5-4-2 Design Conditions

(1) Demand Forecast

Transport demand of international passengers that forms the basis of facility planning is estimated as follows on the basis of existing reference materials.

1) Design Year

Completion of the project is targeted for 1998 under the present study based on Japanese general grant aid program and ADB's loan procedures.
In an airport project, it is considered desirable to set the design year several years after completion of the project for the sake of economy of investment. For this project, the design year set for 2005, seven years after the completion.
Planning of the future expansion should be made at a later date to meet the demand of 2005 and thereafter.

2) International Passengers

① Annual Passengers

Annual passenger volume had been stable until 1988 when the open-door policy was instituted, but thereafter, it started to increase at a rate of 24% annually, and in 1993, VIA handled 92 thousand international passengers.
For estimation of future demand, traffic records of the period before 1987 were excluded from reference, and estimate was made using data of after 1988. If the high growth rate of 24% was to continue, passenger volume would reach 1.25 million in 2005. By linear regression, it amounts to 220 thousand. The growth rate of 24% is very high. Such high rate may be seen for certain limited period, but it is not easy to maintain such trend for a longer time

period, unless all supporting conditions are met including improvement of airline fleet, and development of sufficient facilities at origin and destination airports. In this project, using the growth rate indicated in CAMP, and the estimate is made on the basis of the 1993 data.
As a result, international passenger volume in 2005 is estimated to be 250 thousand.

② Critical Aircraft

Approx. 80% of aircraft operating on international routes to/from Vientiane is B737. The size of aircraft is generally expected to be bigger as the demand increases, and therefore on Bangkok-Vientiane route introduction of B767-class aircraft is assumed and B737-class aircraft is assumed to be operated on other routes. As a whole, 50% of international flights is assumed to be by B767, and the remaining 50% by B737 in 2005.

③ Annual Aircraft Movements

Seating capacity of B737 is about 130 and that of B767 is about 230. As estimated in the previous section, B737 and B767 will occupy 50% of the total aircraft movements, resulting in an average seating capacity of 180. Assuming that the current average load factor of 70% will continue till 2005, average number of passengers per aircraft will be 126. Therefore annual international aircraft movements are calculated to be around 2000.

④ Peal Day Aircraft Movements

Daily aircraft movements widely vary by the day of the week in VIA at present. Generally speaking, such variation will smooth out as aircraft movements increase. At a level of 2000 aircraft movements per year, peak day traffic is

generally 10% more than that of the average day. By applying this general trend, six aircraft movements are estimated for the peak day at VIA.

⑤ Peak Hour Aircraft Movements

Currently operated international air routes such as to Bangkok, Kunming and Hanoi all have a distance of around 500km. When a flight departs from such origin airport at 10 o'clock, a convenient time for passengers, it arrives at VIA around 12 o'clock. This explains why aircraft movements at VIA are concentrated in the 3-hour period from 11 to 14 hours.

Such concentration may lessen when other longer air routes such as to/from Singapore, Hong Kong and Ho Chi Minh become more active, and nighttime operation is facilitated by rehabilitation of radio and visual navigational aids. It is rather difficult, however, to expect that such favorable conditions will be realized in a short time period, and therefore current concentration should be expected to continue for a while.

According to ADB's review report, provision of three contact (boarding bridge) gates (B767x2+B747) and three stand-off gates (B737x2+B767) is recommended but exact design year is not specified.

While ADB's further study on apron configuration is awaited, it is estimated , for the purpose of planning and design of passenger terminal building, that two B767s and one B737 will simultaneously take-off and land.

⑥ Peak Hour Number of Passengers

As stated above, B767 has 230 seats and B737 has 130. Assuming a 70% load factor, departing or arriving passengers in peak hour are estimated at around 410 each.

It means that the terminal facilities designed with this peak-hour passenger number will be able to provide similar service level in handling passengers of one B767 and three B737s at one time.

(2) Buildings

1) Architecture

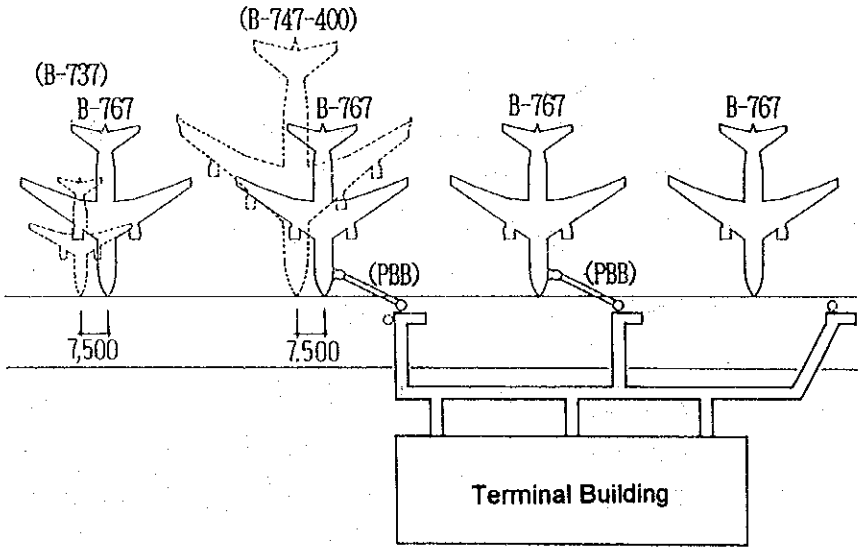
① International Passenger Terminal Building

i. Predetermined Conditions

- Apron Gate Position Configuration

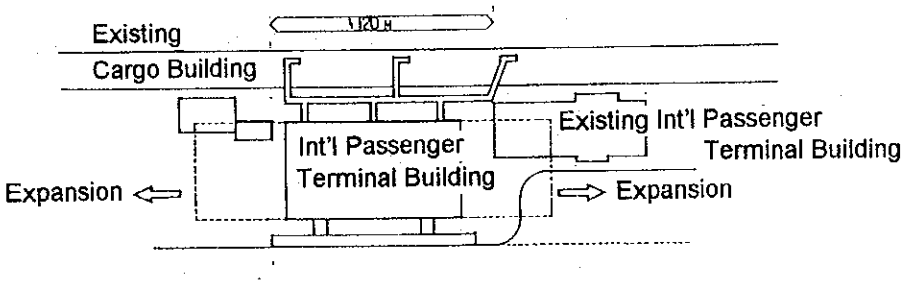
PBB (Passenger Boarding Bridge) shall be installed in order to ensure safety and all-weather protection of passengers.

Nose-in system shall be adopted in the aircraft parking apron, with 4 gate positions for B767-class aircraft allotted for international flights. Three of the positions are to have fixed bridges, including one capable of handling B747. At least one PBB shall be installed.



- Terminal Layout Plan

  In line with the ADB report plan, the new international passenger terminal shall replace the existing control tower and operations building and the fire station. According, the new IPT shall have a width of 120m shall be planned for future expansion first to the direction of the existing cargo terminal, then toward the existing IPT for further expansion.



- Design GL

  In anticipation of the existing apron surface to be raised under the planned improvement including an overlay, the design GL shall be set at 169.4 meters above sea level.

- Check-in Method

  A centralized check-in system shall be employed in the new IPT as in the existing terminal.

ii. Required Facility Elements

Following elements of terminal facilities shall be provided for the new international terminal.

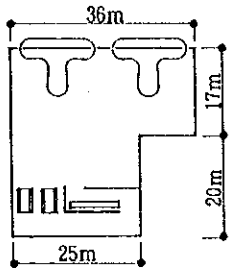
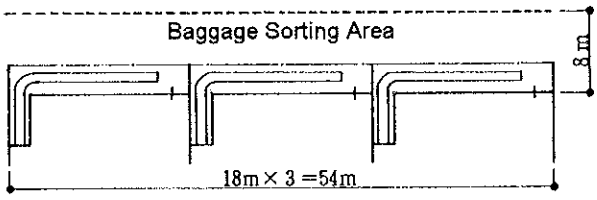
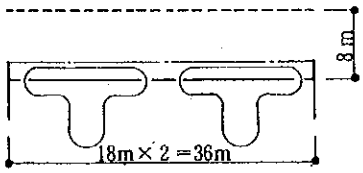
- Check-in and passenger service counters
- Passenger lounges
- Airline and VIP lounges
- Service areas and amenities: including toilets, telephones, information desks, observation decks, etc.
- Concessions: including restaurants, bank, kiosk, souvenir shops, bars, post office, car rental, duty free shops
- Baggage handling facilities
- Airline offices, crew rooms, flight plan room, staff toilets and welfare facilities, etc.
- Airport administration and operations office
- Apron control office
- Security services
- Customs,, immigration and quarantine, and police, services
- Public address, flight information systems, and signage
- Cleaning and maintenance facilities, machine rooms, etc.

iii. Required functions and space

a. Passenger service facilities

	Calculation	Present
a. Check-in lobby Formula $P \times (1.0+\alpha) \times t/60 \times A$ P : number of passengers α : fraction of visitors/passenger t : passenger staying time (25 minutes) A : area per passenger ($2.5m^2$/person)	$770m^2$	$270m^2$
b. Check-in counter Formula $(X_1 \times C_1 + C_2) \times F$ X_1 : number of check-in positions for each flight (4P) C_1 : length of check-in counter (2m/P) C_2 : length of other counters (2m) F : number of flights at peak hour (3 flights)	30m	17m
c. Departure lobby Formula $P \times (1.0+\alpha) \times t/60 \times A$ t : passenger staying time (25 minutes) A : area per passenger ($2.5m^2$/person)	$770m^2$	$340m^2$ (Note 1)
d. Security check X-RAY Formula $P \times B \times 1/a$ B : baggage per person (1.25 PCS/person) a : X-RAY processing capacity (600 PCS)	1 unit	1 unit
e. Number of counter positions for terminal fee collection Formula $P \times a/60$ minutes a : processing per person (0.25 min/person)	2P	2P
f. Number of departure inspection channels Formula $P \times a/60$ minutes a : processing time per passenger (1.0 min/person)	7 channels (4 booths)	3 channels
g. Departure inspection area Calculated from width and depth width depth Formula $\{(C_1+C_2) \times X_1 + C_3\} \times (D+L)$ C_1 : departure inspection booth width (3.0m/booth) C_2 : passenger width 0.7m on booth sides (1.4m/booth) X_1 : number of inspection booths (4 booths) C_3 : wheel-chair and crew passage width (0.9m) D : inspection booth depth (2.5m) L : queue space (11m)	$250m^2$	$40m^2$

	Calculation	Present
h. Departure waiting room Formula $P \times (A_1 \times a + A_2 \times b) \times t/60 \times C$ A_1 : seating space per person (1.5m²/person) a : seat capacity rate (0.75) A_2 : space for standing person (1.0m²/person) b : (1-a) (0.25) C_3 : passenger staying time (50 min) L : rate of associated space (1.3) (wicket and queue space, passways, etc.)	610m²	280m²
i. Arrival lobby Formula $P \times A$ A : space per passenger (1.0m²/person)	410m²	(Note 2)
j. Number of quarantine channel No quarantine channel is provided now, but in future it is planned to be provided within the arrival waiting room and space shall be secured.		
k. Number of arrival inspection channels Formula $P \times a/60$ minutes a : processing time per person (1.2min/person)	9 channels (5 booths)	3 channels
l. Arrival inspection area Calculated form width and depth width depth Formula $\{(C_1+C_2) \times X_1+C_3\} \times (D+L)$ C_1 : arrival inspection booth width (3.0m/booth) C_2 : passage width 0.7m on booth sides (1.4m/booth) X_1 : number of inspection booths (5 booth) C_3 : wheel-chair and crew passage width (0.9m) D : inspection booth depth (2.5m) L : queue space (10m)	290m²	120m²
m. Number of claim conveyors 3 flights at peak hour Process time is estimated to be 25 minutes per flight based on design aircraft of B767. passenger access length 34m dolly access length 12m racetrack type total length abt 50m	2 Sets	2 Sets total length 18m linear type
n. Number of customs inspection channels Formula $D \times \beta \times a/60$ β : rate of declarating passengers (0.3) a : process time per passenger (2 min/person)	4 channels	2 channels

	Calculation	Present
o. Baggage claim and customs inspection area. Calculated from width and depth, with the fooling configuration being assumed.  	1,110m^2	440m^2
p. Arrival lobby Formula $P \times (1.0 \times t_1 + \alpha \times t_2)/60 \times A$ t_1 : passenger staying time (10 min) t_2 : visitor staying time (30 min) a : process time per passenger (2.5 min/person)	580m^2	(Note 3)
q. Departure baggage sorting area Area is calculated from width and depth, with the following configuration being assumed.  	430m^2	60m^2
r. Arrival baggage sorting area Calculated from width and depth, with the following configuration being assumed.  	290m^2	90m^2
Total passenger-related facilities	5,510m^2	1,630m^2

b. Others

	Calculation	Present
a. VIP room Present 150m^2+WC+OFFICE=220m^2 Plan 200m^2+WC+OFFICE=300m^2	300m^2	220m^2
b. CIQ office Present×2.0	220m^2	110m^2
c. DCA office Present×2.0	180m^2	90m^2
d. Airline office Present×2.0	600m^2	300m^2
e. Concession Present×2.0	1,260m^2	630m^2
f. Others 16~18% of grand total area	2,000m^2	990m^2
Others total (b)	4,540m^2	2,340m^2
Grand total (a+b)	10,050m^2	3,970m^2

(Note 1) Includes arrival lobby
(Note 2) Includes arrival inspection area
(Note 3) Includes departure lobby

② Control Tower and Operations Building

i. Predetermined Conditions

a. Transfer of functions

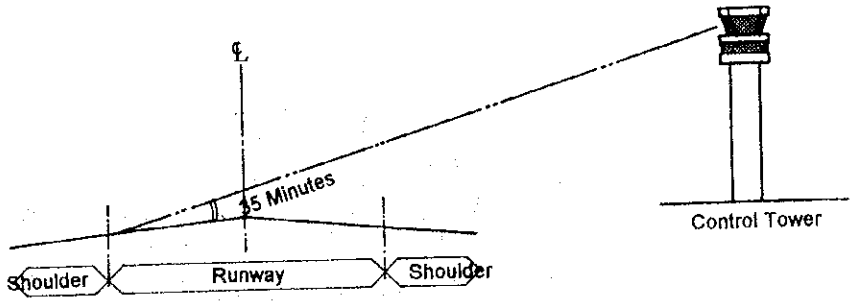
All of the functions of the existing facility shall be transferred to the new facility.

b. VFR room height determination

Because future plans for runway extension have not been formulated, it would be uneconomical to increase the height of the control tower in and effort to cover such unknown future requirements at this stage. Therefore the height of the VFR room in the control tower shall be determined so as to secure full view of the existing runway using the FAA method.

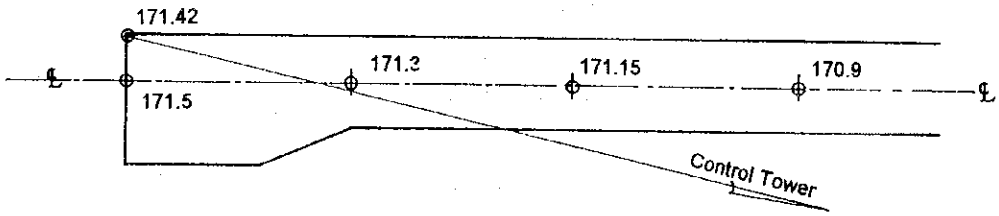
- Conditions for eye level calculation

In order to secure full view of the runway, an angle of at least 35 minutes is necessary between the runway surface and the line of sight.



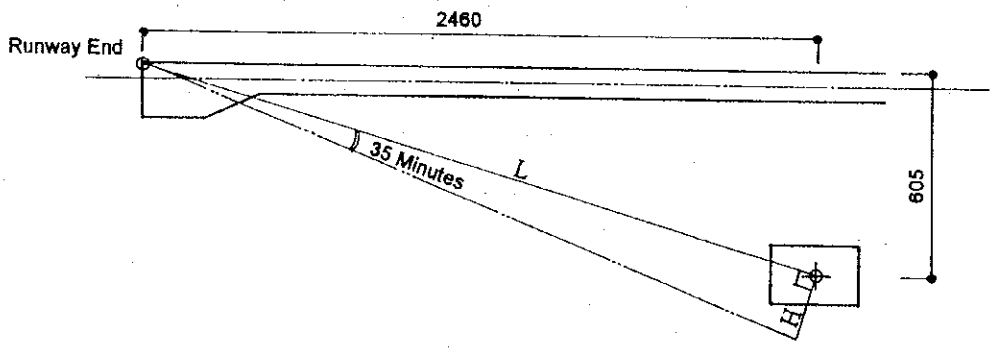
- Existing runway level

An angle of 35 minutes or more shall be taken between the line of sight and the existing runway end surface level as shown in the following figure.



- Calculation method

Assuming that the VFR room is to be located at the center of the planned tower site, the height "H" is calculated by the following formula.



$L = \sqrt{(2460)_2 + (605)_2}$

= 2533.3

VFR eye level is obtained as follows.

H = L(tan 35)

= 2,533.3 x 0.01018

= 25.8m

VFR eye level must be higher than 25.8m

- VFR room floor level

  To realize the seated eye level of 25.8m or higher, the VFR room floor level shall be higher than 24.6m, about 1.2m below the eye level. However, allowing for flexibility of the VFR room location within the tower site, and in consideration of the difference between the runway end level of 171.42m and the design GL of 169.4m, the VFR room floor level shall be set at design GL plus 27.0m or higher.

ii. Required functions and services

- VFR room

  The VFR room is the most important place in the control tower, and shall be equipped with: ATC consoles, 10w standby transceivers, AFTN terminal, AFL control console, and other equipment.

- Equipment room

  The equipment room shall be fitted with ATC console control rack, main transmitters and receivers, AFTN message switching equipment, Navaids remote control equipment, and others. The equipment room is to be provided with reserve space to install radar remote control equipment, a radar data processor, and other ancillary equipment to be needed when radar facilities are installed in the future.

- ACC Operation Room

  The ACC operation room shall be equipped with ACC communication consoles, AFTN terminal equipment, and other equipment. When a radar control system is introduced in future, this room shall be converted to an IFR room, and an ACC shall be established at a separate location. Reserve space shall be secured for future installation of equipment required for radar control.

- FIS Operation Room

  The FIS operation room shall be equipped with AFTN terminal equipment, air navigation service communication console, an other equipment, so as to provide air-ground communication on air routes as well as to meet information and communication needs of international and domestic airports.

- Weather Observation Room

  The weather observation room shall be adequately equipped with weather observation and other ancillary equipment.

- Flight Operation Room

  This room is available for filing flight plans, and also serves as aeronautical information service (AIS) office.

- Rescue Coordination Center

  The rescue coordination center is designed to coordinate search and rescue operation in emergencies, and shall be equipped with AFTN terminal equipment, telephones, and other equipment.

iii. Facility Requirements

a. Control Tower

Facility	Area
1. Roof Top (for VHF antennas)	50m^2
2. VFR Room	50m^2
3. Controllers' Lounge	50m^2
4. Weather Observation Room (1)	50m^2

b. Operations Building

Facility	Area
1. Roof top (for misc. radio antennas)	90m^2
2. ACC operation room	70m^2
3. FIS operation room	70m^2
4. Equipment room	35m^2
5. Airport administrator's office	50m^2
6. Offices (general)	50m^2
7. Offices (for technical personnel)	50m^2
8. Offices (for controllers)	50m^2
9. Maintenance room	20m^2
10. Spare parts storage	40m^2
11. Weather observation room (2)	40m^2
12. Meteorological officers' office	50m^2
13. Flight operation room	60m^2
14. Rescue coordination center	50m^2
15. Conference room	20m^2
16. Dining room	20m^2
17. Store	30m^2
18. Lobby	35m^2
19. Battery and electrical room	40m^2
20. Garage	50m^2
21. Training room	20m^2
22. Shifting staff resting room	
23. Others	

③ Fire Station

i. Predetermined Condition

a. Airport category

VIA shall correspond to "Category 7" of the ICAO Airport Category for rescue and fire fighting purposes.

b. Fire fighting vehicles

Fire fighting equipment to meet the "Category 7" requirements are as follows:

	L	W	H
• 1 RIV (Rapid Intervention Vehicle)	9,400	x 2,800	x 3,800
• 1 MJV (Major Vehicle)	11,500	x 2,840	x 3,800
• 1 Ambulance	4,700	x 1,800	x 2,200

Note- Command Vehicle is excluded, since the commander rides on the RIV.

c. Staffing plan

The manpower needed to operate the above mentioned and present equipment is as follows.

• Site commander			1
• RIV operators	1 driver	3 operators	4
• MJV operators	2 drivers	4 operators	6
• Ambulance	1 driver	2 operators	3
• Station commander, communication man			1
		Subtotal	15
• Clerks and others			abt 3
		Total	18

A fire fighting team of 18 to 20 persons shall be planned.

ii. Facility Requirements

• Chief officer's office :		
$10m^2$ x 1 man + visitor space $15m^2$		$25m^2$
• Command/administration office :		
$6m^2$ x 2 men + instruction space		$20m^2$
• Waiting & lecture room:		
$3m^2$ x 16 men		$40m^2$
• Shifting staff resting room:		
To contain abt 7 beds		$40m^2$
• Locker room :		
20 men x 3 shifts x 1/6 set $1m^2$ x10 sets		$10m^2$
• Shower room, changing room, wash basins,		
2 shower stalls		$18m^2$
• Water heater, cooking room		$10m^2$
• Toilet/WC		$12m^2$
• Workshop		$15m^2$
• Extinguishing agents storage		$15m^2$
• Storehouse		$15m^2$
• Garage 5m x 16m x 5 sets		$400m^2$
	Subtotal	$620m^2$
• Passage ways and others		
abt 10% of the subtotal		$70m^2$
Total floor area required	abt	$690m^2$

④ Airport Maintenance Workshop

i. Predetermined Conditions

a. Scope of Services

- Pavement area, runway, runway strips, stormwater drainage, and turf areas shall be regularly maintained, and minor repair work shall be performed as needed.

- Building service facilities such as air conditioning, water supply and sanitary facilities, and electrical facilities shall be regularly maintained, and minor repair work shall be performed as needed.

b. Equipment Required

	L W H	
• Suction sweeper	7,750 x 2,500 x 3,350	1 unit
• Tractor	3,300 x 1,600 x 2,000	1 unit
• Back hoe	1,500L to 1,100L	1 unit
• Other small workshop equipment		1 set

c. Staffing Plan

A total of ten men including the chief officer shall be assigned to operate the above mentioned equipment.

ii. Facility Requirements

• Chief officer's office: $10m^2$ x one person + visitor space $15m^2$	$25m^2$
• Offices :$6m^2$ x 4 men	$25m^2$
• Waiting & lecture room :$3m^2$ x 10 men	$30m^2$
• Shower room, changing room, wash basins, 2 shower stalls	$15m^2$

• Locker room	$10m^2$
• Toilet/WC, water heater	$20m^2$
• Workshop :	
(vehicle) 10m x 5m	$50m^2$
(building maintenance and other)	$100m^2$
• Warehouse :15m2 x 3 rooms	$45m^2$
• Garage :5m x 10m x 4 units	$200m^2$
Total floor area required	$520m^2$

⑤ Powerhouse

i. Predetermined Conditions

a. Scope of Services

The new powerhouse shall house the central receiving and stepdown substations as well as standby generators to supply electricity for the entire airport facilities. Also to be installed shall be a centralized monitoring system, through which the airport's entire electrical system can be monitored, and which can also function as of the system's maintenance and repair service center.

ii. Space Required for Materials

• Chief officer's office :	$20m^2$
• Waiting room & dining room :	$25m^2$
• Electrical machine room :	$240m^2$
• Generator room :	$200m^2$
• Legurator room: (for airport lighting system)	$80m^2$
• Control room :	$25m^2$
• Workshop :	$25m^2$
• Warehouse :	$25m^2$
• Toilet, shower room, locker room :	$20m^2$
Total floor area required	$520m^2$

2) Structure

There are no codes and standards on building structures in Lao PDR. Therefore, such codes and standards of Japan including those of the Japanese Government and of architectural associations shall be applied in this project. However, as for the earthquake shear coefficient only, one-fourth of the Japanese standard shall be applied because the records of earthquakes that occurred in Laos in the past indicate that in Vientiane earthquakes should be practically unperceived according to the calculation based on the distance to the hypo center and the magnitude. Wind pressure in Vientiane shall be assumed to be half that in Japan, considering the strong gusts during squall.

3) Mechanical Facilities

① Air Conditioning and Ventilation Facilities

i. Outdoor Design Conditions

Outdoor design temperature shall be set at 36.9℃, the highest temperature recorded on April of 1992 based on the records of maximum monthly temperatures between 1980 and 1992.

ii. Indoor Design Conditions

a. International Passenger Terminal Building

Considering that passengers spend not much time in the building because passenger service area connects to the aircraft outdoors, design conditions need not be as severe as for fully indoor structures, provided that due consideration should be given to local climate and environment. The office area

design conditions are set by taking into account the nature and hours of daily work, as well as expected heat load characteristics.

	Conditions of temperature and humidity	
	Temperature(℃)	Humidity(%)
Public Area	27	not specified
Office Area	26	not specified

b. Control Tower/Operations Building and Others

Taking into account the nature and hours of daily work, as well as expected heat load characteristics, indoor design conditions of these buildings are set as follows.

	Conditions of temperature and humidity	
	Temperature (℃)	Humidity (%)
Control Tower & Operation Building	26	not specified
Fire Station	26	not specified
Maintenance Workshop	26	not specified
Power Station	26	not specified

iii. Volume of Fresh Air Intake

The design volume of fresh air intake for rooms occupied by people is set at $20m^3$/hour/person in accordance with the Japanese regulations, as well as in consideration of local climatic factors.

iv. Air Conditioning System

a. International Passenger Terminal Building

Since passenger terminal building is a highly public facility which performs and offers a variety of functions and services, appropriate air conditioning system must be selected according to its use, taking into consideration the following factors:

- To provide for comfortable indoor environment fit for each function
- To be easy to maintain
- To be flexible for possible changes in the future

b. Control Tower

The VFR room in the control tower is the nerve center of the airport, and under no circumstances must its functions be interrupted. In consideration of the climate and heat load, the control tower shall be provided with a 100%-backed-up air conditioning facilities.

② Water supply system

The airport water supply pipe branches off the municipal water main (450 ϕ with water supply pressure of 3.5kg/m^2) that runs along the Vientiane-Luang Prabang road. The city water is first fed into the reservoir tank with a capacity of then pumped up in the elevated water tank with a capacity of 50m^3, and from there distributed by gravity to each of the building outlets. However, water for the toilets on higher levels of the control tower is supplied by means of a pressure pump.

The design of water supply facilities depends to a great extent on the volume of water used, the size of the buildings and other site conditions. Moreover, as aircraft increases in size and traffic demand grows, so does the amount of water required. Design volume of water supply is calculated with estimated number of people using different parts of the airport facilities.

In consideration of the local climate and other conditions, the total capacity of the water tanks shall be set at 100% of the single day's requirements, 50% each to be kept in the receiving tank and the elevated tank. For the sake of economy and future growth flexibility, the height of the height of the elevated water tank shall be determined so as to give sufficient water pressure for gravity supply to the third floor of the international passengers terminal building.

Daily water demand is calculated as shown in the following table:

Building	Daily consumption of water	
International Passengers	PAX	26,180l/d
Terminal building	STAFF	10,000l/d
Domestic Passenger	PAX	33,100l/d
Terminal (existing)	STAFF	5,000l/d
Cargo Terminal Building (existing)		3,000l/d
Control Tower / Operations Building		4,000l/d
Fire Station		2,000l/d
Maintenance Workshop		1,500l/d
Power Plant		1,000l/d
Offices		1,000l/d
Housing		12,000l/d
Total		98,780l/d

From the above, the design water demand is set as Qd = 100,000l/d.

③ Sewage treatment system

Drainage from buildings is divided into 4 separate systems of sewage, waste water, kitchen water and rain water. Sewage and waste water are processed through sewage treatment tanks, and the treated water is discharged directly into the drain ditch. One sewage treatment tank serve the international passenger terminal, the domestic passenger terminal and the cargo terminal building, and one for each one of the other buildings of the airport.

Because the buildings are widely distributed, a distributed system shall be adopted for sewage treatment tanks, with one tank installed in the terminal area, and one for each of the buildings in other areas. In consideration of the local circumstances, simple processing and easy maintenance, the sewage treatment shall be of the individual processed contact aeration system.

The daily volumes of waste water processed in various buildings are estimated as follows.

a. Measurements of daily volume of waste water processed by building

Building	Daily volume of waste water processed
International Passengers Terminal Building Domestic Passenger Terminal (existing) Cargo Terminal Building (existing) Offices Housing	Total 48,008l/d ≒ 50m^3/d
Control Tower & Operations Building	2,000l/d ≒ 2m^3/d
Fire Station	1,000l/d ≒ 2m^3/d
Maintenance Workshop	750l/d ≒ 2m^3/d
Power Plant	500l/d ≒ 2m^3/d

④ L.P. Gas Supply System

L.P. Gas shall be supplied to the third floor concessions and kitchens of the international passenger terminal building. Design capacity of propane gas cylinders shall be equal to 1 week's supply.

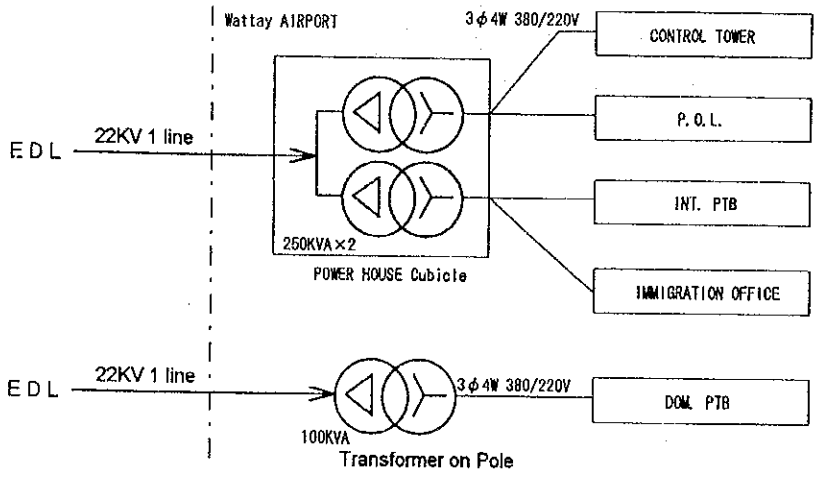
⑤ Kitchen Equipment

The type of kitchen facilities in the International Passengers Terminal Building depends on the type of food to be prepared. Chinese cooking facilities shall be installed as they should be usable for local cuisine.

4) Electrical Facilities

① Power receiving and step-down substation facilities

At present, as illustrated in the figure below, the Vientiane International Airport receives its supply of electricity from the EDL, which is the national power company of Laos. The power distribution system for the existing facilities is set according to EDL standards at 3 ϕ 4W380/220V.



The power load assumed in the present overall VIA development plan is described in Table 5-1. The distribution voltage is in conformity with the standards of EDL, with the high-voltage lead-in wire at 3 ϕ 3W22KV 50Hz, and low-voltage at 3 ϕ 4W380/220V.

Table 5-1 Electrical Load Requirements

ZONE	ITEM	VOLTAGE	CONDITION	AREA	EDL SUPPLY		STANDBY GENERATORs	
		(V)		(m^2)	BLDG.	EQUIPMENT	BLDG.	EQUIPMENT
Airport Administration Zone	1. WATER SUPPLY	380/220	A *3		5.0	20.2		
	2. DCA OFFICE	380/220	B		20.0			
	3. GUARDMAN BOX	380/220	B		–			
	4. LIGHTING (PARKING AREA) *1	380/220	A			62.7		
	5. LIGHTING (ROAD IN TERMINAL AREA) *2	380/220	A			56.1		
	6. OTHERS				10.0		10.0	
	7. POL		B		5.0		5.0	
	1. CONTROL TOWER & OPERATIONS BLDG.		A	1,800	144.0		36.0	
	2. FIRE STATION	380/220	A	770	23.1		11.6	
	3. MAINTENANCE WORKSHOP	380/220	A	750	30.0	20.0		
	4. SEWAGE TREATMENT	380/220	A		5.0	30.0		
	5. OTHERS					10.0		
	1. NAVAIDS	380/220	A			92.0		
	2. AIRFIELD LIGHTING	380/220	A			166.8		
	3. HF SITE	3,300	B			100.0		
	4. ILS	3,300	A			15.0		
	5. RADAR	3,300	C			75.0		
	6. ACC	3,300	C			50.0		
					242.1	697.6	62.6	403.8
	SUBTOTAL				939.7		466.4	
Terminal Zone	1. INTERNATIONAL PASSENGER TERMINAL BLDG.	3,300	A	11,750	881.3		235.0	
	2. DOMESTIC PASSENGER TERMINAL BLDG.	380/220	B	4,043	65.7		65.7	
	3. CARGO TERMINAL BLDG. (INTL.)	380/220	B	1,377	27.5		13.8	
	4. CARGO TERMINAL BLDG. (DOME.)		B	835	16.7		8.4	
	5. OTHERS				–	10.0	–	10.0
					991.2	10.0	322.9	10.0
	SUBTOTAL				1,001.2		322.9	
	GRAND TOTAL				1,940.9		799.2	

*1 : 220 [W] ×38,000 [m^2] /200 [m] ×1.5 [VA/W] =62.7 [KVA]

*2 : 220 [W] × 3,400 [m^2] / 20 [m] ×1.5 [VA/W] =56.1 [KVA]

*3 : A=NEW B=IMPROV. EXISTING C=FUTURE

The overall power load requirement is assumed to be 2000KVA. Because the existing power facilities are superannuated and inadequate in capacity, the project shall include building of a new powerhouse with adequate receiving and step-down substation facilities.

Because the terminal area is widely extended, the power distribution system shall be divided into two zones for the sake of clarity and efficiency of distribution namely, the Terminal Zone covering the passenger and cargo buildings, and the Airport Administration Zone covering the control tower and other facilities. The new powerhouse shall be located close to the Airport Administration Zone, to which it shall mainly supply low-voltage power of 380/220. Since the powerhouse shall be comparatively far away from the Terminal Zone, power to the IPT shall be supplied in high-voltage of 22KV.

On the basis of the figures shown in Table 5-1, the transformer capacities are set as follows.

The transformer capacity for the Airport Administration Zone shall be 1000KVA.

The total load for the Terminal Zone is shown at 1000KVA, however, in consideration of the demand increase to be expected with the renovation and improvement of the existing airport facilities, the transformer capacity for the Terminal Zone shall be set at 1500KVA.

A single-circuit distribution system shall be installed with backup power supply provided by standby generator at times of commercial power failure or of equipment maintenance and repair.
Because malfunctioning of transformer seriously hampers airport operation, and it may take days for delivery of the

replacement unit, transformer should not only be of simple and durable construction, but also be provided with a backup.
The backup unit shall have 100% of the capacity of the main transformer, so that it alone could accommodate the entire power requirements of the airport.

② Standby generator

According to the past record, power interruptions occur on an average of 3 to 4 times per month, lasting an average of 1 to 2 hours each time. Under the construction plan each distribution zone shall be provided with a standby generator to meet the emergency power supply requirements of the respective zone as shown in Table 5-1. In order to be prepared for possible occurrence of commercial power failure while the generator malfunctions or is in repairs, a backup generator shall be provided with a manual switched over system.

5) Terminal Special Equipment

① Passenger Boarding Bridge (PBB)

- 15m or more of clearance shall be secured between aircraft and the PBB rotunda. Although the design shall be made primarily to handle B737- to B767-class aircraft, one of the gate positions shall be made with B747 as critical aircraft to prepare for its anticipated introduction In the future.
- Assuming that the ground level after renovation of the apron shall be 169.5m above sea level, rotunda floor level shall be set at 173.5m.

② Baggage Handling System (BHS)

i. Departure conveyor

- For effective utilization of the back space behind the check-in counters, and to reserve space for offices and corridors, a pit shall be constructed under the floor through which the baggage sorting area shall be connected with the check-in counter.
- Three conveyor lines shall be provided to accommodate the 3 peak-hour flights estimated.

ii. Claim conveyor

- A direct-feed carrousel type conveyor shall be installed for baggage claim, which allows good visibility and broad display of luggage on the flat slatted surface.
- The conveyors shall be long enough to allow processing of baggage within 25 minutes after arrival of the design aircraft of B767.
- Taking the per-flight processing time into account, two conveyors shall be installed to accommodate the 3 peak-hour flights.

iii. X-ray equipment

- Two X-ray baggage inspection machines shall be installed at the entrance of the check-in lobby for inspection of baggages to be checked in. One of the machines shall be the existing machine.
- One X-ray inspection machine shall be installed at the entrance to the international departure lobby to inspect carry-on baggage. However, space shall be reserved for one additional X-ray inspection machine in preparation for the increased traffic in the future.

(3) Civil Works

1) Roads and Car Park

① Design Vehicles

As standard and codes concerning the road structure are not provided in Laos yet, design vehicles in this project are established based the Japanese "Codes on Road Structure".

Sizes (length x width) of the design vehicles are as follows:

- Small Vehicle 4.7m x 1.7m (Taxi, Tuktuk, Minibus, Private Sedans)
- Medium Vehicle 12.0m x 2.5m (Bus, Truck)
- Semi-Trailer 16.5m x 2.5m (Tank Lorry, Trailer)

② Design Speed

Design speed shall be 20km/h for safety and effective utilization of limited terminal area.

③ Number of Lanes

a. Access feeder road from National Road 13 to Airport

Two lanes in each direction shall be provided for the two-way road system in order to prevent road closure due to traffic accident or maintenance works and to secure access for the vehicle traffic to and from the passenger terminal area and airport administration area.

b. Terminal Area Standard Section

One-way traffic shall be planned for the terminal area, and the entrance and exit for taxi pool and car park shall be secured. Lanes for accessing and not accessing these facilities shall be separated for traffic efficiency and safety.

Two lanes shall be provided to avoid road closing due to traffic accident or maintenance works.

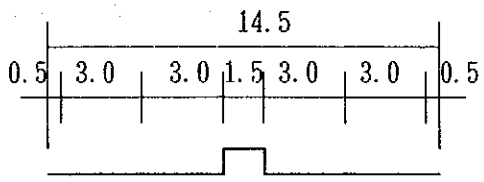
c. Terminal building front

Additional lanes shall be provided in front of the terminal buildings where congestion is anticipated.

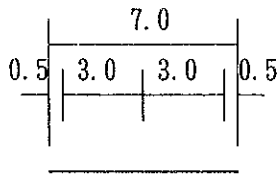
One additional lane for loading and unloading, totally three lanes, shall be provided in front of the new domestic passenger terminal building. One curbside lane and one more additional lane for loading and unloading, totally four lanes, shall be provided in front of the new international passenger terminal building.

④ Widths and Composition of Widths

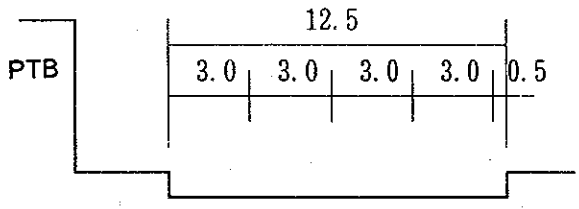
Standard width of the vehicle lane and the shoulder shall be 3.0m and 0.5m respectively. Composition of widths in each section shall be as shown in the following figures.



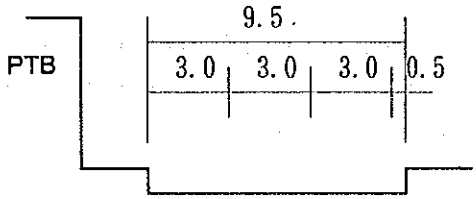
a Access Feeder Road



b Terminal Standard Section



c Int'l Passenger Terminal Building Front



d Domestic Passenger Terminal Building Front

2) Pavement

① Soil Data

Soil survey has not been conducted at planned road and car park sites. CBR of subgrade of the pavement is therefore assumed based on the results of boring made at 6 points in the airport, site survey and previous reports.

② Subgrade Condition

Subgrade shall be classified into the following two categories in terms of bearing strength.

a. Existing road and car park area

This area was prepared by filing just the same as terminal building sites. The ground has been compacted by vehicles traffic and is comparatively good.

Soil classification is SM (silty gravely sand) to the depth of around 1.5m from the ground level, and the field CBR is assumed to be around 20%.

Design CBR of subgrade is set at 16%, which is 80% of the assumed field CBR.

b. Area to the west of existing Terminal Area

This area is mostly of silty or clay, farmland or swamps, and the ground condition is poor.

Soil classification is CL (sandy clays) to the depth of 1.5 ~ 2.0m from the ground level, and the field CBR is assumed to be around 5%.

Design CBR of subgrade is set at 4%, which is 80% of the assumed field CBR.

③ Type of Pavement

Since pavements of the roads in Vientiane city and of the national roads, including the existing roads of VIA are random pavements of penetration macadam, the same shall be adopted for the new roads in VIA for the following reasons:.

- People are familiar with repair and maintenance of this type of pavements.
- Not much of heavy vehicle traffic is expected at the terminal area.

3) Stormwater Drainage

① Rainfall Data

Rainfall observation and recording have not been made at VIA, but there is a meteorological observatory near the airport which has observation data for the last 13 years.

As for the monthly rainfall, 611mm recorded in July 1981 is the heaviest, and the average monthly rainfall of July is around 330mm. As for the daily rainfall, 181mm also in July 1981 is the heaviest, and the records show several days having more than 100mm rainfall.

② Calculation of Probable Daily Rainfall

Probable daily rainfall calculated based on the records of annual maximum daily rainfall using the calculation chart, is as shown in Table 5-2.

Table 5-2 Estimated Daily Rainfall

T (YEAR)	F(%)	ε =Y	0.1238 ε	log(X+64.761)	X+64.761	X (mm/day)
200	99.5	1.8215	0.2255	2.4771	299.99	235.2
100	99.0	1.6450	0.2037	2.4553	285.30	220.5
50	98.0	1.4520	0.1798	2.4314	270.02	205.3
30	96.7	1.2967	0.1605	2.4121	258.29	193.5
20	95.0	1.1630	0.1440	2.3956	248.66	183.9
10	90.0	0.9062	0.1122	2.3638	231.10	166.3
5	80.0	0.5951	0.0737	2.3253	211.49	146.7
2	50.0	0.0000	0.0000	2.2516	178.48	113.7

③ Assumption of Rainfall Intensity Formula

A rainfall intensity formula is needed to determine the drainage facility capacity in airport terminal area. In the absence of rainfall data per hour or for shorter time period, the rainfall intensity formula of a designed time period, cannot be established. Therefore the rainfall data of 27 years in Udonthani Province in Thailand were utilized to obtain the necessary formula since the rainfall characteristics of Udonthani are considered to be similar to those of Vientiane. Maximum rainfall of ten-year probability for the design of stormwater drainage facilities.

Rainfall intensity formula was established by the Talbot Method as follows;

$I_{10} = 107.1 / (t+47.1) \times 80 = 8568 / (t+47.1)$

t : duration of continuous rainfall (min.)

(4) Airport Special Equipment

1) Air Traffic Services, Air Navigation and Communication Equipment

Out of the traffic services, air navigation and communication equipment, those to be provided by Japanese Government are as follows:

① Control Tower	ATC Communication Facilities
② ACC room	ACC Communication Console
③ FIS room	AFTN Facilities and Direct Speech Circuit.

Design conditions for the above facilities are described hereinafter.

① Control Tower

The new control tower shall have functions of an equal level to that of the existing VIA control tower. As the equipment in the existing control tower is aged, and it is also impossible to interrupt the operation to transfer the equipment in actual use, all required equipment shall be newly procured. As for the monitoring equipment of VOR/DME, the existing unit shall be transferred to the new control tower for use until it is renewed in 1995 with assistance from France, because this equipment can be moved within a permissible period of operational interruption.

Power supply conditions in Vientiane are good in general because power source is relatively stable, and emergency generators capable of generating power within 15 seconds after commercial power failure shall be under the Project in accordance with the ICAO recommendation.

For the backup air-ground communication equipment and other equipment with memory, uninterruptible power supply unit (UPI) shall be provided for to enhance operational safety.

As for the new radio communication equipment, current communication coverage shall be secured at least. For this purpose, new transmitter shall have the same power output and use the same frequencies as the existing equipment.

Equipment provided in the new control tower shall be composed of the following items:

a. ATC Consoles

- Approach Control Console 1 set
- Aerodrome Control Console 1 set
- Auxiliary Console 1 set
- Flight Progress Strip Console 1 set
- Assistant Console 1 set
- Supervisory Console 1 set

ATC consoles shall have the following functions other than the air-ground communication.

- VHF Direction Finder (VDF)
- 3-channel NDB Antenna Monitor
- Intercom

ATC consoles shall be of the structure capable of being equipped with monitors for ILS, VOR/DME and anemometer for use in the VFR room.

b. VHF Air - Ground Communication Equipment

- 50W AM Transmitter (dual system) 3 sets
- VHF AM Receiver (dual system) 3 sets
- 10W AM Transceiver (standby equipment) 3 sets
- VHF AM Receiver (for monitor) 1 set

VHF air-ground communication equipment shall be available for the following three frequencies;

- 118.1 MHz (Aerodrome control)
- 119.7 MHz (Approach control)
- 121.5 MHz (Emergency use)

As for the 50W AM Transmitter and VHF AM Receiver, one set is composed of two units, one for operation and another for backup.

c. Portable Communication Equipment

- 10W FM Transceiver 1 set
- 1W FM Transceiver 6 sets

This equipment is used for communication between the control tower and vehicles in the airport, with frequencies ranging within the VHF band.

d. ATC Console Control Rack

- ATC Console Control Rack 1 set

This equipment is for communication control of ATC control console and shall be installed in the equipment room on the 2nd floor of the new operations building.

e. Others

- Light Gun 1 set
- Tape Recorder and Reproducer 1 set
- Power Distribution Board 1 set
- Terminal Board 1 set
- Electronics Clock System 1 set

The tape recorder shall be a system capable of recording ACC and FIS communication.

② ACC room

Communication between aircraft flying in Vientiane Flight Information Region (FIR) and Vientiane Flight Information Center (FIC) is currently conducted by HF.

DCA is planning to provide VHF air-ground communication for control of aircraft flying over Laos by establishing remote transmitting and reserving stations in Luang Prabang and Savannakhet and Area Control Center (ACC) in VIA with financial support from France. Conditions of electrical interface between equipment provided by Japan and France are not decided yet, but it will be no problem because it simply involves connection for voice communication and AC on-off signal.

ACC communication console to be provided in ACC in the new operations building shall be composed of the following equipment:

- Control Console 2 sets (North/South)
- Coordinator Console 2 sets (North/South)
- Supervisory Console 1 set

③ FIS Room - Aeronautical Fixed Communication Service Facilities

Aeronautical fixed communication facilities to be installed in the new FIS room shall comprise AFTN and direct speech circuit, both to be connected to Aerothai Communication Center in Bangkok through microwave circuit and from there to be connected to neighboring countries through satellite circuit.

Facilities to be installed in the FIS room of the new operations building shall be composed of the following equipment:

a. Aeronautical Fixed Telecommunications Network (AFTN)

AFTN is for exchanging teletype information with neighboring countries, and shall be composed of the following equipment;

- AFTN Switching Equipment 1 set
- AFTN Terminal 12 sets

AFTN switching equipment shall have functions not only for exchange of communication with neighboring countries but also with domestic airports in Laos in the future.

b. Direct Speech Circuit

Direct speech circuit is for voice communication between control towers in neighboring countries, and shall be composed of a set of direct speech console including operation console.

This equipment is basically to be for connected to Bangkok by microwave circuit, but it shall also be connected to airports in neighboring countries by existing HF communication means a backup circuit. This equipment shall also be capable of installing HF transmitter/receiver for communication with domestic airports in Laos.

2) Airport Maintenance Equipment

Minimum necessary airport maintenance equipment shall be provided for routine maintenance and minor repair works.

Required number and specifications of equipment for airport maintenance are determined through the following two steps;

- Evaluate current airport maintenance conditions
- Establish adequate maintenance level suitable for VIA

① Objectives of Airport Maintenance

Objectives of the maintenance include the following items::

a. Secure safety of aircraft operation
b. Secure safety of ground service equipment maneuvering and equipment reliability
c. Maintain due level of performance, functionality and efficiency of various airport facilities and equipment
d. Prolong service life of facilities and equipment (Maintain values of airport's fixed assets)
e. Aim to achieve long-term cost-effectiveness of maintenance in terms of material and labor

② Objects and Scope of Airport Maintenance

To identify the current situation of airport maintenance at VIA, maintenance conditions of facilities are evaluated by visual observation as follows:

(Good:G, Average:A, Poor:P)

a. - Airfield Facilities

- Landing/Take-off Area
  - Runway Strip ……(A)
  - Runway (Runway, Stopway, Shoulder) ……(P)
  - Taxiway ……(P)
  - Turfed Area ……(P)
  - Markings ……(P)
- Aircraft Parking Area:
  - Aircraft Parking Apron ……(P)
  - GSE Parking ……(A)
  - Turfed Area ……(P)
  - Markings ……(A)
- Airport Lighting
  - VASIS ……(P)
  - Runway Lighting ……(A)
  - Runway End Light ……(P)
  - Aerodrome Beacon ……(A)
  - Taxiway Lighting ……(A)
  - Runway End Cubicle ……(A)
  - Apron Floodlight (Column) ……(A)
  - Emergency Power Generator ……(A)
  - Constant Current Regulator ……(P)
  - Substation for Navaids and AFL ……(A)
- Radio Navaids and Communications
  - LLZ ……(P)
  - MM ……(A)
  - Compass Locator (NDB) ……(A)

VOR/DME ……(G)

RX / TX (Receiving/Transmitting Station) ……(A)

- Meteorological Facilities

anemometer ……(A)

b. - Airport Terminal Facilities

International Passenger Terminal Building ……(P)

Domestic Passenger Terminal Building ……(P)

Cargo Terminal Building ……(A)

c. - Aircraft Ground Support Service Facilities

Ground Support Equipment (GSE) ……(A)

Fuel Supply Facilities (POL) ……(G)

d. - Airport Utilities Facilities

Electric Power Supply Facilities ……(A)

Water Supply Facilities ……(A)

Waste Disposal Facilities ……(P)

e. - Airport Administration Area:

Control Tower and Operation Building ……(P)

Maintenance Workshop ……(P)

Fire Station ……(P)

f. - Airport Internal Traffic Service Facilities

Access Road ……(P)

Landside ring roads with connecting road ……(P)

Car Park ……(P)

Pedestrian Road, Landscaping facilities ……(P)

g. - Airport Site Facilities

Stormwater Drainage Area ……(P)

Perimeter Road ……(P)

Perimeter Fences & Gates ……(P)

Fire Hydrants ……(P)

③ Evaluation of Airport Maintenance Conditions

Judging from the current conditions of maintenance as observed above, points to be improved are as follows;

a. Improvement of maintenance of airfield facilities
b. Removal of trees and bushes in restricted area
c. Repair and cleaning of runway and taxiways
d. Repair and prevention of concrete joint deterioration
e. Repair and cleaning of existing building exterior
f. Repair of internal road surfaces(including shoulders)
g. Repaint of Markings (repainting)
h. Maintenance and improvement of stormwater drainage
I. Establishment of maintenance system
(Enforcement of maintenance staff)
j. Training of maintenance staff for upgrading of maintenance skills
k. Promotion of importance of maintenance
l. Clarification of maintenance work divisions and cost control

④ Airport Maintenance Equipment

Following maintenance equipment shall be at least necessary to satisfy the above points to be improved.

a. Suction sweeper : cleaning of runway and taxiways
b. Tractor with slasher attachment : removal of trees and bushes
c. Backhoe : removal of trees, plants and soil in drainage
d. Industrial lawn mower : maintenance of turfed area
e. Whipper snippers : maintenance of turfed area
f. Sealing machine : repair and improvement of joint
g. Paint marker : repair and improvement of marking
h. Tip truck : transport of excavated earth, weeded grass, repair tools etc.

i. Motor grader : grading of ground surface
j. Plate compactor : compaction of road surface
k. Vibration roller : compaction of road surface
l. Concrete cutter : cutting of concrete and asphalt surface
m. Compressor : production of compressed air for crushing concrete
n. Concrete mixer : mixing concrete
o. Asphalt heater/mixer : repair of asphalt surface
p. Four-wheel-driven car : airport patrolling, communication, tools transport, etc.

Of the above equipment, i,k,m, and n are considered to be construction equipment and will require too large amount of initial investment and maintenance cost compared with operational frequency. Such maintenance services that require these heavy equipment are recommended to be performed by contractors. The airport maintenance work equipment to be supplied under the project shall therefore comprise only the items other than i,k,m and n above.

3) Fire Fighting Equipment

Design aircraft of this project is B767 for scheduled services and B747 for chartered flights. According to the ICAO Categorization of Airports for Rescue and Fire Fighting Purposes, an airport serving 700 or more of scheduled and non-scheduled flights of the longest aircraft- which is the case of VIA is B747 - falls under Category 9. This categorization, however, may be lowered by two categories in a case such as of VIA, where majority of flights are by far smaller aircraft.
Two fire fighting vehicles are required for this category airport, but specifications of these vehicles are not stipulated. Minimum extinguishing agents as required by ICAO are as follows:

[In case of Protein Foam]

Water required for form production	18,200 litres
Discharge rate of foam	7,900litres/minute
Complementary agent	Dry chemical power 225kg or Halons 225kg or CO_2 450kg.

[In case of Aquarius Film Forming Foam]

Water required for form production	12,100 litres
Discharge rate foam	5,300 litres/minute
Complementary agent	Dry chemical power 225kg or Halons 225kg or CO_2 450kg.

Specifications of fire fighting vehicles shall be determined so as to satisfy the above requirements. The traveling performance of the vehicles shall meet the following ICAO requirements

Rapid Intervention Vehicle (RIV) should have an acceleration capacity to reach of 80km/h within 25 seconds, with maximum speed of at least 105km/h.

Major vehicle (MJV) of more than 4,500 litres of tank capacity should have an of acceleration capacity to reach 80km/h within 40 seconds, with maximum speed of at least 100km/h.

With these characteristics taken into consideration, the required number and type of vehicles are determined as follows:

- RIV/Command car 1 unit
- MJV 1 units
- Ambulance 1 unit

Although the ICAO standards, do not specify permanent provision of ambulance as part of the rescue and fire fighting equipment, provision is definitely required for making ambulance readily available in case of emergency. One ambulance shall, therefore, be included as part of the rescue and fire fighting vehicle fleet for VIA. Command car shall not be included on assumption that commander shall use RIV.

In view of the fact that aircraft accidents involving landings and take-offs, very often take place in the vicinity of both ends of the runway, the fire station shall be located on the airside (apron side) at a distance that enables fire fighting vehicles to reach either end of the runway within 3-minutes response time.

5-4-3. Basic Plan

(1) Terminal Area Layout Plan

1) General Requirements

The plan shall be based on the ADB's development plan as updated by the study team, and shall also take into consideration the results of the local site survey. Details of the plan shall be formulated, full studying the future potential for expansion and adequate utility facility, plan with the Lao authorities.

2) Layout Plan

- Since the ADB's development plan, makes no provision for laying of the underground tube, a 5m wide site area shall be secured for this purpose between the apron edge and the terminal building site. As a result, the distance between the runway centerline and the apron edge shall be reduced by 5m to 545m.

- Based on the ADB development plan, the new International Passenger Terminal Building shall be sited between the existing International Passenger Terminal Building and the Cargo Terminal Building. However, the depth of the site shall be sufficient for appropriate terminal building plan.

- With a view to preserving the existing site condition as much as, possible overall layout shall be planned to keep clear of the large pond which serves as a retarding basin.

- The new control tower and operations building, which shall be constructed along with the fire station prior to the Terminal Building, shall be located close to the Terminal Building for the convenience of liaison between these buildings.

- The fire station, as already mentioned, shall be located within a 3 minute distance from both ends of the runway.

- The existing POL (Shell) shall be left as it is until is moved, according to the DCA plan, and after it oil have been removed, the remaining site shall be reserved as a buffer zone to assure flexibility for future development.

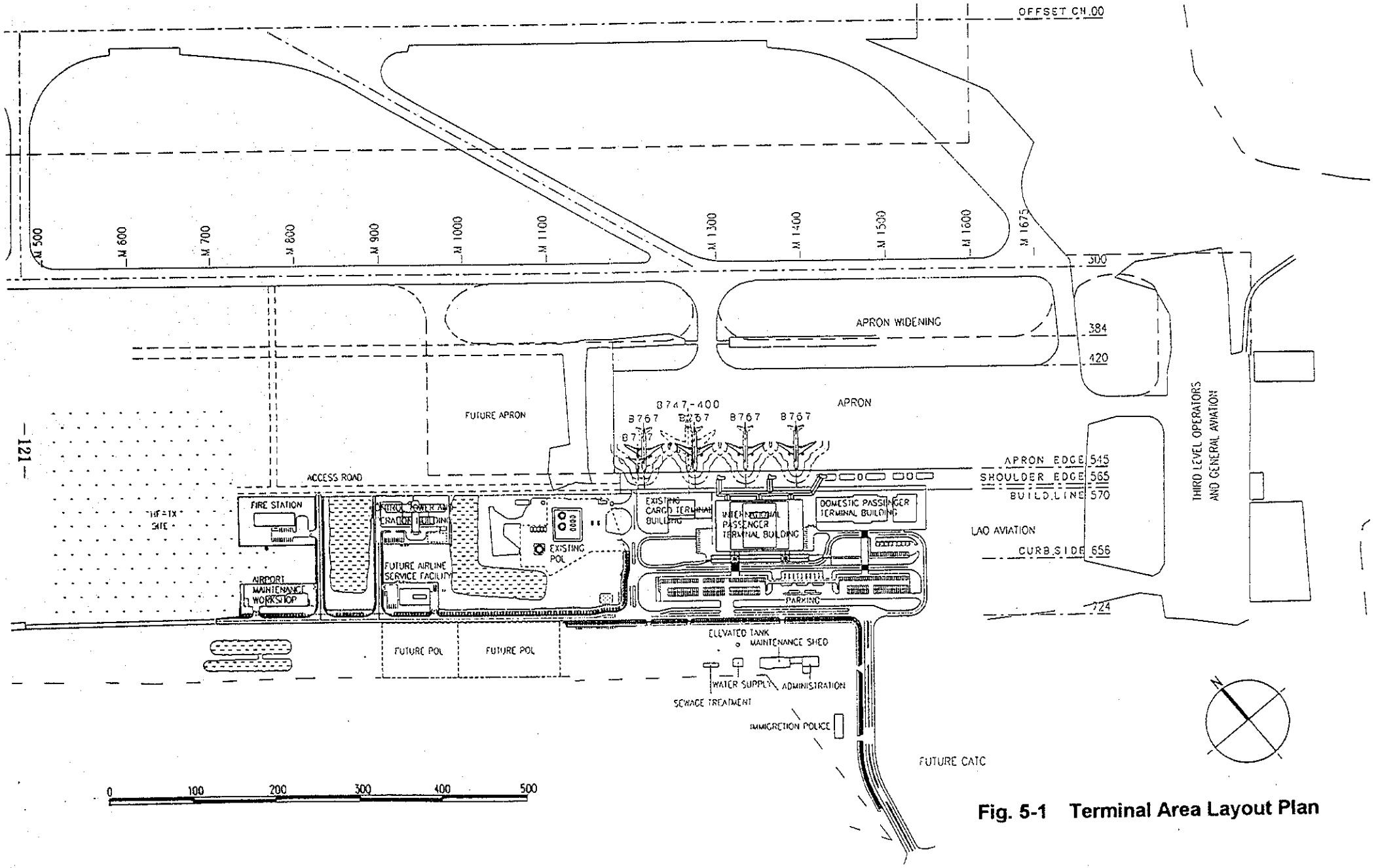


Fig. 5-1 Terminal Area Layout Plan

(2) Buildings

1) Architectural Plan

① International Passenger Terminal Building

i. Functional Arrangement

- On the first floor, the departure facilities of check-in lobby and counter, and the arrival facilities of baggage claim, customs inspection area and arrival lobby shall be provide.

- The second floor shall accommodate departure facilities including lobby, security check, lounge and immigration inspection area. Immigration inspection for arrivals shall also be provided on the 2nd floors.

- The VIP lounge shall be provide with exclusive direct access for boarding or unboarding without having to pass through the customs or the immigration inspection area.

- Observation deck shall be placed on the roof top.

ii. Flow Plan

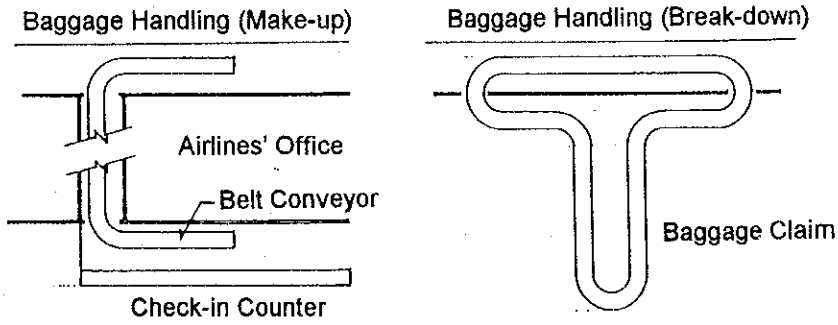
a. Passenger flow

Arrival and departure passenger flows shall be clearly separated by ceiling-high partitions built between the departure lounge, arrival inspection area and the concourse. Separation of departure and arrival flows in the concourse shall be achieved not by physical facilities but by passenger handling in actual operation.

b. Baggage flow

- Departure baggage shall be transported by belt conveyors which will be installed between the check-in counter and the departure baggage make-up area.

- Arrival baggage shall be claimed from a race track type belt conveyors.



c. Handicapped persons flow

Elevators shall be installed as needed for departures and arrivals to facilitate handicapped persons vertical movement between floors necessitated by the overall terminal concept.

d. VIP flow

- A separate VIP entrance shall be provided in the airside of the terminal building. From there a direct and exclusive route shall be established leading to the second floor VIP lounge.

- A door shall be provided in the VIP room for direct access to the concourse.

- Another door shall also be provided in the VIP lounge to allow access to and from the departure lounge intended for use of passengers who have passed through the security check.

e. Staff flow (DCA, airlines and CIQ staff)

- A staff entrance/exit door shall be provided to enter on the southeast side of the terminal building.

f. Service flow

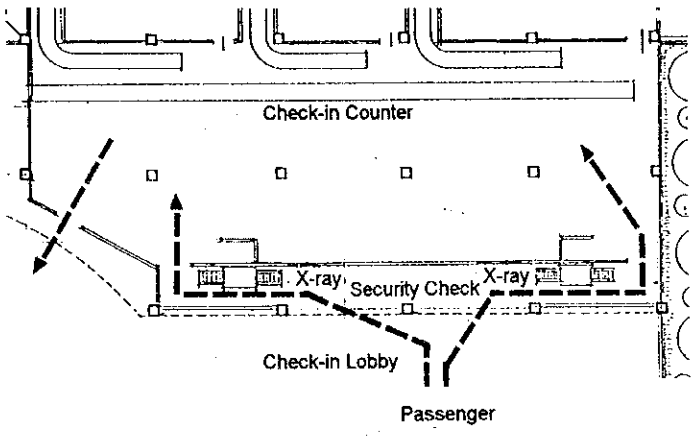
To facilitate delivery of goods and disposal of waste, an exclusive service door shall be provided facing the service yard on the northwest side of the Terminal Building.

iii. Passenger Handling Facility Plan

Described below are the plans of major facilities located in the Terminal Building.

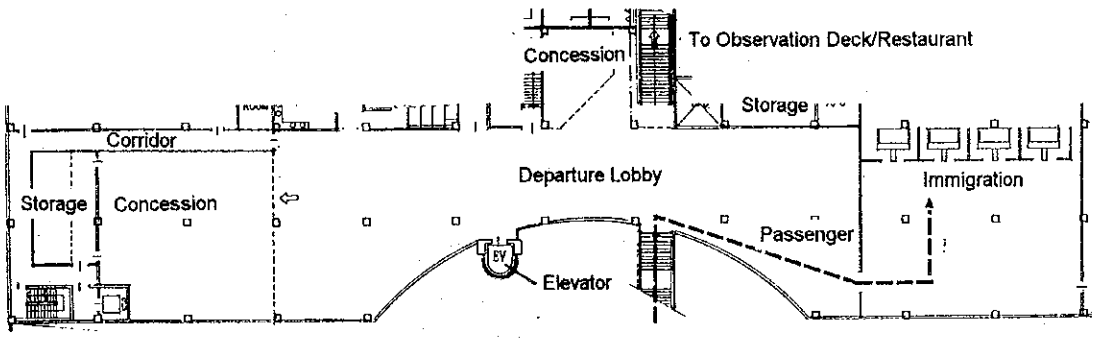
a. Check-in lobby

The check-in counter shall be long enough to handle passengers checking-in for three flights at one time, a section of the counter being assigned for each flights. Security checks of checked-in baggage shall follow the current method, and a stanchion shall be installed.



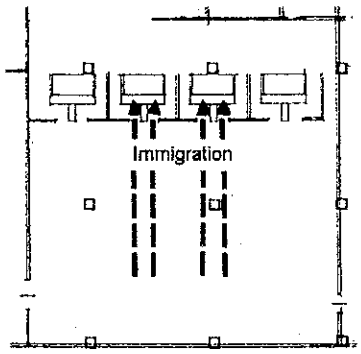
b. Departure lobby

The departure lobby shall serve as a transit space for departing passengers leading to the departure inspection area, on the second floor, or to the restaurants and observation deck on the third-level building top. Concessions and other means of improving services for travelers shall also be provided.



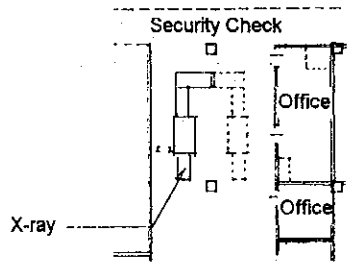
c. Inspection area for international departures

The inspection area for international departures shall have sufficient depth to provide for queuing space for waiting passengers, and shall adjoin the CIQ office. Identical description applies to the arrival inspection area.



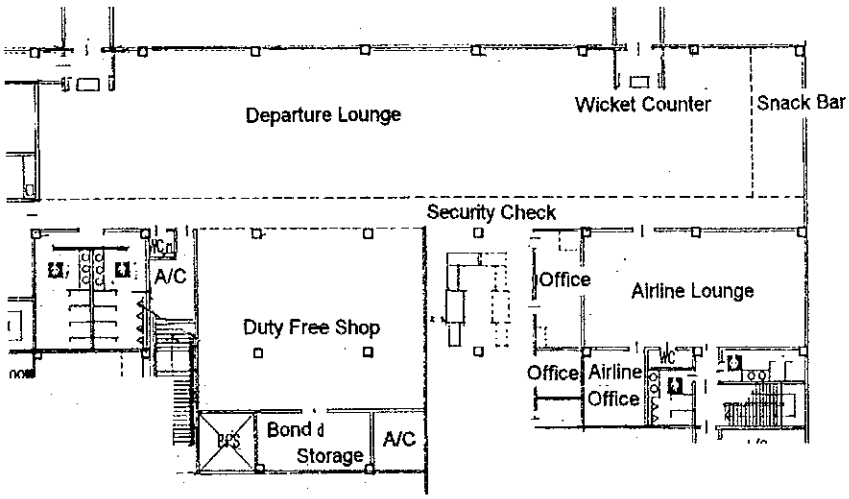
d. Security inspection facilities

The security inspection facilities shall start with one inspection unit installed for the time being since it is considered sufficient to handle the near-future passengers. However, space shall be reserved for an additional unit in preparation for further increase in the number of flights, as well as for introduction of larger aircraft.



e. Departure lounge

While securing space to handle three flights at one time, the departure lounge shall also be provided with airline lounge, duty free shops, snack bars, and other services facilities to enhance passenger convenience.



f. VIP lounge

The VIP lounge shall be made directly accessible from the VIP entrance without having to pass through the security check and departure inspections. It shall also be accessible to and from the departure lounge.

g. Airline lounge

Airlines lounge shall be a common facility shared by the airlines serving VIA or shall be situated facing the departure lounge.

iv. Section Plan

a. Standard ceiling height

Standard ceiling height of the passenger processing area, such as the check-in lobby and departure lobby, shall be at least 3.0m, so as to allow good visibility of signs and to avoid giving travelers an oppressive feeling.

b. Floor heights

Floor heights shall be set at 5.0m for the first and 2nd floors, and 4.5m for the third floor, comprehensively taking into consideration such factors as ensuring adequate passenger access through the boarding bridge to aircraft, adequate clearance for GSE vehicles under the fixed bridge, optimum air-conditioning efficiency, and standard ceiling height of the passenger processing.

c. Open well

Open well shall be arranged effectively in the check-in lobby and departure lobby to create a vertically integrated, continuous space, which enhances smooth normal flow of passengers. Instantaneous view of the overall terminal facility arrangements will facilitate orderly evacuation guidance at times of emergency, and should also contribute to ward inducing customers to the observation deck and the view restaurant on the third floor.

v. Elevators

	Designated use	Capacity	Floors Served	Travel Span	Rate speed	Remarks
ELV (1)	For passengers incl. handicapped	11	1-3	10m	60m/min.	see-through type
ELV (2)	For passengers incl. handicapped	11	1-2	5m	60m/min.	
ELV (3)	For passengers incl. handicapped	11	1-2	5m	60m/min.	
ELV (4)	For freight and passengers	1,000kg	1-3	10m	60m/min.	

vi. Design features

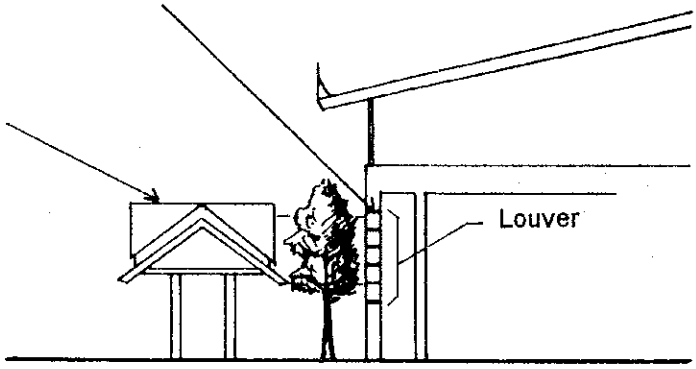
- A traditional large roof constitutes the, key design, feature, which provides protection against the strong sun and the hot, humid and rainy Lao climate.

- The following design features shall be adopted to counter the strong sunlight during the dry season.

  – To effectively shield the curb side facing the southwest from the high mid-day sun, a horizontal louver shall be installed. Platform eaves provide protection from the low-angle rays of the late afternoon sun.

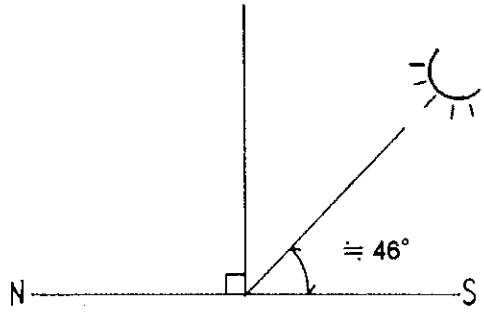
  – Because the northwest side of the building cannot expect protection by the platform eaves against the hot sun striking this area from early afternoon, window openings shall be kept to a minimum in an effort to save energy. The southeast side of the building shall be of the same design.

  – On the northeast air side, the concourse provides protection from the rays of the early morning sun.

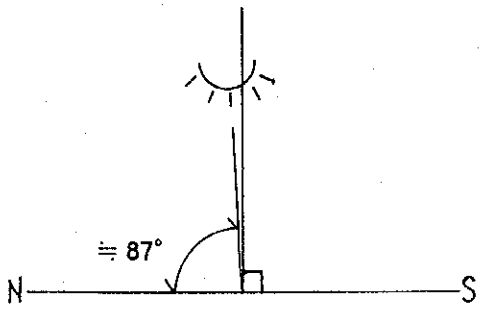


- During the rainy season, the sun light poses less of a problem because there are more clouds compared with the dry season. Since the sun bears slightly to the north of the zenith at culmination, its affect on the departure lounge, VIP lounge, etc. on the northeast air side of the building shall be minimized by keeping the window position below a certain height, as well as by using heat-reflection glass which prevents radiation heat from penetrating into the building. By providing windows with such limitations, rather than to tally eliminating them, air side field of vision is secured for passengers.

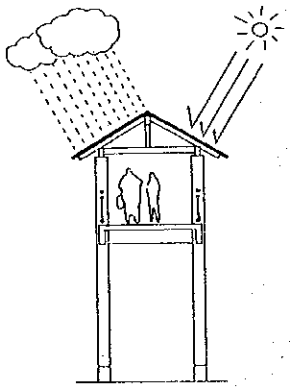
Meridian altitude at winter solstice (dry season)

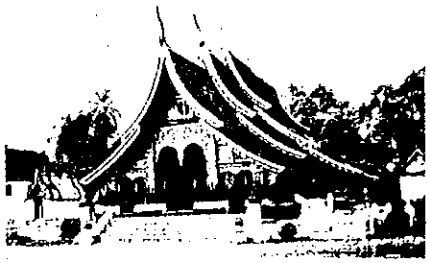


Meridian altitude at summer solstice (rainy season)



- Because the concourse is the first point of contact with Laos for arriving passengers, its design shall feature the deep, overhung roof of Lao temple corridors. The concourse shall also be exposed to the weather as an expression of nature in Laos.





- Materials that can be procured locally and handled with local technical capability shall be used as much as possible.

- Aluminum sash shall be used for window openings for noise protection and air-conditioning efficiency. For the same reason, exterior fittings shall be of semi-airtight specifications.

- For the sake of durability, exterior wall surface shall be finished with tiles.

vii. Disaster Prevention Plan

Although the passenger terminal building itself is to be fairly fire resistant with very limited flammable materials being used, in order to ensure the safety of passengers and airport staff, the following disaster prevention measures shall be taken in addition to the measures commonly applicable to all airport facilities.

- The check-in lobby and the arrival lobby on the first floor are connected with the second floor departure lobby through the open well. Since this arrangement provides for effective visual recognition of evacuation route, no partitions or anything else that would impair the good visibility shall be placed insofar as possible.

- The spreading of fire shall be prevented or contained by providing fire shutters and doors between the open well area and other zones.

- The highest risk area of restaurants shall be located on the top floor to lessen the risk and to secure safer evacuation route for lower floors. Where butane gas is used, gas-leak detector shall be provided .

- For early-stage fire fighting, purposes, fire extinguisher, indoor and outdoor fire hydrant shall be provided.

- Push-button fire alarm shall be provided.

② Control Tower and Operations Building

i. Functional Arrangement

- All rooms in the building shall be arranged so as to be able to establish a clear-cut flow plan.

- The inner courtyard shall help secure ventilation of each room, particularly where air-conditioning is not provided.

- The roof top of the Operations Building shall be used for installing antenna base and outdoor of the air-conditioning equipment.

- As a flood protection measure, important equipment shall be installed wherever possible on or above the second floor, and the first floor level shall be set at GL plus 1,000mm.

ii. Design Features

- In order to avoid the strong sun light, as in the case of the International Passenger Terminal Building, external corridor shall be provided, making the building wall on the southwest side drawn back.

- No windows shall be provided on the northwestern southeast gable sides of the building to avoid penetration of radiation heat.

- For the VFR room in the control tower, as well as the monitor room on the first floor, double-layered heat-reflection glass shall be used to offer further protection against noise and radiant heat.

- Since maintenance of the outside walls of the control tower is not easy, the building exterior shall be finished with tiles for the sake of durability and ease of maintenance.

iii. Elevators

	Designated use	Capacity	Floors Served	Travel Span	Rate speed	Remarks
ELV (1)	For passengers	6	1-4	18.5m	60m/min.	

③ Other Buildings

i. Functional Arrangement

- As a flood protectional measure, the first floor level of various other buildings shall, as a rule, be set at GL plus 1,000mm, with the exception of such facilities as garage where the floor cannot be made much higher than GL.

ii. Design Features

- The design features of various other building shall be consistent with that of the International Passenger Terminal Building and the Control Tower and Operations Building. Particular alternation shall be given to provide for adequate measures to cope with the later afternoon sun.

2) Structural Plan

① Structural types

The superstructures shall be of RC structure that can make use of locally available aggregates. Some parts of the International Terminal Building including the roof shall be of steel-framed structure to provide for wide, flexible floor space made possible by less number of pillars required, and to reduce the overall weight of the building structure. Since there is little risk of earthquakes, walls shall be basically made of concrete blocks that are easily available locally with the exception of the stairwells, which shall be of RC structure, and also except for the nonstructural partition walls. The ground floor of the buildings shall be a structural floor, rather than an earth floor, view of the fact that the groundwater level is high, and the upper-ground layers consist of soft soil.

② Foundation structure

The airport is located on the dried riverbed of the Mekong River, and according to the results of the geological survey of the airport site under by the study team, the upper layers of the ground consist of soft alluvial clay. In the terminal area soft top layer lies a sandy gravel layer which appears to be of diluvial deposits below the depth of 12m from GL. (see Fig. 5-2)

Fig. 5-2 Sample of Boring Log

Ministry of Communication, T.P.C.

SESCML STATE ENTERPRISE FOR SURVEY AND CONSTRUCTION MATERIAL LABORATORY

BORING LOG | REPORTING SHEET

PROJECT FOR REHABILITATION OF WATTAY INTERNATIONAL AIRPORT — ASTM METHOD D 1586 FOR S.P.T

DATE : 11.10.1994.
NAME OF ENGINEER
Mr. SIVISAY VIENGVISA

BORING No.1 . Ground Water Level : 1,00 m — PENETRATION TEST

SCALE m	ELEVATION m	DEPTH m	LAYER THICKNESS m	OBSERVATION RECORD: SYMBOL	NAME OF SOIL	COLOR OF SOIL	DEPTH m	QU Kg/Cm²	NUMBER OF BLOW PER 30 Cm	N - VALUE 10 20 30 40 50 60 70 80	CONSISTENCY
1	2	3	4	5	6	7	8	9	10	11	12
1	169,750										
			1,45		Loam + gravel	Light brown					
	168,300	1,45									
2	166,240	2,06	0,61		Sandy clay loam	Dark grayish brown	1,00-1,30	1,07	10		Soft
3							2,00-2,30	0,85	8		Soft
			2,54		Clay	Red					
4							3,00-3,30	1,71	16		Stiff
	163,700	4,60									
5							4,00-4,30	2,56	24		Very Stiff
6							5,00-5,30	1,17	11		Stiff
7							6,05-6,35	0,85	8		Soft
			7,70		Sandy loam	Yellowish brown					
8							7,15-7,45	-	4		Very Soft
9							8,00-8,30	-	4		Very Soft
10							9,00-9,30	-	2		Very Soft
11							10,00-10,30	2,30	19		Stiff
12							11,00-11,30	1,17	11		Stiff
	156,000	12,30									
13							12,20-12,30	1,39	13		Stiff
							12,60-12,90	5,88	55		Hard
14							13,05-13,35	5,45	51		Hard
15					Sandy loam+gravel		14,00-14,30	6,42	70+		Very hard
16							14,85-15,15	7,16	70+		Very hard

REMARKS : .N - BLOWS PER FT (140 LB HAMMER 30" DROP, 2" O.D. SAMPLER).
.Qu - UNCONFINED COMPRESSIVE STRENGTH (Kg/Cm²).

VIENTIANE 27.10.1994 /.
DIRECTOR

Consequently, with the exception of very light buildings, buildings shall generally be constructed on pile foundations 10m to 15m deep. Furthermore, because the groundwater level is high at 1m below GL foundation beams and floor pits shall be constructed as shallow as possible.

③ Design load (Based on moderated Japanese standards)

Live Load

(KN/m^2)

Building Parts	For floors	For columns, sleepers or foundations	Seismic force
Lobby, lounge	3.53	2.35	1.27
Baggage claim	3.53	2.35	1.27
Immigration	3.53	2.35	1.27
Concessions	3.53	2.35	1.27
Offices	2.94	1.77	0.78
Concourse	3.53	2.35	1.27
Observation Deck	2.94	2.35	1.27
Steel-framed roof	0.34	0.20	0.15
Concrete deck roof	0.98	0.59	0.39
Workshop	3.92	2.94	1.96

④ Structural Materials

Concrete: Standard design strength FC 20.6~23.5 N/mm^2
Aggregate materials: Produced in Laos
Cement: Produced in Thailand

Reinforcing bars: Deformed bars produced in Thailand,
JIS G 3112 SD295 (d≦16mm)
SD345 (d≧19mm)
or equivalent

Steel frame: Produced in Thailand
JIS G 3101 SS400
or equivalent

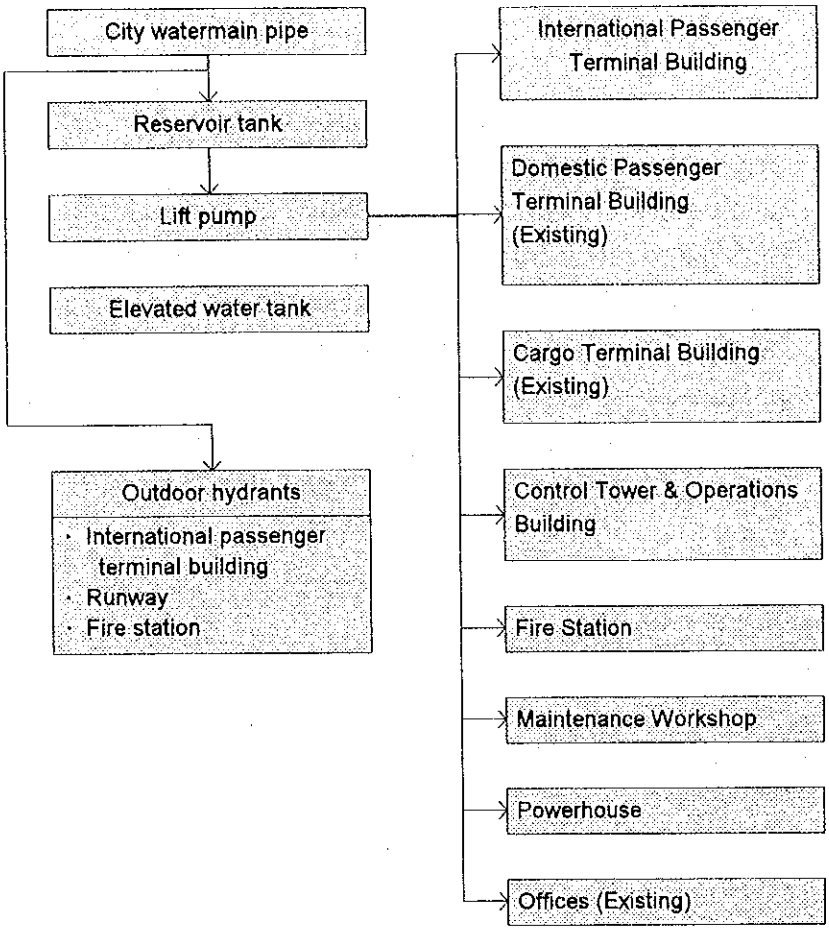
Piles: PC piles produced in either Thailand or Laos 300mm ϕ; Maximum proof stress 490 KN
PC piles produced in Thailand 500mm ϕ ; Maximum proof stress 686 KN
Both piles intended for single-pile direct hammering method.

3) Airport Utilities and Mechanical Facility Basic Plan

① Water supply

i. Water supply system

The airport water supply pipe branches off the municipal watermain (450 ϕ with water supply pressure of 3.5kg/m^2), that runs along the national highway 13. The city water is first fed into a reservoir tank and then is pumped up into an elevated water tank, and from there is distributed by gravity to each of the building outlets. The height of the elevated water tank shall be determined so as to give sufficient water pressure for gravity supply to the third floor of the International Passenger Terminal Building. However, the water for the toilet in the upper floor of the control tower is supplied by means of a pressure pump. Water for outdoor fire hydrants for the International Passenger Terminal Building, runway and the fire station shall be supplied directly from the city water branch line without going through the water tanks.

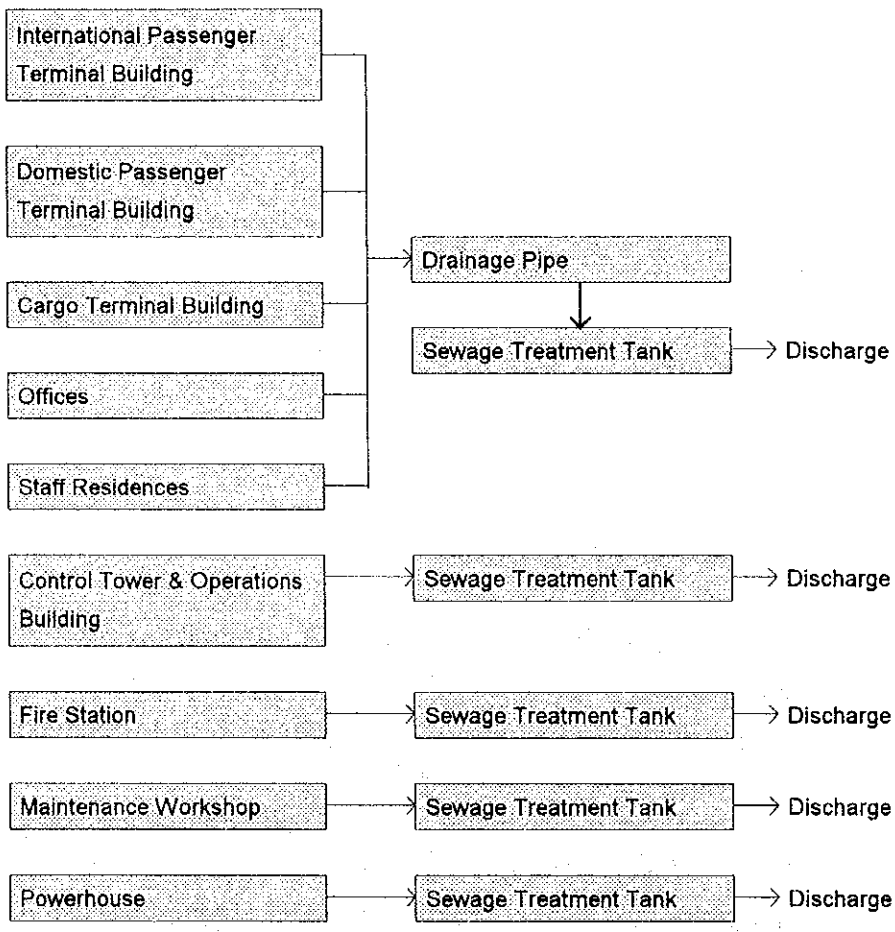


ii. Capacity of the water reservoir

In consideration of the climate and regional factors, the water reservoir should be kept full at 100% capacity for a single day's water requirements. Based on the study of design conditions [5-4-2], this capacity was determined to be $100m^3$ (water reservoir tank: 50^{m3}/elevated water tank: 5^{0m3}). Also, a height of elevated water tank will be determined by supply pressure condition of sanitary fixture which would be installed on third floor level of PTB.

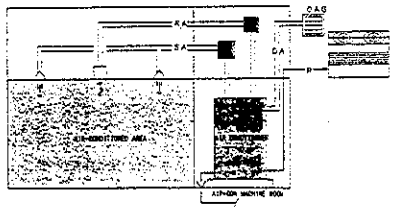
② Drainage system

Because the buildings of the airport facility are distributed across the airport grounds, the sewage treatment tanks will also be distributed in several places, one for the area of the terminal building, and one for each of the other buildings. However, in light of regional considerations, the tanks should be easy to maintain, able to be processed separately, and processed by the contact aeration method. Based on the study of design conditions [5-4-2], estimations of the number processing personnel required, and the volume of waste water to be handled are shown below.

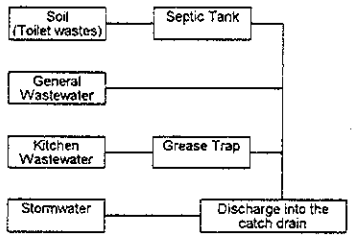
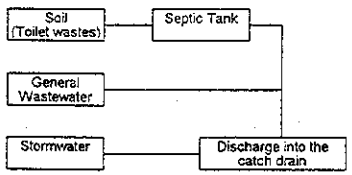


Note 1 : Sewage treatment tank
Process by the contact aeration method

Air Conditioning System Plan for Each Building

Facility	Air Conditioning Method	Ventilation System	Smoke Exhaust System	Automatic Control System
International Passenger Terminal Building	Air cooled package type (for cooling only) combined with air duct system. 	In order to remove odors, dust, and heat generated within the building, a forced mechanical ventilation system shall be installed. Ventilation air volume of each room shall be determined according to the purpose of ventilation and place. Natural ventilation system shall be adopted in the open wall area, provided that ceiling fans shall installed to prevent stagnation of the air.	Natural ventilation shall be adopted for smoke removal without using mechanical means.	Operational conditions and malfunctioning of air conditioning, ventilation and smoke exhaust system of the passenger handling area (baggage claim, customs, check-in lobby, etc.), public offices (CIQ offices, etc.), VIP room, and other areas shall be indicated control and monitor board installed in the monitor room on the 3rd floor. The board shall also be equipped with remote on-off control device for each system. Similar monitoring system shall be provided by the control and monitor board installed in the powerhouse.
Control Tower and Operations Building	The VFR room in the control tower is the nerve center of the airport, and under no circumstances should its functions be interrupted. A full backup system shall, therefore, be installed to cover 100% of the heat load.	In order to remove odors, dust, and heat generated within the building, a forced mechanical ventilation system shall be installed. Ventilation air volume of each room shall be determined according to the purpose of ventilation and place.		The control and monitor board installed in the powerhouse indicates operational status and malfunctioning of air-conditioning and ventilation facilities of the fifth floor VFR room, as well as of the pressure pump for water supply to toilet facilities provided on the fourth floor.
Fire Station Maintenance Workshop Powerhouse	Air cooled package type (for cooling only)			The powerhouse monitoring system shall indicate operational status and malfunctioning warning for the relevant PTB and Tower facilities as tabulated above. The monitoring system shall also indicate operational status and malfunctioning warning for the pumps and tanks of the water supply and sanitary facilities dealt with in the subsequent table.

Plumbing System Plan for Each Building (No.1)

Facility	Water Supply System	Hot Water Supply System	Drainage System	Sanitary Fixture
International Passenger Terminal Building	Water supply system shall provide a steady supply of clean, uninfected water in the volume required and under appropriate water pressure.	Hot water supply system shall provide safe and efficient supply of hot water in the volumes and temperatures as required for different usage for hot water rooms, storage type, electric water heater shall be installed for the case of operation and maintenance. Instant gas water heater shall be installed in the kitchen of the restaurant, which requires large amount of hot water.	The building drainage system consists of 4 subsystems for soil, general wastewater, kitchen wastewater, and stormwater. Pipes of appropriate diameter shall be installed with adequate gradient to prevent clogging and backflow and to facilitate cleaning. Soil, or toilet wastes shall be treated in septic tanks, and the processed water is discharged through the catch drain. Kitchen wastewater shall be filtered through a grease trap before being discharged through the catch drain. Other general wastewater and stormwater shall be discharged directly through the catch drain. 	A water saving type of equipment shall be installed for conservation of water resources.
Control Tower and Operations Building		Wall-type electric instant water heater shall be installed for the shower room. For the kitchen, a gas instant water heater shall be installed.	Drainage system shall be similar to that of the international passenger terminal building, except for wastewater from the kitchen which does not exist in these buildings. 	
Fire Station				
Maintenance Workshop				
Powerhouse				

Plumbing System Plan for Each Building (No.2)

Facility	Fire Fighting System	Gas Supply System	Kitchen Equipment	Septic Tank.
International Passenger Terminal Building	Based on the Fire Service Law of Japan and with consideration to local conditions, following fire fighting equipment shall be installed in locations and quantities as appropriate. • fire extinguisher • indoor fire hydrants • outdoor fire hydrants Outdoor fire hydrants water shall be supplied directly from the city water source as in the existing system (Supply pressure 3.5kg/cm^2)	LPG shall be supplied for the kitchens of the third floor concessions. Considering the local supply situation a reserve equal to a week's supply shall be kept in storage.	Kitchen facilities of the third floor concessions shall be provided with adequate fire prevention measures, and the equipment shall be of a type to allow streamlined operating and hygienic handling of food and utensils. Kitchens shall be outfitted for Chinese cuisine, and be capable of preparing 300 meals a day	Septic tanks shall be capable of satisfactorily processing the amount of sewage calculated based on the expected number of terminal users. The tanks shall also be an independently operated, easy-to-maintain, type of a contact aeration method.
Control Tower and Operations Building	Based on the Fire Service Law of Japan and with consideration to local conditions, following fire fighting equipment shall be installed in locations and quantities as appropriate. • fire extinguisher	LPG shall be supplied for the kitchens. Considering the local supply situation a reserve equal to a week's supply shall be kept in storage.	None	
Fire Station				
Maintenance Workshop				
Powerhouse				

4) Electrical Facilities Basic Plan

① Receiving and step-down facilities

The powerhouse shall receive the commercial power from EDL through two 22KV lead-in power lines. The transformers shall be an indoor type. Two a 22KV lines are then led into the passenger terminal building 3rd floor substation room. Outline of the power supply system is shown in the single-line in Fig.5-3.

② Stand-by power generators

As stated earlier, the airport is divided into two zones for the power supply purposes, i.e. the Terminal Zone and Airport Administration Zone. One 500KVA diesel engine generator shall be provided within the powerhouse for emergence power supply to each zone, and an additional generator shall be provided as a common backup for the generators serving the two zones.

- Radiator : Fan cool system
- Fuel : Light oil
- Starter : Electric type
- Starting time : 10 seconds
- Main tank : 7,000 liters tank placed on ground-based frame
- Room ventilation : Louver-ventilated ceiling intake system plus exhaust fan

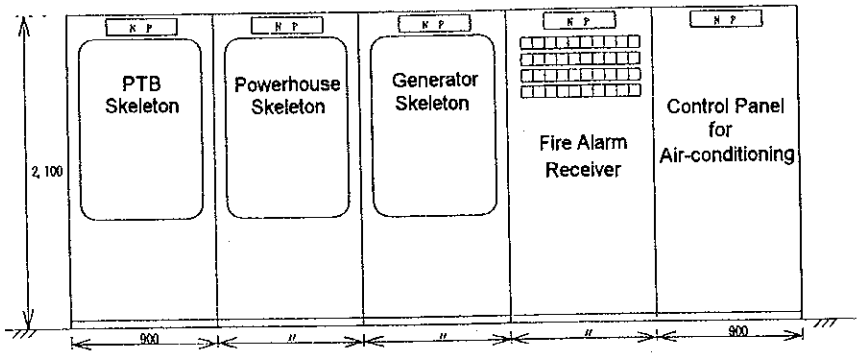
Fig.5-3 shows single-line diagram of the stand-by power system.

③ Monitoring system

Monitor board installed in the powerhouse shall contain monitor panels for the commercial power supply systems of

the PTB and of the powerhouse, as well as for the stand-by power generators. The monitor board shall be shaped as shown in the following drawing. Operational condition of the power supply systems as well as the malfunctioning warnings shall be displayed by LED over the single-line diagram of each system.

Monitor Board



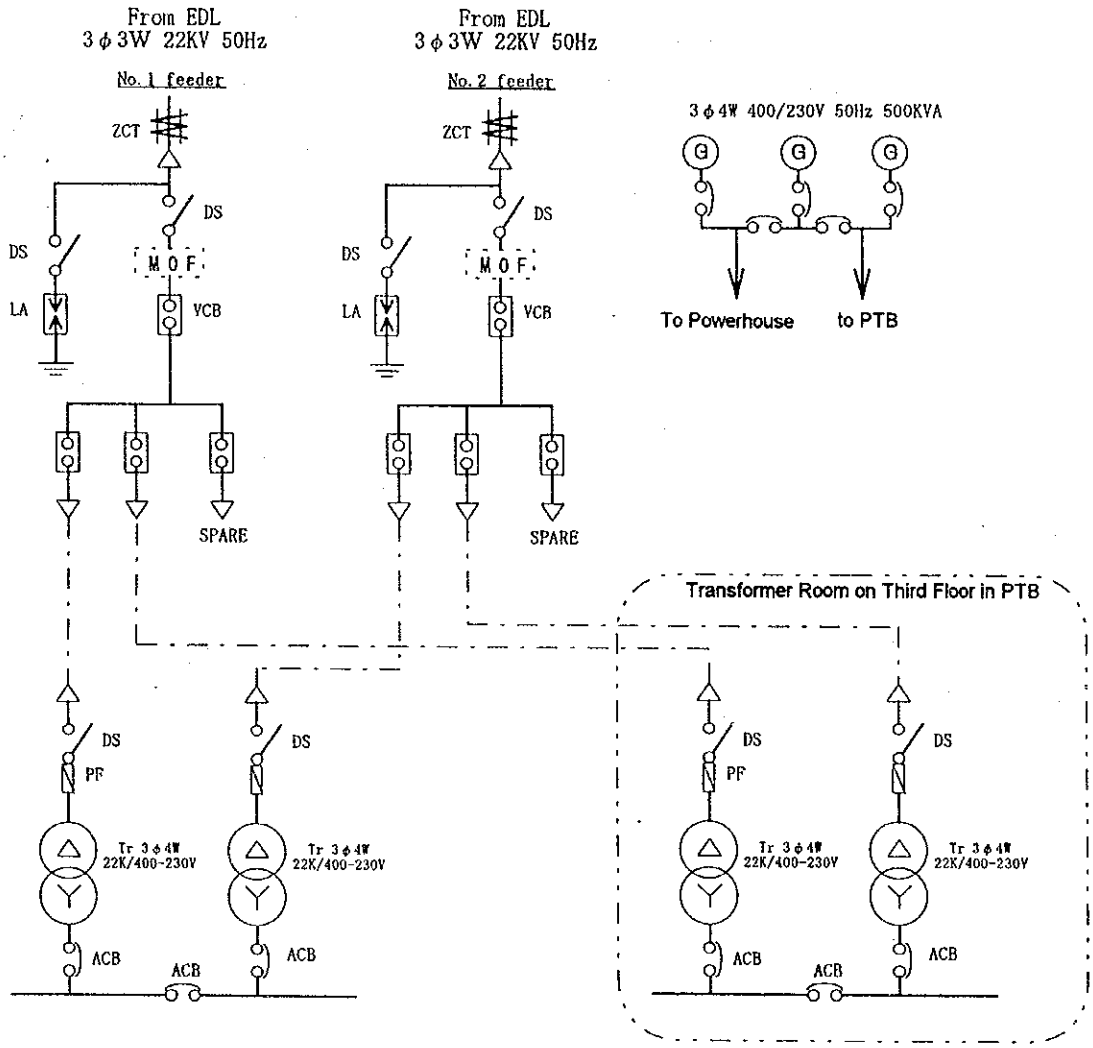


Fig. 5-3 Single-line Diagrams of Commercial and Standby power Supply System

④ Powerhouse room lighting and electrical outlets

Lighting of the rooms with power supply installations shall be 50% back up by the generator system, while 100% generator backup shall be provided for the lighting outlets in the monitor room.

- Electrical outlets of appropriate specifications shall be provided in each room .

⑤ Telephone system

Telephones of the entire airport facilities shall be switched through private branch exchange (PBX) installed in the PBX room of the powerhouse.

i. PBX equipment

Digital PBX with a capacity for over 300 lines channels shall initially accommodate 200 extensions and 50 outside channel. The exchange system shall also include telephone charges recording device (printer). The storage battery capacity shall be sufficient for 3 hours of PBX operation.

ii. MDF

The main distribution frame (MDF) shall be installed in the present project with sufficient terminal board capacity to meet the expected future telephone demand.

⑥ Intercom system

The powerhouse shall house the main equipment of an intercom system which shall interconnect the power supply equipment room and the monitor room of the powerhouse with the machine room of each building of the airport.

⑦ TV master antenna system

Antennas shall be installed in the powerhouse satellite and broadcasting VHF reception.

⑧ Fire alarm system

Sensors shall not be provided, and a push-button alarm system shall be installed with an alarm bell. Alarm signal receiving board shall be installed in not only the power house, but also in the maintenance workshop.

For the sake of integrated monitoring of the airport, alarm signal receiving board of the powerhouse shall indicate the signals from the passenger terminal building and the control tower and operation building, as well as the operational status of indoor fire hydrant pumps.

Power Supply System Plan for Each Building (No.1)

Facility	Substation	Monitoring System	Main Feeder	Power Distribution System
International Passenger Terminal Building	Two 22KV commercial power lines shall be led into the PTB from the new powerhouse. Backup power from the generators shall also be led in at stepped-up voltage of 22KV and then stepped down to 3 ϕ 380/220V. High-voltage (22KV) side of the substation equipment shall be of an indoor cubicle type, and the low-voltage side equipment shall be of an indoor open setting.	Electrical facility monitor board shall be installed in the third floor monitor room, making it possible to centrally monitor the operational conditions and malfunction in warning of the entire electrical system of the PTB. To ensure operational safety , electrical equipment shall be locally operated with no remote control being provided.	As a rule, cables shall used for power distribution within PTB. Each of the following exclusive areas other than the government areas shall be provided with await-hour meter. • Airline office area (including airline lounges) • concessions (banks, restaurants, shops) In principle lighting will receive power from a separate trunk line. However, when the power supply capacity for air-conditioners, etc. is small, separate trunk lines will not be used. In principle, the load on non-utility lines will be as follows; • security power source (backup facilities for generating power to ensure safety of those in the building if the ordinary source of power is cur off). [which could run fire fighting equipment, emergency exit lighting, elevators, security lighting, and disaster prevention equipment] • airport power source (backup facilities for running essential airport functions if the ordinary source of power is cut off). [PBB, conveyor, CIQ AL terminal equipment, PBX, communications equipment]	In principle, power distribution would be as described below. • indoor: CV or vinyl cable, or IV + E tubing • outdoor: CV or vinyl cable, E tubing When the line load is subject to outdoor humidity, an ELB type will be grounded with grounding wires.
Control Tower and Operations Building			The CVCF power source (for control equipment) will use a transmission system to both AC and GC systems. Other areas will be the same as PTB. Direct transmission by radio equipment (outside of the CVCF) also will use a transmission system to both AC and GC system. However, radio equipment in the VFR room and CVCF room and related areas will use a single system for GC circuits for the air-conditioning unit.	
Fire Station			Supply will be by AC and GC. GC circuits will be used from the power source for lighting and fire fighting equipment. The power source for air-conditioning uses a separate 1 ϕ system, entirely on AC current.	
Maintenance Workshop			Supply will be by AC. A power board will be used in for equipment in the repair shop area.	

Power Supply System Plan for Each Building (No.2)

Facility	Lighting Fixture/Outlet	Telephone System	Information Service	Electric Clock
International Passenger Terminal Building	a. In lobbies, office e areas, and places where passengers and staff regularly generator circuits must also be installed with lighting (from 1 light to 0.3 lights per span b. Required lighting will be installed at the necessary distances within each space (corridor, stairwells, lobby, etc.). The power source will be the generator circuits (with 10 second cycles) and an accumulator will not be used. However, as stated above, generator circuits must also be installed with lighting in staff rooms, except in rooms where this is thought unnecessary. c. Guide lighting will be used at emergency exits for easy visibility in the event of an evacuation. The green exit sign lights will be battery powered. d. As a rule, wall sockets will contain 2 electrodes with grounding attachments (parallel+circular pin universal type) e. In commonly used areas, wall sockets for cleaning equipment will be placed at regular intervals of within 30m. f. Lighting devices will mostly be luminescent bulbs, with mercury lamps installed in the open areas between floors, on the deck for seeing off passengers, and related areas. Luminescent lighting will use 40W and 20W bulbs. g. Standards for luminous intensity are described below: offices-inward focus 40W/30lx lobbies-40W/200lx counter, baggage conveyor-40W/300-500lx machine room-concave reflective type 40W/50-100lx h. Distributed wiring: indoor (concealed and exposed): IV + wiring ducts, or VVF cable outdoor underground: CV or VVR + FEP ducts	.a. Distributed wiring will be used for extensions with PBX from the new power station. In addition, outside lead-in lines will use direct wiring for tenants from PTT b. For the EPS on each floor, IDG will be installed, and indoor terminal boards will be put in office rooms. c. Telephones will be installed in all rooms where is thought necessary d. Public pay phones will only be placed in areas where it is thought they will be needed in the future (lobbies, waiting rooms, etc.). Moreover, initially, to supplement the public pay phone service, coin-operated equipment will be placed in the PTT corner on the first floor (2 printer units).	a. Message and announcement boards Facilities will be installed for making announcements of arrivals and departures, and for broadcasting information regarding procedures for leaving and entering the country. Each passenger zone will have loud speakers (in the lobbies, concession areas, toilets, etc.), with remote (repeater) microphones installed at the airline counters, baggage counters, etc. It will be possible to broadcast from each of these areas by means of a switch. b. Flight information announcement facilities Departure information: In the first and second floor lobbies, a magnetic board (main board) will be installed. Each flight will be posted with a flicker type glow lamp, that can be turned on by remote control upon flight departure. Furthermore, a departures announcement board will be installed on the upper part of the gate counter on the second floor. Arrival information In the arrival lobby on the first floor will be installed an announcement board with the same specifications as that of the departure boards. An announcements board will also be installed on the arrival belt conveyor, which can be operated from the baggage counter.	a. Electric clocks will be installed in the third floor monitoring room, with sub-clocks placed in each passenger zone and public area. Electric wiring will also be connected to removable boards and main boards. b. Solar powered clocks will be installed in front of the parking area.
Control Tower and Operations Building	General requirements are the same as for PTB. For the VFR room, 100% GC circuits will be used for embedded glareless devices. Moreover, control lighting will be done with 100W spot lighting installed on the console tables. In addition, control use floodlight outlets will be installed in the ceiling.	Telephones will be installed in all rooms where it is thought necessary.		Main clocks (single circuit) will be installed in first floor offices, with sub-clocks in offices, the VFR room, etc.
Fire Station	Lighting facilities will use 30-50% GC circuits. Guide lighting will not be installed for emergency lighting.			Electric clocks will be installed. Wiring for the main clocks will come from the control building.
Maintenance Workshop	All lighting facilities will use AC, and guide lighting will not be installed for emergency lighting. For the repair shop area, many outlets will be installed with a mounting height set at 700mm from the floor.			

Power Supply System Plan for Each Building (No.3)

Facility	TV antenna System	Fire Alarm System	Emergency broadcast system	Intercom/Lightning Protection
International Passenger Terminal Building	Outside simultaneous reception will be made possible with VHF antennas and satellite dish parabola antennas will be installed as television reception equipment. Receiving sites will be placed in each lobby, in offices, the VIP room, restaurants, etc.	Push-button type fire alarm devices will be installed to alert people in case of a fore outbreak. In addition to push-button type red lamps and alarm bells, fire extinguishers will be installed in rooms and out of doors. When the opening button is pressed, the indoor fire hydrants are automatically activated, and a fitting device will enables operation the water pump. Gas leak warning detectors installed in rooms where gas is used. Receivers will be installed in the first floor offices, by which signals can be transferred to the power station or fire station. Fire doors and fore shutters will be installed in areas where it is thought necessary as a safety measure (such as vertical holes), which will operate in conjunction with smoke detectors.	Disaster prevention amplifiers will be installed (with storage batteries) in the first floor offices in conjunction with fire alarm receivers, which can convey instructional broadcasts to separate or to all floors in the event of an emergency (without automatic recorded voice). Both announcement broadcast speakers and separate system speakers will be installed.	Maintenance Use Facilities maintenance rooms (AC room, outdoor equipment sites, machine rooms, monitoring rooms) will be connected by intercoms, and it will also be possible to communicate by intercom between the power station and the monitoring room. All intercoms and main devices will be of two-way simultaneous type communication devices. Conveyor use Exclusive use intercoms will be installed for communication between the conveyor areas Lightning rod equipment Lightning rod equipment will be installed which meets JIS standards. Further protection will be afforded by use of conductive materials in the large roof framework.
Control Tower and Operations Building	Same as for the power station. Antennas will be installed on the second floor roof tops.	.Receivers will be installed in first floor offices, to which fire alarm information can be transferred from the power station and fire station. In addition, push-button fire alarms and warning bells will have smoke detector equipment attached just as with PTB.	Disaster prevention amplifiers will be installed in first floor offices, with emergency use speakers installed in all rooms and corridors.	Lightning rod equipment will met JIS standards, and installed on roof tops, rod-type being thought necessary because of the radio antennas.
Fire Station	Installed	Fire alarm equipment will not be installed in this buildings However, indicator equipment will be installed throughout the airport facilities and grounds. Messages can be transferred to receiver devices in the PTB, control tower and powerhouse.		
Maintenance Workshop	Installed	Push-button and alarm bell equipment will be installed for transferring signals to the receiving devices in the power station.		

5) Terminal Special Equipment

① Passenger Boarding Bridge (PBB)

The PBB will be of the apron drive telescope type.
The tunnel will be made of steel.
The rotunda and the base of the permanent bridge will be installed inside the shoulder.
As a rule, parking positions will be nose-in.
Pre-set, auto-leveler, and various types of safety switches (for the aircraft, stacks, etc.) will be installed.

② Baggage Handling System (BHS)

Behind the check-in counter, stainless steel guardrails will be installed in the baggage handling area.
Baggage will be processed at a speed of 30m/min. for departures, 25m/min. for arrivals.
As to the height of the conveyor belt:
Behind the check-in counter, in principle at floor level.
For baggage handling for departures, 600mm above floor level.
The height of the baggage claim conveyor for arrivals is set at 350mm above the floor.

③ Spare parts

Each of the special facilities will contain spare parts of the type which local staff can use to make repairs and replacements.

④ Power source

The capacity of the power source for each of the special facilities should be designed to be within the capacity of the generator circuits.

(3) Civil Works

1) Roads and Car Park

① Layout Plan

Layout plan of landside roads and car park is based on the following items;

- Existing access road between national road 13 and circulation road is in comparatively good condition and is utilized as it is. But surface and a part of drainage facility shall be improved.

- Location of roads and car park shall be at existing roads and car park, where ground conditions are good, as much as possible.

- The circulation road in passenger terminal area shall be anti-clockwise one way traffic for smooth flow.

- Vehicles for passenger terminal area and airport administration area shall be separated by making the southside of circulation road both directions. Vehicles for airport administration area do not need to go through in front of passenger terminal buildings.

- Roads in airport administration area are of both directions because traffic is not dense.

- Required lot number is 250 for private cars, 45 for taxi (15 for domestic and 30 for international), 5 for bus.
  Existing park for motorcycle will be utilized.

- Car park shall be available to be charged, therefore it is surrounded by walkway or green area.

- Small car park is provided in front of the new domestic passenger terminal building and large one is in front of the new international passenger terminal building.
  The former one will have one entrance and one exit and the latter one will have two entrances and two exits but one of those is for both roles.

- Configuration of parking lots are based on 90 degree backward parking style for effective use of space.

- Taxi standing shall be provided by international and domestic. The location of it shall be that taxis can wait without interrupting other vehicle flows and approach to each building easily.

- West end of the car park shall be connected to the approach road for airside and fuel tank farm.

- A connection road between airside and landside shall be provided next to fire station as an entrance from airport administration area to airside.

Layout plan of roads and car park is as shown in the preliminary design drawings.

② Pavement Structure

Pavement structure is designed on the basis of Japanese "Random Pavement Code" (Japan Road Association).

Thickness of pavement is as shown in the following table according to design CBR.

Design CBR(%)	1.6	2	3	4	6	8	12	20~
Pavement Thickness	50	40	33	27	22	18	14	10

* Thickness of surface will be 3 ~ 4 cm.

Required thickness calculated based on the design conditions indicated in 5-4-2 is as follows;

T=14cm in passenger terminal area
T=27cm in airport administration area.

Pavement structure is determined in consideration of current road conditions and soil conditions as follows;

Pavement A : Access road between national road 13 ~ car park
T=4cm (surface only)

Pavement B : Existing car park area (design CBR=16%)
T=14cm
(surface 4cm, crusher-run subbase course 10cm)

Pavement C : West part of new terminal area (design CBR=4%)
T=29cm
(surface 4cm, crusher-run subbase course 25cm)

Pavement D : Walkway
T=13cm
(surface 3cm, crusher-run subbase course 10cm)

Pavement area by type is as shown in the preliminary design drawings.

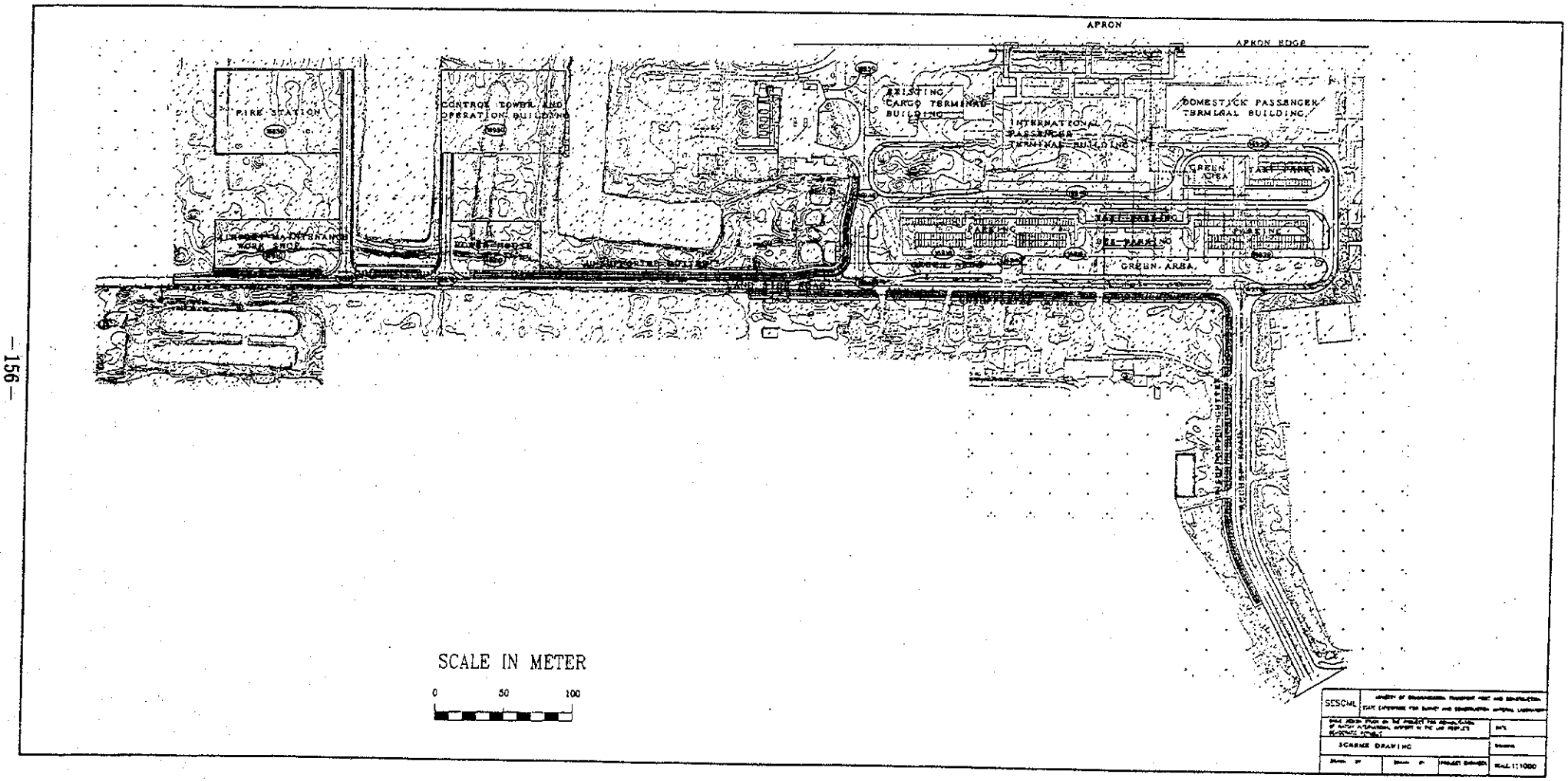


Fig. 5-4 Layout Plan of Roads and Car Park

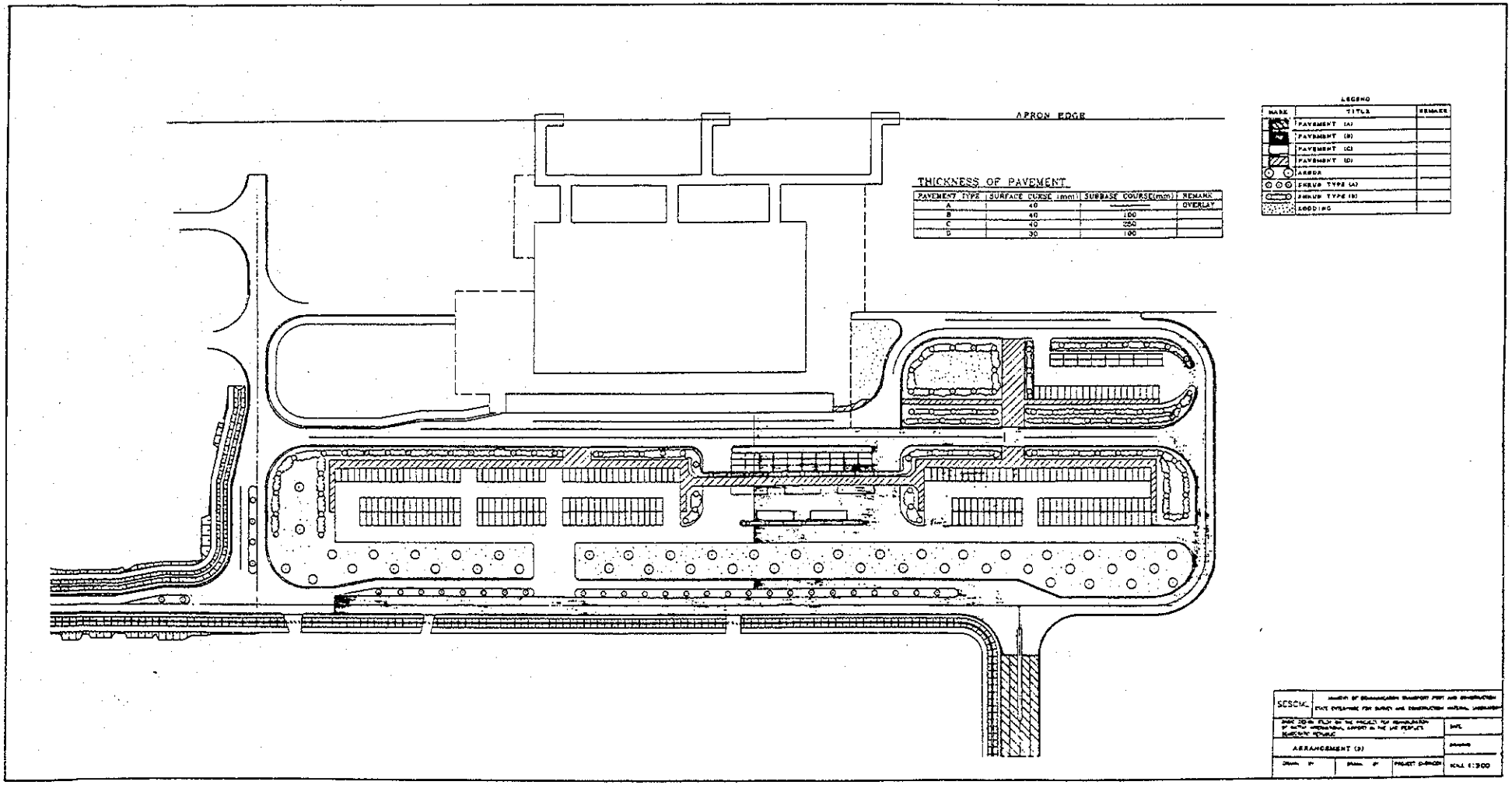


Fig. 5-5 Pavement Area by Classification

2) Stormwater Drainage

① Layout Plan

Stormwater fallen in east part of existing car park, existing passenger terminal building and around existing control tower flows to drain at apron edge through open and covered ditch. Other stromwater flows to swamp area along perimeter road in the terminal area, and to airside at last.
Drainage route is determined on the basis of the existing stormwater flows basically.

The new terminal area is divided by four drainage area as follows;

a. Car park in front of existing passenger terminal buildings

Stormwater is collected through provided concrete ditch and flows to the apron.

b. New international passenger terminal building and adjoining land at west side

Stormwater fallen to a half of building area and adjoining land is collected through excavated ditch provided at the center of the adjoining land and flows to covered ditch, trapezoid ditch along perimeter road and to west at last.

c. Main car park in front of new international passenger terminal building

Gentle down slope is prepared in the car park from terminal side to perimeter side, stormwater is collected at V shaped ditch in green area between car park and perimeter road. The collected stormwater flows trapezoid ditch along perimeter road through covered ditch and to

west as same as the area "b".

d. Access road from national road 13

Existing ditch along the road will be improved and new trapezoid ditch will be provided. These ditches are connected to the existing ditch at west side of the terminal area.

Swamp and ponds are scattered in airport administration area, so stormwater fallen in this area flows naturally to these swamp and ponds.

Layout plan of the above stormwater drainage is as shown in the preliminary design drawings.

② Structure of Ditches

Major ditches provided are V shaped ditch in green area (inner slope is protected by turf), trapezoid ditch along roads (protected by turf or gravel with net), partly U shaped concrete open ditch and covered ditch with lid and concrete box culvert at crossing roads.

Structural drawings of major drainage facilities are as shown in the preliminary design drawings .

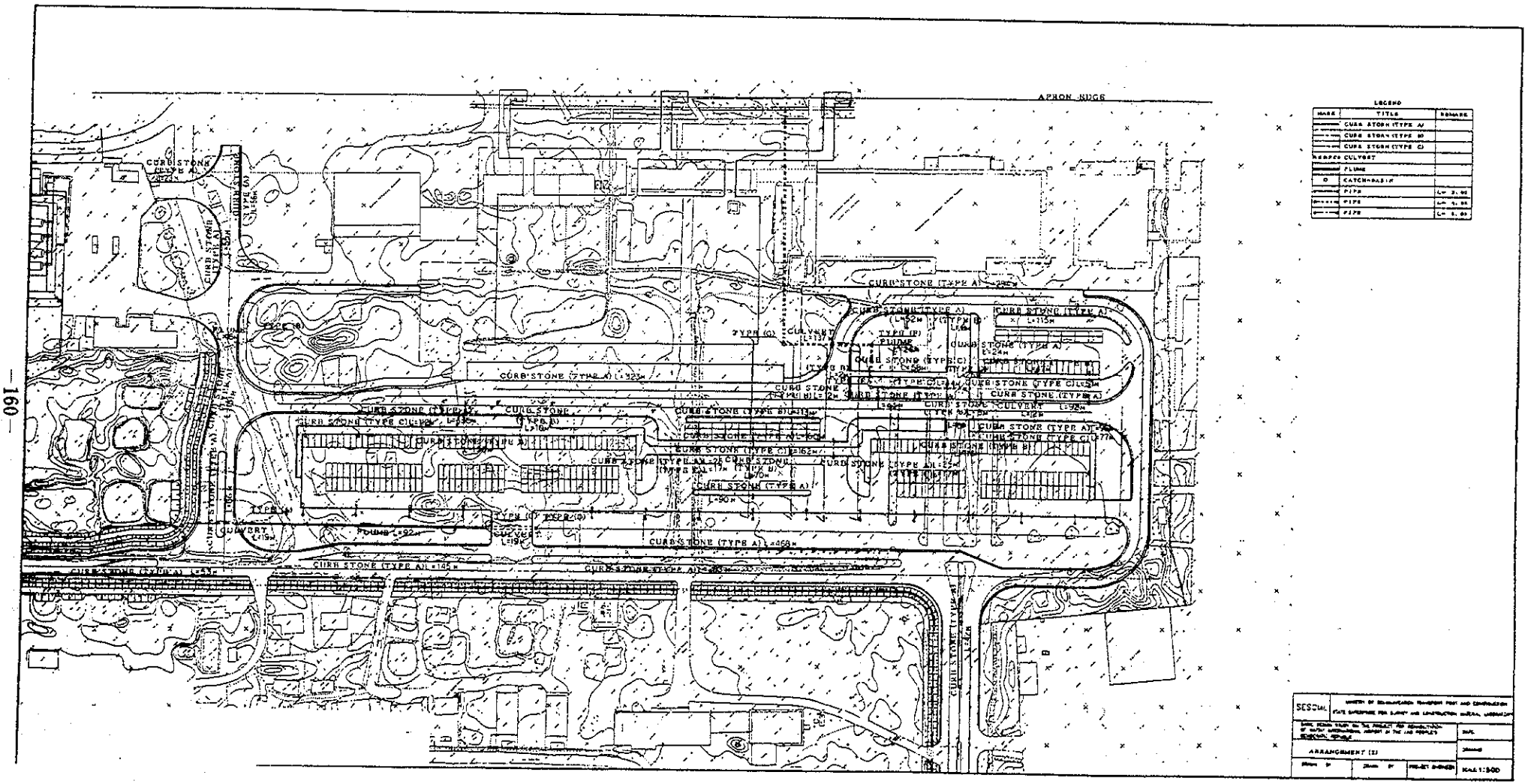


Fig.5-6 Layout Plan of Stormwater Drainage

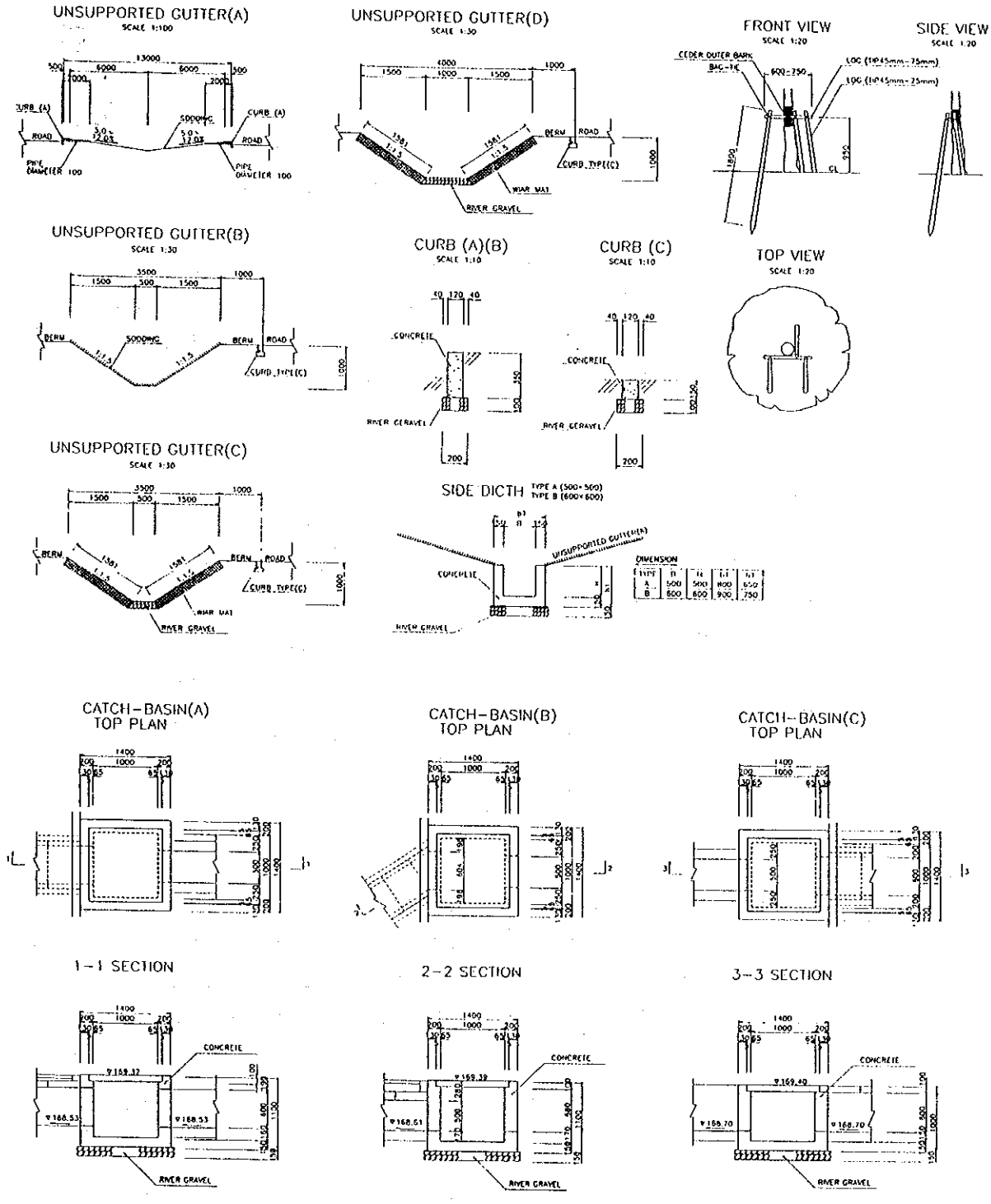


Fig. 5-7 Structural Drawings of Stromwater Drainage

(4) Construction Material

1) Building materials situation

A survey was made of what types of building materials can be procured locally, which determined that sand, gravel, brick, wooden framework materials, lumber, concrete products, PC piles, construction support logs, and fuel for vehicles could all be obtained locally. Other materials will have to be shipped from Japan or other countries, but the majority of the materials which can be found in the Laos market are made in Thailand, which is adjacent to Laos. Moreover, materials made in Thailand are available at a lower cost than those shipped from Japan. In light of these conditions bearing on the construction materials plan, and in consideration of the need for easy maintenance after construction, the decision was made to obtain most materials locally in Laos wherever possible, and from Thailand if they are not readily available locally. However, when engineering standards call for extremely high quality materials, or if specified building materials are not available locally or from Thailand, then they will be shipped from Japan or other countries.

2) On-site construction

The main type of construction used in buildings in Vientiane City is rahmen structures of reinforced concrete. For the most part walls are built of brick or concrete blocks. The building plan for the airport facilities will also make use of this basic type of structure.

3) Building materials plan

① Passenger terminal building

(Exterior finishing)

- roof tops: table flap roofing (metal for the large roof portion)
- outer walls: fixation with magnetic tiles
- outer building fixtures: colored aluminum sash and steel gallery doors, painted.

(Interior finishing)

Room name	Floor	Suspended beams	Walls	Ceiling
check-in lobby, arrivals lobby, hall	terrazzo	terrazzo	elastic tile	aluminum span for floor openings generally, rock-wood sound absorption boards
general offices	vinyl tile	vinyl suspended beams	mortar, all plastered EP	rock-wood sound absorption boards
VIP lounge	felt foundation Wilton carpet	rigid wood CL	LGS, PB foundation	cotton cloth
lounge	carpet	cloth-covered veneered wood rigid wood CL	LGS, PB foundation	
waiting room for international departures	terrazzo	marble-patterned H=100	elastic tile	rock-wood sound absorption boards
concessions (restaurants)	marble-patterned tile	marble-patterned H=100	magnetic tile	rock-wood sound absorption boards

② Control tower and operations building

(Exterior finishing)

- roof tops: rubber waterproofing sheet, secured with concrete
- outer walls: fixation with magnetic tiles
- outer building fixtures:
  colored aluminum sash and steel gallery doors, coated with SOP.

(Interior finishing)

Room name	Floor	Suspended beams	Walls	Ceiling
general offices	vinyl tile	vinyl suspended beams	mortar, all plastered	rock-wood sound absorption boards
FIS, ACC, VFR	free access floor H=300 charge-proof carpet	vinyl suspended beams	mortar, all plastered	rock-wood sound absorption boards

③ Other facilities

(Exterior finishing)

- roof tops: rubber waterproofing sheet, secured with concrete
- outer walls: elastic tiles
- outer building fixtures:
  colored aluminum sash and steel gallery doors, coated with SOP.

(Interior finishing)

Room name	Floor	Suspended beams	Walls	Ceiling
general offices	vinyl tile	vinyl suspended beams	mortar, all plastered EP	rock-wood sound absorption boards
equipment rooms	softening agent for dust protection monolithic construction (non-slip)	plastered with softening agent for dust protection	mortar, all plastered EP	rock-wood sound absorption boards

(5) Airport Special Equipment

1) ATS, Air Navigation and Communication Equipment

Composition and specification of equipment for air traffic control and navigation are described hereinafter.

① Control Tower

System block diagram of control tower equipment is as shown in Fig. 5-8, equipment layout plans in VFR room and IFR room are as shown in Fig. 5-9 and Fig. 5-10 respectively. Composition of equipment and its specification is as follows;

a. ATC Control Console

Equipment :

Approach Control Console	1 set
Aerodrome Control Console	1 set
Auxiliary console	1 set
Flight Progress Strip Console	1 set
Assistant Console	1 set
Supervisory Console	1 set
ATC Console Control Rack	1 set

Specification :

– Function of Major component Panel

Radio Communication

- Radio Control Panel, Voice Control Panel and Foot Switch are used together for controlling VHF transmitters and receivers for radio communication and for indicating communication condition, and speaker panel, jack box and headset and hand

microphone are used together for actual radio communication.

- Radio Control Panel is equipped with 4 receiver selection buttons and 4 transmitter selection buttons.
- Receiving Volume controls for speaker and headset are provided on Speaker Panel and Voice Control Panel.
- A press-to-talk (PTT) operation is done by Foot Switch, PTT button on headset or PTT switch on Voice Control Panel.

Transmitter/Receiver Control

- Main/Standby Control of transmitter and receiver is only possible at main/standby select panel in supervisory console.
- Standby transmitter and receiver selection is made by depressing the push button on main/stand-by select panel.
- Maximum 8 sets of transmitter and receiver can be controlled.

Intercom Communication

- Intercom Control Panel and Voice Control Panel are used together for controlling intercom communication, and handset and headset are used together for actual communication.
- Channel selection and call are synchronously made by depressing a channel selection push button on Intercom Control Panel.
- Receiving indication is made by winking of an indicator in push button and sounding of a buzzer in console.
- A speech circuit is completed by depressing a winking push button and the indicator lights

continuously lighted during conversation.

- Receiving volume control for handset and headset are provided on Voice Control Panel.
- The reset of circuits is made by depressing the push button switch again.

Over-ride Control

- Over-ride control panel is used for over-riding from supervisor to controller.
- When the over-ride selecting switch is depressed, the supervisory console is unable to execute normal transmitting and receiving.

Hotline Control

- Controller's voice will come out of the speaker at the corresponding party when he talks through microphone by simply pressing a press-to-talk button on the hot-line control panel.

Navaids Monitor

- Necessary navaids are monitored by air monitor receiver
- NDB air monitor shall be of 3ch

VHF Direction Finder

- Necessary Direction Finding Equipment are the aircraft position by VHF radio wave.

Time Indication

- Digital clock is used for indication of time by hours, minutes and seconds.

– Electronic Characteristics

Transmitting channel

Frequency Response	Within ±3 dB at range of 300 to 3,000 Hz
Distortion Factor	Less than 5% of 0 dBm output power of rack terminal
S/N Ratio	Not less than 45 dB at 0 dBm output power of rack terminal
Cross-talk level	Not less than 45 dB at 0 dBm output of rack terminal

Receiving Channel

Frequency Response	Within ±3 dB at range of 300 to 3,000 Hz
Distortion Factor	Less than 5% of 0 dBm output of rack terminal
S/N Ratio	Not less than 45 dB at 0 dBm output power of rack terminal
Cross-talk level	Not less than 45 dB at 0 dBm output power of rack terminal

Intercom Channel

Receiving Sensitivity	Less than 15v at 20 Hz
Frequency Response	Within ±3 dB range of 300 to 3,000 Hz
S/N Ratio	Not less than 45 dB
Cross-talk level	Not less than 45 dB

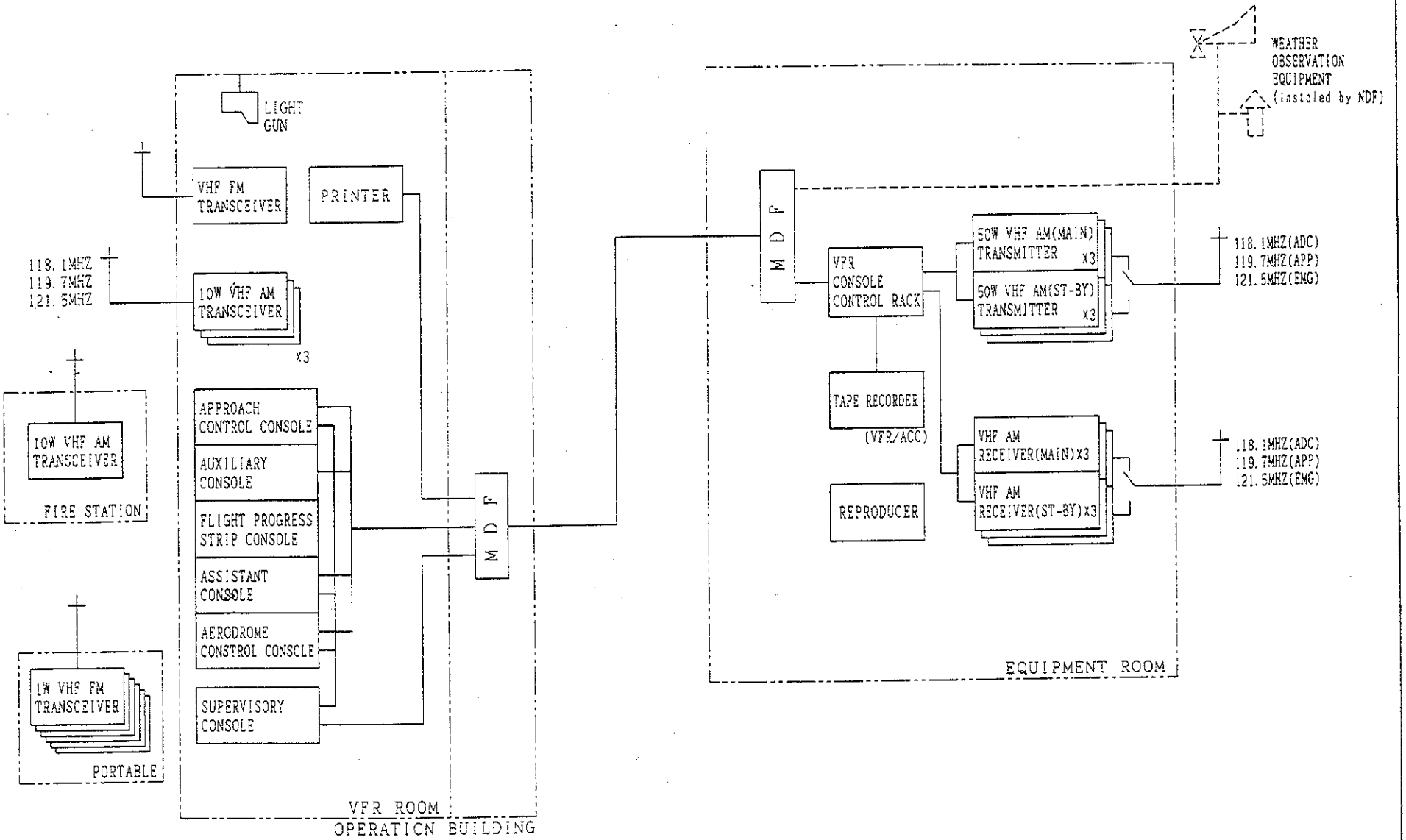
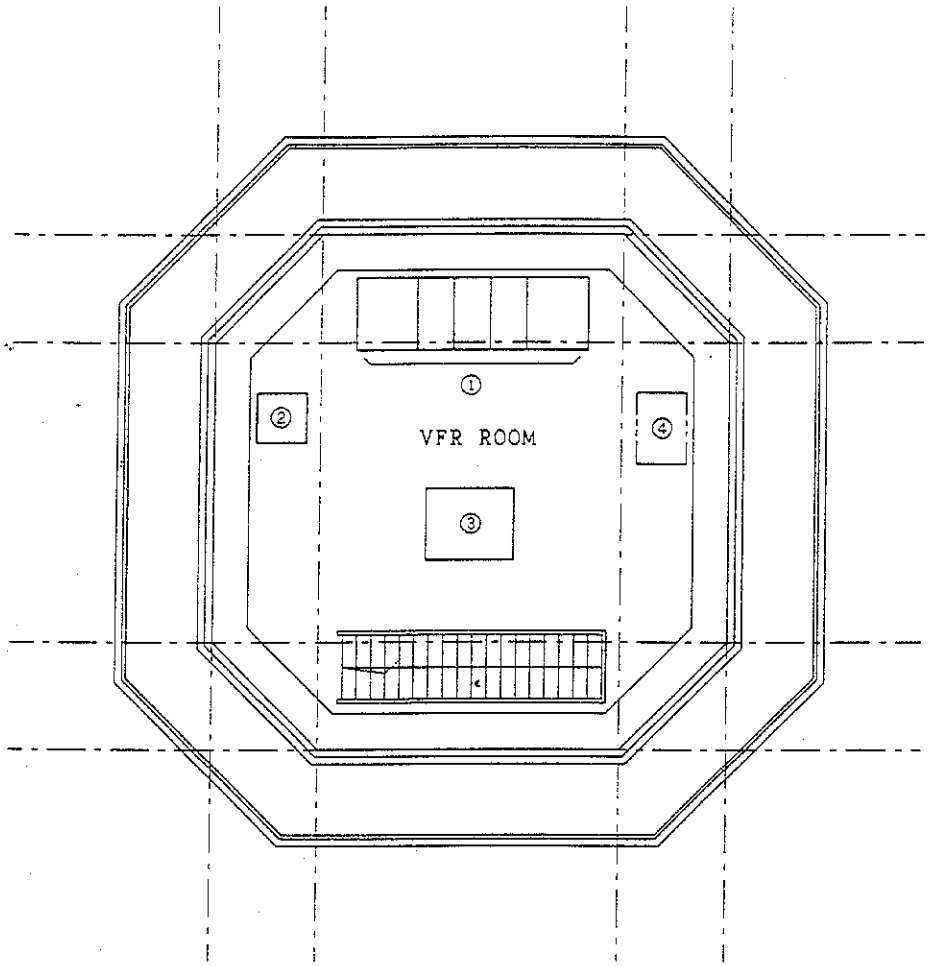


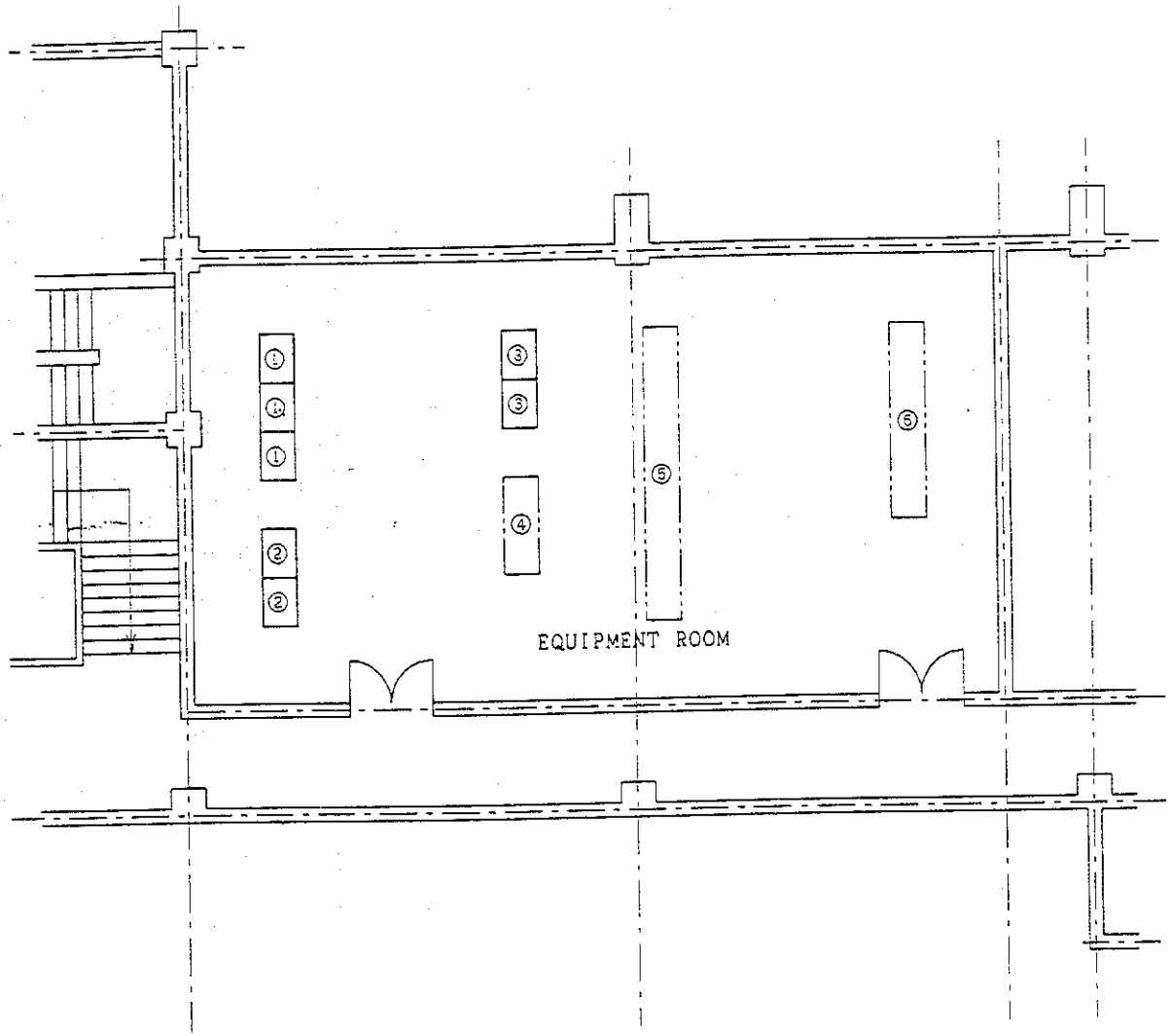
Fig. 5-8 System Block Diagram for Control Tower



VFR ROOM LAYOUT PLAN
S=1/50

No	EQUIPMENT	NOTE
1	ATC CONSOLE	
2	AFTN TERMINAL	
3	SUPERVISORY CONSOLE	
4	AFL CONSOLE	NDF PROJECT

Fig. 5-9 VFR Room Layout Plan



EQUIPMENT ROOM LAYOUT PLAN
S=1/50

No	EQUIPMENT	NOTE
1	VHF RADIO EQUIPMENT	
2	ATC CONSOLE CONTROL RACK	
3	AFTN SWITCHING EQUIPMENT	
4	ACC CONTROL EQUIPMENT	OTHER PROJECT
5	FUTURE PLAN EQUIPMENT	
6	NAVIAIDS EQUIPMENT	OTHER PROJECT

Fig. 5-10 Equipment Room Layout Plan

b. Air - Ground VHF Communication Equipment

Equipment :

50W AM Transmitter (dual system)	3 sets
VHF AM Receiver (dual system)	3 sets
10W AM Transceiver (sub equipment)	3 sets
VHF AM Receiver (for monitor only)	1 set

Specification :

50W VHF AM Transmitter

Frequency range	118 to 136 MHz
Frequency stability	Within $\pm 20 \times 10^{-6}$
Output power	50W
Spurious radiation	80 dB or less
Type of emission	A3
Modulation depth	90%
Audio frequency response	±6 dB or less for 300 to 3,000 Hz (30% modulation at 1 KHz as standard)

VHF AM Receiver

Frequency range	118 to 136 MHz
Sensitivity	1 μ V at S/N 10 dB or better
Selectivity	7.2 KHz min. at 6 dB down point 25 KHz max. at 60 dB down point
Audio frequency response	±6 dB or less for 300 to 3,000 Hz (30% modulation at 1 KHz as standard)

10W VHF AM Transceiver (3 ch)

[General]	
Frequency range	118 to 136 MHz
Frequency selection	3 channels,to be preset to three arbitrarily chosen frequencies,crystal controlled, both in transmission and in reception.
Emission type	A3
Communication method	Press-to-talk
Frequency stability	Within $\pm 20 \times 10^{-6}$
[Transmitter]	
RF power output	10W of more (when nonmodulated)
Spurious radiation	-60 dB or less
Audio frequency response for	Deviation is 6 dB or less 300 through 3,000 Hz
[Receiver]	
Sensitivity	S/N shall be 10 dB or more at input of 1 μ v at 1,000Hz and 30% modulation
Selectivity	± 7.2 KHz of more at -6 dB ± 25 KHz or less at -60 dB

c. Mobil Communication Equipment

Equipment :

10W FM Transceiver	1 set
1W FM Transceiver	6 sets

Specification :

[General]

Station mode	Repeater,duplex base and repeater, base and repeater,and simplex base
Mode of operation	Single of dual frequency simplex system with a duplexer or two antennas
Frequency range	146 ~ 174 MHz
Number of channels	Up to 99 synthesis programmed channels
Switchable channel	3 MHz for VHF band bandwidth
Channel spacing	25 KHz
Input power	DC Battery operate with 3 hour battery and charger.

[Transmitter]

RF power output	1W minimum
Maximum frequency	Wide-band ±5 KHz deviation
Oscillation system	Direct PLL synthesizer system
Frequency stability	$\pm 5 \times 10^{-6}$ with standard TCXO

[Receiver]

Receiving system	Double conversion superheterodyne
Intermediate frequency	1st IF 21.6 MHz 2nd IF 455 KHz
Frequency stability	$\pm 5 \times 10^{-6}$ with standard TCXO $\pm 2 \times 10^{-6}$ with optional TCXO
Sensitivity	Less than 0.5 μ v for 12 dB noise quieting Less than 0.35 μ v for 12 dB SINAD
Squelch sensitivity	Less than 0.25 μ v
Selectivity	More than 70 dB at 25 KHz point

d. Others

Equipment :

Light Gun	1 set
Tape Recorder and Reproducer	1 set
Power Distribution Board	1 set
Terminal Board	1 set
Master and Slave Clock System	1 set

Specification :

Tape Recorder

The component panels will be interchangeable and standardized for all channels of tape recorder. The tape recorder will be composed of dualdeck with play-back and automatic time search functions.

Input channels	20
Tracks	20
Recording input level	-10 dBm ± 10 dB
Overall Frequency Response	Within ±3 dB between 300 and 3,000 Hz
Recording Time	25 hours/reel
Tape Reel	267 mm diameter
Recording Speed	1.19 cm/second ± 1%
Wow and Flutter	Less than 1% at 3,000 Hz (root mean square)
Fast-forward and Rewind Time	4 minutes or shorter

② Area Control Center

System block diagram of ACC equipment is as shown in Fig. 5-11, equipment layout plan of ACC room is as shown in Fig. 5-12. Composition of specification of equipment are described hereinafter.

a. ACC Communication Console

Equipment :

Procedural Control Console	2 sets(North/South)
Coordinator Console	2 sets(North/South)
Supervisory Console	1 set

Specification :

– Console

Radio Communication

- Radio Control Panel, Voice Control Panel, and Foot Switch are used together for controlling VHF/HF transmitters and receivers for radio communication

and for indicating communication condition, and speaker panel, jack box, headset and hand microphone are used together for actual radio communication.

- Radio Control Panel is equipped with 5 receiver selection buttons and 5 transmitter selection buttons.
- Receiving Volume controls for speaker and headset are provided on Speaker Panel and Voice Control Panel.
- A press-to-talk(PTT)operation is done by Foot Switch, PTT button on headset or PTT switch on Voice Control Panel.

Transmitter/Receiver Control

- Main/Standby Control of transmitter and receiver is only possible at Main/standby select panel in supervisory console.
- Standby transmitter and receiver selection is made by depressing the push button on main/stand-by select panel.
- Maximum 10 sets of transmitter and receiver can be controlled.

Intercom Communication

- Intercom Control Panel and Voice Control Panel are used together for controlling intercom communication, handset and headset are used together for actual communication.
- Channel selection and call are synchronously made by depressing a channel selection push button on Intercom Control Panel.
- Receiving indication is made by winking of an indicator in push button and sounding of a buzzer in console.

- A speech circuit is completed by depressing a winking push button and the indicator lights continuously lighted during conversation.
- Receiving volume control for handset and headset are provided on Voice Control Panel.
- The reset of circuits is made by depressing the push button switch again.

Over-ride Control

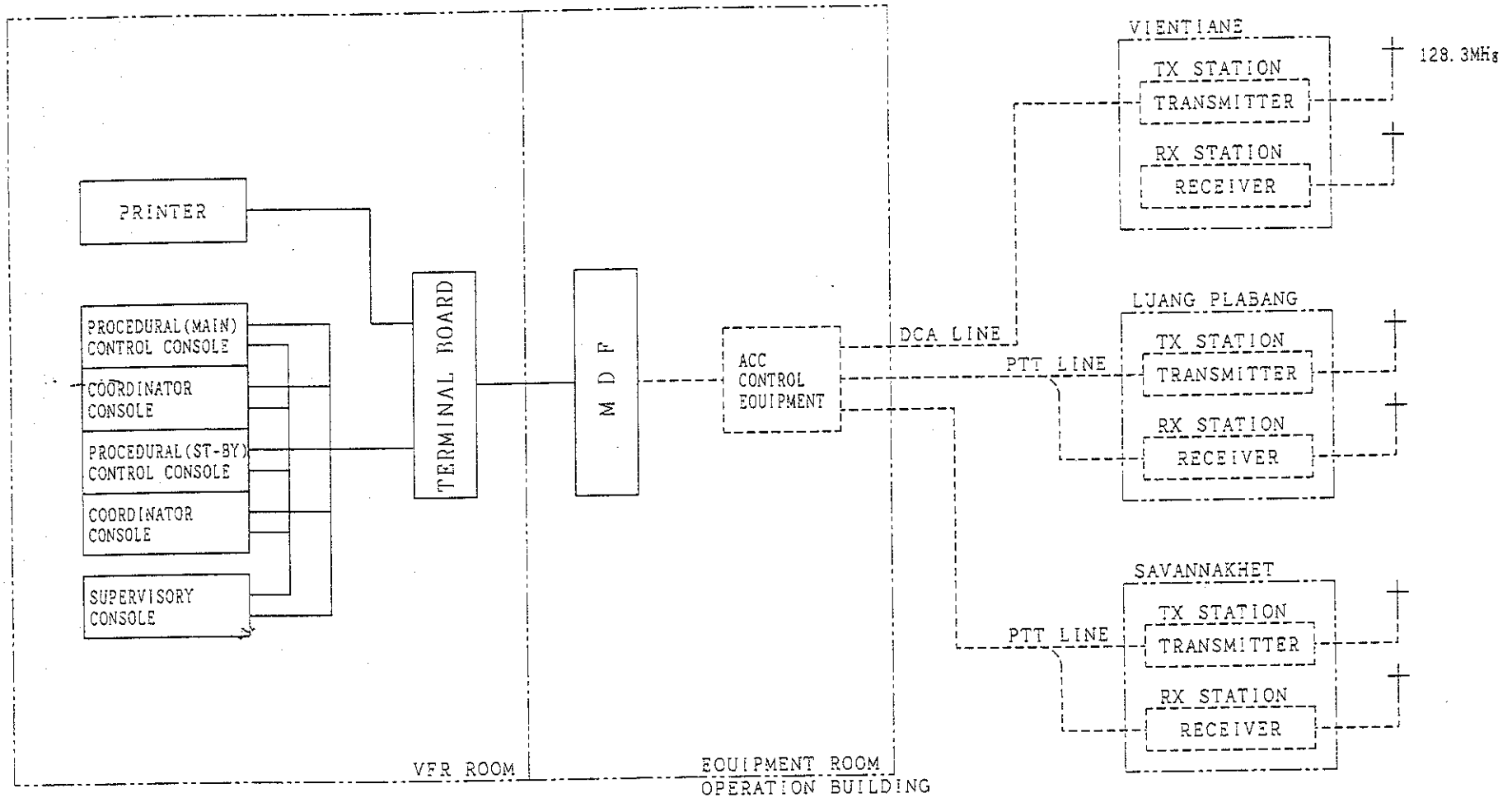
- Over-ride control panel is used for over-riding from supervisor to controller.
- When the over-ride selecting switch is depressed, the supervisory console is unable to execute normal transmitting and receiving.

Hotline Control

- Controller's voice will come out of the speaker at the corresponding party when he talks through microphone by simply pressing a press-to-talk button on the hot-line control panel.

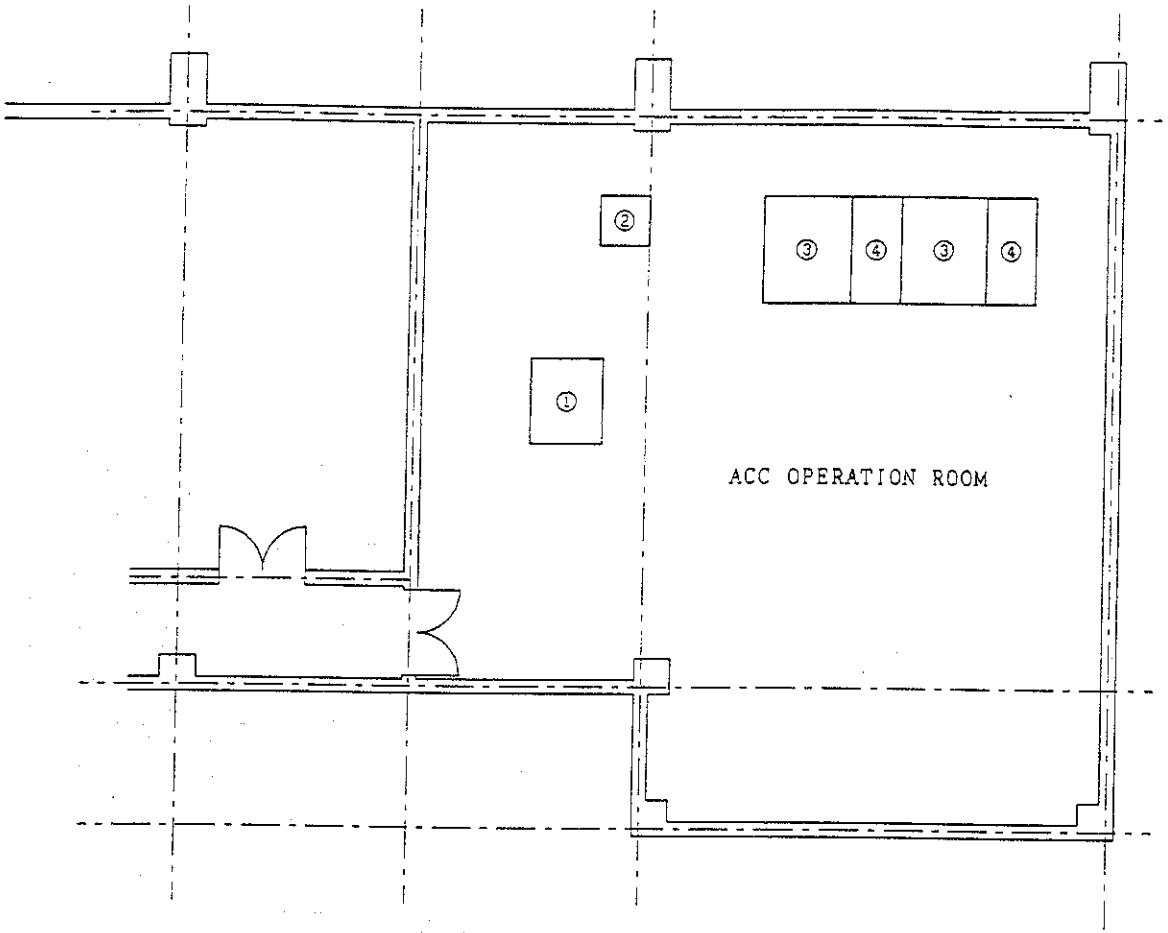
Time Indication

- Digital clock is used for indication of time by hours, minutes and seconds.



NOTES: [ ] QUIPMENTS AER INSTALLED BY FRANCE

Fig. 5-11 System Block Diagram for ACC



No	EQUIPMENT	NOTE
1	SUPERVISORY CONSOLE	
2	AFTN TERMINAL	
3	PROCEDURAL CONSOLE	
4	COORDINATOR CONSOLE	

ACC OPERATION ROOM LAYOUT PLAN
S=1/50

Fig. 5-12 ACC Operation Room Layout Plan

③ Flight Information System

System block diagram of FIS equipment is as shown in Fig. 5-13, AFTN system block diagram is as shown in Fig. 5-14 and equipment layout plan in FIS room is as shown in Fig. 5-15. Composition and specification of equipment are described hereinafter.

a. AFTN

Equipment :

AFTN Switching Equipment	1set
AFTN Terminal	12 sets

Specification :

- This equipment is for transmitting, receiving and exchanging messages automatically between VIA and neighboring airports and local airports.

- This equipment shall have the following functions;
  - Automatic exchange and recording of messages
  - Format check
  - Control of sequence numbers
  - Dealing with prior message
  - Message recovering
  - Dealing with group address
  - Dealing with circuit trouble
  - Automatic equipment switching
  - Operation guidance display

- International communication is done through Aerothai Communication Center with microwave circuit.

- Domestic circuit shall be connectable to PTT microwave circuit.

– Connection points of AFTN are as follows; but expansion shall be considered in future,

[International]

- Bangkok
- Ho Chi Minh
- Phnom Penh
- Yangon
- Hong Kong

[Domestic]

- Luang Prabang (in future)
- Savannakhet (in future)
- Pakse (in future)

b. Direct Speech Circuit

Equipment :

Direct Speech Console 1 set(Including control unit)

Specification :

– This equipment is for direct selective speech between air traffic controllers in VIA, neighboring ACC and domestic local airports.

– Calling is done by pushing independent buttons.

– Display of receiving is by flushing of push button and buzzer

– Air traffic controller can speak with handset, headset and speaker. Voice volume controller is provided on the control panel.

– International communication is done through Aerothai Communication Center with microwave circuit.

– Domestic circuit shall be connectable to PTT microwave circuit.

– Function of direct speech with existing HF transceiver is necessary as back-up.

– Destination points of direct speech are as follows; but expansion shall be considered in future,
[International]
  • Bangkok (call number 21)
  • Ho Chi Minh (call number 52)
  • Phnom Penh (call number 61)
  • Yangon (call number 31)
  • More than 2 channels shall be expanded in future

[Domestic]
  • Luang Prabang (in future)
  • Savannakhet (in future)
  • Pakse (in future)

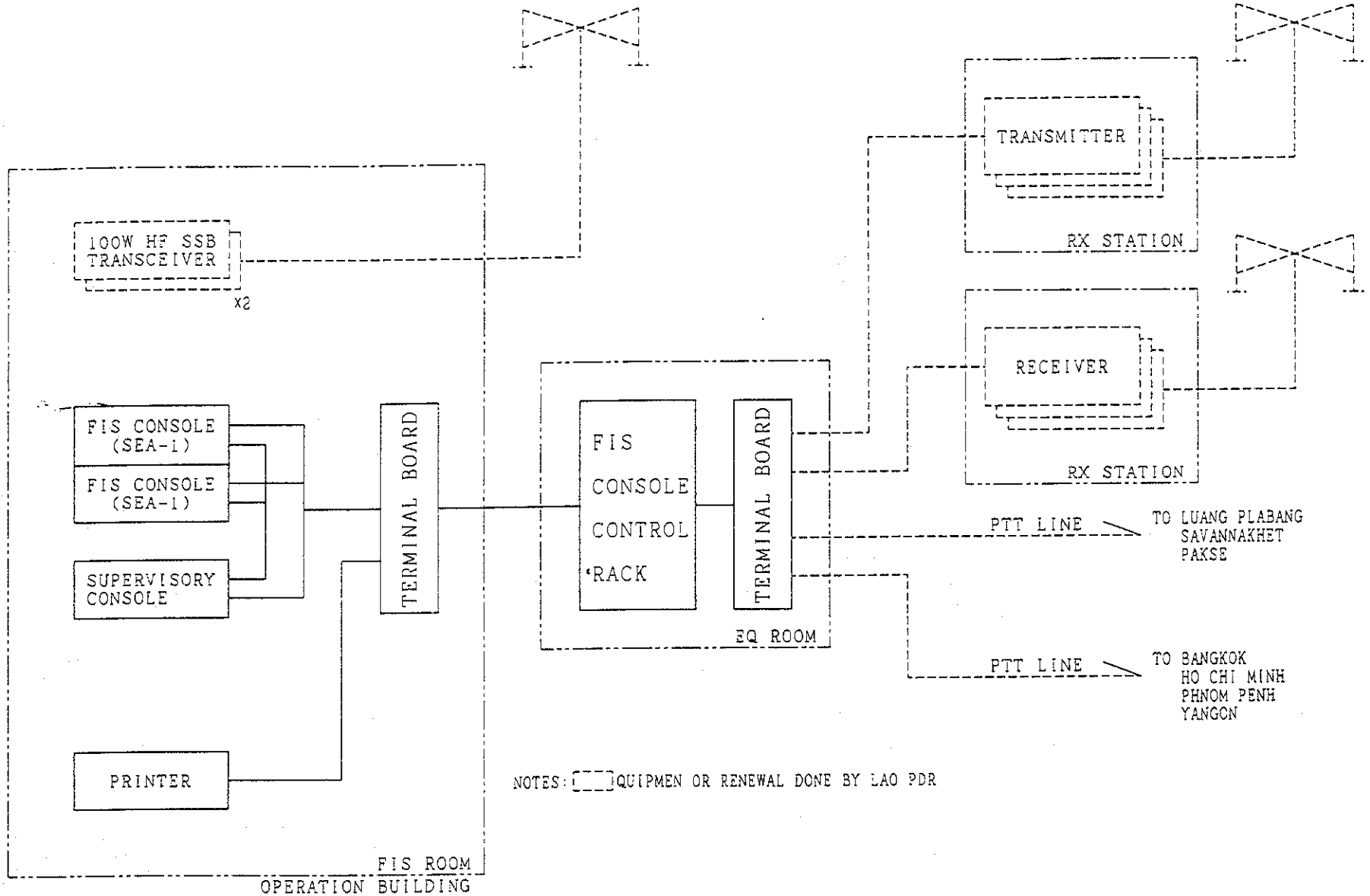


Fig. 5-13 System Block Diagram for FIS

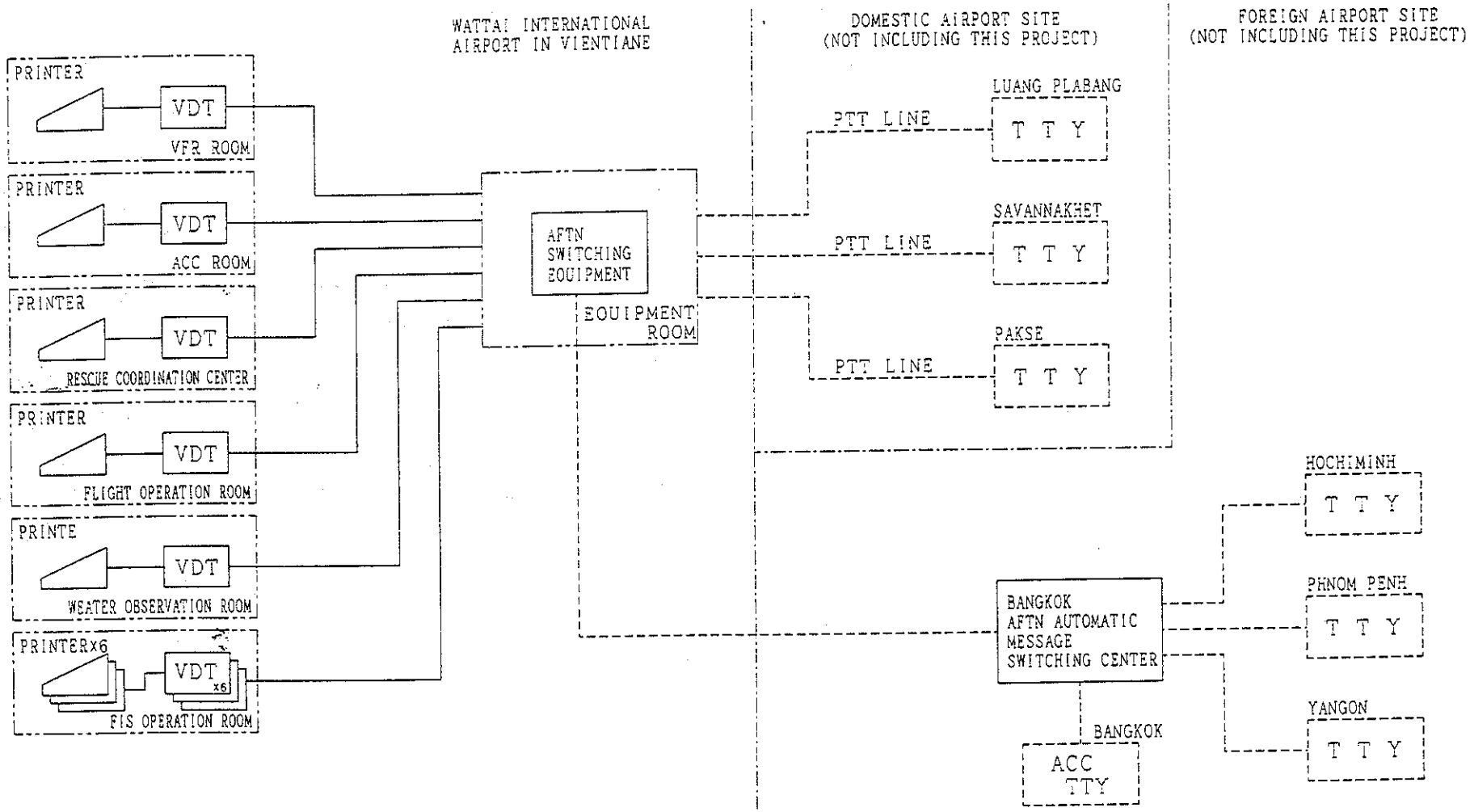
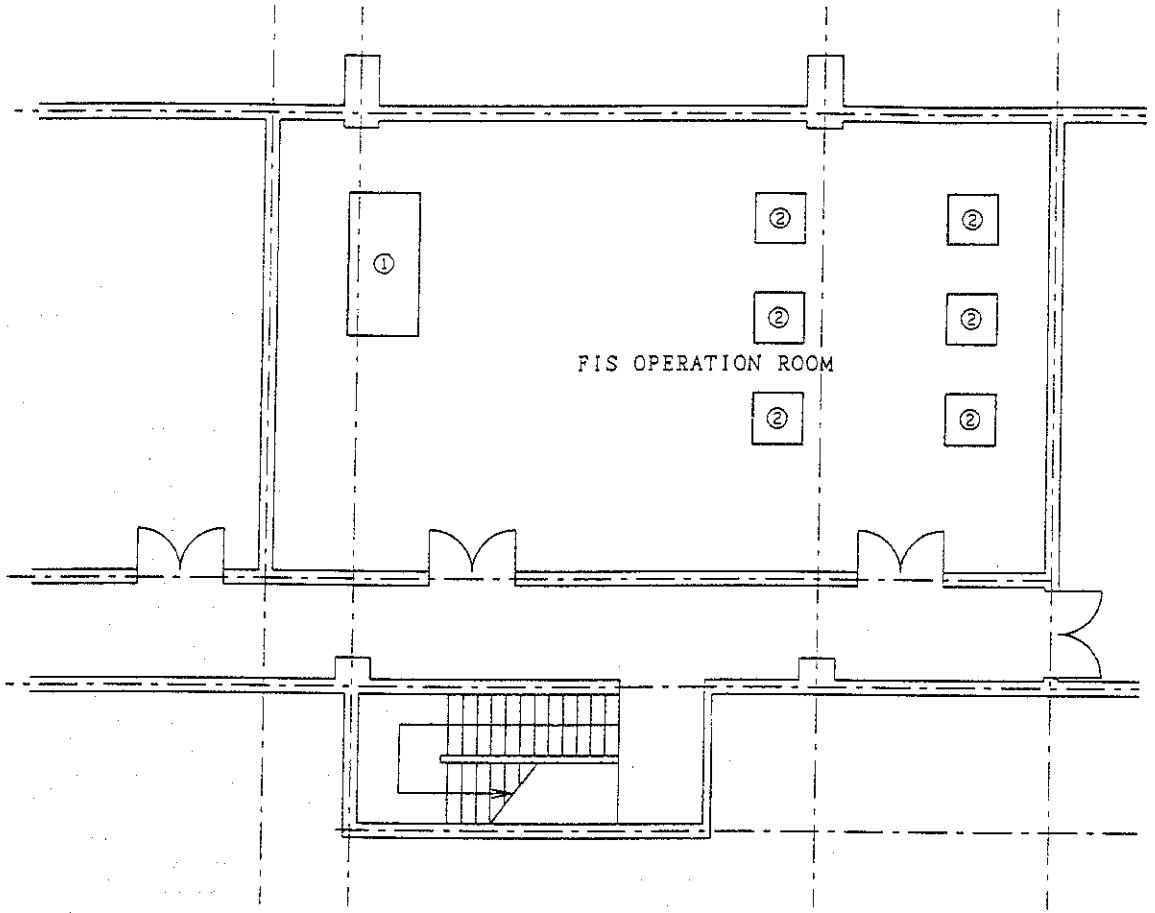


Fig. 5-14 System Block Diagram for AFTN Switching System



No	EQUIPMENT	NOTE
1	DIRECT SPEECH CONSOLE	
2	AFTN TERMINAL	

FIS OPERATION ROOM LAYOUT PLAN
S=1/50

Fig. 5-15 FIS Operation Room Layout Plan

2) Airport Maintenance Equipment

Required airport maintenance equipment to secure air traffic safety is mentioned in the previous section. it is as follows;

- Tractor (with slasher attachment)
- Whipper Snipper
- Backhoe
- Suction Sweeper
- Industrial Lawn mower
- Paint Marker
- Joint Sealing Machine
- Tip Truck
- Four Wheel Driven Car
- Bituminous Heater/Mixer
- Concrete Cutter Saw

Specification of these vehicles are determined for doing routine airport maintenance works with ease. Major specification of these vehicles are as follows;

① Tractor

- Diesel engine of 2500 cc class mounted
- 4 wheel drive
- Size is around 3500mm long x 1800 mm width x 2200mm height - Minimum turning radios is around 3m
- Minimum clearance to ground is more than 400 mm
- with slasher attachment

② Whipper Snipper

- Shoulder mounted type
- Anti-vibration function

③ Backhoe

- Operation weight is around 5 tons
- Capacity of bucket is around 0.15 m^3
- Driven by caterpillar
- Maximum digging depth is around 3.5m

④ Suction Sweeper

- Cleaning width is around 2.5m
- Capacity of hopper is more than 5m^3
- Capacity of water tank is around 1500 l
- Sweeping speed available 20Km/h
- Performance of blower is around 300m^3
- Sweeping performance is more than 1000mmAq

⑤ Industrial Lawn Mower

- Operation weight is around 1200 Kg
- Mowing width is around 1.5m
- Diesel engine of around 1500 cc mounted

⑥ Paint Marker

- Hand push cart
- Paint tank capacity is around 20 l
- Line width is 10 cm ~ 20 cm
- Painting speed is around 2 Km/h

⑦ Joint Sealing Machine

- Hand push cart
- Tank capacity is around 100 l

⑧ Tip Truck

- Diesel engine of around 2500 cc mounted
- 4 wheel drive
- cart capacity is around 1.5 tons

⑨ Four-Wheel Driven Car

- Diesel engine of around 2500 cc mounted
- 4 wheel drive
- for 5 persons

⑩ Bituminous Heater/Mixer

- Capacity of kettle is around 200 l
- Hand push cart

⑪ Concrete Cutter Saw

- Motor of around 1500 cc
- Maximum digging depth is more than 500 mm