15.2.4 Pavement Plan

(1) Type of Pavement

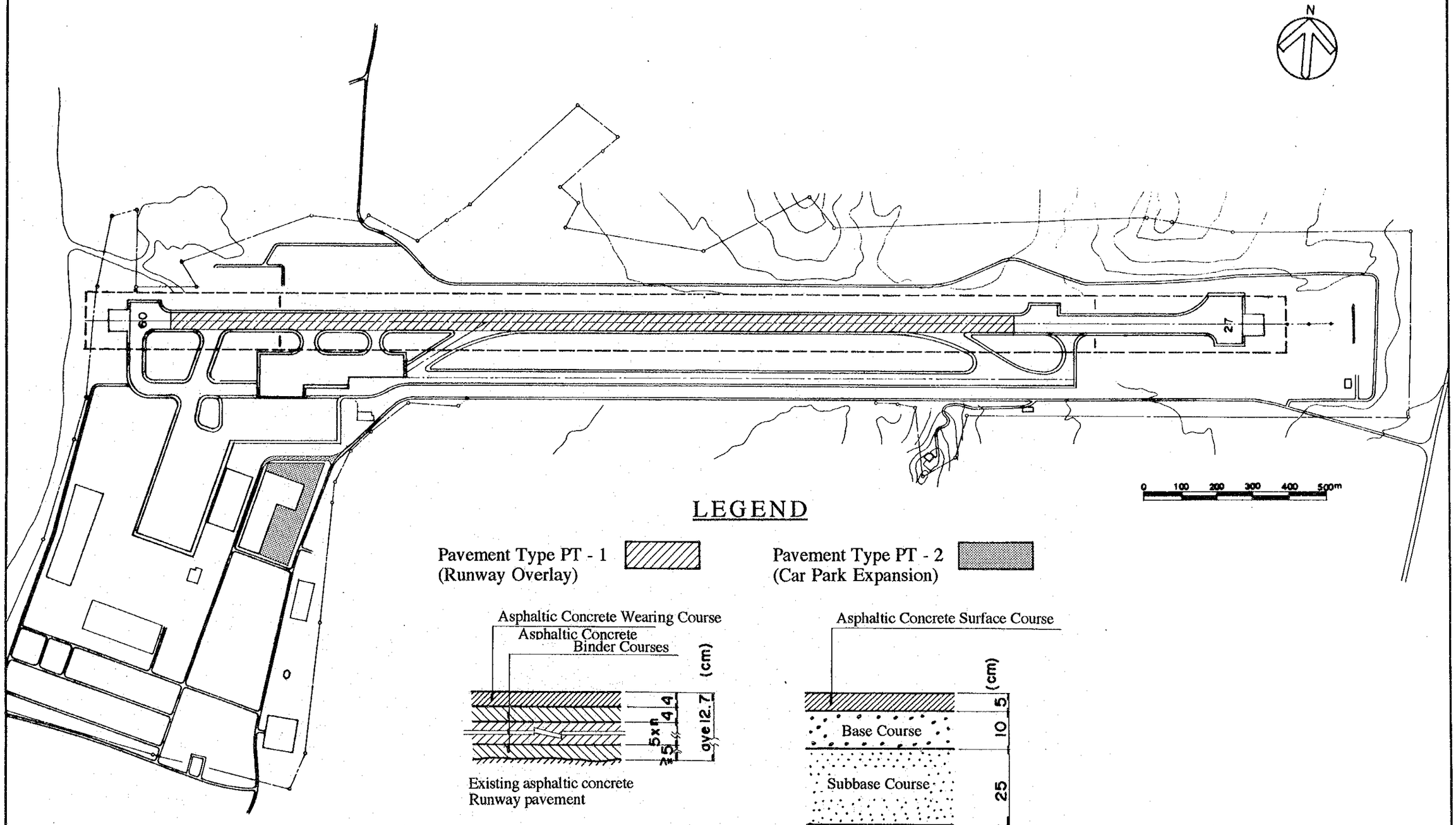
Pavement structure has been designed basically in accordance with Aerodrome Design Manual, Part 3, Pavement, ICAO.

As the result of the evaluation of the existing pavement, pavement overlay is required in the existing flexible pavement of the runway for operation of B747 class aircraft since the strength of existing pavement structure is not sufficient.

Overlay on the rigid pavement in the small sections near the both ends of the runway is not necessary since existing pavement structure has sufficient strength for the design aircraft. Existing rigid pavements of the taxiways and apron are also adequate for design aircraft, therefore, overlay in this area is not necessary.

In the curb side, new construction of flexible pavement is planned in the carpark and terminal road.

Design calculation is shown in Appendix 15.2.4. The pavement plan for the short-term development is shown in **Figure 15.2.4**.



LEGEND

Pavement Type PT - 1
(Runway Overlay)

Pavement Type PT - 2
(Car Park Expansion)

Existing asphaltic concrete
Runway pavement

Design subgrade CBR = 8 %

Figure 15.2.4 Pavement Plan

(Flexible Pavement)

Bituminous Surface :	17 cm
Base Course :	25 cm
Subbase Course :	30 cm
Total :	72 cm

(Rigid Pavement)

Concert Slab :	40 cm
Base Course :	15 cm

Pavement Area : Critical Area

The required overlay thickness is computed to be 7 cm. (see **Figure 15.2.5.**) In compliance with Aerodrome Design Manual, however, it is described that bituminous overlays for increasing strength should have a minimum thickness of 3 inches (7.5 cm). Therefore, minimum overlay thickness of the runway is to be 7.5 cm.

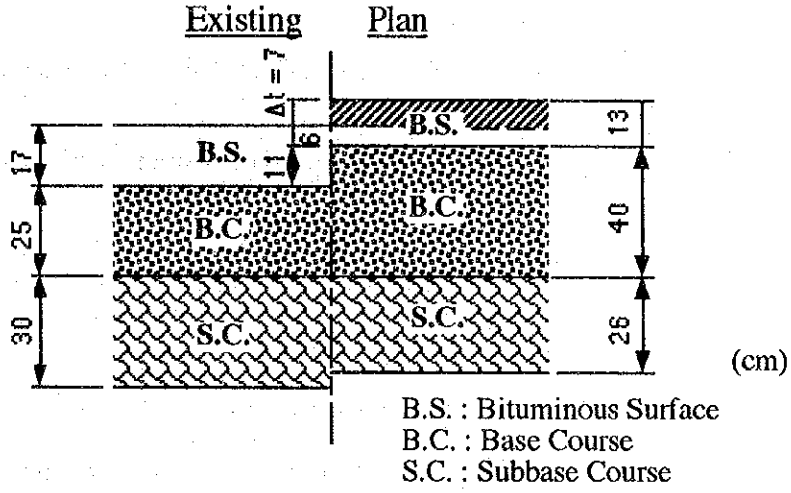


Figure 15.2.5 Thickness of Runway Overlay

(3) Pavement for Car Park and Terminal Road

Pavement structure of the car park and terminal road is designed as follows. Design CBR is 8 % based on the results of soil investigation.

Surface Course :	5 cm
Base Course :	10 cm
Subbase Course :	25 cm

15.3 ARCHITECTURAL WORKS

15.3.1 Passenger Terminal Building

(1) Objectives

The international facilities and a part of the domestic facilities of the existing passenger terminal building will be expanded to meet the demand of the year 2000.

The objectives of the preliminary design of the passenger terminal building are summarized as follows:

a) To expand the existing international passenger facilities for the passenger demand for the year 2000.

b) To achieve a well-balanced distribution of space of each facility, and to provide adequate numbers and volumes of passenger processing facilities.

c) To improve the flow of passengers, baggage and other services as much as possible.

d) To improve the services for the disabled or the handicapped persons.

e) To increase the concession area in order to provide sufficient public service spaces such as restaurants and shops.

(2) Design Principles

The design principles are summarized as follows:

a) To keep the 2-level concept of the existing terminal building as it is.

b) To keep the bus transportation system between remote aircraft parking spots and terminal building as it is.

c) To keep the common use handling facilities, such as check-in counter and gates for domestic and international passengers of the existing terminal as it is.

d) To keep the existing building operable with minimum restrictions during the renovation work.

e) To utilize the existing building structural frames or facilities as much as possible.

In addition to the above-mentioned principles, the following points shall be taken into consideration in the design stage which were pointed out as the problems of the existing facilities in our evaluation study.

- Improvement of security screening procedures.

- Upgrading of ancillary facilities for the passenger terminal building such as flight information system, sign board, etc.

- Provision of adequate information to guide the passengers to:

  (1) Check-in counter which will be separated into two groups after this renovation.

  (2) Baggage Claim which will be separated into two groups after this renovation.

- Improvement of convenience for transfer/transit passengers' transportation from the arrival lobby to the departure lobby.

- Provision of facilities for handicapped persons.

- Increase of the concession area up to an adequate level at the airports in the resort areas.

(3) Required Facilities

The required floor areas for the main terminal components and the number or length of facilities are calculated based on the peak hour passenger traffic taking into account the actual usage in the existing passenger terminal building. These are explained in detail in **Appendix 15.3.1(A)**.

The required units of major facilities to be added to the existing ones are summarized as listed below:

Table 15.3.1 Required Units of Facility

Facility	Number of Additional Units
International	
Check-in Counter	10
Security Check for Departure	2
Passport Control for Departure	5
Customs Inspection for Departure	3
Passport Control for Arrival	3
Baggage Claim Devices	1
Customs Inspection for Arrival	6
Domestic	
Check-in Counter	2
Security Check for Departure	2
Baggage Claim Devices	2

(4) The Procedure of Layout Planning of the Terminal Building

Figure 15.3.1 shows the flow chart for layout planning of the terminal building.

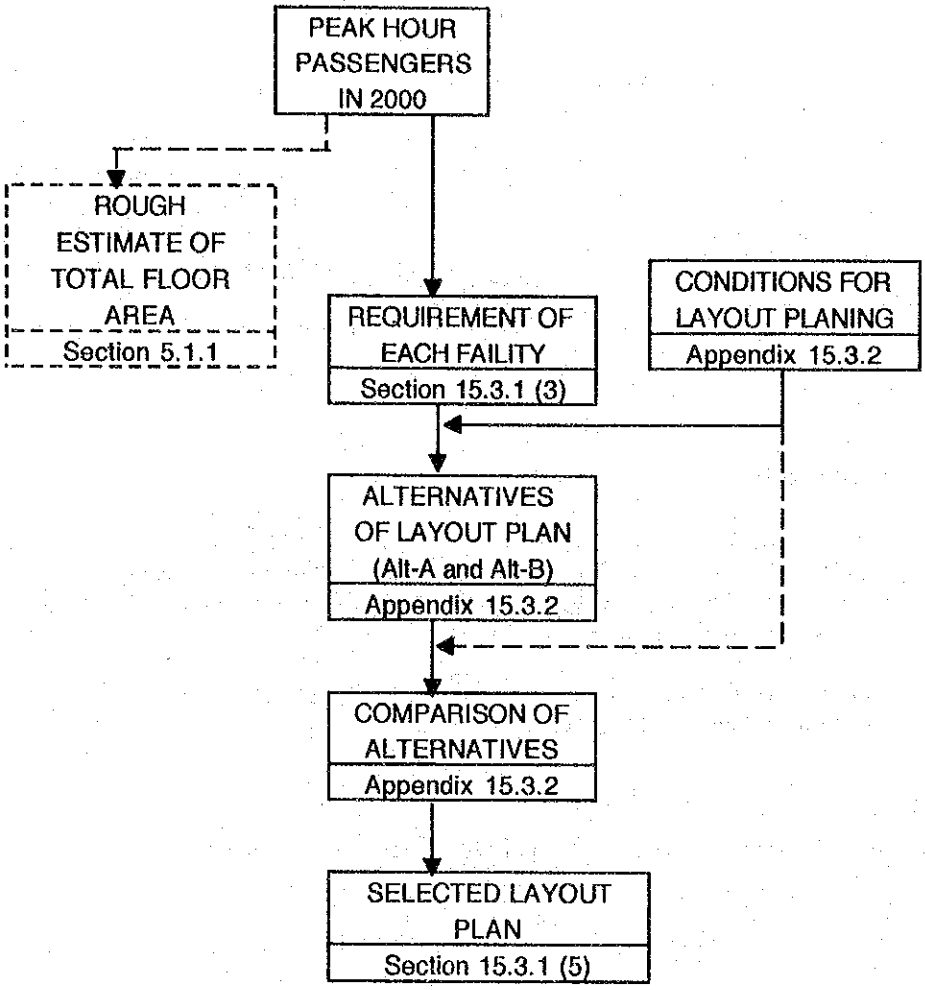


Figure 15.3.1 Flowchart of Terminal Building Layout Planning

(5) Expansion Plan

In case of the expansion of the existing building, there will inevitably be some conversion works of the interior of the existing building. In this Study, two alternatives were established for the layout plan in the terminal building:

Alternative-A is the expansion with minimum conversion works in the existing building so as to minimize the works in the building which will be in operation.

Alternative-B is the expansion allowing some conversion works in the building with temporary closure of some portions.

It is noted that there are some difficulties for expansion in the layout of the existing terminal building. For example, it is very difficult to move some

facilities such as the air handling unit and the transformer which hinders expansion of the facilities. Furthermore, location of some facilities such as escalators and stairs are not favorable for the expansion. Above two alternatives are established considering these situations.

Comparison study for layout planning is carried out as explained in Appendix 15.3.2. As a result of the study, Alternative-A was selected for the preliminary design

The selected layout plans of each floor are shown in **Figures 15.3.2** to **15.3.3.** Elevations are shown in **Figure 15.3.5**.

The features of the determined plan are summarized as stated below.

a) International Area

i) To construct a new two-story and five-span portion of the building connecting to the north side of the existing international block accommodating the following facilities.

- On the Ground Floor

  Arrival lobby
  Baggage claim area
  Customs check area
  Baggage handling area

- On the 2nd Floor

  Check-in lobby
  Security and immigration check area
  Departure lobby and airside corridor
  Offices and concessions

ii) To extend the double deck road of the curb side to the north in accordance with building extension, which makes curb side length almost double the existing length on both departure and arrival levels.

iii) To provide an additional boarding bridge to the airside corridor.

iv) To improve the flow of passengers and baggage in accordance with the increase of each facility by replacing some existing walls or rooms.

v) To increase the concession area for passengers by changing surplus open spaces into shops or restaurants.

vi) To provide additional stairs and escalators from arrival lobby to check-in lobby in the center of the existing terminal building to provide more convenient service for transfer passengers. It will help to brighten the arrival lobby by the introduction of sunshine through the openings for stairs and escalators.

vii) To increase the area of rental office spaces in accordance with relocation of AAT office to a separate building.

b) Domestic Area

i) To extend some areas to the south side which is 10 meters by 30 meters in size with two stories.

- On the Ground floor

  Baggage claim area with 1 additional baggage carrousel.

- On the 2nd floor

  VIP room, airline offices and concessions.

ii) To improve the flow of passengers, baggage and other services in the existing area in accordance with the increasing of main facilities.

iii) To increase the concession area both in departure and arrival areas.

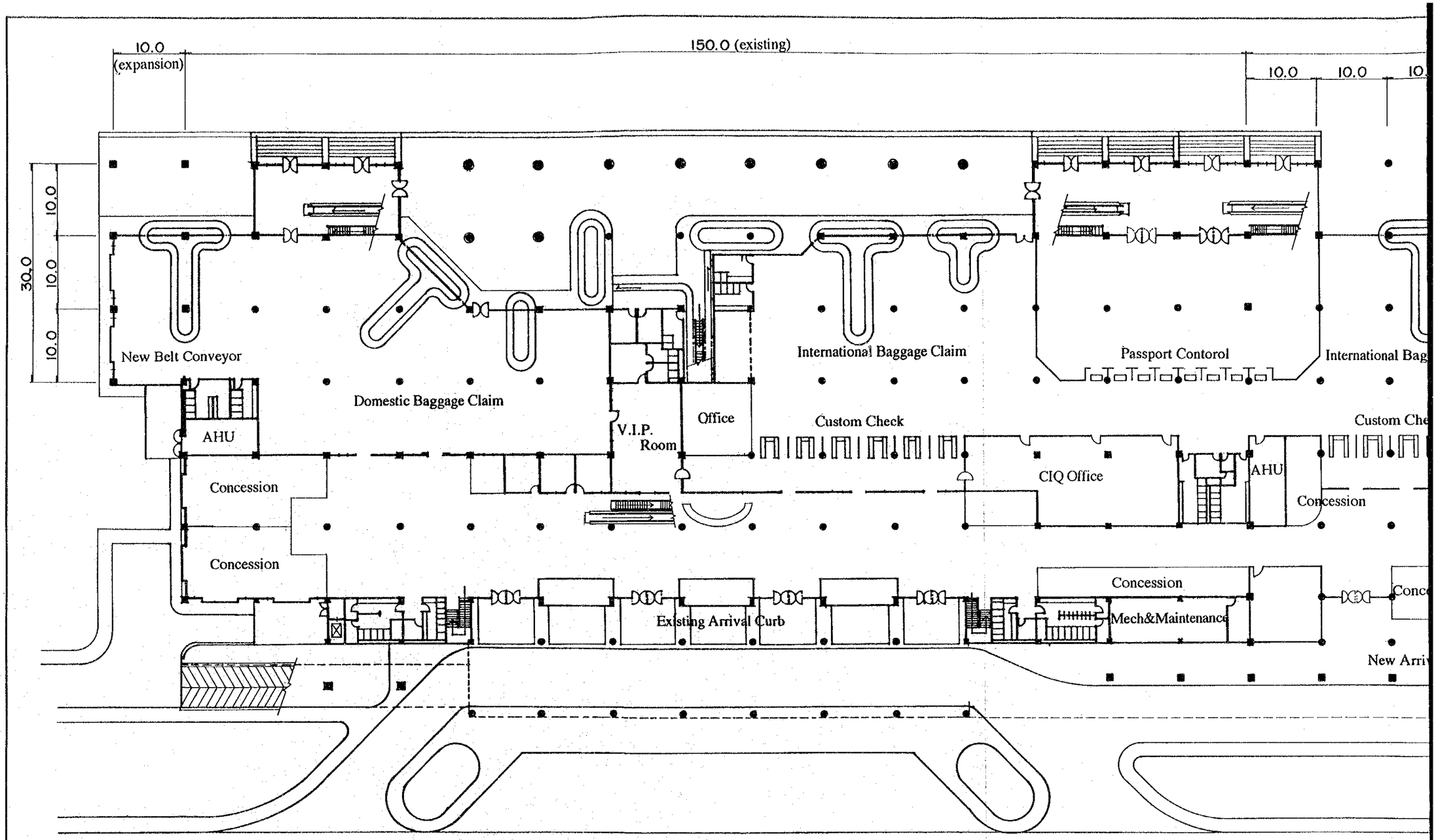
15.3.2 Floor Area of Passenger Terminal Building

The floor areas of passenger terminal building after renovation, obtained from the re-calculation are as listed below :

Table 15.3.2 Floor Area of Passenger Terminal Building

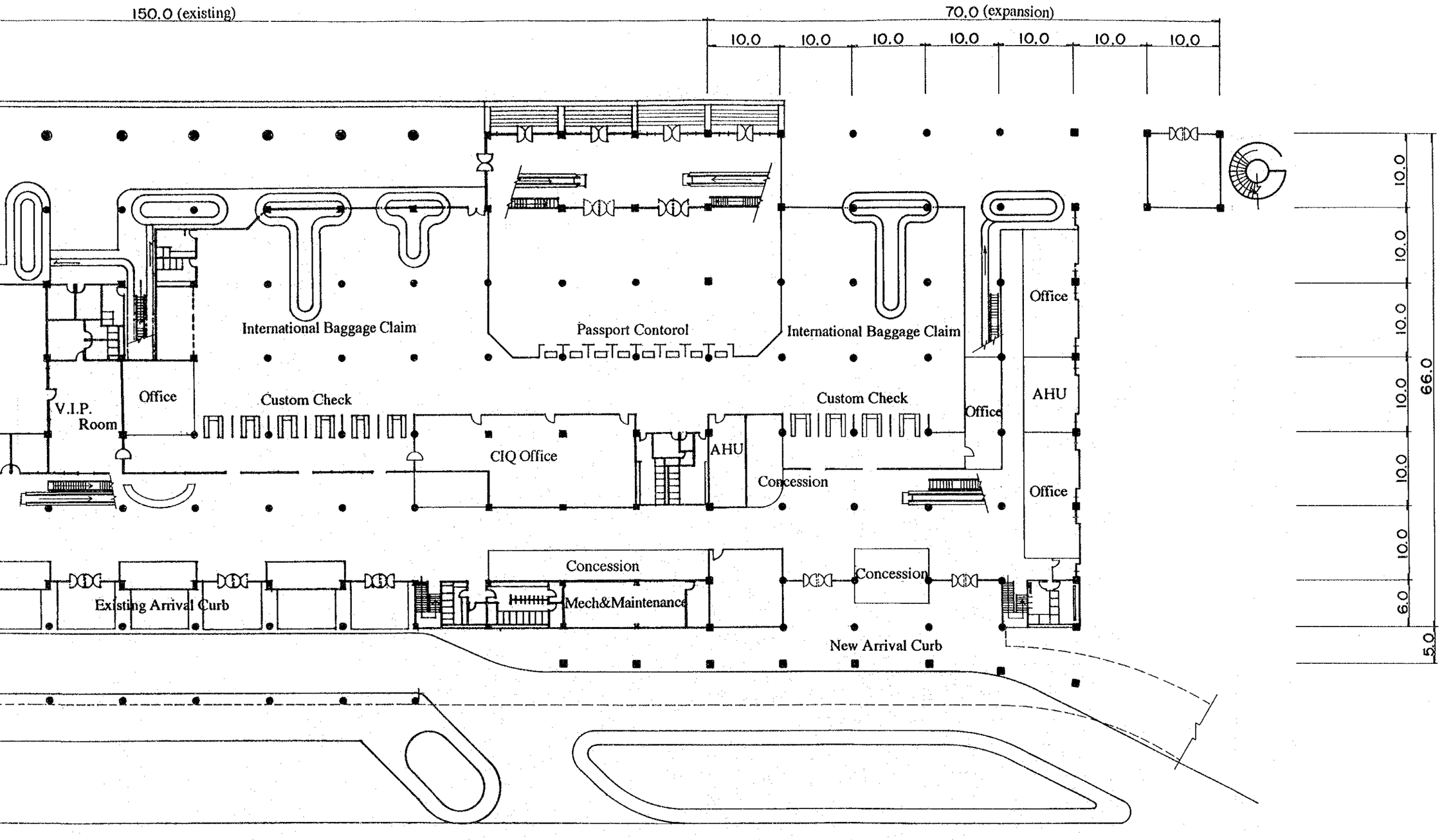
Unit : sq. m

	Existing Floor Area	Additional Floor Area	Floor Area after Renovation
1 st Floor	9,495	3,370	12,865
2 nd Floor	9,240	3,610	12,850
3 rd Floor	5,072	0	5,072
Roof Floor	48	0	48
Total	23,855	6,980	30,835



PASSENGER TERMINAL BUILDING

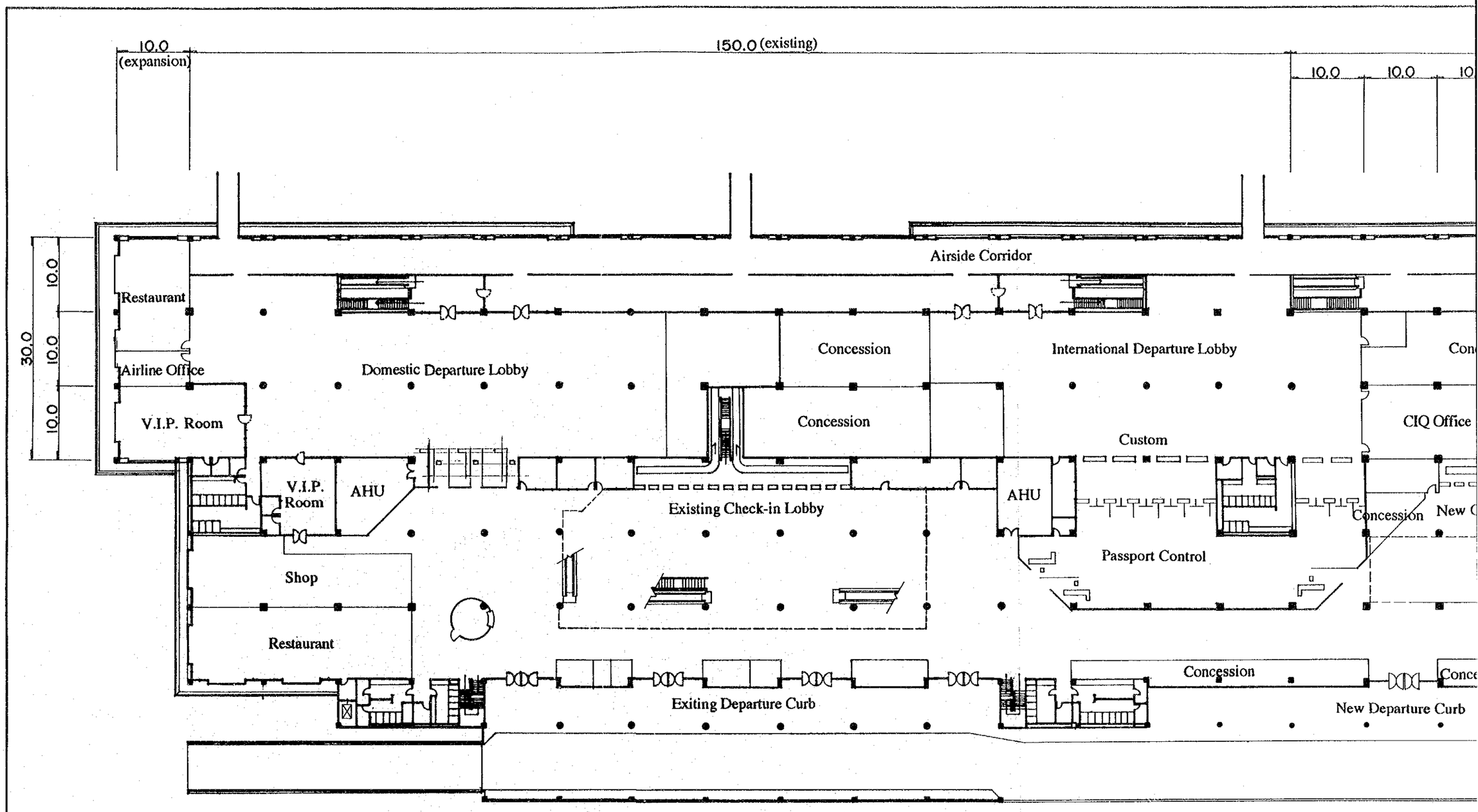
GROUND FLOOR PLAN 1 : 500



PASSENGER TERMINAL BUILDING

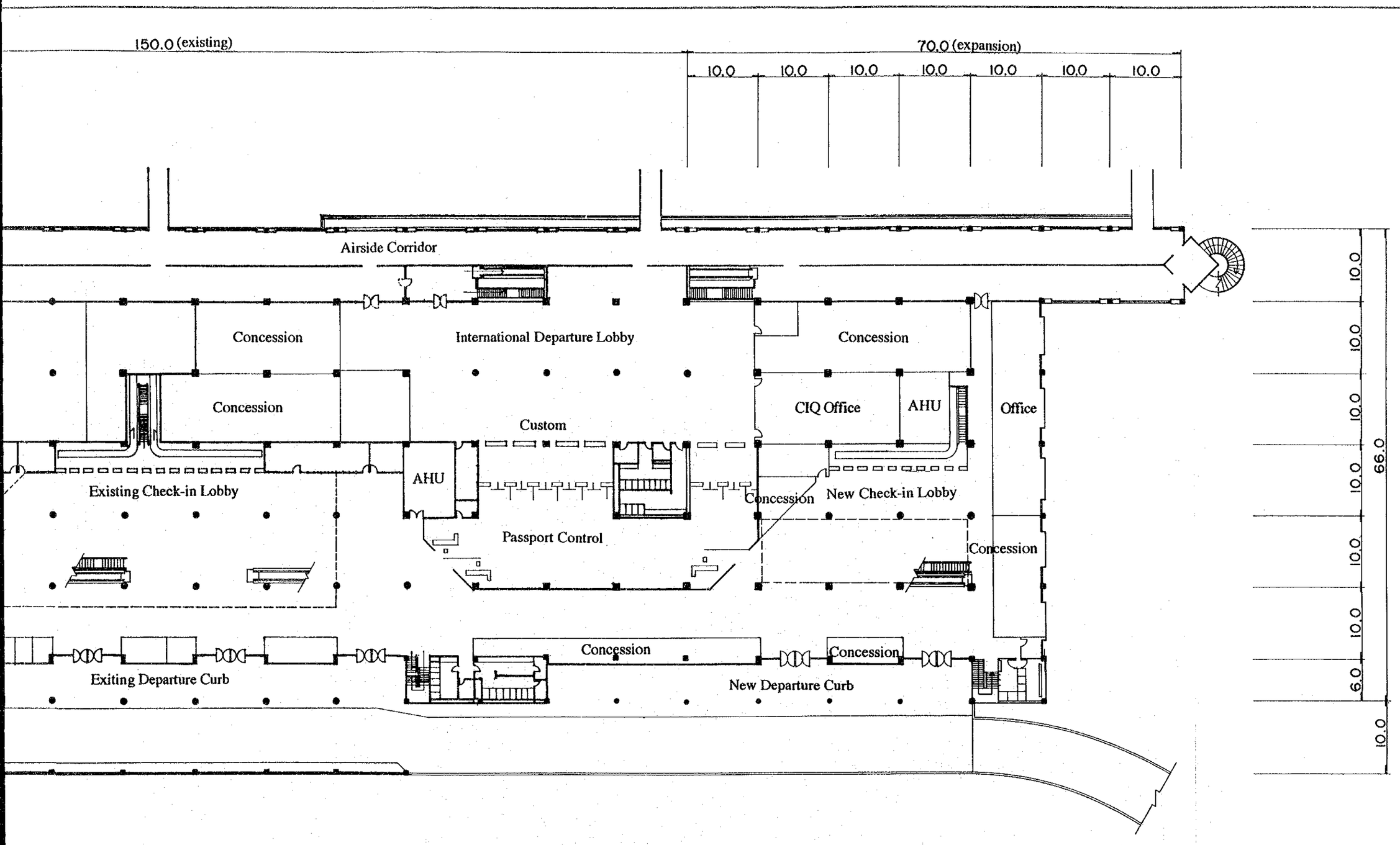
GROUND FLOOR PLAN 1 : 500

Figure 15.3.2 Passenger Terminal Building Ground Floor Plan



PASSENGER TERMINAL BUILDING

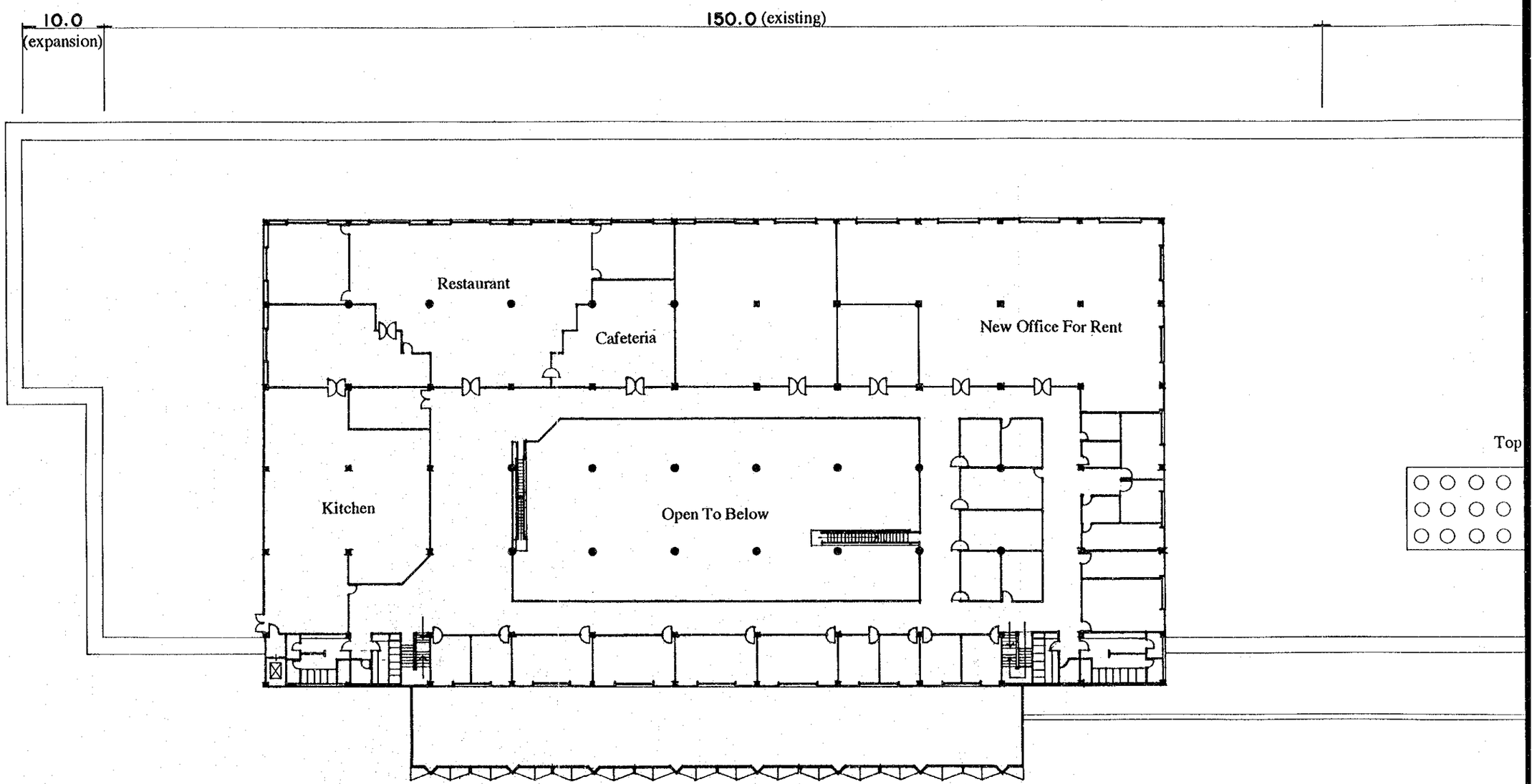
SECOND FLOOR PLAN 1 : 500



PASSENGER TERMINAL BUILDING

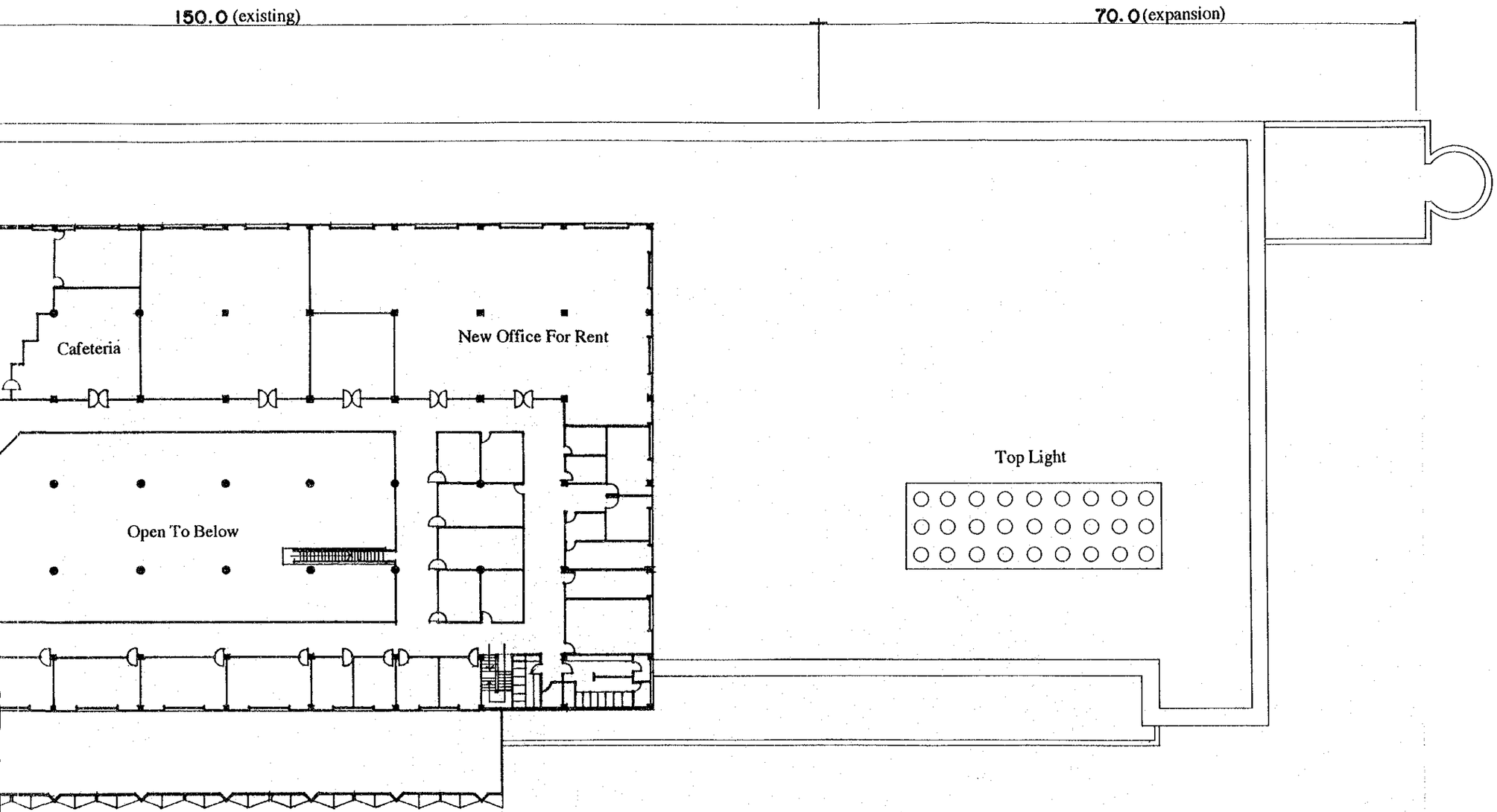
SECOND FLOOR PLAN 1 : 500

Figure 15.3.3 Passenger Terminal Building Second Floor Plan



PASSENGER TERMINAL BUILDING

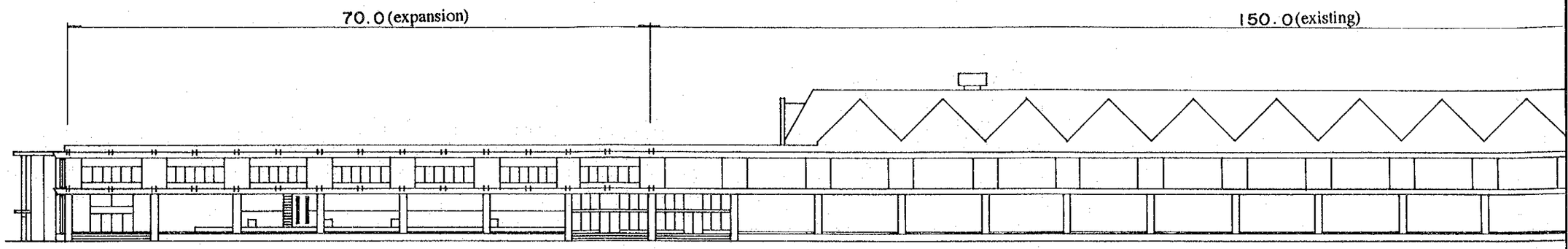
THIRD FLOOR PLAN 1 : 500

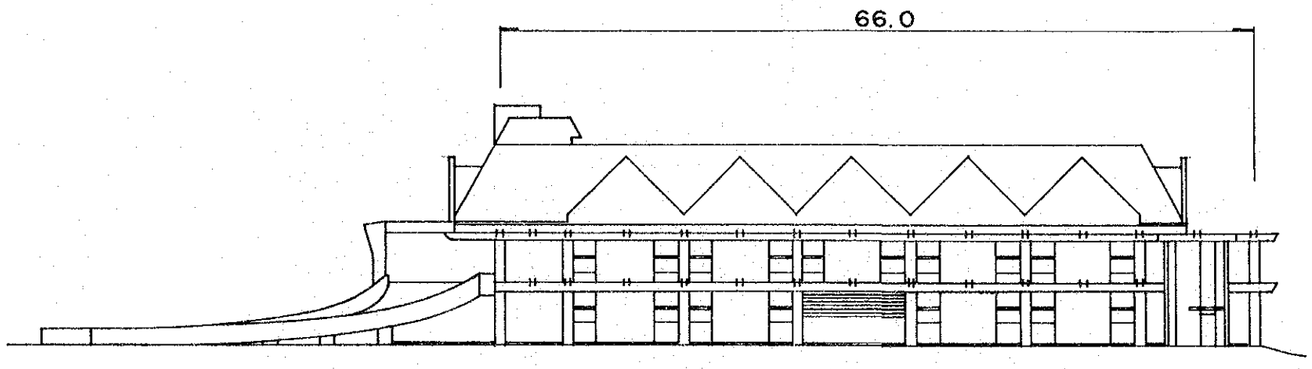


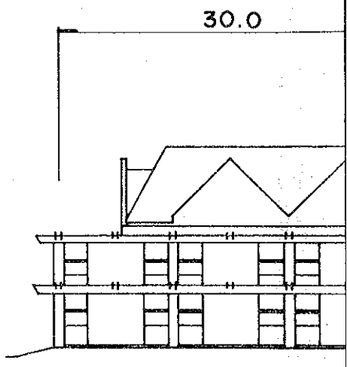
PASSENGER TERMINAL BUILDING

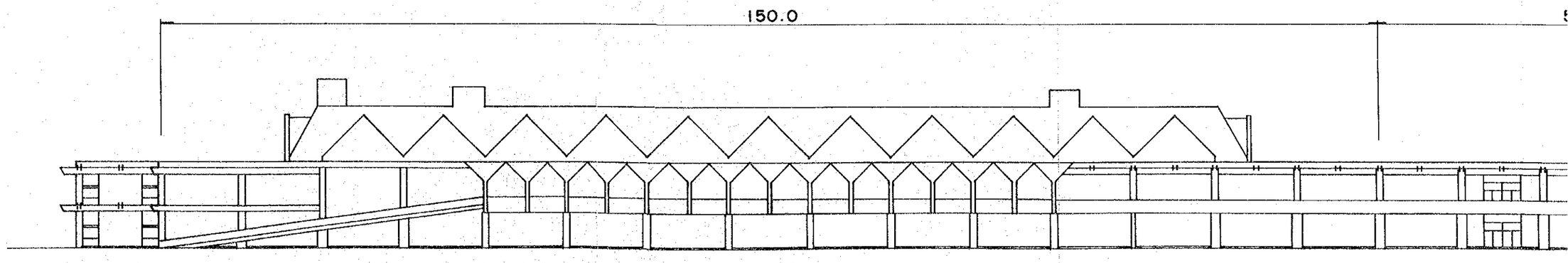
THIRD FLOOR PLAN 1 : 500

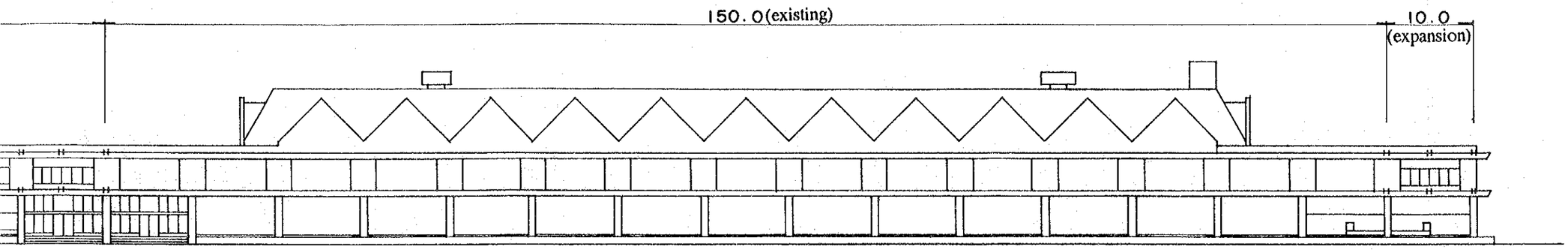
Figure 15.3.4 Passenger Terminal Building Third Floor Plan

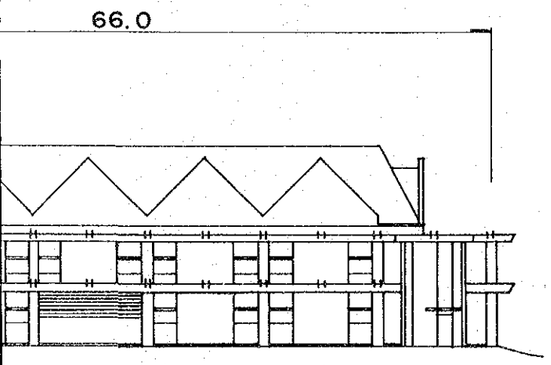

70.0(expansion)
150.0(existing)

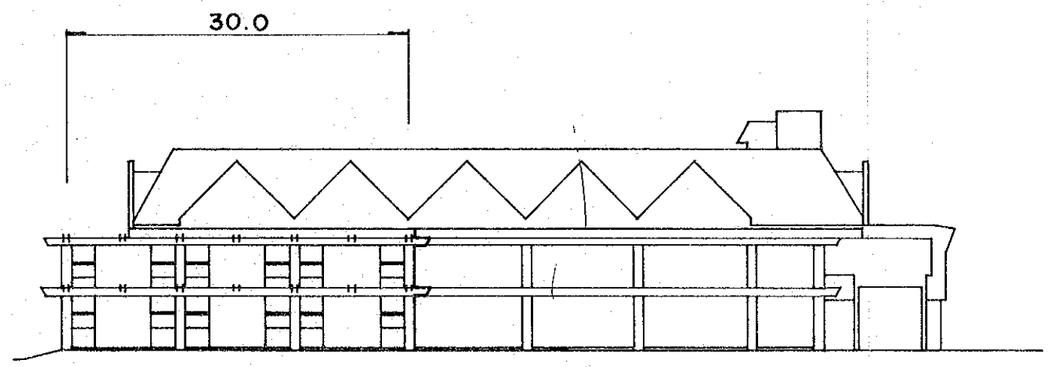

66.0


30.0


150.0







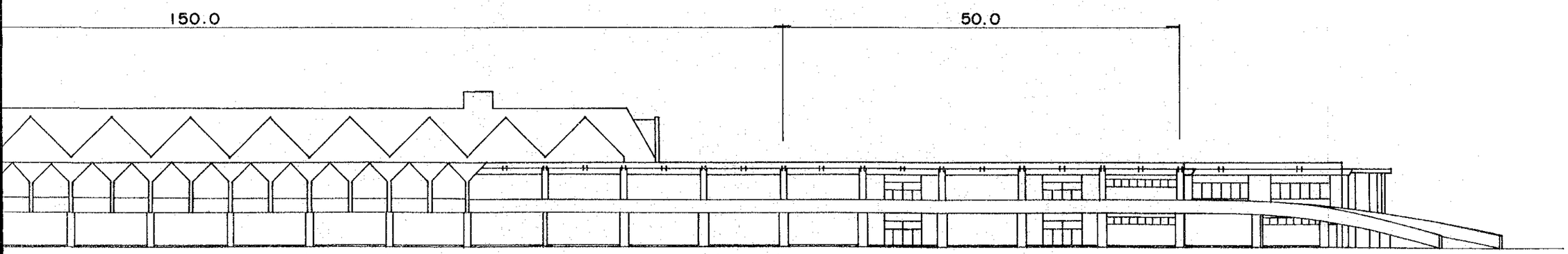


Figure 15.3.5 Passenger Terminal Building Elevations

15.4 AIRPORT UTILITIES

15.4.1 Power Supply System

The existing power supply system will be developed so as to prepare for the increase of load in the short-term development.

The breakdown of the total load capacity in the year 2000 is planned as follows:

Passenger Terminal Building :	3,500 KVA
Cargo Terminal Building :	100 KVA
Control Tower and Other Buildings :	500 KVA
Total :	4,100 KVA

The capacity of the existing emergency generator is 262.5 KVA, and another emergency generator with a capacity of 250 KVA will be installed so as to make up the shortage of the capacity at the moment and to cope with the increase of the demand by expansion of the terminal building.

15.4.2 Water Supply System

Potable water is being supplied from the seven deep wells located in the airport. There is no plan of extension of the city water branch line to the Airport in the near future. Additional two wells, therefore, will be constructed in order to cope with the increase of demand in the short-term development plan period. Maximum daily and hourly demand will be estimated to be 350 tons per day and 55 tons per hour respectively in the year 2000.

15.4.3 Sewerage Treatment Plant

Further expansion of the existing oxidation pond is not required since capacity of existing facilities will be sufficient for the demand in the short-term development plan period.

15.4.4 Solid Waste Disposal System

An incinerator will be installed near the oxidation ponds and the solid waste collected from the buildings will be treated in the incinerator. The incinerator will be able to dispose both rubbish and garbage waste, and a capacity of which will be 2,800 kg per day.

15.4.5 Telephone Exchange

Additional electric telephone exchange with the capacity of 200 channels will be installed in accordance with the expansion of the passenger terminal building. Also the development to ISDN (Integrated Service Digital Network) and other latest communication services will be considered for the performance of the telephone exchange and system in order to consider the future expansion.

CHAPTER 16

AIRPORT MANAGEMENT STUDY

CHAPTER 16 AIRPORT MANAGEMENT STUDY

16.1 GENERAL

This chapter describes the organization and number of airport staff required for the short-term development of Phuket International Airport. Evaluation of the existing airport management is also described in this chapter.

16.2 ORGANIZATION AND NUMBER OF STAFF

Phuket International Airport is administrated by Airports Authority of Thailand (AAT).

AAT has the responsibility for management and operation of the airport as follows:

- operation and maintenance of the civil facilities, terminal buildings and airfield lighting system,
- airport security
- rescue and fire fighting services

The present organization of AAT is shown in **Figure 3.6.1.** The organization of Phuket International Airport and number of staff of each section are shown in **Figure 16.2.1.**

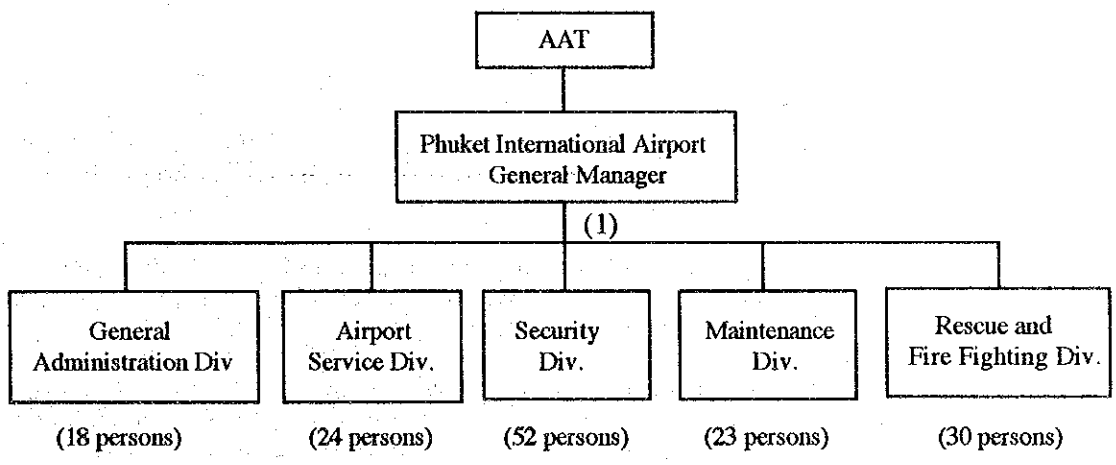


Figure 16.2.1 Organization of AAT Phuket

At present, Phuket International Airport is operated by a staff of 149 persons of AAT.

Air traffic control and following related facilities are operated and maintained by Aeronautical Radio of Thailand Ltd. (AEROTHAI).

- Radio navigation aids
- Air traffic control system
- Aeronautical telecommunication system

Other organizations for airport operation and management are as follows:

- Meteorological Department, Ministry of Transport and Communication
  (Meteorological Service)

- The Customs Department, Ministry of Finance
  (Customs)

- The Royal Thai Police Department, Ministry of Interior
  (Immigration)

- Department of Agriculture, Ministry of Agriculture and Cooperatives
  (Plant Quarantine)

- Department of Communicable Diseases Control, Ministry of Public Health
  (International Health Control)

The number of staff of these organizations is as follows:

- Aerothai	:	101	persons
- Immigration	:	28	persons
- Customs	:	29	persons
- Phuket Airport Plant Quarantine Station	:	2	persons
- International Health Control	:	1	person

16.3 EVALUATION OF PRESENT AIRPORT MANAGEMENT

Generally, Phuket International Airport has been well operated and maintained. There seems no serious problems to be resolved immediately in the present airport management.

However, it should be noted that the number of airport staff in some divisions will be increased in accordance with the increase of air traffic volume and expansion of facilities since their work volumes will increase.

For example, the staff of Security Division will be increased since the number of security check facilities will be increased. The staff of Airport Service Division for information service will be increased as the number of the passengers will increase. It is also necessary to increase the staff of Maintenance Division who will take the responsiblity for the maintenance of the expanded terminal building and car park.

Therefore, it is necessary to increase the total number of airport staff from the present 149 persons to 180 persons in the year 2000 as shown in **Table 16.3.1**. However, the annual growth rate of the number of staff has to be kept not more than 2% in

accordance with privatization policy in the AAT Corporate Plan (1994-1996). According to that policy, total number of AAT staff will be 171 in the year 2000, and remaining 9 person will be hired from subcontractors.

Table 16.3.1 Number of Staff at Present and in Year 2000

Section	Present	Year 2000
1. Airport Manager/Deputy Airport Manager	2	2
2. General Administration Division	18	18
3. Airport Service Division	24	36
4. Security Division	52	68
5. Maintenance Division	23	26
6. Rescue and Fire Fighting Division	30	30
Total	149	180 (AAT staff: 171)

CHAPTER 17

ENVIRONMENT IMPACT ASSESSMENT

CHAPTER 17 ENVIRONMENTAL IMPACT ASSESSMENT

17.1 GENERAL

It is of great importance to give sufficient consideration to the environment in the implementation of development programs.It is defined that environmental consideration is to study whether a development project will have significant impacts on the environment or not, to assess the impacts and to incorporate measures to present or alleviate its effects, if necessary.

The premise of this definition is the understanding that development should not end with a onetime involvement but should be continuous and sustainable. Thus, it is believed that environmental consideration is a prerequisite for securing the sustainability of the development.

Therefore, when undertaking the environmental consideration, it is necessary to take into account of Thailand's policies and structures and to understand Thailand's awareness of environmental problems, while holding sufficient discussions with the people concerned in a flexible manner.

With regard to environmental consideration, basic principales are to promote sustainable development aimed at improving the living standard of the residents, and harmonize the development with a desirable environment based on Thailand's willingness.

If environmental consideration is not sufficiently undertaken for implementing a development project and, if careful attention is not paid to the management of the surrounding natural resources, the base of the development might be jeopardized and the development might be halted.The base of the people's livelihood or even their subsistence can be also threatened.It is necessary, therefore, to try to ensure the sustainable development by harmonizing the development project with natural resources and the base of livelihood and subsistence of the residents in the area.

Typical impacts in airport developments which need particular consideration are on the problems of resettlement and aircraft noise.On the resettlement, loss of livelihood of inhabitants, difficulty in social and cultural adaptation to the site relocation may take place.On the other hand, careful consideration is needed in areas which are highly populated or have unique religious facilities.

17.2 ENVIRONMENTAL EVALUATION

17.2.1 Selection of Environmental Items

(1) Activities which may cause Impacts

The activities which may cause impacts on this short term development are divided into the followings.

- Construction Stage
  -Operation of construction equipment and vehicles

- Operation Stage
  -Operation of vehicles
  -Operation of aircraft
  -Operation of facilities

The relationships of these activities and environmental items are shown in **Table 17.2.1.**

a. Operation of Construction Equipment and Vehicles

It is anticipated that air pollution, and noise and vibration may be generated by the operation of construction equipment and vehicles at the construction stage.

b. Operation of Vehicles

It could be anticipated that noise and vibration as the sources of pollution may be generated by the operation of vehicles at the operation stage.

c. Operation of Aircraft

Air pollution and noise and vibration as a source of pollution may be generated by the operation of aircraft at the operation stage.

d. Operation of Facilities

Waste as the social environment, and water pollution as the source of pollution may be generated by the operation of facilities at the operation stage.

(2) Selection of Environmental Items

The following environmental items are selected by taking into consideration of the environmental items and activities which may cause impacts.

-Social Environment
  -Economic Activity
  -Traffic/PublicFacility
  -Land Use
  -Waste
  -Hazards

-Natural Environment
  -Hydrological Situation
  -Flora / Fauna

-Pollution
  -Air Pollution
  -Water Pollution
  -Noise / Vibration

Table 17-2-1 The Relationship of Activities and Environmental Items

		Activities which may cause impacts / Environmental Items	Overall Evaluation	Construction Stage		Operation Stage			
				Reclamation and Spatial Occupancy	Operation of Construction Equipment and Vehicles	Spatial Occupancy	Operation of Vehicles	Operation of Aircrafts	Operation of Facilities
Social Environment	1	Resettlement							
	2	Economic Activity	△						△
	3	Traffic / Public Facility	△				△	△	
	4	Split of Communities							
	5	Cultural Property							
	6	Land Use	△					△	
	7	Public Health Condition							
	8	Waste	○						○
	9	Hazards (Risk)	○					○	
Natural Environment	10	Topography /Geology							
	11	Soil Erosion							
	12	Groundwater							
	13	Hydrological Situation	△						△
	14	Coastal Zone							
	15	Fauna/Flora	○		△		△	○	○
	16	Meteorology							
	17	Aesthetics							
Pollution	18	Air Pollution	○		○		△	○	
	19	Water Pollution	○						○
	20	Soil Contamination							
	21	Noise/Vibration	○		○		○	○	
	22	Land Subsidence							
	23	Offensive Odor							

Note:

○ : The environmental items which may give a remarkable impact depending upon the scale of project and site conditions.

△ : The environmental items which may give a little impact in case of the scale and site conditions of this project.

No mark: The environmental items which require no impact assessment since the anticipated impacts are not significant.

17.2.2 Evaluation of Short Term Development

(1) Social Environment

a. EconomicActivity

Impact to local economy by change of commercial activities and job opportunity will occur.Therefore the future plan of the area e.g.regional development plan will be required. But this impact will be good for local people as a positive impact. Therefore the problem of economic activity will not arise .

b. Traffic/Public Facility

Impact to traffic and public facilities by increase of traffic by use of the access roads will occur.Therefore the measures of installation of safety facilities will be required. And around the airport the future land use plan and transportation plan will be required. But this impact will be not so large. Therefore the problem of traffic and public facilities will not arise because there are a few facilities around the airport.

c. Land Use

The land use surrounding this area is mainly rubber plantations.There are a golf course and resort facilities at the south-east side of the existing airport , and National Park at the south-west side of this airport .The west side of this area may include the Klong Ta Maphrao mangrove reservation forest . Therefore detail reconnaissance will be required .

There will be problems for the non-establishment of land use policies and development plan around the airport. The land use plan around the airport will be established by the authority concerned so as to avoid the occurrence of environmental problems in the future, and to control the development around the airport vicinity.

d. Waste

The protective facilities and measures to cope with wastes which will be generated from construction works at the construction stage, and the utilization of airport facilities at the operation stage will be provided. Therefore there will be no problems concerning waste.

e. Hazards

The west side of the airport faces the Andaman Sea and the east side is located in the mangrove forest, so there are many sea birds around this area. But accidents by bird hazards have not occurred at the existing airport, therefore there will be no problems from bird hazards.

(2) Natural Environment

a. Hydrological Situation

There are no big rivers nor ponds, therefore there will be no problems from hydrological situations in this site.

b Flora and Fauna

Impact to animals by generation of noise and vibration at construction stage will occur. However the construction scale is very small , therefore there will be no problems on flora and fauna in this site.

(3) Pollution

a. Air Pollution

The traffic volumes to be added to the present traffic by the material transportation at the construction stage will not be so large,because construction works is very small.The frequency of aircraft operations will not be so large, and the volume is not expected to bring about air pollution in large amounts.In the operation stage, exhaust gases emitted from airport facilities and vehicles at the airport are not expected to be so much.From the above, it is not expected to cause problems on air pollution.

b. Water Pollution

Muddy waters will be generated from the earth works at the construction stage, especially during heavy rains in the rainy season, but temporary flood control ponds will be provid.In the operation stage, sewage discharge will be generated from airport facilities, for which sewage treatment system will be provided.From the above, it is not expected that there will be problems on water pollution.

c. Noise and Vibration

Material transportation and construction equipment will generate noise and vibration at the construction stage. And vehicles for access to the airport will generate noise and vibration at the operation stage. The volume of vehicles and construction equipment are not expected to be so many,and the scale of construction works will be very small, therefore there will be no problems for these cases.The aircraft noise problem will not be so large, because there are only a few villages.

CHAPTER 18

AIRCRAFT NOISE ANALYSIS (PRESENT AND YEAR 2000)

CHAPTER 18 AIRCRAFT NOISE ANALYSIS (PRESENT AND YEAR 2000)

18.1 GENERAL

This chapter examines the aircraft noise influence on the surrounding area of Phuket International Airport. The analysis is performed using the present traffic volume in the year 1993 and the forecasted traffic demand in the year 2000 for the short-term development.

General description about the aircraft noise analysis is given in chapter 12.

18.2 AIRCRAFT NOISE CONTOURS

The contour for the present condition is calculated as shown in **Figure 18.2.1**. **Figure 18.2.2** shows the contour for the year 2000.

Table 18.2.1 shows the assumption when the contours were calculated.

Table 18.2.1 Assumptions for the Calculation of Aircraft Noise Contour

Item	Assumption	
Target Year	Year 1993 (Present)	Year 2000 (Feasibility Study)
Traffic Pattern	Straight - in / Straight - out	
Ratio of Runway Use	RWY 09 : 20 % RWY 27 : 80 %	
Runway Length	3,000 m	
Glide Slope Angle	RWY 09 : 3.0 ° degree RWY 27 : 3.0 ° degree	
Number of Daily Frights	A - 300 / B - 767 28.86 B - 737 15.71 ATR - 42 8.57 Total 53.14	B - 747 6.29 B - 777 / A - 330 24.86 A - 300 / B - 767 12.86 B - 737 10.29 ATR - 42 4.86 Total 59.16

18.3 EVALUATION OF NOISE INFLUENCE

18.3.1 Areas Affected by Aircraft Noise

The total area with WECPNL more than 70 and 75 in year 1993 and 2000 are shown in **Table 18.3.1.** The numbers of house units within these areas that were counted on the topographic map are also given in this table.

Table 18.3.1 Noise Affected Areas and House Units around Phuket International Airport

WECPNL	Year	
	1993	2000
more than 70		
Area (ha) *	650	730
Number of House Units	270	430
more than 75		
Area (ha) *	420	450
Number of House Units	190	210

* Area excluding the surface of the water

18.3.2 Land Use Surrounding the Airport

In the year 2000 the contour of WECPNL 70 will be extended approximately 5.7 km long and 1.9 km wide. Contour of WECPNL 70 will cover a part of Ban Laem Sai Village, east of the Runway 27 threshold, but WECPNL 75 contour will not cover this area. Condominiums in the golf resort in the south of the airport will be exposed to noise level WECPNL 70 in 2000.

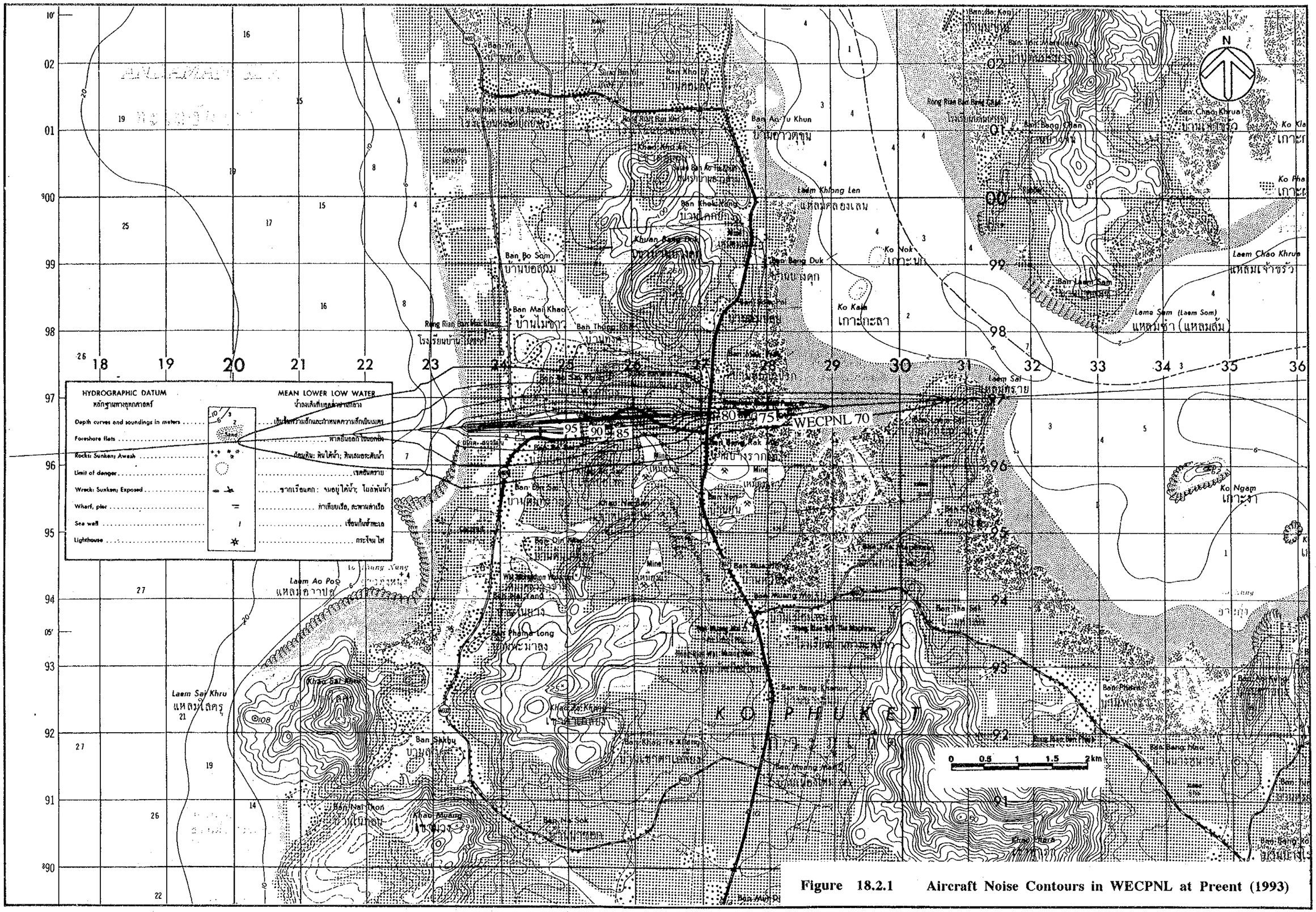


Figure 18.2.1 Aircraft Noise Contours in WECPNL at Preent (1993)

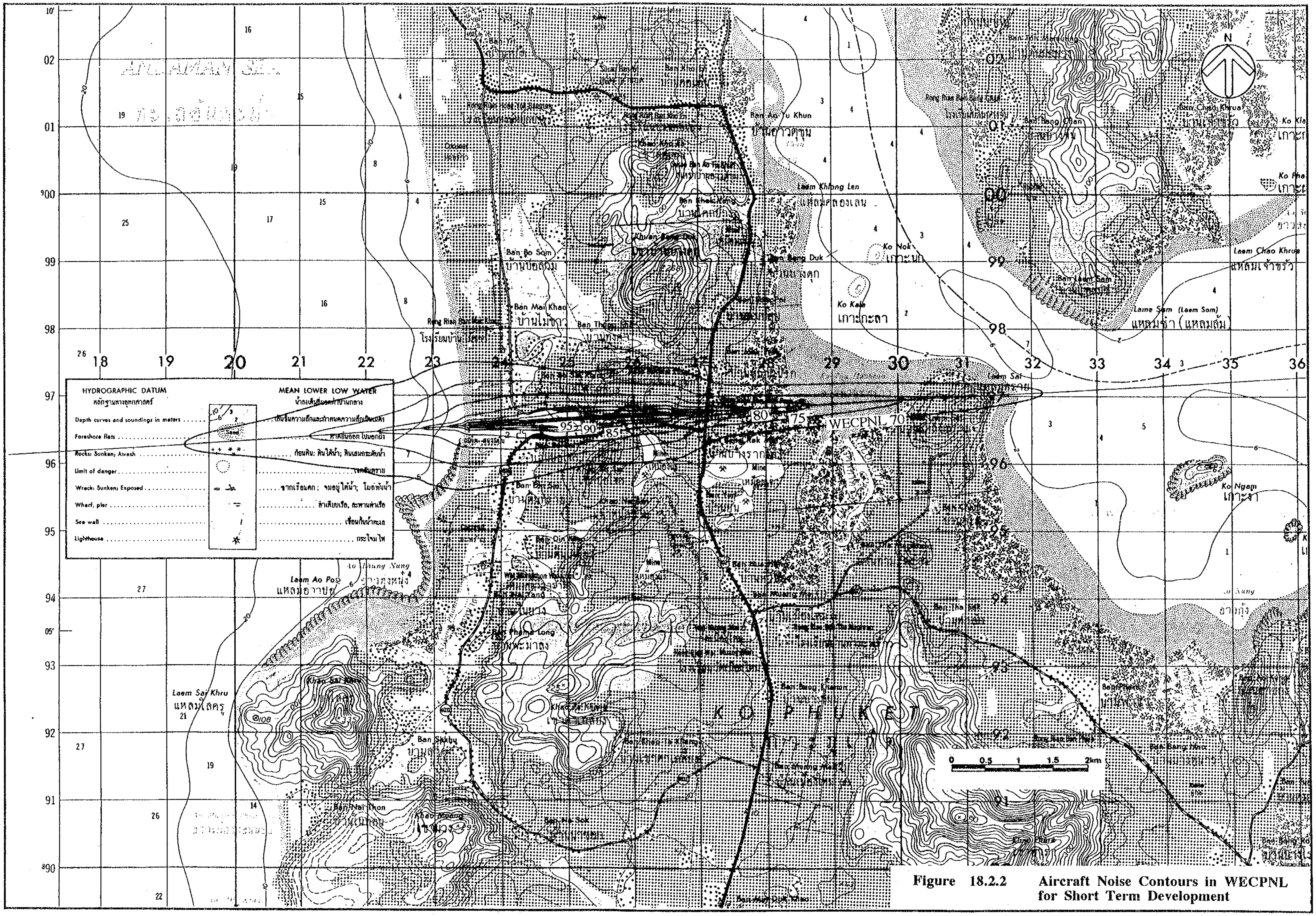


Figure 18.2.2 Aircraft Noise Contours in WECPNL for Short Term Development

CHAPTER 19

PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES

CHAPTER 19 PROJECT IMPLEMENTATION SCHEDULE AND COST ESTIMATES

19.1 GENERAL

This chapter described the implementation schedule and cost estimates of the short-term development project based on the preliminary design in Chapter 15.

19.2 PROJECT IMPLEMENTATION SCHEDULE

Figure 19.2.1 shows the overall project implementation schedule for phase I and phase II.

The implementation schedule of the short-term development project is shown in **Figure 19.2.2**.

The next stage of the project implementation to this Study is the financial arrangement for the project. Other preparatory items to be completed prior to the commencement of the construction work are engineering services including topographic surveys, soil investigations, basic design and detailed design. Tendering will follow the studies.

The construction work will take approximately 24 months to complete including test operations.As shown in **Figure 19.2.2**, the construction works are expected to commence in the early 1996 and to be completed at the end of 1997.

While the design target year of the short-term development plan is 2000, the proposed facilities will accommodate the air traffic demand up to 2005. The level of service will be lowered beyond the year 2000. The master plan of the airport justifies this since it plans the inauguration of the new airport in the year 2005.

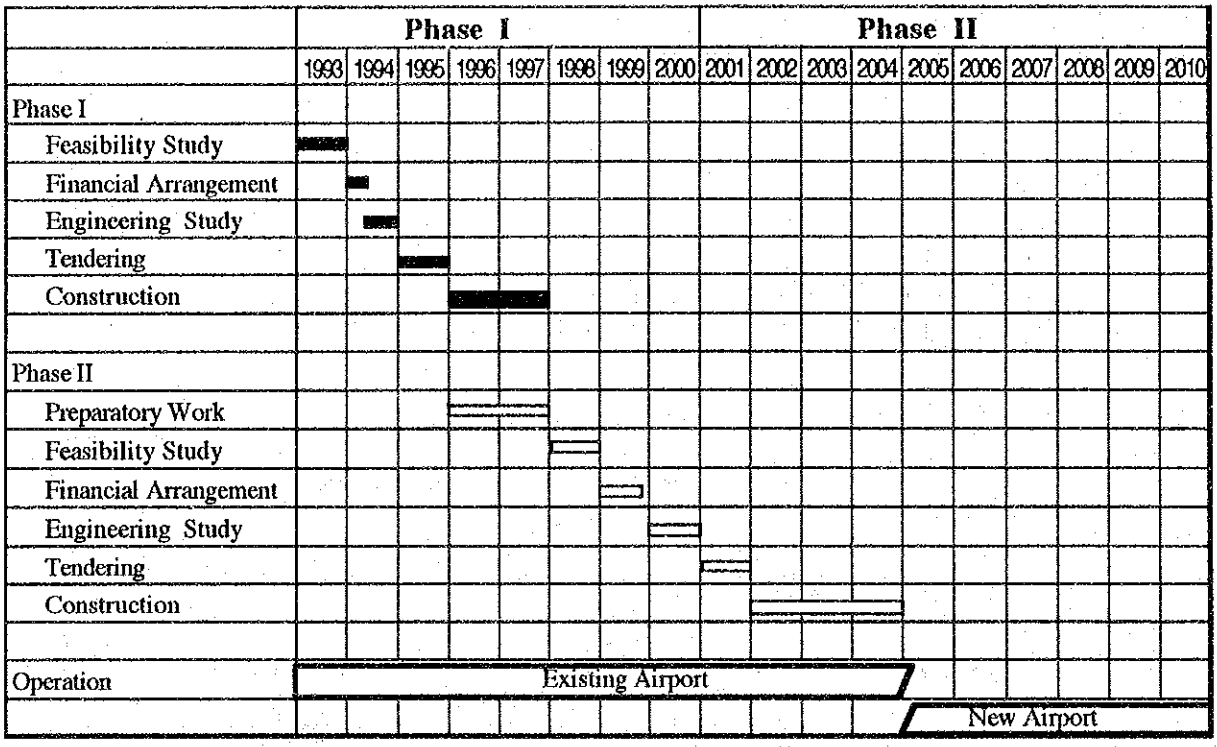


Figure 19.2.1 Project Implementation Schedule for Phase I and II

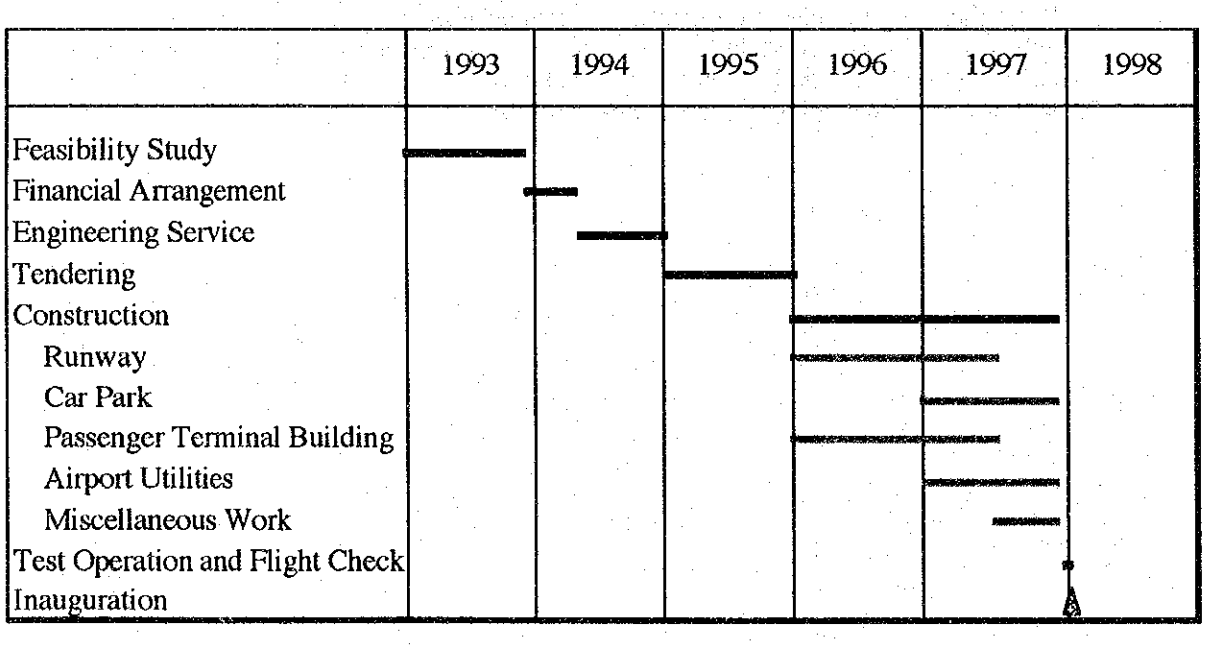


Figure 19.2.2 Project Implementation Schedule for short-term development

19.3 PROJECT COST ESTIMATES

19.3.1 Assumption to the Cost Estimates

The costs are estimated based on the following assumptions :

(1) The costs are based on the May 1993 price index.

(2) The exchange rates were 25 Thai Baht per US Dollar, 110 Japanese Yen per US Dollar, and 4.4 Japanese Yen per Thai Baht.

(3) The costs are estimated in Thai Baht.

(4) No price escalation is included in the cost estimates because this cost estimate has been made primarily for the economic analysis which is made in current prices.

(5) The facilities to be provided by organizations other than AAT or Aerothai such as fuel supply facilities are not included in the project cost.

(6) The contingency is estimated at about 10% of the construction cost.

(7) The cost of the engineering services consisting of soil investigation, topographical survey, basic design, detailed design and construction supervision is estimated at 10% of the total construction cost including the above contingency.

(8) The foreign currency portion of the project costs includes the following items :
- Procurement cost for the imported materials and equipments
- Procurement cost for the imported construction equipments
- The general expenses and profit for the foreign contractors and engineering firms
- Wages for foreign staff

(9) The Thai currency portion of the project costs include the following items :
- Operation cost of the construction equipment including fuel and lubricants
- Procurement costs of the construction materials which are available in Phuket such as most of civil work materials
- Transportation costs for procured materials and labor employed in Thailand
- The general expenses and profit for the Thai contractors and engineering firms
- Wages for Thai laborers

19.3.2 Project Cost

The cost of the short-term development project is shown in **Table 19.3.1**. The total cost of the project is estimated to be 497 million Baht (US$ 20 million)

Table 19.3.1 Cost Estimates for the Short-term Development Project

ITEM	Local Portion Amount (x1,000 Baht)	Foreign Portion Amount (x1,000 Baht)	Total Amount (x1,000 Baht)
A. Construction Cost			
1. CIVIL WORKS			
1.1 Runway Overlay			
1) Pavement Works	28,990	43,500	72,490
2) Pavement Marking	480	1,430	1,910
Sub Total	**29,470**	**44,930**	**74,400**
1.2 Expansion of Car Park			
1) Demolition	30	180	210
2) Earthwork	530	2,820	3,350
3) Pavement Works	11,860	17,800	29,660
4) Drainage	150	250	400
5) Landscaping	2,010	740	2,750
6) Lighting & Signboards	50	290	340
7) Elevated Curb Road	6,000	9,000	15,000
Sub Total	**20,630**	**31,080**	**51,710**
1.3 Miscellaneous Works			
1) Fence and Gate	420	1,270	1,690
- Gate	20	70	90
Sub Total	**420**	**1,270**	**1,690**
Total of item 1.	50,520	77,280	127,800
2. ARCHITECTURAL WORKS			
2.1 Passenger Terminal Building	70,000	105,000	175,000
2.2 Passenger Boarding Bridge	8,000	12,000	20,000
2.3 Other Special Equipment	3,100	27,900	31,000
Total of item 2.	81,100	144,900	226,000
3. AIRPORT UTILITIES			
3.1 Power Supply System	5,640	13,160	18,800
3.2 Water Supply System	6,370	11,830	18,200
3.3 Incinerator	11,200	2,800	14,000
3.4 Telephone	1,260	5,040	6,300
Total of item 3.	24,470	32,830	57,300
Total of Construction Cost	**156,090**	**255,010**	**411,100**
B. Physical Contingncy (10 % of construction cost)	15,609	25,501	41,110
C. Engineering Services (10% of items A.+B.)	4,522	40,699	45,221
Total of Project Cost	**176,221**	**321,210**	**497,431**

Exchange Rate : 1 Baht = 4.4 JP¥
1 US$ = 110 JP¥

CHAPTER 20

FINANCIAL AND ECONOMIC ANALYSIS

CHAPTER 20 FINANCIAL AND ECONOMIC ANALYSIS

20.1 GENERAL

This chapter examines the financial and economic feasibility of the short-term development plan for Phuket International Airport. The purpose of the economic analysis is to ensure the feasibility of the plan from the view point of national economy, while the financial analysis is to evaluate the financial viability of the Project and clarify the impact of the investment on the financial position of AAT.

20.2 METHODOLOGY OF THE ANALYSIS

20.2.1 "With Project" and "Without Project" Assumptions

In order to distinguish the benefits and costs accompanied by the project implementation "with project" and "without project" cases have been assumed below.

The short term development plan is designed to expand the capacity of existing airport so as to cope with the projected traffic demand in 2000 as follows:

- The existing international passenger terminal building which will reach its capacity in 1995 is designed to expand the capacity in cope with the demand in 2000.
- The domestic passenger terminal building maintains sufficient capacity for the projected domestic passenger demand until 2000 as examined in Chapter 6.
- As for the cargo terminal building the present facility will be sufficient for the cargo demand in 2010.
- Therefore the expansion of the domestic passenger terminal building and cargo building are not included in the short-term development plan for 2000.

Main construction work items for short-term development plan are summarized as follows:

- Runway overlay
- Expansion of the international passenger terminal building
- Expansion of car park
- Expansion of airport utility

The increase of revenue for AAT by the implementation of the short-term development plan is mainly derived by the incremental capacity of the international passenger terminal building. Expansion of car park and airport utility have been designed to meet the incremental demand for the increase of international passengers and runway overlay has been designed to secure the required thickness of pavement for the increase of aircraft movements.

Figure 20.2.1 indicates the traffic volume of international traffic in cases of "with project" and "without project". In the "without project" assumption, the traffic volume will remain constant at the level of traffic in 1995. In case of "with project" assumption the traffic volume is assumed to be maintained up to

2004 with consideration of the followings, although the capacity has been designed to meet the demand in 2000:

1) In 2004 the service level of international passenger terminal building will be lower than the initial design standard in the short-term development plan, however, the level is still considered to remain within the adequate level of allowance in the IATA standard for the services of international passenger buildings. In **Appendix 20.2.1** the service level has been examined in accordance with IATA standard.

2) Share of foreign passengers of international passengers in Phuket International Airport is estimated at 99%. International access of foreign tourists to Pheket Island is mostly provided by air transport (99 %). It is not realistic to consider that foreign tourists will transfer from air to other transportation modes due to the decline of the service levels at passenger terminal building of Phuket International Airport.

The future traffic of air passengers, aircraft movements and aircraft storage "with project " is compared with that "without project" and the incremental traffic is calculated in **Table 20.2.1**.

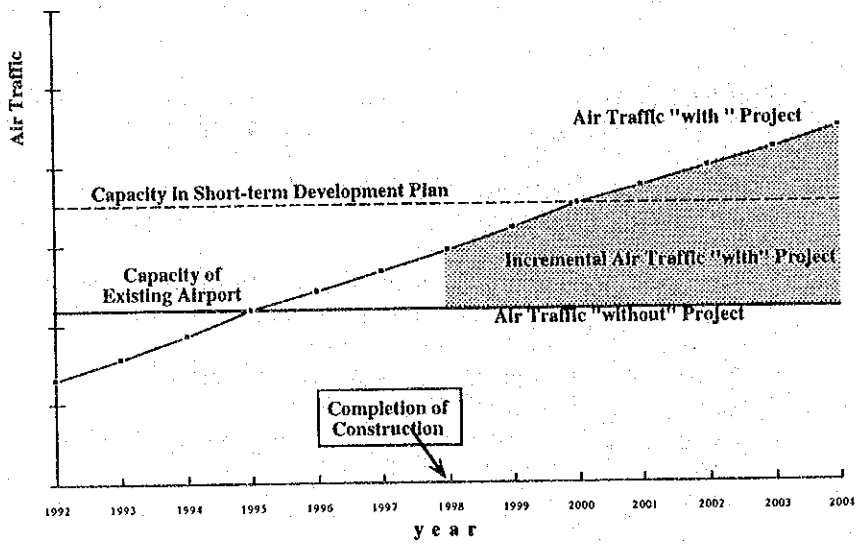


Figure 20.2.1 Traffic Volume "With Project" and "Without Project"

20.2.2 General Assumptions

In order to evaluate financial and economic viability of the Project it is necessary to establish criteria for the analysis. The following assumptions have been made:

a. Project Life: The evaluation period of airport projects is usually assumed to be 20-25 years taking into consideration the economic project life. However for the purpose of financial and economic analysis of this project, a project life has been assumed up to 2004 because the existing airport is designed to be closed in 2004 and the new airport is expected to open in 2005 as recommended by the Master Plan of Phuket International Airport in 2010.

b. Project Revenues and Costs: All revenues and costs have been estimated by using 1993 market prices and evaluated by Thai Baht.

Table 20.2.1 Air Passengers and Aircraft Movements "with" and "without Project"

AIR PASSENGERS

(1) With Project

Unit:thousand persons

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International Passengers	654.1	784.0	929.6	1,093.3	1,206.9	1,329.3	1,460.1	1,599.6	1,748.8	1,861.4	1,978.8	2,100.8	2,227.6
Domestic Passengers	1,261.9	1,343.1	1,419.3	1,491.7	1,595.3	1,702.6	1,812.3	1,924.4	2,039.2	2,175.6	2,318.0	2,466.6	2,621.7
Total	1,916.0	2,127.1	2,348.9	2,585.0	2,802.2	3,031.9	3,272.4	3,524.0	3,788.0	4,037.0	4,296.8	4,567.4	4,849.3

(2) Without Project

Unit:thousand persons

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International Passengers	654.1	784.0	929.6	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3	1,093.3
Domestic Passengers	1,261.9	1,343.1	1,419.3	1,491.7	1,595.3	1,702.6	1,812.3	1,924.4	2,039.2	2,175.6	2,318.0	2,466.6	2,621.7
Total	1,916.0	2,127.1	2,348.9	2,585.0	2,688.6	2,795.9	2,905.6	3,017.7	3,132.5	3,268.9	3,411.3	3,559.9	3,715.0

(3) Incremental Air Passengers with Project

Unit:thousand persons

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International Passengers	-	-	-	-	-	-	366.8	506.3	655.5	768.1	885.5	1,007.5	1,134.3
Domestic Passengers	-	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	-	-	-	-	-	-	366.8	506.3	655.5	768.1	885.5	1,007.5	1,134.3

AIRCRAFT MOVEMENTS

(1) Aircraft Movements with Project

Unit: movements

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B747 class	0	350	700	1,050	1,195	1,340	1,486	1,631	1,776	2,212	2,648	3,084	3,520
B777/A330 class	0	0	0	0	339	678	1,017	1,356	1,695	1,550	1,405	1,259	1,114
B767/A300 class	2,301	2,826	3,350	3,875	3,746	3,617	3,488	3,359	3,229	3,342	3,455	3,568	3,681
B737 class	1,413	1,399	1,386	1,372	1,566	1,760	1,954	2,148	2,341	2,503	2,664	2,826	2,987
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0
B777/A330 class	0	1,425	2,850	4,275	4,596	4,917	5,237	5,558	5,879	6,306	6,734	7,161	7,589
B767/A300 class	2,049	1,455	861	267	303	338	374	410	445	463	481	499	517
B737 class	802	683	564	445	481	517	552	588	623	695	766	837	909
ATR42 class	1,336	1,277	1,217	1,158	1,229	1,300	1,372	1,443	1,514	1,621	1,728	1,835	1,942
Total	7,901	9,415	10,928	12,442	13,455	14,467	15,480	16,493	17,502	18,692	19,881	21,060	22,259

(2) Aircraft Movements without project

Unit: movements

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B747 class	0	350	700	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
B777/A330 class	0	0	0	0	0	0	0	0	0	0	0	0	0
B767/A300 class	2,301	2,826	3,350	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875
B737 class	1,413	1,399	1,386	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372
Domestic	0	0	0	0	0	0	0	0	0	0	0	0	0
B777/A330 class	0	1,425	2,850	4,275	4,596	4,917	5,237	5,558	5,879	6,306	6,734	7,161	7,589
B767/A300 class	2,049	1,455	861	267	303	338	374	410	445	463	481	499	517
B737 class	802	683	564	445	481	517	552	588	623	695	766	837	909
ATR42 class	1,336	1,277	1,217	1,158	1,229	1,300	1,372	1,443	1,514	1,621	1,728	1,835	1,942
Total	7,901	9,415	10,928	12,442	12,906	13,369	13,832	14,296	14,758	15,382	16,006	16,629	17,254

(3) Incremental Movements with Project

Unit: movements

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B747 class	-	-	-	-	-	-	436	581	726	1,162	1,598	2,034	2,470
B777/A330 class	-	-	-	-	-	-	1,017	1,356	1,695	1,550	1,405	1,259	1,114
B767/A300 class	-	-	-	-	-	-	-387	-516	-646	-533	-420	-307	-194
B737 class	-	-	-	-	-	-	582	776	969	1,131	1,292	1,454	1,615
Domestic							0	0	0	0	0	0	0
B777/A330 class	-	-	-	-	-	-	0	0	0	0	0	0	0
B767/A300 class	-	-	-	-	-	-	0	0	0	0	0	0	0
B737 class	-	-	-	-	-	-	0	0	0	0	0	0	0
ATR42 class	-	-	-	-	-	-	0	0	0	0	0	0	0
Total	-	-	-	-	-	-	1,648	2,197	2,744	3,310	3,875	4,440	5,005

STORAGE

(1) Storage with Project

Unit: aircrafts

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B767/A300 class	0	0	0	0	0	0	122	243	365	365	365	365	365
Domestic													
B767/A300 class	0	0	0	0	0	0	122	243	365	365	365	365	365
ATR42 class	365	365	365	365	365	365	487	608	730	730	730	730	730
Total	365	365	365	365	365	365	730	1,095	1,460	1,460	1,460	1,460	1,460

(2) Storage without Project

Unit: aircrafts

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B767/A300 class	0	0	0	0	0	0	0	0	0	0	0	0	0
Domestic													
B767/A300 class	0	0	0	0	0	0	122	243	365	365	365	365	365
ATR42 class	365	365	365	365	365	365	487	608	730	730	730	730	730
Total	365	365	365	365	365	365	608	852	1,095	1,095	1,095	1,095	1,095

(3) Incremental Storage with Project

Aircraft type	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
International													
B767/A300 class	-	-	-	-	-	-	122	243	365	365	365	365	365
Domestic													
B767/A300 class	-	-	-	-	-	-	0	0	0	0	0	0	0
ATR42 class	-	-	-	-	-	-	0	0	0	0	0	0	0
Total	-	-	-	-	-	-	122	243	365	365	365	365	365

c. Foreign Exchange Rate: For the purposes of this study the following exchange rates have been used:

US$ 1.00 = Baht 25.00
US$ 1.00 = Japanese Yen 110.00
Baht 1.00 = Japanese Yen 4.4

d. Inflation: Has not been taken into account both in revenue and expenditure projections.

e. Salvage Value: (Undepreciated value) has not been considered in the analysis.

20.2.3 Capital Costs

The annual disbursement schedule of the capital costs for the short-term development plan is shown in **Table 20.2.2** in accordance with the implementation schedule described in Chapter 19. The total project cost has a grand total of 497.43 million Baht including the Value Added Tax of 32.54 million Baht. The share of foreign portion is 65 % of the total costs.

Table 20.2.2 Cost Estimates

Unit: million Baht

	1996			1997			Total		
	Foreign portion	Local portion	Total	Foreign portion	Local portion	Total	Foreign portion	Local portion	Total
Construction Costs									
Civil Works	27.99	18.36	46.35	44.24	28.85	73.09	72.23	47.21	119.44
Architectural works	67.71	37.90	105.61	67.71	37.90	105.61	135.42	75.80	211.22
Utilities			0.00	30.68	22.87	53.55	30.68	22.87	53.55
Sub-total	95.70	56.26	151.96	142.63	89.62	232.25	238.33	145.88	384.21
Physical contingency	9.57	5.63	15.20	14.26	8.96	23.22	23.83	14.59	38.42
Engineering Services	15.27	1.63	16.90	22.76	2.60	25.36	38.03	4.23	42.26
Value Added Tax	8.44	4.45	12.89	12.58	7.07	19.65	21.02	11.52	32.54
Total Project Costs	128.98	67.97	196.95	192.23	108.25	300.48	321.21	176.22	497.43

20.2.4 Operating Expenses

Operating expenses of AAT consist of "Personnel expenses", "Operating and maintenance expenses" and "Government land rental expenses".

To increase the efficiency of human resources is one of the important policies in AAT. According to the profit and loss statements (pro-forma) of AAT during from October 1, 1992 to September 30, 1993, the annual personnel expenses are estimated at 43 Baht, 16 Baht, 34 Baht, 10 Baht per passenger for Bangkok, Chiang Mai, Hat Yai and Phuket International Airports respectively (**see Appendix 20.2.2**). The expenses in Phuket is estimated at the lowest level.

The personnel expenses of Phuket International Airport during the Project period have been estimated in consideration of the actual personnel expenses in 1991 and 1992 (**see Table 20.2.3**) and the increase of efficiency of human resources in the future. Annual expenses have been estimated at 8.0 Baht per passenger during the Project period.

Table 20.2.3 Personnel Expenses at Phuket International Airport (1991 and 1992)

	1991	1992
Total personnel expenses (thousand Baht)	11,221	14,533
Total passengers (thousand persons)	1,766	1,916
Personnel expenses per passenger (Baht)	6.4	7.6

Source: AAT

The incremental operating and maintenance expenses per year can roughly be estimated at 1 % of the construction costs for civil and architectural works and at 5 % of the construction costs for airport utilities. The annual operating and maintenance expenses are estimated at 5.98 million Baht for the analysis (**Table 20.2.4**).

Table 20.2 4 Operating and Maintenance Expenses

Unit: million Baht

	Construction Costs	Annual Operating & Maintenance Costs
Civil Works	119.44	1.194
Architectural Works	211.22	2.112
Utilities	53.55	2.678
Total	384.21	5.984

At present AAT annually pays an amount of 2 % of the total operating revenues to the Ministry of Finance as "Land rental expenses". Therefore the land rental expenses have been estimated at 2 % of the incremental operating revenues in the analysis of the short-term development plan.

Table 20.2.5 shows the incremental operating expenses during the project period.

Table 20.2.5 Incremental Operating Expenses

Unit: million Baht

	1998	1999	2000	2001	2002	2003	2004
Personnel expenses	2.93	4.05	5.24	6.14	7.08	8.06	9.07
Operating & maintenance expenses	5.98	5.98	5.98	5.98	5.98	5.98	5.98
Government land rental expenses	1.35	1.86	2.41	2.84	3.28	3.74	4.20
Total operating expenses	10.26	11.89	13.63	14.96	16.34	17.78	19.25

20.3 FINANCIAL ANALYSIS

20.3.1 Objective of the Financial Analysis

The main objective of financial analysis is to evaluate and to ensure the financial viability of the short-term development plan for the existing Phuket International Airport. It is generally considered that the generated revenues cannot cover the investment costs in airport development projects due to a great deal of civil works. However as the portion of civil works is small in this project compared with normal airport development projects, it is expected to retain higher return on capital investment. On the other hand as the airport is assumed to be closed in 2004, the project period is considered to be too short to make the Project viable from the financial point of view.

In this Chapter it has been examined whether or not the incremental revenues from the implementation of the Project cover the investment costs of the Project including operation and maintenance costs of the Project and a financing plan has been formulated under an assumption of loan conditions.

The construction of new airport has been selected as a master plan for Phuket International Airport in 2010 and the existing airport will be closed in 2004. Therefore it should be required that the incremental revenues resulting from the implementation of the short-term development will cover all the incremental costs of the Projects including operating and maintenance costs and a substantial portion of the revenues will be reserved for the future investment of the new airport.

Financial analysis have been carried in the context of "with" and "without assumption". The increased revenues have been compared with the increased costs by the implementation of the Project.

20.3.2 Rates of Fees

The operating revenues of AAT consist of the following items:

Passenger service charges
Landing and parking charges
Aviation bridge charges
Rent for offices and real properties
Service revenues, and
Concession revenues

The rates of fees for airport use of passengers and aircraft are fixed by the Civil Aviation Board Regulation No. 29 with the approval of the Ministry of Communications. The rate of charge for the use of properties of the airport, services and other facilities are regulated by AAT.

(1) Passenger Service Charges

The rate of 200 Baht is collected from every passenger boarding an aircraft at Phuket International Airport for departure from Thailand to foreign countries each time. A passenger service charge of 20 Baht is paid in respect of every passenger embarking on an aircraft with its destination in Thailand.

Table 20.3.1 Passenger Service Charges

	Baht per passenger
International passengers	200.00
Domestic passengers	20.00

Source: AAT

(2) Landing Charges and Storage Charges

The payment of the landing charge entitles the aircraft to stay in the airport not exceeding 3 hours and the rate of landing charges of aircraft is calculated on maximum take-off weight as specified in Aeronautical Information Publication as shown in **Table 20.3.2**. Landing rates for domestic flights are reduced by 50 %.

The rate of storage charges of aircraft is also calculated on maximum take-off weight and the rate for domestic flights are reduced by 50 %. Landing charges and storage charges are shown in **Table 20.3.3** by class of aircraft type for international and domestic flights.

Table 20.3.2 Rate of Landing Charges, and Storage Fee

	Baht
Landing and Take-off Fee	
for each metric ton within the first 50 metric tons	85.00
for each metric ton over 50 metric tons	95.00
for each metric ton over 100 metric tons	105.00
Storage Fee	
for each metric ton within the first 50 metric tons	10.00
for each metric ton over 50 metric tons	8.00
for each metric ton over 100 metric tons	4.00

Source: AAT

Table 20.3.3 Landing Charges and Storage Charges by Aircraft Class

Aircraft type	Baht per aircraft (International)	Baht per aircraft (Domestic)
Landing Fee		
B747 class	36,605 /landing	– /landing
B777/A330 class	23,070 /landing	11,535 /landing
B767/A300 class	14,807 /landing	7,217 /landing
B737 class	5,420 /landing	2,717 /landing
ATR42 class	– /landing	689 /landing
Storage Fee		
B767/A300 class	1,121 /landing	553 /landing
ATR42 class	– /landing	162 /landing

Source: AAT
Note: The maximum take-off weight by type of aircraft are shown in **Appendix 20.3.1**.

The rates of landing charge for an aircraft of B747-300 class in main airports in the region are shown in **Table 20.3.4** which reveals the relative competitiveness of AAT's tariff rate in the region.

Table 20.3.4 Rates of Landing Charges for International Flights in Main Airports as of February 1993

Country	Airport	Landing charge for B747-300 (372 tons)
Thailand	Bangkok, Phuket	US$1,488
Philippines	Manila	US$1,692
Hong Kong	Hong Kong	US$2,284
Indonesia	Jakarta	US$2,006

(3) The Rates of Charges for the Use of Properties, Services and Other Facilities

The rates of charges for the use of properties, services and other facilities which are regulated by AAT are shown in **Appendix 20.3.2**. Aviation bridge charges, rent for offices and real properties, car parking charges and other services (electricity and water service, picture taking, etc.) are included in rental charges.

(4) Concession Charges

The rates for concessions are decided by open bidding every three or five years between AAT and customers. At present AAT engages concession contracts with the following eleven customers.

- Goods and souvenirs, Snacks and drink service, Car rent service, Car parking service, Limousine service, Airport clock installation, Florists and fruits shop, Left baggage, advertising board, Duty free goods, and Banking and currency exchange services

The current rates of charges for these customers are shown in **Appendix 20.3.2**.

No tariff revision has been taken into account in order to estimate the revenues of the Project in the financial analysis.

20.3.3 Revenues of the Project

The incremental revenues to AAT from the short-term development plan are calculated based on the incremental traffic by using the current rates of fees for airport use and services described above. The revenues resulting from the increase of international passengers are included in the incremental revenues of the Project, however, the revenues from domestic passengers are excluded.

(1) Passenger service charges

The passenger service charges resulting from the increased international passengers by the implementation of the Project are included in the revenues of the Project (see **Table 20.2.1**, **Table 20.3.1** and **Appendix 20.3.3**).

(2) Landing and parking charges

The landing and parking charges resulting from the increased international flight movements by the implementation of the Project are included in the revenues of the Project (see **Table 20.2.1, Table 20.3.3** and **Appendix 20.3.3**).

(3) Aviation bridge charges

The aviation bridge charges resulting from the increased international flight movements by the implementation of the Project are included in the revenues of the Project (see **Table 20.1.1, Appendix 20.3.2** and **Appendix 20.3.3**).

(4) Rent for offices and real properties

The area for rent in the existing passenger terminal building are classified into spaces for offices, shops and restaurants and the current rent fees for each space are shown below. The total areas for rent in existing passenger terminal building are 2,971 M2 and the total areas for the year of 2000 in the short-term development rent is designed to occupy 5,861 M2. The incremental areas for rent with project are 2,890 M2 as shown in **Table 20.3.5**.

The future revenues of rent for offices and real properties are estimated in proportion to the area of the terminal building using the current rental rates of fees. However the occupancy rates of the rental space are estimated at 40 %, 70 % and 100% in 1998, 1999 and 2000 - 2004 respectively.

Table 20.3.5 Rent for Offices and Real Properties in the Passenger Terminal Building of Phuket International Airport

Rent	Average Monthly Rental Fee (Baht/M2)	Area for Rent in the Existing Terminal Building, 1993 (M2)	Area for Rent in the short-term Development Plan, 2000 (M2)	Incremental Area for Rent (M2)	Incremental Annual Revenues (million Baht)
Offices	250	913.00	2,778.00	1,865.00	5.60
Shops	400	304.00	689.00	385.00	1.85
Restaurants	70	1,754.00	2,394.00	640.00	0.54
Total		2,971.00	5,861.00	2,890.00	7.99

(5) Service revenues and concession revenues:

Table 20.3.6 shows the actual service and concession revenues of AAT at Phuket International Airport in 1991 and 1992.

In order to project the future revenues the average revenue are estimated at 20 Baht per passenger during the project period.

Table 20.3.6 Service and Concession Revenue of Phuket International Airport in 1991 and 1992

	1991	1992
Service revenues (thousand Baht)	7,575.00	7,478.00
Concession revenues (thousand Baht)	24,340.00	30,288.00
Total passengers (thousand persons)	1,766	1,916
Average revenue per passenger (Baht)	18	20

Source: AAT

The incremental revenues of the short-term development plan are estimated in **Table 20.3.7** and the procedure of calculation is shown in **Appendix 20.3.3**.

Table 20.3.7 Incremental Revenues of the Project

Unit: million Baht

Revenues	1998	1999	2000	2001	2002	2003	2004
Passenger service	36.68	50.63	65.55	76.81	88.55	100.75	113.43
Landing & parking	18.56	24.83	31.09	38.67	46.26	53.83	61.41
Aviation bridge	1.53	2.04	2.55	3.05	3.55	4.05	4.55
Rent for office	3.20	5.59	7.99	7.99	7.99	7.99	7.99
Service & concession	7.34	10.13	13.11	15.36	17.71	20.15	22.69
Total revenue	67.31	93.22	120.29	141.88	164.06	186.77	210.07

20.3.4 Tax Payments

Value added tax (VAT) was introduced to Thailand in January 1992. Every operating revenue except "Rent for offices and real properties" is imposed by VAT at 7 % of the total charges.

Property tax is imposed on the revenue of "Rent for offices and real properties" and its rate is 12.5 % of the total charges.

Corporation tax is not imposed on AAT, however, some portion of the net profit for every fiscal year of AAT has been appropriated to the Ministry of Finance after the negotiation with the Bureau of the Budgeting under the Office of Ministry of the Prime Minister every fiscal year.

The payments of VAT and property tax are taken into account for the estimates of revenues and costs of the Project while the payment of appropriation to the Ministry of Finance has been excluded in the analysis.

20.3.5 Calculation and Evaluation

Table 20.3.8 shows the comparison of revenues and costs for Phuket International Airport during the project period.

The **FIRR** (Financial Internal Rate of Return) is estimated at **12.03 %** which indicates the minimum rate to justify the Project from the financial point of view. The **NPV** (Net Present Value) has been calculated using the discount rate of 12 % and the result of calculation has been estimated at **0.47 million Baht**. As the FIRR is estimated at almost 12 %, it is considered that the conditions of long-term loans will considerably affect on the financial feasibility of the Project.

Table 20.3.8 Revenues and Costs of the Project

Unit: million Baht

		1996	1997	1998	1999	2000	2001	2002	2003	2004
REVENUES										
Passenger service				36.68	50.63	65.55	76.81	88.55	100.75	113.43
Landing & parking				18.56	24.83	31.09	38.67	46.26	53.83	61.41
Aviation bridge				1.53	2.04	2.55	3.05	3.55	4.05	4.55
Rent for offices				3.20	5.59	7.99	7.99	7.99	7.99	7.99
Service & concession				7.34	10.13	13.11	15.36	17.71	20.15	22.69
TOTAL REVENUES		**0.00**	**0.00**	**67.31**	**93.22**	**120.29**	**141.88**	**164.06**	**186.77**	**210.07**
COSTS										
CAPITAL COSTS										
Civil Works										
Runway	(69.53)	46.35	23.18							
Terminal RD & Carpark	(48.33)		48.33							
Miscellaneous	(1.58)		1.58							
Architectural Work										
Passenger Terminal Building	(211.22)	105.61	105.61							
Airport Utilities	(53.55)		53.55							
Sub-total	(384.21)	151.96	232.25							
Physical Contingncy	(38.42)	15.20	23.22							
Engineering Service	(42.26)	16.90	25.36							
	(464.89)	184.06	280.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VAT	(32.54)	12.89	19.65							
Total Capital Costs	(497.43)	196.95	300.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OPERATING EXPENSES										
Personnel Expenses				2.93	4.05	5.24	6.14	7.08	8.06	9.07
Operating & Maintenance Expenses				5.98	5.98	5.98	5.98	5.98	5.98	5.98
Government Land Rental Expenses				1.35	1.86	2.41	2.84	3.28	3.74	4.20
Total Operating Expenses		0.00	0.00	10.26	11.89	13.63	14.96	16.34	17.78	19.25
VAT & PROPERTY TAX										
VAT		-12.89	-19.65	4.19	5.73	7.35	8.76	10.21	11.70	13.22
Property Tax		0.00	0.00	0.40	0.70	1.00	1.00	1.00	1.00	1.00
Total Payment		-12.89	-19.65	4.59	6.43	8.35	9.76	11.21	12.70	14.22
TOTAL COSTS		**184.06**	**280.83**	**14.85**	**18.32**	**21.98**	**24.72**	**27.55**	**30.48**	**33.47**
NET PROFITS		**-184.06**	**-280.83**	**52.46**	**74.90**	**98.31**	**117.16**	**136.51**	**156.29**	**176.60**

FINANCIAL INTERNAL RATE OF RETURN (FIRR):	**12.03%**
NET PRESENT VALUE (NPV): **(DISCOUNT RATE 12 %)**	**0.47 million Baht**

20.3.6 Financing Plan

The costs of the project are usually covered by incremental revenues of the project, grants from government, "soft" loan at subsidized rates and "hard" loan at commercial rates. AAT expects that the Project has to be financed at subsidized rates because AAT considers that Thai government will not provide grants for this type of project.

It has been assumed in the financing plans of two cases that a portion of the investment costs will be financed by a hard loan and a soft loan. The conditions for the loans have been reviewed by considering the two cases. In both cases it is assumed that 80 % of investment costs will be financed by long-term loan under the condition shown in **Table 20.3.9**. For a case of Long-term Loan 1, an interest rate has been estimated at 12 %, the same level as commercial bank loan, while for a case of Long-term Loan 2, a subsidized interest rate of 8 %, an average interest rate financed by international financing agencies, has been adopted.

Table 20.3.9 Condition of Long-term Loans

	Interest rate	Repayment period including grace period	Grace period
Long-term Loan 1	12 %	8 years	3 years
Long-term Loan 2	8 %	13 years	3 years

The loan schedule including disbursement, repayment and interest payment schedules both for Loan 1 and Loan 2 is shown in **Table 20.3.10** and cash-flow with finance of the long-term loan under the above conditions are calculated in **Table 20.3.11**. The **ROEs** (Return on Equity) for the project period have been estimated at **9.31 %** and **30.62 %** financed by Loan 1 and Loan 2 respectively. In the case of Loan 2, the balance of loan in 2004, when the airport will be closed, is estimated to remains 183.23 million Baht, while the accumulated cash-flow is estimated to amount to 318.60 million Baht.

Table 20.3.10 Long-term Loan Schedule

Unit: million Baht

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Long-term Loan 1									
Loan Disbursement	157.56	240.38							
Principal Repayment				31.51	79.59	79.59	79.59	79.59	48.07
Balance of Loan Amount	157.56	397.94	397.94	366.43	286.84	207.25	127.66	48.07	0.00
Interest Payment (Rate: 12.00%)	18.91	47.75	47.75	43.97	34.42	24.87	15.32	5.77	0.00
Total Payment	18.91	47.75	47.75	75.48	114.01	104.46	94.91	85.36	48.07
Long-term Loan 2									
Loan Disbursement	157.56	240.38							
Principal Repayment				15.76	39.79	39.79	39.79	39.79	39.79
Balance of Loan Amount	157.56	397.94	397.94	382.18	342.39	302.60	262.81	223.02	183.23
Interest Payment (Rate: 8.00%)	12.60	31.84	31.84	30.57	27.39	24.21	21.02	17.84	14.66
Total Payment	12.60	31.84	31.84	46.33	67.18	64.00	60.81	57.63	54.45

Considering the future investment in the construction of the new Phuket International Airport, it should be required that the capital costs of the short-term development plan will be financed by a soft loan under the subsidized conditions in order to ensure the financial viability of AAT at Phuket International Airport.

Table 20.3.11 Project Cash-flow with Long-term Loan

Unit: million Baht

	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Financed by Long-term Loan 1										
Capital costs										
Construction costs	167.16	255.47								
Engineering services	16.90	25.36								
VAT	12.89	19.65								
Total Capital costs (a)	**196.95**	**300.48**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
Long-term Loan										
Disbursement	157.56	240.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Repayment	0.00	0.00	0.00	31.51	79.59	79.59	79.59	79.59	48.07	
Total Long-term Loan (b)	**157.56**	**240.38**	**0.00**	**-31.51**	**-79.59**	**-79.59**	**-79.59**	**-79.59**	**-48.07**	
Revenues and Expenditure										
Operating revenues	0.00	0.00	67.31	93.22	120.29	141.88	164.06	186.77	210.07	
Operating expenses	0.00	0.00	10.26	11.89	13.63	14.96	16.34	17.78	19.25	
VAT/Property tax payment	-12.89	-19.65	4.59	6.43	8.35	9.76	11.21	12.70	14.22	
Interest (Long-term loan)	18.91	47.75	47.75	43.97	34.42	24.87	15.32	5.77	0.00	
Net Profit (c)	**-6.02**	**-28.10**	**4.71**	**30.93**	**63.89**	**92.29**	**121.19**	**150.52**	**176.60**	
Net Cash-flow ((b)+(c))-(a)										
	-45.41	**-88.20**	**4.71**	**-0.58**	**-15.70**	**12.70**	**41.60**	**70.93**	**128.53**	ROE: 9.31%
Accumulated Cash-flow	-45.41	-133.61	-128.90	-129.48	-145.18	-132.48	-90.88	-19.95	108.58	
Financed by Long-term Loan 2										
Capital costs										
Construction costs	167.16	255.47								
Engineering services	16.90	25.36								
VAT	12.89	19.65								
Total Capital costs (a)	**196.95**	**300.48**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
Long-term Loan										
Disbursement	157.56	240.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Repayment	0.00	0.00	0.00	15.76	39.79	39.79	39.79	39.79	39.79	
Total Long-term Loan (b)	**157.56**	**240.38**	**0.00**	**-15.76**	**-39.79**	**-39.79**	**-39.79**	**-39.79**	**-39.79**	
Revenues and Expenditure										
Operating revenues	0.00	0.00	67.31	93.22	120.29	141.88	164.06	186.77	210.07	
Operating expenses	0.00	0.00	10.26	11.89	13.63	14.96	16.34	17.78	19.25	
VAT/Property tax payment	-12.89	-19.65	4.59	6.43	8.35	9.76	11.21	12.70	14.22	
Interest (Long-term loan)	12.60	31.84	31.84	30.57	27.39	24.21	21.02	17.84	14.66	
Net Profit (c)	**0.29**	**-12.19**	**20.62**	**44.33**	**70.92**	**92.95**	**115.49**	**138.45**	**161.94**	
Net Cash-flow ((b)+(c))-(a)										
	-39.10	**-72.29**	**20.62**	**28.57**	**31.13**	**53.16**	**75.70**	**98.66**	**122.15**	ROE: 30.62%
Accumulated Cash-flow	-39.10	-111.39	-90.77	-62.20	-31.07	22.09	97.79	196.45	318.60	

20.3.7 Sensitivity and Conclusion of Financial Analysis

Financial sensitivity has been examined to ensure the feasibility of the Project by considering the following conditions. For the sensitivity of costs and revenues fluctuation 10 % has been selected because the period of the Project is rather short.

1) 10 % of costs increase including operating costs
2) 10 % of revenue decrease
3) A combination of 1) and 2)

The results are expressed by FIRRs and NPVs corresponding to the above changes in **Table 20.3.12**. The FIRRs still maintain a minimum level under the assumption of three cases.

Table 20.3.12 Result of Sensitivity Analysis

	FIRR	NPV
Base Case	12.03 %	0.47 million Baht
1) 10 % of costs increase	9.55 %	-47.76 million Baht
2) 10 % of revenue decrease	9.30 %	-47.77 million Baht
3) A combination of 1) and 2)	6.90 %	-96.00 million Baht

Note: The details are shown in **Appendix 20.3.4**

For this project the increase in revenues by the project implementation is satisfactory as it covers the capital costs of the Project and the incremental costs for operation and maintenance, if some portion of the capital costs is financed by the loan at subsidized conditions as examined above. This is further confirmed by the FIRRs keeping a minimum level even when the estimated costs increase by 10 % and the revenue decreases by 10 %.

20.4 ECONOMIC ANALYSIS

20.4.1 Objective of the Economic Analysis

The objective of economic analysis is to evaluate the economic feasibility of the short-term development plan for the existing Phuket International Airport in the view point of national economy. "Benefit/cost analysis", which compare the benefits with costs accompanied by the implementation of the Project, has been introduced in the analysis.

Firstly the benefits and costs of the Project have been distinguished and quantified within the context of the "with" and "without assumption". Secondly benefits and costs of the Project have been converted from market prices to economic prices adopting "shadow prices". Thirdly the feasibility of the Project has been estimated using indexes of economic analysis. Finally the sensitivity of the Project has been examined.

20.4.2 Benefit of the Project

The benefits of the Project has been estimated in the view of national economic benefit to Thailand. The main benefits of airport development projects usually consist of travel time savings, travel cost savings, processing time savings, increase in air cargo and increase of foreign exchange from foreign tourist. As discussed in Chapter 20.2.1, the incremental traffic of the Project are derived from the increase of the international passengers and international flights. The benefits of the Project can be distinguished as shown in **Table 20.4.1**

Table 20.4.1 Benefits of the Project

Benefits from	Payments from Foreign Passengers	Payments from Thai Passengers
Passenger Service Charges	Foreign exchange earnings for Thai economy	Transfer payments in Thai economy
Tourist Expenditures	Benefits to Thai economy	Benefits to Thai economy
Air Fares		
Foreign carriers	Benefits to foreign countries	Benefits to foreign countries
Thai carriers	Benefits to Thai economy	Benefits to Thai economy
Time Savings	Benefits to foreign countries	Benefits to Thai economy
	Payments from Foreign Carriers	Payments from Thai Carriers
Landing and Storage Charges	Foreign exchange earnings for Thai economy	Transfer payments in Thai economy
Travel Costs Savings	Benefits to foreign countries	Benefits to Thai economy

Out of the benefits shown in **Table 20.4.1** the following benefits are quantified for the economic analysis of the Project.

1) Benefits from Passenger Service Charges
2) Benefits from Landing Charges, Storage Charges and Aviation Charges
3) Benefits from Commercial Activities in Passenger Terminal Building

Furthermore benefits from the related businesses have been assumed and the benefits of the Project including the benefits of those businesses have been estimated for the further analysis.

4) Benefits from Foreign Tourist Expenditures
5) Benefits from International Air Fares

(1) Passenger Service Charges

The international passenger charges paid by foreign international passengers are national income to Thai economy and the charges paid by Thai nationals are not regarded as national income, which are only transfer payments within the Thai economy. The international passenger charge is 200 Baht per embarking passenger including 7 % of the Value Added Tax.

In Phuket International Airport the share of foreign passengers is estimated at more than 99 % of the total international passengers Therefore the total incremental international passenger charges are included in the benefits of the Project. As Value Added Tax paid by foreign international passengers also contributes to national economy, Value Added Tax have not been eliminated from the benefits of the Project in the economic analysis.

(2) Landing Charges, Storage Charges and Aviation Charges

The payments of landing, storage and aviation charges to AAT by foreign carriers have been calculated as benefits. The share of foreign carriers has been estimated at 50 % of the total international flights based on the current share of the foreign carriers in the international aircraft movements at Phuket International Airport.

(3) Commercial Activities in Passenger Terminal Building

Foreign embarking passengers spend an average of 700 Baht per passenger at shops such as duty-free shops, souvenir shops, restaurants, etc. in the international passenger terminal building according to the Survey of JICA Study in August 1992. As the operating profits from those commercial activities is assumed to be 40 % of the total revenues as calculated in **Appendix 20.4.1**, 40 % of the foreign tourist expenditures in the passenger terminal building has been included in the benefits of the Project.

In order to avoid double counting of benefits, the benefits from rental fees for offices and real properties, service revenues and concession revenues for AAT are not included in the benefits.

The estimated benefits of the Project are shown in **Table 20.4.2**.

Table 20.4.2 Benefits of the Project

Unit: million Baht

Benefits from	1998	1999	2000	2001	2002	2003	2004
Passenger service	36.68	50.63	65.55	76.81	88.55	100.75	113.43
Landing & parking	9.28	12.42	15.55	19.34	23.13	26.91	30.70
Aviation bridge	0.77	1.02	1.28	1.53	1.78	2.02	2.27
Tourist expenditures in terminal building	51.35	70.88	91.77	107.53	123.97	141.05	158.80
Total	98.08	134.95	174.15	205.21	237.43	270.73	305.20

The benefits resulting from the expenditures by the increased foreign tourists and the international air fares paid by the increased passengers have been examined in the following section.

(4) Foreign Tourist Expenditures

Foreign tourists spend an average of 3,000 Baht per day excluding the payments for intentional transportation and the distribution of expenditures items is shown in **Table 20.4.3**.

Table 20.4.3 Distribution of Foreign Tourist Expenditure, 1990

Expenditure Items	Expenditure per tourist (Baht)	
Accommodations	690	23 %
Food & drinks	450	15 %
Shopping	1,170	39 %
Entertainment	240	8 %
Local transport & tour	390	13 %
Miscellaneous	60	2 %
Total	3,000	100 %

Source: Thailand Tourism Statistical Report 1990

The average stay of length for foreign tourists in Phuket Island is estimated at approximately 5.0 days based on the TAT's Reports in 1990 (4.9 days) and the Survey of JICA Study in 1992 (5.1 days).

The total tourist expenditures by the increased international passengers are projected to be 2,751 million Baht, 4,916 million Baht and 8,507 million Baht in 1998, 2000 and 2004 respectively. The increase in the regional incomes of Phuket through the incremental tourist expenditures will further encourage the development of tourism in Phuket.

In order to obtain profits from tourist expenditures, it is also required for the tourism sector to invest for the infrastructure developments such as accommodations, roads, water supply, telecommunications.

Therefore only some portion of tourist expenditure which is related to the airport development can be counted as the benefit of the Project. **Table 20.4.4** shows the foreign tourist expenditure and the contribution to the benefit of the Project based on the following assumptions.

1) 200 Baht of the expenditure for "Food & drinks" and 500 Baht of the expenditure for "Shopping" are the expenditures at passenger terminal building as mentioned above.
2) An amount of 700 Baht of "Local transport & tour" has been assumed to be spent for domestic air fare in Thailand

Table 20.4.4 Tourist Expenditure and Contribution to the Project per Foreign Tourist

Baht

Expenditure Items	Total expenditure per tourist	Contribution to the Project
Accommodations	3,450	0
Food & drinks	2,250	200
Shopping	5,850	500
Entertainment	1,200	0
Local transport & tour	1,950	700
Miscellaneous	300	0
Total	15,000	1,400

Source: Thailand Tourism Statistical Report 1990

The increase of the foreign tourist expenditure by the Project has been estimated at 1,400 Baht per tourist. As the expenditure for food & drink and entertainment have been included in the benefits from expenditures at the terminal building, they are excluded in order to estimate the benefits of other tourist expenditures. The net economic benefits of the increase of tourist expenditures have been assumed at 23 % of the total expenditure with consideration of input structure of transport sector in Thailand (see **Appendix 20.4.1**). The benefits of the Project in the foreign tourist expenditures have been estimated at 160 Baht per tourist.

(5) International Air Fare

The international air fares paid by international foreign passengers are regarded as a benefit of the Project. The air fares paid to the foreign carriers are the benefit to their countries, while the air fares paid to Thai carriers are the benefits to national economy of Thailand.

An average air fare per international passenger estimated at 13,000 Baht based on the distributions among the destinations of flights and 7 % of the air fares (rate of operating profits in Thai Airways International, 1991) is regarded as the benefits of the Project. The average air fare is calculated in **Appendix 20.4.2**. The share of foreign passengers who use the Thai carriers has been estimated at 50 % of the total international passengers.

Travel time savings are not included in the benefits because the incremental international passenger by the implementation of the Project are foreign passengers and the benefits of their time savings belong to the benefit of own countries of the passengers.

The benefits of the Project including the benefits from other tourist expenditures and air fares are shown in **Table 20.4.5**.