

2) Modernization plans

Social Environmental items	Content	Estimation result
1. Resident's movements	Evictions to acquire the site	Yes/No/Not clear
2. Economic Activities	Damage to production opportunities, increases in earning differentials and unemployment	Yes/No/Not clear
3. Traffic and Living Facilities	Impact to the present traffic conditions, schools and hospital from traffic jams or accidents	Yes/No/Not clear
4. Division of Area	Division of Areas by traffic re-routing	Yes/No/Not clear
5. Increase of population	Change of community by the increase of population	Yes/No/Not clear
6. Historical spot and cultural heritage	Loss of the sights, ruins, temples or their loss of value	Yes/No/Not clear
7. Water supply. Community use of forest	Prevention of the right of fishery, water supply and community use of forests	Yes/No/Not clear
8. Public Sanitation	Detrimental public sanitation such as the occurrence of garbage or injurious insects	Yes/No/Not clear
9. Waste	Occurrence of waste from the construction waste soil, waste oil such as	Yes/No/Not clear
10. Risk	Increase in danger, such as from ground collapse and Airplane accidents	Yes/No/Not clear
Natural Environmental items	Content	Estimation result
11. Geology. Topography	Detrimental change to natural features of ground by digging, cutting and filling of earth	Yes/No/Not clear
12. Earth Erosion	Erosion from rainwater after reclaiming and deforestation	Yes/No/Not clear
13. Underground Waste	Drying up the source of water by over pumping, and water pollution	Yes/No/Not clear
14. Quantity of water of lake, swamp and river	Change of water quantity and river bed by reclaiming or drainage	Yes/No/Not clear
15. Animal and plants	Decrease of habitat for rare, special and endangered species	Yes/No/Not clear
16. Coast and Ocean	Coastal erosion and piles from reclamation site and by changes to ocean currents	Yes/No/Not clear
17. Meteorology	Change of temperature and wind by the large scale-construction and/or the very tall buildings	Yes/No/Not clear

( continued)

Natural Environmental items		Content	Estimation result
18.	Natural view	Lack of harmony with other buildings	Yes/No/Not clear
19.	Field Recreation	Loss of international tourist sites	Yes/No/Not clear
Pollution items		Content	Estimation result
20.	Air pollution	Air pollution by exhaust and harmful gases from cars and planes	Yes/No/Not clear
21.	Water pollution	Water pollution by earth and sand from construction and waste water from factories	Yes/No/Not clear
22.	Earth pollution	Earth pollution by dust or asphalt emulsion	Yes/No/Not clear
23.	Noise and Vibration	Occurrence of noise and vibration from cars, planes and factories	Yes/No/Not clear
24.	Land subsidence	Land subsidence from the change of ground surface or decrease of underground water	Yes/No/Not clear
25.	Bad smell	Bad smells from exhaust and general waste	Yes/No/Not clear
26.	Radio Wave	Detrimental effect to radio wave by the taking off and landing of airplanes	Yes/No/Not clear
27.	Sunlight	Decrease of sunlight due to of high buildings	Yes/No/Not clear
Total estimation :		Does this modernization plan need Environmental Impact Assessment (EIA) ?	Yes/No

(6) Scoping

1) Urgent Improvement plan

Social Environmental Items			Evaluation and Reason
1.	Resident's movement	D	There is no need to buy the site for the Airport plan.
2.	Economic Activity	D	Modernization will not produce any bad impact.
3.	Traffic. Living Facilities	D	Ditto
4.	Division of Area	D	Modernization will not create an unfavorable impact.
5.	Increase of population	D	Ditto
6.	Historical items and items of cultural heritage	D	Ditto
7.	Water supply. Community use of forests	D	Ditto
8.	Public Sanitation	D	Garbage from Airport-facilities will be disposed by commissioned agencies.
9.	Waste	D	Wastes created during the construction will be appropriately disposed.

(continued)

Social Environmental Item			Evaluation and Reason
10.	Risk	D	Safety will be higher than now by the improvement of safe facilities.
Natural Environmental Items			Evaluation and Reason
11.	Geology. Topography	D	Excavation, cutting and filling of earth will not create a bad impact .
12.	Earth Erosion	D	No impact
13.	Underground Waste	D	No impact
14.	Quantity of water of lake, swamps and river	D	No impact
15.	Wild life	D	No impact
16.	Coast and Ocean	D	No impact
17.	Meteorology	D	No impact
18.	Natural view	D	There will be no construction of buildings which disturb the natural view.
19.	Field Recreation	D	There will be no impact to International Field Recreation.
Pollution Items			Evaluation and Reason
20.	Air pollution	D	The project has no relation.
21.	Water pollution	D	Filthy water and drainage produced by the airport facilities will be discharge after appropriate disposal.
22.	Earth pollution	D	There are no works which pollute the earth.
23.	Noise and Vibration	D	The project has no relation.
24.	Land subsidence	D	Modernization of the Airport will not give a bad impact.
25.	Odors	D	There will be no works which create bad smells.
26.	Radio Wave	D	There is no impact to radio waves from airplanes.
27.	Sunlight	D	No impact

Note) Classification of Evaluation

A : Significant impact is expected

B : Some impact is expected

C : Not clear (Necessary to be examined in detail. To be taken into consideration to obtain new information later.)

D : No impact. Not necessary to be examined by EIA.

2) Modernization plans

Social Environmental items		Evaluation and Reason	
1.	Resident's movement	D	The project is limited within its original boundary.
2.	Economic Activity	A	The modernization gives significant impact.
3.	Traffic. Living Facilities	D	The project doesn't produce new traffic.
4.	Division of Area	D	No division
5.	Increase of population	D	Modernization does not produce a bad impact.
6.	Historical spots and cultural heritage	D	ditto
7.	Water supply. Community use of forest	D	ditto
8.	Public Sanitation	D	Garbage from Airport-facilities is disposed by commissioned agencies.
9.	Waste	D	Wastes created during the construction are appropriately disposed.
10.	Risk	D	Safety will be higher than now by the improvement of safe facilities.
Natural Environmental item		Evaluation and Reason	
11.	Geology. Topography	D	No impact
12.	Earth Erosion	D	No impact
13.	Underground Waste	D	No impact
14.	Quantity of water of lake, swamp and river	D	No impact
15.	Animal and plan	D	No impact
16.	Coast and Ocean	D	No impact
17.	Meteorology	D	No impact
18.	Natural view	D	There will be no construction of buildings to disturb the natural view.
19.	Field Recreation	D	There will be no impact to international field recreation.
Pollution items		Evaluation and Reason	
20.	Air pollution	B	Exhaust from Airplanes and cars can be considered.
21.	Water pollution	D	Filthy water and drainage in the Airport will be discharged after appropriate disposal.
22.	Earth pollution	D	There are no works which pollute the earth.
23.	Noise and vibration	B	Noise from Airplanes and will be increased.
24.	Land subsidence	D	Modernization of the Airport does not give bad impact.
25.	Bad smell	D	There are no works which produce bad smells.
26.	Radio Wave	D	There is no impact to radio waves from airplanes.
27.	Sunlight	D	No impact

Note) Classification of Evaluation

A : Significant impact is expected

B : Some impact is expected

C : Not clear (Necessary to be examined in detail. To be taken into consideration to obtain new information later.)

D : No impact. Not necessary to be examined by EIA.

(7) Total Estimation

1) Installation of the air safety facilities for existing airport

Installation of safety facilities will contribute to the enhancement of safety of TIA, but there will be no change or impact on the environmental conditions.

2) Modernization plan

The following environmental items was selected through the Initial Environmental Examination for Environmental Impact Assessment.

a) Aircraft Noise

There is aircraft noise around the airport already. This has not yet become a serious problem, but there will be the possibility of aircraft noise becoming a social issue due to the increase of aircraft operations.

This will be studied by means of an aircraft noise forecast simulation.

## CHAPTER 13

### SCOPE OF THE SHORT-TERM MODERNIZATION PLAN



## **CHAPTER 13 SCOPE OF THE SHORT-TERM MODERNIZATION PLAN**

### **13.1 General**

This chapter describes the framework of the Short-term Modernization Plan aiming at the year 2003.

The Short-term plan consists of modernization items which have a comparatively high urgency in the airport modernization master plan, from the viewpoint of airport safety and the level of services provided.

### **13.2 Items of the Short-term Modernization Plan**

The work items of the Short-term modernization plan are shown in Table 13. 2.1.

**Table 13.2.1 Short-term Modernization Plan of Tribhuvan International Airport**

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#### **I. Ground Facilities Improvement Plan**

##### **A. Civil Works**

##### **1. Passenger Terminal Apron**

Construction of a new apron for B747 class aircraft.

##### **2. Aircraft Maintenance Apron**

Construction of a new apron in front of the new aircraft maintenance hangar for B767 class aircraft

##### **3. Isolated Aircraft Parking Position**

Construction of an isolated aircraft parking position for one (1) B747 class aircraft

##### **4. Apron Service Road**

##### **5. Perimeter Road**

##### **6. Security Fence**

##### **7. Terminal Roadway and Car Parks**

##### **B. Architectural Works**

##### **1. International Passenger Terminal Building**

Floor area : 25,000 sq. m, three stories

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2. Domestic Passenger Terminal Building

Renovation of the existing passenger terminal building, Floor area : 10,750 sq. m

3. Cargo Terminal Building

A cargo storage building and an office building, Total floor area : 7,500 sq. m

4. Aircraft Maintenance Hangar

For one B767 class and one HS748 class aircraft, Floor area : 6,500 sq. m

C. Airport Utilities

1. Electrical Power Supply

Installation of an emergency generator (500 KVA)

2. Water Supply

Installation of new elevated water tanks (400t x 2)

3. Sewage Disposal

Construction of a new sewage treatment plant (460 t)

4. Solid Waste Disposal

Installation of a new incinerator (2.4 t)

D. Others

1. Fire engine

2. Airfield lighting

**II. Air Safety Improvement Plan**

A. Urgent Improvement Plan

1. ASR/SSR in TIA and SSR at Mt. Phulchauki

2. LDA with collocated DME

3. Training Facilities

4. Improvement of the Communication System, etc.

B. Short-term Modernization Plan

1. Installation of CGL (Circling Guidance Light)

2. Extension of ATIS coverage

3. Replacement of Message Switching System

4. Replacement of East and South Locators

5. Establishment of ATS direct speech circuit

6. Replacement and rearrangement of the meteorological observation equipment

7. Replacement of locators of NDB

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*PART C.*

*FEASIBILITY STUDY OF  
SHORT-TERM  
MODERNIZATION PLAN*

# CHAPTER 14

## PRELIMINARY DESIGN

## CHAPTER 14 PRELIMINARY DESIGN

### 14.1 General

The preliminary design of the facilities for the Ground Facilities Improvement Plan of the Short-term Modernization Plan is carried out on the selected work items in Chapter 13.

The objective of the preliminary design is to clarify the basic concept and design criteria, and to the outline specifications and dimensions of the facilities for the purpose of cost estimates. The airport layout plan and terminal area layout plan in the short-term modernization plan are shown in Figures 14.1.1 and 14.1.2 respectively.

### 14.2 Civil Works

#### 14.2.1 Passenger Terminal Apron

As explained in Section 7.2.1 "Terminal Area Development," the passenger terminal apron will be expanded so as to have a sufficient number of aircraft stands for the year 2003.

A nose-in parking configuration will be adopted for the international apron, and a self-maneuvering configuration will be adopted for HS748 or smaller aircraft in the domestic apron. Parking spots for helicopters are also planned in the domestic passenger apron.

The existing apron depth is not sufficient to accommodate the maximum aircraft (B747-400 class) in future since the aircraft will intrude upon the transitional surface even with the current runway strip width of 150m. In the new apron in front of the new terminal building, therefore, the position of the aircraft nose is set at 359m from the runway centerline, 110 m deeper than the existing one, so that a B747-400 class parking aircraft will not infringe upon the transitional surface even when the runway strip is expanded to 300 m in the future.

The apron depth including the apron taxiway is to be 130 m so as to keep the minimum clearance between the apron taxiway center line and the parking aircraft stipulated in Annex 14 of ICAO, and to minimize the pavement area.

The existing apron will be utilized by HS748 class aircraft in the Short -term Modernization Plan so that no expansion works will be required.

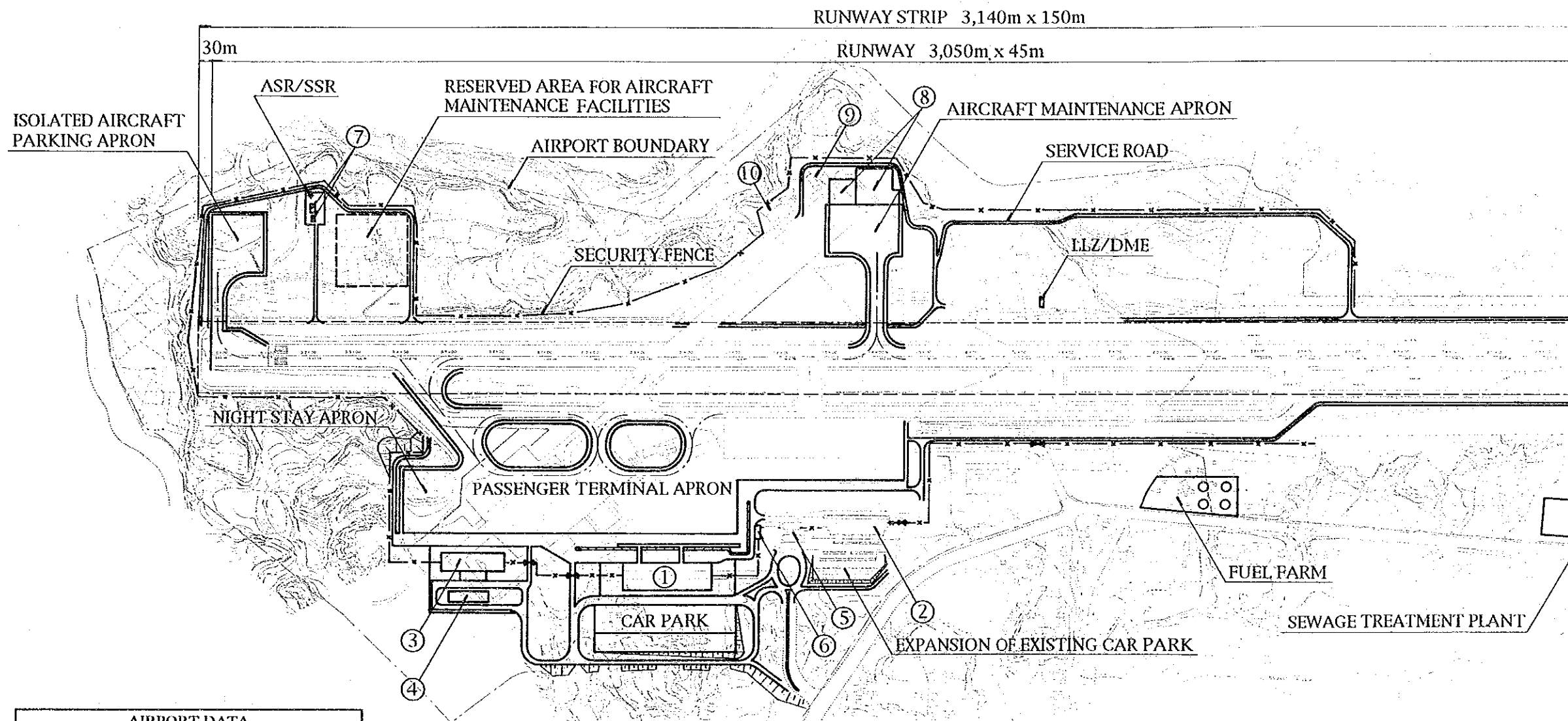
Two connecting taxiways will be provided from the new apron to the existing parallel taxiway.

#### 14.2.2 Aircraft Maintenance Apron and Hangars

The aircraft maintenance area which consists of aircraft maintenance hangars and a maintenance apron will be developed on the eastern side of the runway.

In the Short-term Modernization Plan, two maintenance hangars are planned; one is for B767 class aircraft and another one is for HS748 class aircraft. A maintenance apron will be planned in front of the hangar which has sufficient space for one B767 and one HS748 parking.

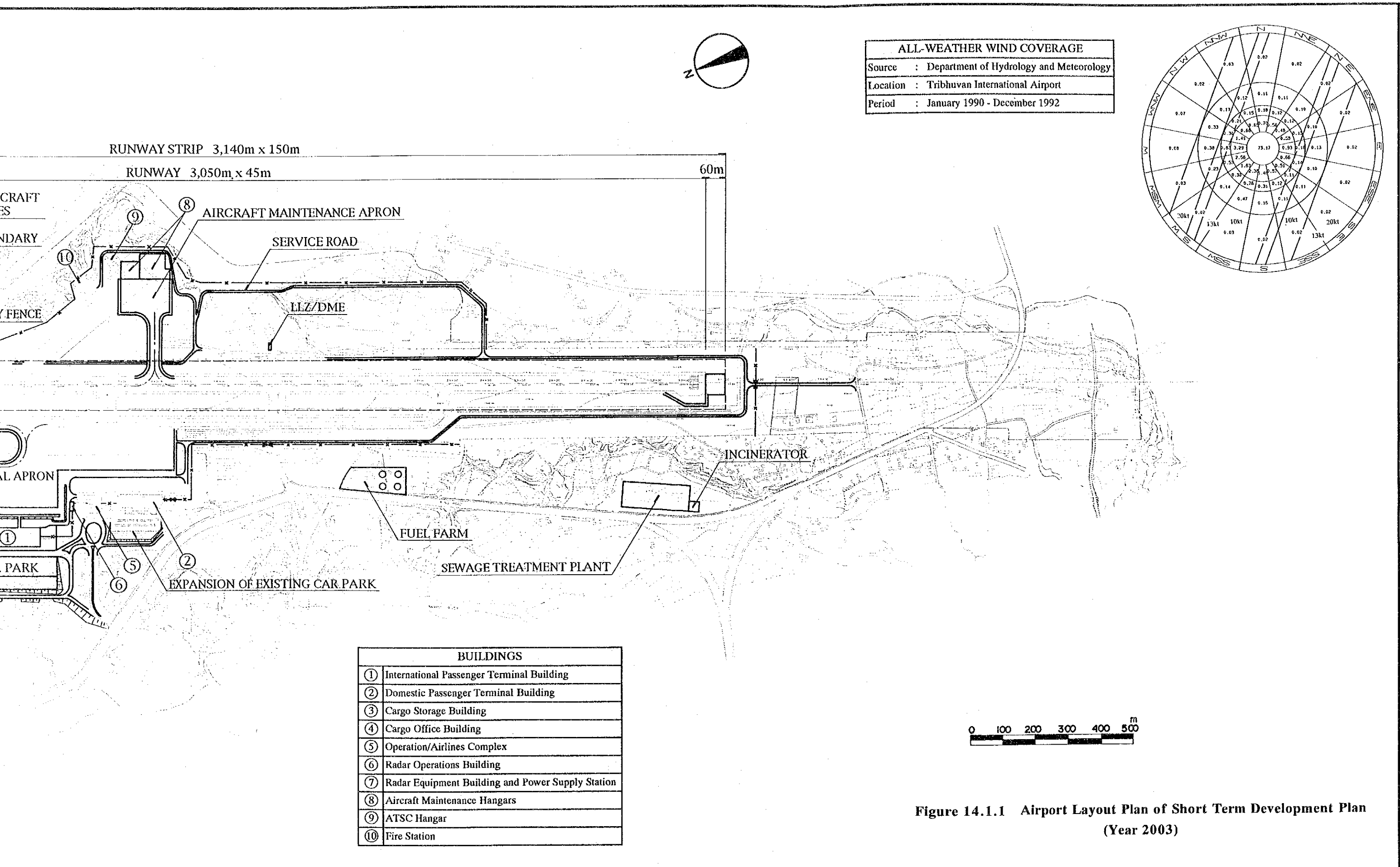
The location of the hangar is so that the buildings may be constructed within the flat space on the terrace, and the B767 class aircraft which is parking in the maintenance apron will not infringe upon the transitional surface for 300 m-wide runway strip in the future.



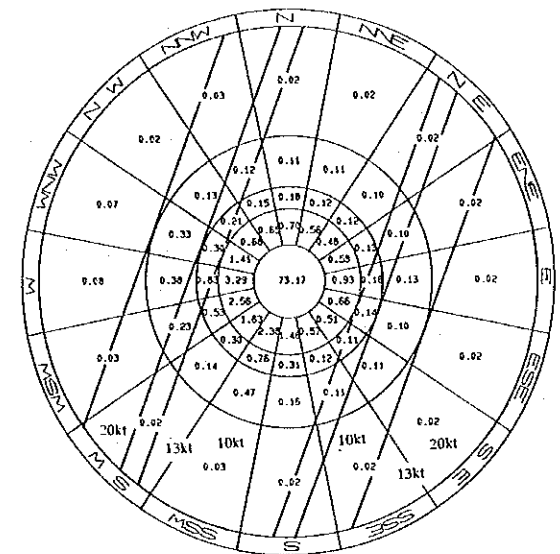
RUNWAY DATA	
Runway Orientating	02/20
Effective Gradient	0.77%
Wind Coverage (Cross Wind)	98.40% (13kt)
	99.73% (20 kt)
Instrument Runway	Yes (RWY 02, 20)
Pavement Strength	PCN 54/F/A/W/T
Approach Surface	1:50
Navigation Aids	RWY 02 DVOR/DME
	RWY 20 DVOR/DME
Visual Aids	RWY 02 SALS
	RWY 20 -

AIRPORT DATA	
Elevation	1,338 m (4,390 ft.) AMSL
Reference Point (ARP)	27°41'47"N 85°21'42"E
Reference Temperature	27.8 °C (AIP Nepal)
Magnetic Variation	1°00'W (May 1980)
Airport and Terminal	DVOR/DME, NDB, ASR/SSR,
Navigation Aids	Locator, Fan Marker Beacon
Fire Protection	Category - 5

BUILDINGS	
①	International Passenger Terminal Building
②	Domestic Passenger Terminal Building
③	Cargo Storage Building
④	Cargo Office Building
⑤	Operation/Airlines Complex
⑥	Radar Operations Building
⑦	Radar Equipment Building and Power Supply Station
⑧	Aircraft Maintenance Hangars
⑨	ATSC Hangar
⑩	Fire Station



ALL-WEATHER WIND COVERAGE	
Source	: Department of Hydrology and Meteorology
Location	: Tribhuvan International Airport
Period	: January 1990 - December 1992



BUILDINGS	
①	International Passenger Terminal Building
②	Domestic Passenger Terminal Building
③	Cargo Storage Building
④	Cargo Office Building
⑤	Operation/Airlines Complex
⑥	Radar Operations Building
⑦	Radar Equipment Building and Power Supply Station
⑧	Aircraft Maintenance Hangars
⑨	ATSC Hangar
⑩	Fire Station

Figure 14.1.1 Airport Layout Plan of Short Term Development Plan (Year 2003)

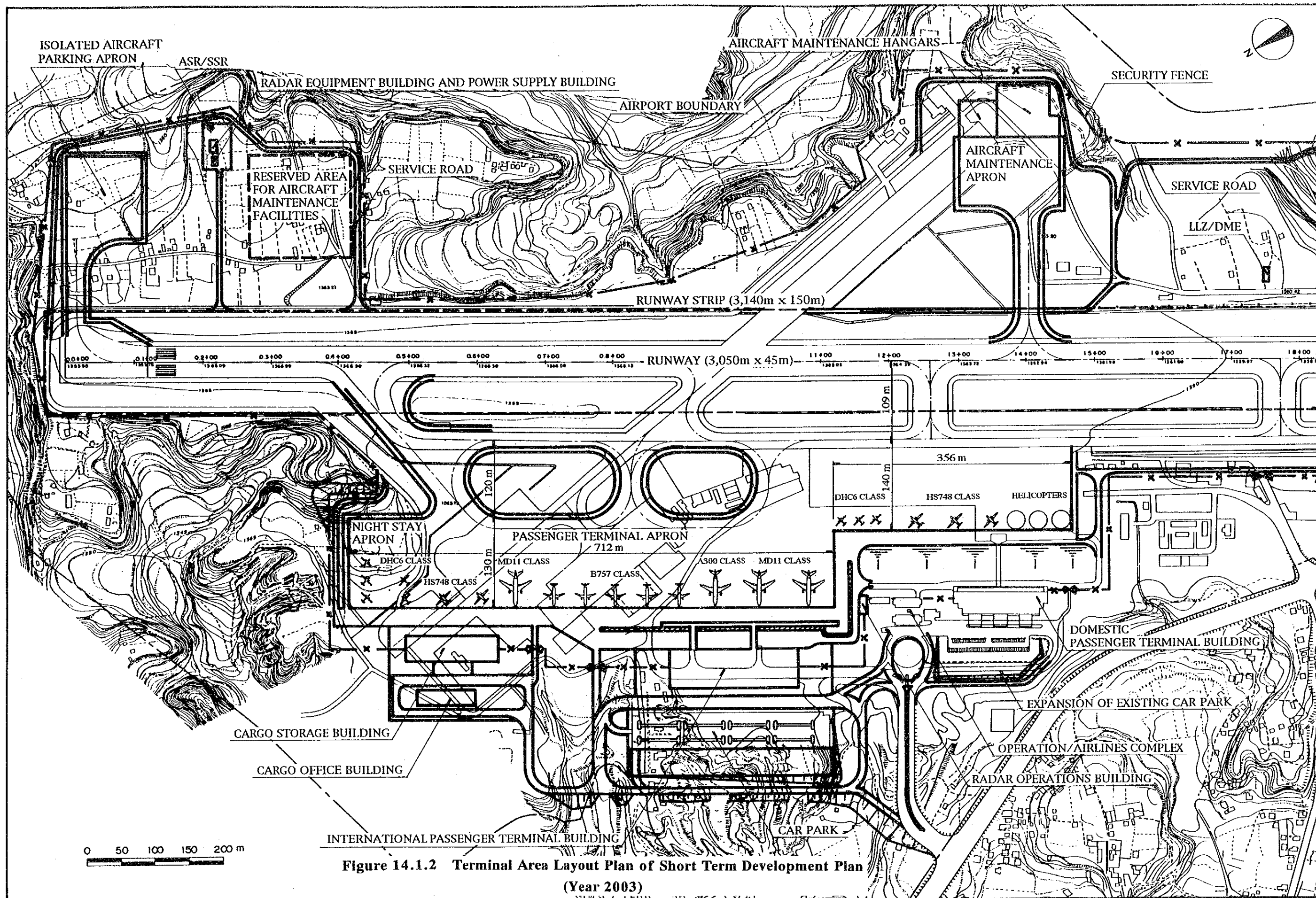


Figure 14.1.2 Terminal Area Layout Plan of Short Term Development Plan (Year 2003)

#### 14.2.3 Isolated Aircraft Parking Position

Dimensions of the parking space are 97.5 m by 120 m which can accommodate a B747 with a self-maneuvering parking configuration.

Location of the parking space is decided so that the vertical tail of the parking B747 aircraft will not intrude upon the transitional surface of the 300m wide runway strip.

#### 14.2.4 Apron Service Road

On the passenger terminal apron, an apron service road of 20 m wide will be provided in front of the aircraft parking stands for maneuvering and parking of ground service equipment.

The ground floor level of the international and domestic passenger terminal buildings is about 5m lower than the apron level. Therefore, a connecting slope is required between both levels as well as the existing terminal apron.

#### 14.2.5 Perimeter Road

The existing perimeter road will be paved with flexible pavement. Around the southern part of the airport where the perimeter road is non-existent, a new paved perimeter road will be constructed so as to surround the runway strip completely for airport activities and services.

#### 14.2.6 Terminal Road and Car Parks

The terminal roadway for the new terminal building is planned for vehicle circulation on the landside of the terminal area.

The width of the terminal road is in principle 6.5 m for two lanes of one-way traffic except for the terminal frontage road where the width is 13 m for four lanes which consists of two through lanes, one weaving lane and one standing lane.

The car park will accommodate 500 cars, for which one entrance and one exit will be provided.

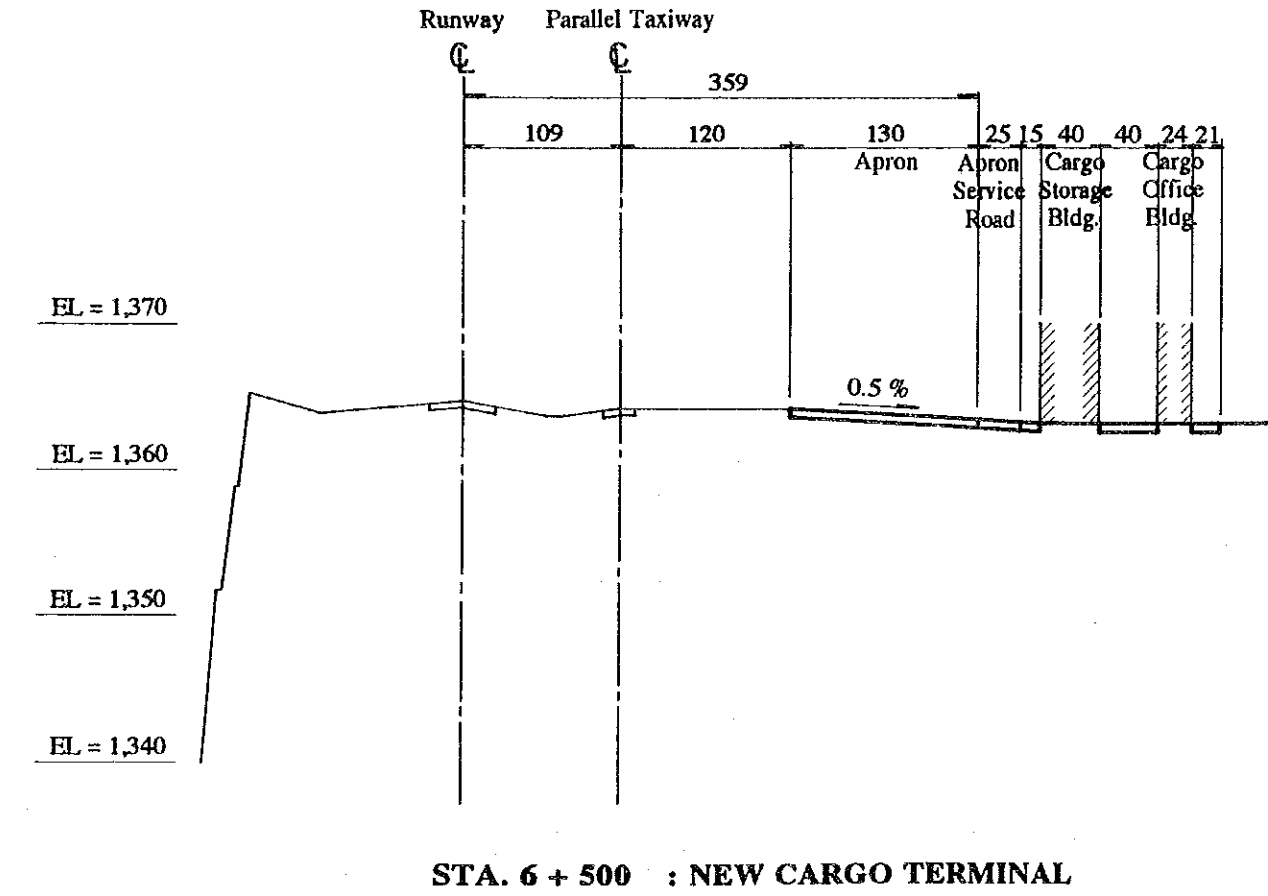
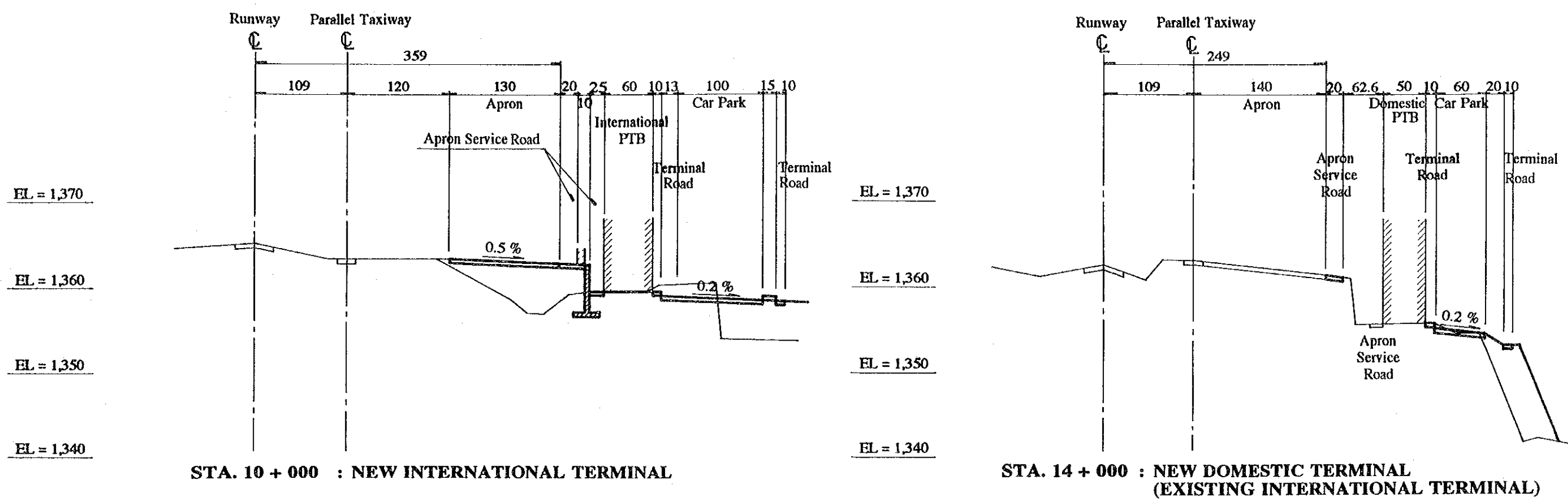
#### 14.2.7 Grading Plan

Typical cross sections of the terminal area are planned in compliance with ICAO recommendations as shown in Figure 14.2.1.

At the ground level, the existing terminal building is situated about 5 m lower than the apron level. At the proposed site for the new terminal building, ground level is also 4 to 5 meter lower than the apron level. Therefore, similar concept is adopted for the new terminal building. The proposed level of the building and car park is set at about 4 m lower than the apron level in order to minimize the earthwork volume of land fill.







Scale: Vertical 1 : 500  
 Horizontal 1 : 5,000  
 Unit : meter

Figure 14.2.1 Typical Cross Sections



The new cargo terminal building is planned at the existing Royal Enclosure site. There is little difference in the planned ground levels between the apron side and curb side and those of the passenger terminal area.

#### 14.2.8 Storm Water Drainage Plan

A storm water drainage system will be prepared in the new terminal area. The rainwater from the expanded terminal area will be discharged through channels into the Bagmati river which flows from the north to the west of the airport.

Trapezoidal channels are adopted in principle for unpaved areas, and U-shaped channels for paved areas. Reinforced concrete pipe culverts will be used at crossing points of taxiways and roads.

#### 14.2.9 Pavement Plan

An asphalt concrete pavement is adopted for the pavement type of taxiway, isolated apron, perimeter road, terminal road, and car park. For the terminal apron, maintenance apron, and apron service road, cement concrete pavement is adopted from the viewpoint of prevention of rutting by the maneuvering and standing loads of large aircraft and the advantage of its oil-proof character.

Required thickness and structural component of each pavement type is designed based on the ICAO standard and the JCAB standard as explained in Appendix 14.2.1. The pavement structure for the Short-term Modernization Plan is shown in Figure 14.2.2.

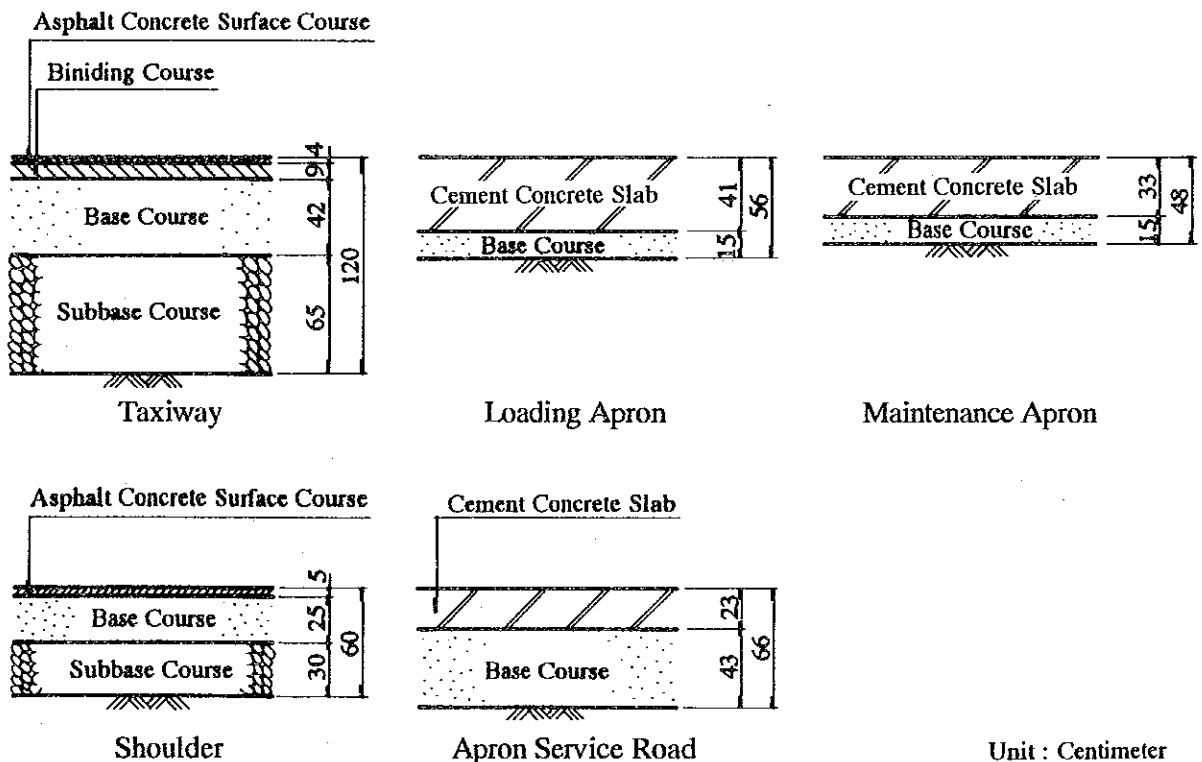


Figure 14.2.2 Pavement Structure

#### 14.2.10 Security Fence

A security fence will be provided so as to enclose the operational areas such as the runway strip, apron, aircraft maintenance area, and isolated apron in order to prevent the runway crossing by unauthorized people and the straying of animals into these areas.

A chain-link fence will be provided with some gates for access of vehicles and persons into the operational areas.

### 14.3 Architectural Works

#### 14.3.1 International Passenger Terminal Building

##### (1) Architectural Design Considerations

The passenger terminal building will design to have local architectural motif with modern facilities suitable for the gateway to the Kingdom of Nepal, taking into account the following.

- 1) Separation of departure and arrival passenger flows to ensure security
- 2) Impression of local identities to be attractive to tourists and visitors
- 3) Effective use of areas and facilities that bring about economic and operational efficiency
- 4) Easy expansion of the terminal building in the future
- 5) Provision of up-to-date facilities and equipment for better services and facilitation
- 6) Taking care of handicapped passengers by providing elevators for departure and an arrival
- 7) Easy maintenance and economical construction cost

##### (2) Passenger and Baggage Flows and Requirements of Areas and Facilities

The functional elements indicating departure and arrival passengers and baggage flows in conjunction with the components and facilities are essential for the design of the international passenger terminal building and is shown in Figure 14.3.1.

The required areas and facilities to be provided in the international passenger terminal building for the short-term (2003) and long-term development (2010) were calculated based on the peak hour passenger volume and IATA standards and are shown in Appendix.

##### (3) Architectural Plans

A new international passenger terminal building will be located to the north of the Control Tower, Operation and Airline Complex to meet the requirements of the short-term modernization (2003) and is designed in a linear frontal concept with one and a half processing level taking into account the passenger demand and the provision of passenger boarding bridges.

Facade design for the passenger terminal building, a local architectural motif like Bhaktapur temple architecture is proposed in order to have an impression of a local identify as one of design possibility, as shown.

The facade is to design for the feasibility study of TIA's master plan. According the facade and floor plans will not be binded for further basic design of the international passenger terminal building.

The international passenger terminal building will have a total floor area of about 31,200 sq. m, with a 3-story reinforced concrete structure. The architectural plans including sections and elevations were studied based on the architectural design considerations and passenger and baggage flows described in the previous sections, and the plans are shown in Figures 14.3.2. through 14.3.7.

The floor areas of the terminal building are mentioned below:

Ground floor area	about	11,400	sq. m
First floor area	about	11,400	sq. m
Second floor area	about	7,700	sq. m
<u>Roof area</u>	<u>about</u>	<u>700</u>	<u>sq. m</u>
Total floor area	about	31,200	sq. m

#### (4) Major Facilities and Special Equipment

The following major facilities and special equipment will be installed in the international passenger terminal building.

##### Major Facilities

- 1) Five elevators for physically handicapped passengers (departure and arrival), and three elevators for restaurant, concession usage, VIP and employees respectively
- 2) Two escalators for departure passengers
- 3) Passenger boarding bridge

Two boarding bridges which can be utilized by passengers of Large aircraft (DC-10, MD-11) will be installed at the edge of the airside corridor.

##### Special Equipment

- 1) Baggage conveyor

Two conveyors for the check-in counters, and two conveyors for the baggage claim area, will be installed as shown.

- 2) Check-in weighing scales

22 check. weighing scales for international flights will be installed at the check-in counters.

- 3) Security equipment

X-ray screening units with walk-through metal detectors and hand held metal detectors, will be installed ahead of departure concourse and the departure lounges as shown.

4) Public address system

An amplifier will be installed in the airport office. Speakers will be installed at appropriate places in the terminal buildings. A public address system will be designed to be able to announce departures and arrivals separately.

5) Flight information system

An automatic TV type flight information system will be installed.

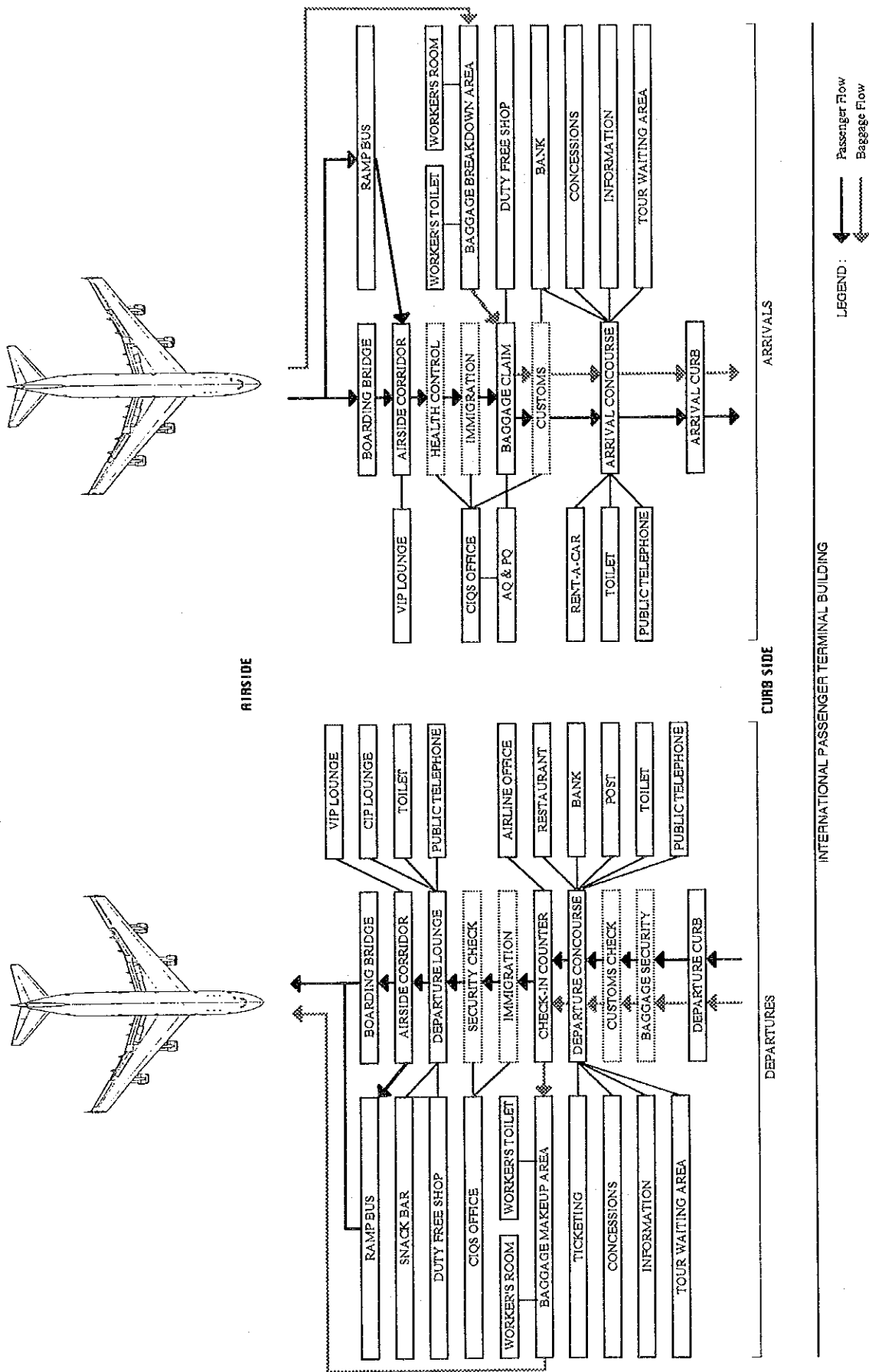
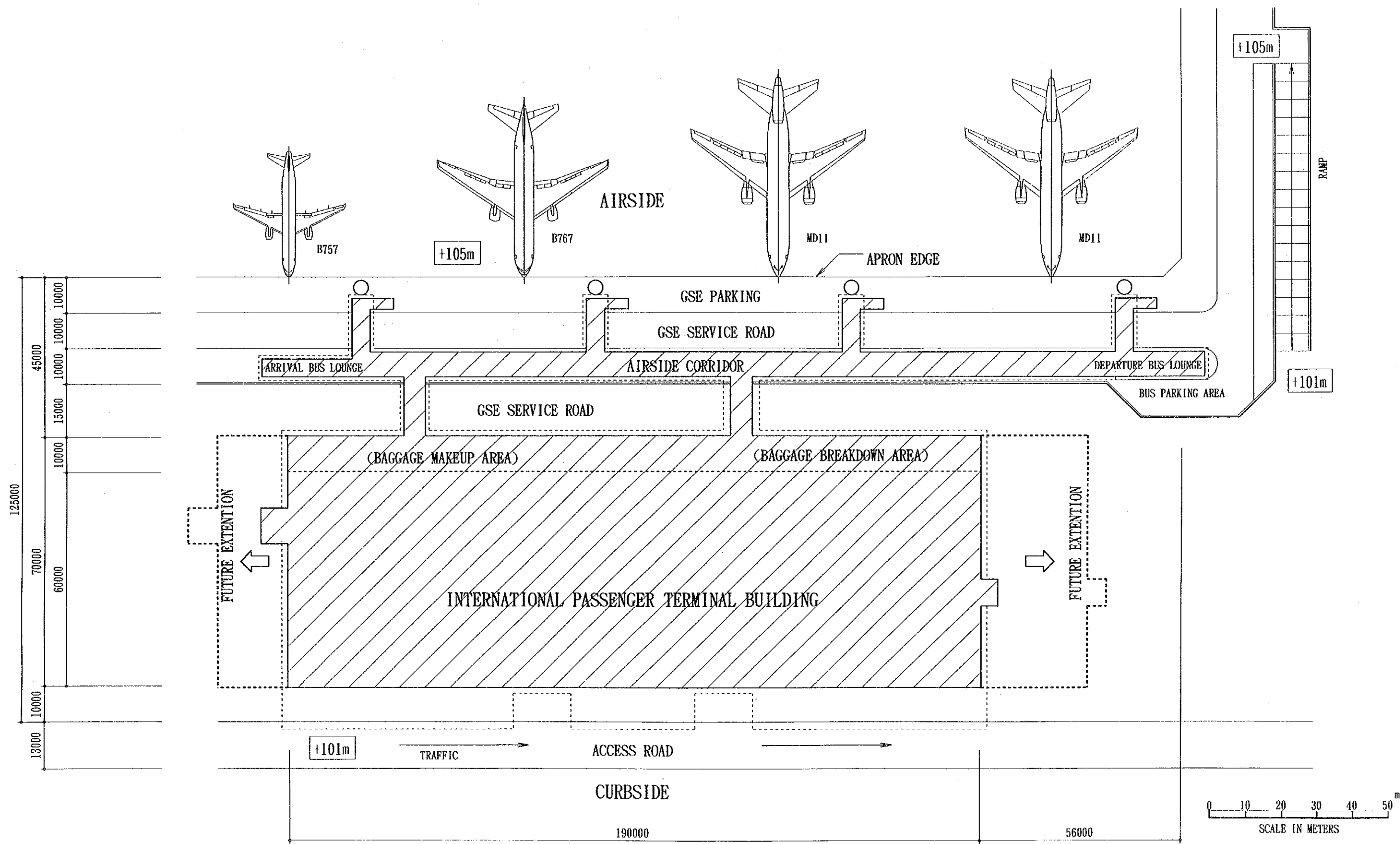


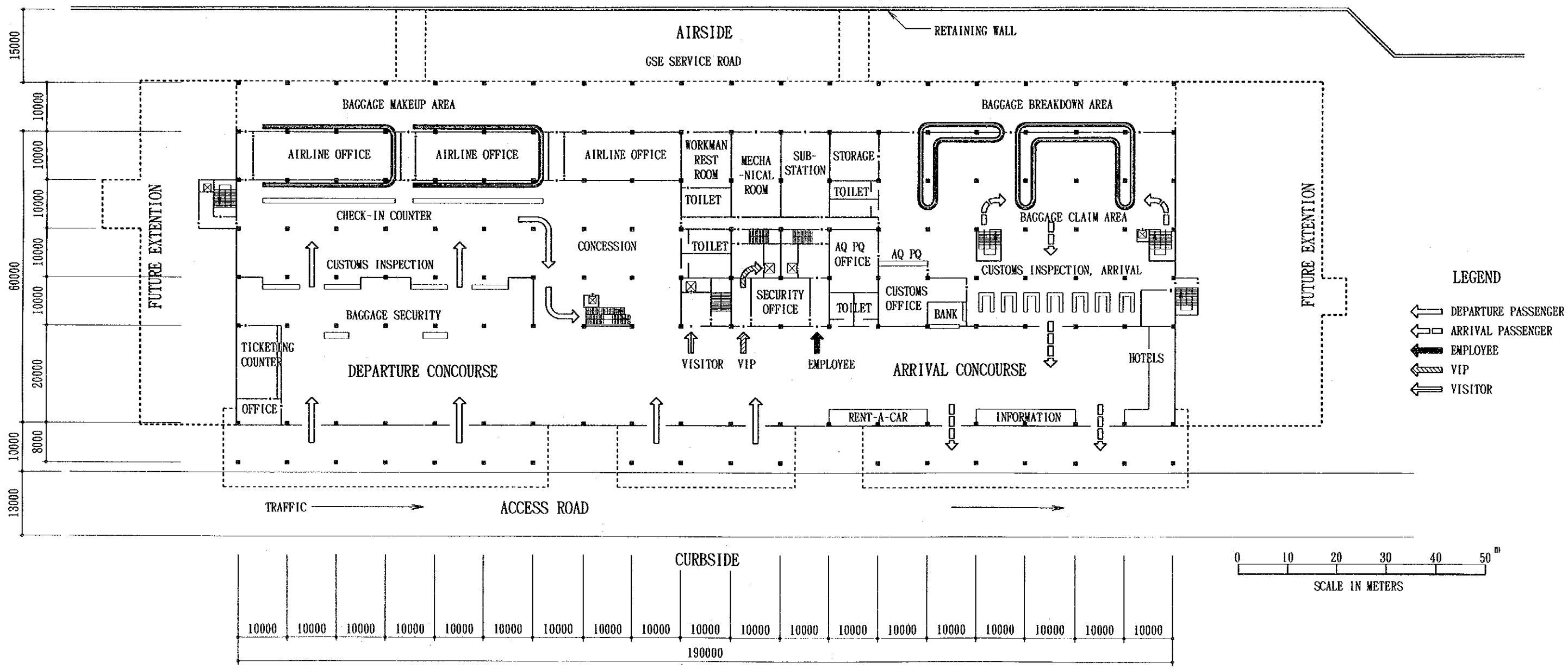
Figure 14.3.1 Passenger and Baggage Flows in Relation to Functional Elements





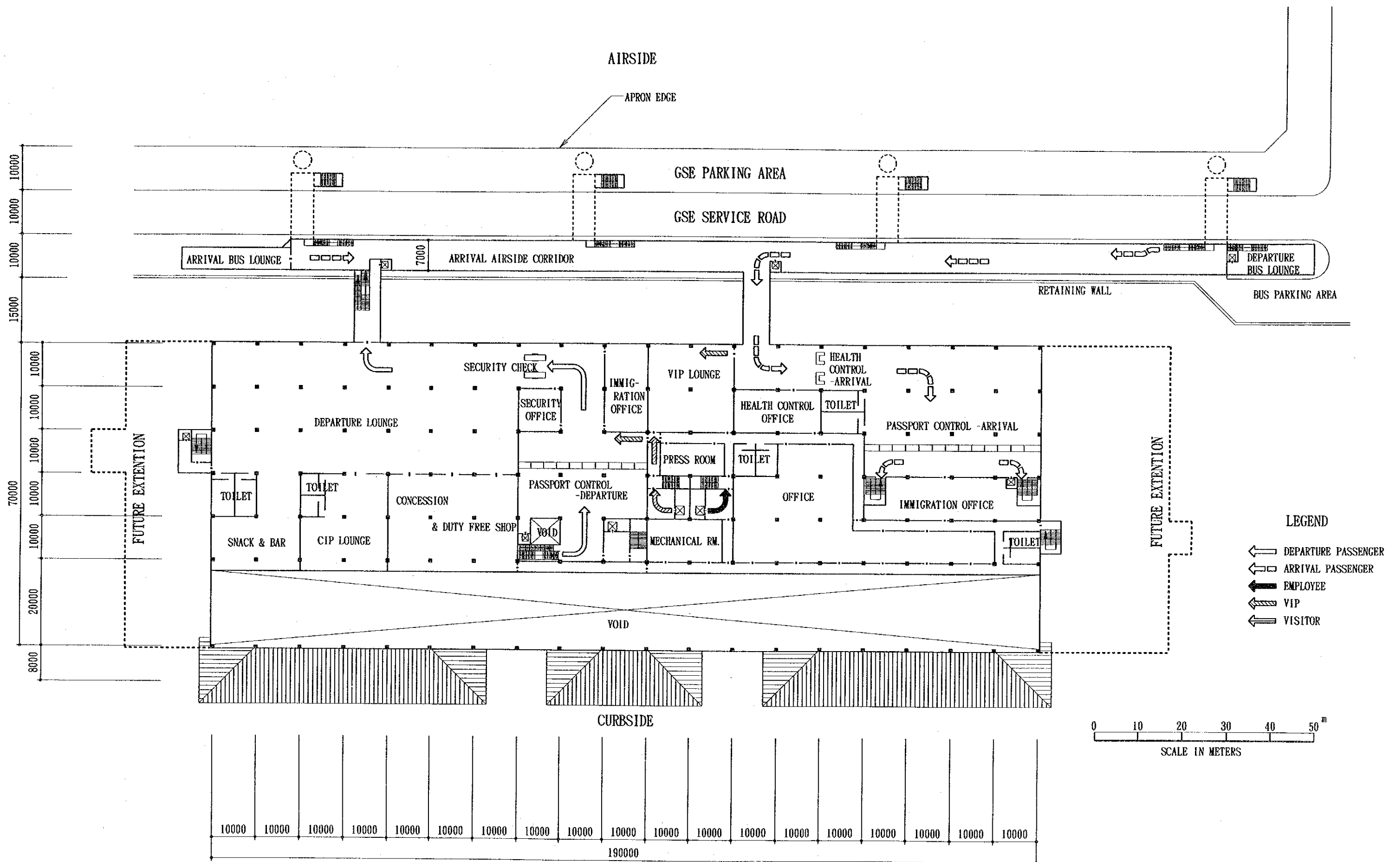
Note: This drawing does not bind the final concept of the building.

Figure 14.3.2 International Passenger Terminal Building, Site Layout Plan



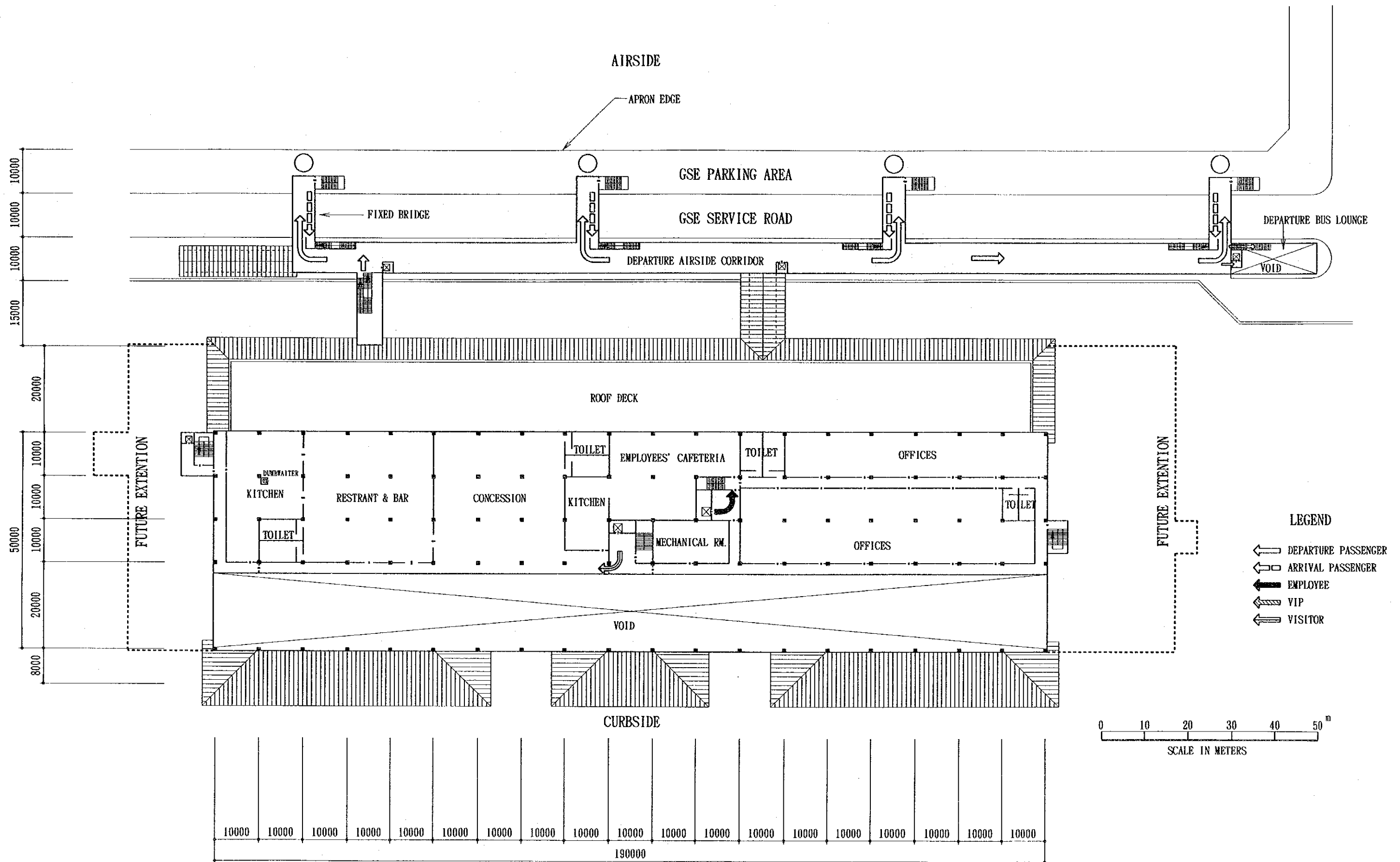
Note: This drawing does not bind the final concept of the building.

Figure 14.3.3 International Passenger Terminal Building, Ground Floor Plan



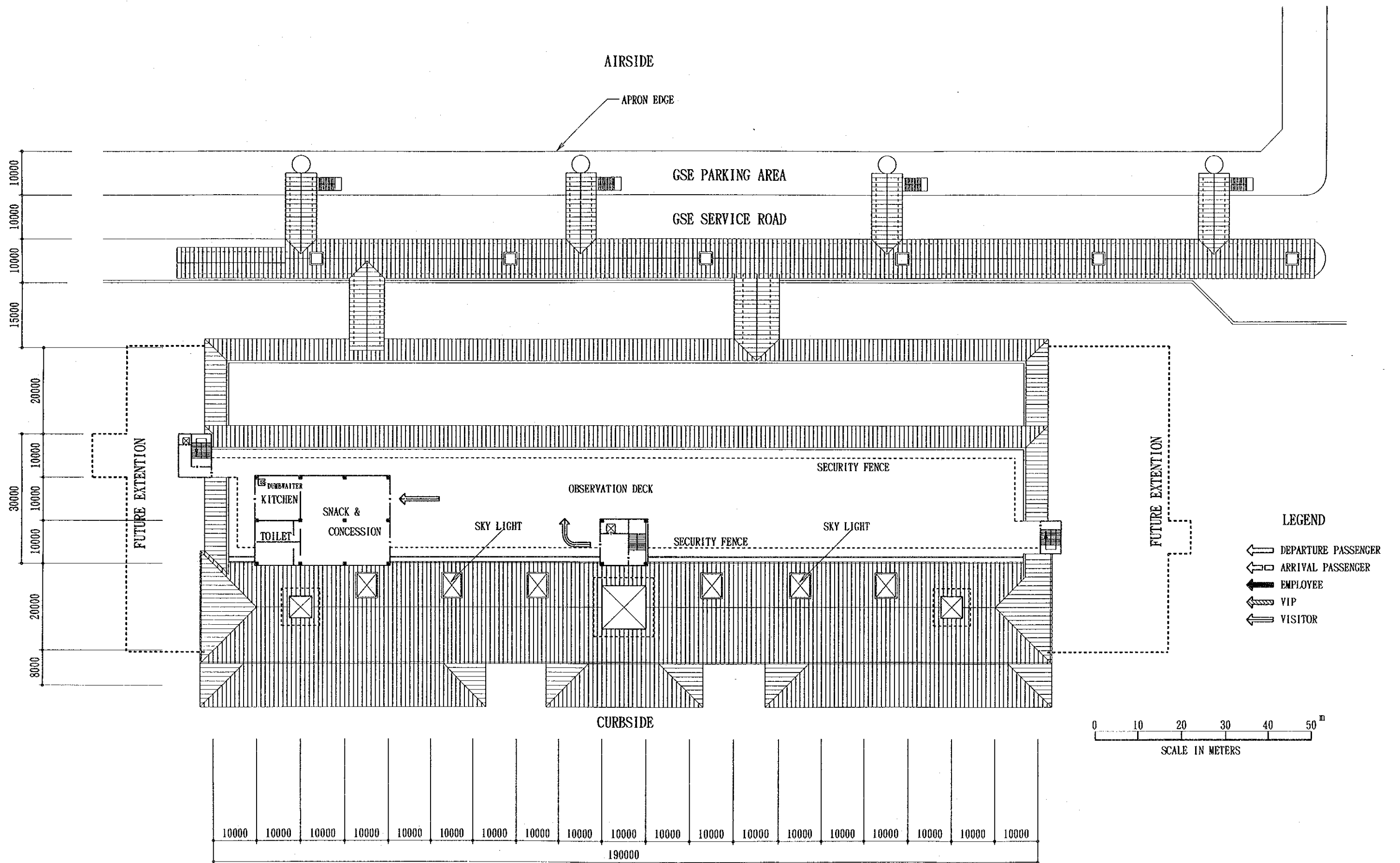
Note: This drawing does not bind the final concept of the building.

Figure 14.3.4 International Passenger Terminal Building, First Floor Plan



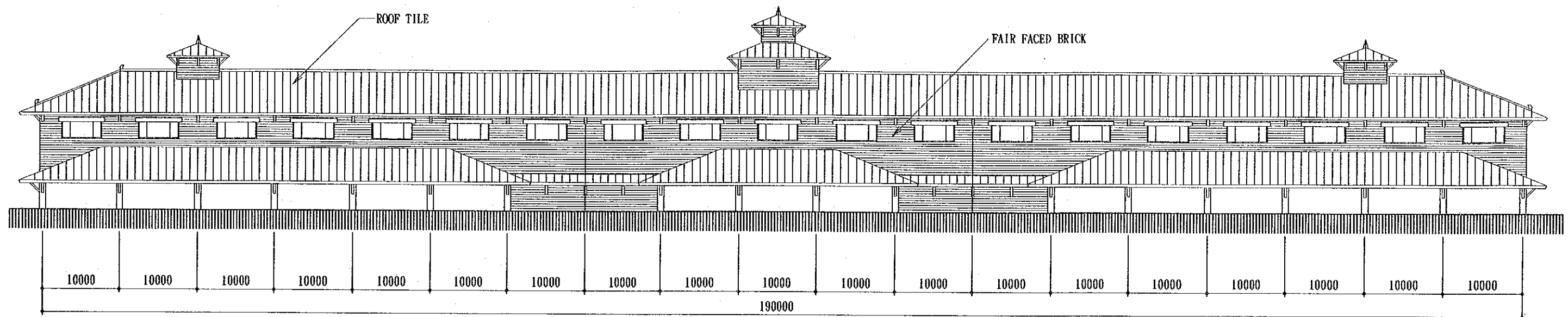
Note: This drawing does not bind the final concept of the building.

Figure 14.3.5 International Passenger Terminal Building, Second Floor Plan

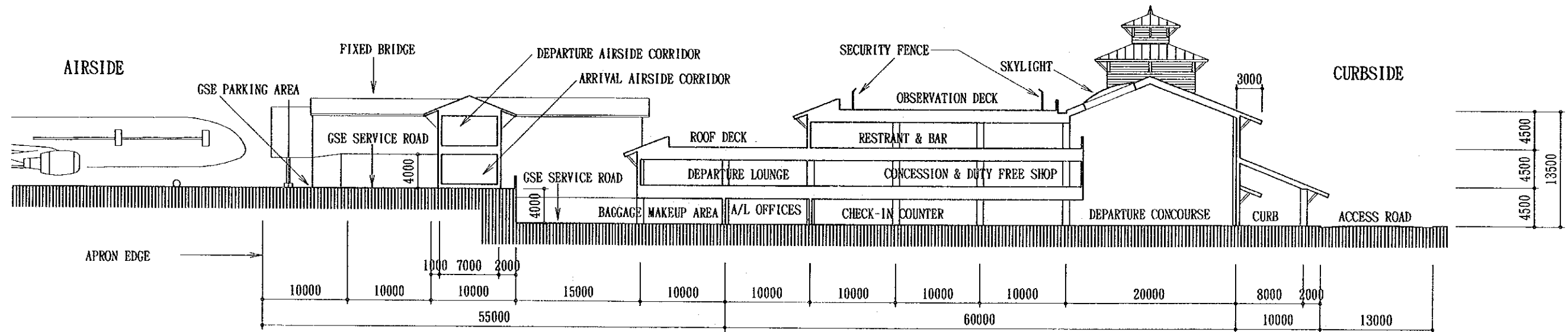


Note: This drawing does not bind the final concept of the building.

Figure 14.3.6 International Passenger Terminal Building, Roof Plan



CURBSIDE ELEVATION



SECTION



Note: This drawing does not bind the final concept of the building.

Figure 14.3.7 International Passenger Terminal Building, Elevation and Section



### 14.3.2 Domestic Passenger Terminal Building

#### (1) Architectural Design Considerations

The existing international passenger terminal building will be renovated and converted into the new domestic passenger terminal building. From the viewpoint of the requirements for area and facilities, the existing terminal building size is enough for the long-term modernization (2010).

The architectural design considerations are described below.

- 1) Effective use of existing areas and facilities not only for domestic terminal functions but also for other functions such as offices etc.
- 2) Separation of departure and arrival passenger flows to ensure security
- 3) Minimum renovation works that bring about economic and operational efficiency

#### (2) Passenger and Baggage Flows and Requirements for Area and Facilities

Passenger and Baggage Flows in relation to the functional components and facilities that are essential for renovation are shown in Figure 14.3.8.

The requirements for areas and facilities to be provided in the domestic passenger terminal building for both of the short-term (2003) and the long-term modernization (2010) are shown in Appendix to chapter 5.

#### (3) Architectural Plans

The terminal building has presently a total floor area of about 10,750 sq. m, being a 3-story reinforced concrete structure. The architectural renovation floor plans were studied based on the architectural design considerations and passenger and baggage flows explained in the previous sections, and the renovation plans are shown in Figure 14.3.9 through 14.3.11.



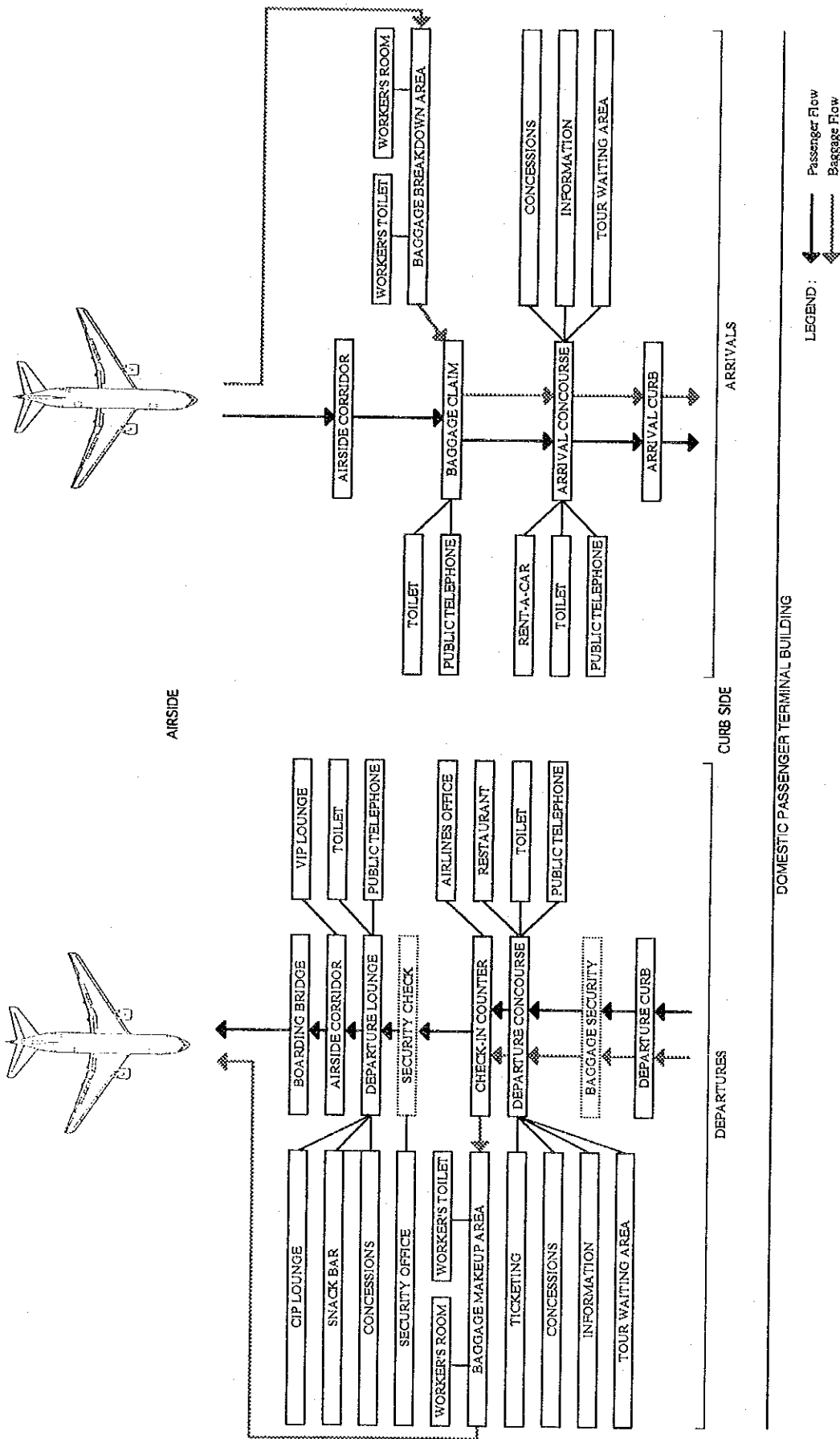


Figure 14.3.8 Passenger and Baggage flows in Relation to Functional Elements



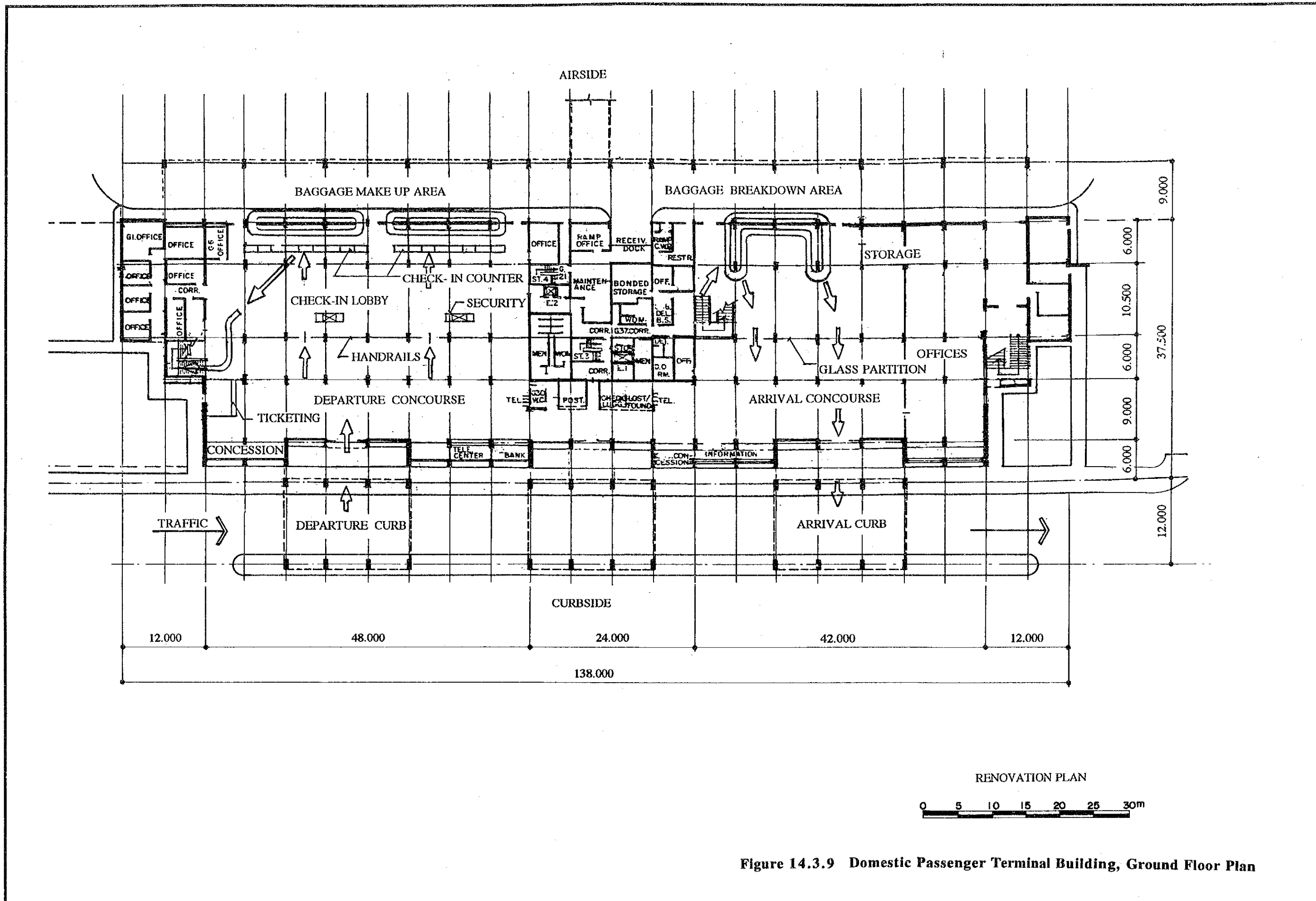
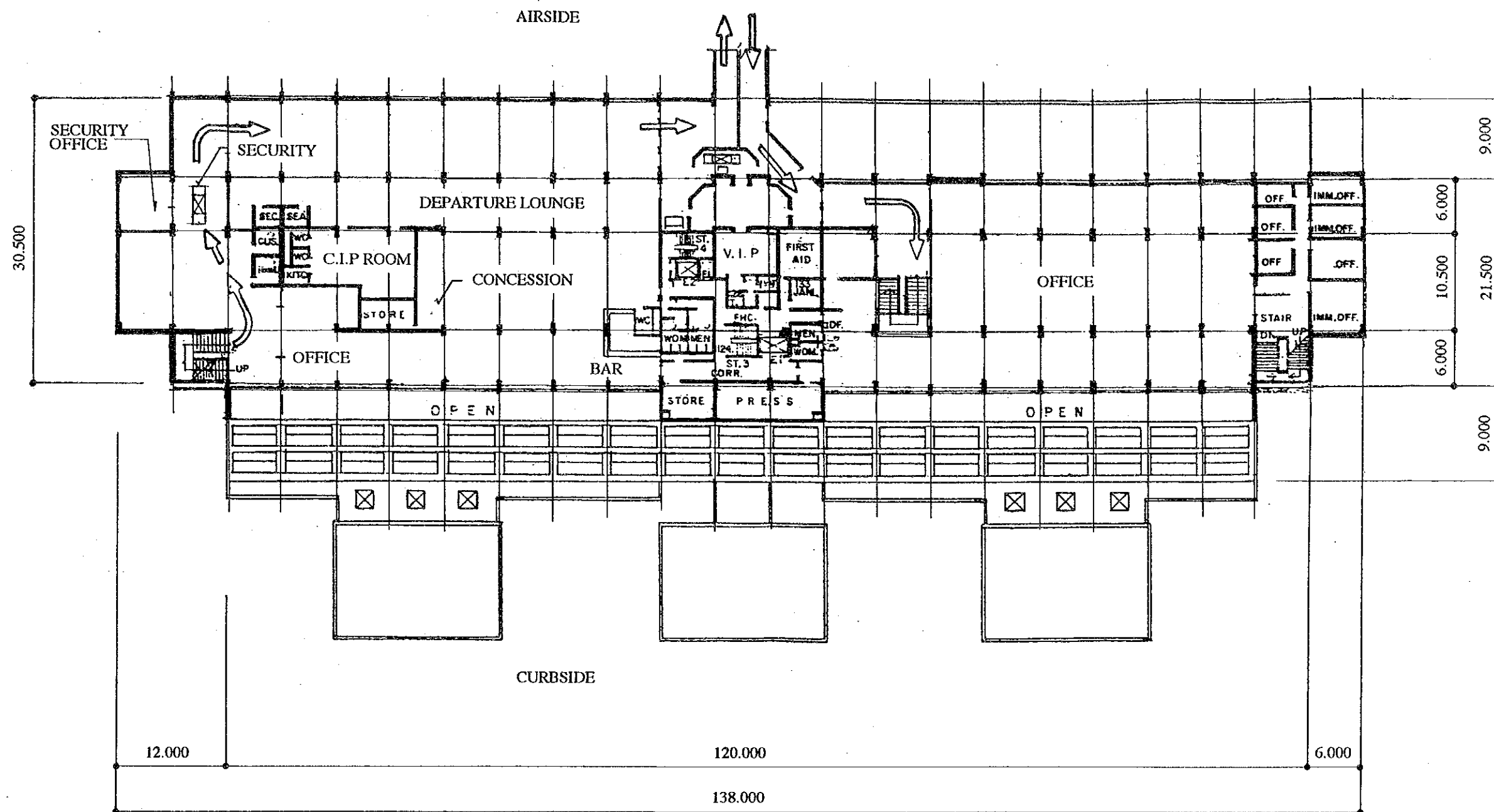


Figure 14.3.9 Domestic Passenger Terminal Building, Ground Floor Plan



RENOVATION PLAN

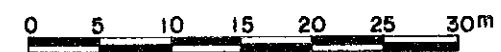
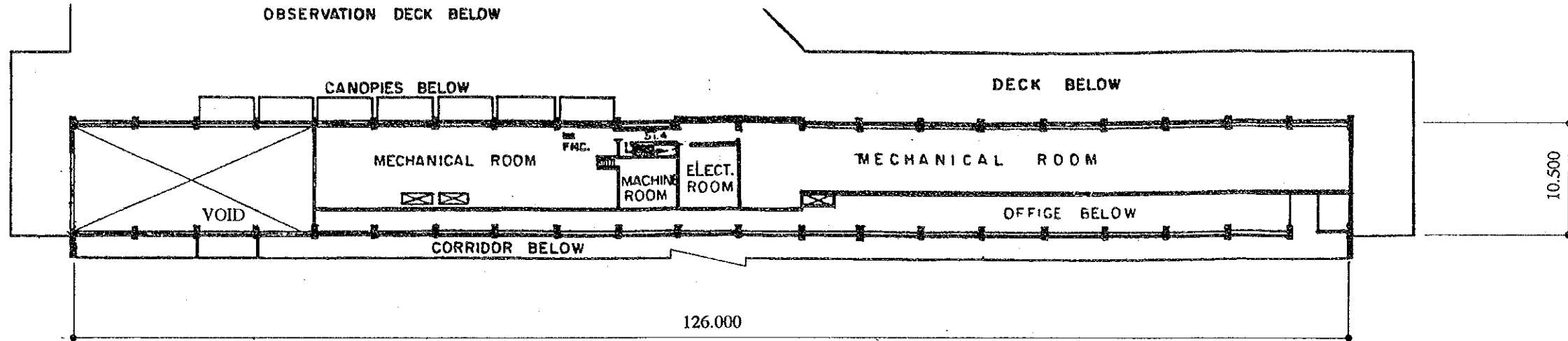
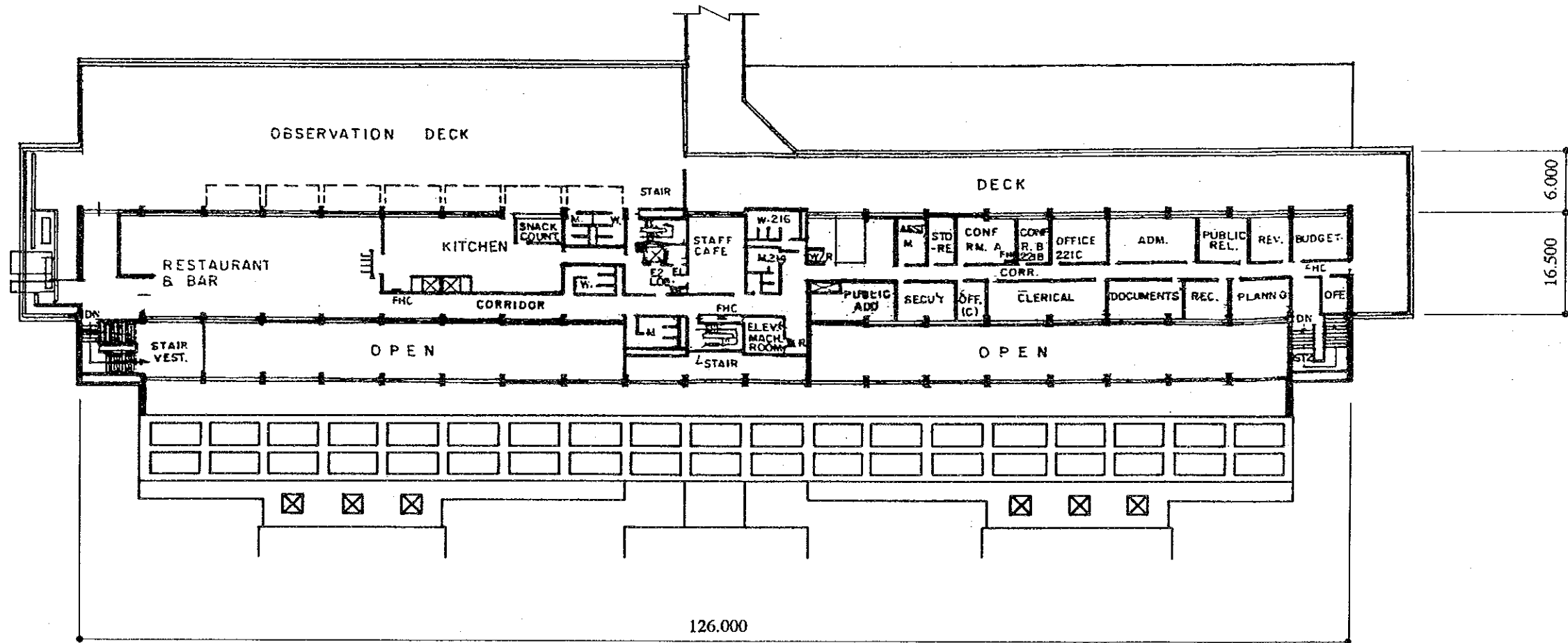
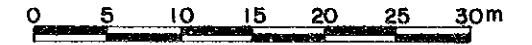


Figure 14.3.10 Domestic Passenger Terminal Building, First Floor Plan



THIRD FLOOR PLAN RENOVATION PLAN



RENOVATION PLAN

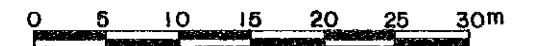


Figure 14.3.11 Domestic Passenger Terminal Building, Second and Third Floor Plans

### 14.3.3 Cargo Terminal Building

Separated functional concept which consist of the cargo storage building and the administration office building is preferable for cargo operational effectiveness and expandability based on a large annual cargo volume (about 38,000 tons in 2003).

The cargo storage building will accommodate international and domestic services. The international and domestic cargo volumes in the year 2003 are expected to be 36,400 tons and 1,500 tons respectively. Therefore, the cargo storage building will mainly accommodate international services.

New cargo terminal buildings will be located to the north of the new international passenger terminal. The terminal buildings consist of a cargo storage building and an office building and will have total floor area of about 7,500 sq. m for the short-term modernization (2003).

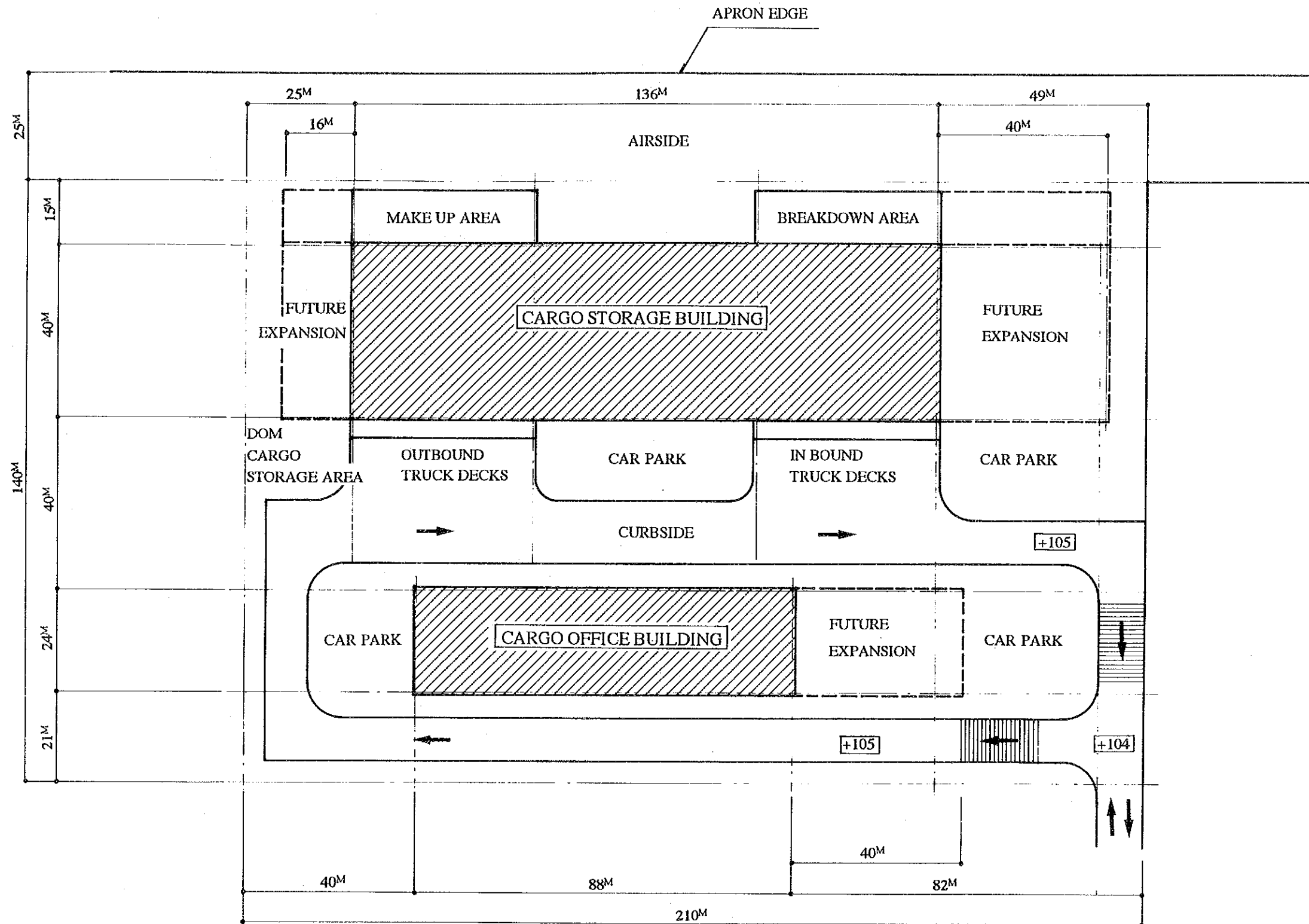
The cargo storage building will be a single story building with a steel frame structure and will be about 5,400 sq. m in total floor area. The office building will accommodate airline offices, customs offices, AQ (animal quarantine) and PQ (plant quarantine) offices, agent offices etc., and will be a single story reinforced concrete structure with a total floor area of about 2,100 sq. m.

Site layout, floor plans, sections and elevations of the cargo terminal buildings are shown in Figure 14.3.12 through 14.3.15.

### 14.3.4 Maintenance Hangar

A new maintenance hangar will be located to the east of the runway, almost in front of the terminal across the runway and will accommodate one B-767 and one HS748 aircraft for the short-term modernization (2003). The maintenance hangar will have a total floor area of about 6,500 sq. m with a steel frame structure. For the long-term modernization (2010) the maintenance hangar will be expanded to accommodate another DH aircraft. A plan and a section of the maintenance hangar is shown in Figure 14.3.16.



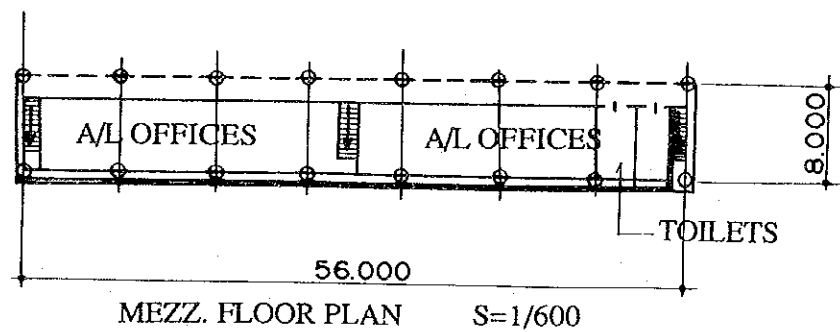
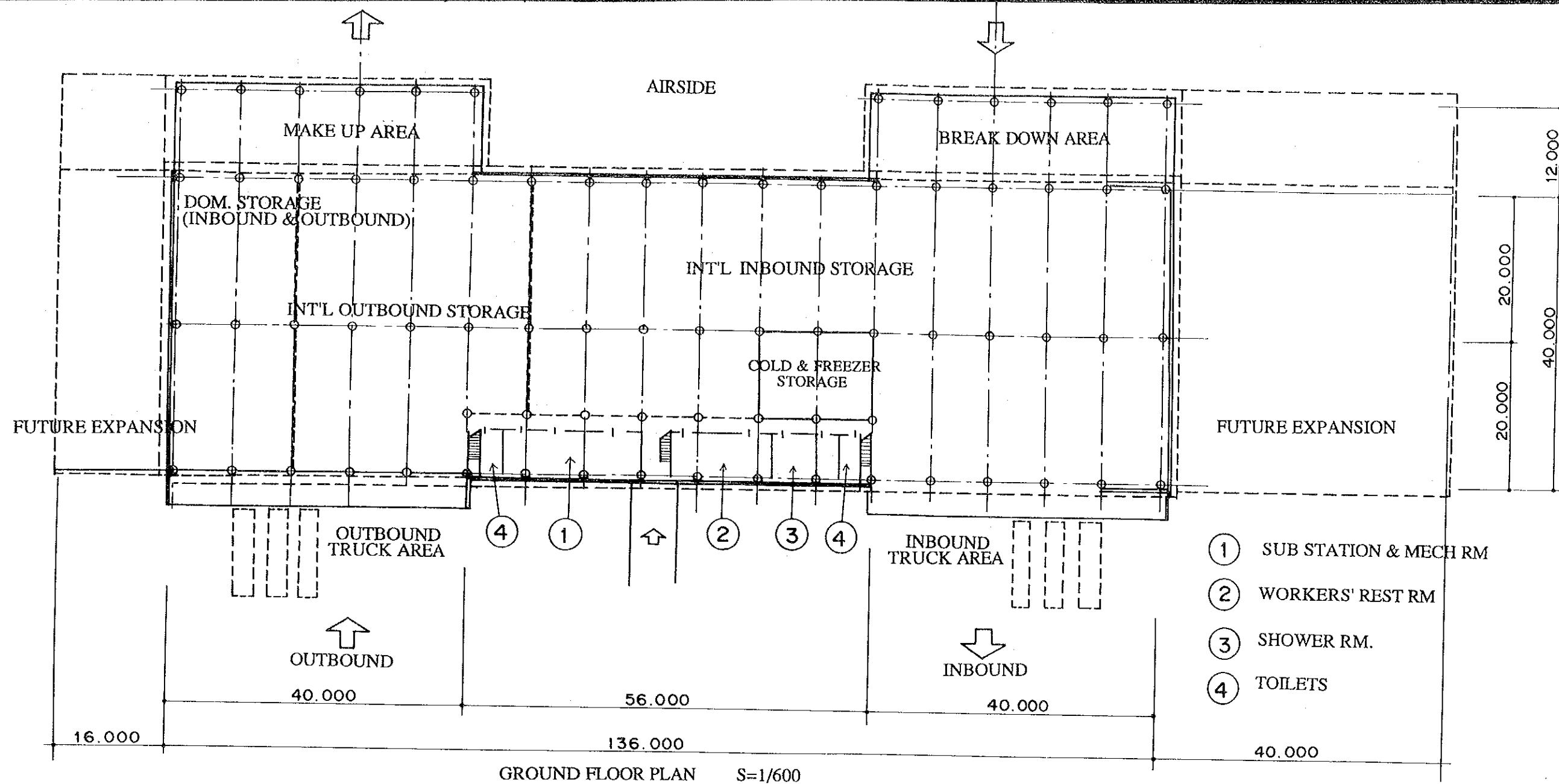


Note: This drawing does not bind the final concept of the building.



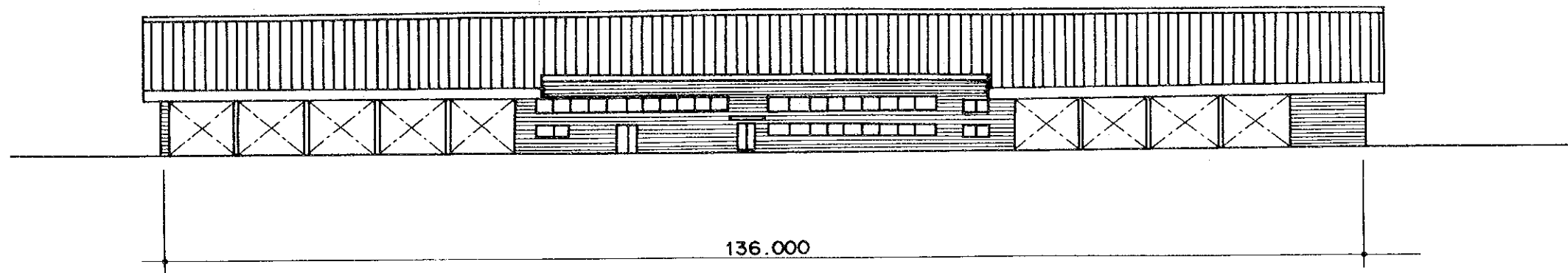
Figure 14.3.12 Cargo Terminal Building, Layout Plan



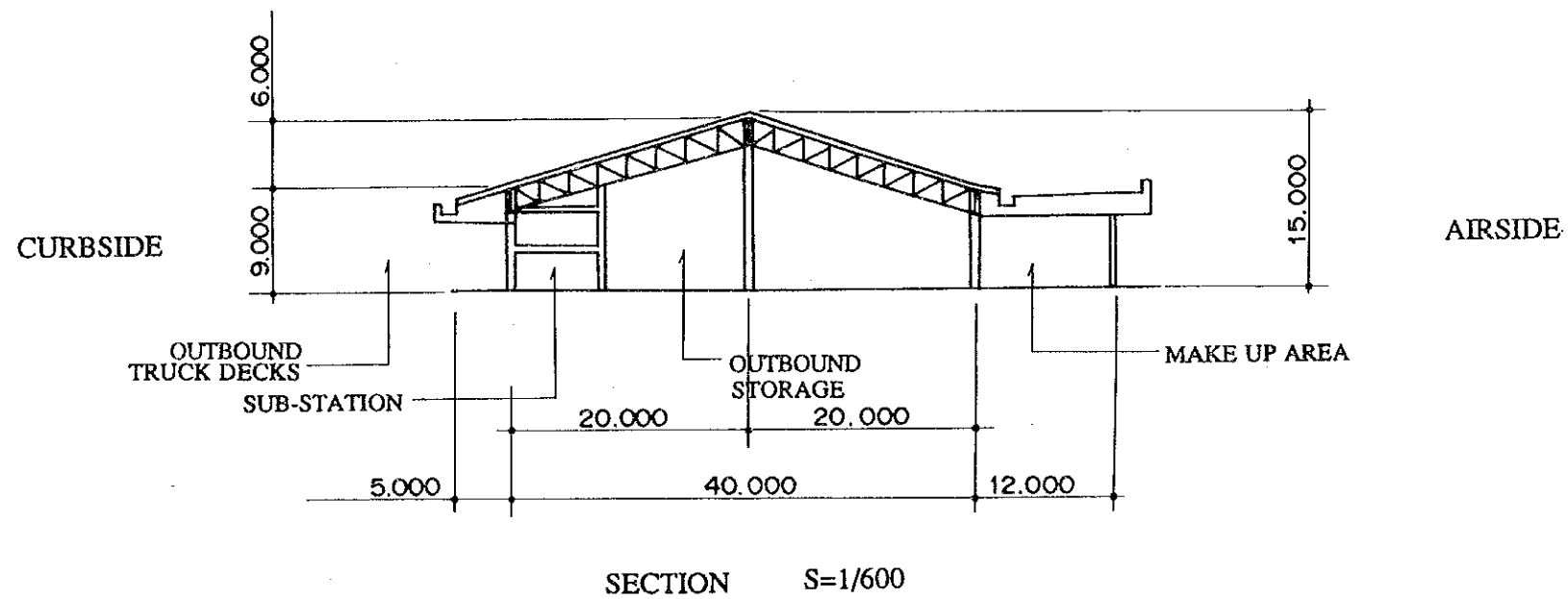


Note: This drawing does not bind the final concept of the building.

Figure 14.3.13 Cargo Storage Building, Ground Floor Plan and Mezz. Floor Plan



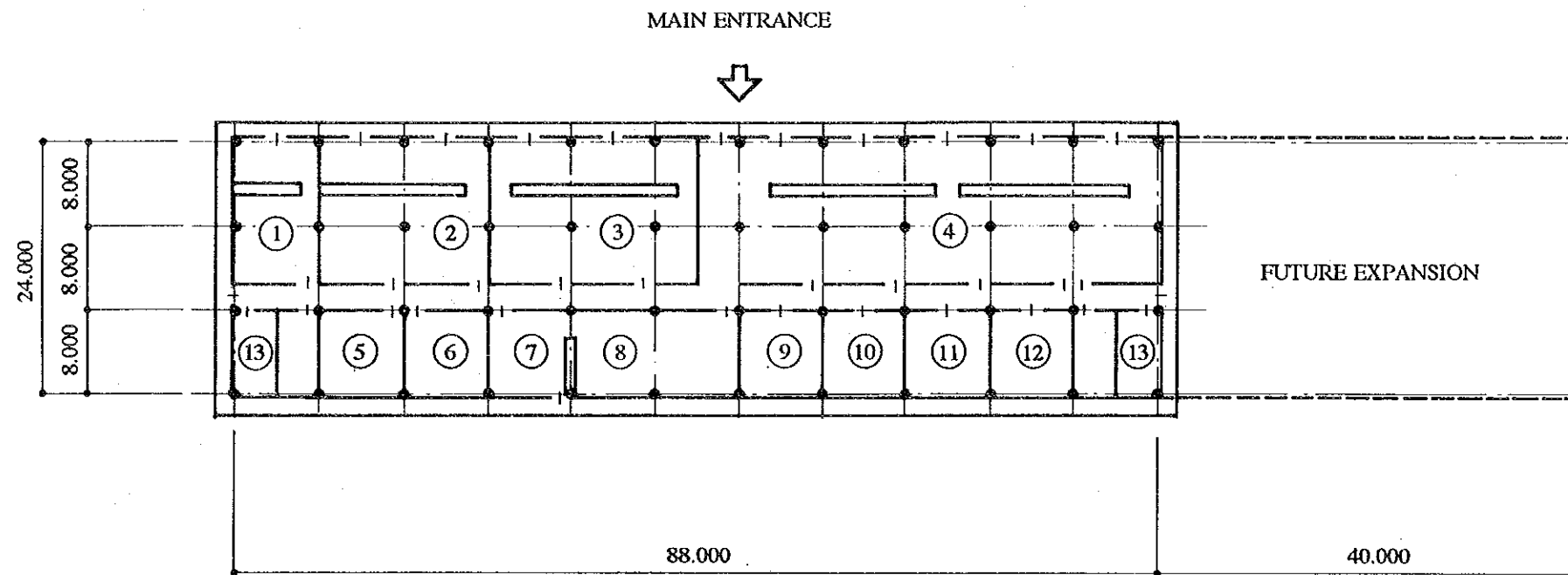
CURBSIDE ELEVATION S=1/600



SECTION S=1/600

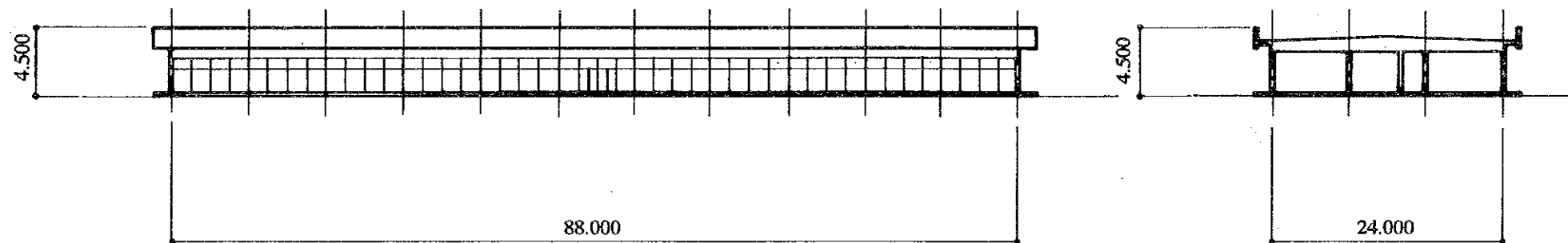
Note: This drawing does not bind the final concept of the building.

Figure 14.3.14 Cargo Storage Building, Elevation and Section



- LEGEND
- ① AQ AND PQ OFFICE
  - ② CUSTOMS OFFICE
  - ③ CARGO AGENT OFFICE
  - ④ A/L OFFICES
  - ⑤ STORAGE FOR CUSTOMS
  - ⑥ SAFE
  - ⑦ KITCHEN
  - ⑧ CAFETERIA
  - ⑨ STORAGE-1
  - ⑩ STORAGE-1
  - ⑪ MECH. R M
  - ⑫ SUB-STATION
  - ⑬ TOILETS

GROUND FLOOR PLAN



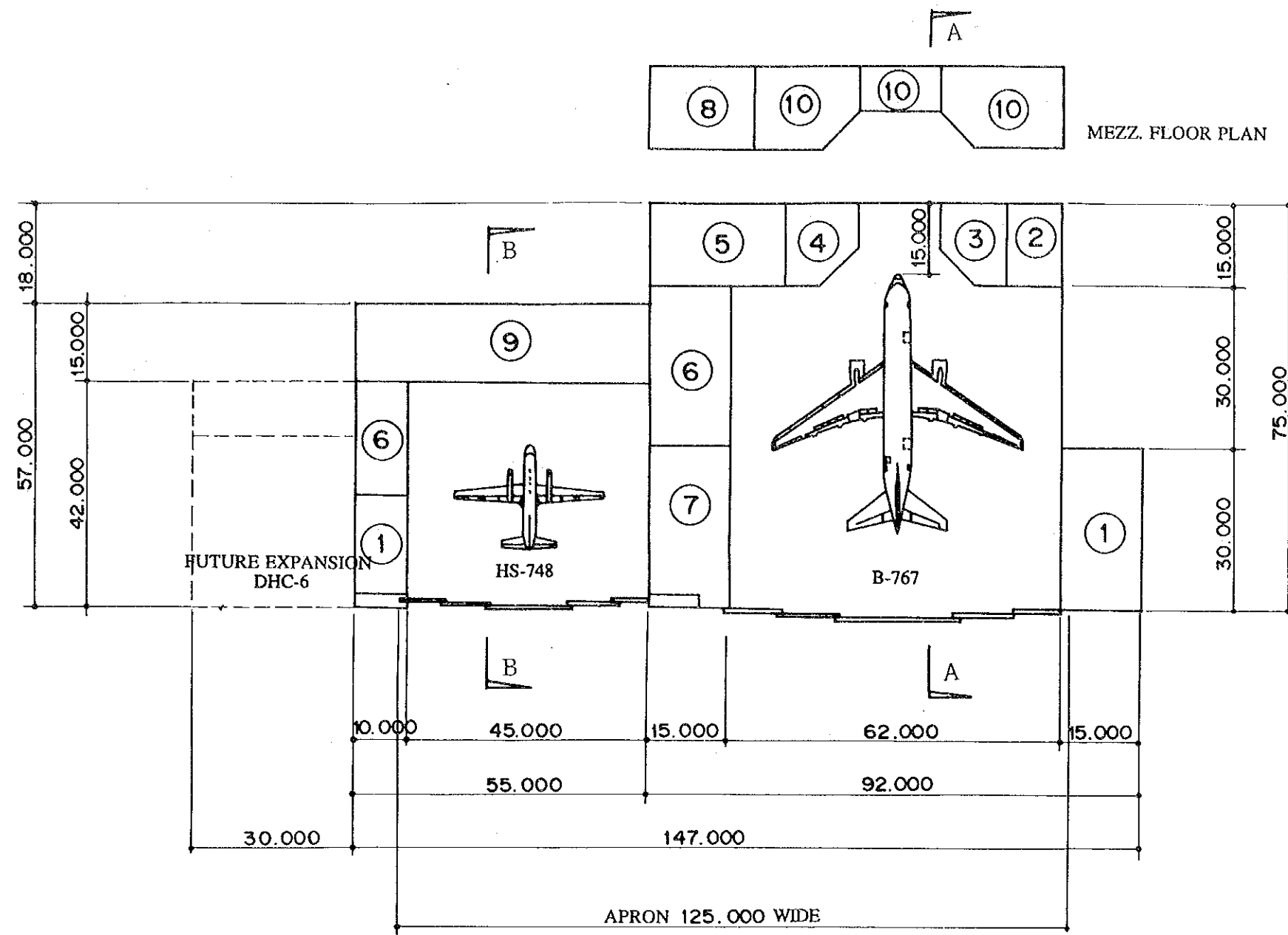
MAIN ENTRANCE ELEVATION

SECTION

Note: This drawing does not bind the final concept of the building.



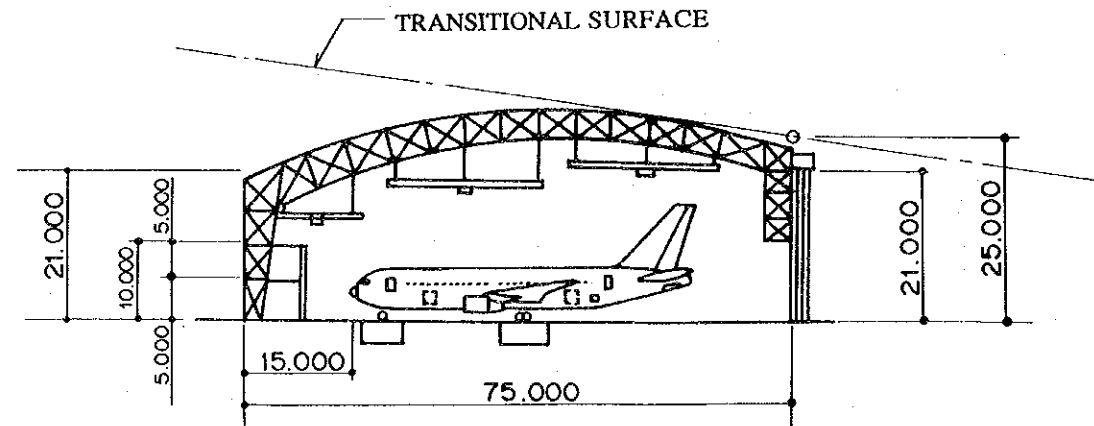
Figure 14.3.15 Cargo Office Building, Ground Floor Plan, Main Entrance Elevation and Section



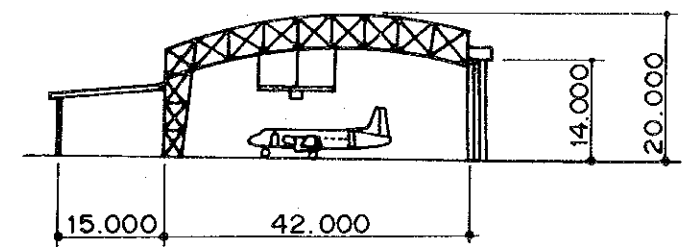
LEGEND

- ① ENGINE SHOP
- ② CABIN PARTS WORKSHOP
- ③ SCREEN RM.
- ④ MACHINE RM.
- ⑤ SHEET METAL WORKSHOP
- ⑥ TOOL RM
- ⑦ CONTROL BOARD RM
- ⑧ TRAINING RM
- ⑨ STORAGE
- ⑩ OFFICES

GROUND FLOOR PLAN S=1/1000



SECTION A-A



SECTION B-B

Note: This drawing does not bind the final concept of the building.

Figure 14.3.16 Maintenance Hangars, Floor Plans and Sections



## **14.4 Airport Utilities**

As mentioned in Chapter 11, "Airport Modernization Plan", there will be a variety of construction and expansions of the airport facilities in TIA. Therefore, demand of utilities such as electric power, water, sewage and waste disposal will all increase as shown in Chapter 5 "Airport Facility Requirements". Therefore, it is required that all supply systems of utilities be constructed by the completion of the expanded facilities.

### **14.4.1 Electrical Power Supply**

At present, there are two transmission lines to the airport and at the moment supply power in the manner of three phase, three wire, 11 kV. However these transmission lines are not dedicated lines for the airport and some other consumers are connected to these lines.

Therefore the supplying capacity and reliability of these existing transmission lines will be insufficient for the new power demand at each stage of the Short-term Modernization Plan.

The NEA, will be required not only to study the matters with regard to shortages and unreliability, but also to construct new exclusive transmission lines as soon as possible during the period of the Short-term Modernization Plan.

### **14.4.2 Water Supply**

At present, water is supplied by the city's water mains and from the wells in the airport. However there is insufficient capacity to supply the increasing demand in the Short-term Modernization Plan stage.

At the moment TIAO is executing a study and survey for the installation of new wells in the airport. However it is anticipated that the supplying capacity of all the wells will still not be sufficient to meet the increasing demand. Therefore, these wells will be considered as a sub component of the water supply system to the airport, and city water supply will be the principal source of water.

Therefore, the capacity of city water supply system should be reinforced in accordance with the increase of water demand. For this purpose, the capacity of the wells are to be studied at first, and then a request for the reinforcing the capacity of the city water supply shall be made to the responsible authority.

In the Short-term Modernization Plan of this Study, the installation of new elevated water tanks is planned as a temporary measure until the above-mentioned development is completed.

### **14.4.3 Sewage Disposal**

At present, all effluence in the airport is discharged to the sewage lagoon through sewage pipe lines; the effective capacity of lagoon being about 670 cu. m. which is sufficient for the discharge volume until 2003. However, the system of natural aered and percolation will not be suitable for the newly developed airport.

A new sewage treatment plant will be constructed to treat all effluent and discharge to drainpipes connected to the river near the airport.

### **14.4.4 Solid Waste Disposal**

At present, all solid waste is carried out by trucks everyday. However, all inflammable waste should be treated by an incinerator in the airport to save transportation time and costs. Therefore, an incinerator will be installed in the airport in the Short-term Modernization Plan.

## **14.5 Aeronautical Ground Light System**

As mentioned in Chapter 9, guidance lighting systems for the approach to and departure from the Runway 20 are not installed. It is desirable that an Approach Guidance Lighting system (AGL) and Circling Guidance Lighting (CGL) system, which are specified as guidance lighting systems in ICAO Annex 14, be equipped as safety improvements for circling approach as soon as possible.

However, the AGL system will be not so easy because the land acquisition will take a long time and need lot of compensation. The CGL system may be easily installed in a short construction period and with a comparatively cheaper cost.

It is recommended that at first the CGL system be installed to the Runway 20 by 2003 and proceed with land acquisition for the AGL lighting poles at the same time.

CGL shall consist of several flood light fixtures installed on the parallel line of the runway and on the extension line of the runway threshold. CGL will perform to indicate the direction of the runway and the location of the threshold by flood light, so that the pilot will be able to clearly recognize and location. All installation sites of the CGL lighting are located inside of the airport site so that the system can be easily installed.

# CHAPTER 15

## AIRPORT MANAGEMENT STUDY





## CHAPTER 15 AIRPORT MANAGEMENT STUDY

### 15.1 General

This chapter describes the result of the study on the airport management of TIA, consisting of evaluations and recommendations on reflection of the present condition and the future modernization plan.

### 15.2 Airport Management Modernization

#### (1) Strengthening the Airport Management System

It will be requested that the following points, which form the theory of modern management, be taken into consideration in the airport management modernization. They will help to achieve speedy, efficient and economical management of an airport.

##### a. Clarification of Airport Activities

An airport can be operated smoothly with the support of many services and activities. In order to organize these many kinds of services and activities in an airport, each activity should be clarified in terms of individual service, responsibility and its responsibility the other activities. Job descriptions of TIAO in a ministerial and/or departmental decree will be quite helpful to identify these. Also it should be expected to be revised at any time to meet the current necessity for a modern airport.

##### b. Organizing Activities and Personnel

In order to activate and effectuate the many services, activities and personnel of TIAO, good coordination between each division and/or section is primarily necessary. The institution of discussion, communication, instruction and reporting are required to be performed properly and positively.

##### c. Standardization

In order to get rid of individual differences in achieving services and activities, it will be very helpful to establish technical standards and criteria in planning, design, construction, operation and maintenance of an airport. In particular, operation manuals, maintenance manuals, check lists and flight calibrations are very useful. In addition, the standardization will bring other advantages of reducing the time and man-power, preventing human errors, etc., in addition to the achievement of uniform services between individuals.

##### d. Regular Training

In order to operate and maintain successfully the activities of a modern airport and modern facilities, it will also be required to maintain the level of expertise as well as the systems and facilities. Therefore it is very important to keep and constantly improve the skills and the knowledge of staff, which should be constantly renewed in accordance with technical innovations, by establishing a training system including on-the-job training (OJT) to the staff of TIAO.

##### e. Provision of Vehicles, Facilities and Equipment

In the operation and maintenance of an airport, regular checks, maintenance services and also emergency works are usually executed to secure the performance of airport facilities as good and safe. The following increases and/or provisions are basic requirements to be arranged for the airport operation and maintenance of TIA, as current provisions are not adequate in that airport operations and maintenance are hampered by the current shortages.

- vehicles with communication equipment for internal service of the airport
- vehicles for outside services
- portable communication equipment

- tools (at each location)
- spare parts
- test equipment and devices

f. Facilities and Spare Parts Management Systems

The basis of management is to understand the current condition of airport activities and equipment. This will allow good planning and designing of facilities and also the provision of parts and stock control.

For this purpose, it is mandatory to record the condition of facilities, equipment, vehicles, tools and spare parts in a master file with inventories, lists and drawings in addition to the history and data concerned.

And it is also recommended that they be revised continually to update the contents.

It is also desirable to discard unnecessary and useless facilities and equipment, as they will deprive the limited resources of man-power and budget.

g. Precise Topographic Survey

Modern navigation of aircraft relies upon the accuracy of the locations of airports and navigational aids on the ground.

Airspace use planning is also based on their precise locations.

Therefore it is requested to identify each coordinate of the locations concerned by means of a survey.

(2) Personnel Management

- a. TIAO operates and maintains the airport through the services of flight operations, communications, facility maintenance, security control and administration, partially with the help of the customs office, immigration office, quarantine office, airport police, airline companies and others.

TIAO currently possesses personnel consisting of 141 administrative staff and 241 technical staff, totaling 382 persons.

- b. DCA has made an effort to reform and strengthen the present organization of TIAO by clarification of the tasks by themselves and their mutual relations. Also an increase of staff has been planned on the lines of the modernization as follows;

Current			Planned		
administrative	technical	total	administrative	technical	total
141	241	382	83	410	493

This implies an increase of 111 persons or 29 %. This increase mainly comes from the change in the number of shifts in airport operations and maintenance crews from two (2) to three (3).

- c. In the short-term modernization plan with the target year 2003, there is planned the development of new international terminal buildings for passengers and freight, a new domestic terminal building and the expansion of the apron. At the same time there will be installed new navigational aids such as the radar for the improvement of air safety. It seems to be normal and general accordingly increase personnel to operate and take care of these facility and equipment increases.

The following table shows the comparison of numbers of staff of TIAO and of similar-sized airport offices in Japan, which handle more or less 2 million passengers annually. (In 2003, TIA is expected to handle 1.850 million passengers.)

Airport office		Number of staff
TIAO/Nepal	At Present	382
	Planned	493
Airport offices of JCAB/Japan	Minimum	147
	Maximum	392
	Average	275

The staff numbers at the Japanese airport offices are expressed as the sum of personnel of the airport office and terminal building company.

In Japanese airports, there is an extension of business into private sectors at the passenger terminal, cargo terminal, facility maintenance and security checks, because of the commercial benefits.

- d. It is, of course, not easy to compare precisely these differences, which are caused by the extent of airport services, the development of commercialization and national policy. Therefore it is not correct to conclude from the comparison directly.

This gives only some suggestions to the personnel management of TIA. Namely the "modernization" may change not only the quantity but also the quality of facilities and human resources. An international airport equipped with modern facilities to secure high air safety and to provide high level of services will require high quality (high capability, morals and hospitality) personnel to handle and serve them.

Therefore attention should be paid on developing and improving the current human resources as much as possible, not on increasing the number of personnel.

### (3) Security Control

- a. Concerning access control, this is handled by the airport police in TIA. However as described in the current conditions of facilities and equipment in chapter 6, the fencing should be more improved and the communication system upgraded.
- b. Concerning baggage security checks in the international terminal building, there are two x-ray detective machines installed, which should be maintained well to facilitate the flow of passengers.
- c. There is no modern detection equipment in the domestic terminal building of TIA. It is strongly recommended to complete the security check system in the new domestic terminal in the future.

### (4) Search and Rescue

- a. The institution required for the search and rescue (SAR) was prepared by DCA in 1992 (such as the organization and operation). Also some equipment has been arranged in TIA as a rescue co-ordination center (RCC), as follows;
- three (3) consoles for communication

- four (4) hot lines to connect with fire fighting stations and hospitals
- other installations of local telephone lines

However it is not yet furnished well enough to accommodate RCC activities in view of the requirement for SAR and the need for a 24-hours basis. There are a lack of a display boards for conducting RCC operations, maps for estimation of location, communications operational at any time, etc..

It is also required to conduct regular practices by the staff in charge of RCC, utilizing these kind of facilities and equipment in order to be familiar with the activities.

- b. DCA/Nepal has encountered aircraft accidents in recent years after the preparation of SAR. However the institution prepared by DCA has not yet been authorized by the Government. Therefore, there is no assignment of staff in charge of ASR and no budget to provide equipment and goods.

Therefore it is urgently necessary to establish a SAR organization in DCA and to implement the SAR institution by official authorization of the Government as soon as possible, as an international agreement.

#### (5) Facilitation

- a. There is partial congestion in the existing international terminal building caused by improper departure processing, complexity and delays in cargo processing due to the dispersed buildings and no access roads within the airport site.
- b. The necessity of improving facilities in TIA is most urgent. This will be achieved by the implementation of TIA modernization plan, in which the concept of facilitation is reflected.

### 15.3 Human Resources Development

#### 15.3.1 General

- (1) Airport operations and management are executed and supported by many kinds of airport activities. As these activities are specified to contribute to civil aviation, it is requested to educate and train special personnel specifically for airport and aviation duties. In order to advance this idea, a human resources development plan should be established.
- (2) As described in previous chapters, the Civil Aviation Training Center (CATC) of DCA/Nepal has been conducting several courses of training programs. However it cannot carry out adequate human resources development. In accordance with the TIA Modernization Plan, there are plans and projects to introduce modern systems and equipment which require a higher handling capability than before.
- (3) Thus, the necessity of human resources development is greater than ever before.

#### 15.3.2 Objectives

The objectives of human resources development are to develop and activate human resources by (1) training the required personnel for the required airport activities through education of the necessary knowledge or technology, and (2) giving the necessary training to personnel to maintain and raise the capability of handling the activities.

#### 15.3.3 Basic policy

The basic policy of human resources development in the field of civil aviation in Nepal is as follows;

- a. to be developed in Nepal
- b. to utilize the international technical and financial assistance at the beginning of the progress
- c. to develop independently in the future

UNDP/ICAO have already studied and proposed "Modernization and Upgrading of the Civil Aviation Training Center" (UNDP/ICAO Project, NEP/85/028) in 1992.

Therefore, it is quite reasonable to establish a plan based on the Study.

#### 15.3.4 Institution of human resources development

##### (1) training authority

As CATC has been the core of the current training system on civil aviation, CATC will be expected to play a pivotal role in the new human resources development. CATC will take part in all basic training courses, that is to say, basic education and training not only for novices but also to take part in refresher courses.

If there are similar institutions in the Nepalese government that conduct similar training to that of CATC, it is expected to utilize these circumstances so as to cut costs.

##### (2) On-the-job-training (OJT)

As the final objective of human resources development is for the personnel to carry out the airport activities smoothly, they are requested to be familiar with doing the activities. Therefore OJT is the application and familiarization stage of the basic training prior to becoming in charge of the duty.

OJT has to be planned as being applied at a later stage of the total training.

##### (3) Instructors

It is requested to arrange instructors who carry out the training, in terms of their numbers and their technical level. It might be necessary to utilize overseas training so that the instructors themselves can be trained.

##### (4) Arrangement training facilities

For the practical training, it is requested to arrange the physical requirements necessary such as buildings, equipment and materials.

#### 15.3.5 Training program

The program and curriculum of training may be different due to the fields or target. The following should be paid attention to for the planning of the program.

##### a. requirement of training:

field, level of trainees, level of achievement, number, etc.

##### b. schedule of training:

time, period, etc.

# CHAPTER 16

## ENVIRONMENTAL IMPACT ASSESSMENT

## CHAPTER 16 ENVIRONMENTAL IMPACT ASSESSMENT

### 16.1 General

This chapter describes the environmental impact assessment and countermeasures to maintain the amenities of communities surrounding TIA so that they can co-exist with the airport and the airport's activities. Through screening and scoping in Chapter 12, aircraft noise is selected as the environmental factor to be considered.

### 16.2 Aircraft Noise

#### (1) Aircraft Noise Forecast

Figures 16.2.1, 16.2.2 and 16.2.3 depict the aircraft noise contours of TIA at present and in the years 2003 and 2010 respectively.

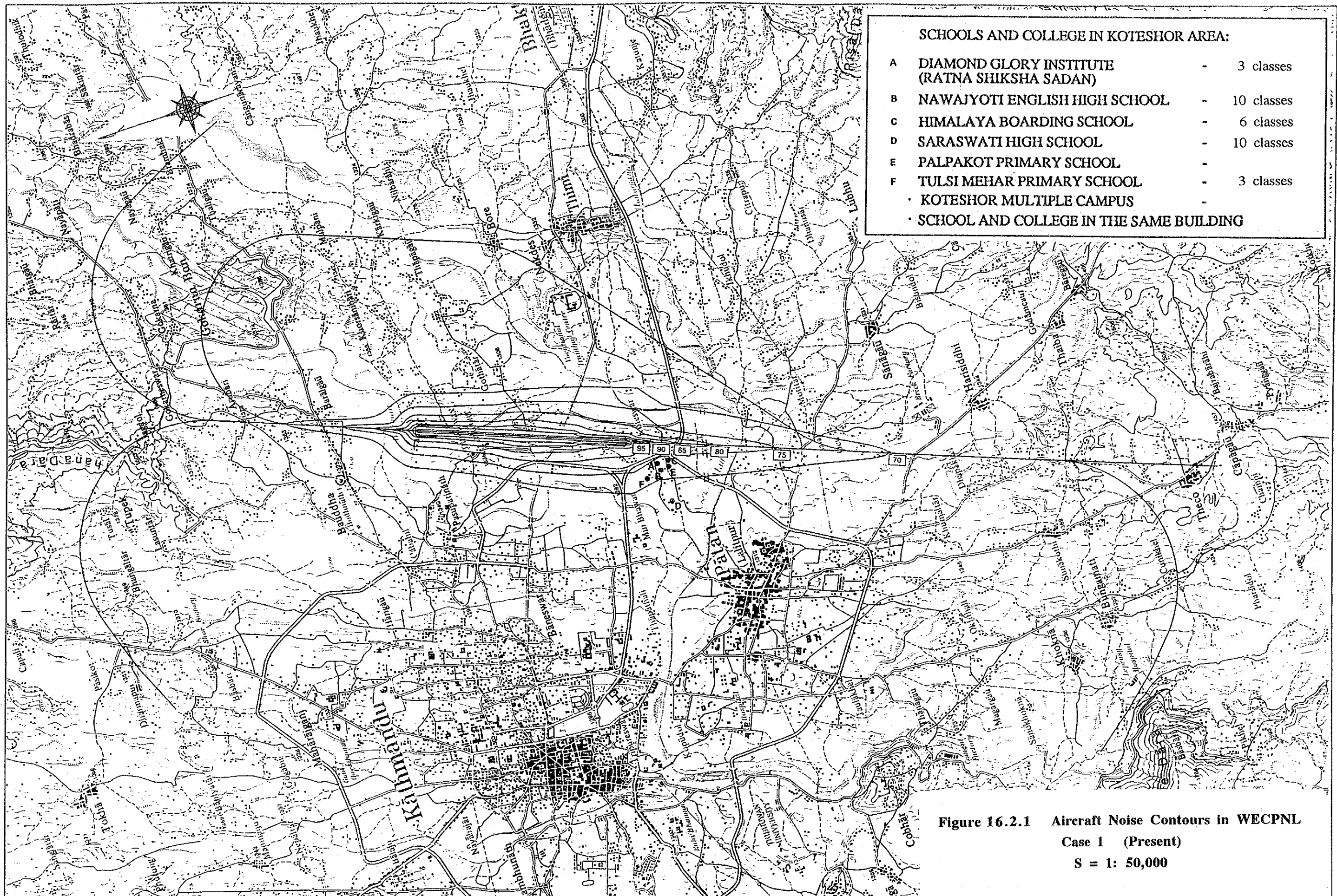
The basis of the simulation of aircraft noise is as follows;

**Table 16.2.1 Assumptions for Calculation of Aircraft Noise Contours**

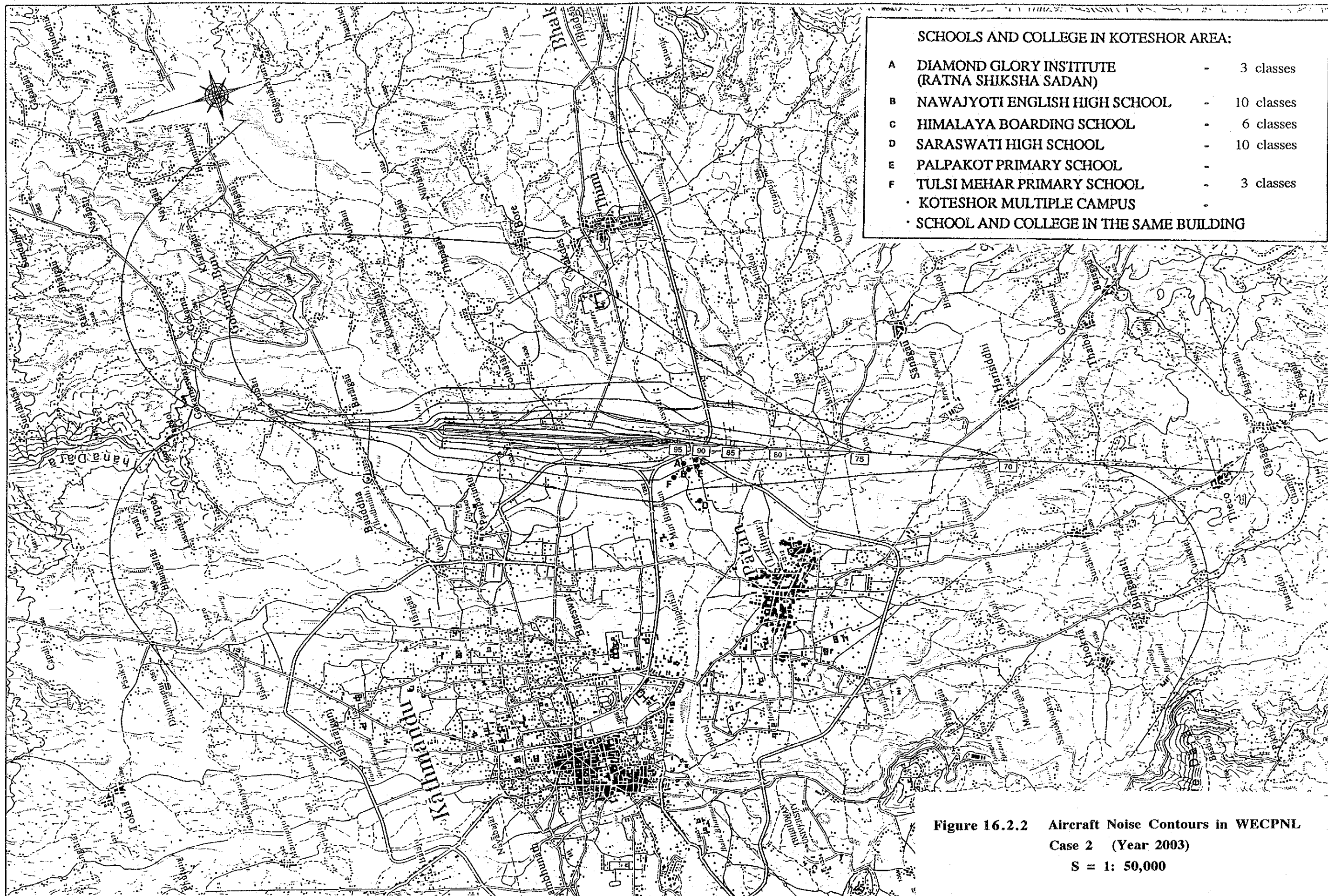
Item	Assumption					
	Present		2003 (Short-term)		2010 (Long-term)	
Target Year	Present		2003 (Short-term)		2010 (Long-term)	
Traffic Pattern	Same as existing procedure		Ditto		Ditto	
Ratio of Runway Use	Landing : Takeoff :		RWY 02 : 20 = 80 % : 20% RWY 02 : 20 = 20% : 80%			
Runway Length	3,050 m		3,050 m		3,050 m	
Aircraft Type and Number of Daily Flights	B747-400	0	B747-400	0	B747-400	4
	MD11	0	MD11	6	MD11	6
	A300	4	A300	4	A300	6
	B757	8	B757	12	B757	16
	B737	12	B737	16	B737	12
	HS748	12	HS748	22	HS748	32
	DHC6	56	DHC6	44	DHC6	36
	Total	92	Total	104	Total	112

As there were no records available for the aircraft noise around TIA, simulations were made by using aircraft noise data recorded in Japan and a simulation program developed in Japan.





**Figure 16.2.1 Aircraft Noise Contours in WECPNL Case 1 (Present) S = 1: 50,000**



**SCHOOLS AND COLLEGE IN KOTESHOR AREA:**

A	DIAMOND GLORY INSTITUTE (RATNA SHIKSHA SADAN)	-	3 classes
B	NAWAJYOTI ENGLISH HIGH SCHOOL	-	10 classes
C	HIMALAYA BOARDING SCHOOL	-	6 classes
D	SARASWATI HIGH SCHOOL	-	10 classes
E	PALPAKOT PRIMARY SCHOOL	-	-
F	TULSI MEHAR PRIMARY SCHOOL	-	3 classes
	• KOTESHOR MULTIPLE CAMPUS	-	-
	• SCHOOL AND COLLEGE IN THE SAME BUILDING	-	-

**Figure 16.2.2 Aircraft Noise Contours in WECPNL Case 2 (Year 2003) S = 1: 50,000**

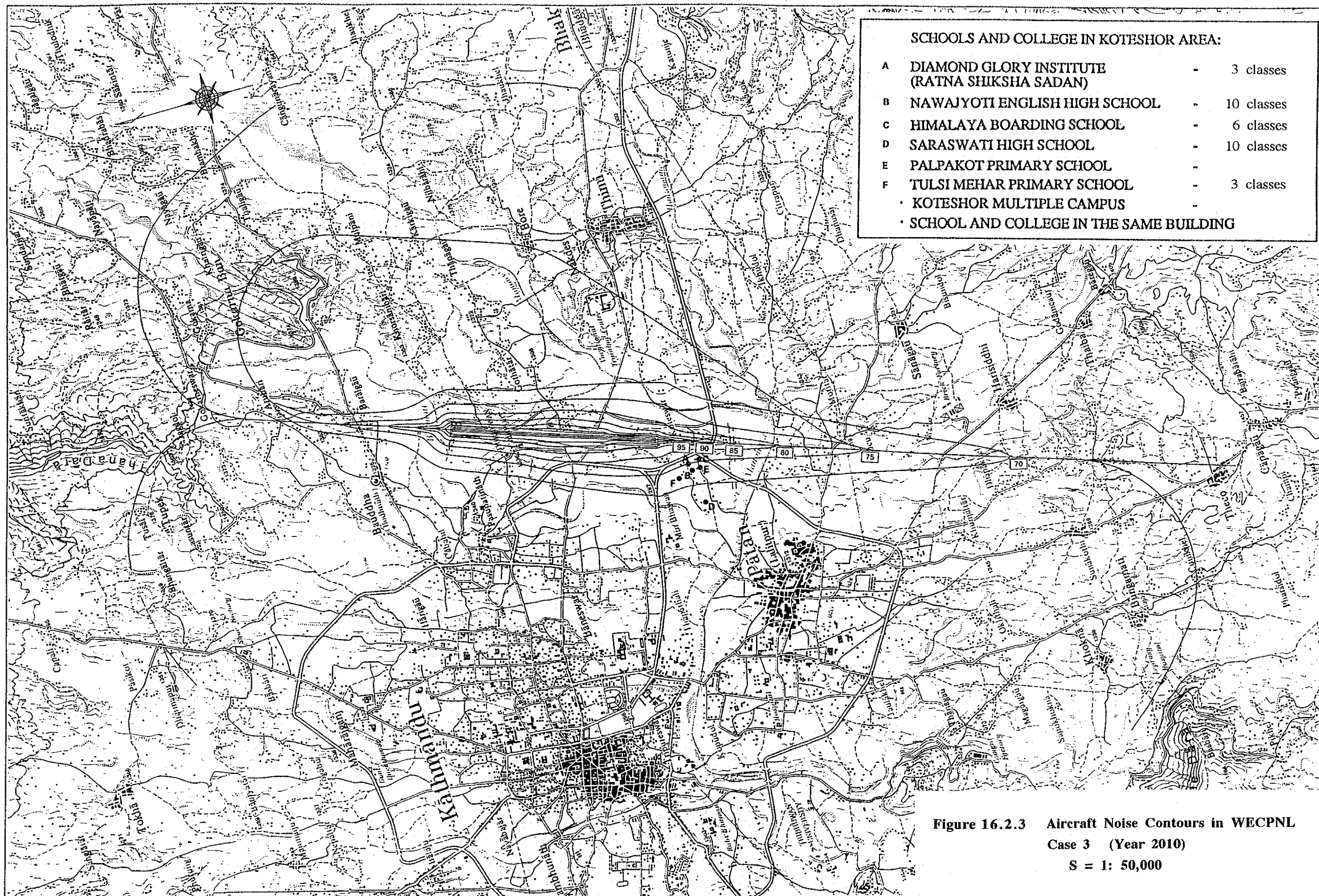


Figure 16.2.3 Aircraft Noise Contours in WECPNL Case 3 (Year 2010)  
S = 1: 50,000





The noise is expressed as Weighted Equivalent Continuous Perceived Noise Level (WECPNL) of the ICAO index of noise exposure level, which takes into account peak noise level and duration of noise exposure.

The formula is shown as follows;

$$\text{WECPNL} = \overline{\text{dB(A)}} + 10 \log N - 27$$

$\overline{\text{dB(A)}}$  : average of each noise power at the peak level

N : weighted numbers of daily flights

$$N = N_1 + 3 N_3 + 10 (N_1 + N_2)$$

N<sub>1</sub> : flights between 07:00 and 19:00  
 N<sub>2</sub> : between 19:00 and 22:00  
 N<sub>3</sub> : between 22:00 and 07:00

The results of the simulation are summarized as follows;

- the extent of aircraft noise in the future is estimated not to increase from the present one.
- there are and will be areas which will suffer from serious noise levels outside the airport.
- the total area affected by aircraft noise with WECPNL more than 70 and 75 at present, and in the year 2003 and 2010 are as follows:

Year	WECPNL	Area (ha)	
		More than 70	More than 75
present		830	390
2003		1,000	480
2010		970	470

In order for TIA to exist together with the surrounding communities in harmony, with aircraft noise in particular it is recommended to consider aircraft noise abatement measures.

(2) Aircraft Noise Abatement Measures

There are some aircraft noise abatement measures which are generally applied at airports in the world. These are as follows:

- Noise Source Control
  - aircraft & engine improvement
  - restriction of flights
  - improved operation methods
- Airport Structural Improvements
- Land Use Control
- Indemnities and Sound Proof Works

Referring to the current topographic condition around TIA, the following measures selected from the above table are considered to be applicable to TIA.

- introduction of quieter aircraft and engines with low noise levels
- restriction of flights (curfew)
- land use control
- indemnities and sound proof works

The measure of aircraft noise abatement should be studied carefully based on understanding of the local conditions and noise measurement results. The applicable legislation is also expected to be studied.

### (3) Land Use Control

Table 16.2.2 is a typical example of compatible land uses around airports presented by ICAO. ICAO recommends that three zones should be established for the purpose of land-use planning with regard to aircraft noise in the vicinity of airports, as a minimum.

Zone A : where developments and land uses need not be restricted by noise exposure considerations.

Zone B : where moderate noise exposure levels may be encountered and there may be some need to restrict land use and developments.

Zone C : where high noise exposure levels may be encountered and as a consequence, most land uses may need to be restricted, and most developments not permitted.

Each state has established their own noise exposure indexes and zoning categories based on their history of noise measures and/or the nation's local conditions.

Table 16.2.3 is the concept of the United States of America developed in connection with the use of the NEF unit.

Table 16.2.4 depicts a summary of the Japanese legislation of land use control concerning aircraft noise in terms of WECPNL. The environmental standard was established by the government to protect people from aircraft noise. For existing airports, it is not easy to relocate residents from areas surrounding airports, so that the government has been indemnified and/or subsidized relocation and/or provided sound proof works for the existing housing which is capable of maintaining in environmental standards inside the house.