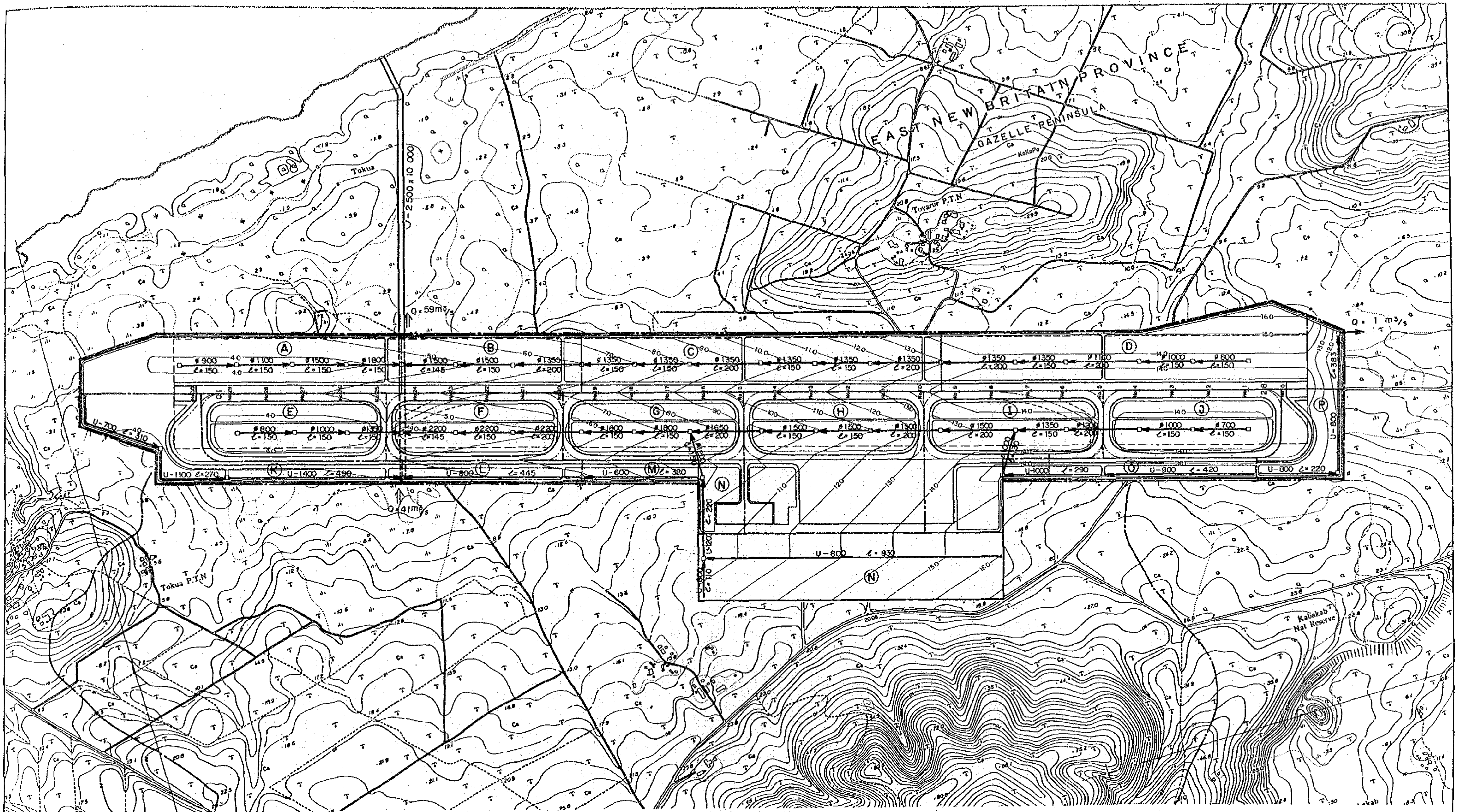
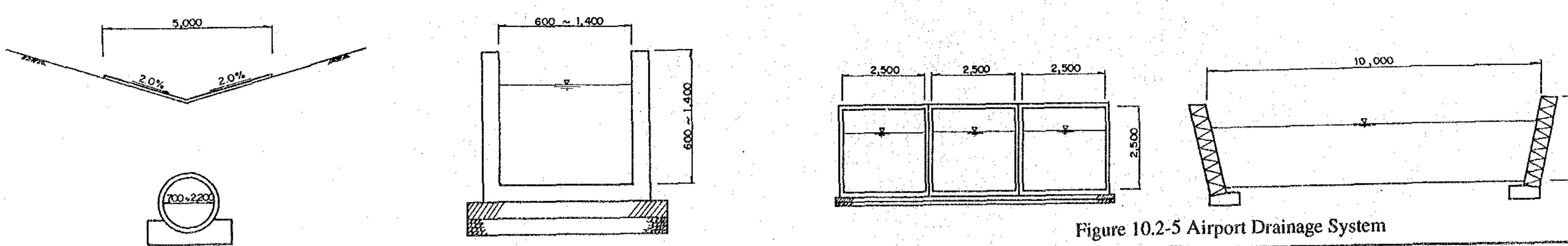





LEGEND

- DRAINAGE AREA
- INLET
- PIPE CULVERT
- U - TRENCHS
- BOX CULVERT

Figure 10.2-5 Airport Drainage System

4) Design of Drainage System

Based on the amount of runoff, the following drainage facilities were designed as a drainage system of the airport as shown in Figure 10.2-5.

(1) Along the perimeter, U-trench with dimension from 600 mm to 1800 mm are allocated and connected to the box culvert which is crossed to the airport area.

(2) In the area between runway and parallel taxiway, flat channels are provided and connected to the box culvert through pipe culvert with diameter from 700 mm to 2200 mm located underneath the channels.

(3) The surface flow in the apron area is lead to the flat channels between runway and parallel taxiway by the grading slope.

(4) In the terminal area, surface flow is collected to lead to the pipe culvert between runway and parallel taxiway.

(5) In order to spill out the water from the area, 3 cells of box culvert with dimension of 2500 mm, which is crossing the runway strip, are provided.

### 10.2.3 Pavement

1) Type of Pavement

(1) Runway and Taxiway

Runway should be provided on the existing runway and therefore the existing runway should be closed at the time of construction. However, after starting the airport operation, closing of the runway should not be allowed. Taking the matter into account, asphaltic pavement was selected for runway and taxiway due to easy maintenance work without disturbance to the airport operation.

(2) Apron

Considering high shear strength, rutting and resistance to oil, PCC (Portland Cement Concrete) pavement was selected for the apron area under operation for the middle jet aircraft, whereas for GA apron asphaltic pavement was selected due to light load of small aircraft.

2) Design aircraft

According to the aircraft movement forecast described in sub clause 9.2.4 as shown in Table 10.2-5, maximum aircraft at each target year are A310 for 2000 and B747-SP for 2010.

Table 10.2-5 Aircraft Movement Forecast per Year

(Unit: flight)

| Aircraft \ Year | | 2000 | 2010 | 2020 |
|---|---|---|---|---|
| B747 | I | – | 41 | 60 |
| A310 | I | 143 | 228 | 330 |
| B737 | I | 111 | 186 | 270 |
| | D | 2,389 | 4,250 | 4,574 |
| F28 | D | – | – | – |
| DHC8 | D | 1,759 | 3,130 | 3,368 |
| GA | D | 11,287 | 16,065 | 17,290 |

I : International
D : Domestic

The design aircraft is generally the aircraft among others which produces the maximum pavement thickness on the same design basis, that is, the heaviest aircraft is not always design aircraft as the pavement structure shall be designed based on the capability of the pavement performance.

As international standard for the indication of pavement strength, ACN/PCN method was developed by ICAO. The PCN (Pavement classification number) rating established for a pavement indicates that the pavement is capable of supporting aircraft having an ACN (Aircraft classification number) of equal or lower magnitude. Furthermore, when the ratio of ACN/PCN is less than 1.3, a few times of aircraft movement per day will be allowed.

Using to aircraft ACN table and PCN chart referred to the ICAO Design Manual Part 3, each index number is selected as follows.

Table 10.2-6 ACN of Aircraft

| Aircraft Type | Pavement | |
|---|---|---|
| | As. Pavement | Rigid Pavement |
| B737 class | 26 | 29 |
| A300 class | 44 | 45 |
| B747 class | 58 | 58 |

| | | | |
|---|---|---|---|
| PCN : | Asphaltic pavement for B737 | = | 33 |
| | Rigid pavement for B737 | = | 38 |
| | Asphaltic pavement for A300 | = | 48 |
| | Rigid pavement for A300 | = | 52 |

Ratio of ACN/PCN is shown in Table 10.2-7

Table 10.2-7 Ratio of ACN/PCN

| Pavement | Operated Aircraft | Ratio of ACN/PCN | |
|---|---|---|---|
| | | As. pavement | Rigid pavement |
| for B737 | B737 class | 26/33 = 0.79 | 29/38 = 0.76 |
| | A300 class | 44/33 = 1.33 | 45/38 = 1.18 |
| | B747 class | 58/33 = 1.76 | 58/38 = 1.52 |
| for A300 | B737 class | 26/48 = 0.54 | 29/52 = 0.56 |
| | A300 class | 44/48 = 0.92 | 45/52 = 0.87 |
| | B747 class | 58/48 = 1.21 | 58/52 = 1.11 |

It is evident from the above table that the pavement for the aircraft of A300 class is capable of supporting B747 when the aircraft movement is small. Turning round to the aircraft movement forecast as shown in Table 10.2-5, the movement of B747 is estimated to be 60 flights in 2020, thus meaning that B747 flight shall occur within a few times per week.

As a result of the above, design aircraft for the pavement design is selected to be A-300 class from the view point of pavement performance and economy of the cost.

3) Design Coverage (Refer to Attachment 10-1)

The aircraft movement is as mixture of variety of aircraft, then all the aircraft must be converted to the same landing gear type as the design aircraft and aircraft movement shall be adjusted to the design coverage.

Based on the aircraft movement forecast and design aircraft of A300, since the coverage for some period was calculated to be less than 2000 times as shown in Table 10.2-8, design coverage was categorized to be 3,000 times.

Table 10.2-8 Coverage

| Period \ Facilities | Runway | Taxiway |
|---|---|---|
| 1. 2000 - 2010 (for 10 years) | 596 | 744 |
| 2. 2010 - 2020 (for 10 years) | 968 | 1,210 |
| 3. 2000 - 2020 (for 20 years) | 1,400 | 1,750 |

Design Aircraft : A300

4) Bearing Capacity of Subgrade

The result of field CBR test indicated the values of 6 to 14% whereas value of 4 day soaked CBR for one sample of embankment material showed to be 20% by the laboratory test. Thus the design CBR value of the subgrade was determined to be 10% for using selected good material.

The K-value of the subgrade was determined to be 5.5 $kg/cm^3$ from the relation between CBR-$K_{75}$ as shown in Figure 10.2-6.

5) Structural Design of Pavement

(1) Runway and Taxiway

The pavement structure of the runway and taxiway was designed by CBR method on the following design input.

| | | |
|---|---|---|
| Design Aircraft | : | A300 B2 |
| Design Coverage | : | 3000 times |
| Subgrade CBR | : | 10% |

Total thickness of the pavement is to read 69 cm from Figure 10.2-7. The typical cross section of pavement structure and pavement layout plan are shown in Figure 10.2-8 and Figure 10.2-9.

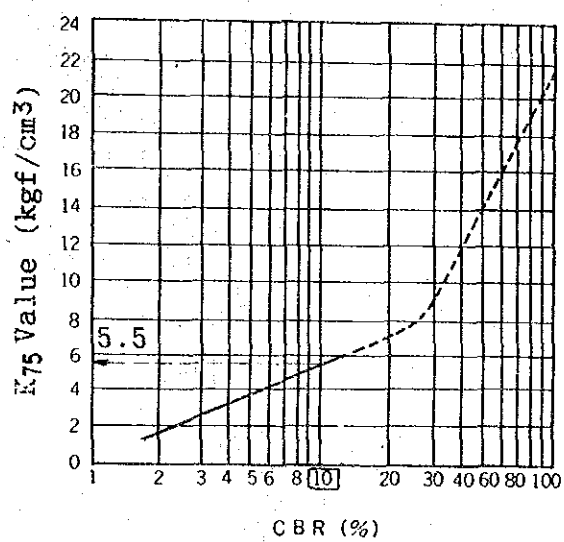



Figure 10.2-6 Relations between CBR and K-value

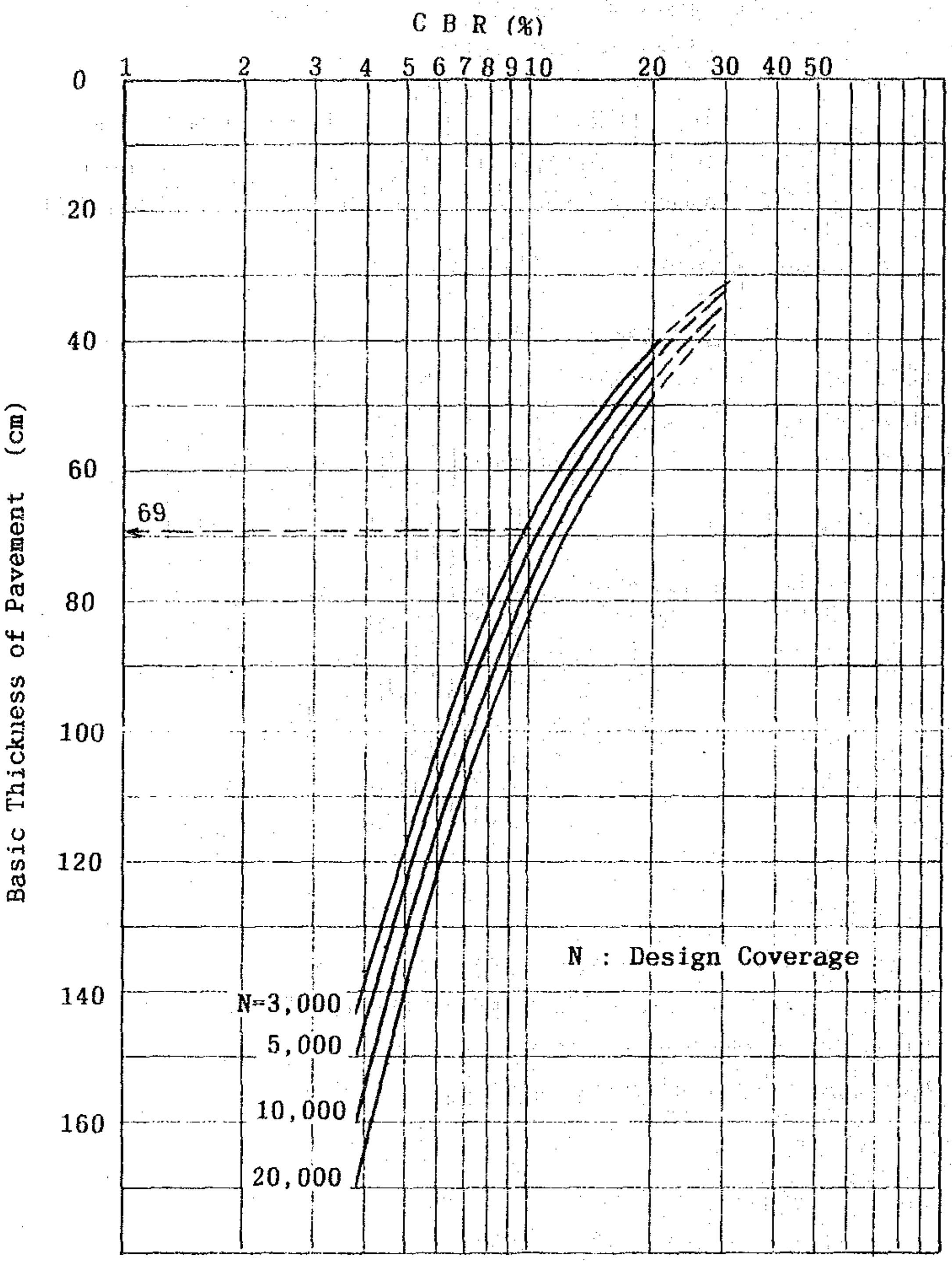
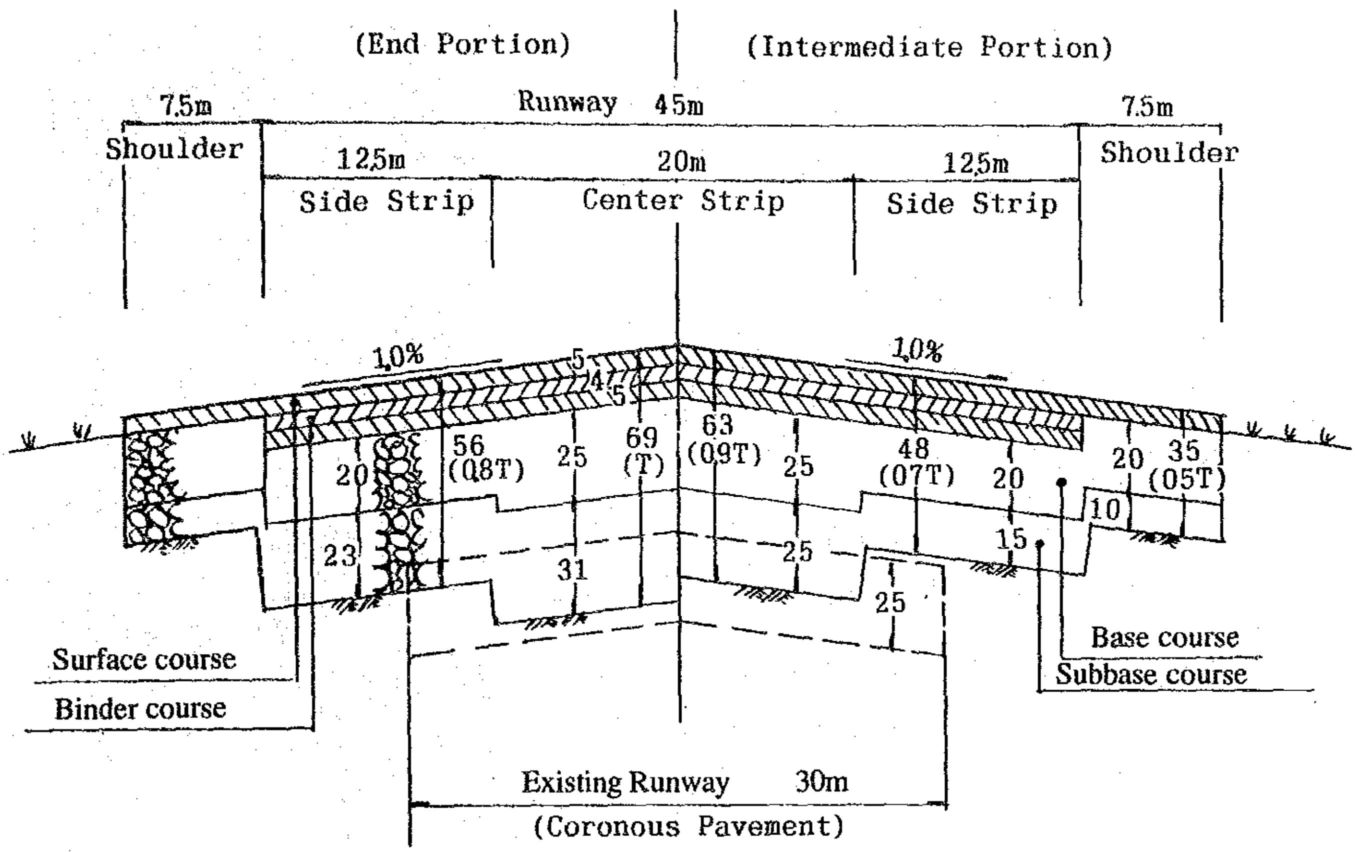



Figure 10.2-7 CBR Values and Pavement Thickness (A300B2)

( Runway )




UNIT(cm)

( Apron )

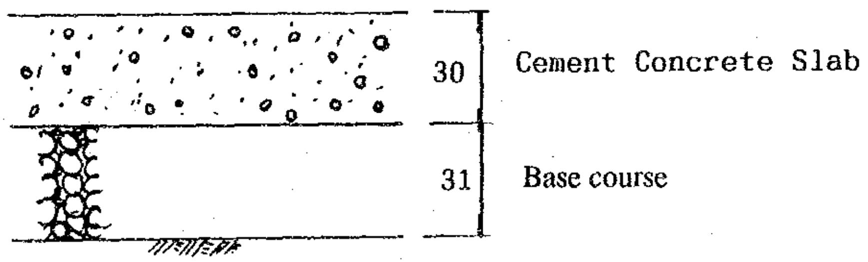
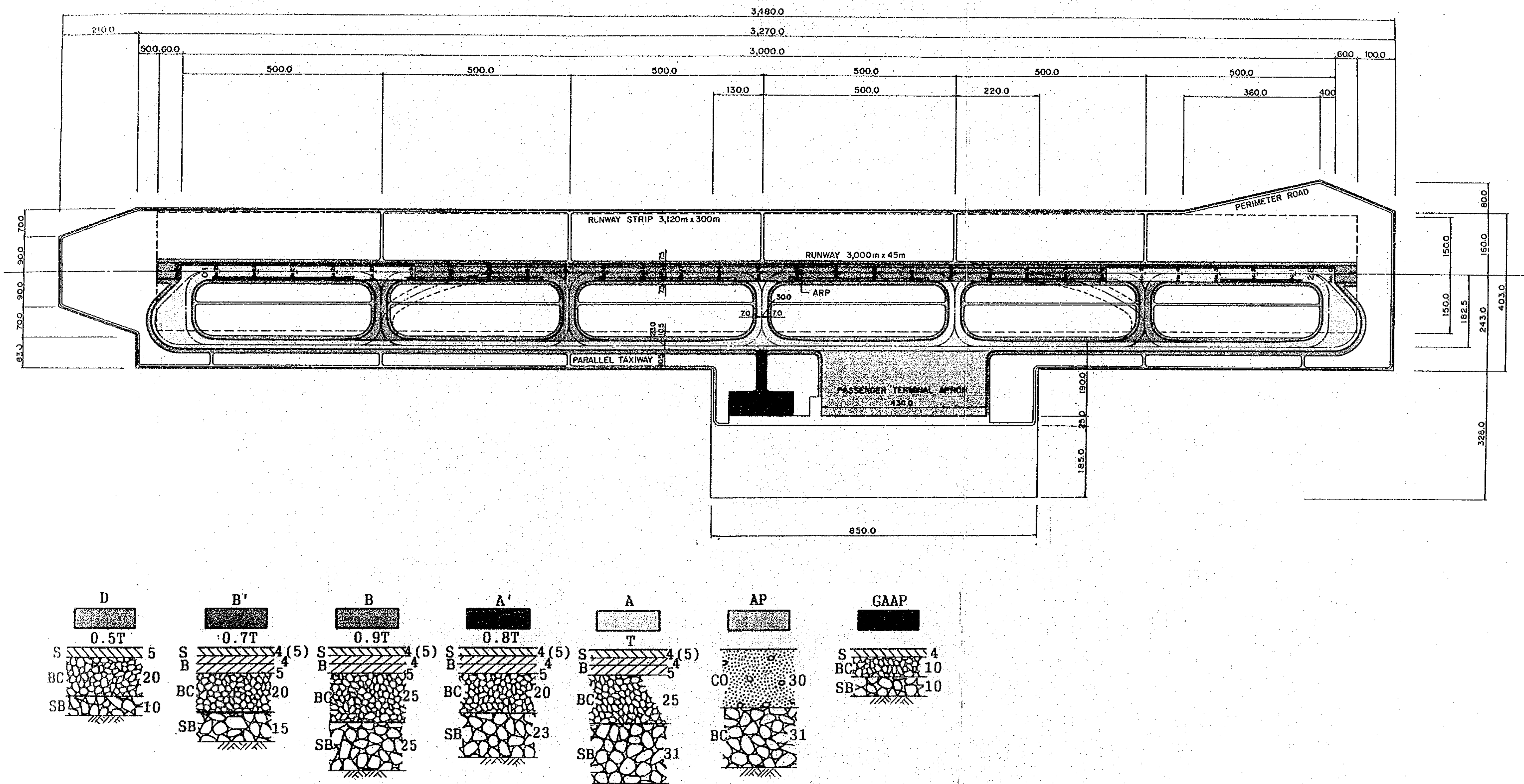



Figure 10.2-8 Typical Cross Section of Pavement




LEGEND

S : Surface course (Asphalt Concrete) (5) : Runway only
B : Binder course (Asphalt Concrete)
BC : Base course (Mechanically Stabilized Crushed Stone)
SB : Subbase course (Mechanically Stabilized Crushed Stone)
CO : Cement Concrete Slab

Figure 10.2-9 Airfield Pavements Plan (Master Plan)

(2) Apron

The pavement structure for the apron was designed based on the PCN method using Westergaard's formula on the following design inputs:

| | | |
|---|---|---|
| Design Aircraft | : | A300 B2 |
| Safety Factor F | : | 1.7 |
| Subgrade $K_{75}$ value | : | 5.5 kgf/cm$^3$ |

To obtain 7 kgf/cm$^3$ of $K_{75}$ value on the base course, required thickness of base course is to read to be 31 cm from Figure 10.2-10. Based on the 7 kg/cm$^3$ of $K_{75}$ value on the base course and 29.4 kgf/cm$^2$ of flexural stress (50 kgf/cm$^2$/1.7), concrete slab thickness is to read to be 30 cm as shown on Figure 10.2-11.

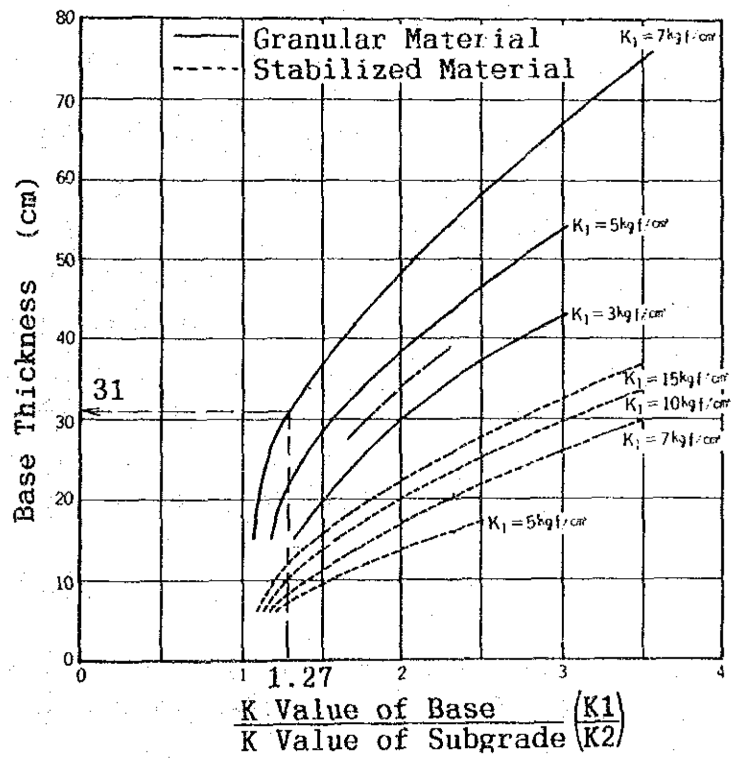



Figure 10.2-10 Design Curve of Base Thickness

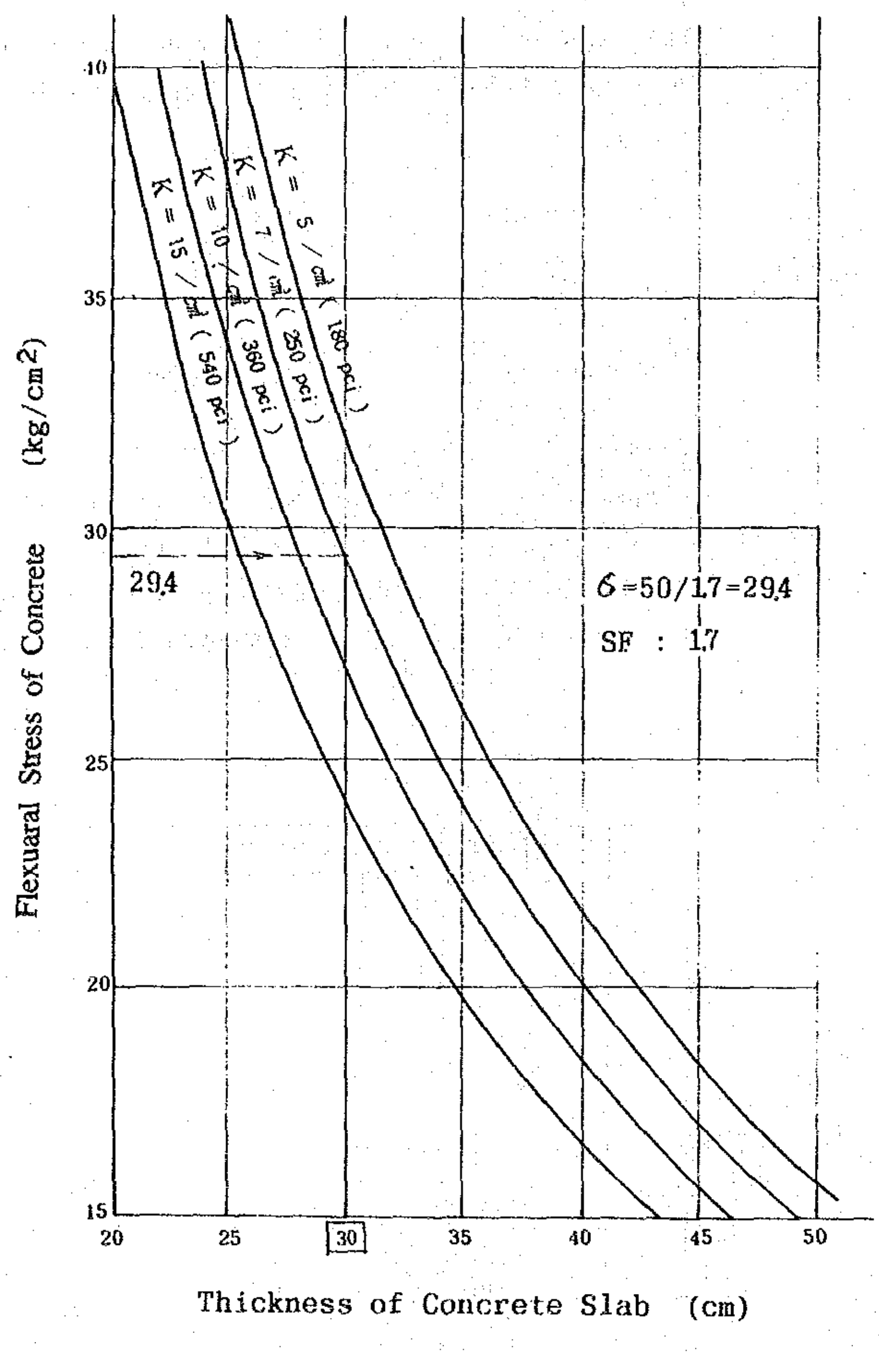



Figure 10.2-11 Chart of Thickness (A300B2)

## 10.3 Terminal Area

### 10.3.1 Passenger Terminal

The floor plan of year 2010 is proposed as illustrated in Attachment 10-2. It is noted that the floor plan does not adhere exactly to the content of the area requirements as indicated in Section 9.1, but are only approximately designed and alternated for the preparation of the master plan. During the course of the subsequent design, some modifications would be made for a better efficiency of plan. Some new functions, such as international passenger transit lounges, would also be added.

1) Block Planning

Passenger areas, such as departure lounges, arrival halls, transit lounge and baggage claim areas are allocated at the blocks of air side. While the area where both passengers and general public are accessible such as check-in lobbies, departure lobbies, arrival lobbies are located at the blocks of land side. In order to divide these two, what is called core facilities, such as toilets, snacks, kitchens, security office, quarantine office, custom office, shops, and etc. are allocated as much as practical.

2) Common Use of Space

A part of the baggage claim area and the arrival greeting area can be used by both international and domestic as required merely by moving the blocking chain. A characteristic of this international passenger terminal is that, according to the projection of aviation demand, the number of flight arrivals as well as departures are really few, even though the size of aircraft becomes larger (i.e.B747 and A300). This means underutilization of the terminal facilities will be the normal case. Therefore, a flexible layout of the space will allow a more efficient utilization of the space and facilities.

3) Flexible use of Space

Departure lobbies can be too large or too small, depending on the number of well-wishers. For planning purpose, the rate of one to one is often applied, but a preliminary study of the Team shows the rate of well-wishers is 3.2 which is unusually high. In order to cope with this uncertain situation check-in area, departure lobby and arrival lobby spaces are planned to be used in a flexible manner as much as possible according to situations.

4) Options

An alterative plan of the passenger terminal building is considered as an option for the master plan. The proposed master plan is a single floor plan, while the option plan is of one and a half (1 & 1/2) floor. However, one and a half floor plan is eliminated from this study on the basis of the difficulty in maintenance of boarding bridges.

Conceptual master plan of landside facilities is illustrated on Figure 10.3-1.

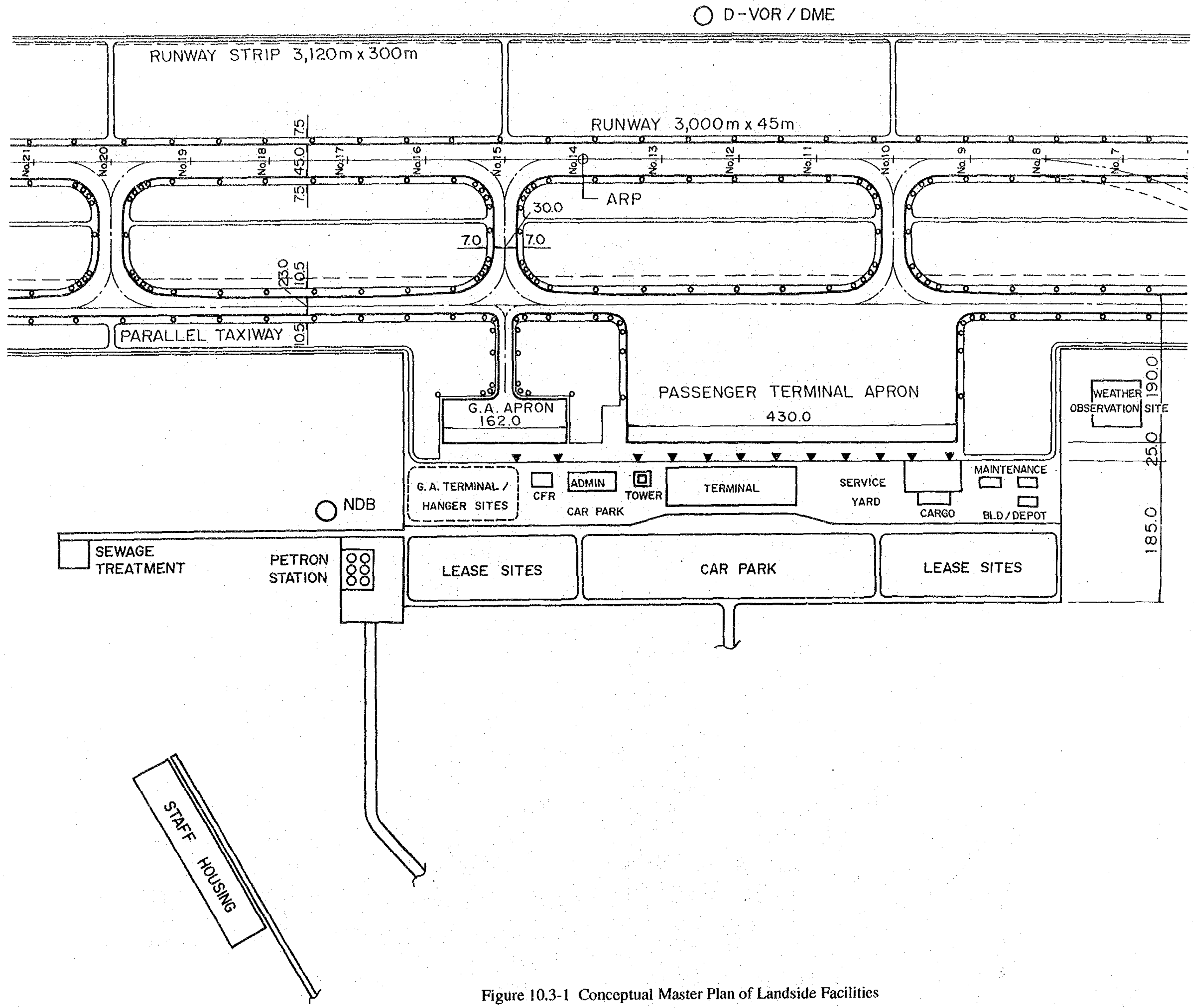



Figure 10.3-1 Conceptual Master Plan of Landside Facilities

10.3.2 Cargo Terminal

The floor plan of the cargo terminal building in year 2010 is proposed as illustrated in attachment drawing 10-3. During the course of subsequent design, more study would be made for elaboration.

The operation of the cargo terminal facility is illustrated in the schematic diagram in Figure 10.3-2.

10.3.3 General Aviation Facilities

A proposed location and necessary space for General Aviation Facilities are provided in the Figure 10.3-1.

10.3.4 Access Road and Parking Lot

1) Access Road

As prescribed in Chapter 9.3.3, assuming that the passengers and visitors come in and go out of the airport with a certain time lag before departure and after arrival of aircraft and that the departing passengers and their greeters will arrive at the airport 60 minutes before the departure time and the arriving passengers and their greeters will leave the airport 30 minutes after the arrival time, the peak hour traffic volume of the access road is estimated as shown below.

| Peak hour *Traffic Volume (2010)* | |
|---|---|
| Peak Hour Traffic: | 373 |
| Designed Hour Traffic: | 250 |

Two (2) lanes of carriageway, one each for the both directions of in and out, should be provided.

2) Parking Lot

The required number of cars to park in a parking lot is derived as shown below.

| Number of cars to park and Area requirement | |
|---|---|
| No. of Car to Park: | 284 |
| Parking Lot Area: | 7,100 $m^2$ |

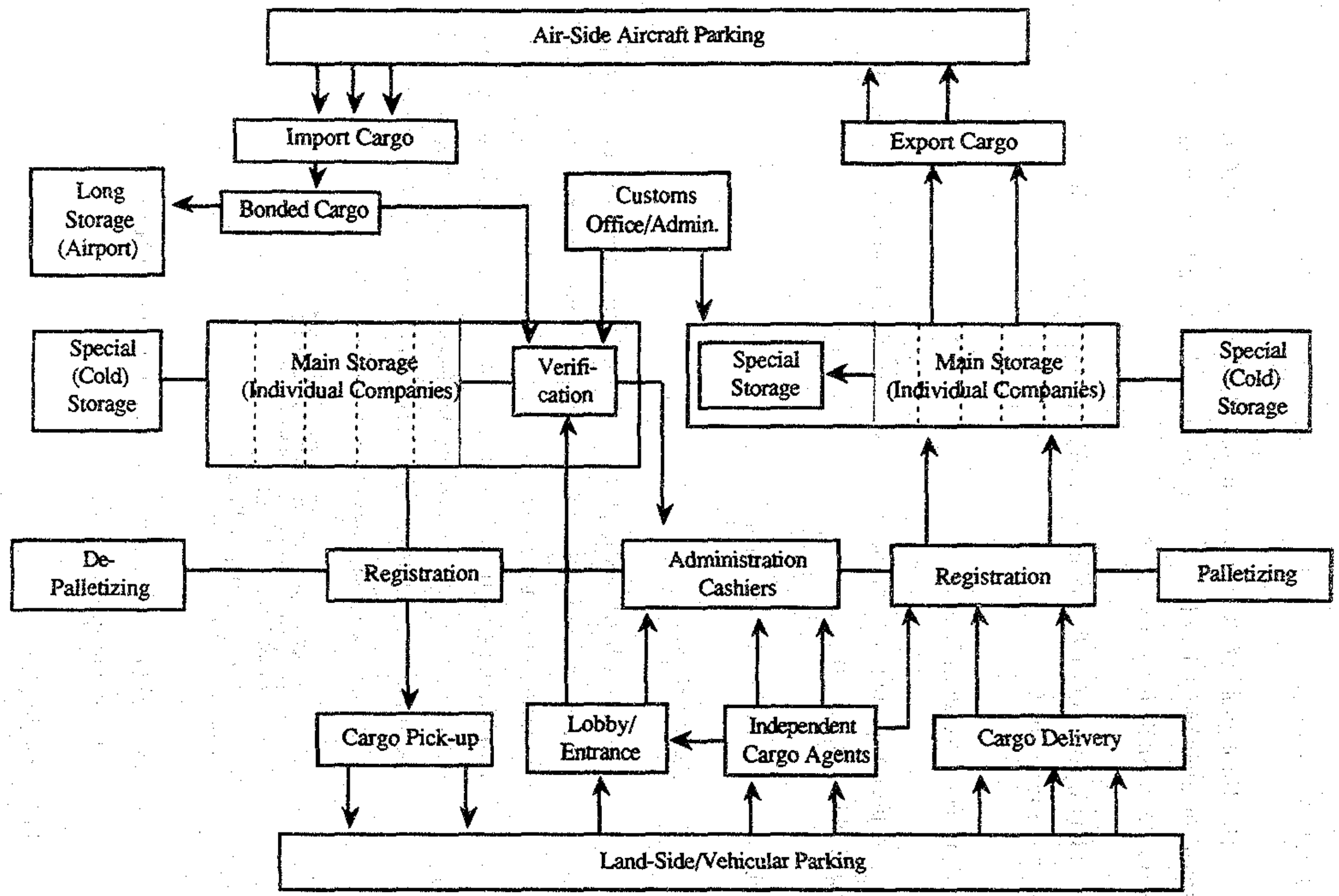



Figure 10.3-2 Operation Flow of Cargo Terminal

### 10.3.5 Airport Security

For the master plan of the airport development (2010), it is recommended that all way along the airport boundary should be surrounded by fence with a detective censor system installed at some important spots which can be monitored in the central monitor room. Number of guardsmen required is estimated to be 25 with assistance of an appropriate number of policemen.

## 10.4 Airport Support Facilities

### 10.4.1 Control Tower

In Section 9.4.1 of Chapter 9, the required scale of Control Tower was specified according to those requirements, the following were derived:

1) Recommended Tower Height

The tower height should be so designed as to avoid adding the height in future, since a tower once built, any construction work to raise its height would be almost impossible. With an assumption that the tower is to be located at a site of 1,350 m from the runway 28 end (east end) and 450 m off and south from the runway center line and that the runway is to be extended to the west to have a length of 3,000 m in future, the tower cab eye level will be 18 m at minimum,applying the formula mentioned in 9.4.1 that the normal eye level in the tower cab is about 1.5 m above the floor of the tower cab.

Hence, the floor elevation will be about 16.5 m. Then, the tower height should be about 21 m minimum. On the other hand, the Obstacle limitation Surface (OIS) derived from the transitional surface at the proposed tower site is calculated as follows:

- The shortest distance from the runway centerline : 400 m
- The runway-strip edge from the runway centerline: 150 m

Therefore

$$(400\ m - 150\ m) \times 1/7 = 35.714\ m$$

Consequently, the tower height can be up to approximately 35.7 m at maximum without penetrating into the transitional surface, with the floor elevation at about 31 m and the eye level at 32.5 m. Thus, the tower height will be between 21 m and 35.7 m.

Taking into account accommodating appropriate ATS functions in the tower shaft, a substantial height of the tower is considered to be 26 m being equivalent to eight (8)-story of this type of building. However, the given site forementioned may differ due to an unavoidable conditions of the terminal area layout. Thus, the height may be subject to change.

2) Selection of Tower Structure

Three optional structures of the tower are considered as follows:

a) A free standing functional, without an associated base building.

b) The combination of a base building with a non-functional tower shaft.

c) A single or two-story base building.

The Study Team recommends the option c) as the best design, though final selection will be subject to discussion with DCA.

In this tower functional shaft, the Aerodrome Cab and Radar Approach Control Room (RAPCON) and the others will be located.

3) Layout Plan of Tower Shaft

Layout plan in the tower shaft can have 2 options, as summarized as follows, and the Options 1 is shown in Figure 10.4-1.

OPTION 1

| Story | Facilities | Space |
|---|---|---|
| (7) | VFR Control Room: | 35 $m^2$ |
| (6) | RAPCON<br>(Radar Approach Control Room) | 50 $m^2$ |
| (5) | Break & Briefing Room<br>and Radar simulator<br><br>Training Room: | 50 $m^2$ |
| (4) | Computer Room: | 50 $m^2$ |
| (3) | Radar Equipment Room: | 50 $m^2$ |
| (2) | Communication Room | 50 $m^2$ |
| (1) | Power Supply Room: | 272 $m^2$<br>(17 m x 16 m) |

OPTION 2

| Story | Facilities | Space |
|---|---|---|
| (9) | VFR Control Cabin: | 35 $m^2$ |
| (8) | RAPCON<br>(Radar Approach Control Room) | 50 $m^2$ |
| (7) | Break & Briefing Room<br>and Radar simulator<br><br>Training Room: | 50 $m^2$ |
| (6) | Computer Room: | 50 $m^2$ |
| (5) | Radar Equipment Room: | 50 $m^2$ |
| (4) | Communication Room: | 50 $m^2$ |
| (3) | ATS Meeting & Training Room | 50 $m^2$ |
| (2) | ATS Office: | 50 $m^2$ |
| (1) | Power Supply Room: | 272 $m^2$<br>(17 m x 16 m) |

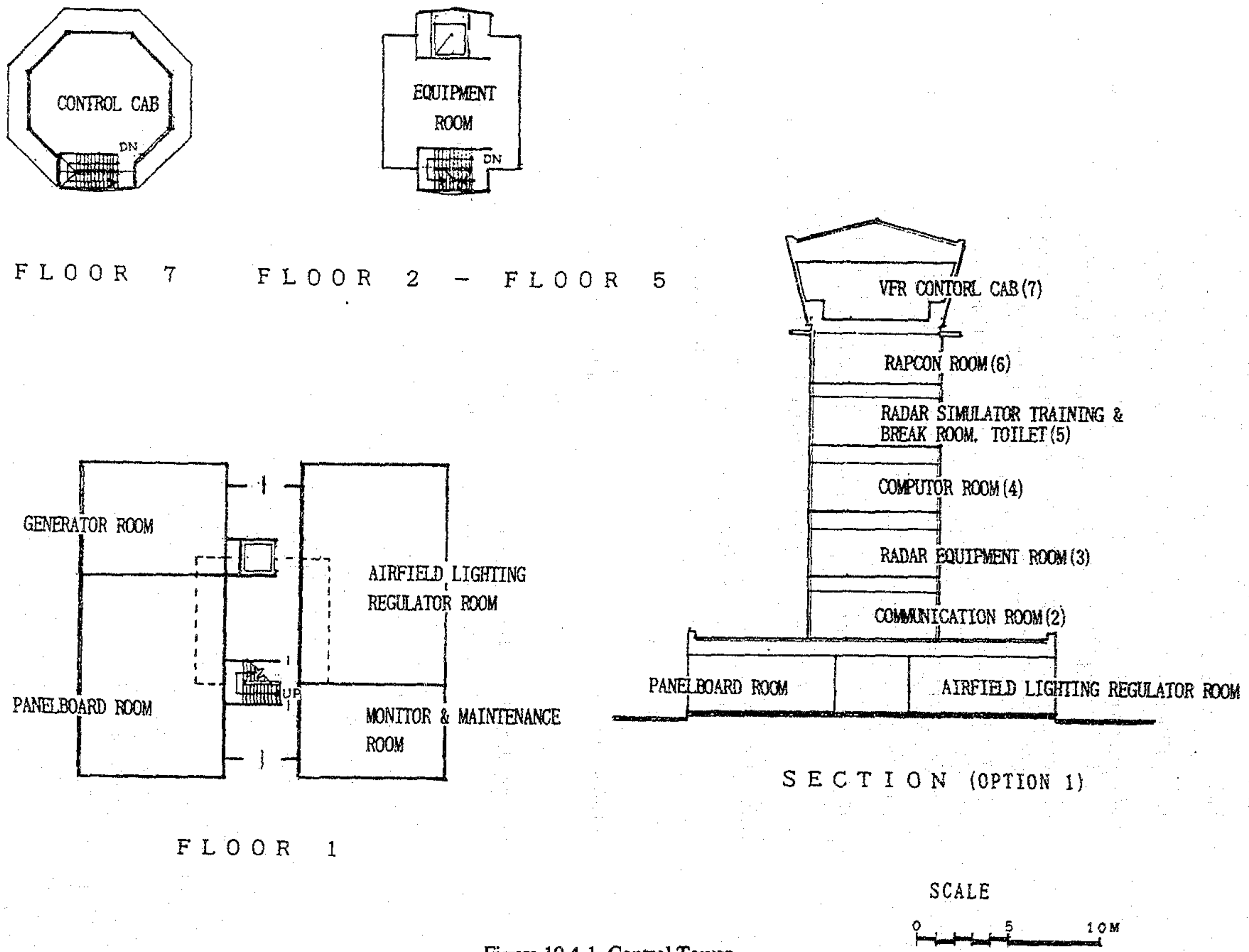



Figure 10.4-1 Control Tower

4) Accommodations and Equipment

The following are the requirements for accommodations and equipment in the control tower.

(1) Aerodrome Control Cab

a) Consoles to house equipment and desk of the same height should be provided as follows:

a. Aerodrome Lighting Panels

b. ILS Monitor Panels

c. Telephone and Radio Selector Panels

d. Brackets to hold Microphones and Telephone Handsets, etc. Aerodrome Lighting Control Panel should be incorporated on a separate desk. Consoles backed to the outer walls of the cab should open at the front for ease of maintenance.

b) Wind Direction and Speed Indicators, Altimeter Readout Indicators, Light Guns and Clocks should be provided.

c) An ATC Direct Speech system should be provided at the tower with major and intermediate activity.

d) Windows require transparent, glare-proof shades which can be raised or lowered as needed.

e) Secured floor hatch (75 x 90 cm at minimum) should be provided in the cab floor with an electric mechanical hoist which permits hoisting heavy equipment between the cab and the top elevator landing. If the highest elevator level is not on the floor level immediately below the tower hatch, it should also be provided on an intermediate floor.

(2) Radar Approach Control

a) Approach Control units in the tower shaft or base building should be provided with a "drop tube" to send current Flight

Progress Stripes on departures and arrivals to Approach Control position.

b) The approach Operation Room size is largely determined by the number of operating positions and radar consoles.

c) Wind Direction and Speed Indications, Altimeter Readout Indicators and Clocks should be provided.

Where approach Control is provided for one aerodrome only Tokua, the Approach Control Room should be accommodated within the control tower structure.

(3) Other Required Rooms

a) The Radar Simulator Training Room should be located in the training area and close to or above the radar equipment room.

b) A room for Meeting and Training should be provided with adequate size for the number of operational personnel.

c) In functional shaft facilities, the break room should be located under the cab. This room can be also used as the briefing room when controllers change their shifts. Allowance of 2.5 $m^2$ should be provided per occupant but starting with a minimum size of 10 $m^2$

d) Recorder equipment is located in the communication room where access to cable ducts is facilitated. However, the equipment should be under direct control of a man in charge in order to keep the secrecy of recorded data.

e) Space for electronical equipment, including adequate cable length, is critical to temperature, in some cases, to the cleanlines of the room.

### 10.4.2 Administration Building

The location of the administration building is between C.F.R. building and the control tower. The characteristics and functional roles of DCA and Tokua Airport is shown in Figure 10.7-1. The figure also shows the preliminarily estimated number of staff to be required. ATS room is included in this administration building instead of the

Control Tower building. The floor plan is proposed as illustrated in attachment drawing 10-4. The extension plan is also illustrated in the same figure.

### 10.4.3 CFR Building

The primary functional space in the building is the fire trucks parking area. Surrounding this space are various service areas arranged functionally in order to optimize the efficiency of the use of the equipment. The success of the design of a CFR building must be judged in terms of the adequacy of the interaction of those three components, namely, man, machine and service areas.

The arrangement of these function are illustrated in Attachment drawing 10-5, 10-6 as a feature of year 2010.

Regarding the structure of the building, the roof over the vehicle parking space is of a steel structure in view of the large span required for the space. A watch room and a training room are fit into the mezzanine, as the ceiling height of vehicle parking space is quite high. A device would be made to improve the view of watch room at the stage of detailed design.

### 10.4.4 Maintenance Shop

Maintenance bay is the primary service space in the building. Other service bays and compartments will be laid out around it. The maintenance bay will face the exterior wall with individual entrances so that the vehicles are taken into the bay directly without passing through other spaces.

The maintenance bay area will have a sufficient height to enable lighting of vehicles and parts. The building structure materials will possibly be of hollow concrete block and the roof will be covered with light weight materials with a good heat insulating material.

To maintain a good working condition inside the building, natural lighting and natural ventilation will be provided as much as possible.

Attachment drawing 10-7 shows the illustration of the maintenance shop mainly for mechanical work.

Ground service depot and building repair shop are located in a site allocated for maintenance workshops.

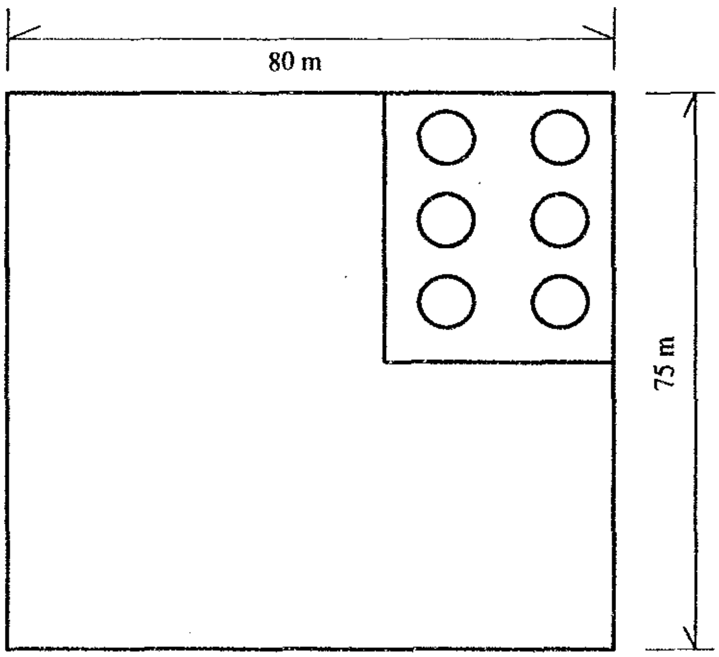
10.4.5 Fuel Farm

As prescribed in Chapter 9.4.5, it has been a common practice at many airport to provide a storage capacity for one week demand. The required amount of fuel for a week is estimated to be about 1,290 kl for the year 2010.

No appropriate design standard can be found as an international one. The design should be made taking into consideration the condition of each airport peculiar to the state to which the airport is located. In computing the required fuel storage capacity at Tokua Airport, the concrete standard of JCAB (Japan Civil Aviation Bureau) is used.

It is estimated to require 6 tanks with a tank capacity of each 300 kl in the fuel farm area of 6,000 $m^2$ to cope with the requirement of 1,290 kl for the year 2010.

Assuming that each tank has a storage capacity of 300 kl, the required minimum tank yard area is roughly 6,000 $m^2$ as illustrated below.




10.4.6 Electrical Facilities

Electrical works for various buildings to be built at Tokua Airport will consist of the following systems:

- Lighting system
- Flight information and clock system

- CCTV security system
- Telephone and intercom system
- Public address system
- Fire alarm system
- Power supply monitoring and lightning protection system

The proposed electrical systems are outlined hereunder.

1) Power Supply System

Power demand for the airport facilities is tentatively estimated to be around 1,350 kVA as follows:

| | |
|---|---|
| Control tower | 150 kVA |
| Passenger terminal building | 500 kVA |
| Cargo building | 100 kVA |
| Administration building | 200 kVA |
| Radio navigation aids | 40 kVA |
| Fire fighting station | 50 kVA |
| Air field lighting | 300 kVA |
| Others | 10 kVA |
| Total | 1,350 kVA |

$$\frac{1{,}350\ \text{kVA x Load factor}}{\text{Diversity factor}}$$

$$= \frac{1{,}350\ \text{kVA x } 0.8}{1.05} = 1{,}028\ \text{kVA}$$

(Say 1,000 kVA)

While, as shown in Figure 10.4-2, the current power system in Gazelle peninsula consists of Rabaul and Kerevat thermal power stations which are coupled by a 66 kV line and a 22 kV line. Warangoi hydro power station is also connected to the 66 kV system. The Kokopo 22 kV line which presently has a maximum capacity of 2 MW will be extended to Tokua Airport.

Electricity commission in PNG has their own plan for power development in Gazelle peninsula network, which is shown in Table 10.4-1, to cater for the power demand up to year 2,000 shown in Table 10.4-2.

The demand forecast of electricity in Gazelle peninsula should be requested to be reconsidered including a big-ticket item of the Tokua Airport, to cater for the need to the commercial power at the master plan stage.

Proposed system block diagram for commercial power supply system in Tokua Airport is shown in Figure 10.4-3.

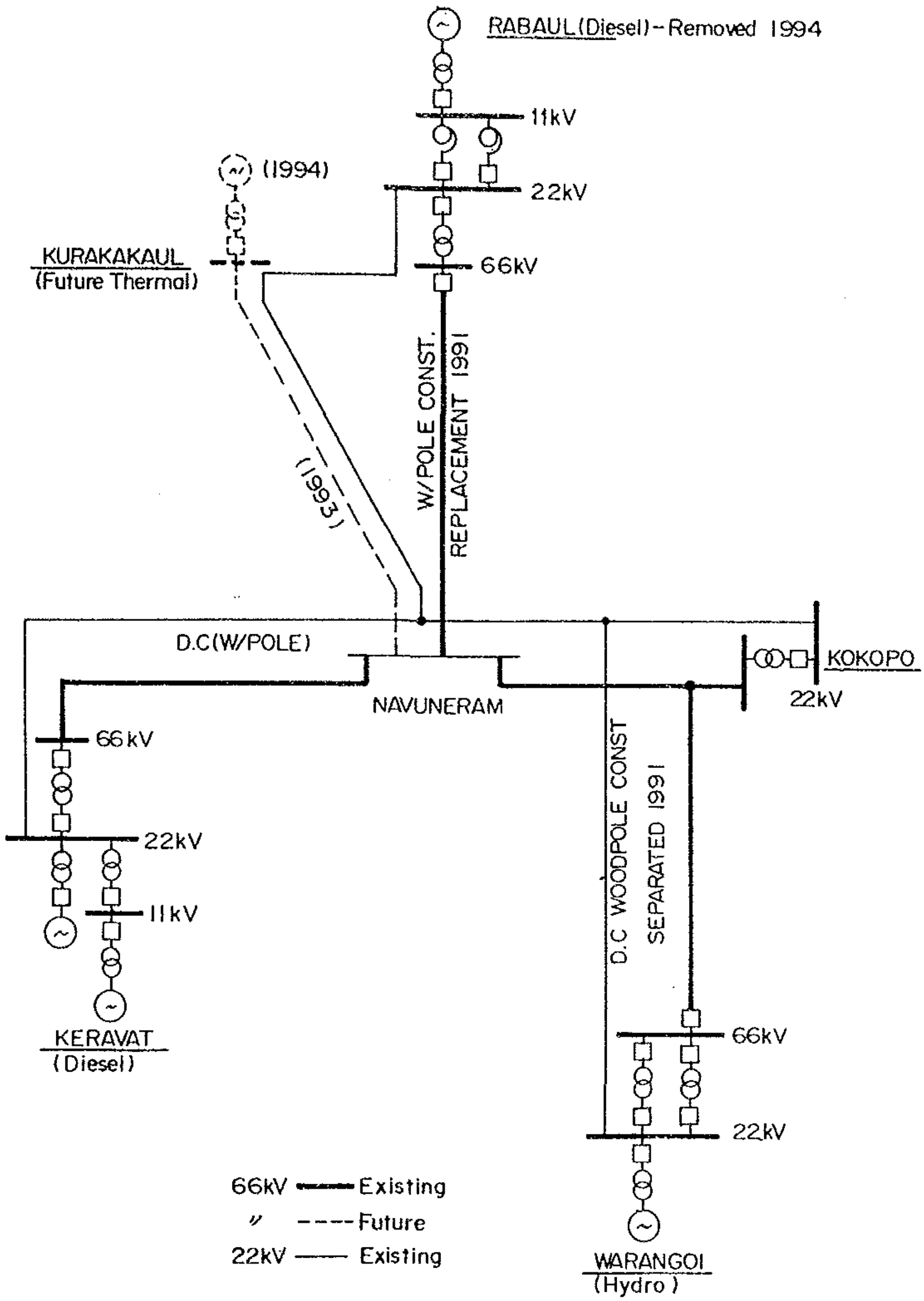



Figure 10.4-2 Existing Electrical Network Tokua A/P Power System in Gazelle Peninsula

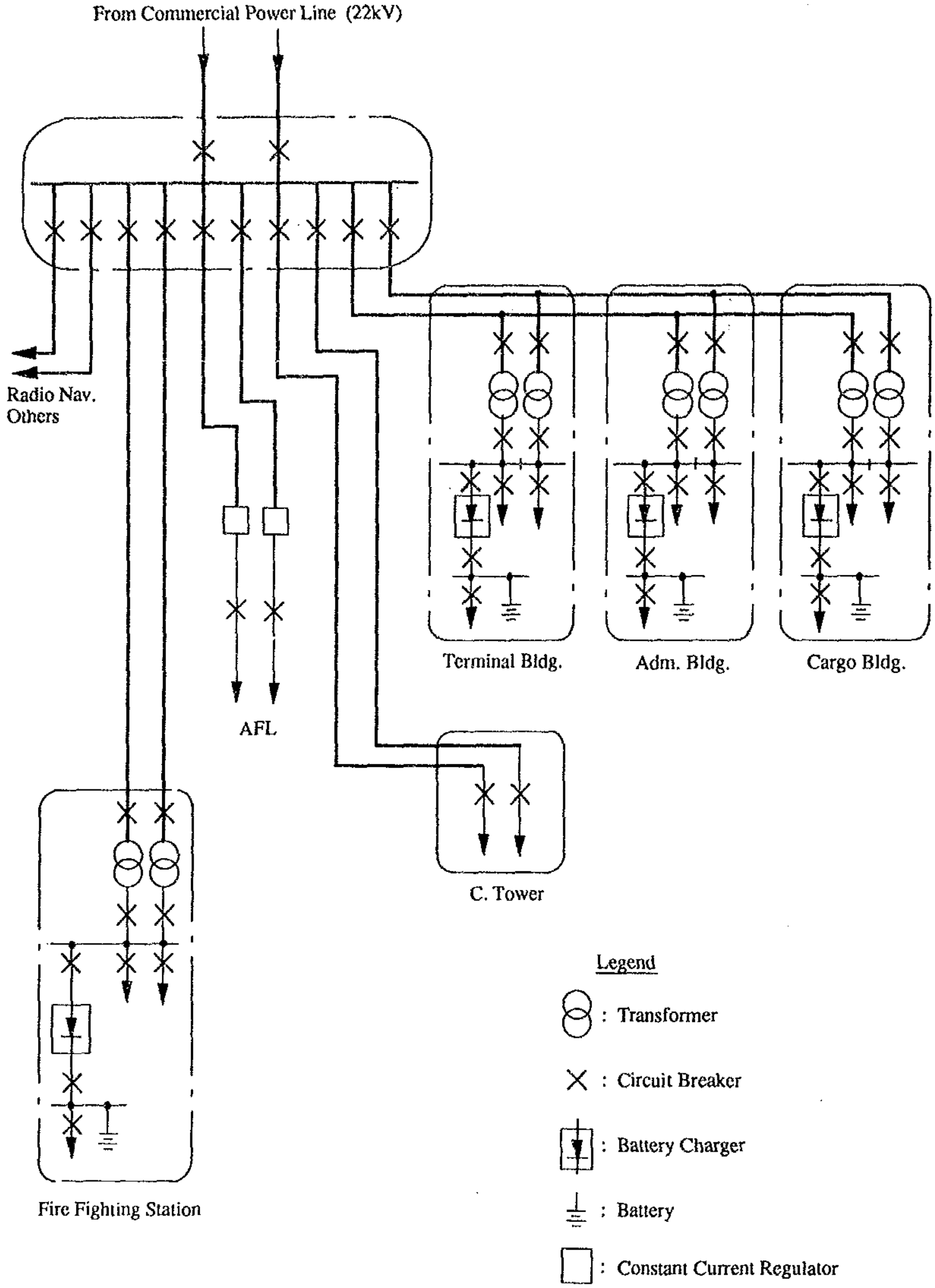



Figure 10.4-3
PROPOSED SYSTEM BLOCK DIAGRAM
TOKUA A/P

Commercial Power Supply System

2) Emergency Power Supply System

In emergency cases, power should be supplied by the diesel engine generators for the radio navigation aids. In addition to the diesel engine generators, battery and charger sets are required for power supply to prevent several seconds of interruption by transferring commercial power to engine start up. Required capacity is estimated as follows:

| Facilities | Demand |
|---|---|
| Telecommunications | 10 kVA |
| Radar (ASR/SSR) | 20 kVA |
| Meteorological EQ | 1 kVA |
| Field lightings | 300 kVA |
| Emergency lights in the terminal buildings and the control tower | 300 kVA |
| Others | 10 kVA |
| Total | 641 kVA |

Therefore, it is proposed that a 650 kVA diesel engine generator is to be provided for emergency power supply.

Table 10.4-1 Gazelle Peninsula System Development Plan

| Plant | Voltage | Works | Year |
|---|---|---|---|
| Z. Substation | | | |
| New Thermal P/S | 22/66 | Purchase 1 x 10/15 MVA step-up Transformer & switchgear | 1993 |
| | | Install transformer & switchgear | 1993 |
| Transmission | | | |
| Overall | 22 kV | Separate the 22 kV lines from the 66 kV | 1991 |
| | 66 kV | Investigate replacement of 66 kV wood poles with alternative line structures | 1992 |
| | 66 kV | Wood pole replacement | 1992 |
| Navunaram to New Thermal P/Station | 66 kV | Construct new 66 kV circuit | 1993 |
| | | Complete new 66 kV circuit | 1993 |

Table 10.4-2 Gazelle System Area and Zone Substation MVA Load Forecast

| Area | Assume p.f. | Growth rate % | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rabaul | 0.80 | 4.8 | 5.2 | 5.5 | 5.7 | 6.0 | 6.3 | 6.6 | 7.0 | 7.4 | 7.7 | 8.1 | 8.5 |
| Kokopo | 0.80 | 4.8 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 |
| Kerevat | 0.80 | 4.8 | 1.5 | 1.6 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 |
| Warangoi | 0.80 | 4.8 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| Total: | | | 7.7 | 8.1 | 8.5 | 8.9 | 9.4 | 9.8 | 10.4 | 10.9 | 11.5 | 12.0 | 12.6 |
| Diversity factor: | | | 1.04 | 1.05 | 1.05 | 1.04 | 1.04 | 1.03 | 1.06 | 1.07 | 1.08 | 1.09 | 1.09 |

Note : 1. Warangoi includes Warangoi and surrounding area loads.
2. Kerevat includes Kerevat and surrounding area loads.

3) Lighting System

Buildings are illuminated by lighting system with emergency lights. The lighting system will be adequately arranged for obtaining necessary illumination level for the operation and maintenance of airport function and services. Power outlets are provided for utilization by various appliances at proper locations.

4) Flight Information and Clock System

Flight information and clock system are provided for passenger service both at the international and domestic terminal buildings. The main control equipment will be installed at the electrical room in the terminal building. A block diagram proposed for the flight information and clock system is shown in Figure 10.4-4.

5) CCTV Security System

CCTV security system will be provided to secure the operation and maintenance of the airport. X-ray inspection equipment is also furnished for inspection of hand-baggage and personal effects. Pan/tilt cameras are installed at the suitable location of indoor and outdoor of the buildings. A block diagram for the proposed CCTV security system is shown in Figure 10.4-5.

6) Telephone and Intercom System

Telephone and intercom system are essential for exchange of information and data for the airport crew and airline companies. One set of private automatic branch exchange (PABX) will be provided for the telephone system which is interconnected with the public telephone system. PABX will be equipped with billing function for the airline companies and private user. A block diagram for the proposed telephone and intercom system is shown in Figure 10.4-6.

7) Public Address (Paging) System

Public address (paging) system will be provided for giving information to the passengers and airport crew with background music sets. A block diagram for the proposed public address (paging) systems is shown in Figure 10.4-7.

8) Fire Alarm System

Fire alarm system will be provided for quick detection of fire according to the International Fire Protection Regulation. This system is interconnected with the alarming system in the Fire Fighting Station. A block diagram for the proposed fire alarm systems is shown in Figure 10.4-8.

9) Power Supply Monitoring and Lightning Protection System

Power supply monitoring and lightning protection system is provided for operation and maintenance of airport terminal buildings and power supply facilities.

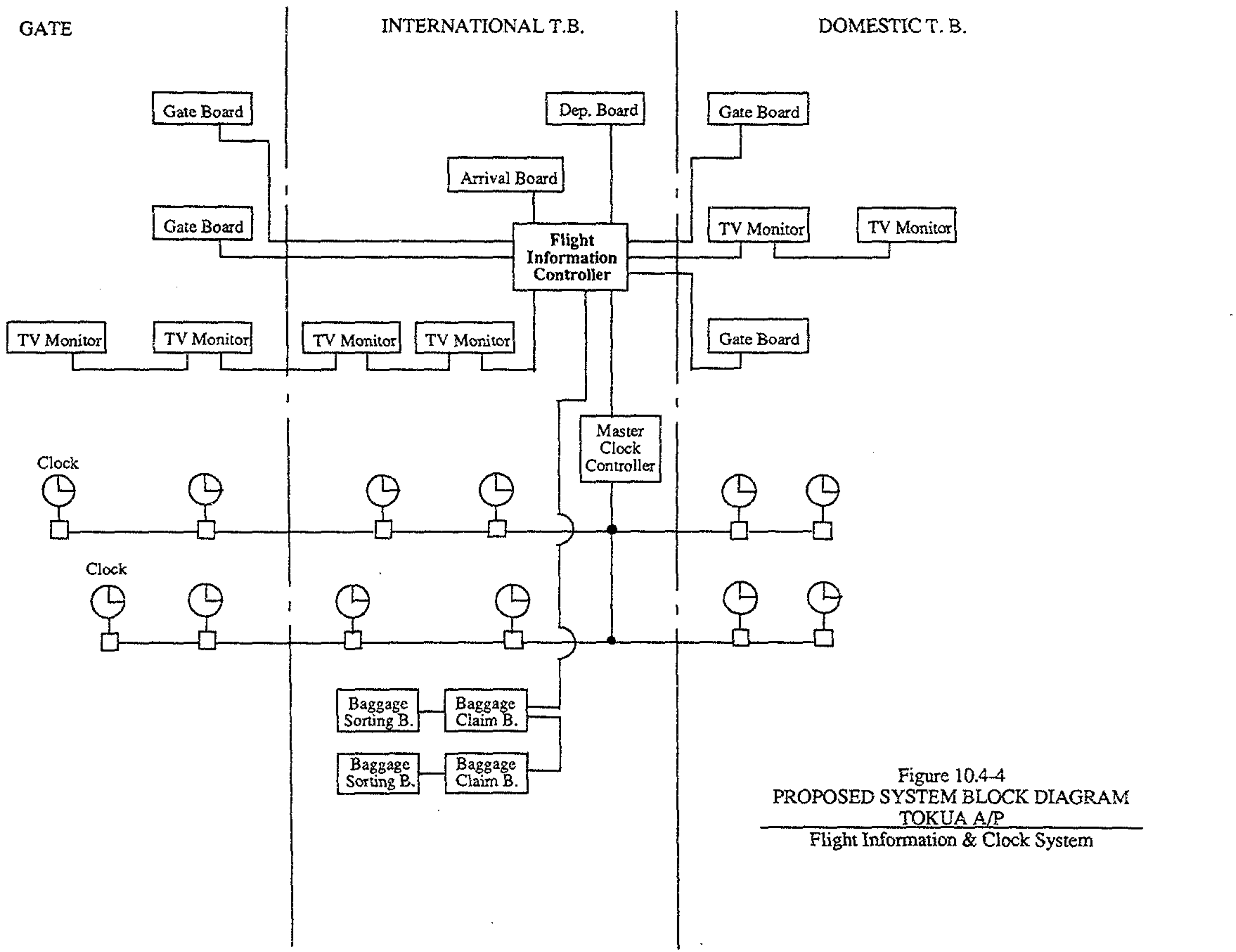



Figure 10.4-4
PROPOSED SYSTEM BLOCK DIAGRAM
TOKUA A/P
Flight Information & Clock System

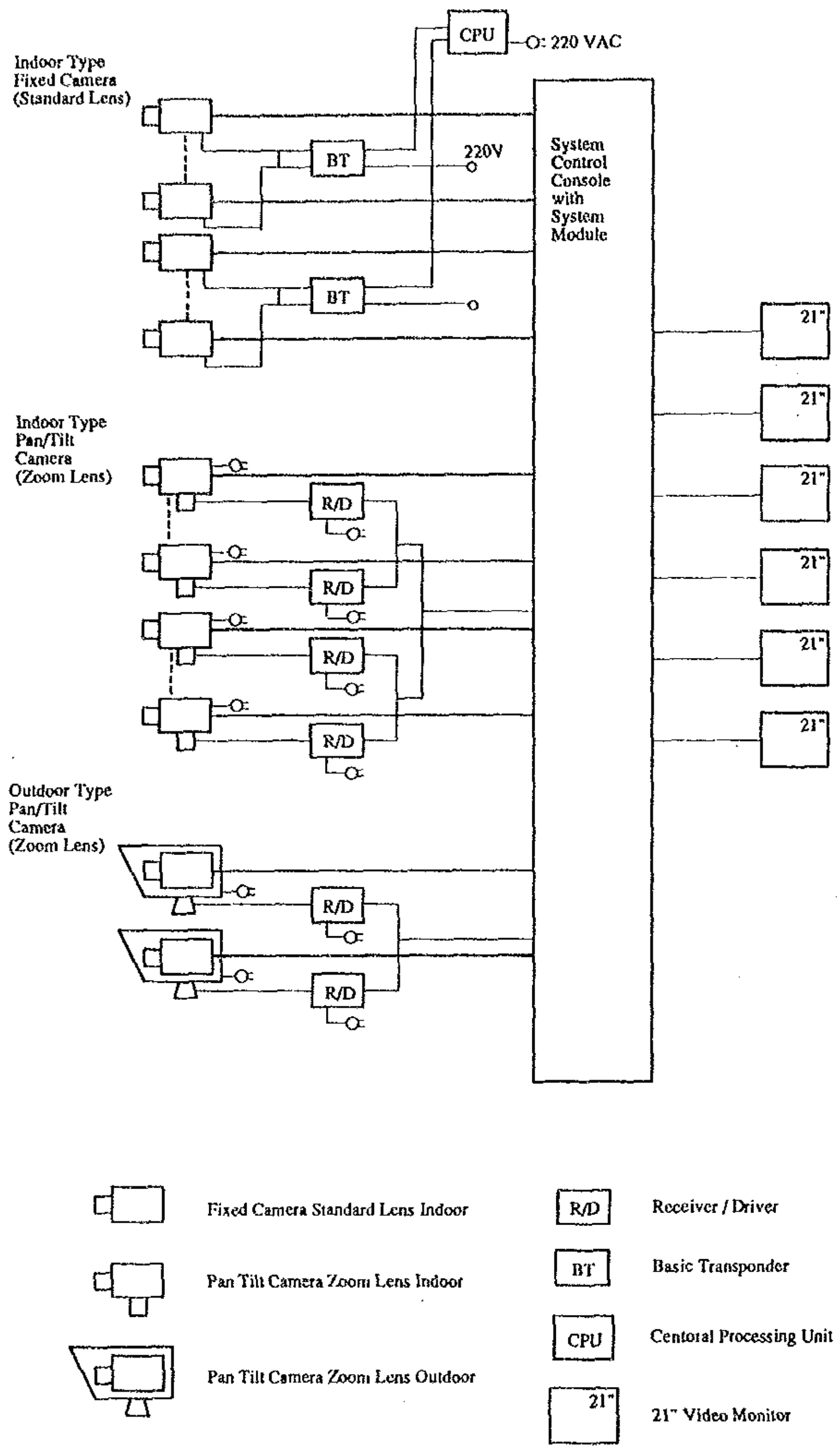



**FIGURE 10.4-5**
**PROPOSED SYSTEM BLOCK DIAGRAM**
**TOKUA A/P**

**CCTV Security System**

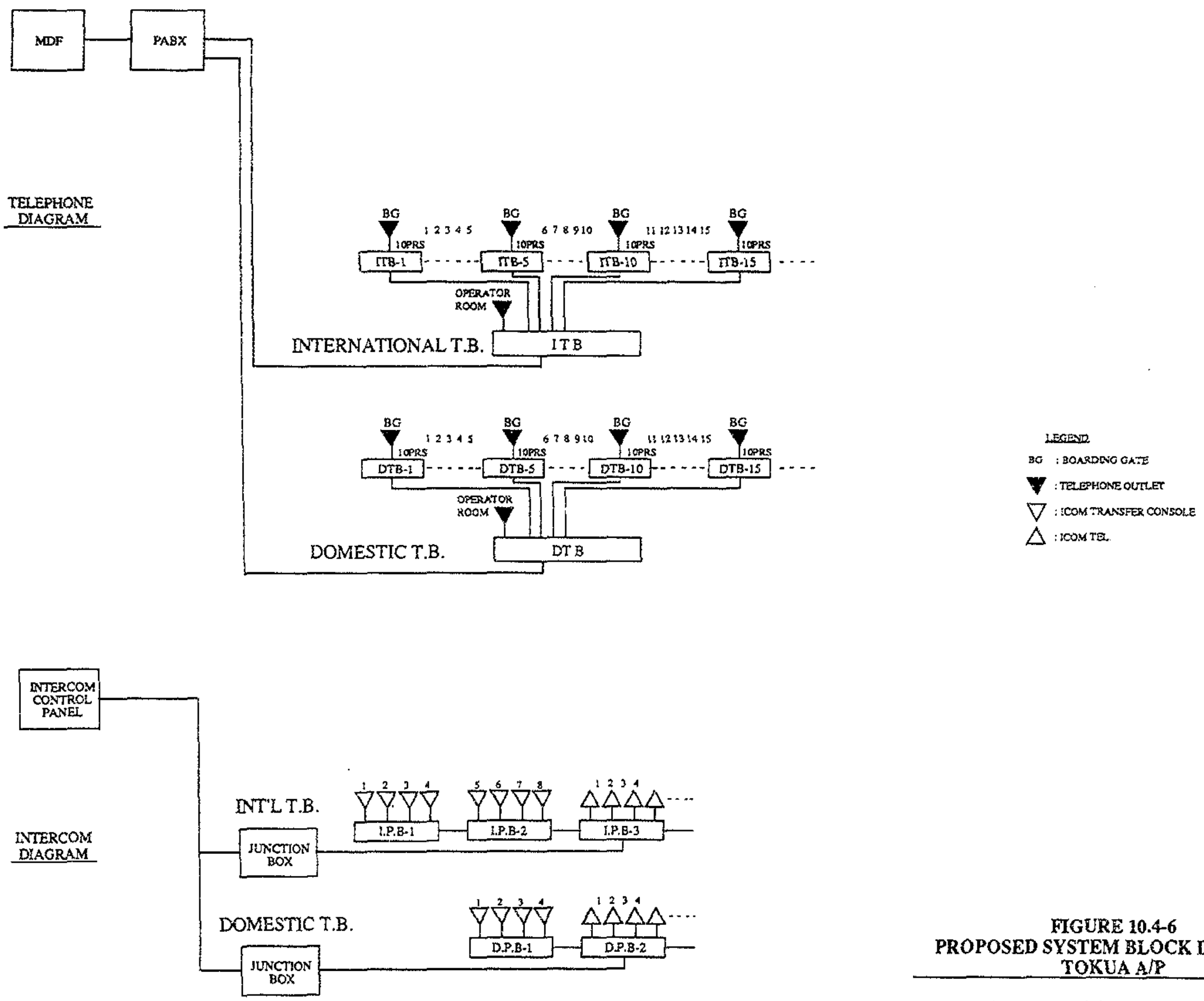



**FIGURE 10.4-6**
**PROPOSED SYSTEM BLOCK DIAGRAM**
**TOKUA A/P**

**Telephone & Intercom System**

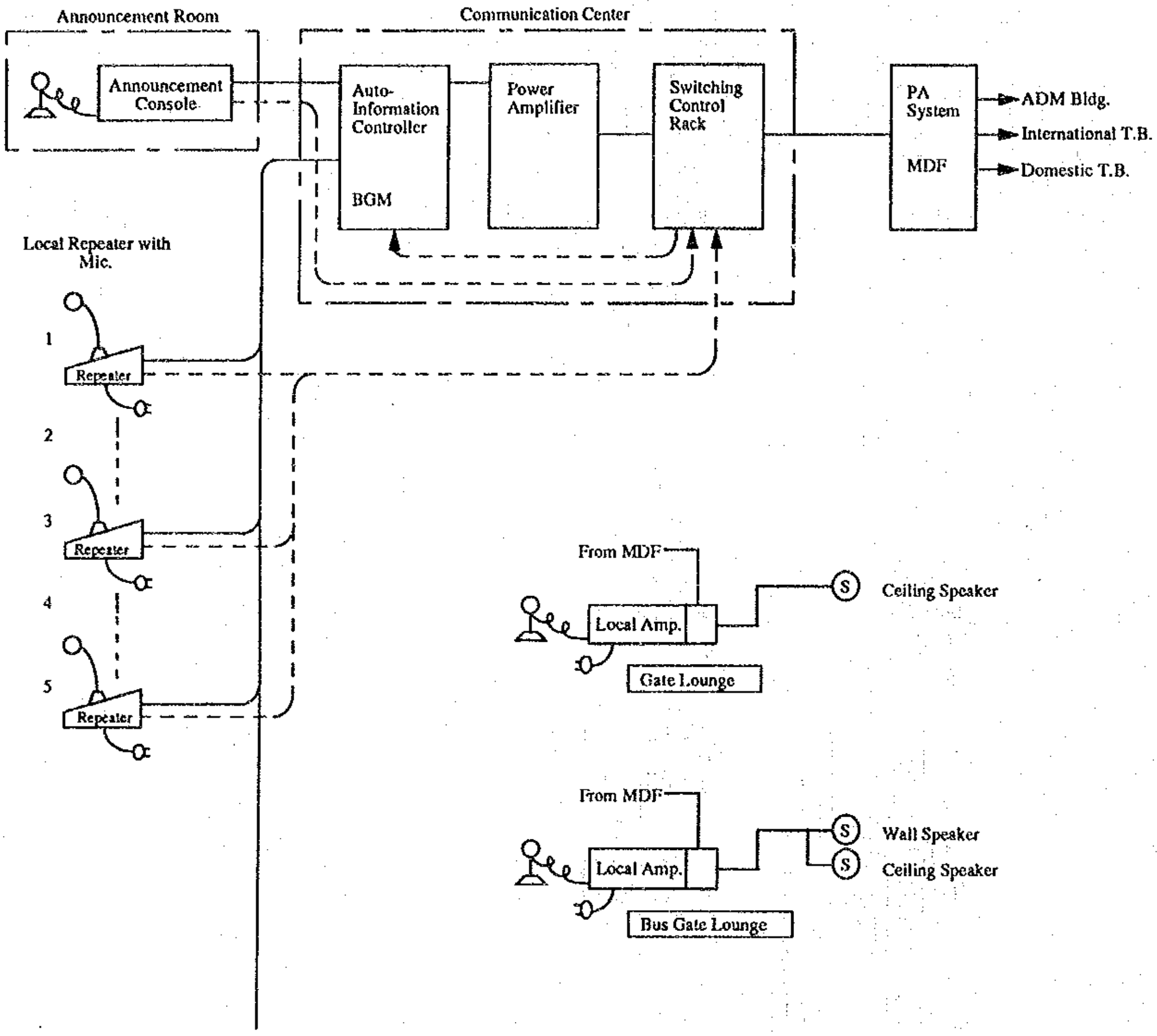



**Figure 10.4-7**
**PROPOSED SYSTEM BLOCK DIAGRAM**
**TOKUA A/P**
**Public Address (Paging) System**

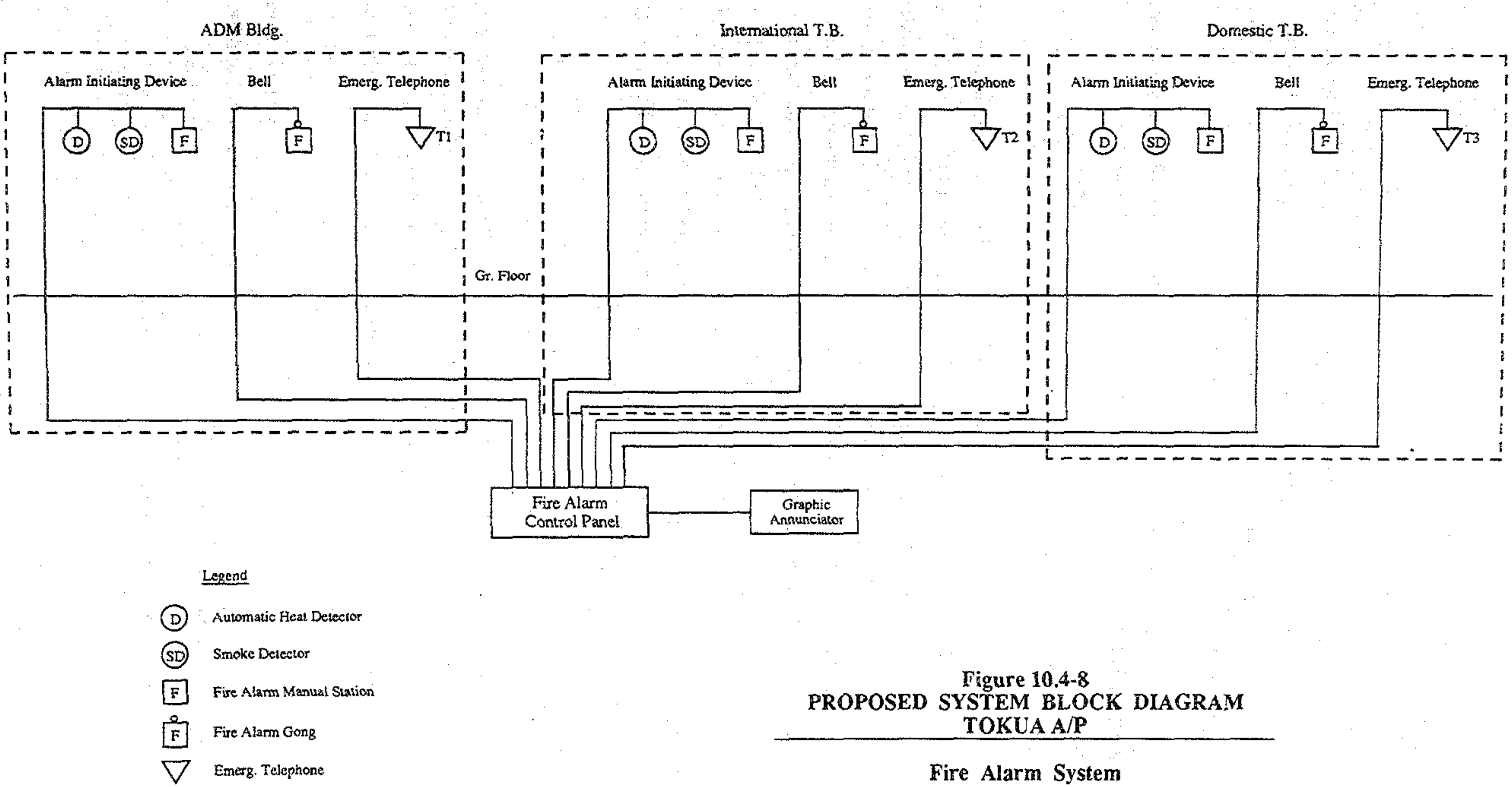



**Figure 10.4-8**
**PROPOSED SYSTEM BLOCK DIAGRAM**
**TOKUA A/P**

**Fire Alarm System**

## 10.5 Operational Equipment

### 10.5.1 Navigation Aids

Development of navigation aids will be planned so as to be consistent with the forecast air traffic increase, proposed development of airside infrastructures and terminal buildings, and proposed control tower facilities. The development is required to ensure efficient and safety operations of the airport.

Major navigation aids to be proposed for the master plan development are summarized as follows:

1) DVOR/DME

A doppler VOR and DME will be installed at opposite side of the terminal area crossing the runway. The location of the DVOR/DME will be better at an aerodrome facilities than the beneath the approaching course as an off aerodrome facilities to minimize the minimum descent altitude (MDA). Output power might be considerably selected to permit satisfactory operation of a typical aircraft installation at the minimum service level at the maximum specified service radius to be 90 $\mu$V/m or -107 dBW/m$^2$ for DVOR and -83 dBW/m$^2$ of the peak effective radiated power for DME. Since DME at Tokua Airport will be associated with a DVOR, DME coverage shall be at least that of the VOR to the extent practicable.

2) NDB

An existing NDB, type ND500-02 (125 watt) manufactured by NAUTEL, Canada, was installed in 1987 by the Department of Civil Aviation, Rabaul. The NDB is operated for 24 hours by solar energy, with the equipment of solar controller, batteries and solar cells made in Australia.

The NDB should be replaced by a new NDB in the early stage, from the present location to the terminal side of the airport so as not to penetrate obstacle limitation surface.

3) ILS

ILS is not proposed to be installed under the master plan program, even if DME can be used to substitute the Outer Marker (OM) which is obliged to be over the sea, since ILS will be replaced by MLS after 1998, according to the ICAO recommendation.

4) MLS

It is a precision approach and landing guidance system which provides position information and various ground-to-air data. The position information is provided in a wide coverage sector and is determined by an azimuth angle measurement, an elevation angle measurement and a distance measurement.

The basic configuration of the MLS will be composed of the following:

a) approach azimuth equipment, associated monitor, remote control and indicator equipment;

b) approach elevation equipment, associated monitor, remote control and indicator equipment;

c) a means for the transmission of basic data words, associated monitor, remote control and indicator equipment;

d) DME, associated monitor, remote control and indicator equipment.

MLS is a navigation aids which is suitable for any type of aircraft for practical use in the future. The feature can be summarized below:

(a) Can freely select the approach course

ILS course is a locus of the same level on the field course and set on the runway center line and the glides path angle is fired 2.5° to 3° generally; these can not be properly changed. MLS, however, azimuth information can be obtained at horizontal and vertical surfaces within a coverage. And by adding an accurate distance information from the basic point, three dimensional position can be continuously identified.

By the function of MLS, the approaches, as shown in Figure 10.5-1 are enabled to and any operational requirement by small aircraft, STOL and VTOL etc. can be satisfied. And in case of using MLS together with RNAV (Area Navigation), effective utilization of the air space will be enabled.

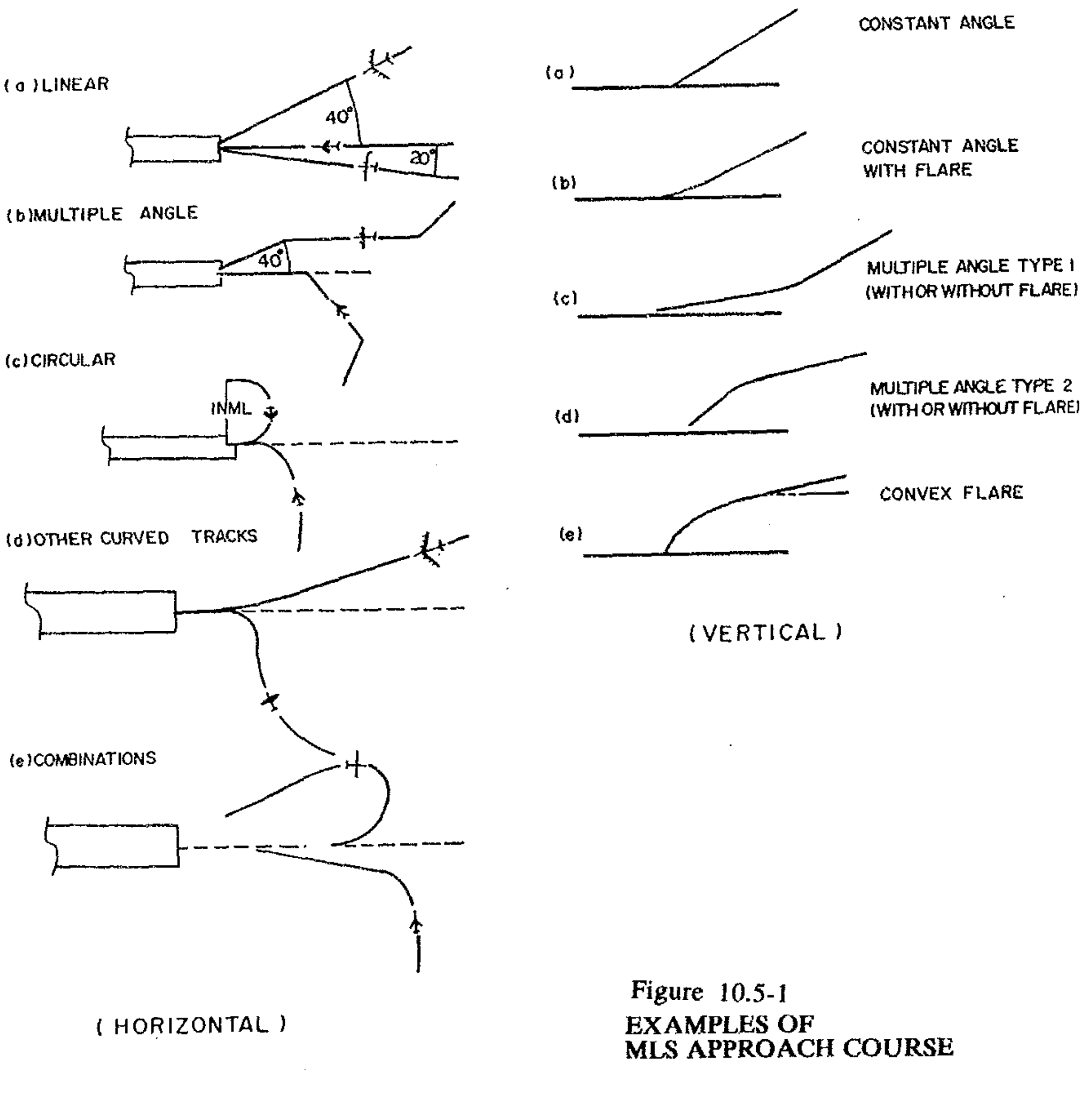



Figure 10.5-1
EXAMPLES OF
MLS APPROACH COURSE

(b) Can be matched system configuration with various conditions.

MLS has a function of flexible system configuration showing in Figure 10.5-2.

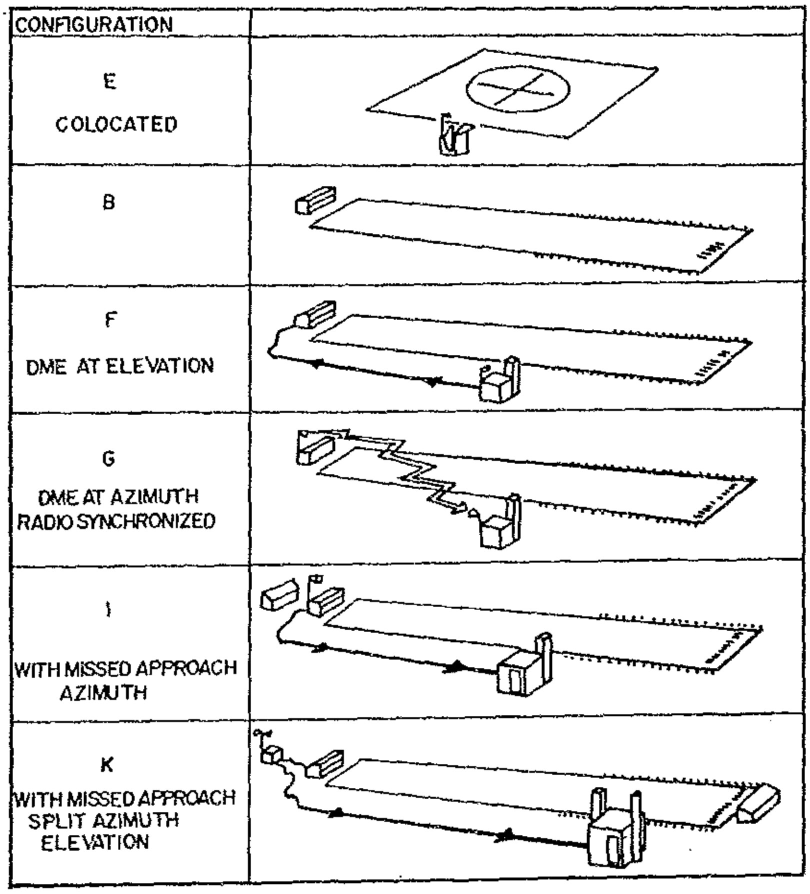



Figure 10.5-2 Examples of MLS System Configuration

(c) Mitigation of siting criteria

Since ILS radio approach course is easy to be disturbed by buildings and ground surfaces of its vicinity, severe siting conditions is required. Therefore, in some cases it might be difficult to determine the location to install the ILS or it could not fullfill the characteristics of the system. And these limitations are a problem for the airport development.

While, MLS can generate a sharp electric field pattern by microwave, and it can reduce the reflected radio wave by data processing technique.

Figure 10.5-3 and Figure 10.5-4 show a typical siting for MLS and a comparison of ILS & MLS approach respectively.

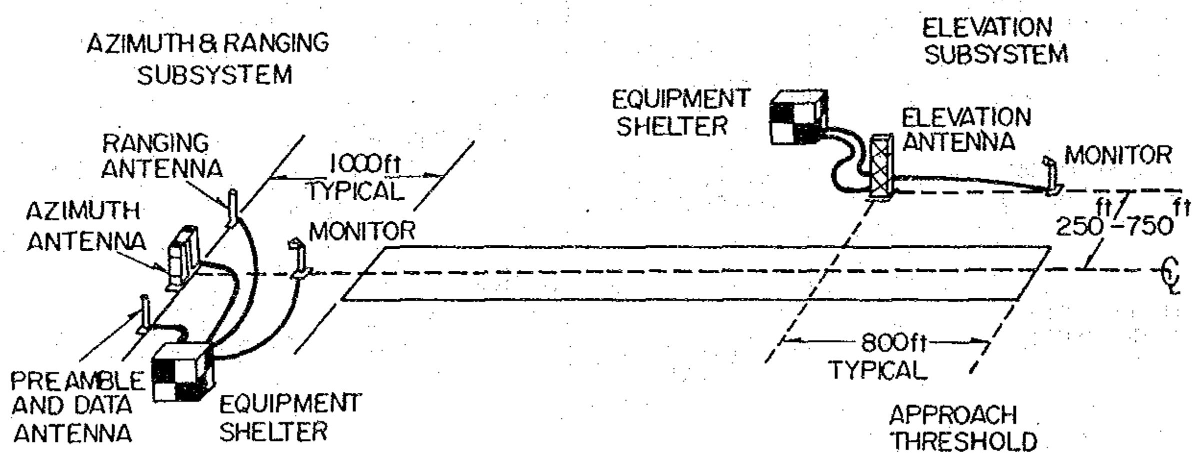



Figure 10.5-3 Typical Siting for MLS

ILS

MLS

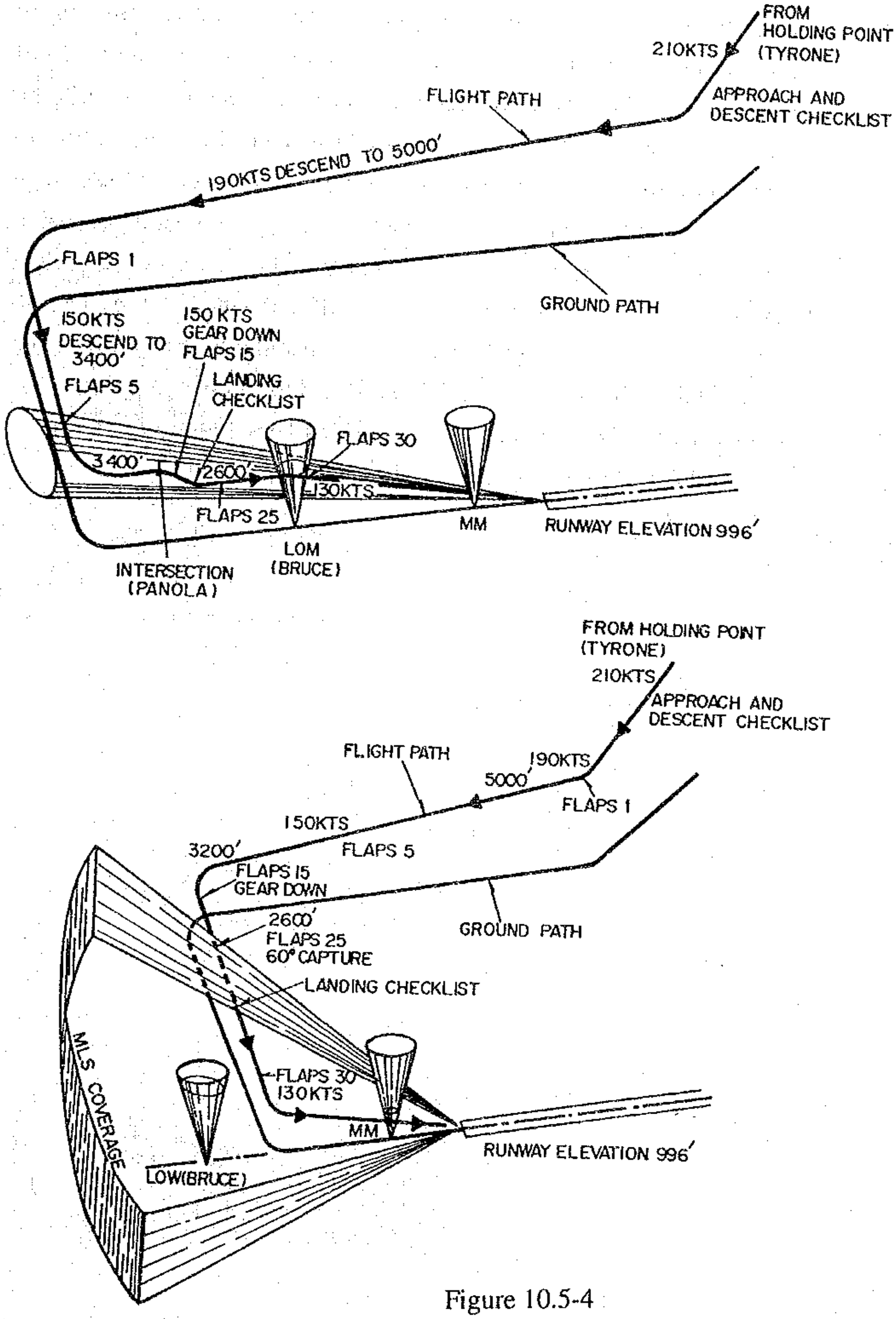



Figure 10.5-4

**COMPARISION OF ILS & MLS APPROACHES**

5) Radar

Showing in Figure 10.5-5, ASR should be provided for smooth air traffic control. And the SSR system will be also introduced at Tokua Airport to provide signals to augment desired radar returns and to provide means of aircraft identification through the transmission of pulse coded replies from the aircraft. The SSR can display airborne transponder replies only at bearings and distanced corresponding to actual positions. All equipped aircraft within the volume of coverage will be seen in a manner which permits continuity of tracking to within 1.85 km of the interrogator. The SSR can provide an over-all resolution comparable to that of the primary radar ASR with which it is associated, and also provide service under all weather conditions at all bearings and at all distances between 1.85 and 370 km, and at all operational altitudes up to at least 30,480 m above the mean sea level between at least the angles of elevation of 0.5 degree and 45 degrees.

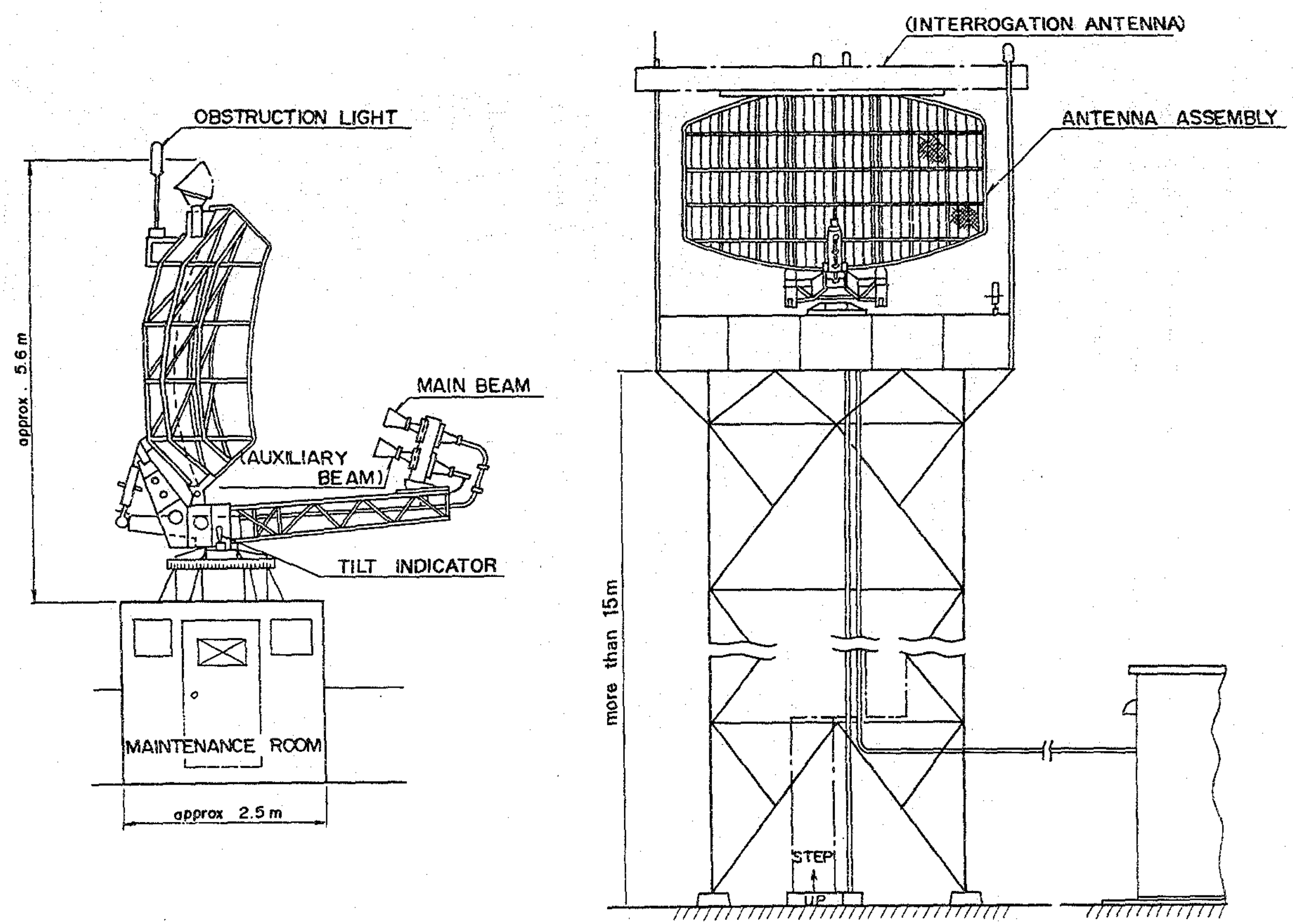



Figure 10.5-5
**TYPICAL OUTLINE OF RADAR FACILITY**

### 10.5.2 Telecommunication Systems

1) AMS

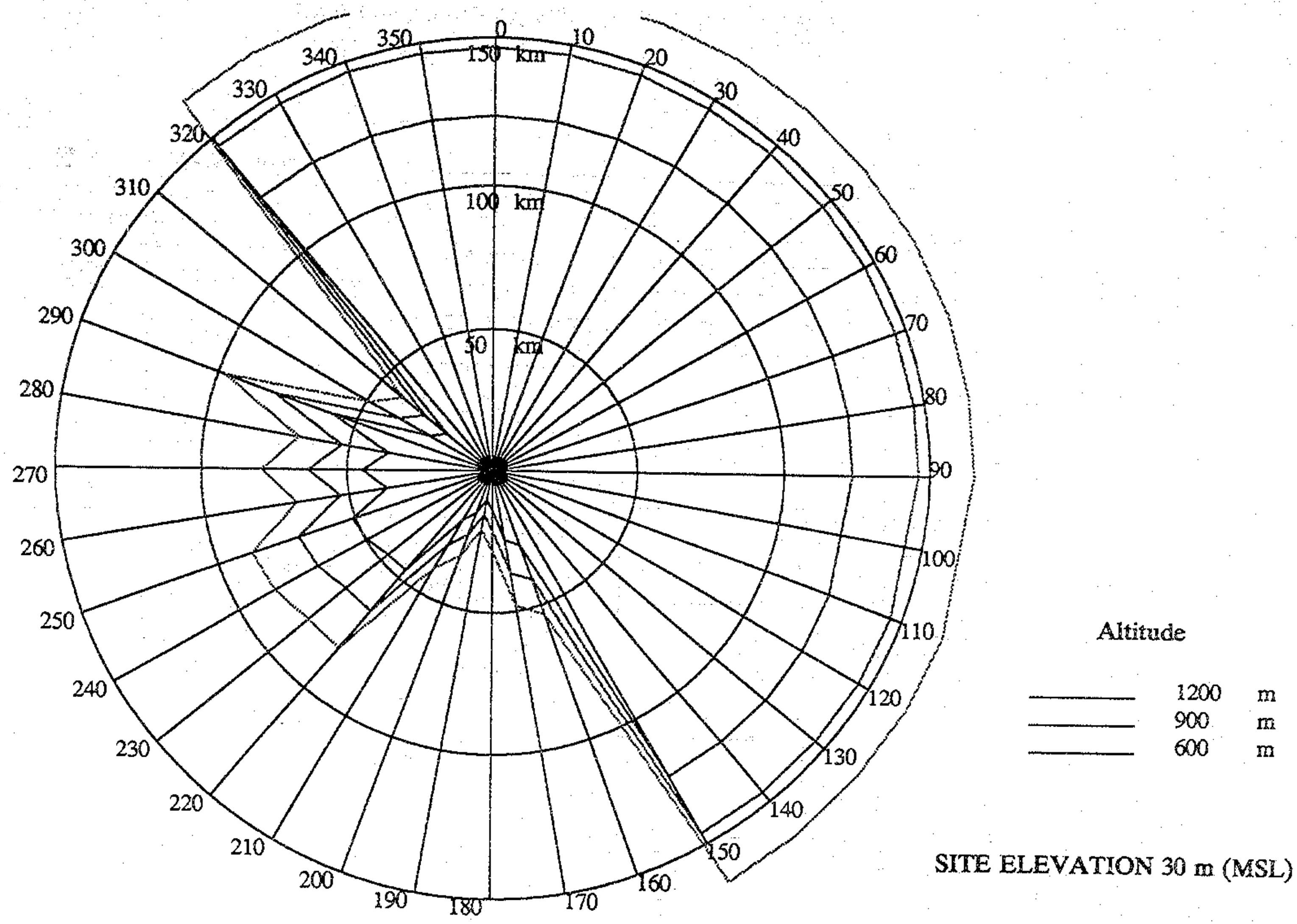
The VHF AM air-ground radio should be installed at Tokua Airport for the communication between a pilot and a controller. The radio coverage is shown in Figure 10.5-6 supposing the antenna height is 30 m from the mean sea level. From the figure, the coverage is not always enough to the directions of 190° and 310°.

To cover a wider range of communication for air-ground, the VHF radios will be required at the higher point near Tokua Airport.

2) AFS

It is not recommended to establish a private (utility-owned) telecommunications network for the main circuit of AFTN. The private network for AFTN should be limited to the back-up system of HF. Generally to establish a private communications network, the cost is immense. And moreover, great effort will be required for the line-maintenance from both aspects of cost and personnels.

Showing in Figure 10.5-7, the AFTN in PNG is composed by the leased line from PTC. The line was observed to be quite reliable and will be suitable for AFTN network.




SITE ELEVATION 30 m (MSL)

**TOKUA AIRPORT**

Figure 10.5-6
**VHF COVERAGE CHART**

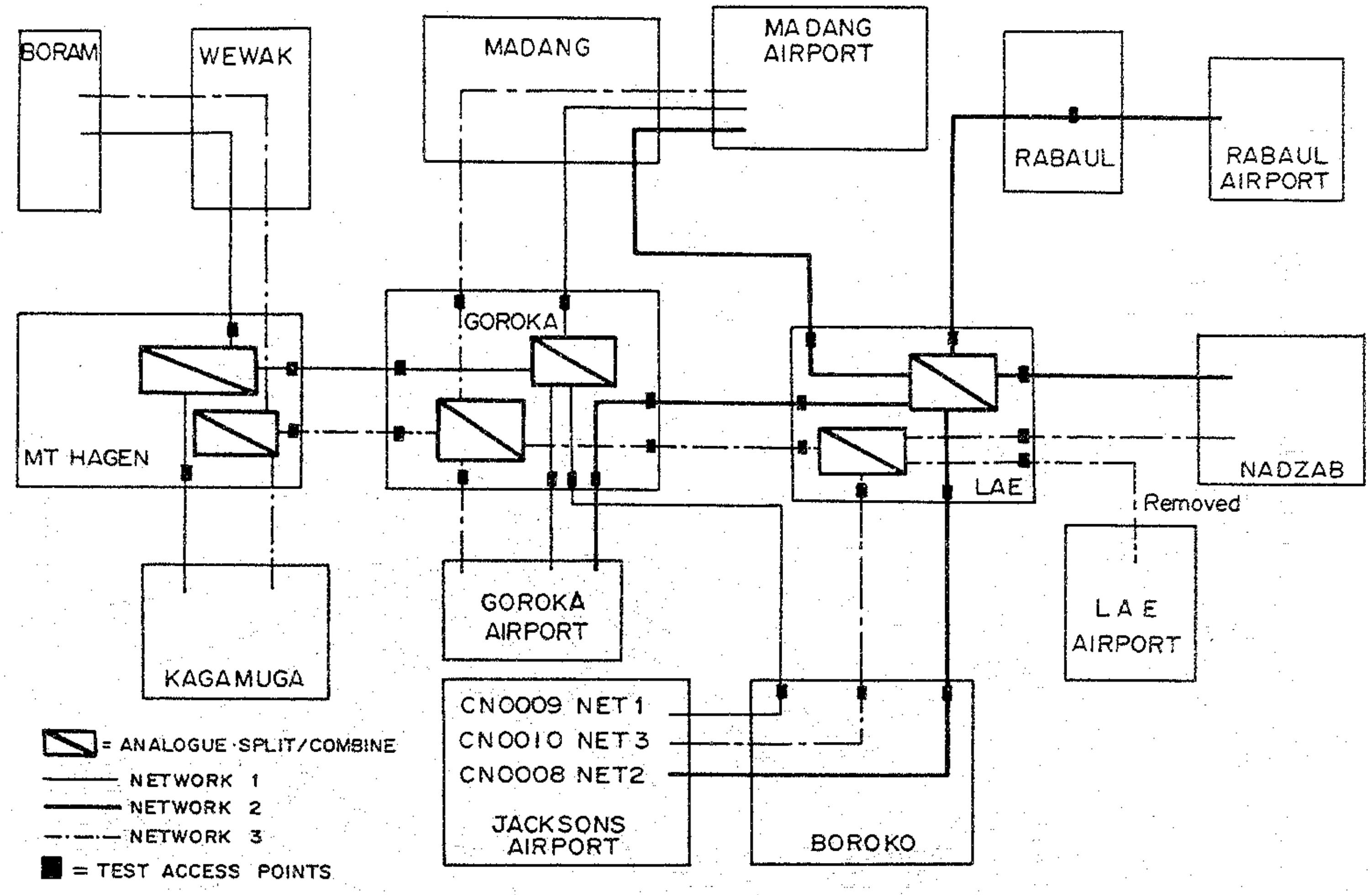



Figure 10.5-7
**EXISTING TELECOMMUNICATION NETWORK**
**TOKUA A/P**

To connect Tokua Airport to the existing PTC network, a new link between the airport and the existing Tomavatur repeater station owned by PTC is requested to be established. Two systems will be available shown in Figure 10.5-8. 960 channels of frequency division multiplex (FDM) microwave system is available between Lae and Rabaul now whose airport is fed from the telephone exchange by 100 pair cables. PTC services provided to Rabaul airport now include:

- 3 PABX lines with increasing capacity of up to 10.
- 15 leased lines of AFTN network
- Other services.

The Lae-Rabaul link is planned by PTC to be replaced with 140 Mbit/sec. digital radio bearer in 1993 which will increase the capacity to 1,920 channels and the completion is targeted for 1995. Total telephone network in PNG is attached as Figure 10.5-9 as a reference.

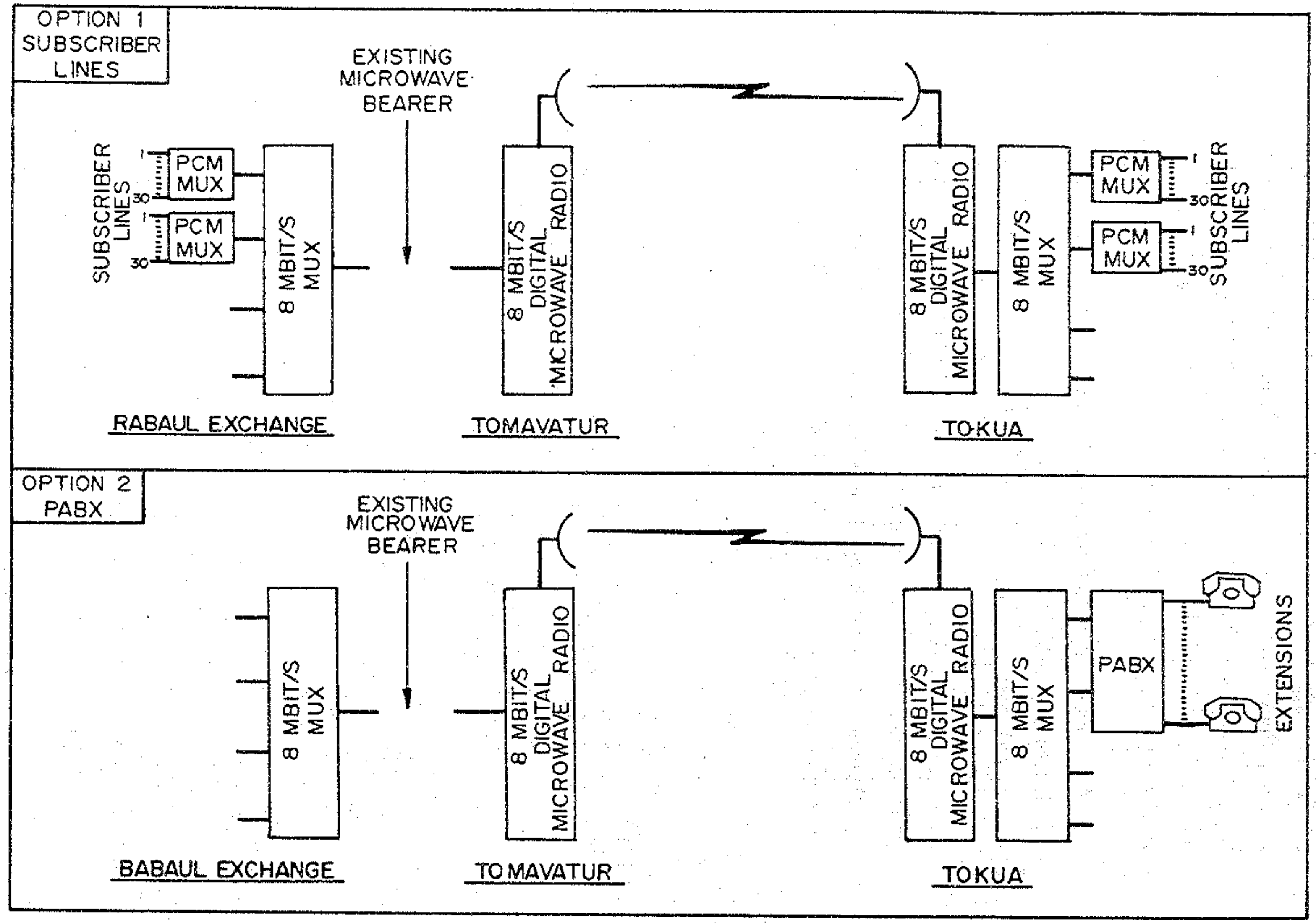



Figure 10.5-8

**PROPOSED SYSTEM BLOCK DIAGRAM TOKUA A/P**

**Telephone System**

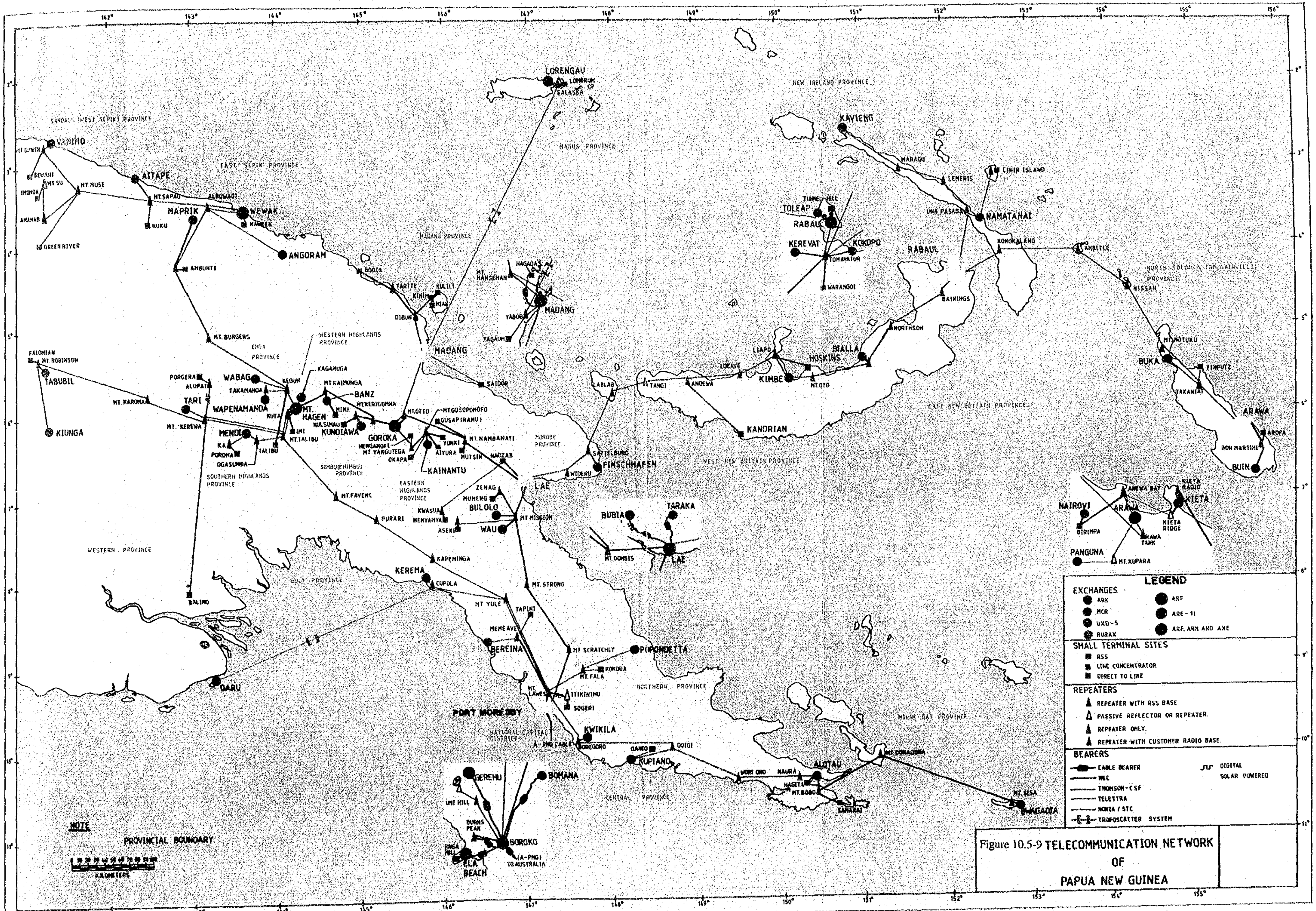



Figure 10.5-9 TELECOMMUNICATION NETWORK OF PAPUA NEW GUINEA

Going back to Tokua telecommunication system shown in Figure 10.5-7, Option 1 shows that 60 channel will be provided at Tokua Airport with an expansion capacity of up to 120 channels. Option 2 can be also given in relation to the actual distribution of telephone lines at Tokua. The latter plan involves the use of a digital PABX at Tokua, and the use of it would negate the need for 30 channel PCM multiplex, but require interface equipment at Rabaul.

This telephone network can be utilized by both AFTN and the public.

### 10.5.3 Lighting Systems

The layout for Naviads including lightings is shown in Figure 10.5-10

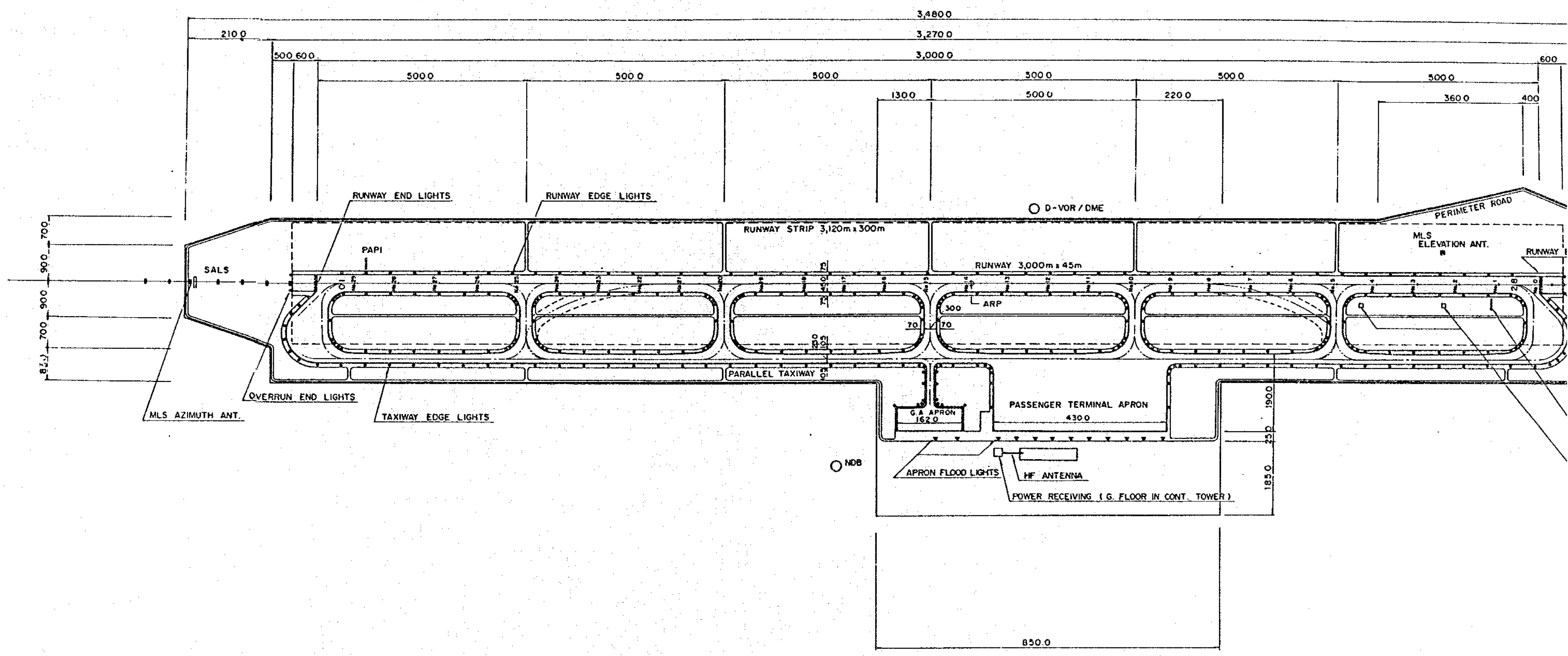



Figure 10.5-10 Naviaids System

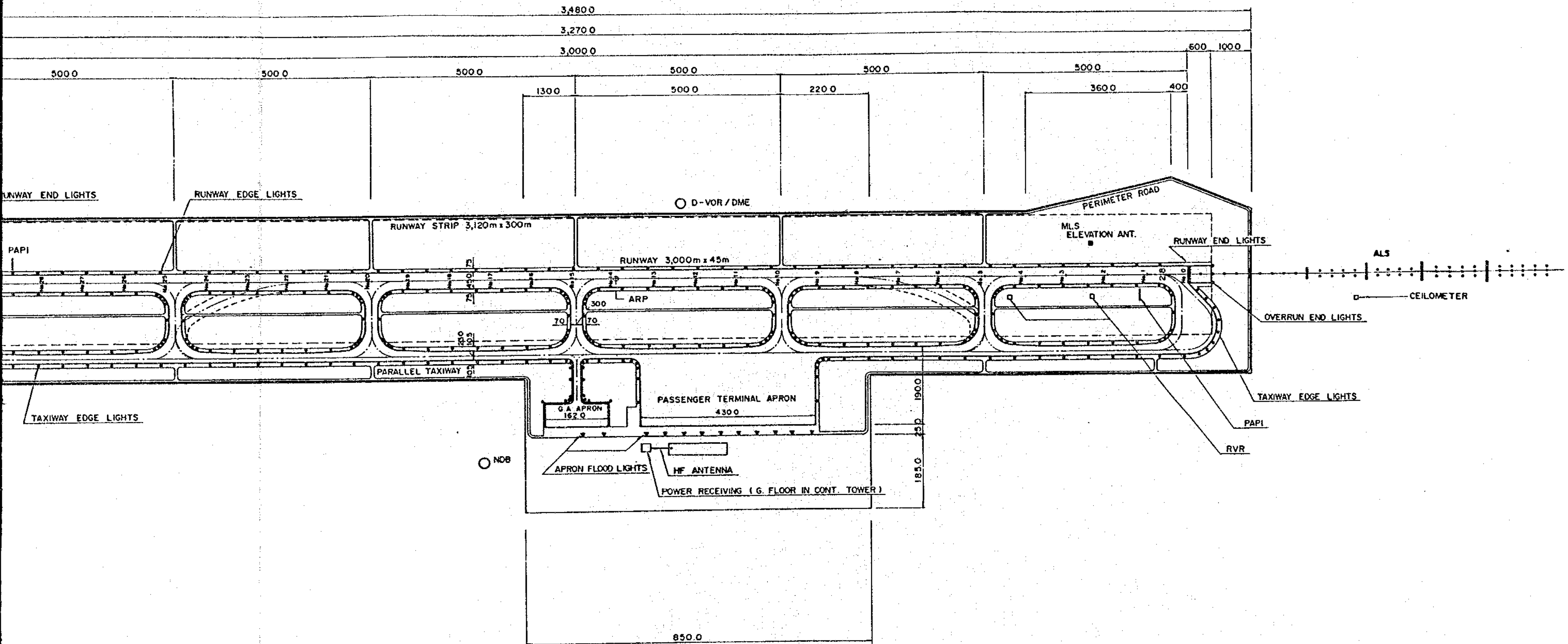



Figure 10.5-10 Naviaids System

## 10.6 ATC Operations

### 10.6.1 Airspace

The requirement for Airspace in the master plan is almost the same as stated in 9.6.1 of the previous chapter. The airspace which conflicts with the obstacle limitation of horizontal surface is shown in Figure 10.6-1.

### 10.6.2 Air Traffic Control

The whole requirements of the air traffic control services stated in 9.6.2 will be enforced and an authentic ATC will come into actual operation.

### 10.6.3 SIDs and STARs

In line with air traffic structure, necessary numbers of SIDs and STARs will be established.

1) SIDs

At least 3 SIDs should be provided for the main departure routes in the flights toward KAV, BUK, and HKN (including POM).

2) STARs

As the same as the SIDs, at least 3 STARs should be provided for the main arrival routes in the flights from the direction of KAV, BUK and HKN.

### 10.6.4 Radar Control

Radar Control services with necessary man-powers (including both ATCs and electronic technicians) will be executed as scheduled in the master plan.

## 10.7 Administration System

DCA has been in charge of administration and management of the airports in PNG, without having regional aeronautical headquarters. Jackson Airport itself has at present the organization and man-power to cope with the international airport operational use. By 2010, DCA organization would be largely amplified and destined to be reorganized.

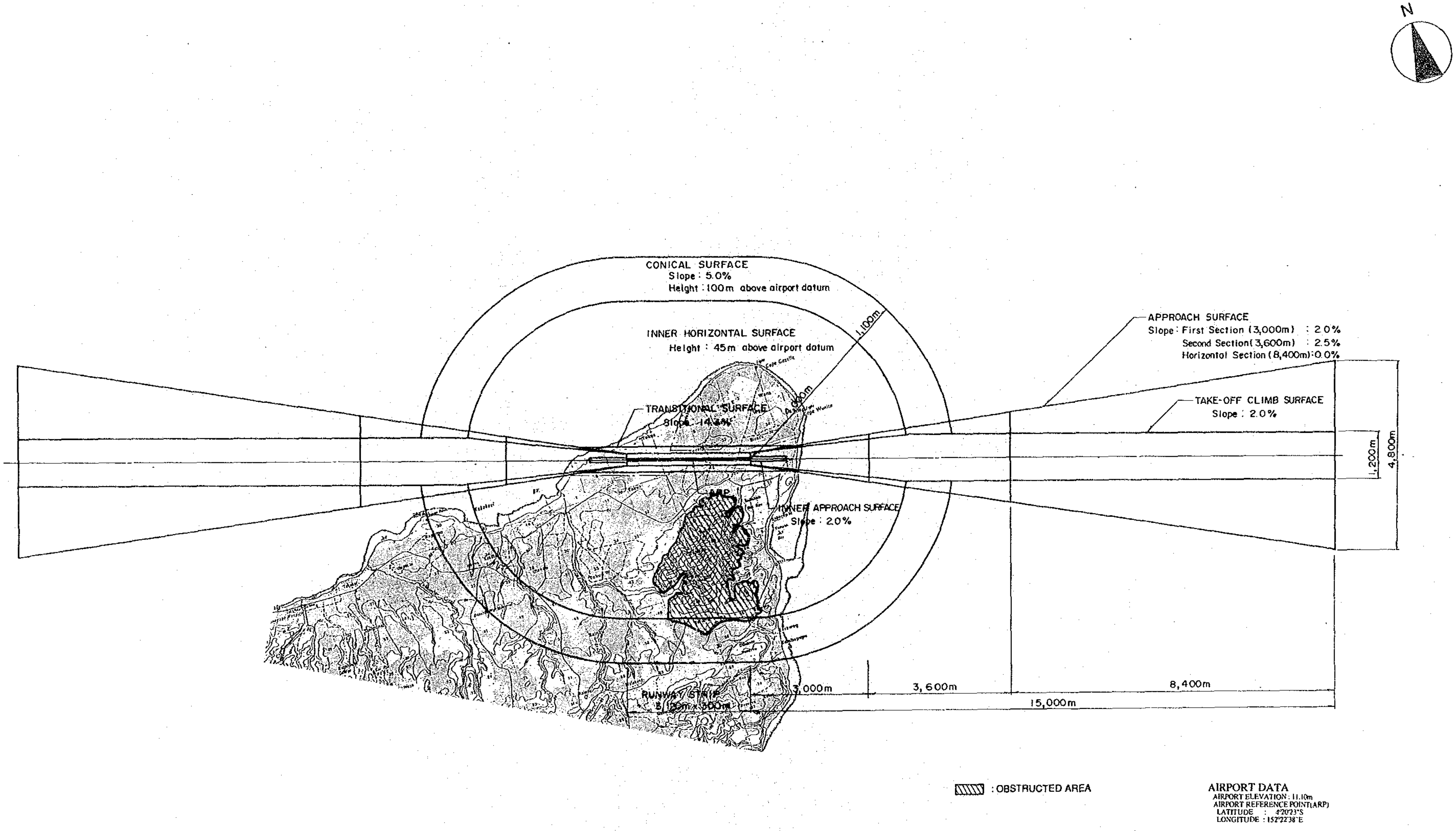



Figure 10.6-1 Obstacle Limitation Surfaces

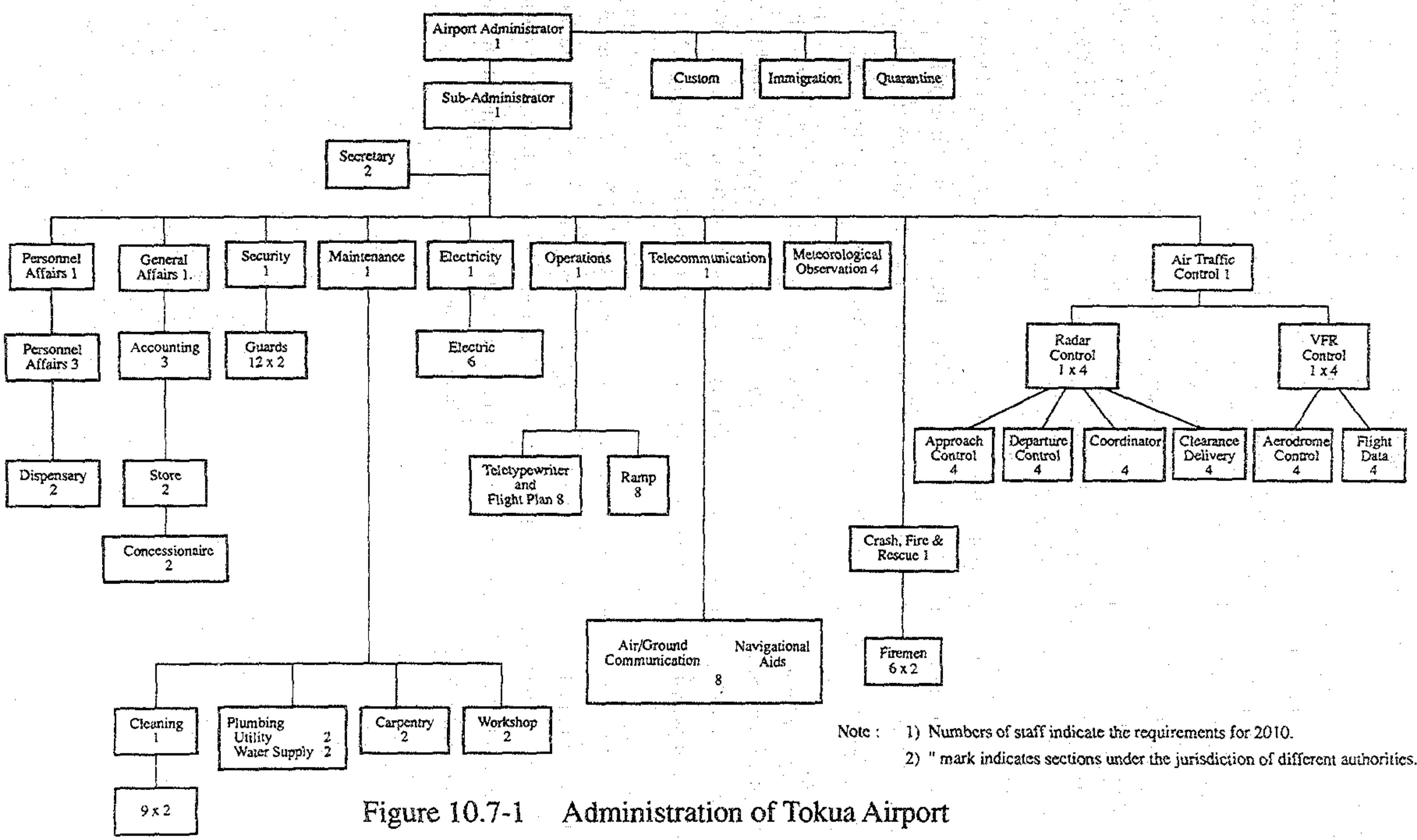
For the administration and management of the proposed master plan development, characteristics and functional roles of the existing Rabaul Airport have been reviewed in the light of the prevailing organization noted in Chapter 4.3 from a viewpoint of functions of a new airport at Tokua and a new organization to be established for Tokua Airport operation is going to be totally different from that of the existing Rabaul Airport.

It is inevitable that the development of a new airport would require more man-power in space with airport expansion and traffic increase. An organization and man-power of the new airport at Tokua, to operate and maintain the facilities and services consistent with the traffic increase proposed for master plan, should be prepared to cope with the magnitude of airport operation.

Table 10.7-1 and Figure 10.7-1 show the preliminarily estimated number of staff at minimum to be required for Tokua Airport for the target year 2010. The preliminary estimate of the man-power requirement has been worked out on the basis of the historical trend of man-power increase and functionability of each field of speciality at an airport, as well as in the light of the airport developments in Japan.

Table 10.7-1 Preliminarily Estimated Staff Requirement (2010)

| Discipline | Work-Hour | Man-Power |
|---|---|---|
| Administrator | Day | 1 |
| Vice Administrator | Day | 1 |
| Secretary | Day | 2 |
| General Affairs, including | Day | 8 (1 + 7) |
| Accounting | | 3 |
| Store | | 2 |
| Concessionaire | | 2 |
| Personnel Affairs, including | Day | 6 (1 + 5) |
| Personnel Affairs | | 3 |
| Dispensary | | 2 |
| Maintenance including | Shift | 30 (1 + 18 + 11) |
| Cleaning | | 18 (9 x 2) |
| Plumbing (Utilities) | | 4 |
| Carpentry | | 4 |
| Workshop | | 3 |
| Security | Shift | 25 [1 + (12 x 2)] |
| Electricity | Shift | 7 [1 + (3 x 2)] |
| Telecommunication | Shift | 9 (1 + 4 x 2) |
| Air/Ground Communication and | | 2 |
| Navigational Aids | | 2 |
| Meteorological Observation | | 4 |
| Air Traffic Control, including | Shift | 33 [1 + (8 x 4)] |
| Shift Supervisor | | 1 |
| Approach Control | | 1 |
| Aerodrome Control | | 1 |
| Flight Data | | 1 |
| Radar Control | | 1 |
| Operations, including | Shift | 17 [1 + (4 x 4)] |
| Flight plan and | | 2 |
| Teletypewriter | | (4 x 4) |
| Ramp | | 2 |
| Fire Crews | | 13 [1 + (6 x 2)]+Night operators |
| | | Total : 152 |




Note : 1) Numbers of staff indicate the requirements for 2010.
2) " mark indicates sections under the jurisdiction of different authorities.

Figure 10.7-1 Administration of Tokua Airport

## 10.8 Financial Selection of Optimum Plan

The Study Team analyzed and compared the several alternative proposals of construction plan for the master plan. The Table 10.8-1 shows the construction costs of the master plan selected from the alternative plans which are divided into foreign currency portion and local currency portion.

The base cost of construction for the master plan consists of civil works, building works, operational facilities and utility. The price contingency was assumed to be 10% of the total base costs and the physical contingency at 5% of the respective costs. Total construction cost was figured out as 136 million Kina.

The cost of engineering services were estimated to be 10% of the total base cost of construction and the price contingency and the physical contingency were assumed to be the same percentage of the base as of construction costs mentioned above. The cost of engineering services was totally estimated as 14 million Kina.

The grand total of the Project cost for construction came out to be 150 million Kina of which the shares of foreign currency portion and local currency portion are 53.6% and 46.4% respectively. The feasibility study is to be carried out for the short term development plan and its construction costs will be referred to the section of 11.8.

In the case that the traffic demand in the master plan is under the level of minimum range, the construction will be considerably over investment. On the other hand, for the short term development plan, the traffic demand is forecasted on the assumption that existing aircraft will be operated in the future, and the aircraft in large size will be able to be operated with some preconditions.

Table 10.8-1 Construction Costs for the Master Plan

As of December 1991
1 Kina = 1.04 US$

| Work Item | | 2010 | | |
|---|---|---|---|---|
| | | Total (1000 K.) | F.C. (1000 US$.) | L.C. (1000 K.) |
| A. | Construction Cost | 136,266 | 75,910 | 63,275 |
| 1. | Civil Works | 77,966 | 33,696 | 45,566 |
| 2. | Building Works | 16,118 | 13,410 | 3,224 |
| 3. | Operational Facilities | 22,796 | 17,561 | 5,910 |
| 4. | Utility | 1,612 | 1,342 | 322 |
| | Sub-total (Base Cost) | 118,492 | 66,009 | 55,022 |
| 5. | Price Conti. *1) | 11,849 | 6,601 | 5,502 |
| 6. | Physical Conti. *2) | 5,925 | 3,300 | 2,751 |
| B. | Engineering Services | 13,627 | 7,591 | 6,328 |
| 1. | Base Cost *3) | 11,849 | 6,601 | 5,502 |
| 2. | Price Cont. *1) | 1,185 | 660 | 550 |
| 3. | Physical Conti. *2) | 592 | 330 | 275 |
| C. | Grand Total | 149,892 | 83,501 | 69,603 |

Notes *1) 10% of base cost.
*2) 5% of base cost.
*3) 10% of the total base cost of A.

# 11. PROPOSED SHORT TERM DEVELOPMENT OF TOKUA AIRPORT

## 11.1 General

As mentioned in the Inception Report, the feasibility study on short term development plan of the Tokua Airport for the year 2000, should be phased out of the master plan for year 2010.

The purpose of this short term development is to find out an economic and financial feasibility to substitute , as soon as possible, the existing Rabaul Airport which has various constraints, within the framework of the proposed master plan.

## 11.2 Proposed Airside Infrastructure Developments

### 11.2.1 Runway, Taxiway and Apron

Airport layout plan based on the airport requirements for short term development is shown in Figure 11.2-1.

1) Runway

A runway of 2,200 m in length and 45 m in width, with 7.5 m shoulders on the both sides, should be planned to cater for aircraft operations of A310. The location of the runway is planned to be extended from the existing runway threshold to 500 m to the western side taking into account the site topography and future runway extension. Turning pads are planned both runway thresholds to cater for aircraft turning.

2) Runway Strip

A runway strip of 2,320 m in length, including 120 m (60 m x 2) of the over-run areas on the both runway threshold, and 150 m in width is planned to cater for non-precision runway.

However, the trees existing in the runway strip of 300 m in width should be trimmed off for the safety aircraft operation.

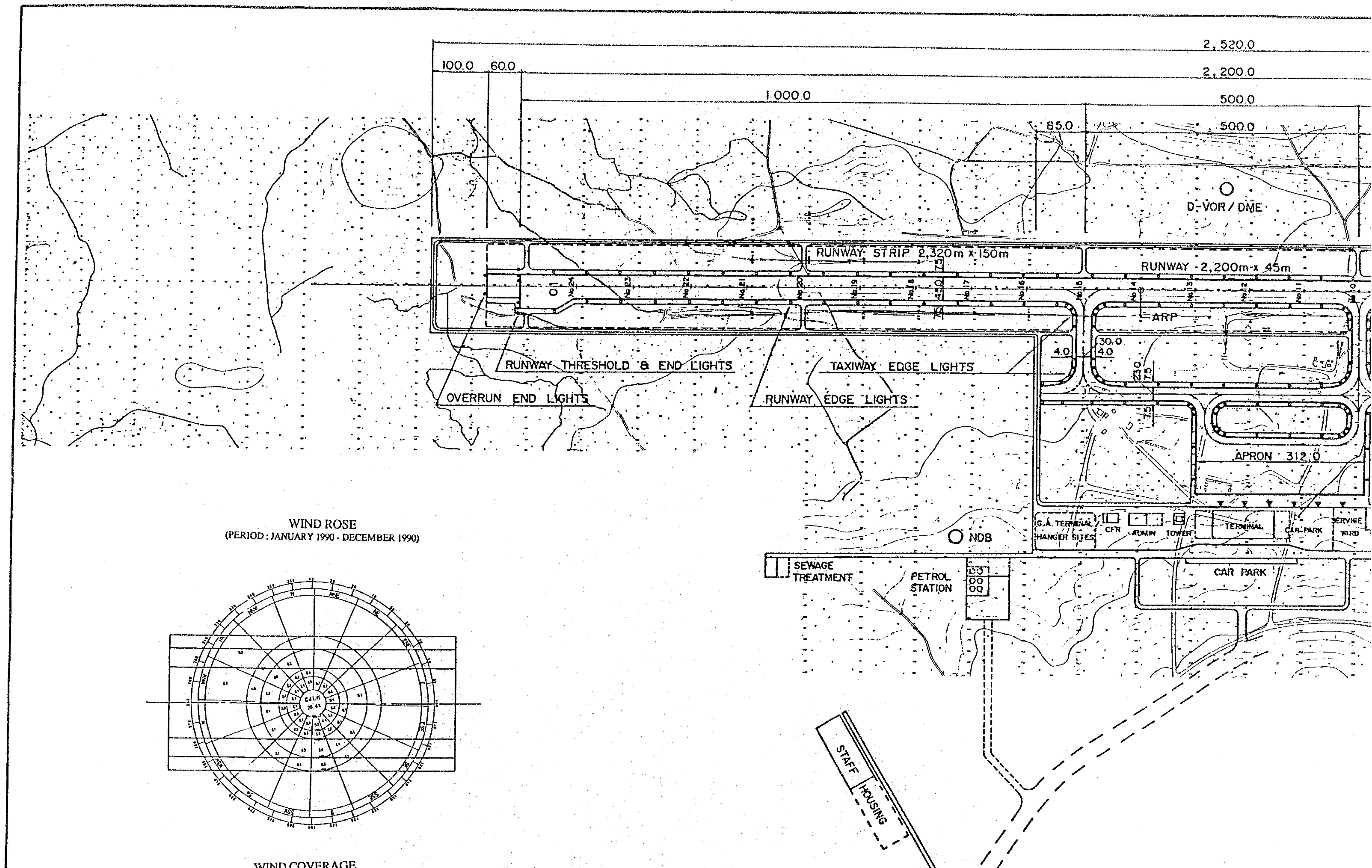



Figure 11.2-1 Airport Layout Plan (Short Term Dev

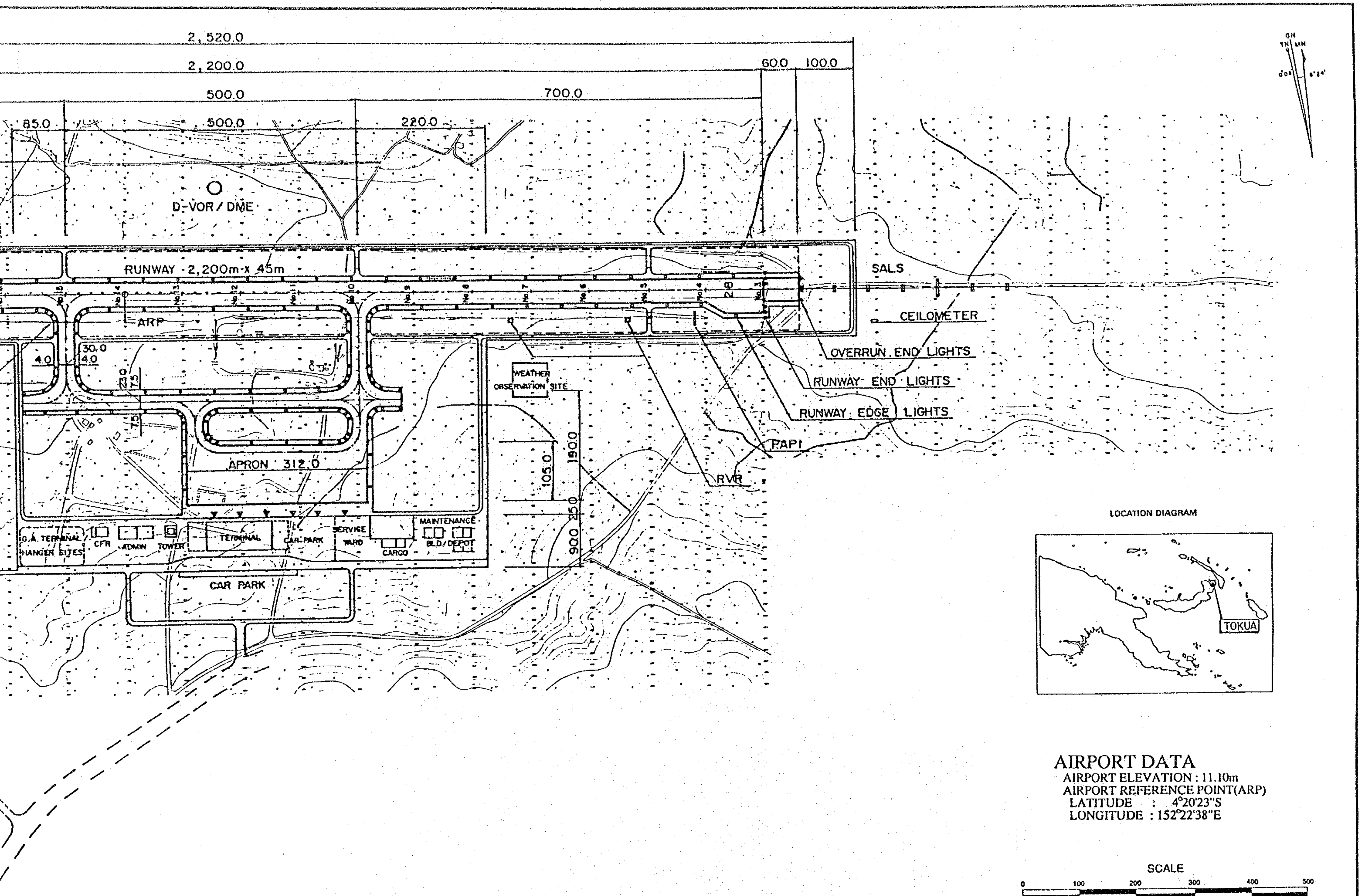



Figure 11.2-1 Airport Layout Plan (Short Term Development)

3) Taxiway

Two conventional taxiways of 30 m in width, with 4.0 m shoulders on the both sides, are planned at an interval of 500 m.

A partial parallel taxiway of 650 m in length, considering future extension and influence of jet blast, and 23 m in width, with 7.5 m shoulders on the both sides, is planned with 182.5 m separation between the centerlines of runway and proposed taxiway taking into account an introduction of larger aircraft in future.

4) Apron

The positions for each aircraft stand on the apron are planned for convenience of accessibility to the passenger terminal building as illustrated in Figure 11.2-2.

Depth of the apron are planned to be 190 m taking into account the accommodation of B747 aircraft in future. Green belt is planned between apron and parallel taxiway from the economic view point.

The positions of general aviation apron based on the JCAB standards are planned as shown in Figure 11.2-3 allocating mixture of single-engined and twin-engined plane.

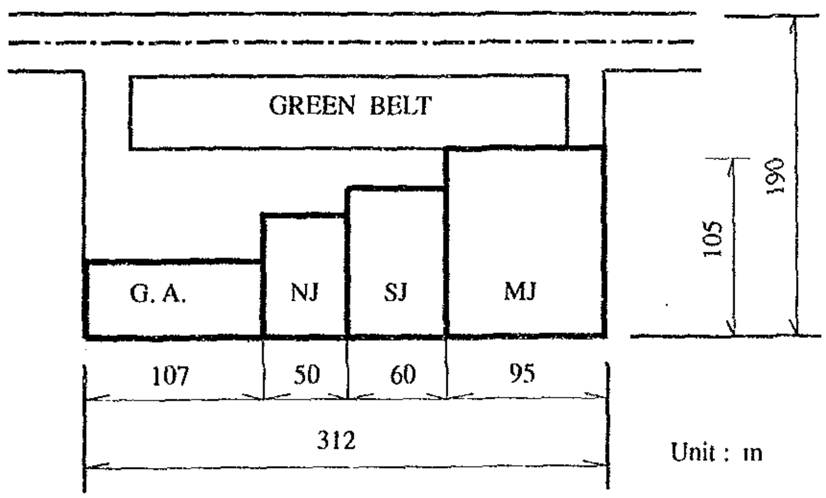



Figure 11.2-2 Apron Arrangement for Short Term Development

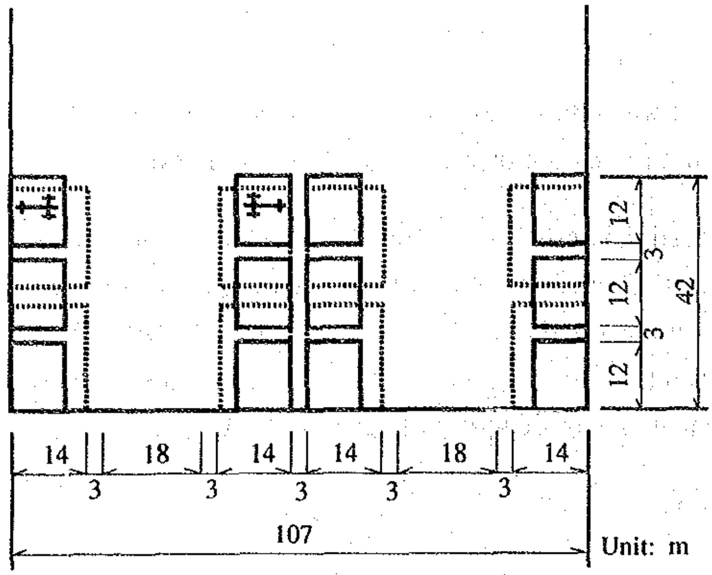



Figure 11.2-3 General Aviation Apron Arrangement for Short Term Development

11.2.2 Other Facilities

1) GSE

GSE vehicle pass strip and buried pipe space between the apron and the terminal building etc. are planned to be 25 m.

2) Airport Roads

Perimeter Roads around the air side area, just inside the airport fencing, are planned for the use of both maintenance personnel and security patrols.

Service roads are also planned to connect perimeter roads and runway, taxiways, etc.

11.2.3 Site Preparation and Pavement

1) Site Preparation

West side of the aerodrome site is swamp area and embankment is required to provide proposed slope of runway and runway strip. The construction of the airport should be performed in 2 phases, first one is to construct 2,200 m runway and second phase is to provide 3000 m runway extending further 800 m.

Regarding the first phase, the minimum scale of the airport facilities shall be provided in order to meet the requirement based on the traffic forecast at year 2000 and minimize the construction cost. Taking the matter into account, the width of runway strip was determined to be 150 m as shown in the Figure 11.2-1. The longitudinal slope was decided to be 0.7 percent to follow the existing slope and the height of reference point was selected to be EL.11.10 m so that the excavation volume was almost equal to the embankment volume.

As for the drainage system, U-trenches with dimension from 600 mm to 1800 m were provided along the perimeter and connected to the box culvert at west side of the area to discharge the surface water to the outside of the airport area. These U-trenches should be changed to flat channels with pipe culvert to expand the runway strip from 150 m to 300 m at the 2nd phase of construction for the master plan. However, the discharge capacity of the box culvert was designed to meet the runoff volume at the master plan stage for the safety from the damage and impracticability of the reconstruction under the operational runway. As a result of runoff calculation, the discharge volume was to be 51 $m^3/s$ which was consisted of 10 $m^3/s$ from the airport area and 41 $m^3/s$ from the southern area of the airport.

Longitudinal and typical cross section and airport drainage system are shown in Figure 11.2-4, Figure 11.2-5 and Figure 11.2-6 respectively.

Table 11.2-1 Amount of Runoff (Short Term Development)

| Basin Name | Area (ha) | Coefficient of Runoff "C" | Time of concentration "T" (min.) | Rainfall Intensity "i" (mm/hr.) | Runoff volume "R" (m3/sec.) |
|---|---|---|---|---|---|
| A-1 | 0.36 | 0.30 | 10.0 | 161.5 | 0.048 |
| A-2 | 1.47 | 0.45 | 12.7 | 140.9 | 0.259 |
| B | 4.21 | 0.53 | 35.2 | 84.2 | 0.522 |
| C | 5.10 | 0.53 | 30.7 | 89.8 | 0.674 |
| D | 4.25 | 0.53 | 27.2 | 95.2 | 0.596 |
| E | 2.98 | 0.53 | 23.8 | 101.6 | 0.446 |
| F | 2.27 | 0.52 | 19.9 | 111.1 | 0.364 |
| G-1 | 0.49 | 0.30 | 18.2 | 116.3 | 0.047 |
| G-2 | 0.72 | 0.30 | 21.7 | 106.4 | 0.064 |
| G-3 | 0.49 | 0.30 | 18.2 | 116.3 | 0.047 |
| H-1 | 0.36 | 0.30 | 10.0 | 161.5 | 0.048 |
| H-2 | 1.47 | 0.51 | 12.2 | 144.1 | 0.300 |
| I | 4.21 | 0.54 | 40.6 | 78.9 | 0.498 |
| J | 3.23 | 0.53 | 37.0 | 82.3 | 0.391 |
| K | 4.53 | 0.38 | 35.2 | 84.2 | 0.403 |
| L | 7.24 | 0.30 | 33.1 | 86.7 | 0.523 |
| M | 1.32 | 0.73 | 27.4 | 94.9 | 0.254 |
| N | 17.10 | 0.64 | 26.9 | 95.7 | 2.909 |
| O | 4.63 | 0.35 | 24.4 | 100.4 | 0.452 |
| P | 2.70 | 0.35 | 23.7 | 101.8 | 0.267 |
| Q | 2.38 | 0.53 | 23.0 | 103.3 | 0.362 |
| R | 2.21 | 0.59 | 19.9 | 111.1 | 0.402 |

2) Pavement

As mentioned in 10.2.3 "Pavement", procedures of pavement structure design for the short term development plan are similar to as that of the master plan.

Regrading the apron for general aviation, pavement structure was designed to be similar to that for the jet aircraft since the area should be used by the jet aircraft at the master plan stage and overlay in the future is not practicable to adjust the slope or height of the apron.

Airfield pavement plan for Short Term Development is shown in Figure 11.2-7.

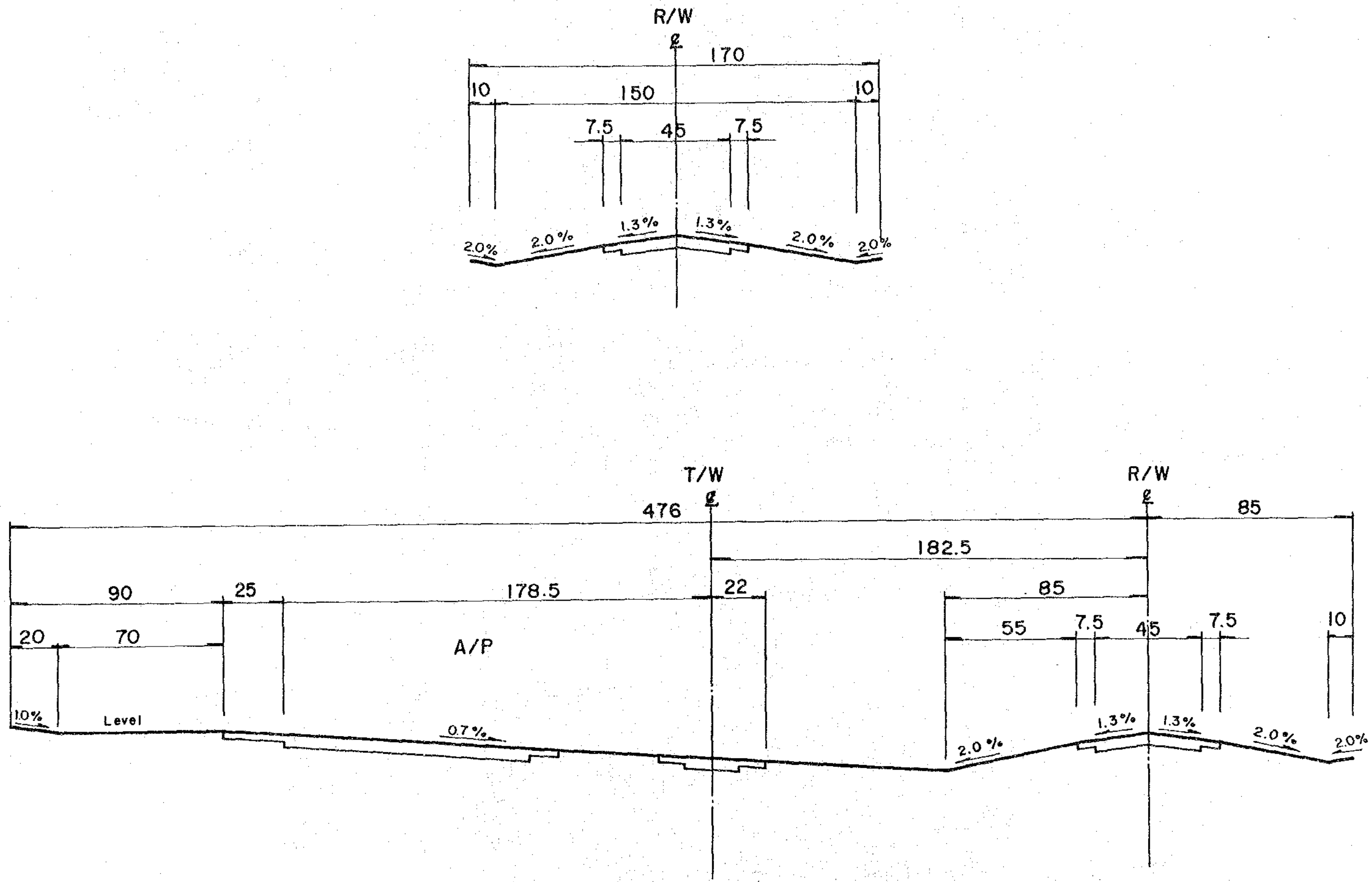



Figure 11.2-5 Typical Cross Section

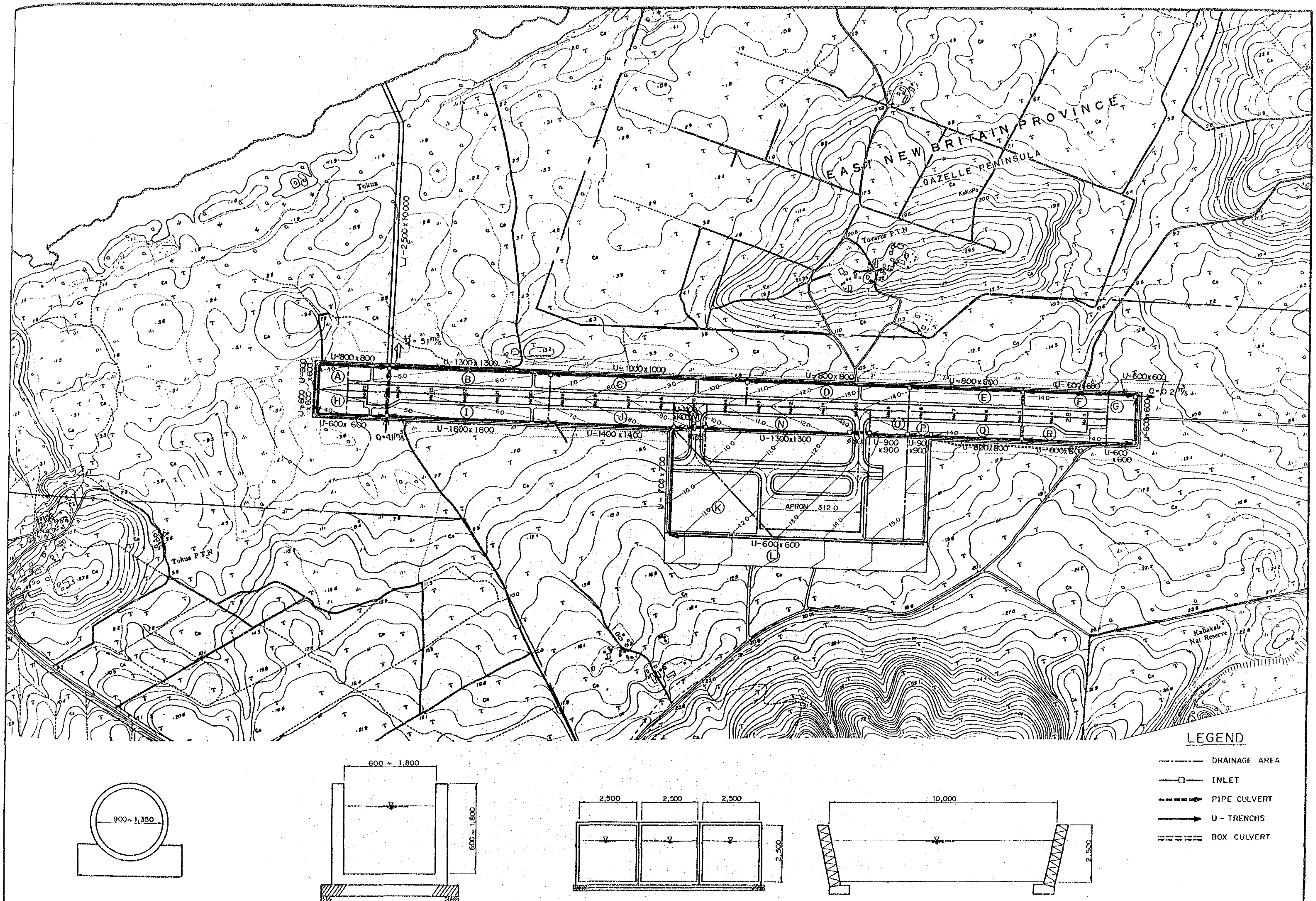
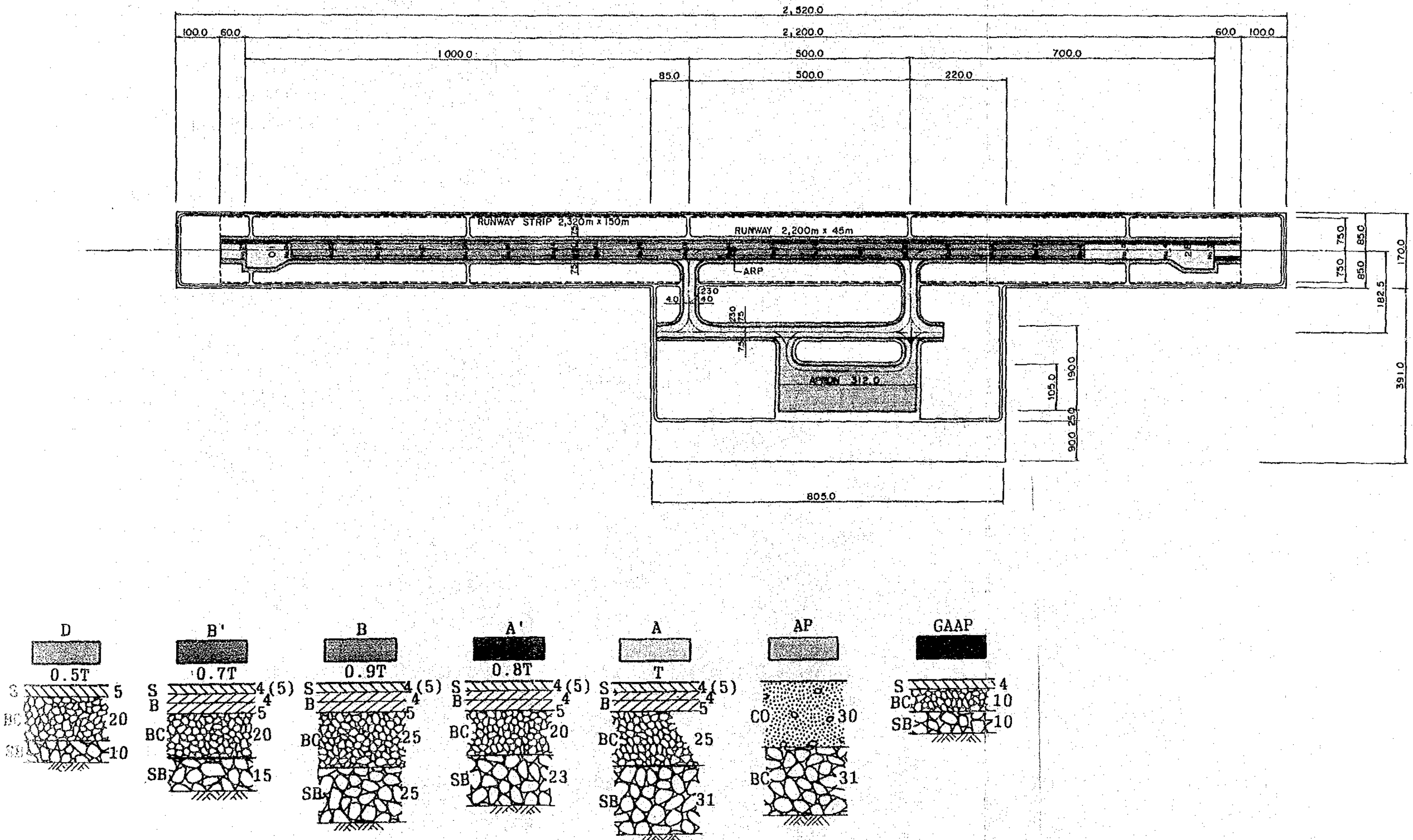



Figure 11.2-6 Airport Drainage System




LEGEND

S : Surface course (Asphalt Concrete) (5) : Runway only
B : Binder course (Asphalt Concrete)
BC : Base course (Mechanically Stabilized Crushed Stone)
SB : Subbase course (Mechanically Stabilized Crushed Stone)
CO : Cement Concrete Slab

Figure 11.2-7 Airfield Pavements Plan (Short Term Development)

### 11.2.4 Security for Airport Compound

ICAO, IATA, IFALPA as well as the other agencies recommend that an airport should be secured from any possible act unfavorable to the airport operation. Airport security is one concept which has gained increasing importance in the field of airport planning in the last few years. This term is used to designate various phenomena which have affected modern life and which require serious consideration, as they relate to airport operation, namely drug trafficking and terrorism.

At this stage, 15 guardsmen and an appropriate number of policeman are supposed to be needed for the airport security.

## 11.3 Passenger and Cargo Terminals

### 11.3.1 Passenger Terminal Building

A proposed floor plan for year 2000 is illustrated in attachment drawing 11-1. This is the preliminary step towards the master plan for year 2010. The requirements for the passenger terminal facilities for this stage were studied in Section 9.3.1 together with the requirements for the master plan for year 2010. The proposed floor plan does not necessarily adhere to the space allocations. Modifications would be made during the course of subsequent design.

The design concept of the passenger terminal facility for year 2000 follows the same as that for year 2010, i. e. modular planning, block planning, common use of space and flexible use of space. By following these concepts as much as possible the building is designed to be more functional, easier to use and more efficient use of space, and less troublesome to extend for year 2010 master plan.

Landside facilities layout plan is illustrated in Figure 11.3-1.

### 11.3.2 Security in Terminal Area

The main concern in the passenger terminal will be terrorism, security measures against drug traffic should also be addressed. For example, General Aviation terminal should be also considered. In addition, the airport grounds will be adequately fenced and monitored.

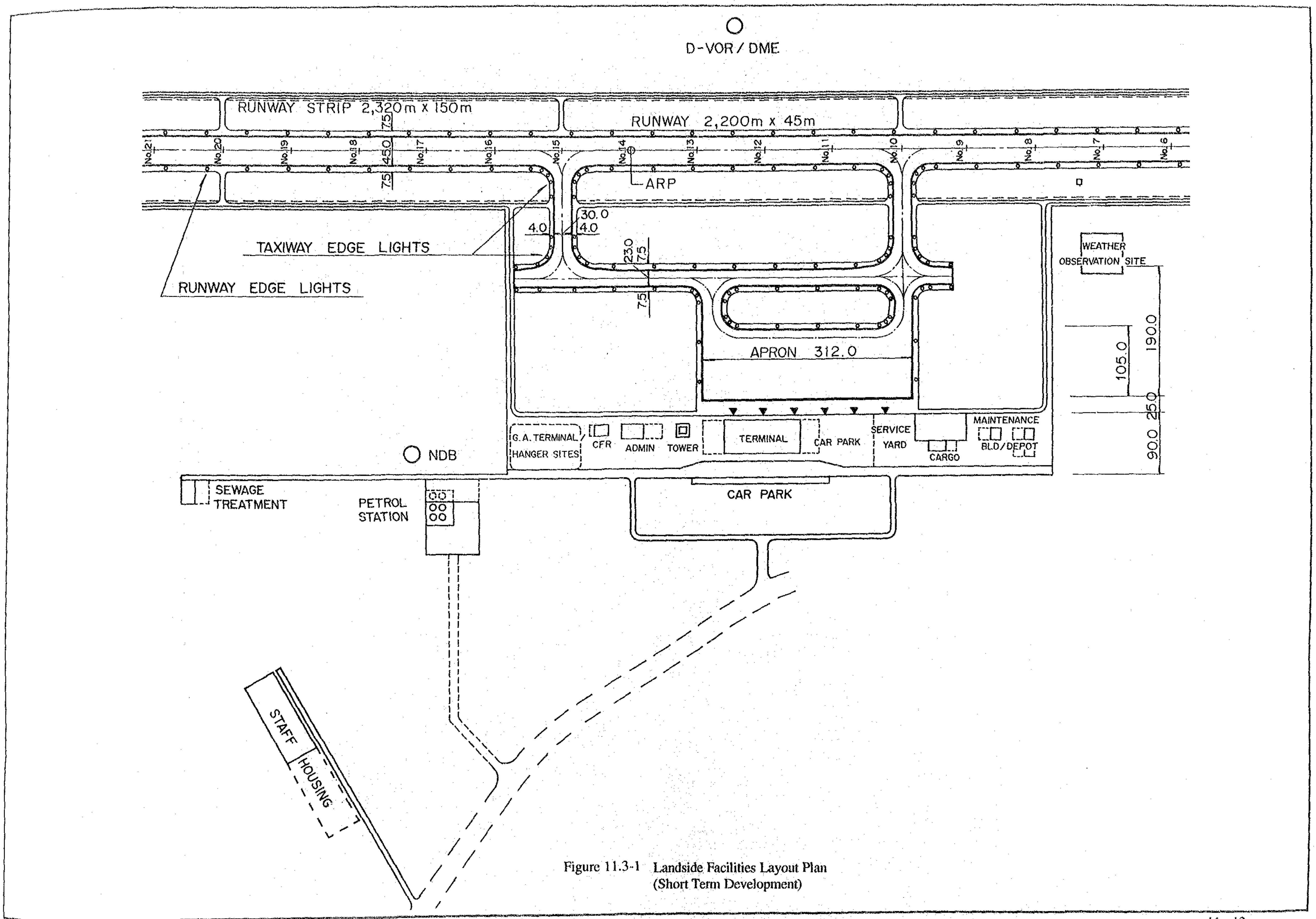



Figure 11.3-1 Landside Facilities Layout Plan
(Short Term Development)

In the passenger terminal, special attention was given to the prevention of acts of terrorism, specifically the loading of firearms and explosives on board any flight. (In many cases, deterrent against terrorism will also act as deterrents against drug trafficking). More specifically, the following measures deserve to be mentioned.

a) Separation of Arrival and Departure Traffic:

One of the typical concerns in the international aviation community is the difference in the control standards at various airports. When arrival and departure passengers, mix with others, passengers can exchange weapons and/or drugs in an uncontrolled environment. The separation of traffic avoids the possibility of such exchange.

b) Baggage Sorting

Another security concern is the fact that baggage handlers manipulate the suitcases from the aircraft to the belt, before they are carried through customs by the passenger. Therefore, a pre-determined arrangement can allow somebody to retrieve any article from such luggage before they are verified. The location of the belt loading area facing the apron is intended to expose that process to the public eye and make any interference impossible.

c) Baggage Make-up

Similarly, baggage make-up (the grouping of luggage before from check-in to airplane) must be made secure, even if it is physically not possible to locate that function near the apron. However, through the use of adequate lighting and surveillance, the same results can be achieved.

### 11.3.3 Cargo Terminal Building

A proposed floor plan for year 2000 is illustrated in attachment drawing 11-2. This will be expanded for the master plan for year 2010. The requirements for the cargo terminal facilities for this stage were studied in Chapter 9.3.2 together with the requirements for the master plan for year 2010 regarding the space allocations. Modifications would be made during the course of subsequent design.