN INLET
		RUNWAY AND TAXIWAY LIGHTS
		PAVED AREAS
		BUILDING TO BE REMOVED
		BUILDING TO REMAIN
		PROPOSED BUILDING CONSTRUCTION / RENOVATION
		PROPOSED BUILDING COMPLETED IN PRIOR PHASE
		R/W CLEAR ZONE
		AVIATION CLEAR ZONE
		USE AREA
		LANDSCAPING
		STAFF HOUSING AREA
ILS		INSTRUMENT LANDING SYSTEM
BRL (FOL)		BUILDING RESTRICTION LINE (FIXED OBSTRUCTION LINE)
IM		INNER MARKER
MM		MIDDLE MARKER
ALS		APPROACH LIGHTING SYSTEM
SALS		SIMPLE APPROACH LIGHTING SYSTEM

75 MASTER PLAN

PHASE -2

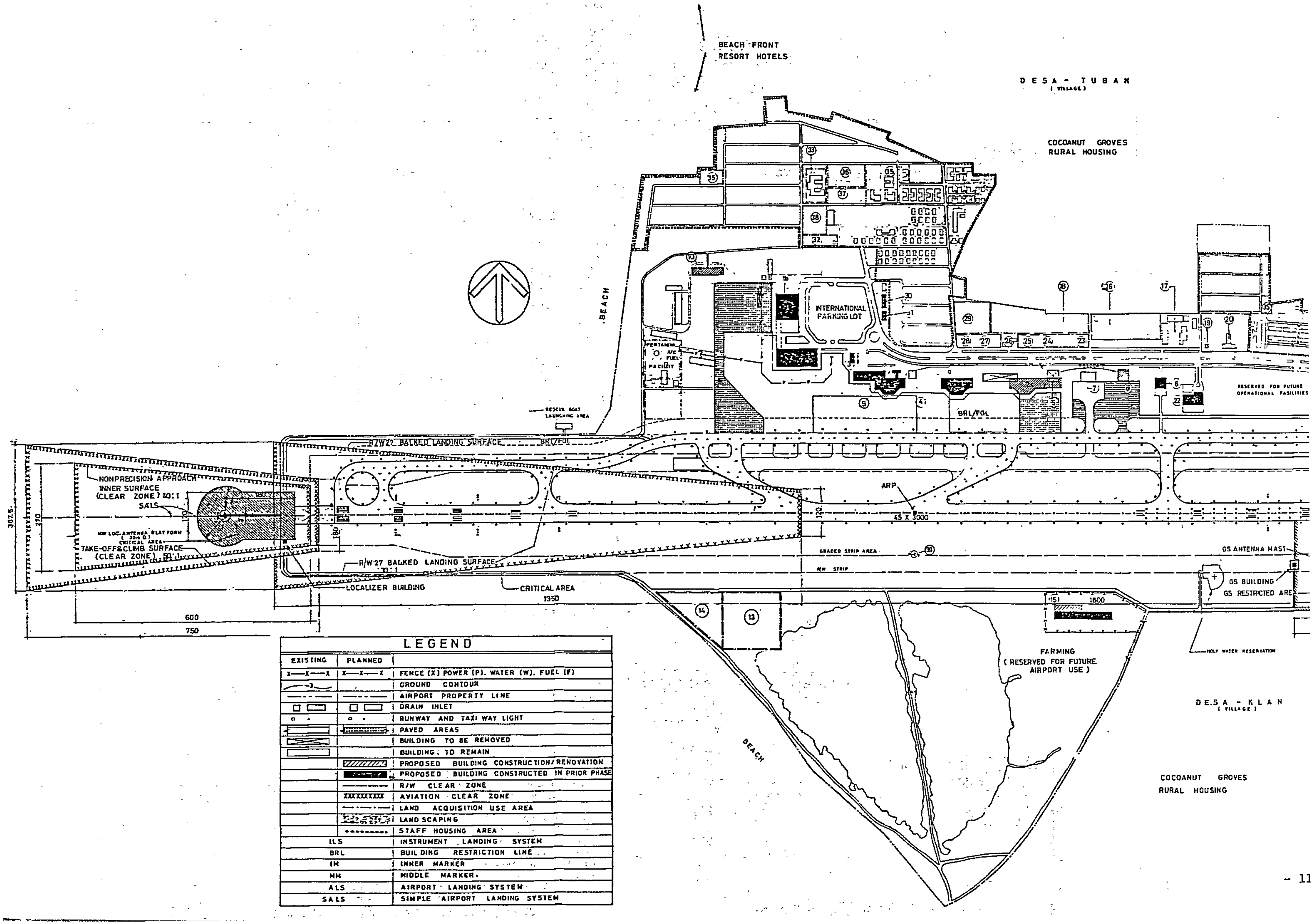
3.5 MILLION ANNUAL PAX

(±1990)



FACILITIES

NO	ITEM	NO	ITEM
1	INT'L TERMINAL BUILDING (UNIT a)	21	MOSQUE , TEMPLE , CHAPEL
2	DOMESTIC TERMINAL (UNIT a , b)	22	SMALL WATER TOWERS
3	VIP FACILITY	23(a)	TELEPHONE OFFICE
4	POWER SUBSTATION	(b)	ARRIVAL QUARANTINE
5	INT'L & DOMESTIC CARGO	(c)	PLANTS QUARANTINE
6	AIRPORT RFF (& FIRE STATION)	(d)	METEOROLOGICAL OFFICE
7	ZAMRUD (OR LEASE FACILITY)	24	AIRPORT HEALTH CENTER & PUBLIC
8	AURI		QUARANTINE
9	AIRPORT CONTROL TOWER	25	WATER SYSTEM FACILITY
10	METEOROLOGICAL FACILITY, FIC, ACC, ADC, FSS;	26	KINDERGARDEN
11	AIRPORT CONSTRUCTION CENTER.	27	PRIMARY SCHOOL
12(a)	AIRPORT SECURITY	28	COMMUNITY CENTER
(c)	POST OFFICE	29	SPORTS CENTER
13	IMMIGRATION OFFICE	30	POLICE STATION
14	MOTOR POOL	31	AIRPORT ADMINISTRATION AND
15	ASR / SSR INSTALATION		OPERATION CENTER
16	CUSTOMS BUILDING	32	WIND I
17	AIRPORT WAREHOUSES & MAINTENANCE.		
18	STANDBY POWER STATION		
19	NDB / DME FACILITY		
20	TRANSCEIVER BUILDING		



LEGEND

EXISTING	PLANNED	
x—x—x	x—x—x	FENCE (X) POWER (P). WATER (W). FUEL (F)
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		DRAIN INLET
		RUNWAY AND TAXI WAY LIGHT
		PAVED AREAS
		BUILDING TO BE REMOVED
		BUILDING: TO REMAIN
		PROPOSED BUILDING CONSTRUCTION/RENOVATION
		PROPOSED BUILDING CONSTRUCTED IN PRIOR PHASE
		R/W CLEAR ZONE
	XXXXXXXXX	AVIATION CLEAR ZONE
		LAND ACQUISITION USE AREA
		LAND SCAPING
		STAFF HOUSING AREA
ILS		INSTRUMENT LANDING SYSTEM
BRL		BUILDING RESTRICTION LINE
IM		INNER MARKER
MM		MIDDLE MARKER.
ALS		AIRPORT LANDING SYSTEM
SALS		SIMPLE AIRPORT LANDING SYSTEM