4.3.2.4 Apron Floodlighting

Four floodlight units will be installed between the apron and the terminal building. Each unit will be a combination of High Pressure Sodium Lamp and Metal Halide Lamp. Illuminance will comply with the Design Manual Part 4 and Annex 14 published by the ICAO. Power will be supplied via 415/240V, 3-phase, 4-wire lines from the switchgear house. Floodlights will be controlled from the administration office in the new terminal building. Floodlight poles will be steel pipes 18m in height with ladders to comply with the restriction requirements of the transitional surface of the secondary runway.

4.3.2.5 Taxiway Edge Lights

Taxiway edge lights will be installed on the new apron and taxiway. They will be an elevated type and their power will be supplied from the existing taxiway edge lights circuit. Due to the increase in the number of edge lights, it will not be possible to supply power from the existing 5 kVA TMS. This TMS will be replaced by a new 7 kVA TMS. Underground conduits will be installed under the taxiway for both the taxiway and the runway edge light circuits.

4.3.2.6 Runway Edge Lights

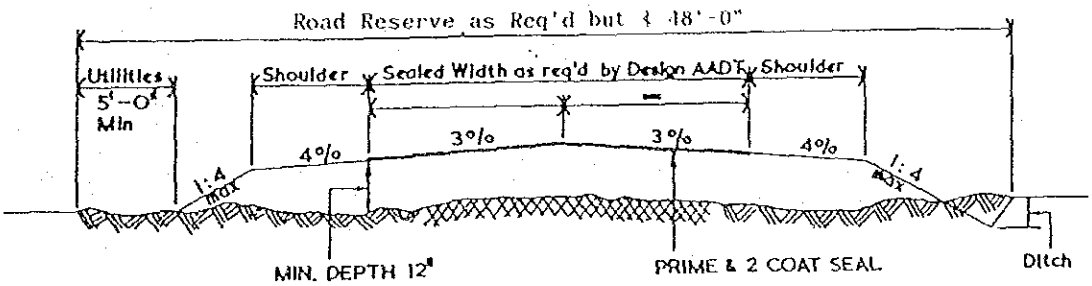
Owing to the provision of a new connecting taxiway, the existing runway edge lights (RE 77) will be altered to an inset type. A runway edge light cable will be re-routed through an underground conduit to be installed under the taxiway.

4.3.3 Road and Car Park

4.3.3.1 Layout Plan

The road at the curbside will have a design speed of 20km/hr and a design curve radius of 40m. The road will be of a one-way, dual-lane design because of the necessity for frequent decelerating, stopping and turning. The parking spaces in the car park will number approximately 200 on the basis of the peak-hour traffic survey, with vehicles parked at a 45° angle in the space (each 2.25m x 5.0m.) The road width will allow 3m for each lane and be provided with a 1.8m shoulder in accordance with standard cross sections of the Road Manual published by the Tongan Ministry of Works as shown in Fig 4.7. In front of the terminal building, the curbside road will have 4m wide stopping lane in addition to the dual lane, for a total 10m paved width with a 1.8m wide unpaved shoulder on the car park side. A single-lane road will be constructed with a paved width of 5.5m, with 0.5m shoulders on both sides, in accordance with the Japanese Airport Civil Engineering Design Standard. This width will allow passage of such large vehicles as fire fighting vehicles in addition to normal vehicles.

Fig. 4.7. Typical Cross Section of Road
(Ministry of Works)



Shoulder Width: As required by Design Traffic Volume but not less than 6'-0"

Sealed Pavement Width: As required by Design Traffic Volume but not less than 20'-0"

Ditch: Depth as required to provide longitudinal drainage

Slopes to Batters: 1:4 max. 1:6 preferred

Road Reserve Width: As required for pavements, shoulders, bus bays etc.

4.3.3.2 Sectional Planning

Based on the standard cross sections as shown in Fig 4.8, the transverse gradient of the road surface will be 3%, the shoulders 4%, and the car park surface 1.5%. The turfed area surrounding the car park will be used to absorb rainwater runoff from the road and car park

4.3.3.3 Pavement Design

On the basis of the subgrade CBR value of 6%, a total pavement thickness of 40cm is obtained by using Fig 4.8 of MOW's Road Manual. Using a CBR value of 30% for the coral materials of the selected fill, a combined thickness of 20cm for the surface course and the basecourse is obtained.

Many trunk roads in Tonga are built only by a basecourse of coral materials with a prime and two-coat seal of bitumen. Thus, this surface course will be adopted with a 20cm crushed coral rock upper basecourse. Below this a 20cm selected fill basecourse of coral materials will ensure adequate performance of the road. The pavement design for the car park and associated roads is as shown in Fig 4.9.

Fig. 4.8. Design Curves for Flexible Pavements
(Ministry of Works)

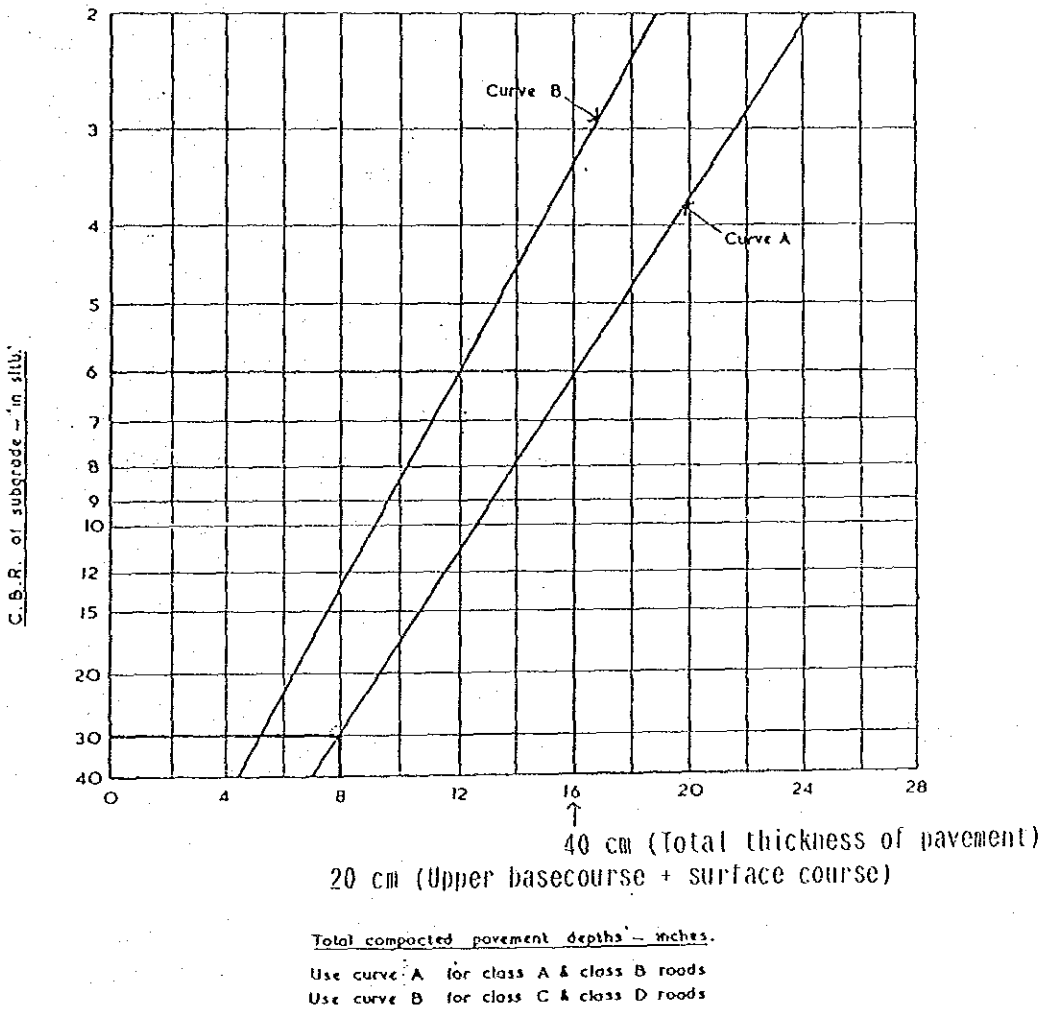
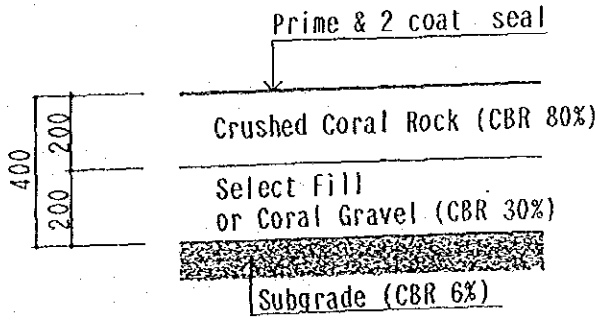


Fig. 4.9. Pavement Structure for Road & Parking
in the Basic Design



4.3.4 GSE Road

4.3.4.1 Layout Plan

The GSE road will be designed so that GSE can smoothly manoeuvre and transport baggage between the apron and the terminal building. The road width will be 10m which is the width currently used in Japan. It will approach the terminal building at a 45° angle with pavement fillet of 10m radius.

It is expected that GSE traffic between the existing and new terminal buildings will continue because the workshops and storage yard for GSE as well as the hangars for small aircraft are located in the vicinity of the existing terminal building. Consequently a 5.5m wide road linking both aprons will be constructed. This road will also serve as a taxiway for small aircraft using the secondary runway.

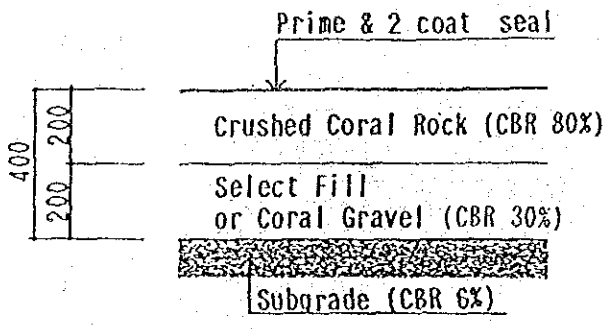
4.3.4.2 Sectional Planning

The same gradient (1.5%) as the car park will be adopted for GSE parking and manoeuvering suitability.

4.3.4.3 Pavement Design

A prime and 2 coat seal will be adopted on the 20cm base course of crushed coral rock and 20cm subbase course of coral materials, as shown in Fig 4.10.

Fig. 4.10. Pavement Structure for GSE Road in the Basic Design



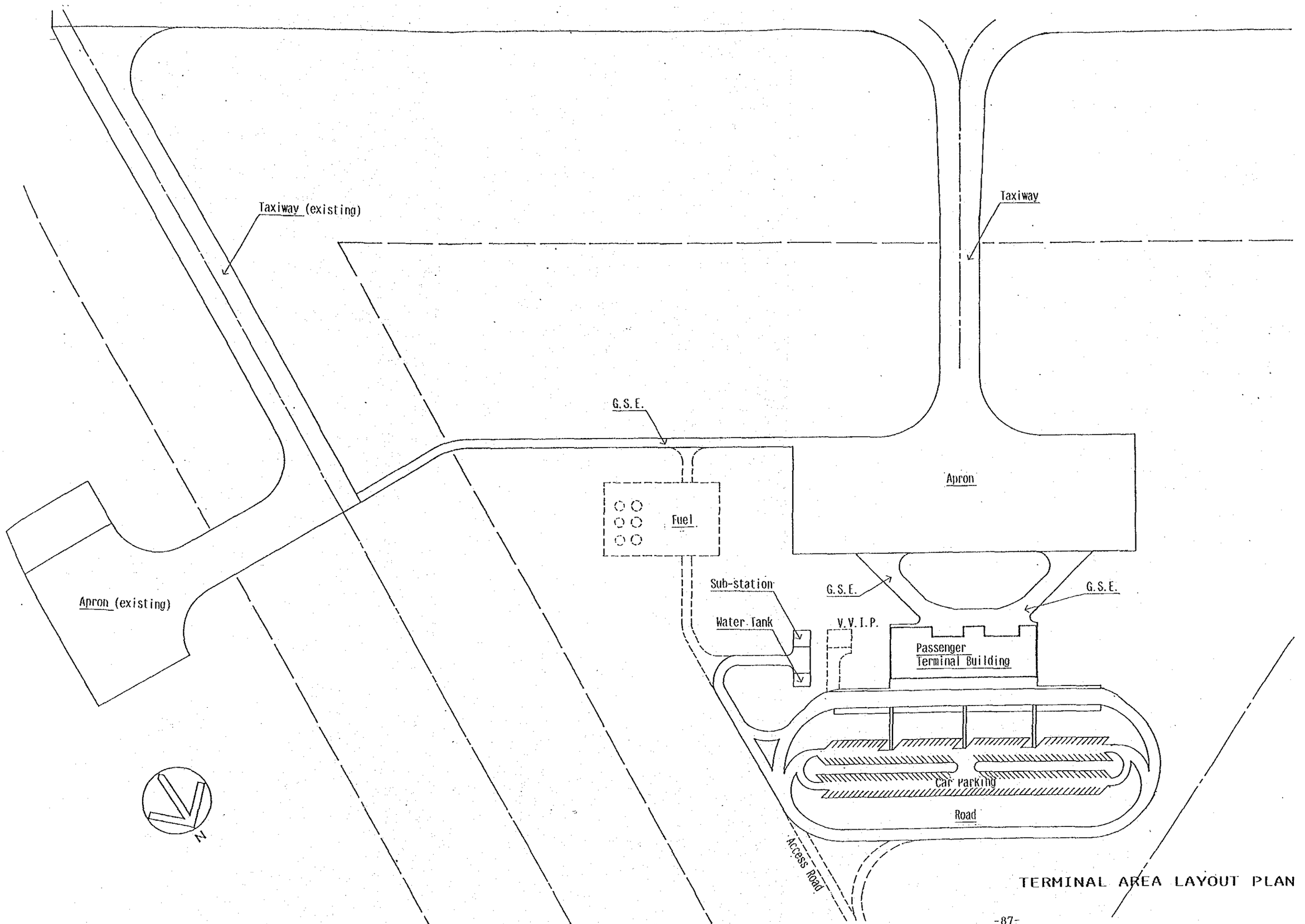
4.3.5 Car Park Lighting

High Pressure Sodium Lamps will be provided for the car park and associated roads. Average horizontal illuminence will be not less than 0.1 lux.

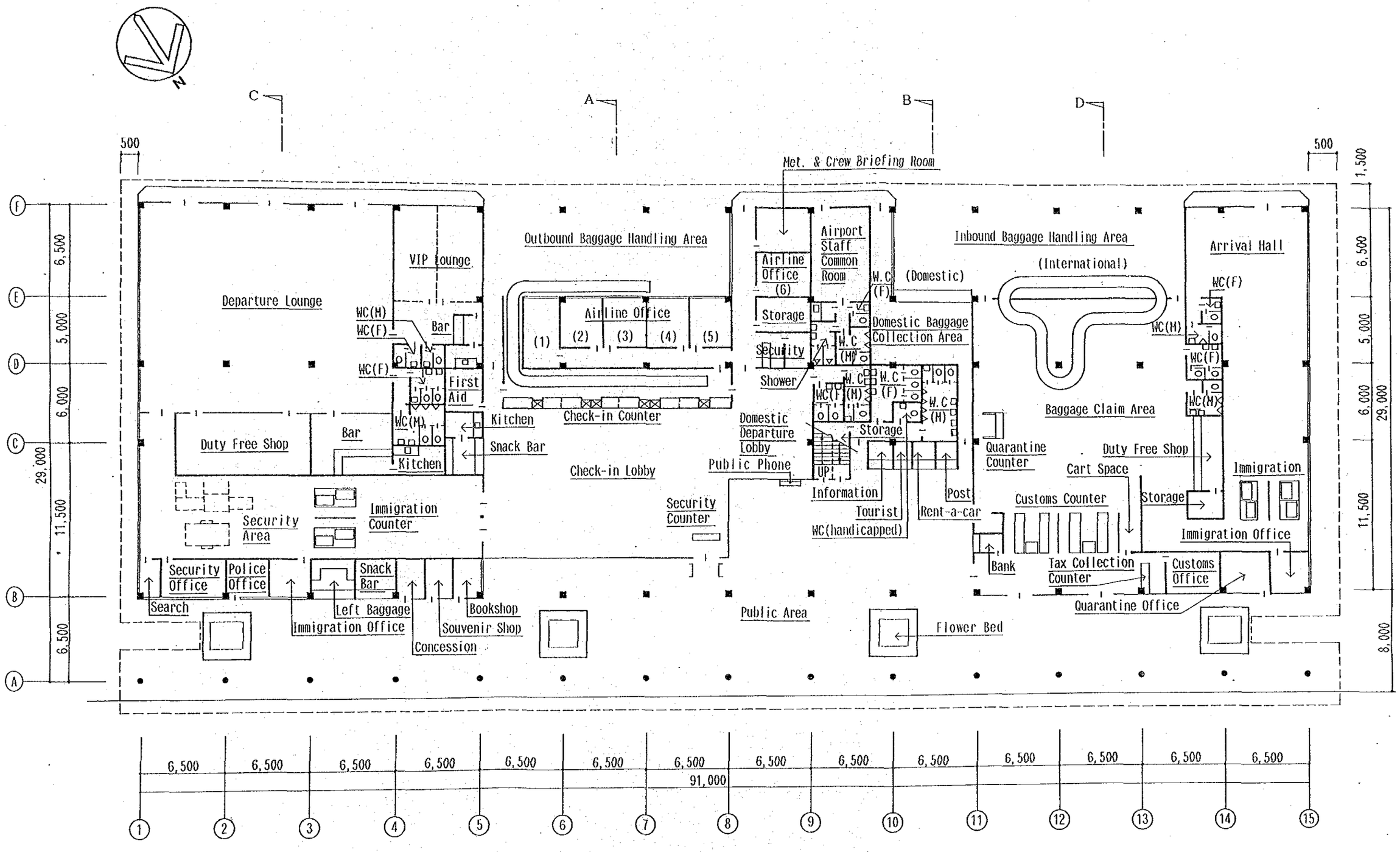
4.4 BASIC DESIGN DRAWINGS

The basic design drawings are listed below:

Terminal Area Layout Plan
Terminal Building Plan (Ground Floor)
Terminal Building Plan (First Floor)
Terminal Building Elevations
Terminal Building Sections
Electrical Plan
Water Supply and Sewerage Plan
Electrical Equipment Layout (Ground Floor)
Electrical Equipment Layout (First Floor)
Air Conditioner, Ceiling Fan and Ventilation Layout (Ground Floor)
Air Conditioner, Ceiling Fan and Ventilation Layout (First Floor)
Typical Cross Section (Sta. 550)

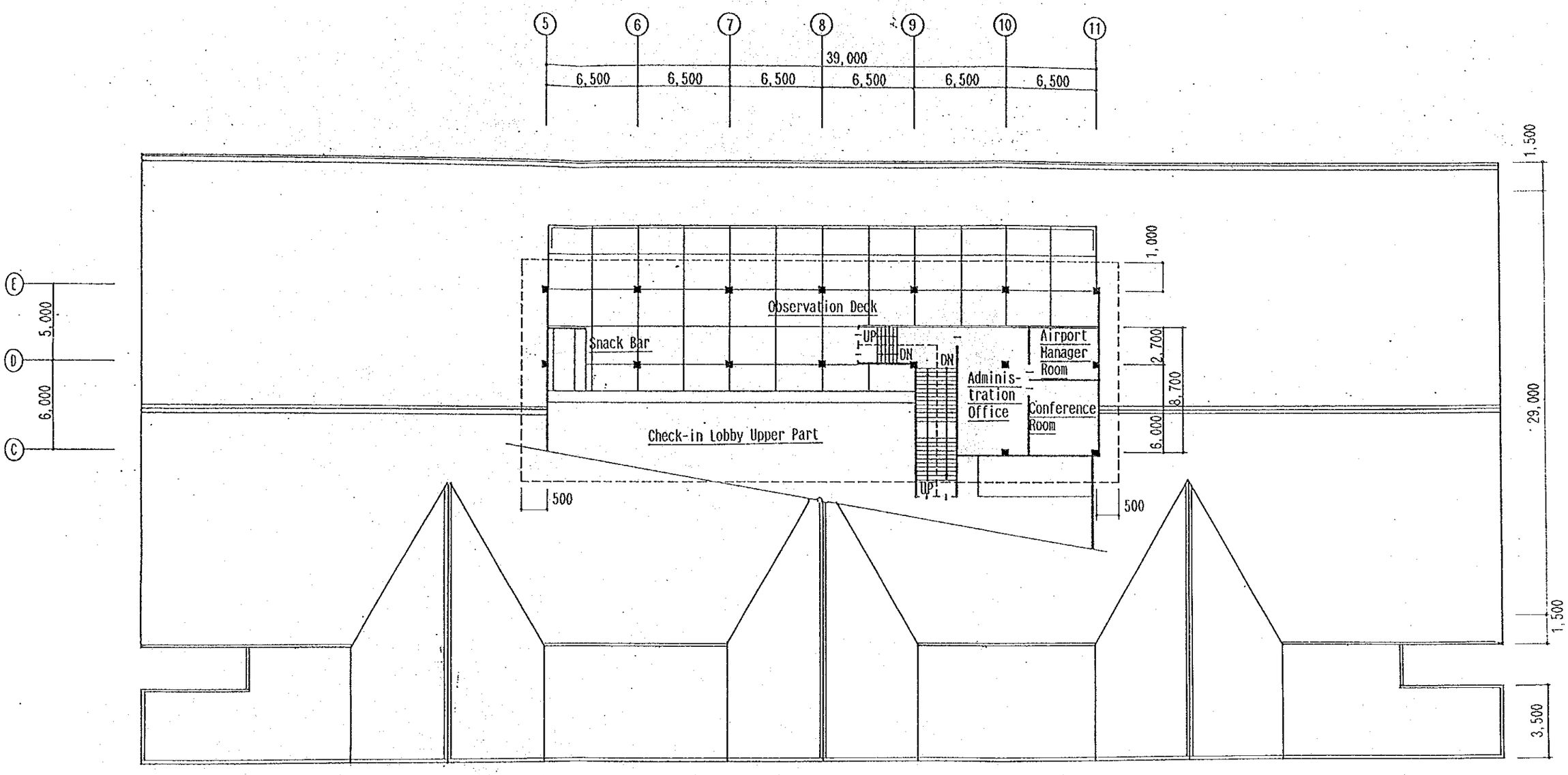


TERMINAL AREA LAYOUT PLAN



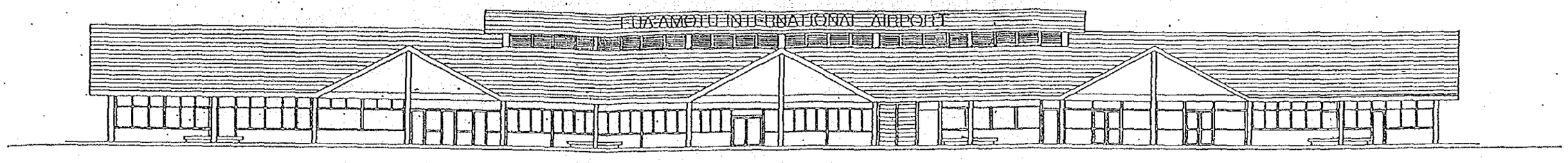
GROUND FLOOR PLAN

TERMINAL BUILDING PLAN (Ground Floor)

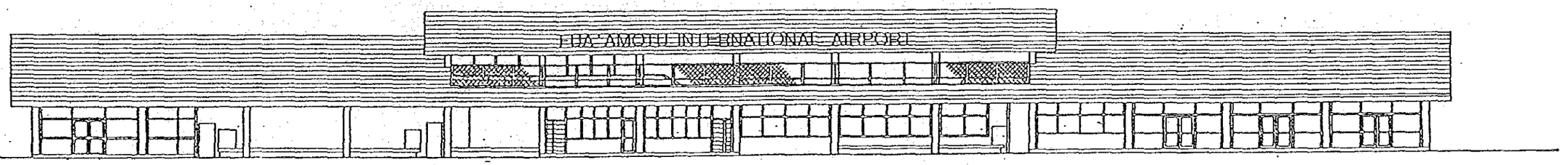


FIRST FLOOR PLAN

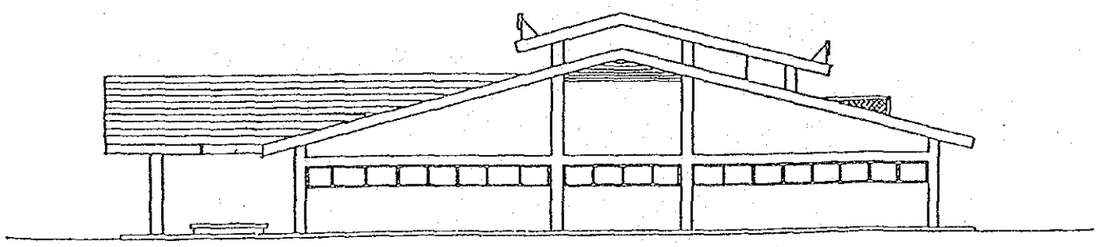
TERMINAL BUILDING PLAN (First Floor)



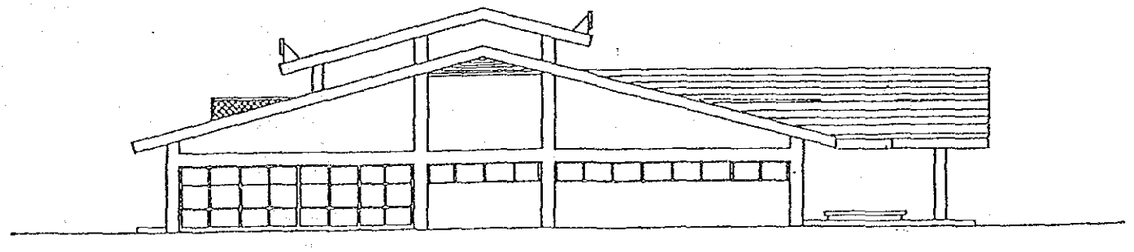
NORTH ELEVATION



SOUTH ELEVATION

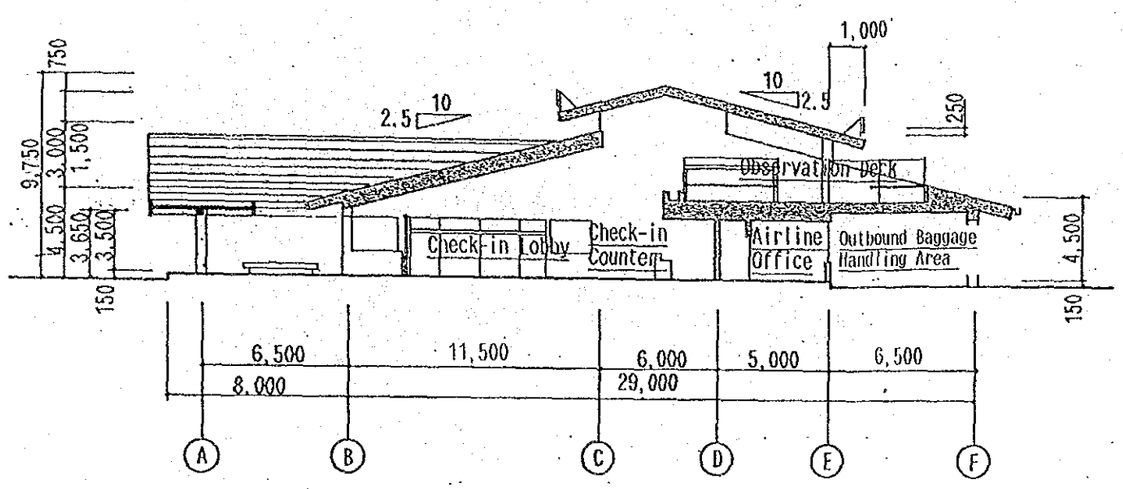


WEST ELEVATION

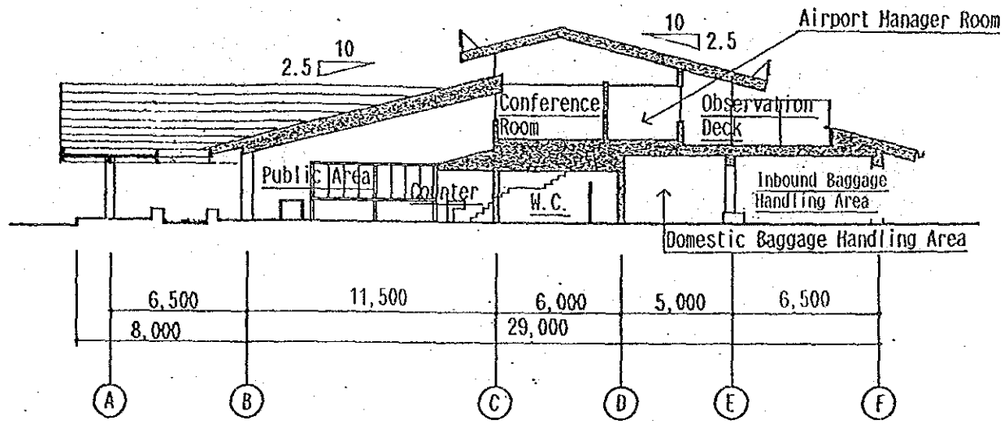


EAST ELEVATION

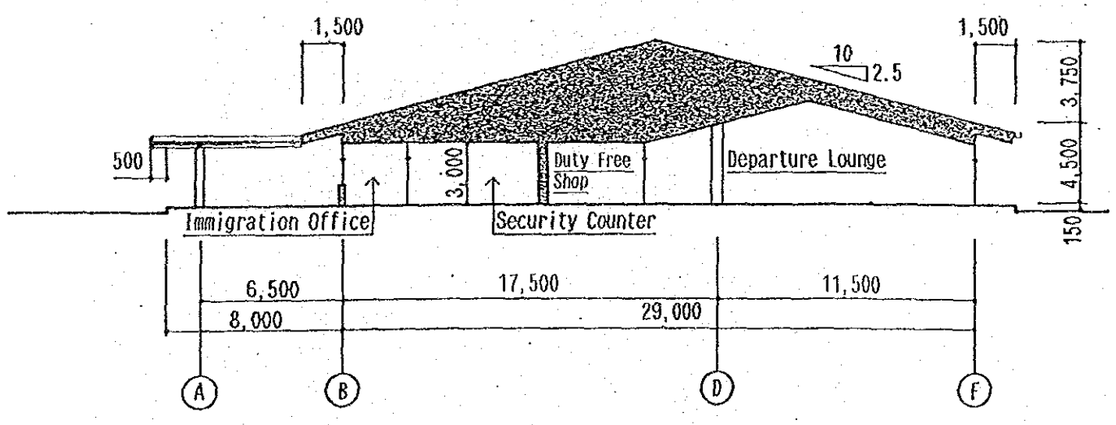
TERMINAL BUILDING ELEVATION



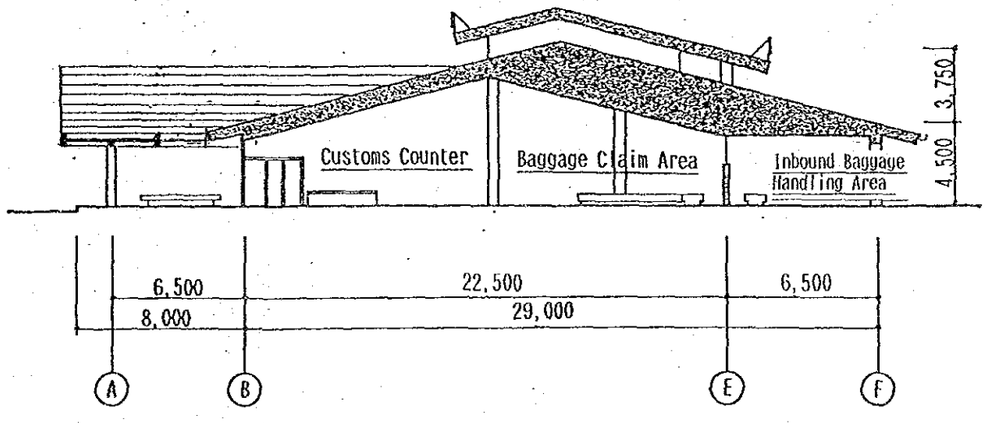
SECTION - A



SECTION - B



SECTION - C



SECTION - D

TERMINAL BUILDING SECTION

LEGEND

—E— Power Cable

—T— Telephone Line

Manhole

Apron Floodlight

Parking Area Light

Distribution Board

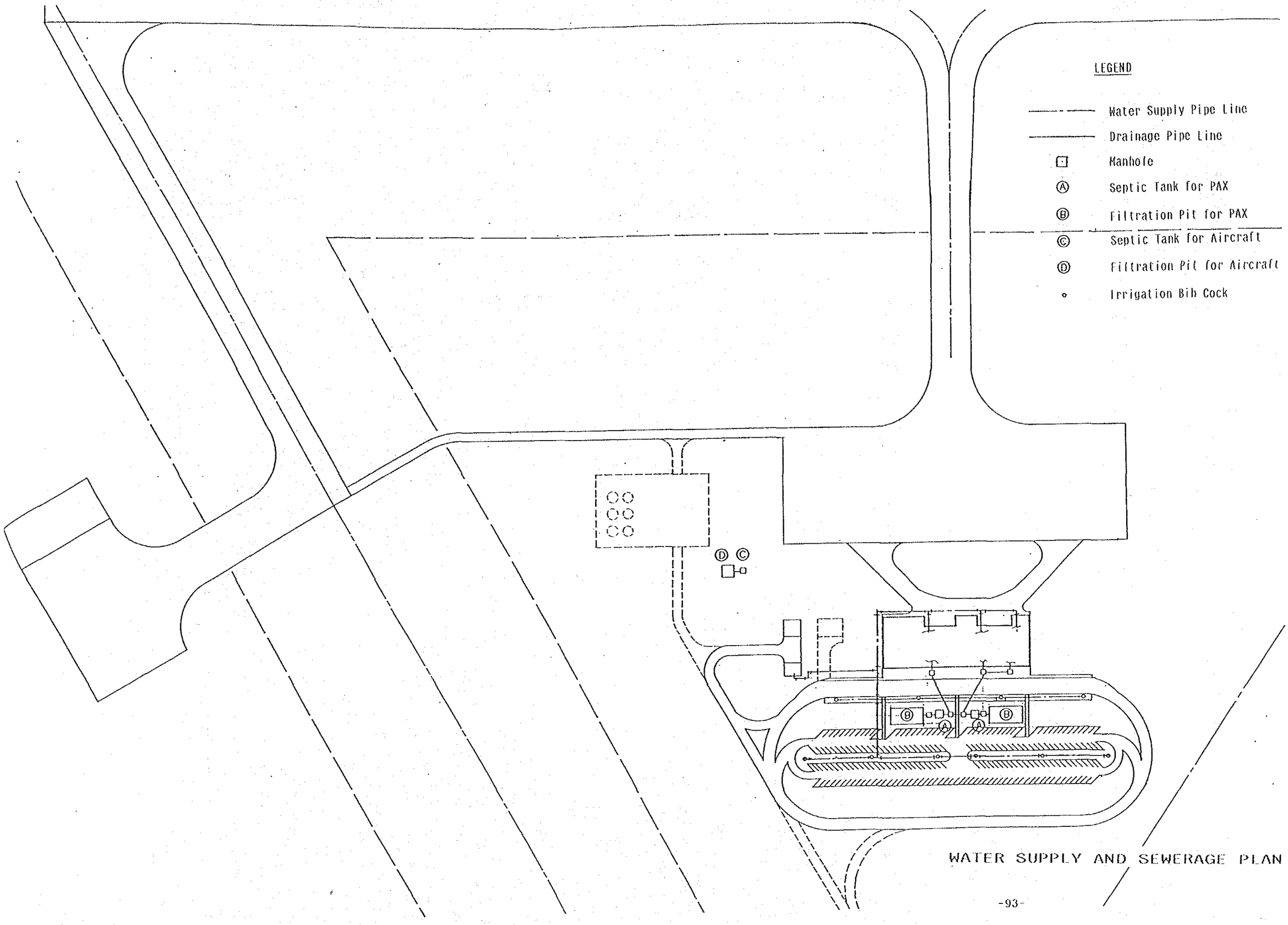
Terminal Board

Apron/Taxiway Edge Light

Telephone Incoming Line installed by Tonga

Electricity Incoming Line installed by Tonga

ELECTRICITY PLAN



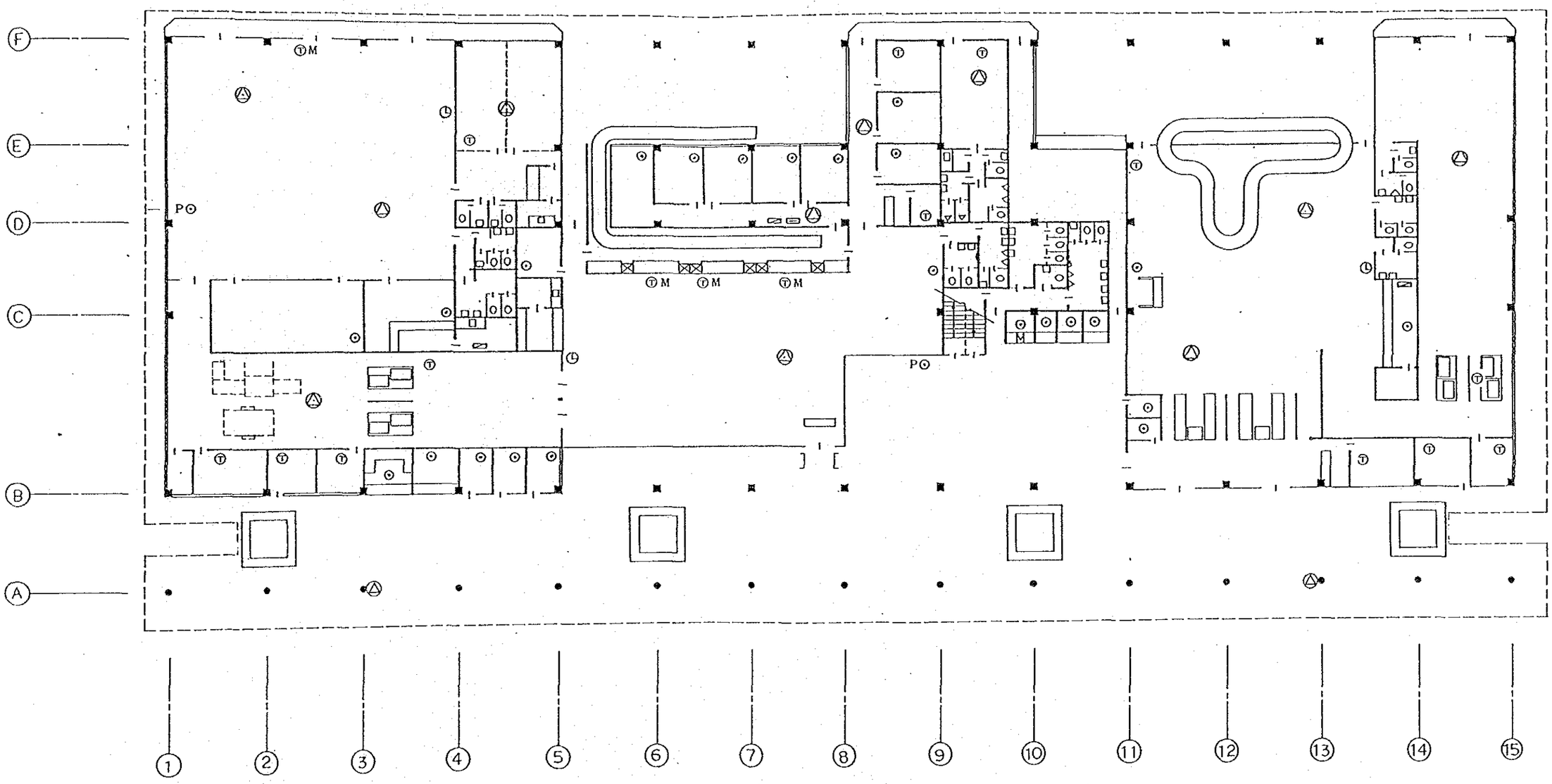
WATER SUPPLY AND SEWERAGE PLAN

LEGEND

- Distribution Board
- Terminal Board
- Telephone Outlet
- PO Public Telephone Outlet
- TM Telephone with Microphone
- T Telephone

LEGEND

- T Telephone PABX
- Master Clock
- Service Clock
- Speaker
- AMP Amplifier



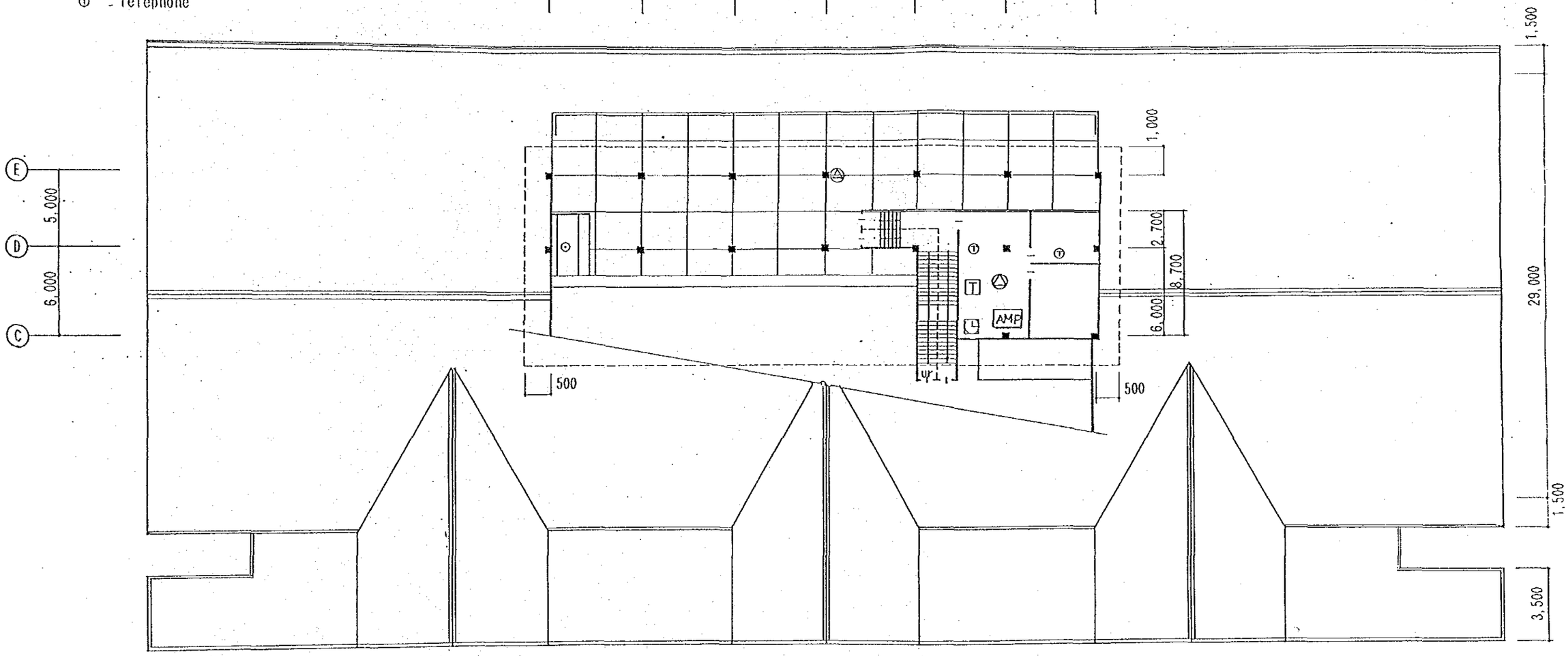
ELECTRICAL EQUIPMENT LAYOUT (Ground Floor)

LEGEND

- Distribution Board
- Terminal Board
- Telephone Outlet
- Public Telephone Outlet
- Telephone with Microphone
- Telephone

LEGEND

- Telephone PABX
- Master Clock
- Service Clock
- Speaker
- Amplifier



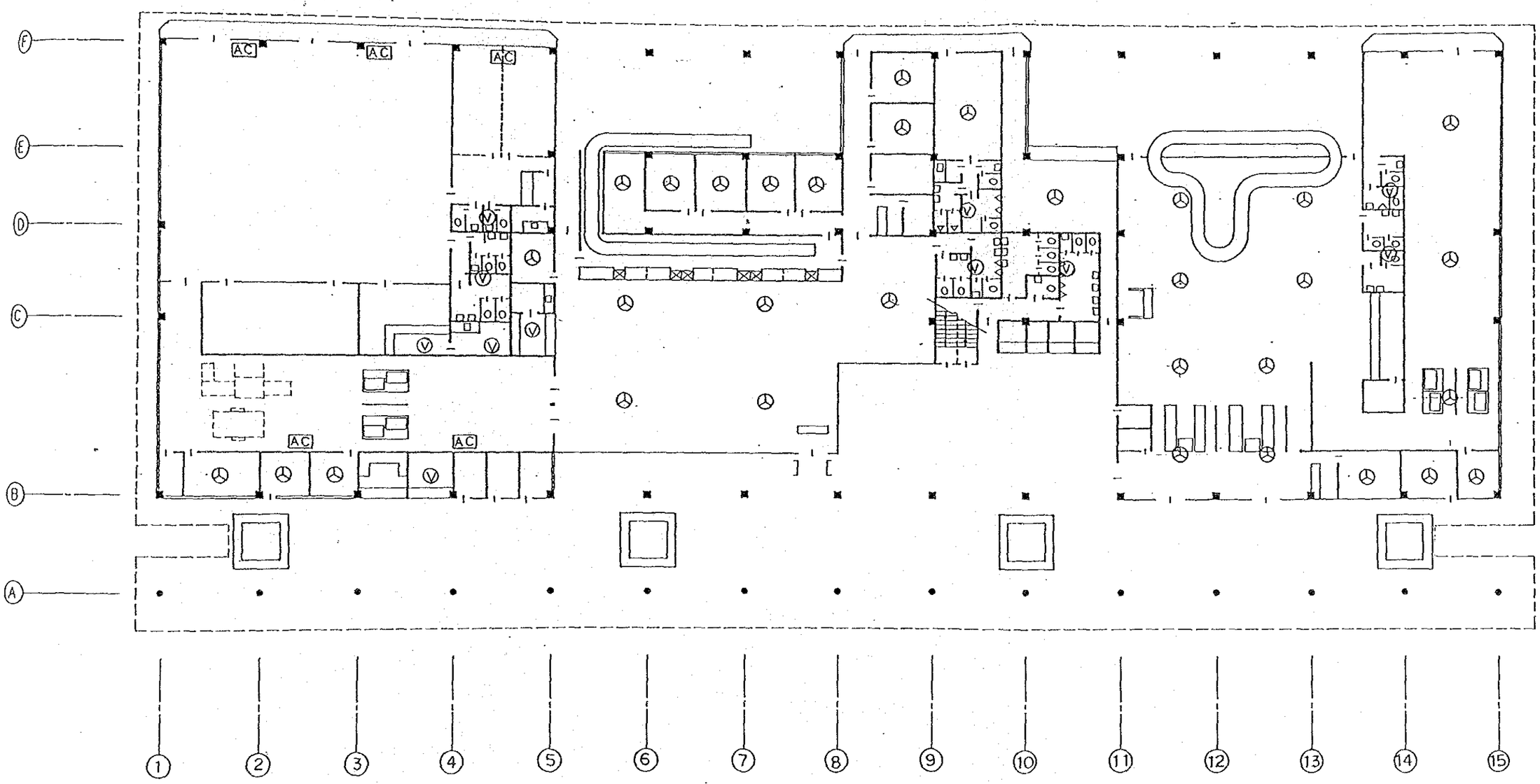
ELECTRICAL EQUIPMENT LAYOUT (First Floor)

LEGEND

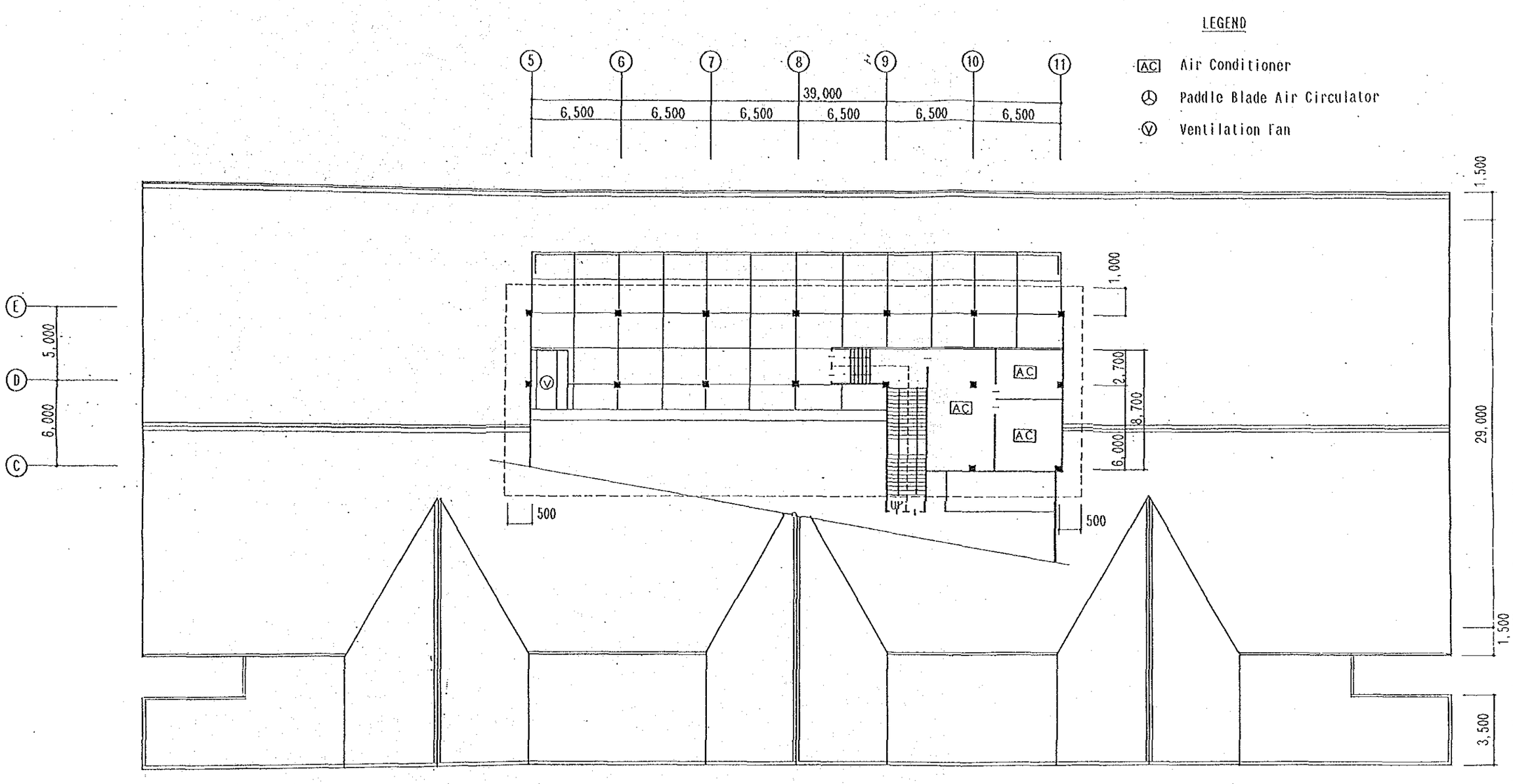
AC Air Conditioner

Paddle Blade Air Circulator

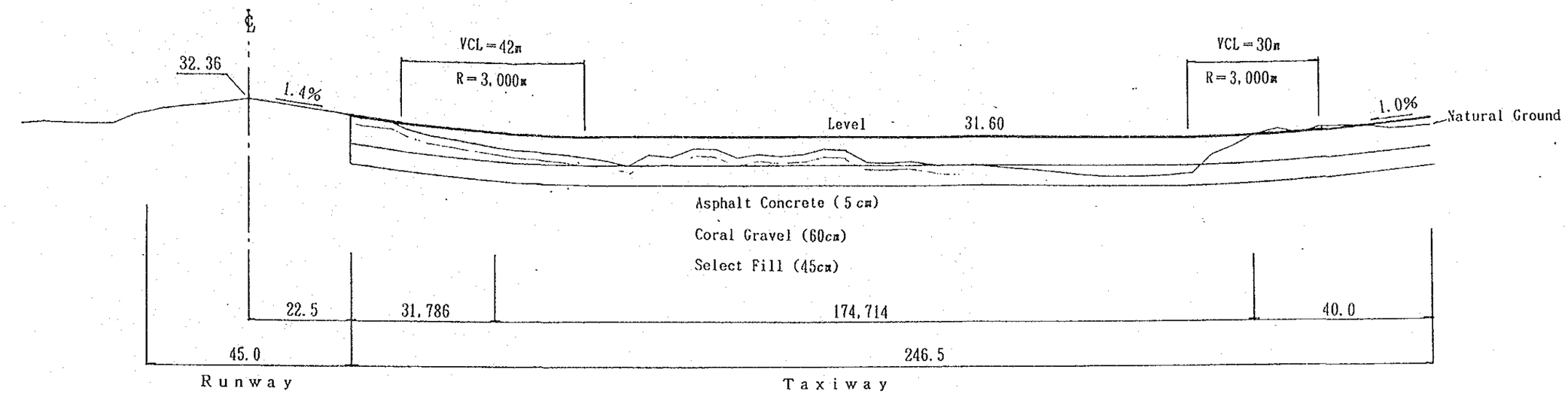
V Ventilation Fan

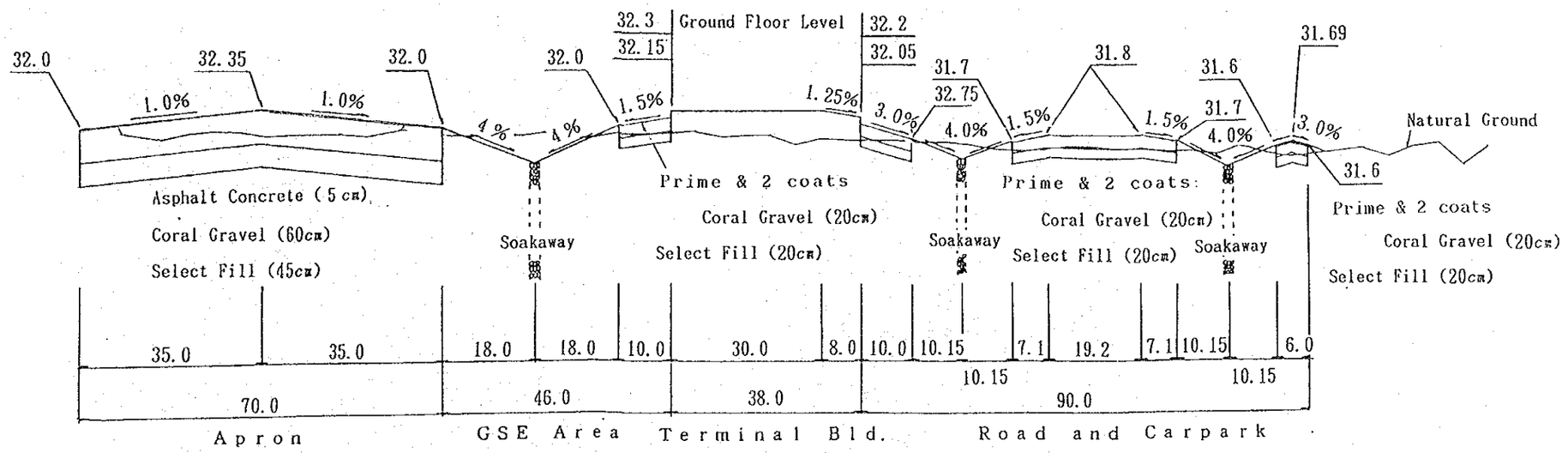


AIR CONDITIONER, CEILING FAN
and VENTILATION LAYOUT (Ground Floor)



AIR CONDITIONER, CEILING FAN
and VENTILATION LAYOUT (First Floor)





TYPICAL CROSS SECTION (Sta. 550)

CHAPTER 5. IMPLEMENTATION PROGRAMME

CHAPTER 5 : IMPLEMENTATION PROGRAMME

5.1 BASIS OF PROJECT IMPLEMENTATION

The Project will be implemented in accordance with the regulations of Japan's Grant Aid funding programme. After this Basic Design has been approved by the Government of Japan, Exchange of Notes for the Project will be mutually agreed upon between both the Governments of Japan and the Kingdom of Tonga. Project implementation can then proceed. A Japanese consultant will be selected by the Tongan government to carry out detailed design, preparation of tender documents, assistance in tendering, and construction supervision for the facilities and equipment to be provided. A contractor will also be selected among Japanese construction companies for the construction and provision of those facilities and equipment.

The executing agency for the Project is the Ministry of Civil Aviation, who will also be, upon completion of the Project, responsible for the management and maintenance of those facilities and equipment.

The Project will be implemented in the following two stages:

Stage 1 : Construction of new Terminal Building.

Stage 2 : Construction of Apron, Taxiway, Road and Car Park.
Provision of Ground Service Equipment (GSE)

5.2 SCOPE OF WORK

The scope of Japan's Grant Aid and the responsibilities of the Government of Tonga are shown on Table 5.1. The Government of Tonga will also be responsible for the following:

- to ensure prompt unloading and customs clearance of materials for the Project at the port of arrival in Tonga.

- to exempt from customs duties, internal taxes or other fiscal levies all goods to be imported in connection with the Project.

Table 5.1. Scope of Work (1)

Item	Scope of Japanese Side	Scope of Tongan Side
1. Preparation		- Site acquisition. (including temporary site) - Cutting grass & grading on site. (including temporary site) - Construction of access road to site from main road. - Supply & installation of temporary water supply pipe and electricity power cable to site.
2. Building Work (Terminal Building)		
2.1. Structure	- 1 Lump sum	—
2.2. Finishing	- 1 Lump sum (excluding items at right)	- Finishing work (incl. counter) and supply & installation of relevant equipment in the following areas/rooms. * Duty free Shop (♯) * Snack Bar & Kitchen (♯) * Bar (♯) * Concession, Bookshop and Souvenir Shop (♯) - Supply and installation of furniture excluding the following areas/rooms. * International Departure Lounge (chairs) * Domestic Departure Lounge (chairs) * Check-in Lobby (chairs) * Arrival Hall (chairs)

♯ Note: These rooms will be preliminarily finished by Japanese side.

Table 5.1. Scope of Work (2)

Item	Scope of Japanese Side	Scope of Tongan Side
2.3. Mechanical & Electrical		
2.3.1. Air conditioner & Ceiling Fan	- 1 Lump sum	—
2.3.2. Plumbing	- 1 Lump sum (excluding items at right)	- Supply & installation of water supply pipe to water tank.
2.3.3. Fire Fighting	- 1 Lump sum	—
2.3.4. Electrical	- 1 Lump sum (excluding items at right)	- Supply & installation of transformer (outdoor type, 200 kVA) adjacent to sub-station. - Supply & installation of electricity power cable to the above transformer.
2.3.5. Telephones	- 1 Lump sum (excluding items at right)	- Supply & installation of telephone line to PABX. - Supply & installation of telephone receiver for outside line in the following rooms. * Airline Office * Public Telephone * Duty Free Shop * Snack Bar * Concession * Information * Rent-a-car * Bank * Post Office

Table 5.1. Scope of Work (3)

Item	Scope of Japanese Side	Scope of Tongan Side
2.3.6. Equipment	- Supply & installation of the following equipment. * Belt conveyor * Baggage scale * Metal detector (portable type) * Sign board * Master Clock System	—
3. Civil Work (Apron, Taxiway, Road & Parking)	- 1 Lump sum	—
4. External Work	—	- Fencing - Landscaping - Other

5.3 IMPLEMENTATION SCHEDULE

The implementation schedule for the Project is shown in Fig 5.1, which is summarized as follows:

- approximately 5 months will be required for the consultant's detailed design and tendering procedure after the issuance of the Exchange of Notes up to awarding of the stage 1 contract.

- approximately 12 months will be required for the completion of Stage 1.

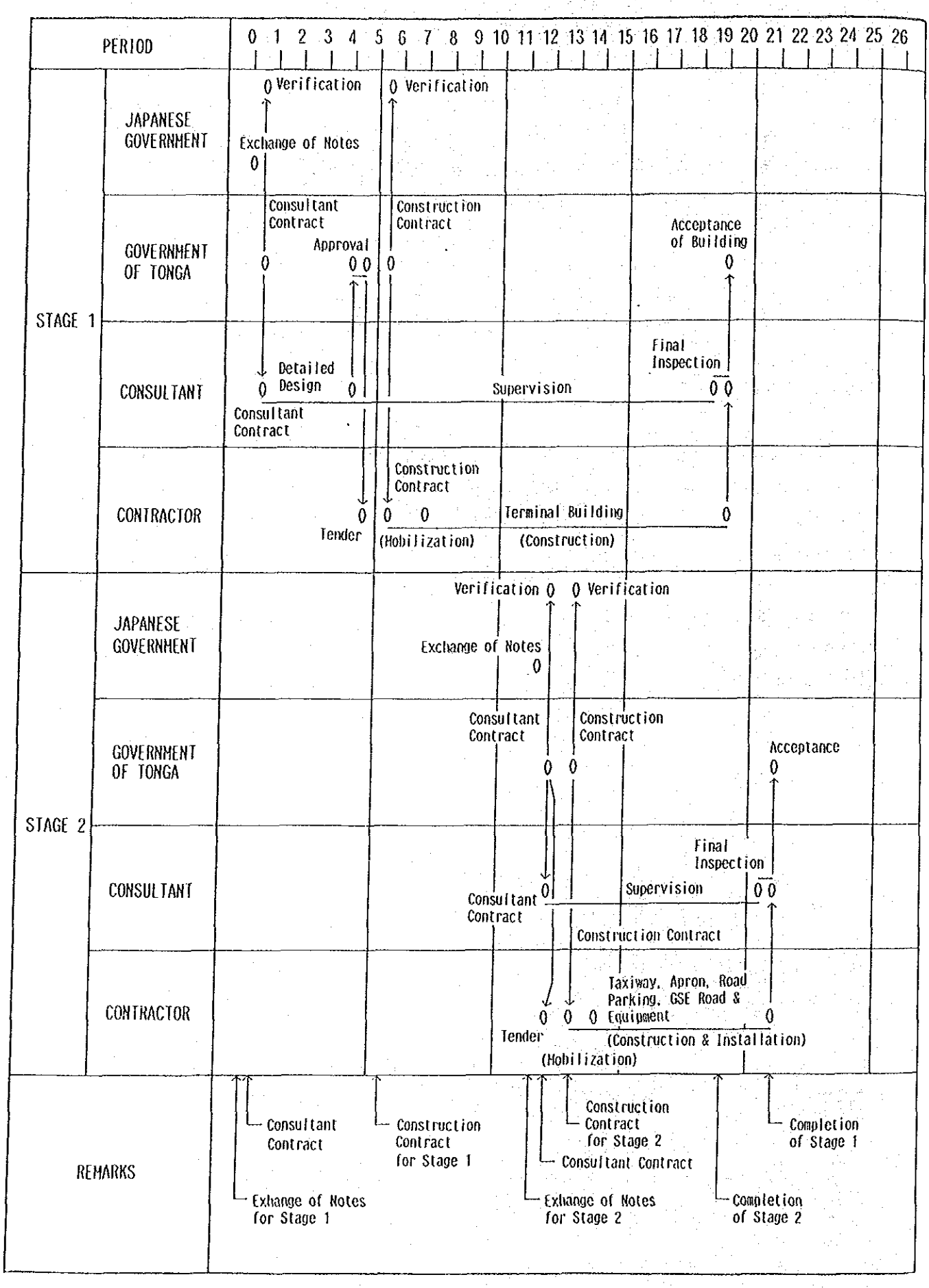
- approximately 7 months will be required for Stage 2

5.4 CONSTRUCTION PLANNING

Construction methods will be carefully planned to achieve smooth and locally-suitable execution, with due consideration given to the supply of materials and equipment and availability of the workforce, and also to avoid any disturbance to existing flight operations.

When the rainy season persists in Tonga, between November and April, careful attention shall be paid particularly to earthwork and preparation of foundation for any structures.

Fig. 5.1. Implementation Schedule



5.5 CONSULTANCY SERVICES

In accordance with the principles of Japan's Grant Aid programme and with the Basic Design, the consultant will organize a project team for detailed design, assistance in tendering, and construction supervision. During the construction supervision stage, the consultant will dispatch a resident engineer who is familiar with such service, and dispatch specialists from respective technical fields for short periods as required during the progress of the work.

5.5.1 Policy of the Services

5.5.1.1 Schedule Control

Close coordination will be maintained between Japanese and Tongan officials in an effort to ensure that the facilities are completed without delay in accordance with the implementation schedule. The contractor's schedule control will be closely monitored from time to time.

5.5.1.2 Quality Control

The construction will be supervised to ensure that all work completed by the contractor is in accordance with technical specifications. Attempts will be made to achieve technology transfer related to construction methods and skills.

5.5.1.3 Other

Local officials will be advised and trained for the management, operation and maintenance of the facilities and equipment to be provided.

5.5.2 Scope of Consultancy Services

5.5.2.1 Detailed Design

On the basis of the Basic Design, the consultant will specify every detail of the facilities and equipment to be provided and produce their detailed drawings and technical specifications.

5.5.2.2 Assistance in Tendering

The consultant will decide the type of contract to be used, prepare the contract documents, review tenders, select a contractor to perform the work and witness the signing of the contract.

5.5.2.3 Review and Approval of Shop Drawings and Material Samples

The consultant will review shop drawings and material samples to be submitted by the contractor.

5.5.2.4 Reports

The consultant will submit the report on the progress of the Project to both Japanese and Tongan officials.

5.5.2.5 Assistance in Payment Progress

The consultant will check the contractor's invoice, issue statements of work performance, process the progress payment applications from the contractor, and assist in expediting the payments.

5.5.2.6 Inspection of Works

The consultant will regularly inspect the work and issue instructions to the contractor where necessary in order to confirm that all of the work proceeds in accordance with the technical specifications. The consultant will attend the final inspection of facilities by Tongan officials and will receive from the Tongan officials a final confirmation of acceptance of the facilities.

5.6 PROCUREMENT PLANNING OF MATERIALS AND EQUIPMENT

As a basic principle of the procurement planning, local resources and locally available materials and equipment will be used as much as possible. Where necessary, imports will have to be used.

5.6.1 Locally Available Materials and Equipment

The following materials and equipment will be procured locally:

Materials	Equipment
sand	dump trucks
gravel	excavator (small)
	small equipment

5.6.2 Imported Materials and Equipment

The following materials and equipment will be imported. The anticipated countries of origin are given in brackets.

(a) Materials
- steel structures and other main building materials (Japan)
- cement, reinforcing bars, mechanical and electrical materials, other building materials (New Zealand, Australia, etc.)

(b) Equipment
- concrete batching plant (Japan)
- asphalt plant (Japan)
- cranes (Japan)
- bulldozers (NZ, Australia, etc.)
- backhoes (NZ, Australia, etc.)
- motor graders (NZ, Australia, etc.)
- rollers (NZ, Australia, etc.)
- other (NZ, Australia, etc.)

In order to minimize customs clearance procedures in Tonga, close coordination with officials concerned of the Government of Tonga will be maintained.

5.7 MAINTENANCE COSTS

The whole revenue of the Ministry of Civil Aviation depends on Fua'amotu International Airport. The revenue was T$ 423,787.68, while the expenditure was T$ 481,901.99 according to "Ministry of Civil Aviation Financial Report, July 1986 - June 1987". The expenditure exceeded by T$ 58,114.31. The expenditure of Fua,amotu International Airport was T$ 357,405.15, and the proportion was 74% of the total expenditure of the Ministry of Civil Aviation.

Although the number of present airport staff is 66 in Fua'amotu International Airport, approximately 110 staff will be required after the completion of the project.

Required cost for management and maintenance of the airport is estimated as follows:

Staff Remuneration	T$ 350,000
Electricity/Telecommunications/Consumables etc.	T$ 60,000
Maintenance	T$ 190,000
Others	T$ 60,000
Total	T$ 660,000

On the other hand, the assumed airport revenue to meet the forecasted demand in 1996 is estimated as follows:

Aircraft Landing Fee	T$ 290,000
Airport Tax	T$ 250,000
Concession	T$ 60,000
Others	T$ 170,000
Total	T$ 770,000

These figures show an adequate condition of financial affairs of the airport that airport revenue will barely exceed its expenditure.

5.8 PROJECT COSTS by the Government of Tonga

Costs of the works to be carried out by the Government of Tonga are estimated as follows:

(A) Site Preparation:	
(1) Clearance and Levelling 251,000 m^2	$50,000
(2) Security Fence 840m	$25,000
(B) Access Road:	
Highway Standard 1.6km	$200,000
(C) Electric Power:	
2080m lead	$77,000
(D) Water Supply:	$16,300
(E) Telephones:	
500m lead	$1,500
Total Estimated Cost	$370,000

CHAPTER 6. PROJECT EVALUATION

CHAPTER 6 : PROJECT EVALUATION

The Project comprises a substantial part of the overall development project of Fua'amotu International Airport which includes strengthening and extension of the runway, construction of a control tower, and provision of other required airport facilities and equipment.

The existing terminal building facilities have become superannuated and cannot even cope with present demand; in addition, space for future expansion is very limited. This results in an impediment to the future development of the tourism industry which has been identified as one of the major objectives of the Fifth Five-Year Development Plan. Implementation of this Project will bring the airport such necessary revenues as aircraft landing/parking fees from the airlines, floor space rental fees from concessionaires, entry fees for the observation deck and car park from the publics, as well as the departure tax from passengers. This will contribute to the safe and sound operation and maintenance of the airport, and preparation for future renovation and expansion. Furthermore, implementation of this Project will establish facilities capable of handling the anticipated increase in international tourists coming to the Kingdom, which is a basic prerequisite for development of the tourism industry.

Development of the tourism industry will not only increase foreign exchange income but will also stimulate other industries and contribute to the total economic development of the Kingdom.

Hence, the implementation of the Project is considered to be highly significant for the Kingdom.

CHAPTER 7. CONCLUSION AND RECOMMENDATIONS

CHAPTER 7 : CONCLUSION AND RECOMMENDATIONS

7.1 CONCLUSION

The Project involves construction of a new terminal building, apron, taxiway, road and car park, and provision of GSE at the Fua'amotu International Airport in the Kingdom of Tonga. Implementation of the Project will considerably improve not only the terminal capacity but the overall airport capacity by providing a new terminal building in a convenient location with flexibility for future expansion. Through the improvement of airport facilities to meet present and future demands, the Project will make a great contribution to the development of the national economy through the development of the tourism industry which is a major foreign exchange earner. Implementation of this Project under the Japanese Grant Aid programme will furnish a very positive stimulus for the economic advancement of the Kingdom.

7.2 RECOMMENDATIONS

(a) The Tongan government will be responsible for construction of the access road and provision of utilities (water, electricity and telephone) to the site. Re-fuelling facilities will have to be constructed by private companies such as Shell and British Petroleum. Continual and effective coordination between those parties concerned will be necessary to ensure smooth implementation from the budget allocation stage, through the detailed design, up to completion of the Project.

(b) Effective coordination to ensure proper interfacing with projects being implemented by other donor countries should be maintained.

(c) Planning and design of the facilities and equipment has been done so that minimal maintenance is required after completion. However, to ensure long-term operation, periodic maintenance is indispensable. It is therefore recommended that the Tongan government take positive action to arrange for suitable staff and allocate the necessary budget for maintenance.

(d) As asphalt concrete will be adopted for the apron pavement surface, strict instructions should be issued to the airlines and fuel companies to promptly clean up any spilt fuel or lubricants from the pavement surface because this could possibly lead to its premature deterioration. Deterioration could also be caused to sections of the asphalt pavement surfaces that remain out of use for considerable periods. The airport authority is advised to run vehicles over these sections to maintain them in satisfactory condition.

(e) Upon being notified of the date on which the new terminal complex will become operational, the airport authority should act promptly to secure the necessary staff and arrange for their accommodation and training.

APPENDICES

APPENDIX-A

ORGANIZATION OF THE STUDY TEAM

A.1. Survey (23 Jan.-17 Feb. 1989)

Mr. Koh Hasegawa (Team Leader)	Advisor Environmental Division Aerodrome Department Civil Aviation Bureau Ministry of Transport
Mr. Hiroshi Shiono (Coordinator)	Grant Aid Planning and Survey Department JICA
Mr. Hiroaki Seki (Airport Planning Engineer)	Japan Airport Consultants, Inc.
Mr. Haruhisa Yamaguchi (Airport Architect)	Japan Airport Consultants, Inc.
Mr. Akira Ichige (Building Services Engineer)	Japan Airport Consultants, Inc.
Mr. Tadashi Aoi (Airport/Civil Engineer)	Japan Airport Consultants, Inc.
Mr. Hideaki Iida (Estimator)	Japan Airport Consultants, Inc.

A.2. Explanation of Draft Final Report (16 Apr.-27 Apr. 1989)

Mr. Koh Hasegawa (Team Leader)	Advisor Environmental Division Aerodrome Department Civil Aviation Bureau Ministry of Transport
Mr. Tetsuji Tamagoshi (Coordinator)	Official Policy Division International Transport and Tourism Bureau Ministry of Transport
Mr. Hiroaki Seki (Airport Planning Engineer)	Japan Airport Consultants, Inc.
Mr. Haruhisa Yamaguchi (Airport Architect)	Japan Airport Consultants, Inc.
Mr. Tadashi Aoi (Airport/Civil Engineer)	Japan Airport Consultants, Inc.

APPENDIX—B

STUDY ITINERARY

B.1. Survey

Jan 23	Mon	11:55 Messrs. Hasegawa/Shiono/Seki/Yamaguchi/Aoi departed Narita flight FJ 303. Arrived Nadi 23:25.
Jan 24	Tue	07:30 Departed Nadi flight FJ 107. Arrived Suva 08:00. Visited JICA office and Japanese Embassy. Explained purpose of study. Visited SPEC. Obtained information on economic co-operation with Tonga and training programmes.
Jan 25	Wed	07:00 Departed Suva flight FJ 400. Arrived Tongatapu 09:50 Explained content of Inception Report at Ministry of Civil Aviation. Submitted a questionnaire.
Jan 26	Thur	Discussed Tongan government budget allocations with officials at Ministry of Finance. Discussed location of project site and facilities required at Ministry of Civil Aviation.
Jan 27	Fri	Commenced site survey. Gathered information at Central Planning Board on future air transportation and tourism trends. Held discussions at Ministry of Civil Aviation on size of terminal building and apron. Investigated existing terminal building.

Jan 28	Sat	Studied arrangement of general facilities.
		Studied arrangement of terminal building facilities.
Jan 29	Sun	20:30 Messrs. Iida/Ichige departed Narita flight TE 034.
		Mr. Hasegawa and other 4 members of team held discussions and reviewed data collected.
Jan 30	Mon	Messrs. Iida/Ichige arrived Auckland 10:15. Obtained information on availability of materials and equipment.
		Mr. Hasegawa and other 4 members paid courtesy call on Ministry of Foreign Affairs.
		Discussed arrangement of general facilities at Ministry of Civil Aviation.
Jan 31	Tue	08:15 Messrs. Iida/Ichige departed Auckland flight TE 072. Arrived Tongatapu 11:15
		Mr. Hasegawa and other 6 members discussed contents of Minutes of Discussion at Ministry of Civil Aviation.
Feb 1	Wed	Commenced soil investigation.
		Held final discussions on above-mentioned Minutes. Signed document.
		22:10 Messrs. Hasegawa/Shiono departed Tongatapu flight FJ 407. Arrived Suva 23:20.
Feb 2	Thur	Messrs. Hasegawa/Shiono visited JICA office and Japanese Embassy. Provided interim briefing on study.

		Mr. Seki and other 4 members conducted site investigation of terminal facilities and navigational facilities.
Feb 3	Fri	Messrs Hasegawa/Shiono departed Suva for Narita. Flights FJ 122/ FJ 914/ QF 021.
		Mr. Seki and other 4 members carried out check on existing ground handling equipment.
		Traffic count and other checks at airport (18:00-24:00)
Feb 4	Sat	06:10 Messrs. Hasegawa/Shiono arrived Narita.
		Mr. Seki and other 4 members studied arrangement of general facilities.
Feb 5	Sun	Data Review
Feb 6	Mon	Checked power generator
		Collected data and information on construction materials and other matters at Ministry of Works.
Feb 7	Tue	Collected data and information on utilities at Electric Power Board, Telecommunications Commission and Water Board.
Feb 8	Wed	Studied planning of facilities.
Feb 9	Thur	Studied planning of facilities.
Feb 10	Fri	Held discussions on planning of facilities and ground handling equipment at Ministry of Civil Aviation.

Feb 11	Sat	11:00 Messrs. Iida/Ichige departed Tongatapu flight TE 081. Arrived Auckland 14:05. Mr. Seki and other 2 members studied planning of facilities.
Feb 12	Sun	Data review.
Feb 13	Mon	Messrs. Iida/Ichige collected information on construction materials, etc., and obtained design standard codes. Mr. Seki and 2 other members reviewed data.
Feb 14	Tue	07:30 Messrs. Iida/Ichige departed Auckland flight QF 034. Arrived Melbourne 09:15. Collected data and information on construction materials, etc. Mr. Seki and other 2 members held final discussions at the Ministry of Civil Aviation. Minutes of Meeting signed.
Feb 15	Wed	07:45 Messrs. Iida/Ichige departed Melbourne flight AN 076. Arrived Sydney 09:00. At JICA offices, explained study to representatives of AIDAB. Obtained information on policy and content of Australian aid. 12:55 Mr. Seki and other 2 members departed Tongatapu flight PH 743/QF 044. Arrived Sydney 17:45
Feb 16	Thur	10:25 Mr. Seki and other 2 members departed Sydney flight JL 772. Arrived Narita 17:45 Messrs. Iida/Ichige discussed interfacing with ACCA.
Feb 17	Fri	10:25 Messrs. Iida/Ichige departed Sydney flight JL 772. Arrived Narita 17:45.

B.2. Explanation of Draft Final Report

Apr 16	Sun	11:00 Messrs. Hasegawa/Tamagoshi/Seki/Yamaguchi/Aoi departed Narita flight UA 822. Arrived Honolulu 23:00.
Apr 17	Mon	14:35 Departed Honolulu flight HA 461. Arrived Tongatapu 21:55.
Apr 18	Tue	Submitted Draft Final Report and explained content at Ministry of Civil Aviation. Carried out supplementary investigation at Fua'amotu International Airport.
Apr 19	Wed	Discussed content of Draft Final Report at Ministry of Civil Aviation.
Apr 20	Thu	Ditto
Apr 21	Fri	Discussed content of Minutes of Discussion at Ministry of Civil Aviation.
Apr 22	Sat	Held meeting with team members
Apr 23	Sun	Ditto
Apr 24	Mon	Visited Ministry of Foreign Affairs and confirmed budget allocations for the project of construction of new terminal facilities at Fua'amotu International Airport. Signed Minutes of Discussions at Ministry of Civil Aviation. 20:35 Mr. Hasegawa and other 4 members departed Tongatapu flight FJ 401. Arrived Suva 21:45.

Apr 25	Tue	8:30 Mr. Aoi departed Suva flights FJ 108/QF 094/ AN 023. Arrived Melbourne 16:15.
		Mr. Hasegawa and other 3 members visited JICA office and Japanese Embassy. Submitted Draft Final Report and explained the content.
		19:00 Messrs. Seki and Yamaguchi departed Suva flight FJ 710. Arrived Brisbane 23:50
Apr 26	Wed	10:30 Messrs. Hasegawa and Tamagoshi departed Suva flights FJ 108/TE 23. Arrived Narita 17:45.
		Messrs. Seki and Yamaguchi visited Riedel and Byrne Consulting Engineers office in Brisbane. Held a discussion on foundation of terminal building. 12:00 departed Brisbane flight AN 021. Arrived Sydney 13:20
		Mr. Aoi visited head office of ACCA in Melbourne and held a discussion on interconnection between basic design of new terminal facilities and master plan for improvement of Fua'amotu International Airport. 13:00 departed Melbourne flight AN 018. Arrived Sydney 14:10.
		Messrs. Seki/Yamaguchi/ Aoi visited JICA office and explained content of Draft Final Report.
Apr 27	Thu	9:30 Messrs. Seki/Yamaguchi/Aoi departed Sydney flight JL 772. Arrived Narita 18:00.

APPENDIX—C

LIST OF PERSONNEL VISITED

(a) EMBASSY OF JAPAN, FIJI

Mr. Toshio Isogai	Ambassador
Mr. Hiroyuki Ozawa	Second Secretary
Mr. Takumi Ueshima	Second Secretary

(b) JICA OFFICE, FIJI

Mr. Shunichi Mizuochi	Assistant Resident Representative

(c) JICA OFFICE, AUSTRALIA

Mr. Hiroshi Sasaki	Resident Representative

(d) GOVERNMENT OF TONGA

Mr. T. Va'inga Palu	Secretary for Civil Aviation
Mr. R.C.R. Cooper	Director of Civil Aviation
Mr. Dennis Hoskin	Acting Director of Civil Aviation
Mr. Sitafooti 'Aho	Acting Airport Manager Fua'amoto Airport
Mr. Tevita Kaitu'u Fotu	Assistant Secretary for Civil Aviation
Mr. Soane Patolo	Senior Airport Supervisor Fua'amoto Airport
Mr. Sonatane Tu'a Taumoepeau Tupou	Secretary for Foreign Affairs
Miss M. Lupe 'Ilaiu	Assistant Secretary for Foreign Affairs
Mr. Siosiua Utoikamanu	Deputy Secretary for Finance
Mr. Siale A. Puloka	Assistant Secretary for Finance
Mr. Don Seiler	Economic Analyst Ministry of Finance
Mr. T. Paula Lavulo	Acting Director of Planning
Mr. G. Masaso Paunga	Project Economist Central Planning Department
Mr. Stewart M. Hadfield	Project Economist Central Planning Department

Mr. Sione M. Taumoepeau	Director of Works
Mr. Kaveinga Tu'itahi	Secretary Electric Power Board
Mr. Joe Viglietta	Electric Power Board
Mr. Siosaia Founua	Engineer-Planning & Development Telecommunications Commission
Mr. Mosese Ueleni	Assistant Engineer-Planning & Development Telecommunications Commission
Mr. Viliami Tuipulotu	Controller-Planning & Development Telecommunications Commission
Mr. Filipe Koloi	Manager Water Board
Mr. Ron Julian	Quantity Surveyor Ministry of Works

AUSTRALIAN INTERNATIONAL DEVELOPMENT ASSISTANCE BUREAU (AIDAB)

Mr. Ralph E. Kennedy	Pacific Islands Section

SOUTH PACIFIC BUREAU FOR ECONOMIC CO-OPERATION

Mr. Arnold van Buuren	Regional Transport Advisor
Mr. Paul McDonnell	

AIRPORT CONSULTING AND CONSTRUCTION AUSTRALIA (PTY) LTD.

Mr. Graham F. Haack	Director
Mr. Malcolm Dow	Director

RIEDEL & BYRNE CONSULTING ENGINEERS

Mr. Gerry Byrne	Director

HARRISON GRIERSON CONSULTANTS LTD.

Mr. Alastair Kent Johnston	Director
Mr. Alexander G. McCulloch	Director

FLETCHER CONSTRUCTION

Mr. Robert J. Gibson	Divisional Construction Manager
Mr. Ian R. Marshall	Commercial Manager South Pacific
Mr. Alan Brown	Regional Manager South Pacific

APPENDIX—D

MINUTES OF MEETING

BETWEEN THE MINISTRY OF CIVIL AVIATION AND JICA STUDY TEAM.

Ref. No. 01

DATE: January 25, 1989

PLACE: Ministry of Civil Aviation

ATTENDANTS: (Tongan Side)

T. Va'inga Palu (Secretary for Civil Aviation)
Sitafooti 'Aho (Acting Airport Manager)
Dennis Hoskin (Acting Director of Civil Aviation)

(Japan's Side)

K. Hasegawa (Civil Aviation Bureau, Ministry of Transport)
H. Shiono (JICA)
H. Seki (Japan Airport Consultant's, Inc.)
H. Yamagachi "
T. Aoi "

SUBJECT: Inception Report

MAJOR ITEM DISCUSSED: (1) Contents of the Report

Chapter 1

(1) 600m extension of main runway is scheduled to be carried out in July or August to December, 1989, by MOU (Memorundum of Understanding) between the Governments of Tonga and Australia.

(2) ILS installation is not yet requested to any Government.

Chapter 2

(3) (2.1) Facilities and equipment to be covered by the study are:

- Passenger Terminal Building
- Passenger Loading Apron and Taxiway
- Roads and Carparks which will be just inside the new ternimal complex.
- Ground Handling Equipment

(4) (2.2) Existing fuel storage and refueling facilities belong to British Petroleum and Shell. Necessary action related to the relocation of the new terminal complex shall be taken by those private companies (BP, and Shell).

Chapter 4

(5) Location of Project site (Fig. 4.1) is mutually agreed upon.

(2) Questionnaire

(1) Answers to Questionnaires shall be made by January 30, 1989.

(2) The following data and information shall be given to the Study Team as soon as possible within one or two days:

- the latest ACCA's Report
- the latest statistics of air traffic
- the latest air traffic demand forecast
- present Time Table

APPENDIX-E

MINUTES OF DISCUSSIONS

ON

THE PROJECT

FOR

CONSTRUCTION OF NEW TERMINAL COMPLEX

FOR

THE FUA'AMOTU INTERNATIONAL AIRPORT

IN

THE KINGDOM OF TONGA

In response to the request of the Government of the Kingdom of Tonga, the Government of Japan decided to conduct a basic design study on the Project for Construction of New Terminal Complex for the Fua'amotu International Airport, (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency(JICA). JICA sent to Tonga the study team headed by Mr.Koh Hasegawa, Advisor, Environment Division, Aerodrome Department, Civil Aviation bureau, Ministry of Transport, from January 23 to February 17, 1989.

The team had a series of discussions on the Project with the officials concerned of the Government of the Kingdom of Tonga and conducted a field survey at the Fua'amotu International Airport area.

As a result of the study and discussions, both parties agreed to recommend to their respective Government that the major points of understanding reached between them, attached herewith, should be examined toward the realization of the Project.

Nuku'alofa, February 1, 1989

Koh Hasegawa
Team Leader
Basic Design Study Team
JICA

T.V.Palu
Secretary for Civil Aviation
Ministry of Civil Aviation
the Kingdom of Tonga

1.TITLE OF THE PROJECT

The title of the Project is "The Project for Construction of New Terminal Complex for the Fua'amotu International Airport".

2.OBJECTIVES OF THE PROJECT

The objectives of the Project are to construct a new terminal building and other related facilities and provide necessary equipment for the airport .

3.EXECUTING AGENCY

The executing agency for the Project is the Ministry of Civil Aviation, the Government of Tonga.

4.PROJECT SITE

The proposed project site is on the north side of the main runway, which is shown in ANNEX 1.

5.REQUEST OF THE GOVERNMENT OF TONGA

1) The major items requested by the Government of Tonga are as shown in ANNEX 2.

2) The Government of Tonga understood that provision of Ground Handling Equipment will be subject to the result of study and the budget to be allocated to the Project.

3) The study team explained to the Tonga side, and the latter understood, that VVIP building is not included in this Project, although the Tonga side expressed the need of VVIP building for Their Majesties and Royal Family to be included in the Project.

4) The study team will convey to the Government of Japan the desire of the Government of Tonga ,that the former will take the necessary measures to cooperate in implementing the Project within the scope of Japan's Grant Aid Programme.

6.JAPAN'S GRANT AID PROGRAMME

1)The Tonga side has understood the system of Japan's Grant Aid Programme explained by the team which includes a principle for use of a Japanese consultant and Japanese contractors for the implementation of the Project.

2)The Tonga side will undertake to ensure the necessary budget and personnels for the proper and effective operation and maintenance of equipment and facilities provided under the Grant Aid Programme.

7.NECESSARY MEASURES TO BE TAKEN BY TONGA

1)To clear and level the Project Site.

2)To provide access road, electricity and water supply, telephone and other incidental facilities to the new terminal site.

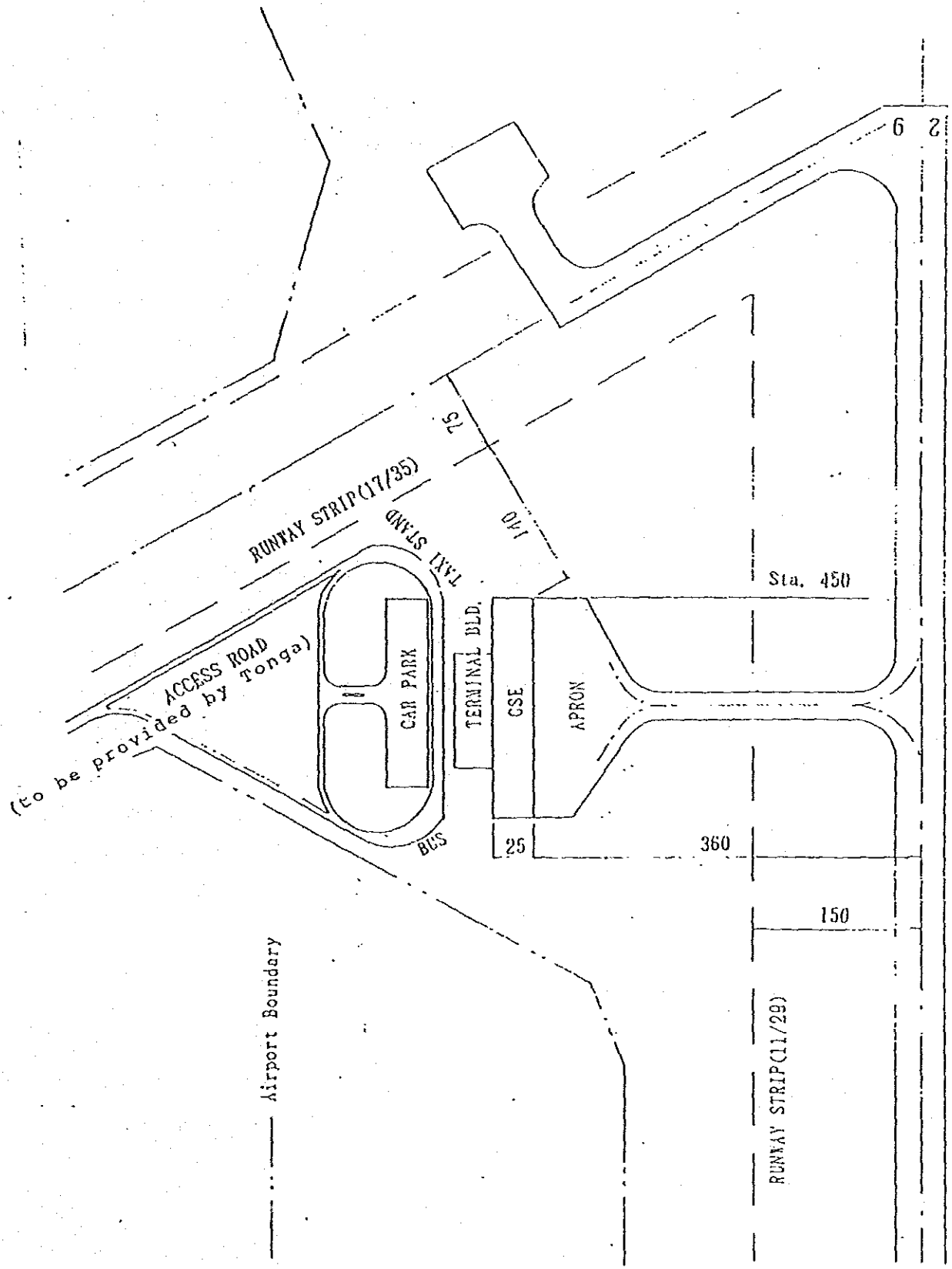
3)To provide fuel storage and/or supply facilities, if necessary, to the new terminal site.

4)To provide remote control cable ducts under the main runway, if necessary, for the additional airfield lights (for the new taxiway and apron).

5)To modify the remote control desk in the control tower, if necessary,for the additional lights (for the new taxiway and apron).

The Government of Tonga will also take the necessary measures as listed in ANNEX 3 on the condition that Japan's Grant Aid shall be extended to the Project.

ANNEX 1 PROJECT SITE



ANNEX 2 FACILITIES AND EQUIPMENT REQUESTED BY TONGA

1. New terminal building to cater for present and foreseeable future demand of peak-hour passengers

2. New apron to accmmodate existing and foreseeable future aircraft apron requirements for both international and domestic air services, and taxiway including associated lighting facilities

3. New car parking area to accommodate passengers and airport visitors demand during peak hour, interior roads and lightings

4. Stand-by power for the terminal building and apron floodlighting

5. The following Ground Handling Equipment:

1) Ground power 115 volts AC and 28 volts DC capable of wide body jet requirements, and 28 volts DC capable of starting Rolls Royce dart or Garret TBE331 engine (28 volts 200 amperes)
2) Air start unit capable of starting RB211,JT9D,CF6 series engines
3) Air conditioner unit capable of providing conditioned air for wide type body aircraft
4) Lavatory cart
5) Portable water cart
6) Container farat deck cargo roader
7) Belt conveyer-baggage loader
8) Container cargo trairers
9) Galley servicing vehicle
10) Baggage and cargo tugs
11) Aircraft tugs

ANNEX 3 NECESSARY MEASURES TO BE TAKEN BY TONGA

1. To provide data and informations necessary for detailed design

2. To ensure prompt unloading, tax exemption, customs clearance of the equipment under Grant Aid Programme, if any, at ports of disembarkation in Tonga

3. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Tonga respect to the supply of the products and services under the verified contract

4. To accord Japanese nationals whose services may require in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry to Tonga and stay therein for the performance of their work

5. To maintain and use properly and effectively the facilities and equipment provided under the Grant Aid

6. To provide necessary permissions, licences and other authorizations in carrying out the Project

7. To bear all the expenses other than those borne by the Grant Aid such as fencing and gates

8. To bear two kinds of commissions to the Japanese foreign exchange bank for the banking services, based upon the "Banking Arrangement", namely, the advising commission of the "Authorization to Pay", and payment commission

APPENDIX—F

MINUTES OF MEETING

1. DATE: February 10th, 1989

2. PLACE: Secretary office, Ministry of Civil Aviation

3. ATTENDANT: Mr T Va'inga Palu, Secretary for Civil Aviation
Mr Dennis Hoskin, Acting General Manager for FIA
Acting Director of Civil Aviation
Mr Sitafooti 'Aho, Acting Airport Manager
Mr Tevita Kaitu'u Fotu, Assistant Secretary
Mr Hiroaki Seki, JAC
Mr Haruhisa Yamaguchi, JAC
Mr Tadasi Aoi, JAC
Mr Hideaki Iida, JAC
Mr Akira Ichige, JAC

4. SUBJECT: Design of Master Plan and passenger Terminal Building

5. MAJOR ITEM DISCUSSED: The discussion was made on the proposed master plan and layout plan of the passenger Terminal Building, etc, between the Ministry of Civil Aviation and JICA Study Team.

The following are comments and/or request from the Ministry of Civil Aviation:

(1) Facilities layout plan:

a) Carpark is desirable to have one entry and one exit.

b) The Ministry however want more number of car-parking lots than was proposed by the JICA Study Team, so as to accommodate the weekly peak-hour visitors demant.

c) VIP site should be closer to the passenger terminal building rather than the Power/Water site.

d) Access route is not yet decided at present. So that the ring road is desirable to be built in curbside so as to accommodate whichever alternative will be chosen.

(2) Passenger Terminal Building:

a) The departure lounge is desirable to be provided with three gates at the airside.

b) The police office and the quarantine office doors should be opened to the curb side.

c) The concessionaires for public area is desirable to be devided into three section by removeable partition.

d) Entry and exit security doors should be provided for both corridors for domestic departure and arrival passenger access.

e) A Quarantine counter should be provided in the baggage claim area.

f) A passenger bench should be provided in the arrival hall.

g) The cart space should be provided beside Customs counter.

h) The Customs and Quarantine counters should be removable.

i) The public telephones will be required to be installed in the departure/arrival lounges and public area.

j) The proposed elevation of passenger Terminal building was basically agreed to in principle.

k) The dire need for more covered area for the observation deck.

(3) Furnitures and equipment to be installed in the passenger terminal building:

The following furnitures and equipment are requested to be installed in the passenger terminal building:

- Necessary furniture such as check-in counters, CIQ counters, chairs in public hall, etc, except for office.
- Baggage conveyors for arrival and departure areas.
- Walk-through and hand type metal detectors.
- Public address system.
- Scales for check-in baggage (6).
- Telephones.
- Septic Tanks/and sewage.
- Emergency generator service.
- Air conditioning serving for departure lounge, VIP Lounge, Departure Immigration and Security control area, Administration office, Airport Manager room, Conference room (ref. marked area in Floor Plan).
- Interior Lighting.
- Sign boards complying with ICAO standard.
- Master clock system.
- Baggage carts.
- Fire extinguishers/hydrants.
- Removeable security-check counter at main entrance to Check-in lobby.
- Emergency siren.

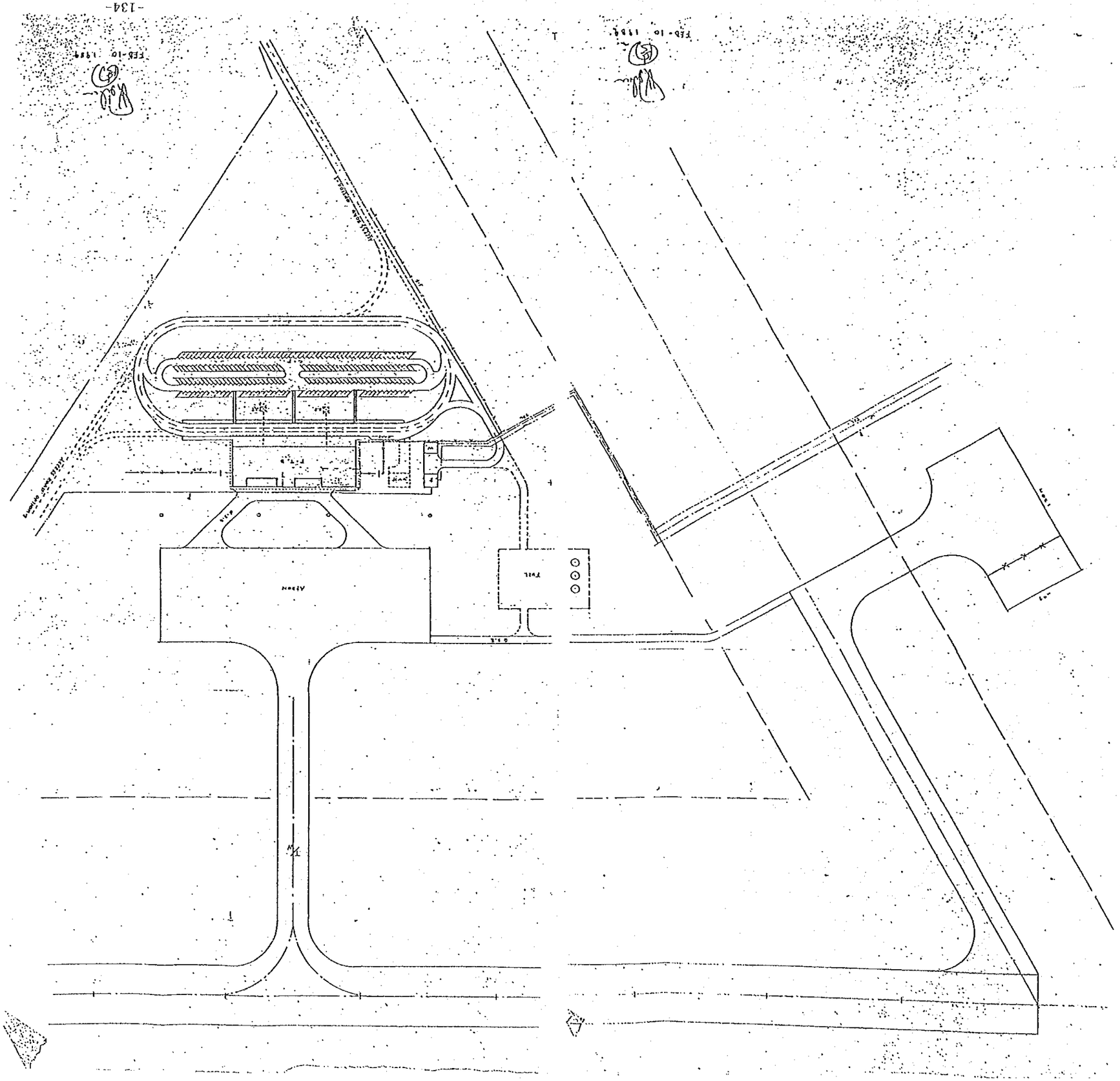
(4) Other equally important items/components requested and discussed included the followings:

- the need for airoraft refuge disposal site/system.
- the need for proper drainage from Terminal roof to water catchment area.

The Ministry would endeavour to inform JICA Team of the budget allocation for local costs by early March, 1989.

Mr. T. V. Palu
Secretary for Civil Aviation
T O N G A

Mr. Hiroaki Seki
J A C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HUDSON AVENUE
ATRIUM
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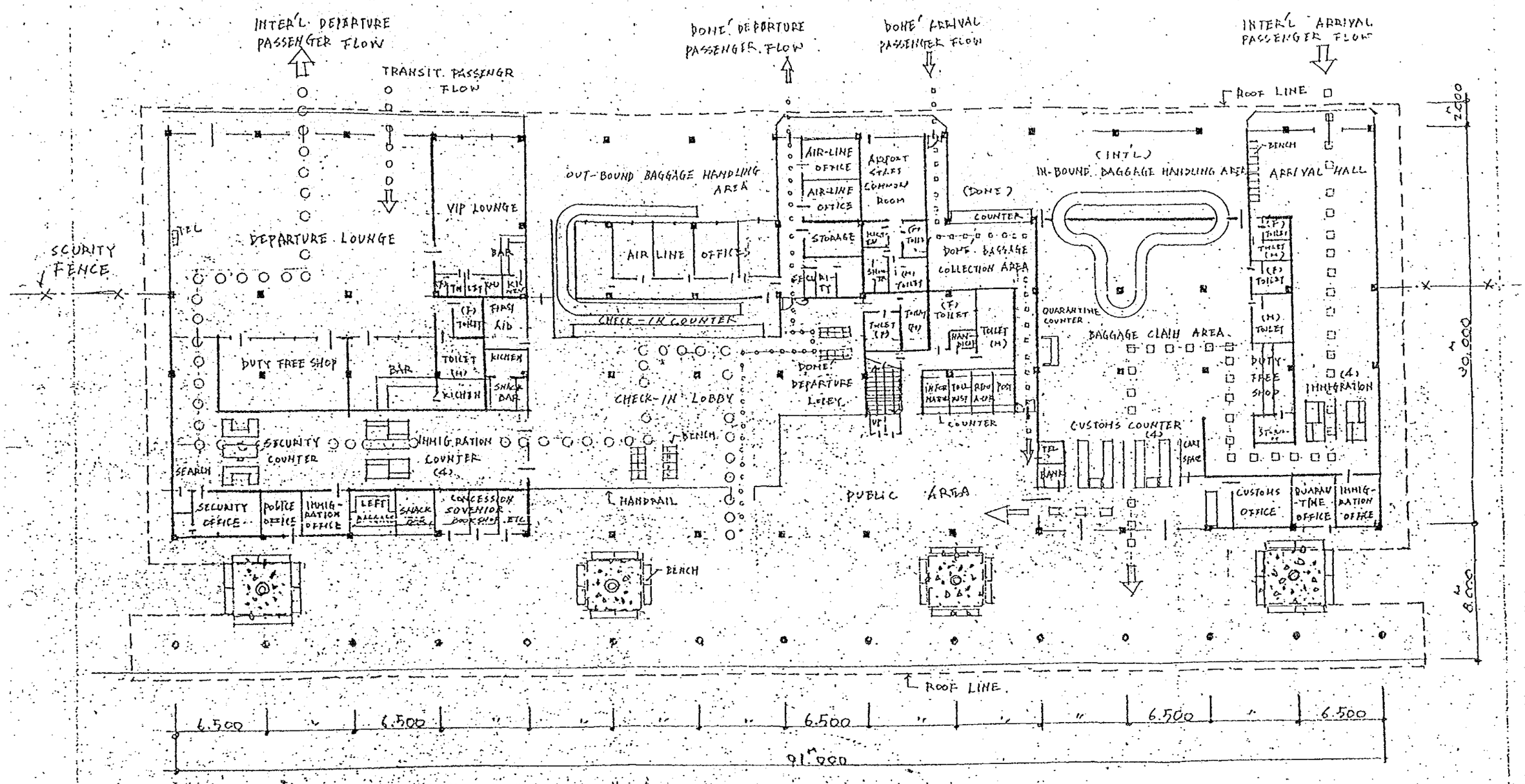
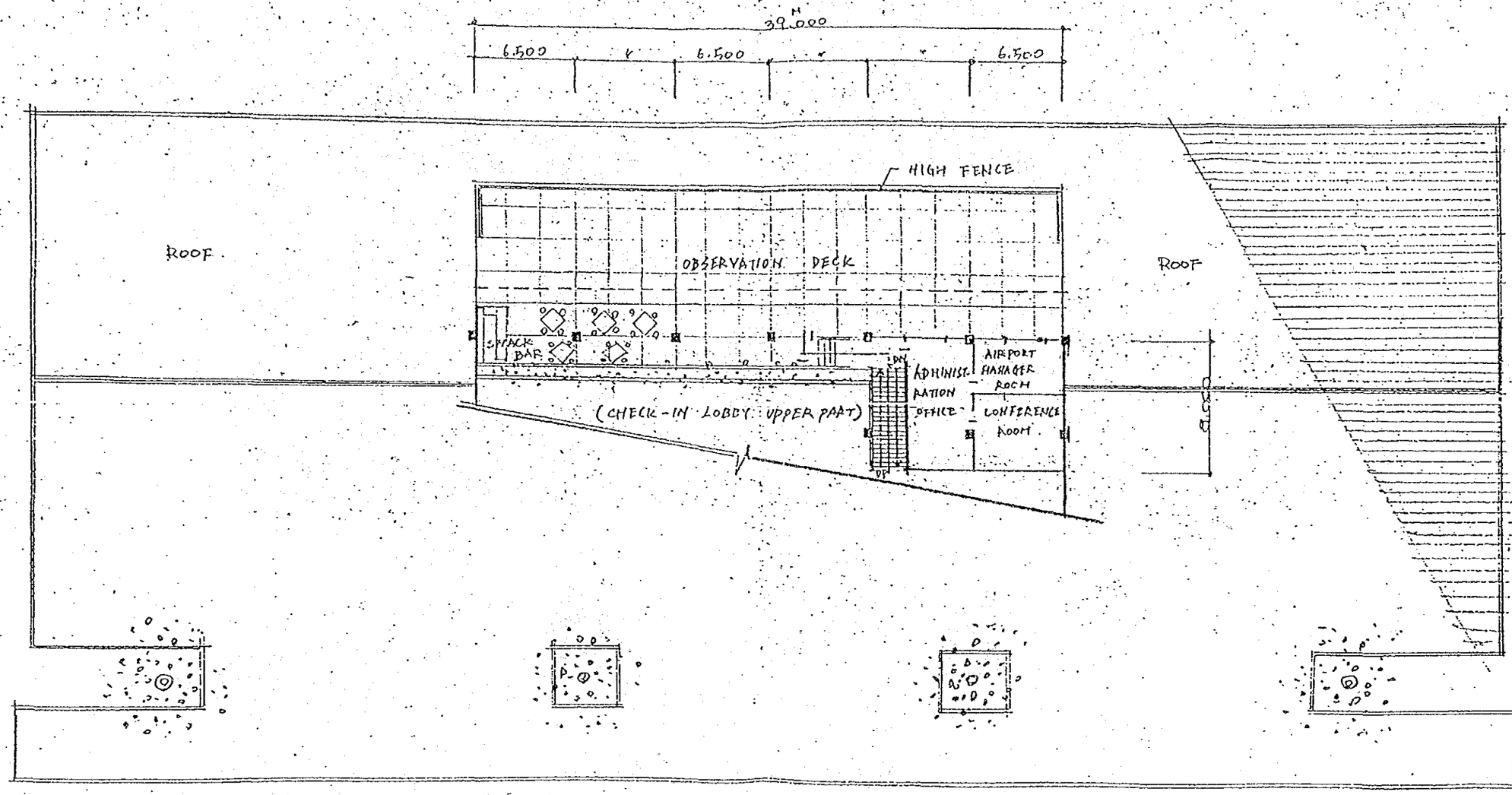


GROUND FLOOR PLAN

FEB-10 1989.

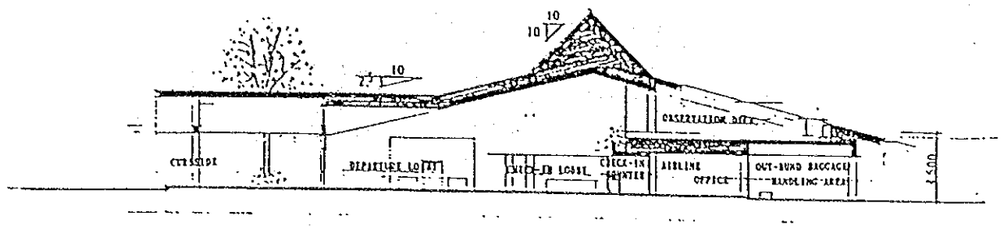
FUA'AMOTU AIRPORT TONGA PASSENGER TERMINAL BUILDING



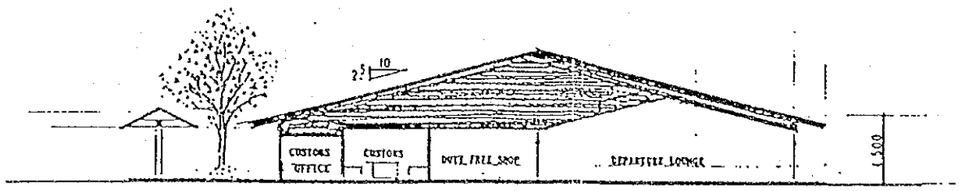
FIRST FLOOR PLAN

FEB-10, 1989.

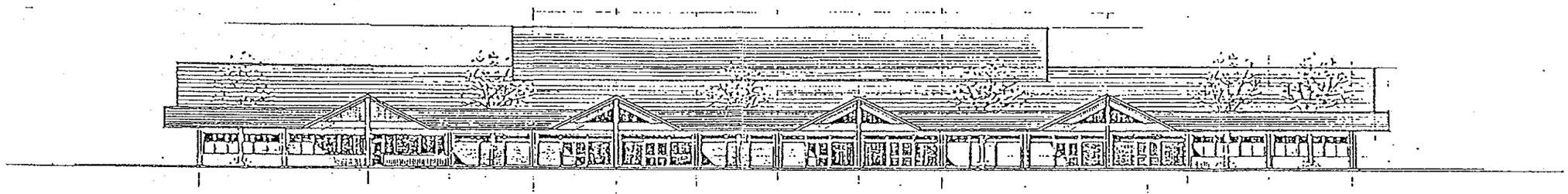
FUAʻAMOTU AIRPORT, TONGA PASSENGER TERMINAL BUILDING.



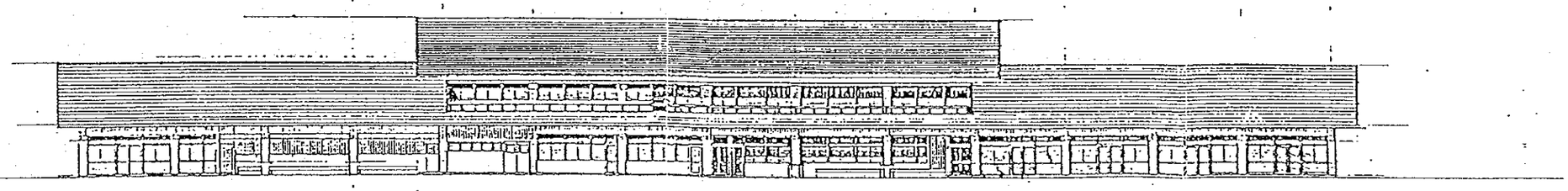
SECTION - A



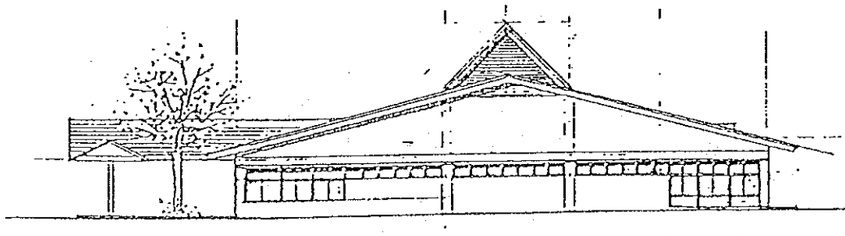
SECTION - B



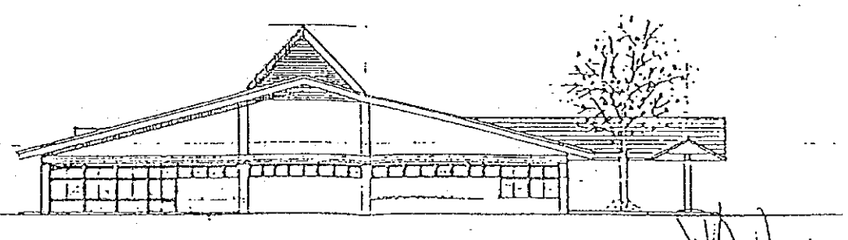
NORTH ELEVATION



SOUTH ELEVATION



WEST ELEVATION



EAST ELEVATION

JAPAN AIRPORT CONSULTANTS, INC.
日本空港コンサルタンツ

REVISIONS	
DATE	BY

APPROVED BY	DATE
CHECKED BY	
DRAWN BY	SCALE

SUBJECT: FUA'AMOTU AIRPORT, TONGA
PASSENGER TERMINAL BUILDING
NO.

DRAWING: SECTION + ELEVATION
NO. -

APPENDIX—G

MINUTES OF DISCUSSIONS

ON

THE PROJECT

FOR

CONSTRUCTION OF NEW TERMINAL COMPLEX

FOR

THE FUA'AMOTU INTERNATIONAL AIRPORT

IN

THE KINGDOM OF TONGA

In response to the request of the Government of the Kingdom of Tonga, the Government of Japan decided to conduct a basic design study on the Project for Construction of New Terminal Complex for the Fua'amotu International Airport, (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Tonga the study team headed by Mr. Koh Hasegawa, Advisor, Environment Division, Aerodrome Department, Civil Aviation bureau, Ministry of Transport, from January 23 to February 17, 1989.

As a result of the study, JICA prepared a draft report and dispatched a team headed by Mr K Hasegawa to explain and discuss it with the Tonga Government from April 16 to 27, 1989.

Both parties had series of discussions on the Report and agreed to recommend to their respective Government that the major points of understanding reached between them, attached herewith, should be examined toward the realization of the Project.

NUKU'ALOFA, April 24, 1989.

Koh Hasegawa
Team Leader
Basic Design Study Team
JICA

T V Palu
Secretary for Civil Aviation
Ministry of Civil Aviation
the Kingdom of Tonga

ATTACHMENT

1. The Tongan side has agreed in principle to the Draft Final Report with some alteration/deviation as shown in ANNEX I and II to be incorporated in the Final Report.

2. The Tongan side and direfully requested to widen the apron by 10m (totally 210m in width), in order to allow a little more safety margin for delayed-turn which aircraft crews likely make during its self-manoeuvering in such locally inclement conditions with low visibility, instead of provision of a part of GSE, if necessary, subject to budget allocation.

   The study team has stated that they would convey this request to the Government of Japan.

3. The Tonga side has requested to provide baggage X-Ray machine in place of walk-through metal detector with regard to item 2 of ANNEX I. The study team has stated that it was not necessary to provide additionally because the X-Ray machine which was scheduled to also be provided by ICAO was assumed to sufficiently check the baggage security, but they would convey this request to the Government of Japan.

4. The Tongan side has requested concurrent hand-over of both stages 1 and 2, due to the difficult and long-term (7 months) maintenance of completed facilities without operation. The study team has stated that they would convey this request to the Government of Japan.

5. The Tongan side has requested the taxiway edge lights at curved parts (totally 16 lights at 4 fillets) to be surface type instead of proposed elevated type in view of their experience in which such locally inclement condition has likely caused aircraft wheel deviation.

   The study team has stated that they would convey this request to the Government of Japan.

6. The Tongan side has understood Japan's Grant Aid System and confirmed the measures to be taken by the Tongan side for realization of the Project as shown in the Annex which are manifested in the ANNEX 3 of the MINUTES OF DISCUSSIONS on the Project signed on February 1st, 1989 on condition that the Grant Aid by the Government of Japan is extended to the Project.

7. The Government of Tonga will assure the necessary budget and personnel for the operation and maintenance of the facilities and equipment provided on condition that the Grant Aid by the Government of Japan is extended to the Project.

8. The Final Report (10 copies in English) on the project will be submitted to the Tongan side by the end of June, 1989.

ANNEX I

ALTERATION TO THE DRAFT FINAL REPORT

1. Apron Floodlight will also have the function to provide necessary illumination in front of the Terminal.

2. Walk-through Metal Detector, which was already provided by ICAO, will be omitted from the Project.

3. The public telephone room in the public area will be used for other purpose instead. Public telephone booths will be provided beside stair-way.

4. Roof-voids above the planters of the public area will be covered with roof.

5. Water supply system will include the utilization of the Terminal Building roof water.

ANNEX II

EDITORIAL CORRECTIONS/OMISSIONS ON THE BASIC DESIGN STUDY
DRAFT FINAL REPORT

1. Page 27 Airport operation hour is not 24.

2. Page 31 para 2 re Water Supply - change "Water Board" to "Ministry of Civil Aviation".

3. Page 33 para 4 - there is a gate - type metal detecting equipment.

4. Page 34 para 1 first sentence change 1983 to 1982.

5. Page 37 para 2 last sentence change 1989 to 1985.

6. Page 45 para 1 third line change Hawaiian Air to Air New Zealand.

7. Page 48 Add following to last sentence last para after B737. "or aircraft of similar size". Delete rest of the sentence.

8. Page 51 para 2 change Ministry of Law and Order to Ministry of Police and Ministry of Health to Ministry of Agriculture.

9. Page 56 para 1 and 2 change word "planned" to "provided".

10. Page 68 B1.b) English word for Japanese letters.

11. Page 75 add Master Clock System as 4.4.1.1.5(e).

12. Page 102 2.3.6 Equipment same as above (11).

13. Page 117-(1) Mr. Sione Patolo title is Senior Airport Supervisor not Advisor.

(2) Change V to U on Utoikamanu

(3) Sitafooti not Sitafoati

(4) Puloka not Pulota

ANNEX III

NECESSARY MEASURES TO BE TAKEN BY TONGA

1. To provide data and information necessary for detailed design.

2. To ensure prompt unloading, tax exemption, customs clearance of the equipment under Grant Aid Programme, if any, at ports of disembarkation in Tonga.

3. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Tonga respect to the supply of the products and services under the verified contract.

4. To accord Japanese nationals whose services may require in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry to Tonga and stay therein for the performance of their work.

5. To maintain and use properly and effectively the facilities and equipment provided under the Grant Aid.

6. To provide necessary permissions, licences and other authorizations in carrying out the Project.

7. To bear all the expenses other than those borne by the Grant Aid such as fencing and gates.

8. To bear two kinds of commissions to the Japanese foreign exchange bank for the banking services, based upon the "Banking Arrangement", namely, the advising commission of the "Authorization to Pay", and payment commission.

M E M O R A N D U M

1. All the necessary information boards are to be included in the Project.

2. Indoor fire hydrant will include alarm system.

3. Baggage scale will be electrical type.

4. Doors of one directional type to be installed in respective security areas will be designed to keep airport security.

5. Cable ducting for airline's seating reservations computer will be incorporated in detailed design.

6. Anticorrosive painting for steel work will be considered in detailed design.

7. Double-glazing windows for the rooms at apron side will be considered in detailed design, if necessary, subject to budget allocated.

8. Detailed finishing schedule is to be provided in detailed design.

9. The programme of scheduled maintenance of the facilities is to be provided in detailed design.

APPENDIX-H

List of Data Collected

Data	Source
Kingdom of Tonga,Fua'amotu Airport, Report on Airport Development	Australian Development Assistance Bureau
Tonga International Airport Revised Master Plan	Civil Aviation Department, Tonga
Fua'amotu Airport, Tonga Airport Development Study, Final Report	Australian Development Assistance Bureau
Fua'amotu Airport Extension, Soil Tests Results	Ministry of Works, Tonga
Bulletin of Air Transport Statistics, 1986	Statistics Department, Tonga
Meteorological Observation for 1986, Pacific Island Stations	Ministry of Transport, New Zealand
Kingdom of Tonga, Fifth Five-Year Development Plan. 1986-1990	Central Planning Department, Tonga
Kingdom of Tonga, Estimates of Revenue and Expenditure and the Development Estimates for the Year 1987-88	Ministry of Finance, Tonga
Tonga, National Trade and Business Directory	South Pacific Bureau for Economic Cooperation
1987 Annual Report, Visitors	Tonga Visitors Bureau

Statistics, Kingdom of Tonga	
Third Multiproject, Tonga, Unit Rates for Selected Construction Work	Asian Development Bank
Kingdom of Tonga, Civil Service List	Prime Minister's Office
Map of the Kingdom of Tonga	Lands & Survey Department, Tonga
Airport Feasibility Study, Kingdom of Tonga	UNDP/ICAO
AIP New Zealand, Fua'amotu International Airport	Ministry of Transport, New Zealand
Mid-term Review, Fourth Development Plan	Central Planning Office, Tonga
Foreign Trade Report for 1983, '84, '85, '86 & '87	Statistics Department, Tonga
Tonga, A Development Plan for Tourism	Development Planning Unit. U.K.
Tonga, Visitor Information Guide	Tonga Visitors Bureau
Tonga, Agents Manual and Tariff	Tonga Visitors Bureau
MOW Plant Hire Rates	Ministry of Works, Tonga
Conversion Table, Approved New Wages Rate	Ministry of Works, Tonga
Soils/Concrete Listing Laboratory Inventory	Ministry of Works, Tonga

Engineering Survey for Fish Pond Rehabilitation and Feasibility Study for New Fish Pond Construction, Tonga	F.A.O.
Tourist Map of the Kingdom of Tonga	Tonga Visitors Bureau
Guide Map of Nuku'alofa City	Tonga Visitors Bureau
Building Cost Guide	Cordell
Building Price Lists	Master Builders Association (Auckland)
New Zealand Construction Handbook, 3rd Edition	The Rawlinsons Group
Price List	Ministry of Works, Tonga
Wage List	Ministry of Labour, Commerce & Industies, Tonga
Organization Chart at Fua'amotu Airport	Ministry of Civil Aviation, Tonga
Future Organizational Plan of the Ministry of Civil Aviation, Tonga	Ministry of Civil Aviation, Tonga
Fua'amotu Airport Expenses 1986, '87, '88	Ministry of Civil Aviation, Tonga
Ministry of Civil Aviation Financial Report 1987	Ministry of Civil Aviation, Tonga
Tariff and Duty List	Ministry of Finance, Tonga

Port and Wharf Service Charges	Wharf Administration Department
Motor Vehicle Hire Rates	Ministry of Labour, Commerce & Industry, Tonga
Standard Method of Measurement of Building Works	Standards Association of New Zealand
Code of Practice for General Structural Design and Design Coding for Buildings	Standards Association of New Zealand
Code of Design of Steel Structures	Standards Association of New Zealand
Code of Practice for the Design of Concrete Structures	Standards Association of New Zealand
Commentary on the Design of Concrete Structures	Standards Association of New Zealand
Code of Practice for Design for Access and Use of Buildings and Facilities	Standards Association of New Zealand
The Drainage and Plumbing Regulations	Standards Association of New Zealand
Electrical Wiring Regulations 1976	Standards Association of New Zealand
Form of Contract Agreement	Ministry of Works, Tonga
Architectural Specification	Ministry of Works and Development, New Zealand
General Conditions of Contract Form	Ministry of Works and Development, New Zealand

Airport Arrival Statistics	Ministry of Civil Aviation, Tonga
International & Domestic Flights Schedule	Ministry of Civil Aviation, Tonga
Drawing of Fua'amotu Airport, Lighting System	Ministry of Civil Aviation, Tonga
Road Manual	Ministry of Works, Tonga

APPENDIX – I

CALCULATION OF FLOOR AREAS REQUIRED

(A) : AVERAGE WAITING TIME AND REQUIRED FLOOR SPACE

The following assumptions have been made for the calculations:

- number of international peak-hour passengers = 400
- number of domestic departing peak-hour passengers = 37
- visitors/friends/relatives not permitted to enter check-in lobby
- number of visitors/friends/relatives per passenger = 5.0

Table I.1. Average Waiting Time & Required Space

Facility		Average Waiting Time (Min.)	Required Space (m2 per person)
Check-in Lobby	Passenger	25	2.5
Public Area	Departure Passenger	30	1.0
	Arrival Passenger	10	1.0
	Well-wisher	30	1.0
Departure Lounge	Standing Passenger		1.0
	Seated Passenger		1.5

(B) : NECESSARY TIME FOR PROCEDURE AND PERIOD OF PASSENGER CONCENTRATION

Table I.2. Necessary Time for Procedure

Procedure	Period of Passenger Concentration	Required Time
International		
Check in	60 min.	60 sec./person
Departure Formalities	45	45
Security check	45	20
Entry Formalities	45	45
Customs	60	60
Domestic		
Check in	45	60
Security check	45	20

(C) : CALCULATION FOR EACH FACILITY

The following abbreviations have been used:

P = number of peak-hour passengers
A = area required (m^2)
T = period of passenger concentration (min.)
t = time required for procedure (min.)
L/F = passenger load factor
F = number of aircraft seats
T_w = average waiting time (min.)

1. DEPARTURE FACILITIES

(a) Check-In Counters

Number of units required = P x t x 1/T = 200 x 90/60 x 1/60 = 5
(international)

Number of units required = P x t x 1/T = 37 x 60/60 x 1/45 = 0.82 say 1
(domestic)

Total counter length = (5 + 1) x (1.5m + 0.75m)/1 unit = 13.5m

Total counter area = 13.5 x 3.5 = $47m^2$

(b) Check-In Lobby

Floor area reqd = P x T_w /60 x A = 200 x 25/60 x 2.5 = $208m^2$

(c) Departure Lounge

Floor area reqd = F x L/F x (a x A_1 + b x A_2) x c
(international) = 340 x 0.6 x (0.25 x 1.0 + 0.75 x 1.5) x 1.1
= 308 m^2

Floor area reqd = 47 x 0.8 x (0.25 x 1.0 + 0.75 x 1.5) x 1.1
(domestic) = 56.87 say 57 m^2

A_1 = unit floor area for standing passengers = 1.0 m^2

A_2 = unit floor area for seated passengers = 1.5 m^2

c = ineffective space factor = 1.1

F = number of Int. aircraft seats = 110 (B-737) + 230 (B-767) = 340

" " Dom. " " = 19 x 2 (DHC-6 x 2) + 9 (BN-2) = 47

a = proportion of standing passengers = 0.25

b = proportion of seated passengers = 0.75

2. ARRIVAL FACILITIES

(a) Baggage Claim Area (International)

Effective Baggage conveyor belt length required = F x L/F x d x e x f

= 230 x 0.6 x 1.2 x 0.3 x 0.45

= 22.3 say <u>23 m</u>

d = number of baggage items per passenger = 1.2

e = waiting factor = 0.3

f = length of belt required per passenger = 0.45

Floor space required = (F x L/F x A x t + g) x 1.1

= (230 x 0.6 x 1.5 x 30/60 +44) x 1.1 = <u>162 m^2</u>

g = area of baggage conveyor belt unit = 44 m^2

c = ineffective space factor = 1.1

(b) Baggage Claim Area (Domestic)

Floor space required = F x L/F x A = 19 x 0.8 x 1.5 = 22.8 say <u>23 m^2</u>

3. CUSTOMS AND IMMIGRATION FACILITIES

(a) Departures

Number of channels required = P x t/T = 200 x 45/60 x 1/45 = 3.33 say 4
Floor area required = U x W x L = 2 x 3.15 x 12 = 75.6 say 76 m^2

U = number of channels per unit = 2
W = overall width = 1.35 + 1.8 = 3.15
L = length including queueing space = 12 m

(b) Security Check Area (International)

U = number of counters reqd = P x t/T = 200 x 20/60 x 1/45 = 1.48 say 2
W = counter width = 2.3 m
L = length of counter + waiting space = 10.5 m
h = width of metal detector = 1.8 m

Floor area required = (U x W + h) x L = (2 x 2.3 x 1.8) x 10.5
= 67.2 say 68 m^2

(c) Security Check Area (Domestic)

U = P x t/T = 37 x 20/60 x 1/45 = 0.27 say 1
W = 3 m
L = 7.5 m

Floor area required = U x W x L = 1 x 3 x 7.5 = 22.5 say 23 m^2

(d) Arrivals

Number of channels required = P x t/T = 200 x 45/60 x 1/45 = 3.33 say 4

Floor area required = U x W x L = 2 x 3.15 x 18 = 113.4 say 114 m^2

Waiting area = (p - p') x T_w x A
= (220 - 124) x 45/60 x 1.0 = 57 m^2
p' = number of queueing arrival passengers = 4 x 14/0.45 = 124

(e) Customs

U = number of counters reqd = P x t/T = 200 x 60/60 x 1/60 = 3.33 say 4
W = overall width = 2.25 m
L = length of counter + waiting space = 14 m

Floor area reqd = U x W x L = 4 x 2.25 x 14 = 126 m^2

4. BAGGAGE HANDLING FACILITIES

(a) Outbound Baggage Handling Area (International and Domestic)

Floor space reqd = W x L = 19.5 x 6.5 = 126.7 say 127 m^2

(b) Inbound Baggage Handling Area (International and Domestic)

Floor area reqd = W x L = 22.75 x 6.5 = 147.8 say 148 m^2

5. OFFICE SPACE

(a) CIQ Office

N = number of personnel = 8(C) + 8(I) +2(Q) =18 total
A = area reqd per person = 2.5 m^2

Floor area reqd = N x A = 18 x 2.5 = 45 m^2

(b) Security Office

N = 8
A = 2.5
A_1 = security check room = 4.5 m^2

Floor area reqd = N x A + A_1 = 24.5 say 25 m^2

(c) Airline Office

Floor area reqd = number of airlines x area per airline = 6 x 10 = 60 m^2

(d) Police Office

Floor area reqd = N x A = 4 x 2.5 = 10 m^2

(e) Administration Offices

Floor area reqd (main office) = N x A = 8 x 5 = 40 m^2

Floor area reqd (airport manager's office) = 15 m^2

Floor area reqd (conference room) = N x A = 12 x 2 = 24 m^2

6. OTHER

(a) Concession - 5% of total floor space

(b) Airport Staff Common Room

Floor area reqd = W x L = 5 x 12 = 60 m^2

(c) VIP Room

Floor area reqd = W x L = 7 x 12 = 84 m^2

7. PUBLIC AREA

(a) Public Area

Tw1 = time spent by departing passengers = 30 min
Tw2 = time spent by arriving passengers = 10 min
Tw3 = time spent by visitors/friends/relatives = 30 min

Floor area = P x (1 + k) x Tw1 x A + P x (1 x Tw2 + k x Tw3) x A
= 200 x (1+5) x 30/60 x 1.0 + 200 x (1 x 10/60 + 5 x 30/60) x 1.0
=1,133 m^2

(b) Toilets, Corridors,Stairs

16 % of total floor area

Table I.3. List of Required Floor Areas

	Facility	Area (m2)	Remarks
Departure Area	Check-in Counter	47	5 No. (international) 1 No. (domestic)
	Check-in Lobby	208	
	International Departure Lounge	308	
	Domestic Departure Lounge	23	
	Sub-total	586	
Arrival Area	International Baggage Claim Area	162	Baggage conveyor belt: 23 m long
	Domestic Baggage Claim Area	23	
	Sub-total	185	
Passenger Check Area	Outbound Immigration	76	4 channels
	International Security Check Area	68	1 No. Walk-through 2 No. Counter
	Domestic Security Check Area	23	1 No. Counter
	Inbound Immigration	114	4 channels
	Arrival Hall	57	
	Customs	126	4 No. Counter
	Sub-total	464	
Office	C.I.Q. Office	45	
	Security Office	25	
	Airline Office	60	
	Police Office	10	
	Administration Office	40	
	Airport Manager Room	15	
	Conference Room	24	
	Sub-total	219	

Table I.3. List of Required Floor Areas (cont'd)

	Facility	Area (m2)	Remarks
Baggage Handling	Departure Baggage Make-up	127	
	Arrival Baggage Break-down	148	
	Sub-total	275	
Other	Concession	190	
	Airport Staff Common Room	60	
	VIP Room	84	
	Sub-total	334	
Common Area	Public Area + Observation Deck	1,133	
	Toilet, Corridor, Stairs & Other	604	
	Sub-total	1,737	
	TOTAL	3,800	

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