5.2 Design of Major Structure

5.2.1 Maintenance Shop

This maintenance shop is planned mainly for the repairing of containers but the minor repairing of forklifts, chassis, top loaders, etc can also be available. The maintenance shop has the dimension of 50 m in length and 30 m in width, and a spare parts store(120 m^2), battery room(40 m^2) and locker room for mechanics (40 m^2) are provided on ground floor and a valuable spare parts store(20 m^2) and office (40 m^2) are provided on upper floor. Minimum clear height inside the maintenance shop is 6 m. Population and space of this shop were assumed as follows.

Population

Officer : 4 person Mechanics : 12 person Space of Room

Space of Room

Office	: 40 m^2 (0.12 person/m^2)
Locker Room	: 40 m^2 (0.35 person/m^2)
Work Shop	: 1260 m^2 (90 m^2/container)

Maximum 14 numbers of containers can be accommodated for repairing.

The shed consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminium box-rib sheet roof with transparent PVC panel and a reinforced concrete floor slab.
The floor slab is designed to be able to support the equipment of 3 ton/m^2. The columns and floor slab of this shed are supported by the concrete piles, since poor subsoil condition.

The open area for maintenance purpose is provided around this maintenance shop. The conceptual plans are presented in Fig. 5-2-1.

5.2.2 Container Cleaning Area and Maintenance Open Area

The container cleaning area and maintenance open area are located near the empty container storage yard and having the space of 3430 m^2 and 3750 m^2 respectively. The container cleaning area is planned mainly for washing reefer container. The concrete

pavement for tractor/trailer for 40'container is adopted in these areas and the closed drainage system is provided surrounding these pavement areas.
The drain is collected in the grease trap first and after oil is removed the drain is discharged to the storm drain manhole.

The plan and structure of pavement are shown in Fig. 5-2-2 and the typical cross section of grease trap is indicated in Fig. 5-2-5.

5.2.3 Gate for Export CFS & Empty Container Storage Yard in West Quay

Three(3) gates for the Export CFS and empty container storage yards are planned to be provided as shown in the Short-Term Plan. The gate No.2 and No.3 comprises a gate canopy which covers 2 traffic lanes, 1 lane each for incoming and outgoing Traffic, and a check room. The gate No.1 comprises a gate canopy which covers 4 traffic lanes, 2 lanes each for incoming and outgoing traffic and a check room. And the security offices are provided nearby each gates.

A check bridge is arranged above the traffic lanes covered by the canopy with the clear height of 4.2 m from the road level. And the canopy is made of reinforced concrete columns and flat slab supported by the RC foundation piles. The check room has a space of 25 m^2 with toilet. The security room has a space of 100 m^2 and is made of reinforced concrete.

Gate 1 having four (4) lanes in the Short-Term Plan is planned to be reduced to two (2) lanes in the Master Plan. However, the surplus 2 lanes will be left intact for emmergency in the Master Plan.

The typical dimensions of these gates are presented in Fig. 5-2-3.

5.2.4 Container Yard in East Quay

(1) Existing Building (to be demolished) Area

The existing cargo warehouse (5,150 m^2) and transit sheds No.11 (9,000 m^2) and No.12 (9,000 m^2) are planned to be demolished and the area is going to be used for the container marshaling yard.

As explained in the Chapter 13.2 in Part I, after demolished the floor slab and superstructure of existing buildings, new concrete beams and slabs, which can support the uniform load of 3.0 ton/m^2 or the concentrated load of transtainer or top loader, are installed on the existing reinforced concrete foundation piles.

The slab is planned to be divided by the construction joints, since the area is too wide for a single concrete slab, and the surface of the slab is sloped at 0.5 % to 2.0 % for the rain water. The beam has a dimension of 0.5 m x 0.8 m and the slab has 0.2 m in thickness.

(2) Surrounding Area of Existing Buildings

The surrounding area of existing cargo warehouse and transit sheds No.11 and No.12, the proposed terminal gate area, and existing reefer container area are planned to be elevated the ground elevation for open storage of containers. The present ground elevation in this area is between 1.6 m to 2.0 m above MSL that is 0.6 m to 1.0 m lower than the surface elevation of newly completed container yard of the eastern part of east quay. Thus,it is assumed that the consolidation of subsoil in this area has been mostly completed. Therefore, new concrete pavement for stacking of containers is provided on the existing pavement. However, the runway of RTG will be reinforced concrete beam with RC foundation piles.
The new concrete pavement is divided into three (3) types based on the thickness on existing ground elevation, more than 0.55 m thick, 0.35 m to 0.55 m thick, and less than 0.35 m thick.
Typical section of pavement structure is presented in Fig. 5-2-4.

5.2.5 Transtainer Repair Area

Four (4) R.T.G.(Rubber Tired Gantry Crane) repair areas are planned to be located in the east quay. Three (3) areas has the dimension of 20 m in length and 15 m in width for small R.T.G (4+1), and one (1) area have the dimension of 25 m in length and 15 m in width for large R.T.G (6+1). The area is paved by concrete with the same pavement structure of adjacent container yard. The closed drainage system is provided surrounding this pavement area and the drain is collected in the grease trap first and after oil is removed the drain is discharged to the storm drain manhole.
The drainage surrounding the pavement is the trench which has the dimension of 0.5

m x 0.5 m made by the reinforced concrete and grating cover.
The structure of pavement and grease trap are shown in Fig. 5-2-5.

5.2.6 Terminal Office Building

One (1) terminal office building is planned to be built for the container terminal No.3 in the East Quay. The building is three (3) story reinforced concrete structure having the floor space of 600 m^2. This building comprises container terminal operators' office room (116 m^2), customs office room(50 m^2), workers' refreshment room (50 m^2), documentation room (50 m^2), canteen and toilets, etc.
The conceptual floor plans and elevation of this building are shown in Fig. 5-2-6. Population and space of rooms were assumed as follows.

Population

Officer : 25 person Worker : 15 person

Space of Room

Office : 217 m^2 (0.12 person/m^2) Workers Room : 50 m^2 (0.30 person/m^2)

This building is supported by the reinforced concrete foundation piles, since subsoil condition here is very poor.

5.2.7 Container Terminal Gates

As explained in the Master Plan, three (3) terminal gates are provided in the east quay. Gate 1 and Gate 2 comprises a gate canopy which covers 7 traffic lanes, 4 lanes for incoming and 3 lanes for outgoing. Gate 3 is divided to the two (2) places, a entrance and a exit. The entrance gate has 4 traffic lanes and the exit gate has 3 traffic lanes. Gate 2 and the exit of Gate 3 has a extra traffic lane without canopy for emergency passage.

A check bridge is arranged above the traffic lanes covered by the canopy with the clear height of 4.2 m from the road level. And the canopy is made of reinforced concrete flat slab and columns supported by the RC foundation piles.

Gate 1 is planned to be built 5 check rooms. There are two (2) types of check rooms, a small type which has a space of 7.5 m^2, and a large type which has a space of 21 m^2 with a toilet. The two (2) small rooms and the one large room are provided for

incoming traffic, and the one small and one large rooms are provided for outgoing traffic. A small room is provided for two (2) lanes service, and the other rooms are for one lane service.

The Gate 2 area has five (5) existing check rooms, four (4) small existing rooms and one (1) large existing room. Two (2) small rooms and a large room are used for incoming traffic of Gate 2. Other two (2) small rooms are planned to be demolished. Four (4) new check rooms are constructed, one (1) large room and two (2) small rooms for outgoing traffic, and one (1) small room for incoming traffic. Those new check rooms have a same space as the rooms of Gate 1.
Gate 3 is provided seven (7) check rooms, three (3) small rooms and one (1) large room for the entrance, and two (2) small rooms and one (1) large room for the exit. The small room has a space of 7.5 m^2, and the large room has a space of 21 m^2 with toilet.

In each gate, the check room is made of the reinforced concrete. At Gate 1 and Gate 3, two (2) truck scales are installed at the incoming traffic lanes, and are mounted on the reinforced concrete foundation supported by the reinforced concrete foundation piles. The scale can measure the weight up to 80 tonnes. Three (3) truck scales has been installed already at Gate 2.

The typical plan of container terminal gates is shown in Fig. 5-2-7.

5.2.8 Bridge connecting East Quay and West Quay

The bridge is made of prestressed concrete slab of 23 m wide, including 2 side walks of 3 m wide each and prestressed concrete girders supported by the RC foundation piles. The side walks of total 6.0 m wide is planned to be reduced to 2.5 m wide and remained 3.5 m is shifted to the incoming traffic lane as shown in Fig. 5-2-8.

By this modification, the loading condition for the prestressed concrete girders at both ends of bridge becomes more severe than the existing one but the new loading condition is still lower than that of middle girders. Therefore, this bridge is still structurally safe enough, since the capacity of end girder and middle girder is the same.

5.2.9 Gas Station

(1) Gas station in the East Quay

The existing gas station in the east quay is planned to be demolished, and replaced to nearby existing canteen building. The new gas station is provided for truck trailor, RTG, and passenger cars. The gas station has a space of 1200 m^2, and station office, parts store and fuel storage tanks are provided in this area.

For diesel fuel, three (3) underground cylinderical storage tanks, each 2.1 m in diamater and 6.0 m in length, are installed. For gasolin, two (2) underground strage tanks, each 1.5 m in diamater and 3.0 m in length, are installed, one for premium gasoline and one for reguler gasoline.

The demand of fuel is estimated based on the following number of truck trailers, RTG and passenger cars ;

Truck Traler : 70 units RTG : 31 units Passenger car : 50 units

Diesel fuel consumption ;
Truck Traler : 260 l/day/unit x 70 unit = 18200 l/day (Peak Condition)
RTG : 450 l/day/unit x 31 unit = 13950 l/day (Peak Condition)
Passenger car: 5 l/day/unit x 50 unit x 25% = 63 l/day
Total = 32213 l/day(Peak Condition)
Gasoline consumption ;
Passenger car : 200 l/month/car x 50 unit x 75% /30 day=250 l/day

(2) Gas station in West Quay

The gas station in parking area near the Checking Post 1 is provided for passenger cars, and has a space of 600 m^2 for the station office and fuel storage tanks .

The demand of the fuel by passenger cars is estimated based on the following assumption.
The number of car : 1000 unit
Fuel consumption 200 l/unit/month --- 6670 l/day

Diesel fuel	: 25% 1660 l/day
Premium gasoline	: 25% 1660 l/day
Regular gasoline	: 50% 3350 l/day

As a result, eight (8) underground strage tanks are required. Two tanks are 2.1 m in diamater and 6 m in length for regular gasoline, and six tanks are 1.5 m in diamater and 3.0 m in length for diesel fuel and premium gasoline.

5.2.10 Main Port Road in West Quay

As explained in the Master Plan Chapter 13., it is proposed that the third main road is straightened and widened and becomes a main port road for two-way traffic with 4 traffic lanes, 2 temporary stoppage lanes and a side walk. The traffic lanes are paved by concrete for the vehicles of tractor/trailer for 40'container.

The concrete pavement is provided on the existing ground. It is designed four (4) types based on the existing ground elevation, more than 0.45 m in thickness, 0.25 m to 0.45 m in thickness, and less than 0.25 m in thick-ness. In case the less than 0.25 m in thickness, the existing ground is cut up to keep the minimum thickness of 0.25 m. The side walk is 2.0 m in width paved by concrete blocks.
Typical cross section of the main port road is presented in Fig. 5-2-9.

5.2.11 New Checking Post 1

This gate is located at the west end of west quay. 2 lanes are provided for incoming traffic with the width of 4.0 m. 3 lanes are provided for outgoing traffic with the width of 4.0 m.

A gate for emergency passage is provided next to the outgoing lanes by taking into account the passage of large truck, top loader or crane, etc.

The checking post 1 for the west quay comprises with a canopy which covers 5 traffic lanes and 4 check rooms. The canopy has the clear height of 5.3 m from the road level and is made of reinforced concrete columns and flat slab. The check room has a space of 30 m^2 and is made of reinforced concrete. The canopy and check room are mounted on the same foundation sup-ported by reinforced concrete piles.

The typical plan of new checking post 1 in the west quay is shown in Fig. 5-2-10.

5.2.12 Port Office Building, Police Station, and Canteen in West Quay

As explained in the Chapter 1.1 of Part II, it is proposed in order to improve traffic flow that the existing offices are transferred to site of the existing supplementary shed No 1 which is planned to be demolished.

(1) Port Office Building

Import Control & Immigration Office, Export Inspection Office, Part of Vehicle Section, Harbor Service Section, Craft Service Section, and others are transferred to new complex building (Port Office Building).

The office space is determined based on the space of existing offices, as follows.

Import Control & Immigration Office	: 700 m^2
Export Inspection Office	: 180 m^2
Vehicle Section	: 150 m^2
Harber Service Division	: 350 m^2
Craft Service Section	: 230 m^2
Common Space	: 690 m^2
Total	:2300 m^2

The building is three (3) story reinforced concrete structure supported by RC foundation piles, since subsoil condition is poor. Each floor has a space of 800 m^2 consisting of office rooms, refreshment room, toilet, etc.

The building plans are presented in Fig. 5-2-11.

(2) Canteen

A canteen is provided in parking area near the checking post 1. The canteen is provided for the drivers of passenger cars, has aspace of 150 m^2, and is made of reinforced concrete.

5.2.13 Repair Shop and Office in West Quay

As explained in the Master Plan, the repair shop and office for the container cargo handling equipment are planned to be constructed in the area of demolished supplementary shed No.6 in west quay.

The shop has the dimension of 30m in length and 25m in width. A spare parts store ($60m^2$), battery room ($30m^2$) and a locker room for mechanics ($40m^2$) are provided on the ground floor, and a valuable spare parts store ($18m^2$) and a office ($30m^2$) are provided on upper floor. Minimum clear height is 6m for inside, 5m for entrance door.

The shed consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter door, aluminum box-rib sheet with transparent PVC panel and reinforced concrete floor slab supported by RC foundation piles. The floor slab is designed to be able to support the equipment of 3 ton/m^2.

A office building for container cargo handling equipment division is planned to be built near the new repair shop. The building is two story reinforced concrete structure supported by RC foundation piles having the floor space of 900 m^2. The building has the dimensions of 30m in length and 15m in width, and office rooms, meeting rooms, a refreshment room and toilets are provided.

The conceptual plan of repair shop is presented in Fig. 5-2-17.

5.2.14 Rail Way Yard

As explained in the Master Plan, new one siding railway line is planned to be installed in the west quay. Both side of the new siding rial way line are connected to the existing siding railway line. Along the siding railway lines, 20 m with open yards are provided for cargo handling operation.

The conceptual plan is presented in Fig. 5-2-18.

5.2.15 Fence

(1) Customs Fence

This fence is installed at the new boundary of the customs area in the port which is shown in Port Layout Plan. The approximate length of this fence is 1325 m. This fence is made of concrete block wall of 2.8 m high supported by RC foundation piles, and barbed wire on it up to the height of 3.3 m above ground level, as shown in Fig. 5-2-12.

(2) Container Terminal Fence

This fence is installed at the boundary of each container terminal in the east quay and the boundary of empty container storage yard in the west quay. This fence is made of wire netting with steel column and frame to the height of 1.5 m above ground level, as shown in Fig. 5-2-13.

5.2.16 Parking Lot No.1

The parking lots for port traffic is planned to be prepared nearby the Checking Post 1. This area has a space of approximate 19000 m^2 and can accommodate 1060 passenger cars. It is considered that the subsoil conditions in this area is not so good but has an enough strength to built the parking lots for trucks without subsoil improvement. However, the occurrence of settlement during years should be considered. Therefore, the asphalt pavement is recommended.
Fig. 5-2-9 shows the recommended profile of asphalt pavement for the parking lot.

5.2.17 Modification of Transit Shed No 13, No 14

The present sheds has the dimension of 115 m in length and 44 m in width. However, the sheds has no platform, and the cargo handling is carried out on the road in front of the sheds. Therefore, the cargo flow is not so smooth and taking time for the handling. In order to improve the cargo flow, it is proposed that the platform and additional entrance to the sheds should be built.

The present floor elevation of sheds is 0.5 m higher than the surrounding road elevation. Idealistic floor level is the same level as the truck height and will be 1.3 m high from

the ground level. It is recommended to raise the floor for 0.8 m higher than the present floor level. The difference of 0.8 m is shared by sloped platform and sloped approch. The sloped approch area will be expected to be flat by the consolidation of subsoil in the future. The platform is made of the reinforced concrete supported by RC foundation piles, and the additional shutter doors are provided on the side walls of sheds.

The modification plans are presented in Fig. 5-2-14 and Fig. 5-2-15.

5.2.18 Modification of Transit Sheds No 1 to No 9

The present sheds are located just behind the berth in west quay, and the shed has the dimension of 300 m in length. The bulky cargoes needs to be transported to the open storage yard through the side way around the shed for the distance of about 300 m. Therefore, the cargo flow is not so smooth. In order to improve the cargo flow, the road path is provided at the middle part of each sheds.

The present sheds consists of 15 ridges of 20 m wide each. It is proposed that the one ridge is to be demolished, and the existing RC floor slab is to be modified. The slab elevation of the present shed is 0.8 m higher than the road at the land side of the shed, and the slab is on the RC beams supported by wood foundation piles. Therefore, the part of slab and beams are required to be modified as shown in Fig. 5-2-16.

5.2.19 Utilities

(1) Electricity

It is assumed that required electricity for the port use is receivable from the Metropolitan Electricity Authority (MEA). Therefore, the design of electricity supply system is conducted within the port in this study.

The lighting system for the container terminal No.3 in east quay, the maintenance area, each gate, new road and parking area, and the power supply system for maintenance shops, the terminal office, the port office, gate checking rooms, the police station, gas stations and the reefer storage yard are provided.

The electrical demands of each facilities are estimated as follows.

Unit Load

Facility	Unit Load (VA/m2)				
	Lighting	Receptacles	Air-Con	Others	Total
Terminal Office Bldg	38	11	62.5	20	131.5
Gate Checking Room	38	11	86.5	20	155.5
Port Office Bldg	38	11	62.5	20	131.5
Gas Station No1 Office	38	11	62.5	20	131.5
No1 Yard	21	11	-	20	52
Gas Station No2 Office	38	11	62.5	20	131.5
No2 Yard	21	11	-	20	52
Maintenance Shop Office	38	11	62.5	20	131.5
Shop	6	11	-	20	46
Canteen	38	11	-	20	69
Parking Lot	2.5	-	-	-	2.5

Load Estimates

Facility	Floor Area	Unit Load	Demand	Power Load		Particuler	Total
	m2	VA/m2	Factor	(KVA)	(KW)	Factor	(KW)
Terminal Office Bldg	600	131.5	0.7	55.23	44.18	300 kw	344.18
Gate Checking Room	7.5	155.5	0.7	0.82	0.65		0.65
Port Office Bldg	2300	131.5	0.7	211.72	169.37		169.37
Gas Station No1 Office	100	131.5	0.7	9.21	7.36		7.36
No1 Yard	1100	52	0.6	34.32	27.46	8 kw	35.46
Gas Station No2 Office	100	131.5	0.7	9.21	7.36		7.36
No2 Yard	500	52	0.6	15.60	12.48	8 kw	20.48
Maintenance Shop Office	160	131.5	0.7	14.73	11.78		11.78
Shop	1340	46	0.6	36.98	29.59	100 kw	129.59
Canteen	150	69	0.7	7.25	5.80		5.8
Parking Lot	14000	2.5	0.6	21.00	16.80		16.8
Reefer Container	-	-	-	-	-	3000 Kw	3000
Container Terminal No3	-	-	-	-	-	100 kw	100

Notes

Gate Checking Room : 0.65 kw/unit

Repair Shop is same as the maintenace shop.

Container Terminal No.3 Lighting System

Yard lighting is designed to be 2000 W rainproof out door luminaires installed on steel structure of 20 m high. The electricity is supplied by transformer and switchgear in cubicles installed nearby the lighting tower.
Four (4) new lighting towers supported by RC foundation piles are installed in the terminal No. 3 and the two (2) existing towers are available in this area.

Reefer Container Power Supply

The power for reefer container is supplied by 22 kv line in condit from substation. Sub-station is provided near the reefer container yard and power line is derived through cable trench from the transformer to each switchgear nearby the reefer container.

(2) Water Supply

It is assumed that required water for the port use is obtainable from the Municipal Water Authority and the own existing wells.

The water supply system is provided for the maintenance shops, the container cleaning area, the container terminal office, gas stations, the port office, the police station, the canteen and gate checking rooms.

The fire hydrant system is arranged for the maintenance shops, the container terminal office,the port office, the police station, gas stations and the canteen.

The maximum daily demands of water supply are estimated as follows.

Facility	Assuumed Population	Unit Demand (m3/day)	Water (m3/day)	Particular Factor	Total (m3/day)
Terminal Office Bldg	45	0.1	4.5	3 m3/day	7.5
Maintenance Shop	16	0.4	6.4	1 m3/day	7.4
Port Office Bldg	130	0.1	13		15
Gas Station No1	6	0.1	0.6	1 m3/day	1.6
Gas Station No2	4	0.1	0.4	1 m3/day	1.4
Canteen Employee	6	0.15	0.9		0.9
Visitor	130	0.04	5.2		6
Cleaning Area				12 m3/day	12

(3) Drainage System

Drainage System in East Quay

New drainage system is provided in the area of existing transit shed No.11, No.12 and the existing cargo warehouse. The existing drainage system in surrounding area of the existing sheds has not functioned well, since the ground level had subsided. Therefore, it is proposed that the existing drainage system is replaced and the new drainage pipes are conected to the existing outlet.

The new underground pipes of reinforced concrete structure having the diamater from 300 mm to 1200 mm are installed based on the existing drainage system.

Drainage System in West Quay

The existing drainage system in west quay has been functioning well. Thus, the new drainage system for the main gate area, the parking area, the port office area, the main road of near the gate and new roads are connected to the existing drainage system. The underground pipes of RC structure having the diamater from 100 mm to 800 mm are installed.

(4) Sewage system

Waste water from buildings, restaurants, offices and those toilets with septictank has been discharged to the rain water drainage directly.

Nowadays, the water pollution of the Chao Phraya River is serious problems. Therefore, the municipal office has a plan to build sewage treatment system near the checking post 2.

Upon completion of the municipal sewage treatment system, the waste water produced in the port area should be discharged through this sewage treatment system.

Qualities of Wastewater (mg/l)

Treated Waste Effluent

BOD (5days) :< 20

Suspended Solids (ss) :< 30

PH : 5-6

The quality of treated waste effluent is determined by NEB standard.

Waste Water Volum (Japan Standard)

Daily Sewage Flow (Qs) = 0.9 x Qw (m3/day) Qw = Water Demand
Infiltration (Qi) = 0.15 x Qs (15% of daily sewage fiow)
Maixmum Daily Sewage Flow (Qmax) = Qs + Qi
Average Daily Sewage Flow (Qave) = 0.8 x Qmax
Peak Sewage Flow (Qpea) = 1.5 x Qma x /24 (m3/hr)

Calculations of each Facilities

Facility	Water Demand m3/day	Sewage Flow m3/day	Infilt-ration m3/day	Max Sewage m3/day	Average Sewage m3/day	Peak Sewage m3/hr
Terminal Office Bldg	7.5	6.75	1.01	7.76	6.21	0.49
Port Office Bldg	13	11.7	1.76	13.46	10.76	0.84
Canteen	6.1	5.49	0.82	6.31	5.05	0.39
Maintenance Shop	7.4	6.66	1.00	7.66	6.13	0.48

General plans of major facilities are presented in the following Figures attached hereunder.

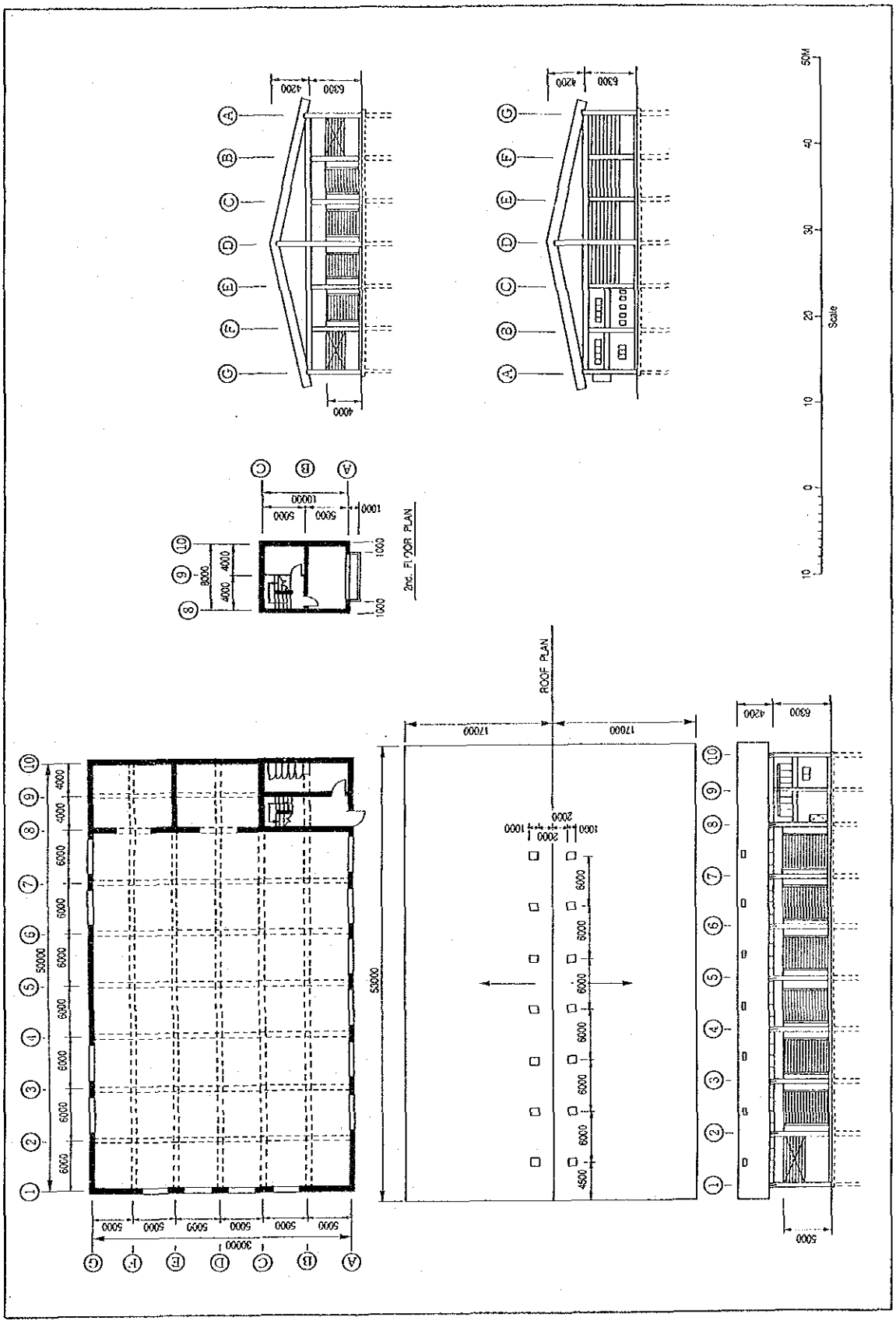


Fig. 5-2-1 Container Maintenance Shop

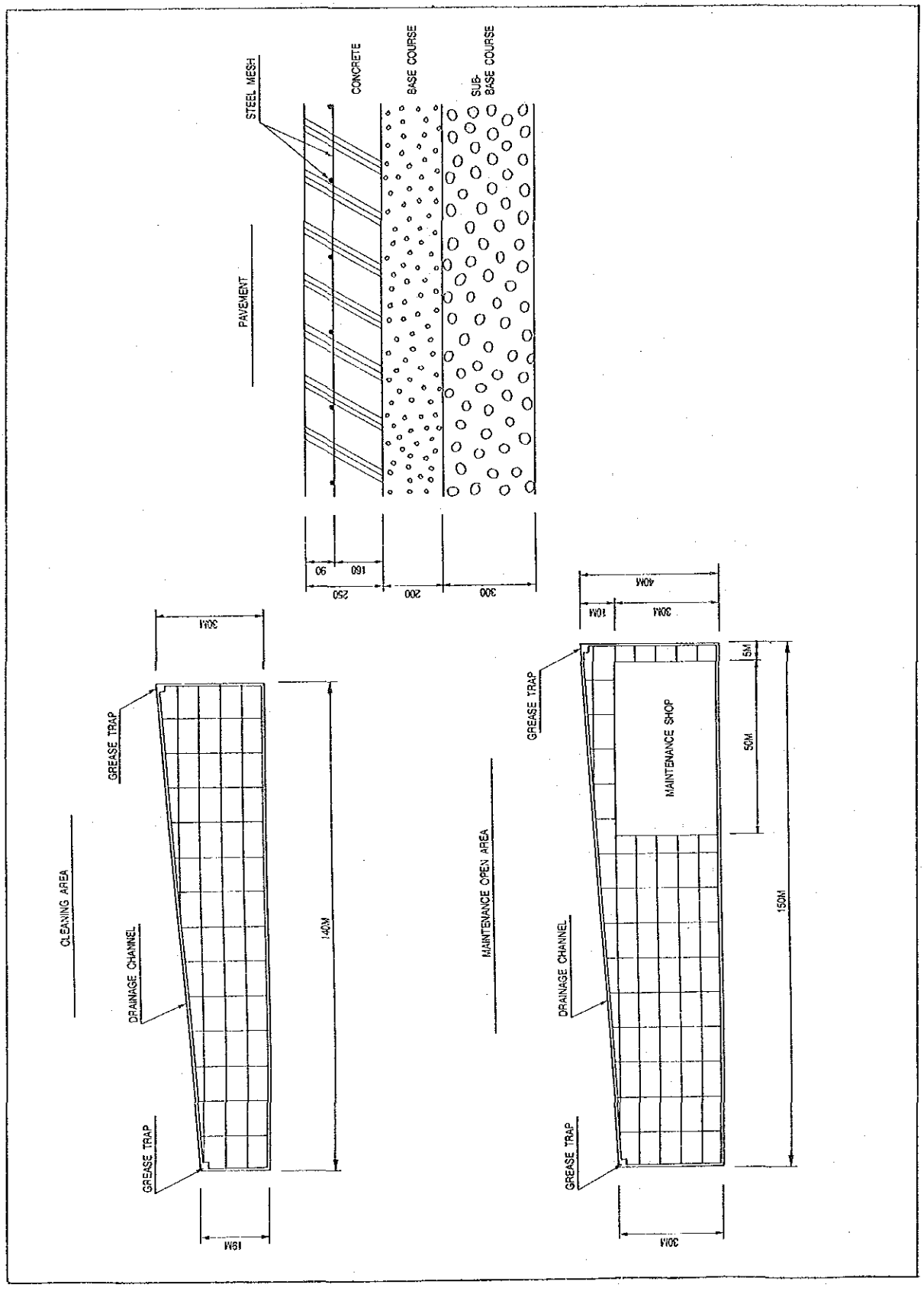


Fig. 5-2-2 Container Creaming Area and Maintenance Open Area

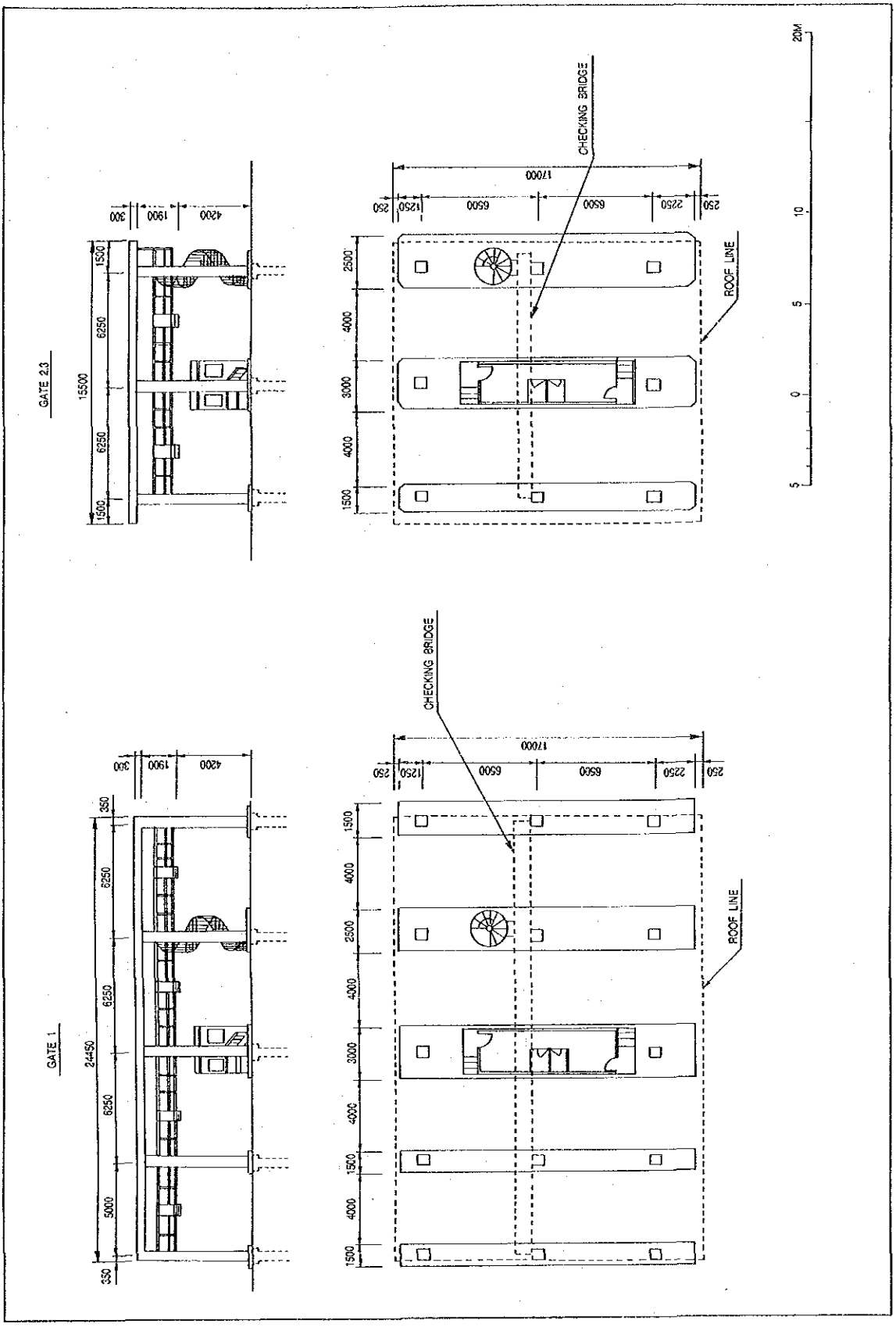


Fig. 5-2-3 Empty Container Yard gates

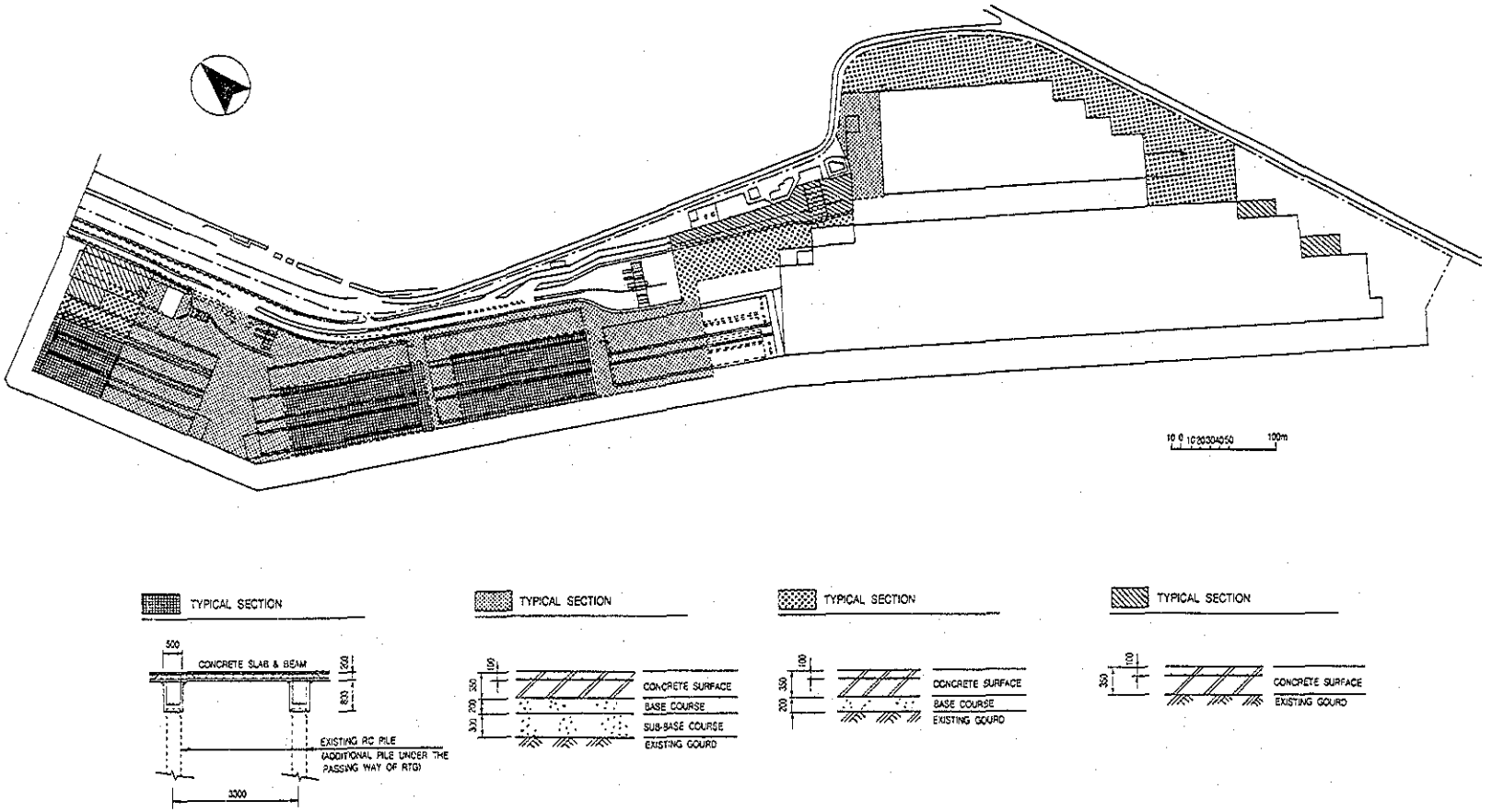


Fig. 5-2-4 East Quay site paving Plan

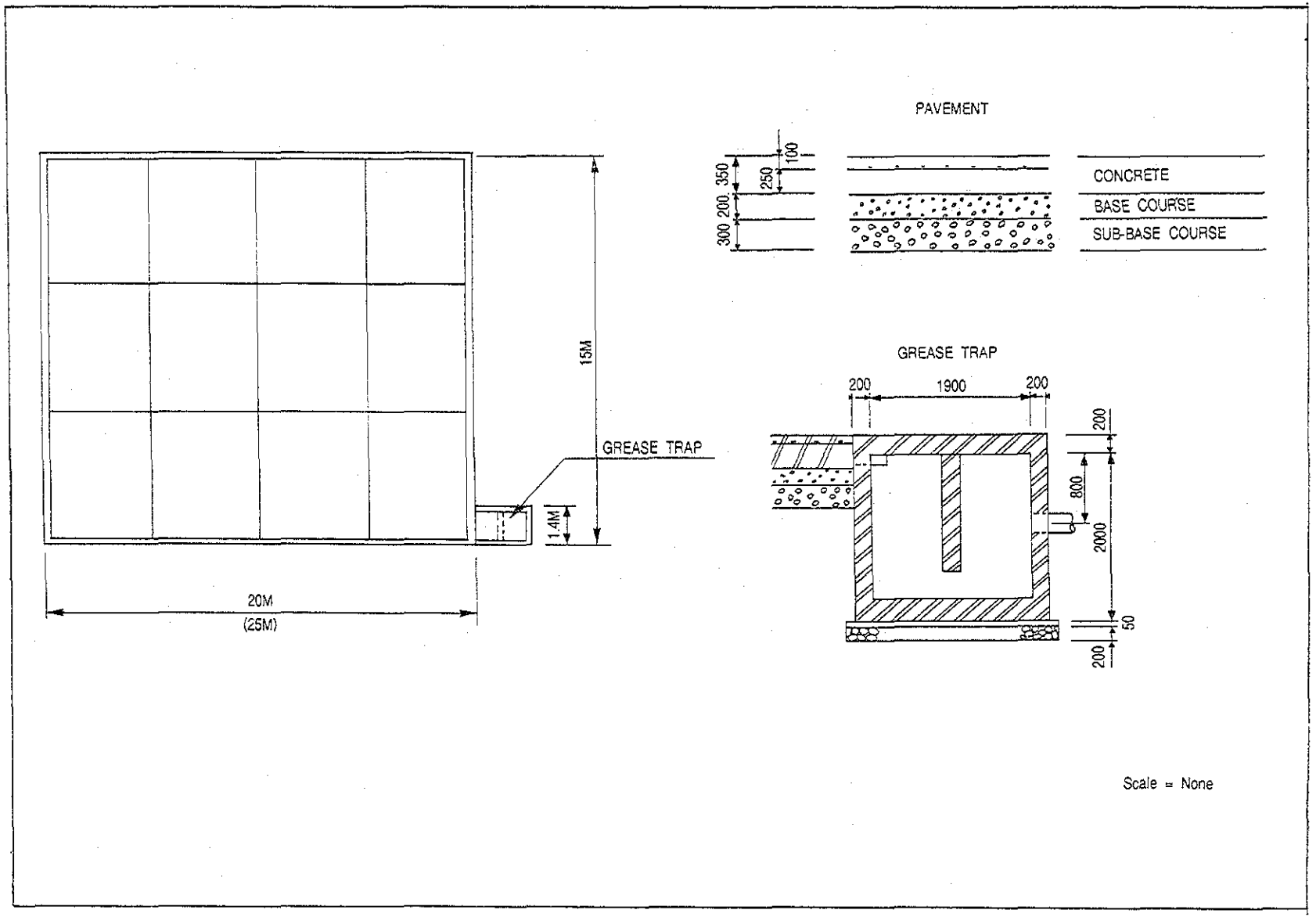


Fig. 5-2-5 Transtainer Repair Area

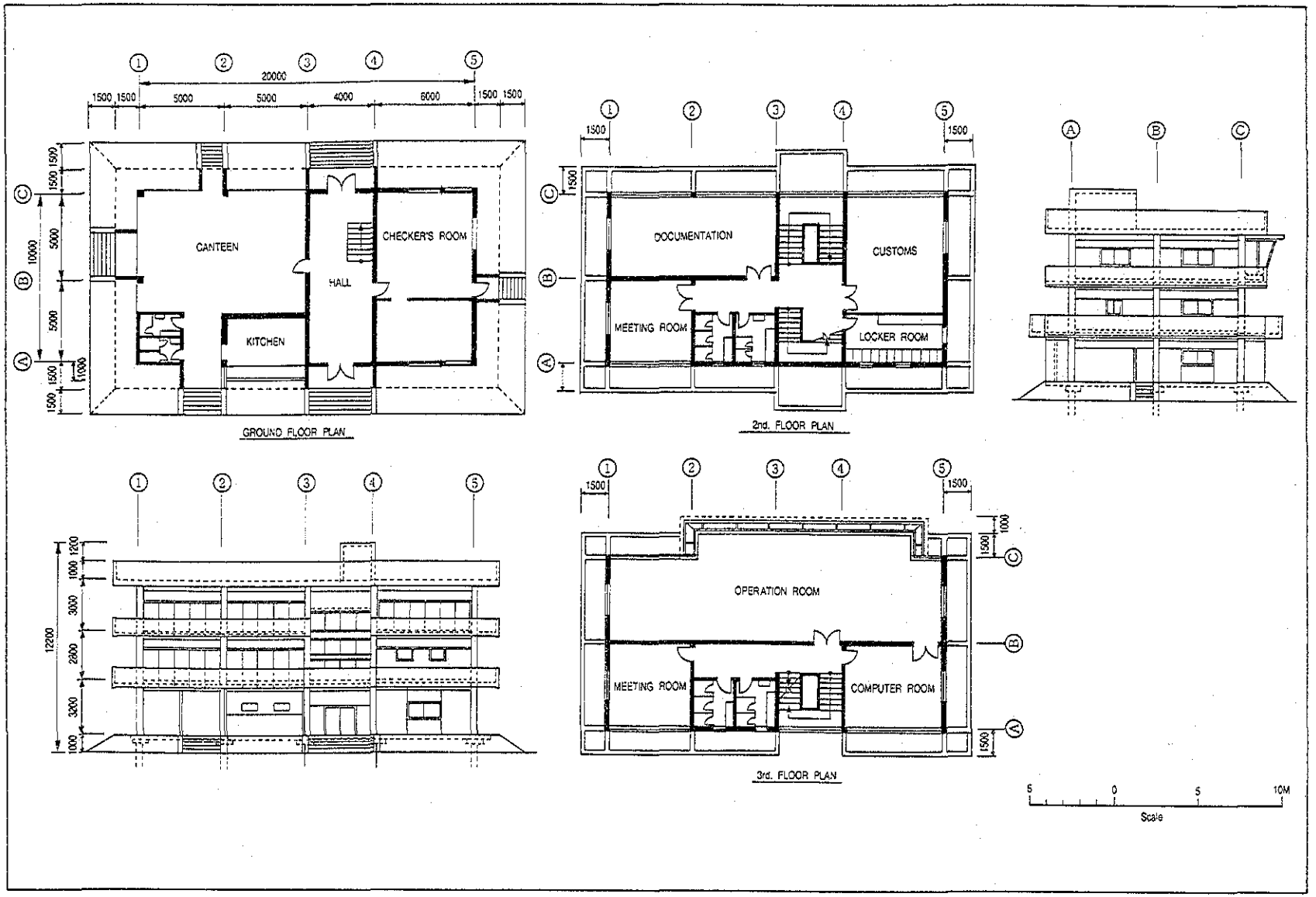


Fig. 5-2-6 Terminal Office Building

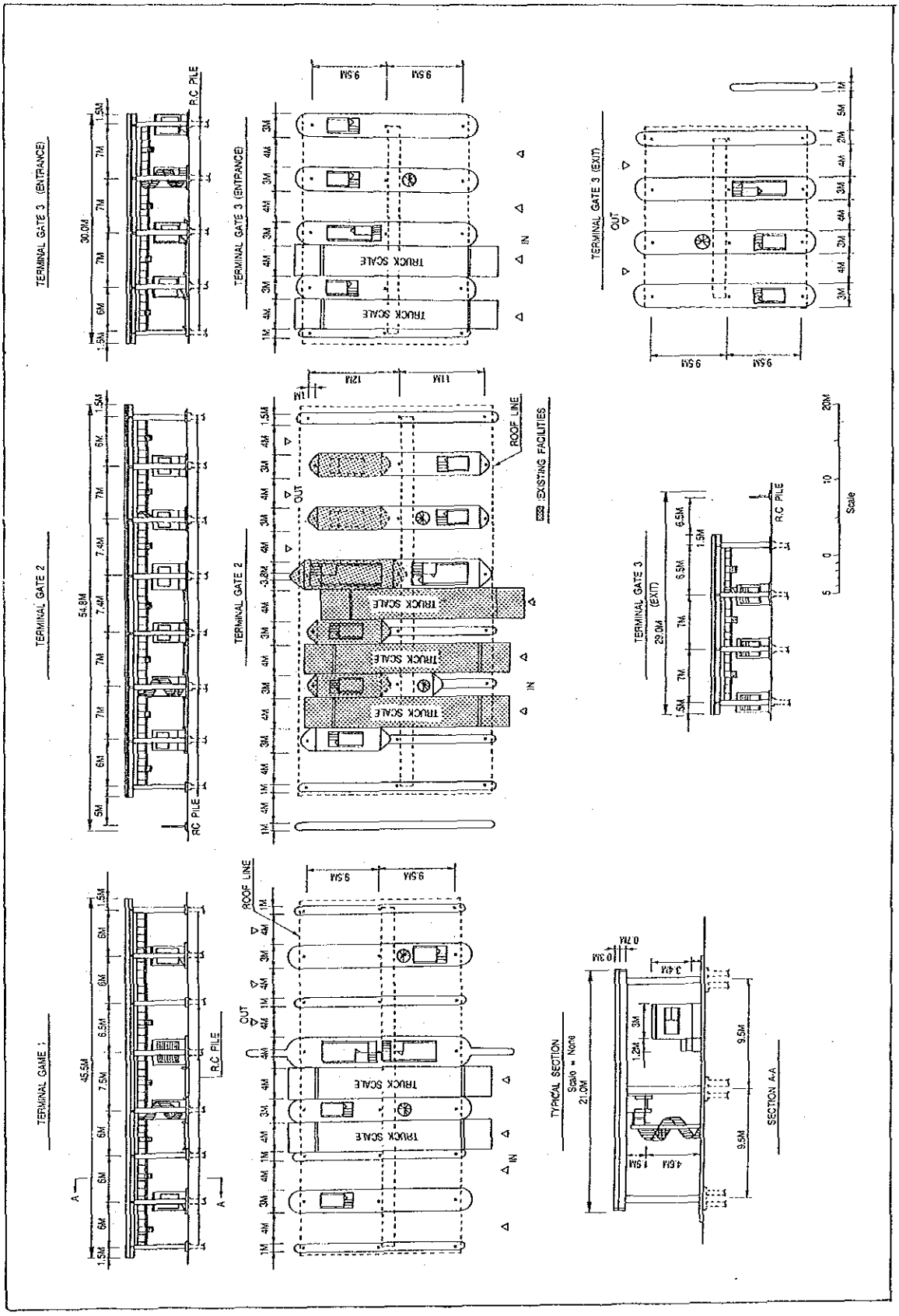


Fig. 5-2-7 Container Terminal Gates

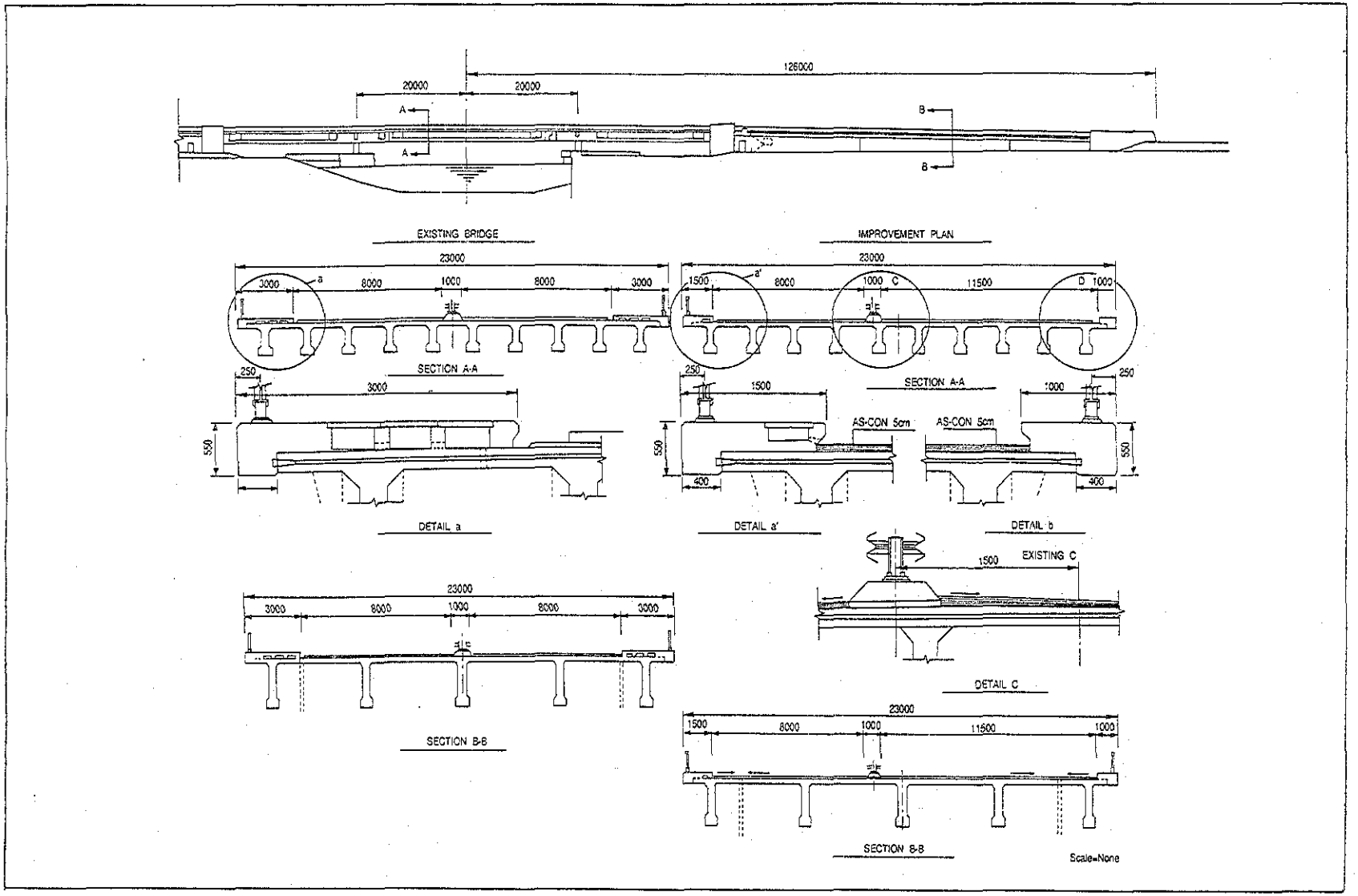
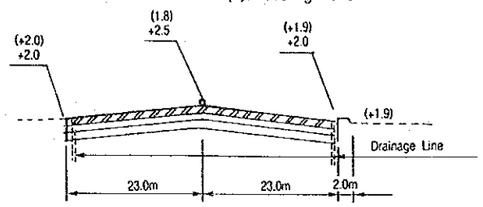


Fig. 5-2-8 Bridge Modification Plan

WEST QUAY SITE PAVING PLAN

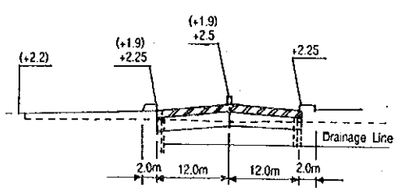
50 0 50 100 150m

A-A SECTION
( ): Existing Level

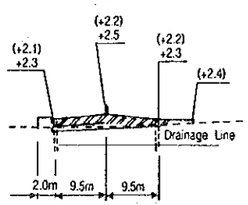


IMPORT CFS
IMPORT CFS
MAINTENANCE SHOP
GATE 1
SHED 14
SHED 13
EXPORT CFS & EMPTY CONTAINER YARD
PARKING LOT No.3
CLEANING AREA
GATE 2
GATE 3
PARKING LOT for Chassis and Tracker
PARKING LOT No.1
EMPTY CONTAINER YARD
GAS STATION
PORT OFFICE
GENERAL STORE DIVISION
SUPPLEMENTARY SHED 2
SHED 10
SHED 15
SHED 16
SHED 17
MARINER'S CLUB
REPAIR SHOP
GENERAL STORE DIVISION
MAIN ROAD
CANTEEN
REPAIR SHOP
FIRE STATION
MAIN GATE
SHED 1
SHED 2
SHED 3
SHED 4
SHED 5
SHED 6
SHED 7
SHED 8
SHED 9

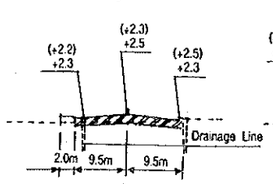
B-B SECTION
( ): Existing Level



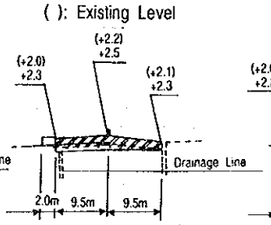
C-C SECTION
( ): Existing Level



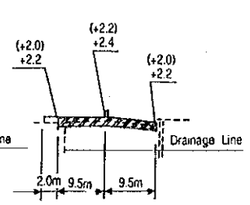
D-D SECTION
( ): Existing Level



E-E SECTION
( ): Existing Level



F-F SECTION
( ): Existing Level



PAVEMENT SECTION

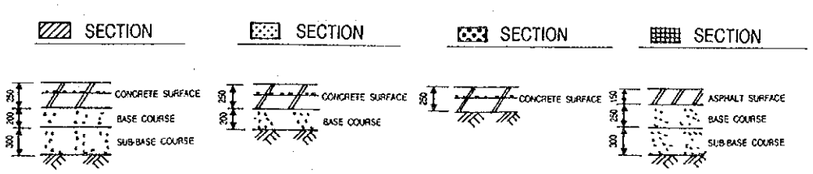


Fig. 5-2-9 West Quay Site Paving Plan

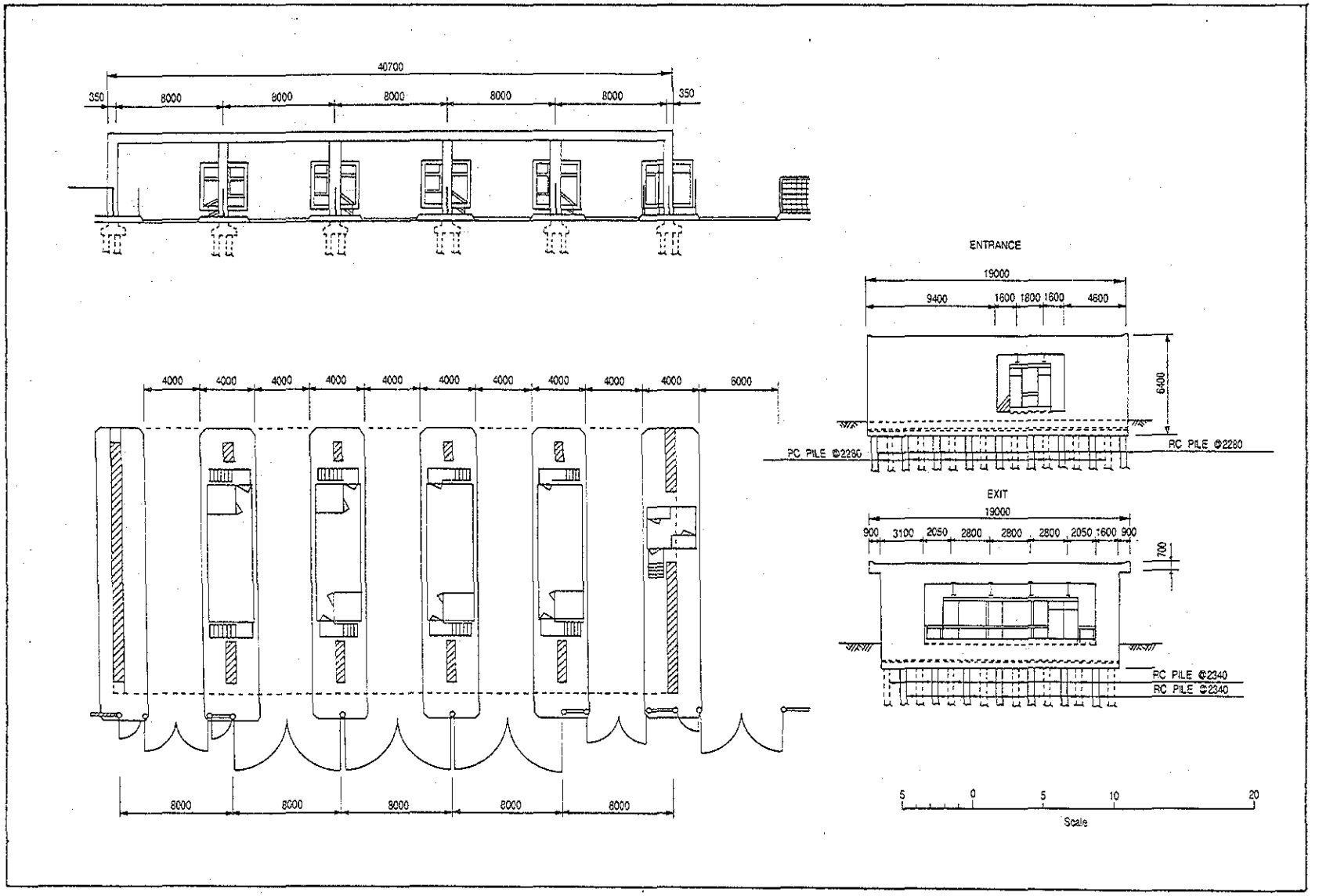


Fig. 5-2-10 Checking Post 1

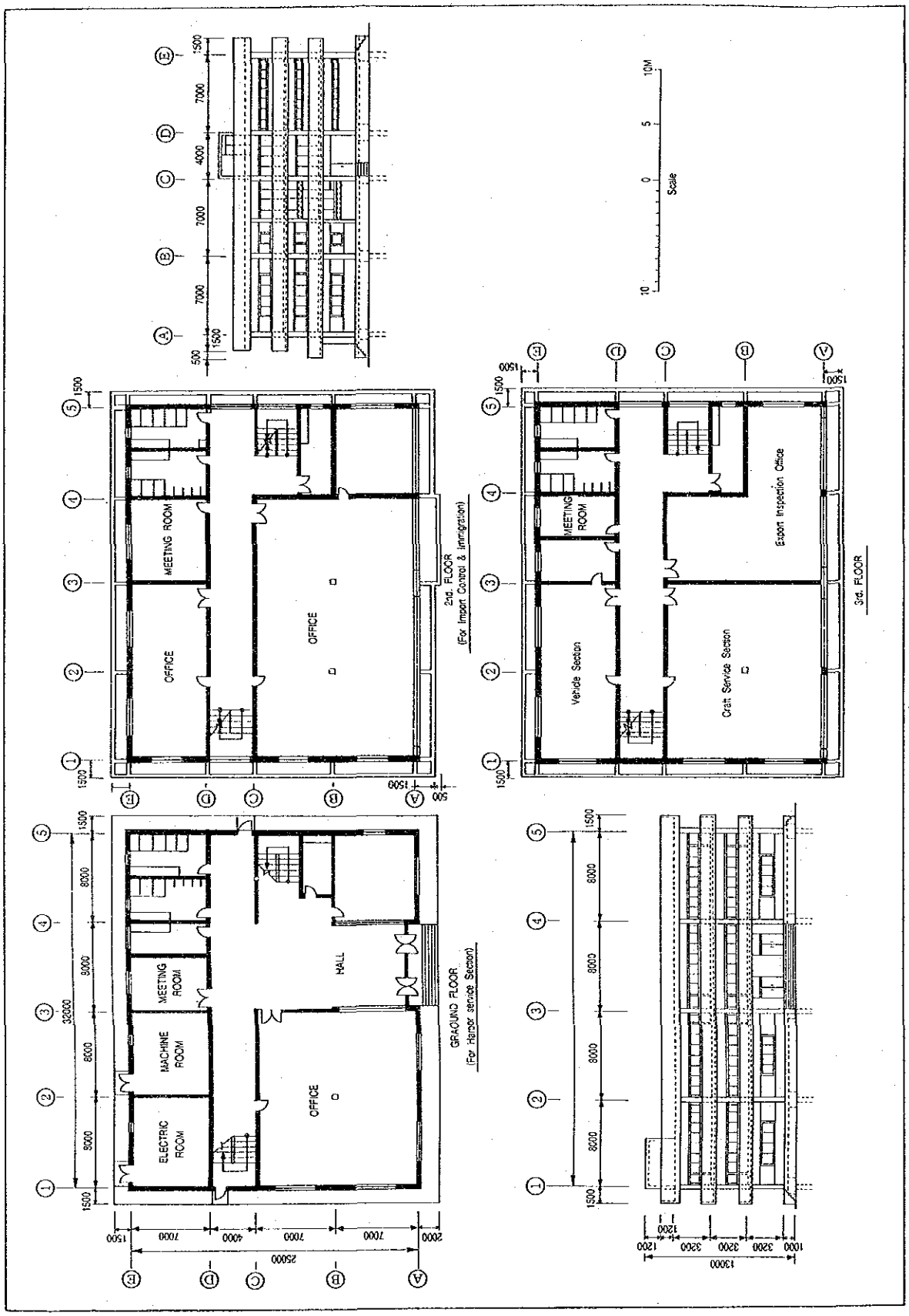


Fig. 5-2-11 Port Office Building

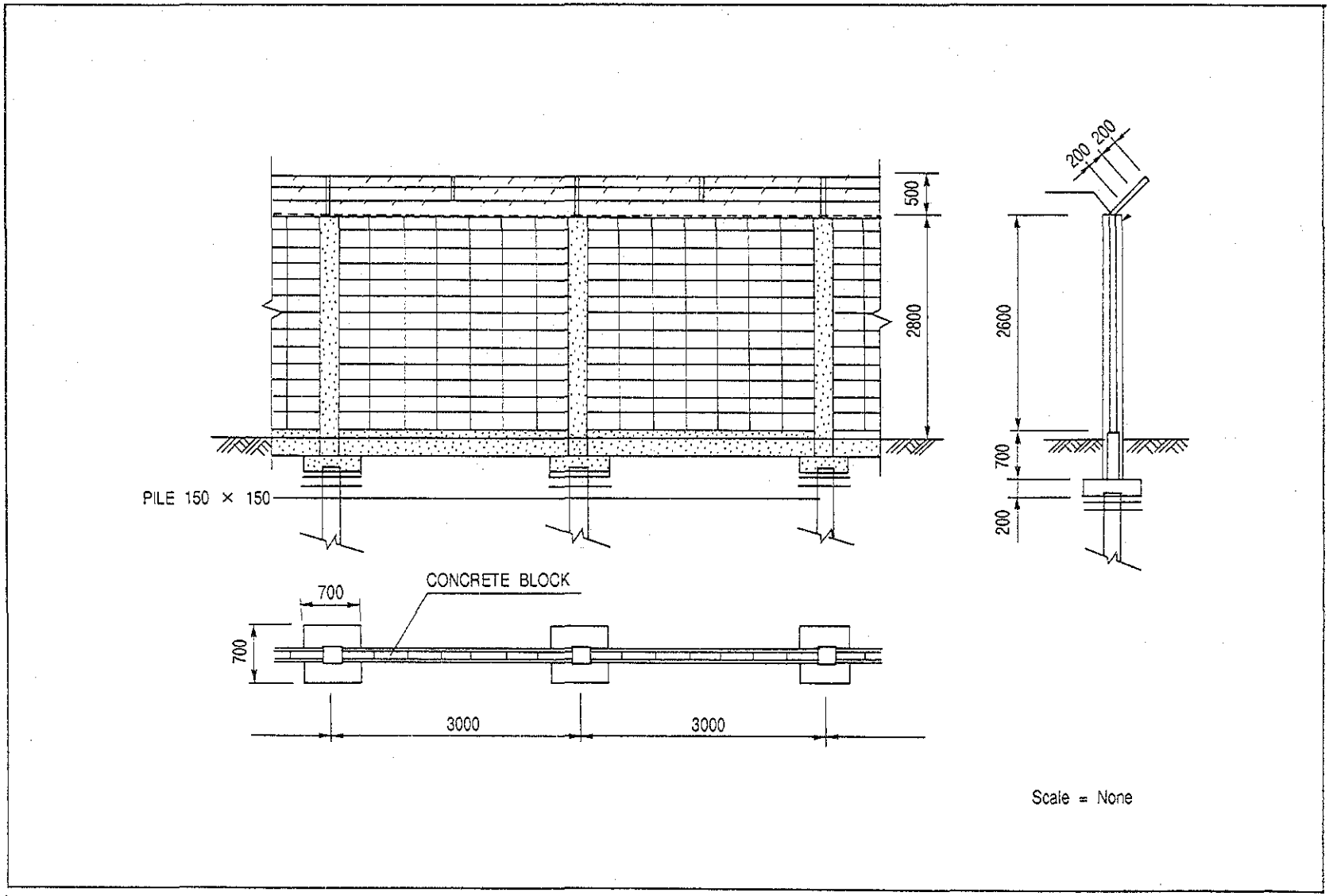


Fig. 5-2-12 Customs Fence

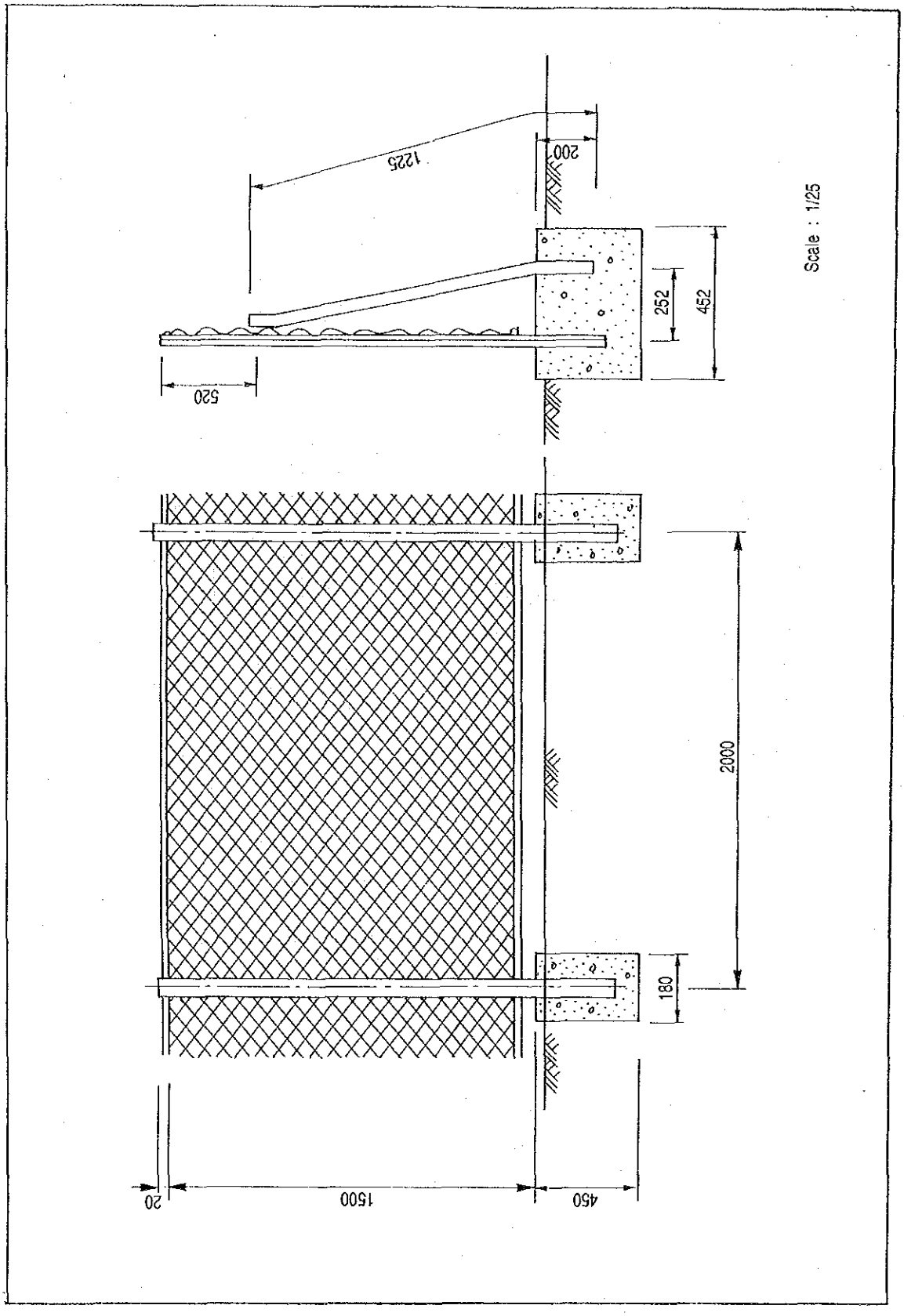


Fig. 5-2-13 Container Terminal Fence

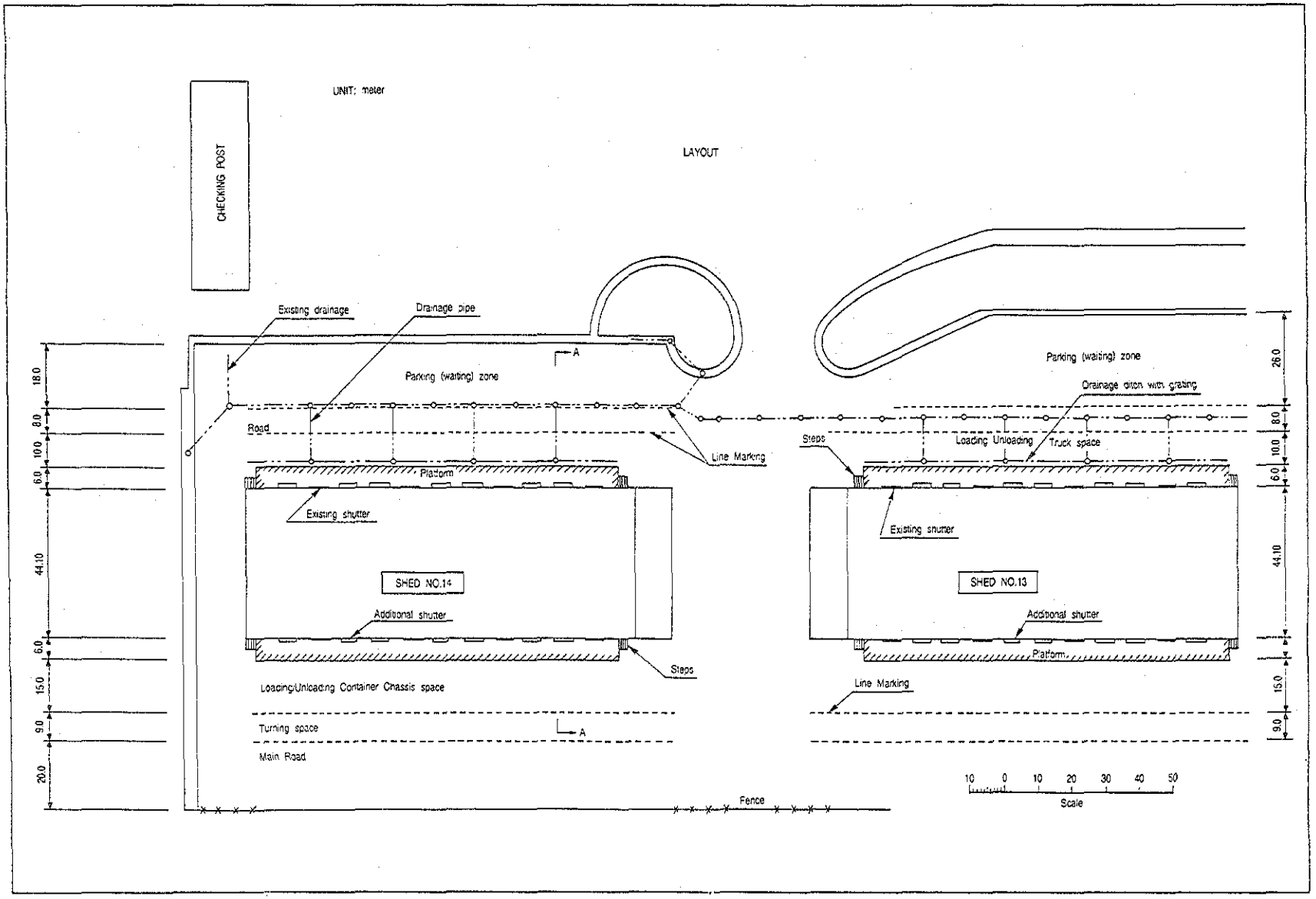


Fig. 5-2-14 Modification Plan of Transit Shed No.13, 14

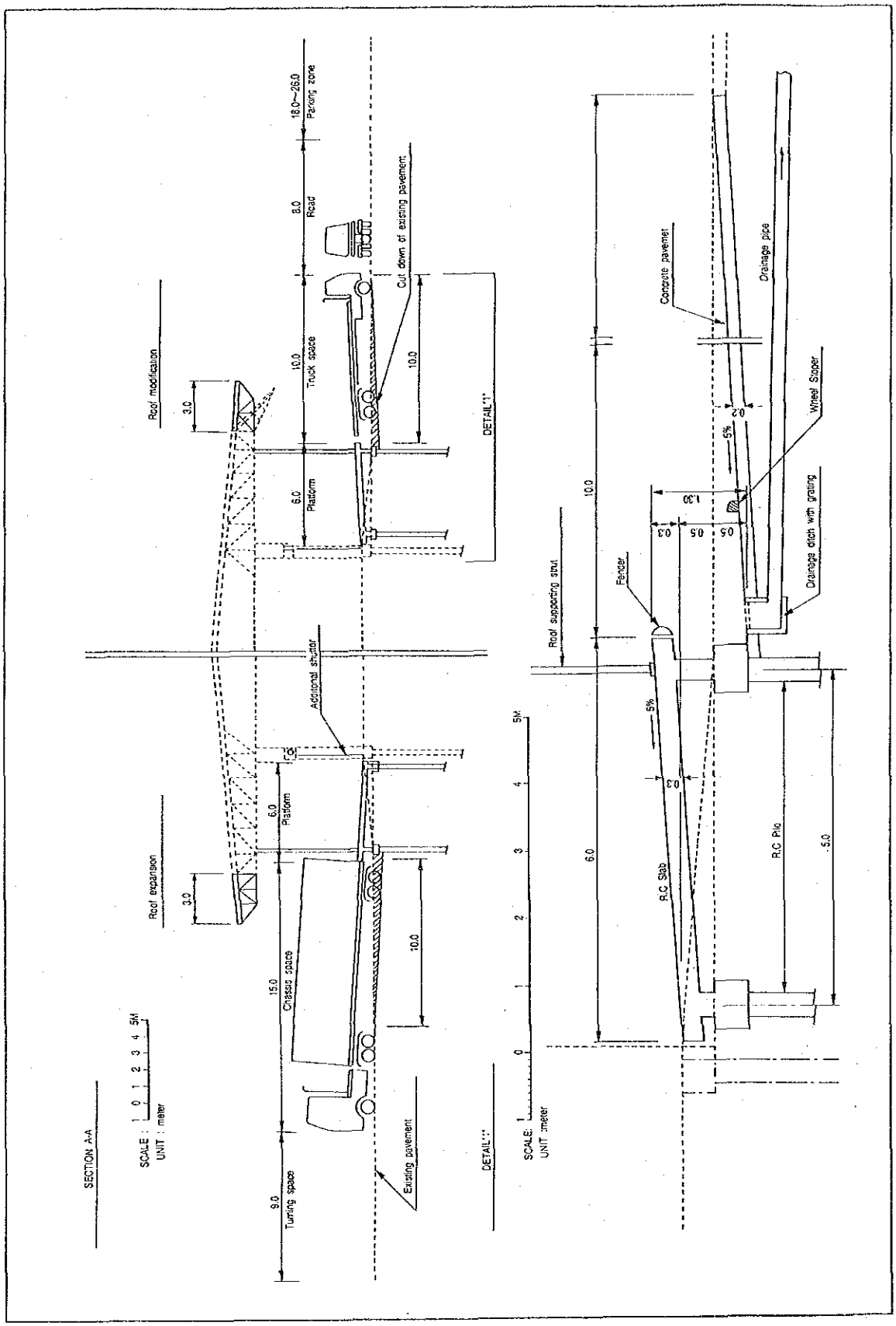


Fig. 5-2-15 Modification Plan of Transit Shed No.13, 14

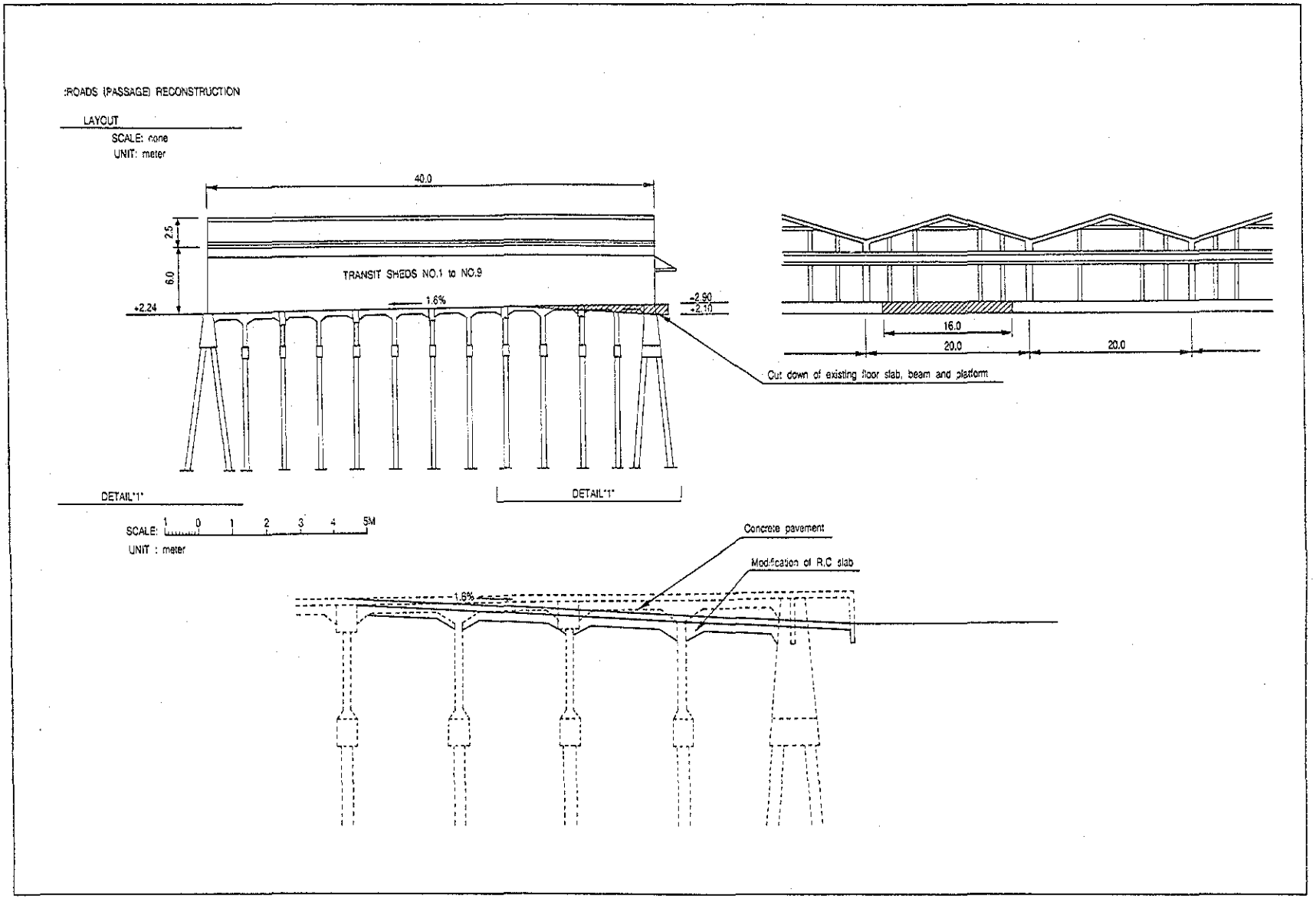


Fig. 5-2-16 Modification Plan of Transit Shed No.1 ~ No.9

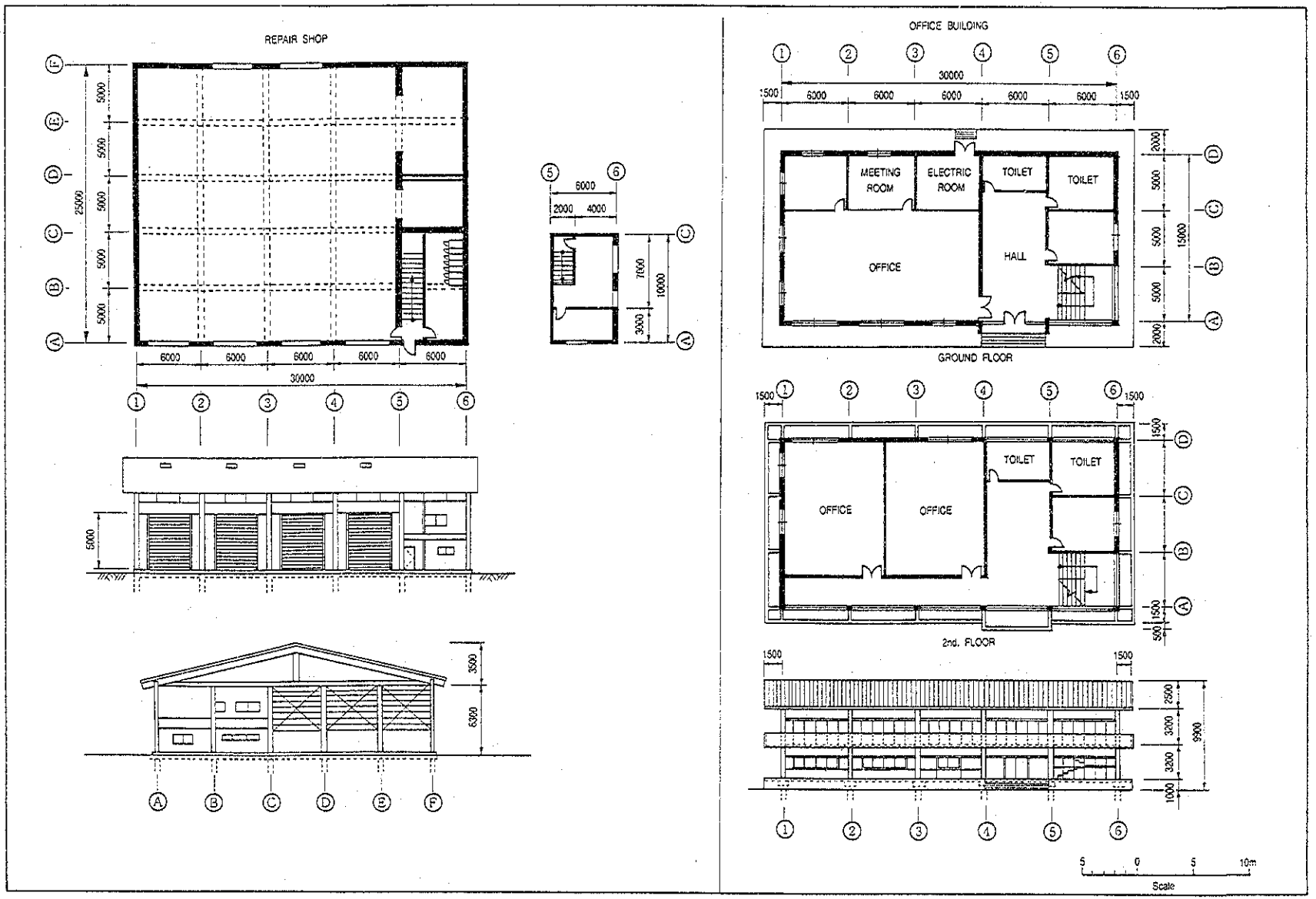


Fig. 5-2-17 Repair Shop and Office

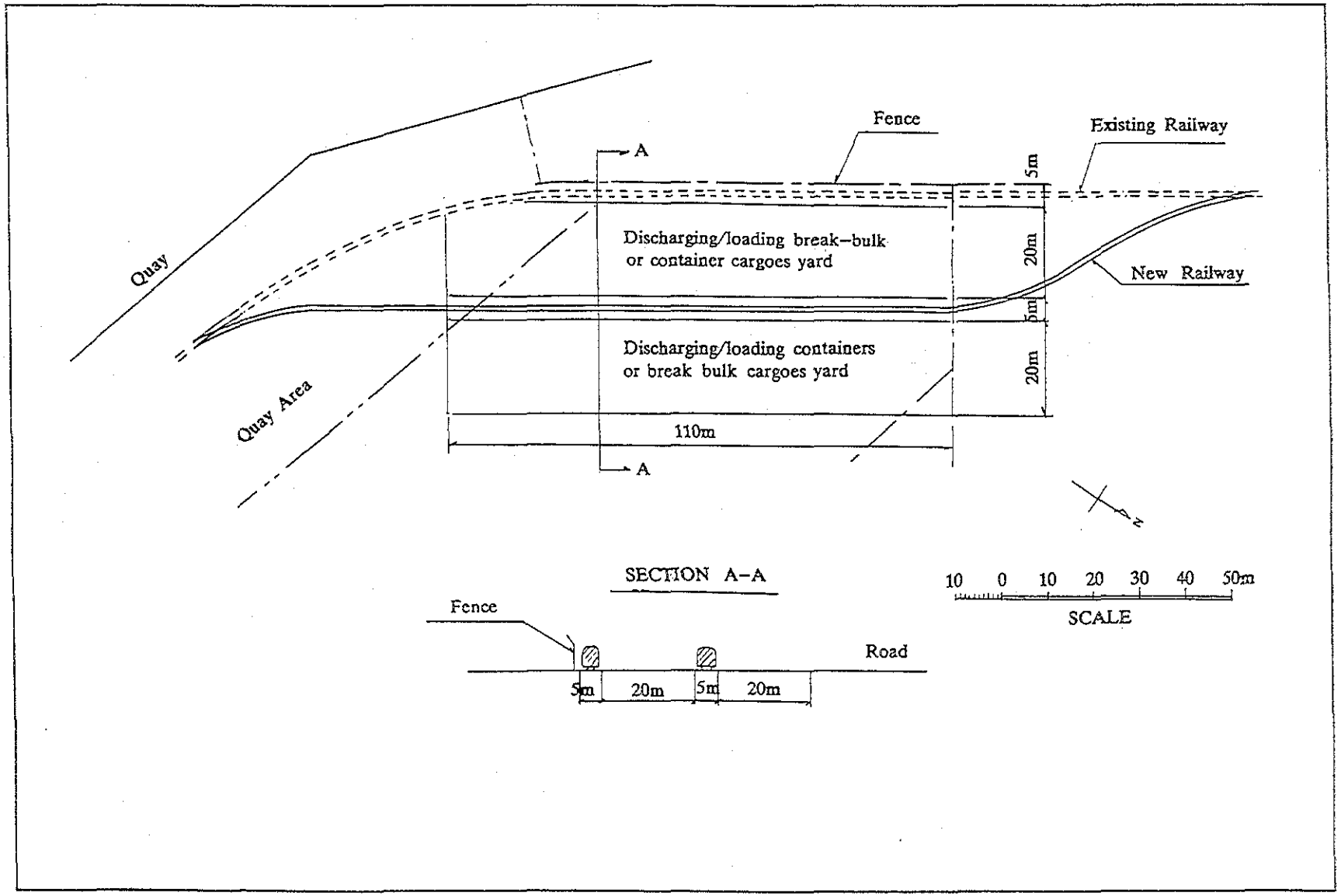
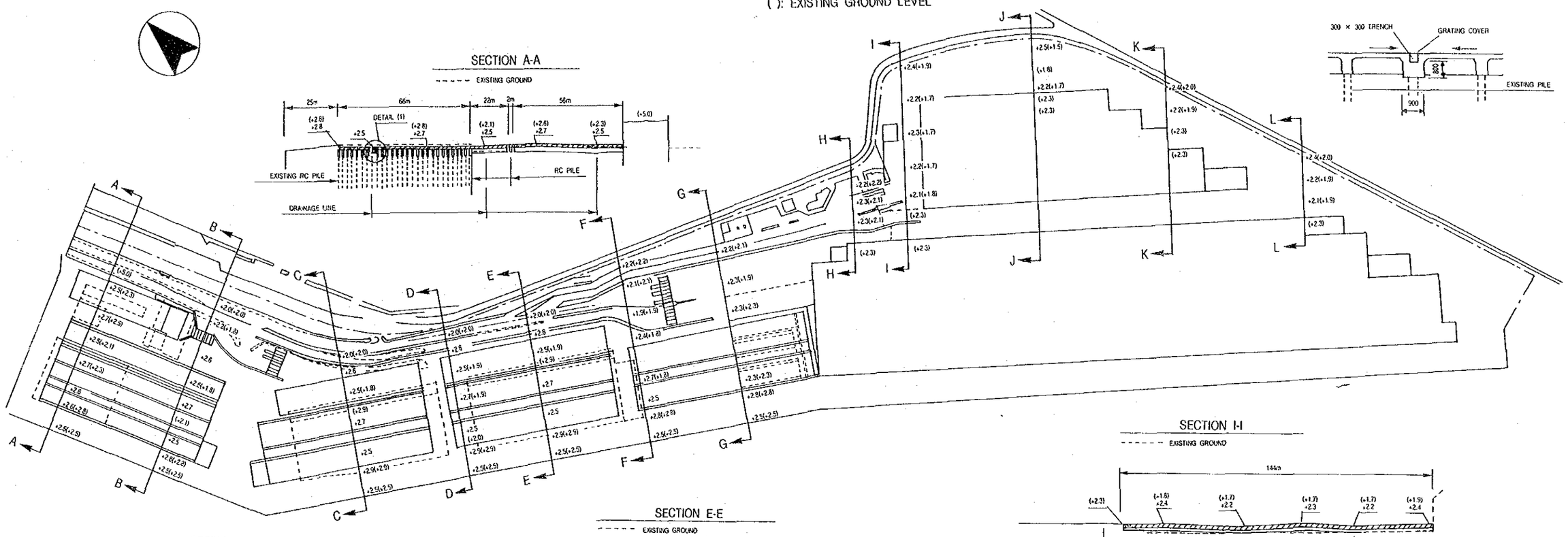


Fig. 5-2-18 Railway Yard

EAST QUAY GENERAL GRADING PLAN

( ): EXISTING GROUND LEVEL



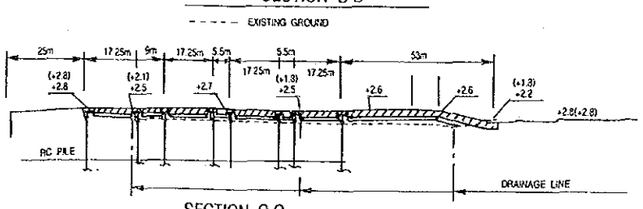
SECTION A-A

EXISTING GROUND

DETAIL (1)

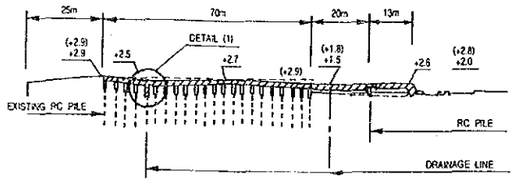
SECTION B-B

EXISTING GROUND



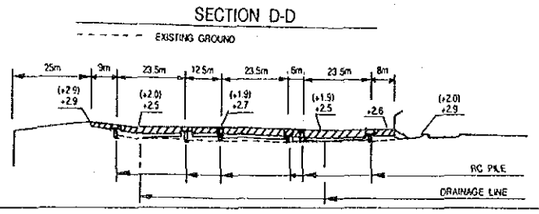
SECTION C-C

EXISTING GROUND



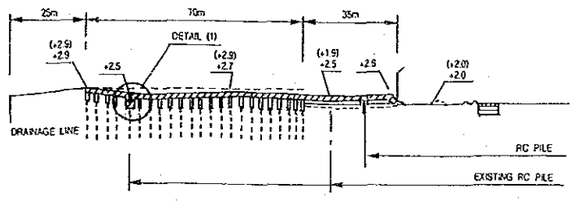
SECTION D-D

EXISTING GROUND



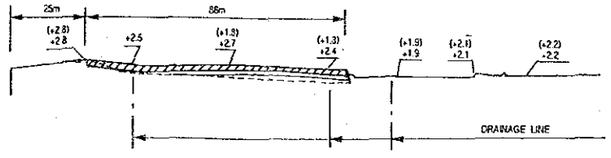
SECTION E-E

EXISTING GROUND



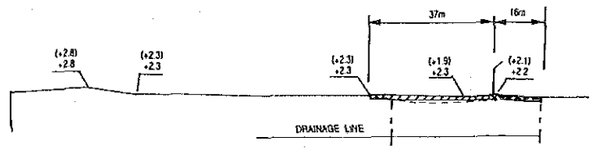
SECTION F-F

EXISTING GROUND



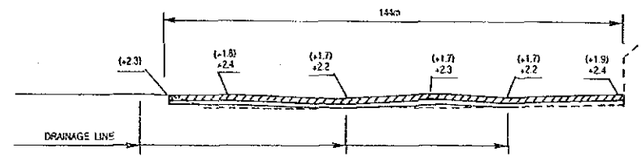
SECTION G-G

EXISTING GROUND



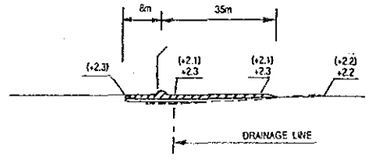
SECTION I-I

EXISTING GROUND



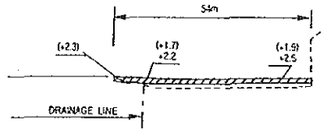
SECTION H-H

EXISTING GROUND



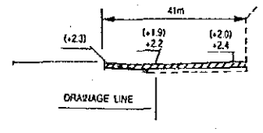
SECTION J-J

EXISTING GROUND



SECTION K-K

EXISTING GROUND



SECTION L-L

EXISTING GROUND

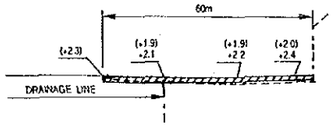


Fig. 5-2-19 East Quay General Grading Plan

EAST QUAY STORM DRAINAGE PLAN

EXISTING DRAINAGE PIPE
PROPOSED DRAINAGE PIPE (INCLUDE REPLACING)
EXISTING INSPECTION MANHOLE
PROPOSED INSPECTION MANHOLE (INCLUDE REMAKING)

EXISTING OUTLET

EXISTING POMP STATION

DEMOLISH EXISTING PIPE LINE

GENERAL ELECTRICAL PLAN

EXISTING UNDERGROUND ELECTRICAL CABLE CONDUIT
PROPOSED UNDERGROUND ELECTRICAL CABLE CONDUIT
EXISTING LIGHTING TOWER
PROPOSED LIGHTING TOWER
EXISTING POWER TRANSFORMER
PROPOSED POWER TRANSFORMER

0 10 20 30 40 50 100 150 200 300

Fig. 5-2-20 East Quay Drainage Plan & Electrical Plan

WEST QUAY STORM DRAINAGE PLAN

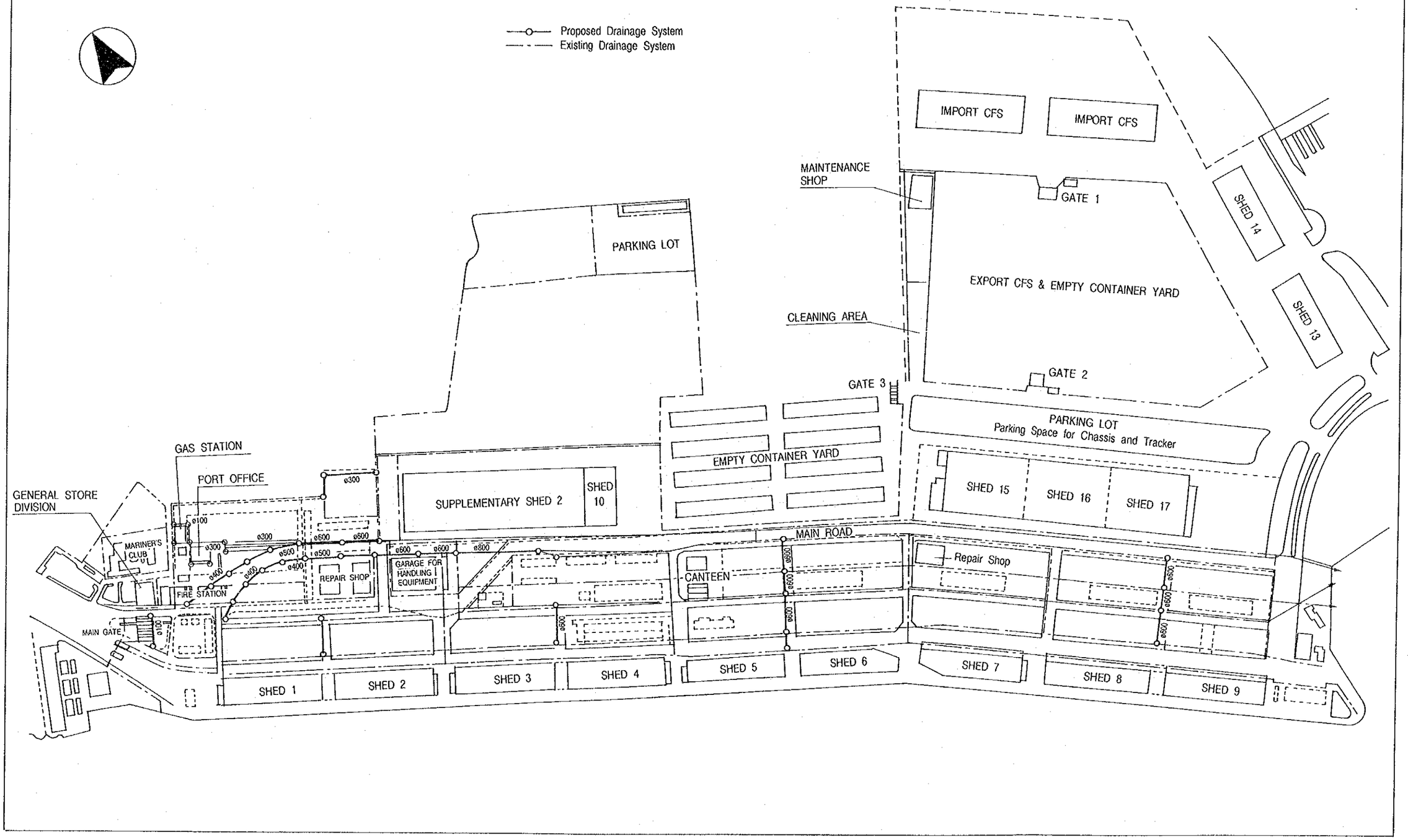


Fig. 5-2-21 West Quay Storm Drainage Plan

5.3 Design of Cargo Handling Equipment

5.3.1 Large Size R.T.G

Cargo handling equipment is planned to be procured by PAT under the overall equipment procurement programme. Only equipment recommended for the project is the large size container transfer crane which can work on the six row and four high stacked containers in lieu of the existing type container transfer crane. Recommended number of the large size transfer crane is 9 numbers instead of 11 numbers in the case of smaller size transfer crane.

Preliminary technical specification is referred to hereunder for a reference purpose. Fig. 5-3-1 shows the preliminary general arrangement of the large size RTG.

Type : Tyre Mounted Gantry type Container Transfer Crane Procurement Equipment
Numbers : 9 units

Rated load : 40 LT
Container Stacking : 4 Tiers + 1 Over
(9' - 6" High) 6 Rows + 1 Chassis Lane

Main Dimensions
Lift (under spreader) : 15.24 m
Span : 23.47 m
Clearance between legs : 21.30 m
Traversing distance : 19.07 m
Wheel base : 6.90 m

Speed Hoist(40 LT) : min. 20 m/min
(30.5 MT) : min. 20 m/min
(No load) : min. 50 m/min
Traverse : 80 m/min
Travel : min. 120 m/min

Spreader Type :20'/40'/45' Telescopic
Spreader slew : 3 degrees, both direction
Spreader trim : 3 degrees,both direction

Power source : Diesel engine generator
Speed control Hoist : Ward-Leonaed system
Traverse : VVVF system
Travel : Ward-leonaed system
Travel steering : Manual steering / Automatic steering 90 degrees turn
Generator : 1 x DC generator and 1 x AC generator
Driven by 1 x Diesel engine
Diesel engine Type : 4 cycle, water cooling
Output : 390 BHP / 1800 rpm(peak)
355 BHP / 1800 rpm(normal)
Fuel tank : 400 Litter

Travel tyre No.of tyres : 8(2/corner)
Size : 18.00-25-28 PR, tubeless type
Wheel load : Appro x. 29.6 MT (under no-load, no-wind)
Crane Weight : Appro x. 120.0 MT

5.3.2 Renewal Plan of Existing Cargo Handling Equipment

Number of the existing cargo-handling equipment in Bangkok Port except R.T.Gs, Rail Mounted Gantry Cranes and Trucks are sufficient for the requirement of the Short-Term Plan. However, some of the equipment must be replaced often the expiration of their lifetimes.

The depreciation periods of the cargo-handling equipment regulated by PAT, are as follows.

Depreciation period (Durable Year):
5 years : Forklift, Trucks, Trailers, Yard Hustler, etc
10 years : Mobile Crane, Top-Loader, etc

The depreciation period for the equipment is not necessarily the same as actual lifetime, it often happens that the equipment is still usable after the expiration of the depreciation period. Actually, forklifts, chassis, yard-hustlers, cranes and etc of PAT has been working for more than 10 years. Actual replacement of the equipment by PAT has been on the basis of the rate of working hours, repairing fee and working conditions.

Considering the present situation, Trucks is available for 5 years depreciation period has expired, and the replacement plan of the existing equipment excluding RTGs, Rail Mounted Gantry Cranes and Trucks is prepared hereunder for reference under the condition that the equipment is usable for five years beyond the expiration of the regulated depreciation period.

The replacement plan of the equipment is shown in Table 5-3-1(1), (2).

Table 5-3-1(1) Replacement Plan of Equipment (1994~1997)

Equipment		Existing Number	Renewal Age	Availabile Number of Equipment 1994	1995	1996	1997	Demand 1997 Container	Cargo	Demand of Replacement
1 Forklift	2~3t	43	10	25	25	20	20	0	18	0
	3~5t	414	10	349	311	291	257	233	14	0
	10t	5	10	5	5	5	5	0	28	23
2 Top-Loader	6~16t	18	15	18	18	18	16	18	0	
	40t	41	15	41	41	41	39	12	0	0
3 Yard Hustler	30t	170	10	159	155	155	155	134	0	0
4 Chassis	30t	208	15	184	184	184	149	213	0	67
5 Mobile Crane	10t	7	15	7	7	7	7			0
	40t	10	15	10	10	10	10	-	-	0
6 Trailer	6t	10	10	5	5	5	5	0		
	10t	34	10	19	15	15	15	0	33	12
	20~30t	10	10	1	1	1	1	0		

Replacement Plan		Yrar	1994	1995	1996	1997	Total
1 Forklift	2~3t	Number	0	0	0	0	0
	3~5t	Number	0	27	0	0	27
	10t	Number	0	10	7	6	23
2 Top Loader	7~10t	Number	9	0	0	0	9
	40t	Number	8	0	0	0	8
3 Yard Hustler	30t	Number	0	0	0	0	0
4 Chassis	30t	Number	25	0	0	42	67
5 Mobile Crane	10t	Number	0	0	0	0	0
	40t	Number	0	0	0	0	0
6 Trailer	6t	Number	10	0	0	0	10
	10t	Number	10	0	0	0	10
	20~30t	Number	0	0	0	0	0

Note: The replacement plan as of 1994 and 1995 is based on the procurement of handling equipment which has been planned by PAT in 1993.

Table 5-3-1(2) Replacement Plan of Equipment (1998~2005)

Equipment		Number 1997	Renewal Age	Availabile Number of Equipment 1998	1999	2000	2001	2002	2003	2004	2005	Demand 2005 Container	Cargo	Demand of Replacement
1 Forklift	2~3t	20	10	20	15	15	15	15	15	0	0	0	18	18
	3~5t	284	10	274	268	268	168	168	128	27	27	138	14	125
	10t	28	10	28	28	28	28	28	28	23	23	0	28	5
2 Top-Loader	6~16t	25	15	25	25	25	24	24	19	19	14	27	0	
	40t	47	15	47	47	47	46	44	38	33	30	0	0	0
3 Yard Hustler	30t	155	10	155	135	122	107	107	107	0	0	111	0	111
4 Chassis	30t	213	15	196	194	194	194	194	194	174	174	213	0	39
5 Mobile Crane	10t	7	15	7	7	4	4	2	2	0	0	-	-	7
	40t	10	15	10	8	8	8	8	6	5	5	-	-	5
6 Trailer	6t	15	10	15	15	15	15	15	15	10	0			
	10t	25	10	21	21	15	15	15	15	10	0		33	33
	20~30t	1	10	0	0	0	0	0	0	0	0			

Replacement Plan		Yrar	1998	1999	2000	2001	2002	2003	2004	2005	Total
1 Forklift	2~3t	Number	0	4	0	0	0	0	14	0	18
	3~5t	Number	5	2	0	53	0	15	50	0	125
	10t	Number	0	0	0	0	0	0	5	0	5
2 Top-Loader	7~10t	Number	0	0	0	0	0	0	0	0	0
	40t	Number	0	0	0	0	0	0	0	0	0
3 Yard Hustler	30t	Number	0	15	10	10	0	0	76	0	111
4 Chassis	30t	Number	17	2	0	0	0	0	20	0	39
5 Mobile Crane	10t	Number	0	0	3	0	2	0	2	0	7
	40t	Number	0	2	0	0	0	1	2	0	5
6 Trailer	6t	Number	0	0	0	0	0	0	5	5	10
	10t	Number	3	0	5	0	0	0	4	8	20
	20~30t	Number	3	0	0	0	0	0	0	0	3

Note; Mobile crane is retained the existing number.

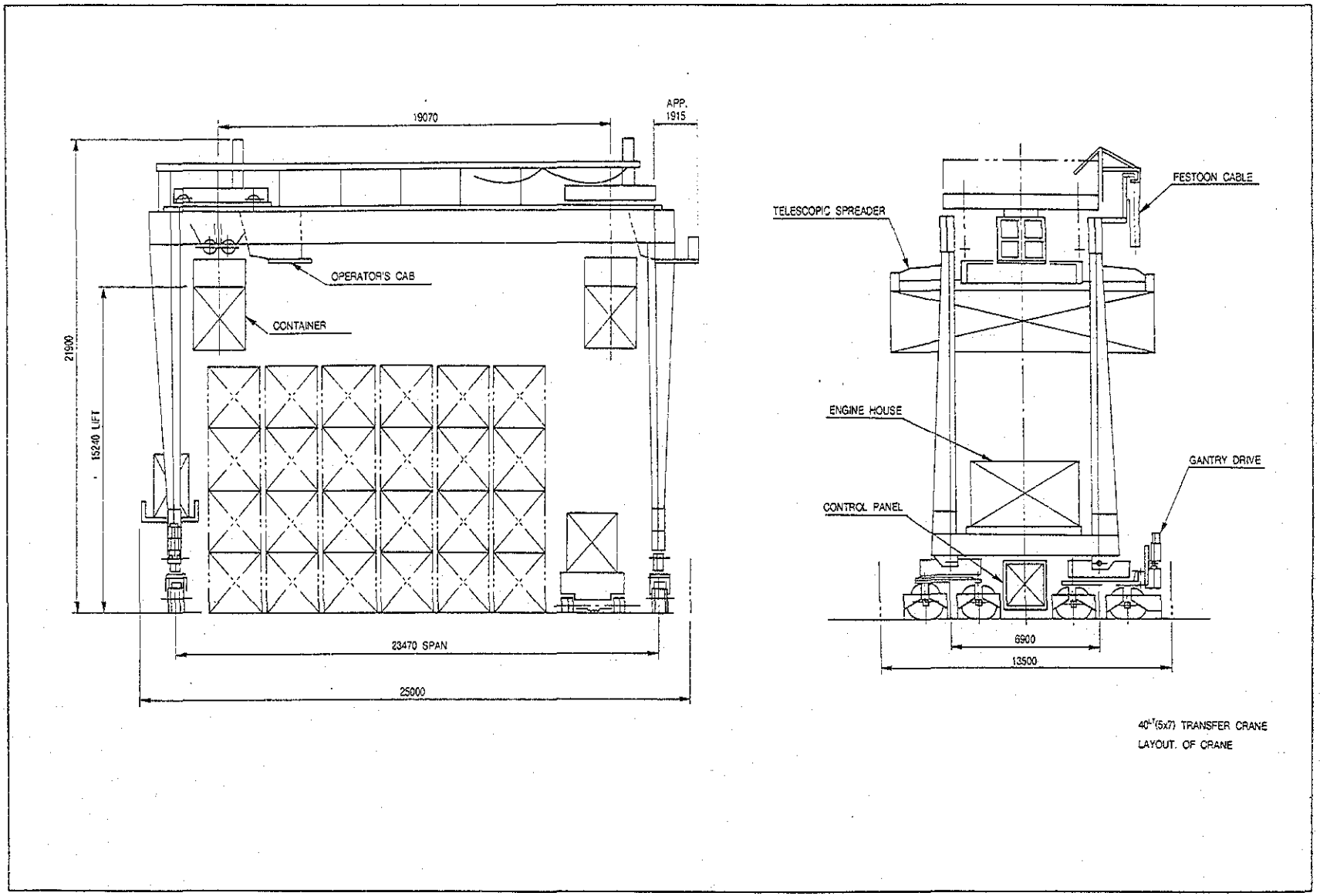


Fig. 5-3-1 General Arrangement of Large Size RTG.

5.4 Construction Planning

5.4.1 General

The project implementation schedule must be established not to stop or effect inferiority to the port operation, since the present port operation of Bangkok Port is very important for the economy of Thailand, and the port activities now are very busy and even the instantaneous stoppage of any port activities is not allowed. The schedule of project implementation is established assuming that the PAT's scheduled works concerned with this project will be completed on schedule.

5.4.2 Constructual Presumption

The construction schedule is prepared to cover the works such as demolishing works and the PAT's works.

The construction period of the project implementation is estimated as 43 months.

5.4.3 Technical Assumption

In preparing the construction schedule the following technical assumptions are applied.

(1) Working days considered in schedule
The number of working days considered in the schedule are every day except Sunday, National Holidays and rainy days.

(2) The productivity of demolishing works. (include foundation)
- RC structure shed and steel structure building : 120m^2/day
- RC structure office building : 70m^2/day (total floor space)

(3) The productivity of foundation work of building
- Concrete pile : 6 pcs/day/party
- RC beam and pile cap : 20m^3/day/party
- RC slab : 100m^2/day/party

(4) The productivity of pavement (exclude base course)
- Concrete pavement : 200m^2/day/party
- Asphalt pavement : 2000m^2/day/party

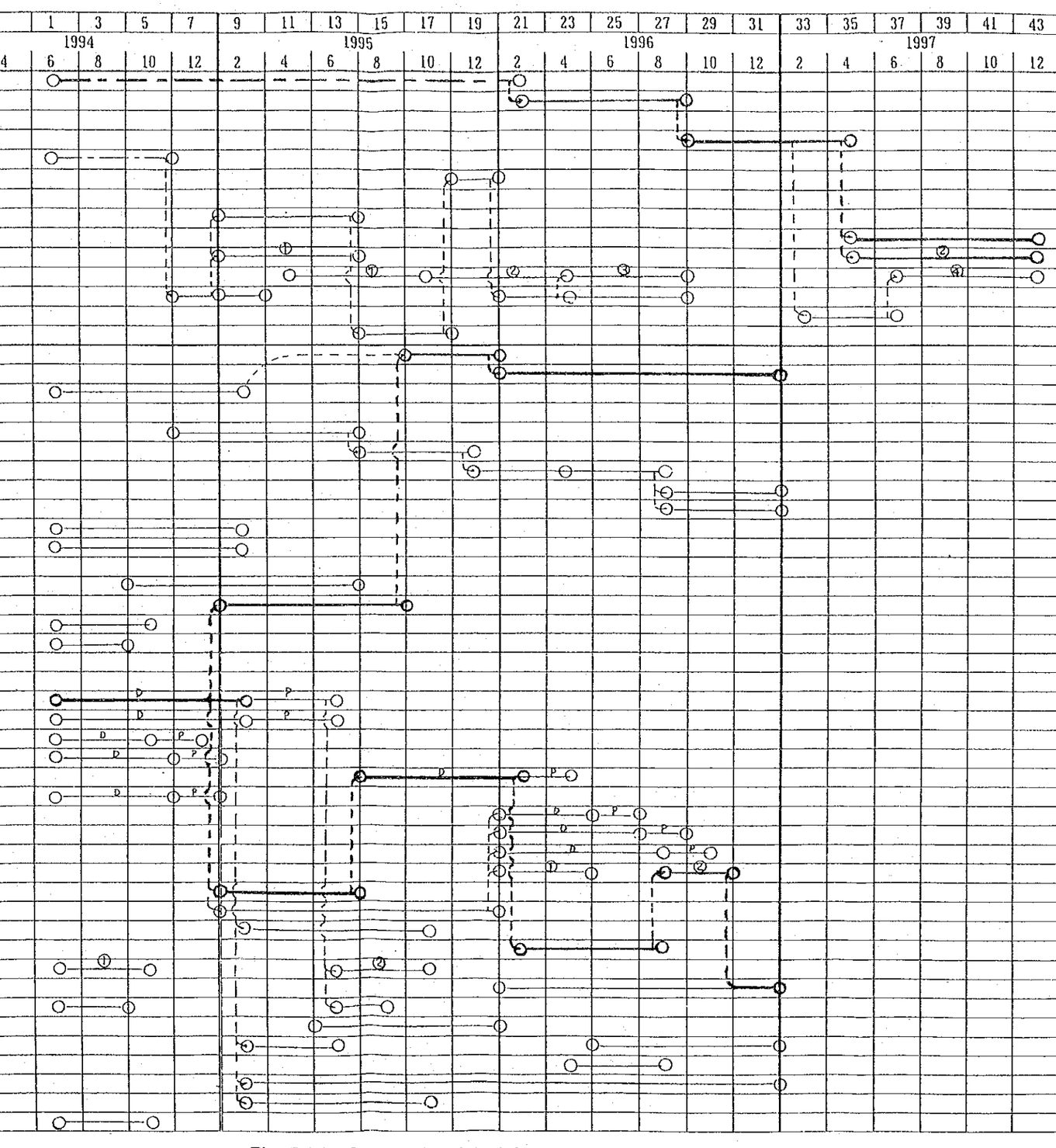
5.4.4 Construction Phasing

In general the phase plan for project implementation is necessary in other not to stop or affect inferior to the port operation. However, Since the scope of this project is relatively small, this project is not divided into any construction phases.
Even though, in other to maintain the smooth port operation during the project implementation, the rational work order should be established carefully.
Based on above assumptions and considerations, the prospective construction schedule is prepared as shown in Fig. 5-4-1.

As known from Fig. 5-4-1, the critical path of project starts from the construction of 2(two) new import CFS in Area 2 and ends at the demolish of transit sheds No.11 and No.12.
In the master plan, it is proposed that the transit sheds No.11 and No.12 are demolished and this area is used for container marshaling yard to increase container handling capacity. Therefore, as the substitutional facilities, 2(two) import CFS sheds must be built in area 2 at the first step and the transit sheds No.13 and No.14 are improved for import CFS at the second step. After completion of the second step works, the transit sheds No.11 and No.12 can be demolished and the concrete slab is reconstructed on the existing piles of transit sheds for the container marshaling yard.

CONSTRUCTION SCHEDULE (Short Term Plan)

Work Items	Project Month / Year	
Facilities for Container Cargo	Unit	Quantity
1. Import CFS (2 Sheds by PAT)	LS	1
2. Modification Shed No.13,14	LS	1
3. Demolishing Work		
Shed No.11,12 (East Quay)	m2	21470
Warehouse (by PAT)	m2	5150
Reefer Facility	m2	3000
4. Container Yard		
Ware House Area	m2	5150
Shed No.11,12 Area	m2	21470
RTG Passage	m2	3200
Concrete Paving Area	m2	83470
5. Drainage Work	lm	3955
6. Yard Lighting Work	unit	2
7. Utilities for Reefer Container	LS	1
8. Demolishing Equipment Div Bldg	m2	1710
9. Terminal office Bldg	LS	1
10. Gas Station	LS	1
11. Terminal Gate		
No.1	LS	1
No.2	LS	1
No.3	LS	1
12. Road Improvement (East Quay)	LS	1
13. Fence in East Quay	LS	1
14. Maintenance Shop	LS	1
15. Cleaning Yard	m2	3430
16. Empty Container Yard Gate		
No.1,2,3	LS	1
17. Repair Shop & Office (West Quay)	m2	1200
18. Empty Container Yard Repair	LS	1
19. Modification Bridge	LS	1
Facilities for Conventional Cargo		
1. Demolishing Work & Paving		
S.Shed No.1~No.9	m2	22480
Bonded Warehouse	m2	9000
Port Operation Bldg	m2	2000
PAT Operation Bldg	m2	2800
Police Station & Fire Vehicle Garage	LS	1
Vehicle Section	m2	3456
Craft Service Sct.	m2	275
Harbor Service Sct.	m2	420
Import,Export Office	m2	1115
Checking Post 1 (West Quay)	LS	1
2. Fire Vehicle Garage	m2	200
3. Port Office Bldg	m2	2300
4. Gas Station & Canteen	LS	1
5. Checking Post 1	LS	1
6. Parking Lot No.1,3	m2	18700
7. Main Road Paving	m2	29340
8. Fence Yard Fence	lm	1220
Customs Fence	lm	1630
9. Lighting Tower	unit	7
10. Rail Way	lm	150
11. Utilities	LS	1
12. Modification Shed No.1~No.9	LS	1
13. Demolishing Crane	unit	12



Remarks

——: PAT s Planned Work

4. RTG Passage

① : Reefer Container Area
② : Dry Container Area

4. Concrete Paving Area

①: Between Terminal No.2 and Transit Shed No.12 (18300 m2)
②: Surrounding Area of Existing Warehouse (23200 m2)
③: Existing Reefer Container Yard (19000 m2)
④: Surrounding Area of Transit Shed no.11,12 (23240 m2)

D : Demolishing Work
P : Paving Work

1. Checking Post 1

①: Entrance

②: Exit

6. Parking Lot No.1,3

①: Parking Lot No.3 (Near the Dengerouse Cargo Yaed 13300 m2)
②: Parking Lot No.1 Near the Checking Post No.1 (Paving 4500 m2)

Fig. 5-4-1 Construction Schedule

5.5 Cost Estimation

The project cost for the modernization of Bangkok Port is estimated based on the Short-Term Plan in Chapter 1 of Part II.

5.5.1 Basic Assumption for Cost Estimation

(1) Unit Price and Exchange Rate

The project costs are estimated based on the unit price as of 1993 and the foreign currency exchange rate of 4.27 YEN/Baht (US$=107.50¥=25.1756Baht).

(2) Demolishing Work

Part of the electrical demolished materials for reefer container such as electric cable and electric transformer are utilized for the new facilities.

It is assumed that demolished materials except above matelials are not tilized for new construction works.

It is assumed that the scraps of steel from the demolished facilities are sold, and the sales of the scraps are included for this project cost.

(3) PAT's Schedule Work

The budget allocation for the Import CFS and yard construction in the west quay, the demolishing warehouse in the east quay and the parking lot construction near the east quay has been completed already by PAT.
Therefore, those facilities are excluded in this project cost.

5.5.2 Construction / Procurement Cost

The construction costs of civil and architectural work are estimated at 441 million is total as summarized in Table. 5-5-1 and the procurement costs are 574 million in total as presented in Table 5-5-2.

5.5.3 Project Cost

In addition to the construction and procurement cost, the engineering fee for the detailed design and construction supervision, the physical contingency estimated by this study and VAT are included in the project cost. However the contingency for price escalation is not included in the project cost, as mentioned in Section 13.3.3 of Chapter 13 in Part 1. The base year of the project cost is as of 1993.

Table. 5-5-3 shows the summary of project cost for the Short-Term Plan of modernization of Bangkok Port.

5.5.4 Foreign and Local Currency Components

(1) Foreign Currency Costs

- Cost of imported construction materials
- Cost of imported construction plant and equipment
- Cost of expartriate supervisory staff

(2) Local Currency Costs

- Cost of local construction materials
- Cost of local construction plant and equipment
- Cost of local supervisory staff, labour and operator
- Thai taxes and duties

(3) Thai Taxes and Duties

The taxation element of costs in Thailand has been calculated based on the followimg components.

- VAT : 7.0 % of contract value
- Duty of import materials: 15% of majar construction materials cost
- Duty of import equipment: 15% of majar construction equipment cost

The foreign and local currency costs of the project are presented in Table. 5-5-4. The annual disbursement schedule for the project are presented in Table. 5-5-5.

Table 5-5-1(1) Construction Cost

East Quay				Unit Price	Cost	Remarks
Description	Work Items	Unit	Quantity	Baht	Million B	
1. Container Yard on Existing Shed	Demolishing Work	sq.m	10735 x 2	230	4.94	Transit Shed 11,12
	Sales of Scrap Steel	ton	450	1250	-0.56	
	RC Slab & Beam	sq.m	10735 x 2	2180	46.80	
	RC Slab & Beam	sq.m	5150	2180	11.23	Cargo Ware House
	Demolishing work	sq.m	1710	350	0.60	Office, etc
Total					63.01	
2. RTG Passing Way around Existing Sheds	Piling Work	m	524 x 21m	1050	11.55	
	RC Slab	sq.m	3200	900	2.88	
	RC beam	m	1600	1850	2.96	
Total					17.39	
3. Container Yard Paving without Existing Shed Area	Sub-Base & Base & Surface	sq.m	48300	1120	54.10	
	Base & Surface	sq.m	19000	1000	19.00	Existing Reefer Yard
	Base & Surface	sq.m	11500	1000	11.50	
	Surface	sq.m	4670	830	3.88	
Total					88.47	
4. RTG Repair Area	Concrete Paving	sq.m	1350	1120	1.51	
	Grease Ditch	m	300	2000	0.60	
	Grease Trap	Unit	4	23000	0.09	
Total					2.20	
5. Road Improvement	Demolishing Walkway	sq.m	1170	70	0.08	
	Road Paving	sq.m	508	980	0.50	
	Block for Separation Band	m	668	200	0.13	
	Walk Way	sq.m	1350	300	0.41	
Total					1.11	
6. Terminal Gate 1	Piling work	m	504	1050	0.53	
	Checking room	LS	1	491000	0.49	
	Roofing Work	LS	1	1200000	1.20	Concrete Column
	Check Bridge	LS	1	105000	0.11	
	Weigh Bridge	Unit	2	1200000	2.40	
	Utilities Work	LS	1	210000	0.21	
Total					4.94	
7. Terminal Gate 2	Piling Work	m	504	1050	0.53	
	Checking room	LS	1	337000	0.34	
	Roofing Work	LS	1	1260000	1.26	Concrete Column
	Checking Bridge	LS	1	112000	0.11	
	Utilities Work	LS	1	100000	0.10	
Total					2.34	
8. Terminal Gate 3	Piling Work	m	567	1050	0.60	
	Checking room	LS	1	540000	0.54	
	Roofing Work	LS	1	1570000	1.57	Concrete Column
	Checking Bridge	LS	1	150000	0.15	
	Utilities Work	LS	1	270000	0.27	
	Weigh Bridge	Unit	2	1200000	2.40	
Total					5.53	
9. Terminal Office	Piling Work	m	374	1050	0.39	
	Foundation Beam	m	100	1850	0.19	
	Building Work	sq.m	600	10500	6.30	
	Utilities Work	sq.m	525	3340	1.75	Include A.C System
Total					8.63	
10. Utilities for Container yard	Drainage Work	m	3955	3500	13.84	
	Electrical Work	LS	1	2630000	2.63	
	Power Transformer	Unit	2	200000	0.40	
	Lighting Tower	Unit	2	1700000	3.40	
Facilities for Reefer Container	Deolishing Work	m	600	400	0.24	Existing Facility
	Construction New Facilities	LS	1	5141000	5.14	
Total					25.65	
11.Other Facilities	Gas Station	Unit	1	5500000	5.50	
	Fence	m	755	1800	1.36	
	Steel Gate	m	145	3900	0.57	
	Line Marking	m	8000	35	0.28	
Total					7.70	
East Quay Total					226.98	

Table 5-5-1(2) Construction Cost

West Quay & Others				Unit Price	Cost	Remarks
Description	Work Items	Unit	Quantity	Baht	Million B	
1. Maintenance Shop	Piling Work	m	1760	1050	1.85	22 m RC Pile
	RC Beam Work	m	650	1850	1.20	
	RC Slab Work	sq.m	1500	900	1.35	
	Building Work	LS	1	8150000	8.15	
	Utilities Work	sq.m	1500	1500	2.25	
	Yard Paving Work	sq.m	3750	980	3.68	
	Grease Trap	Set	2	23000	0.05	
	Grease Ditch	m	380	2000	0.76	
Total					19.28	
2. Cleaning Area	Area Paving Work	sq.m	3430	980	3.36	
	Utilities Work	sq.m	3430	370	1.27	
	Grease Trap	set	2	23000	0.05	
	Grease Ditch	m	345	2000	0.69	
Total					5.37	
3. Main Road Paving	Sub-Base + Base + Surface	sq.m	5625	980	5.51	
	Base + Surface	sq.m	6705	870	5.83	
	Surface Course	sq.m	13790	760	10.48	
	Walk Way	sq.m	3220	300	0.97	
	Separation Block	m	1440	200	0.29	
Total					23.08	
4. Checking Post 1 in West Quay	Piling Work	m	1980	1050	2.08	
	Foundation Work	m	114	1850	0.21	
	RC Slab Work	sq.m	161	900	0.14	
	Building Work	LS	1	4850000	4.85	Include Canopy
	Steel Gate Work	m	42	3900	0.16	
Total					7.45	
5. Empty Container Yard Gate 2,3 (2 Gates)	Piling Work	m	189 x 2	1050	0.40	
	Checking room	unit	1 x 2	114000	0.29	
	Roofing Work	unit	1 x 2	400000	0.80	RC Concrete Support
	Checking Bridge	unit	1 x 2	100000	0.20	
	Steel Gate Work	m	12.5 x 2	3900	0.10	
Total					1.79	
6. Empty Container Yard Gate 1	Piling Work	m	252	1050	0.26	
	Checking room	unit	1	114000	0.11	
	Roofing Work	LS	1	480000	0.48	RC Concrete Support
	Checking Bridge	LS	1	145000	0.15	
	Steel Gate Work	m	18.8	3900	0.07	
Total					1.08	
7. Fence	Customs Fence	m	1630	2250	3.67	
	Yard Fence	m	1220	1800	2.20	
Total					5.86	
8. Demolishing Buildings	Wooden Structure	sq.m	234	150	0.04	
	Steel Structure	sq.m	3155	200	0.63	
	RC Office	sq.m	18724	350	6.55	
	RC Shed	sq.m	23977	230	5.51	
	Sales of Scrap Steel	ton	650	-1250	-0.81	
Total					11.92	
9. Pavement after Demolished Bldg	Paving Work	sq.m	34855	980	34.16	
Total					34.16	
10. Parking lot (No.1,No.3)	Paving Work	sq.m	18700	880	16.46	
	Line Marking	m	12000	35	0.42	
Total					16.88	
11. Empty Container Yard	Yard Repairing	sq.m	184000	10	1.84	
	Line Marking	m	15000	35	0.53	
Total					2.37	
12. Rebuild Facilities	Repair Shop &Office	sq.m	1200	9500	11.40	
	Port Office	sq.m	3F 2300	12000	23.00	
	Gas Station	LS	1	2500000	2.50	
	Fire Vehicle Garage	sq.m	200	6000	1.20	
	Canteen	sq.m	150	7500	1.13	
	Rail way	m	150	3500	0.53	
Total					39.75	
13. Utilities of Road & Yard	Drainage Work	m	1260	3500	4.41	
	Manhole & Others	LS	1	500000	0.50	
	Lighting Tower	Unit	7	1700000	11.90	
Total					16.81	
Sub Total					185.79	

Table 5-5-1(3) Construction Cost

14. Modification of Transit Shed No1~No9	Demolishing Work	sq.m	2800	200	0.56	
	RC Beam & Slab	sq.m	960	2180	2.09	
	Repair Wall	m	280	1200	0.34	
	Others	LS	1	1000000	1.00	Back Filling , etc
Total					3.99	
15. Modification of Bridge & Access	Demolishing Work	LS	1	170000	0.17	
	Paving Surface	sq.m	1134	220	0.25	
	Paving Access	sq.m	1830	380	0.70	
	Separation Band	sq.m	452	300	0.14	
	Walk Way	sq.m	325	300	0.10	
	Drainage Work	set	48	3000	0.14	
Total					1.49	
16. Modification of Transit Shed 13,14	Demolishing Work	LS	1	1000000	1.00	
	Piling Work	m	5720	1050	6.01	
	RC Slab & Beam	sq.m	2913	2450	7.14	
	Shutter	set	28	70000	1.96	
	Others	LS	1	2200000	2.20	Utilities, etc
	Paving Work	sq.m	4280	980	4.19	
Total					22.50	
17. Demolishing Crane	Dock Side Crane	set	12	50000	0.60	
	Sales of Scrap Steel	ton	300	-1250	-0.38	
Total					0.23	
Sub-Total					28.20	
West Quay Total					213.99	
East Quay & West Quay Total					440.97	

Notes
* The unit prices estimated include: Temporary Works, Overheads, Contractor Supervision Risks of inclement weather, Import Duties.

Table 5-5-2 Procurement Cost

				Unit Price	Cost	Remarks
Equipment	Description	Unit	Quantity	Baht	Million B	
Cargo Handling Equipment	(Rail Mounted) (Gantry Crane)	(Unit)	0		0.00	
	Rubber Tyred Gantry Crane	Unit	9	61100000	549.90	RTG(6+1)
					0.00	
Computer Equipment	Computer(Terminal)	Set	31	240000	7.44	
	Package Soft-ware	LS	1	16500000	16.50	
Total					573.84	

Table 5-5-3 Summary of Project Cost

Project Cost	Unit	Quantity	Million B	Remarks
I Construction Cost	LS	1	440.97	
Engineering Fee	%	10	44.10	
Physical Contingency	%	10	44.10	
Sub-Total of I			529.17	
II Procurement Cost	LS	1	573.84	
Engineering Fee	%	3	17.22	
Physical Contingency	%	0	0.00	
Sub Total of II			591.06	
Total			1120.23	
VAT	%	7	78.42	
Project Cost Total	Million Baht		1198.64	

Table 5-5-4 Foreign and Local Currency Cost

East Quay Facilities		Construction Cost	Foreign	Local	Currency		
Description		(Market prices)	Portion	Portion	Foreign	Local	Remarks
		Million Baht	Million B	Million B	%	%	
1. Container Yard	Demolish	4.98	2.82	2.16	57	43	
on Existing Shed	Slab. Beam	58.03	28.54	29.49	49	51	
2. RTG Passing Way		17.39	8.07	9.32	46	54	
3. Container Yard	(Paving)	88.47	34.16	54.31	39	61	
4. RTG Repair area		2.2	0.85	1.35	39	61	
5. Road Improvement	Demolish	0.08	0.04	0.04	50	50	
	Improve	1.04	0.43	0.61	41	59	
6. Terminal Gate 1		4.94	2.56	2.38	52	48	
7. Terminal Gate 2		2.34	1.15	1.19	49	51	
8. Terminal Gate 3		5.53	2.86	2.67	52	48	
9. Terminal Office		8.63	4.75	3.88	55	45	
10. Utilities	Drainage	13.84	6.73	7.11	49	51	
	Electrical	6.43	3.85	2.58	60	40	
11. Reefer Container	Demolish	0.24	0.13	0.11	54	46	
Facilities	Facilities	5.14	3.41	1.73	66	34	
12. Gas station		5.5	3.09	2.41	56	44	
13. Other Facilities		2.2	1.32	0.88	60	40	
Sub-Total		226.98	104.76	122.22	46	54	
West Quay Facilities							
1. Maintenance Shop	Building	14.79	8.72	6.07	59	41	
	Pavement	4.49	1.73	2.76	39	61	
2. Cleaning Area		5.37	2.09	3.28	39	61	
3. Main Road		23.08	8.92	14.16	39	61	
4. Checking Post 1		7.45	3.67	3.78	49	51	
5. Empty Container	Gate 2.3	1.79	0.88	0.91	49	51	
Yard Gate	Gate 1	1.08	0.54	0.54	50	50	
6. Fence		5.86	3.34	2.52	57	43	
7. Demolishing Buildings		11.92	6.77	5.15	57	43	
8. Pavement (Demolished Area)		34.16	13.2	20.96	39	61	
9. Parking Lot No.1,3		16.88	8.61	8.27	51	49	
10. Container Yard Repairing		2.37	0.54	1.83	23	77	
11. Building		39.75	21.86	17.89	55	45	
12. Utilities	Drainage	4.91	2.38	2.53	48	52	
	Electrical	11.90	6.54	5.36	55	45	
13. Modification Shed No1~No9		3.99	1.91	2.08	48	52	
14. Modification Bridge		1.49	0.68	0.81	46	54	
15. Modification Shed No 13,14		22.50	10.12	12.38	45	55	
16. Demolish Crane		0.23	0.11	0.12	48	52	
Sub-Total		213.99	102.61	111.38	48	52	
Construction Cost		440.97	207.37	233.6	47	53	
Engineering Fee		44.10	22.05	22.05	50	50	
Physical Contingency		44.10	20.68	23.42	47	53	
VAT		37.04		37.04	0	100	
Total		566.21	250.1	316.11	44	56	

Procurement		Foreign	Local	Currency		
Description	(Market prices)	Portion	Portion	Foreign	Local	Remarks
	Million Baht	Million B	Million B	%	%	
1. Rubber Tyred Gantry Crane	549.90	423	126.9	77	23	
2. Computer Terminal	7.44	5.72	1.72	77	23	
3. Package Soft-Ware	16.50	16.5	0	100	0	
Procurement Cost	573.84	446.94	126.9	78	22	
Physical Contingency	0.00	0	0	0	0	
Engineering Fee	17.22	15.5	1.72	90	10	
VAT	41.37	0	41.37	0	100	
Total	632.43	462.44	169.99	73	27	
Total Construction & Procurement	1198.64	712.54	486.1	59	41	

Table 5-5-5 Annual Disbursement Schedule

Unit : Million Baht

East Quay Facilities / Description		1994			1995			1996			1997		
		F	L	T	F	L	T	F	L	T	F	L	T
1. Container Yard	Demolish				0.34	0.26	0.60	1.25	0.95	2.20	1.23	0.95	2.18
on Existing Shed	Slab.Beam				5.50	5.73	11.23				23.84	23.76	46.88
2. RTG Passing Way					4.00	4.60	8.60				4.07	4.72	8.79
3. Container Yard	(Paving)				12.58	19.67	32.25	12.58	19.67	32.25	9.00	14.97	23.97
4. RTG Repair area					0.47	0.73	1.20	0.38	0.62	1.00			
5. Road Improvement	Demolish							0.04	0.04	0.08			
	Improve							0.43	0.61	1.04			
6. Terminal Gate 1		0.64	0.59	1.23	1.92	1.79	3.71						
7. Terminal Gate 2					1.15	1.19	2.34						
8. Terminal Gate 3					0.36	0.34	0.70	2.50	2.33	4.83			
9. Terminal Office								4.75	3.88	8.63			
10. Utilities	Drainage	1.10	1.16	2.26	1.10	1.16	2.26	4.53	4.79	9.32			
	Electrical	0.88	0.43	1.31	0.88	0.44	1.32				2.09	1.71	3.80
11. Reefer Container	Demolish				0.13	0.11	0.24						
Facilities	Facilities				3.41	1.73	5.14						
12. Gas station		2.70	2.10	4.80	0.39	0.31	0.70						
13. Other Facilities								1.16	0.77	1.93	0.16	0.11	0.27
West Quay Facilities													
1. Maintenance Shop	Building	8.72	6.07	14.79									
	Pavement	0.38	1.61	1.99	1.35	1.15	2.50						
2. Cleaning Area		1.83	2.87	4.70	0.26	0.41	0.67						
3. Main Road								8.92	14.16	23.08			
4. Checking Post 1								3.67	3.78	7.45			
5. Empty Container	Gate 2,3	0.03	0.04	0.07	0.85	0.87	1.72						
Yard Gate	Gate 1	0.54	0.54	1.08									
6. Fence		0.86	0.64	1.50	2.48	1.88	4.36						
7. Demolishing Buildings		5.84	4.41	10.25	0.34	0.29	0.63	0.59	0.45	1.04			
8. Pavement(Demolished Area)		0.86	1.34	2.20	9.35	14.62	23.97	2.99	5.00	7.99			
9. Parking Lot No.1,3		5.97	5.73	11.70	2.64	2.54	5.18						
10. Container Yard Repairing		0.54	1.83	2.37									
11. Building (Office,etc)					21.57	17.65	39.22	0.29	0.24	0.53			
12. Utilities	Drainage				1.15	1.26	2.41	1.23	1.27	2.50			
	Electrical				1.86	1.54	3.40	4.68	3.82	8.50			
13. Modification Shed No1~No9					1.91	2.08	3.99						
14. Modification Bridge		0.68	0.81	1.49									
15. Modification Shed No 13,14								10.12	12.38	22.50			
16. Demolish Crane		0.11	0.12	0.23									
Construction Cost		31.68	30.29	61.97	75.99	82.34	158.33	60.11	74.75	134.86	39.59	46.22	85.81
Engineering Fee		13.23	13.23	26.46	2.94	2.94	5.88	2.94	2.94	5.88	2.94	2.94	5.88
Physical Contingency		2.90	3.28	6.18	7.46	8.41	15.87	6.34	7.14	13.48	3.98	4.59	8.57
VAT		0.00	6.62	6.62	0.00	12.60	12.60	0.00	10.80	10.80	0.00	7.02	7.02
Construction Total		47.81	53.42	101.23	86.39	106.29	192.68	69.39	95.63	165.02	46.51	60.77	107.28
Procurement Cost								134.00	38.00	172.00	312.94	88.90	410.84
Engineering Fee								4.65	0.51	5.16	10.85	1.21	12.06
Physical Contingency								0.00	0.00	0.00	0.00	0.00	0.00
VAT								0.00	12.41	12.41	0.00	28.96	28.96
Procurement Total								138.65	50.92	189.57	323.79	119.07	442.86
T o t a l		47.81	53.42	101.23	86.39	106.29	192.68	208.04	146.55	354.59	370.30	179.84	550.14

Chapter 6 Economic Analysis

6.1 Purpose and Methodology of Economic Analysis

6.1.1 Purpose

The basic purpose of this chapter is to investigate economic benefits as well as economic costs which will arise from the project, and to evaluate whether the net benefits exceed those which could be derived from other investment opportunities.

6.1.2 Methodology

An economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of this project (refer to A.1.1).
In estimating costs and benefits of the project, they should be fixed quantitatively as much as possible. Then, "Economic Pricing" is applied after the removal of "Transfer Items" such as tax. "Economic Pricing" here means the appraisal of costs and benefits in terms of international prices (refer to A.1.2).

6.1.3 Prerequisites for the Economic Analysis

(1) Benefits of the Project

The following benefits are considered to be brought about by the Short-Term Plan for modernization of Bangkok Port:

(i) Savings in ships staying costs
(ii) Savings in administration and operation costs
(iii) Improvement of cargo handling safety and reduction of cargo damage
(iv) Reduction of traffic congestion in the port area
(v) Reduction of robbery of container cargo
(vi) Contribution to the national economic development through upgrading international status of Bangkok Port

Among the above benefit items, (i) and (ii) are evaluated monetarily as benefits from the project. This results in safe side evaluation in the economic analysis.

(2) Project Life

Taking account of the depreciation period of the main facilities, the period of calculation ("Project Life") in the economic analysis is assumed to be thirty years from beginning of construction.

(3) Foreign Exchange Rate

The foreign exchange rate adopted for this analysis is :
1Baht = 4.27 Yen as of 18th June, 1993

(4) "Without" Case

A cost-benefit analysis is conducted on the difference between the "with" and "without" investment cases. In other words, incremental benefits and costs arising from the proposed investment are compared, and it is examined whether or not the net benefits generated by the project exceed the opportunity cost of capital in Thailand. Therefore, determining the "without" case is one of the key points of the economic analysis.

In this study, following conditions are adopted for the "without" case.

(i) The cargo volume loaded/discharged on/from conventional vessels and container vessels is the same as that of "with" case.
(ii) Number of container boxes at Klong Toei Wharf will be one million TEUs both for "with" and "without" cases.
(iii) Number of personnel will be kept unchanged from the present number.

6.2 Costs

6.2.1 Construction Costs

The construction costs are estimated at market price in Chapter 5. Project cost of the Short-Term Plan will not include the cost of on-going projects such as procurement of two gantry cranes and fourteen small RTGs. In the economic analysis, these costs have to be divided into foreign currency portions, non-traded goods, skilled labour and unskilled labour after exclusion of tax (refer to A.1.3).

Since the foreign currency portions are shown in CIF prices, they do not need to be converted into economic prices. Economic prices of non-traded goods are calculated by multiplying the SCF, and the local labour costs are converted into economic prices by using the respective conversion factors mentioned previously.

Replacement costs should be considered at the end of depreciation through the project life. Also, residual values should be considered as a negative cost in the final year of the project.

6.2.2 Maintenance Costs

The costs of maintaining the port facilities are estimated as a fixed proportion (1% for structures, 4% for handling equipment) of the economic construction costs excluding the costs of demolition. Annual maintenance costs are 23.00 million Baht at economic prices.

6.3 Benefit

6.3.1 Saving of ships staying costs

The implementation of this project will generate benefits through reduction of ship staying costs from the present level. As to the attribution of the above benefits in this study, half of them is assumed to be attributed to Thailand through the market mechanism in international trade.

The average staying time for container vessel will be reduced from about 32.5 hours to about 14.4 hours per vessel in 1997. Since 1,161 container vessels will call at the port, difference of total staying time is calculated as 876 days. Considering daily ship staying cost of the representative feeder vessels of 500 TEUs capacity, difference of total ship staying costs between "with" and "without" cases is estimated as 248 million Baht.

6.3.2 Saving in Administration and Operation Costs

Administration and operation costs will be saved by the reduction of the number of personnel (see Section 7.3.1 (7) of Chapter 7). When economic prices of the above costs are estimated, CFC (personnel) and SCF (adminis-tration) are considered.

6.4 Economic Profitability

6.4.1 Calculation and Assessment of the Economic Internal Rate of Return

The resulting EIRR of this project is estimated as 12.4% (see Table 6-4-1) and it exceeds the criterion of 10 % which is generally adopted to assess the economic justifiability of a project.

Table 6-4-1 Cost/Benefit Analysis

Unit: Million Baht

		Benefits			Costs				Net Present Value (NPV)		
	Total	Savings in Ship Staying Cost	Savings in Admi. & Op Cost	Total	Construction Cost	Maintenance Cost	Total	Benefits -Costs	Benefit	Cost	Benefit -Cost
1	1994				84.4		84.4	-84.4	0.0	84.4	-84.4
2	1995				159.1		159.1	-159.1	0.0	141.5	-141.5
3	1996				685.0		685.0	-685.0	0.0	542.1	-542.1
4	1997	124.1	5.4	129.5		23.0	23.0	106.5	91.2	16.2	75.0
5	1998	124.1	11.0	135.1		23.0	23.0	112.1	84.6	14.4	70.2
6	1999	124.1	16.8	140.9		23.0	23.0	117.9	78.5	12.8	65.7
7	2000	124.1	22.7	146.8		23.0	23.0	123.8	72.8	11.4	61.4
8	2001	124.1	28.8	152.9	16.5	23.0	39.5	113.4	67.4	17.4	50.0
9	2002	124.1	35.0	159.1		23.0	23.0	136.1	62.4	9.0	53.4
10	2003	124.1	41.5	165.5	5.7	23.0	28.7	136.8	57.8	10.0	47.8
11	2004	124.1	48.1	172.1		23.0	23.0	149.1	53.5	7.1	46.3
12	2005	124.1	54.9	178.9		23.0	23.0	155.9	49.4	6.4	43.1
13	2006	124.1	61.9	185.9	456.4	23.0	479.4	-293.5	45.7	117.8	-72.1
14	2007	124.1	69.0	193.1		23.0	23.0	170.1	42.2	5.0	37.2
15	2008	124.1	76.4	200.5		23.0	23.0	177.5	39.0	4.5	34.5
16	2009	124.1	84.0	208.1		23.0	23.0	185.1	36.0	4.0	32.0
17	2010	124.1	91.8	215.9	5.7	23.0	28.7	187.2	33.2	4.4	28.8
18	2011	124.1	99.8	223.9	16.5	23.0	39.5	184.4	30.7	5.4	25.3
19	2012	124.1	108.1	232.1		23.0	23.0	209.1	28.3	2.8	25.5
20	2013	124.1	116.5	240.6		23.0	23.0	217.6	26.1	2.5	23.6
21	2014	124.1	125.2	249.3		23.0	23.0	226.3	24.0	2.2	21.8
22	2015	124.1	134.2	258.2		23.0	23.0	235.2	22.2	2.0	20.2
23	2016	124.1	143.4	267.4	456.4	23.0	479.4	-212.0	20.4	36.6	-16.2
24	2017	124.1	152.8	276.9	5.7	23.0	28.7	248.2	18.8	1.9	16.9
25	2018	124.1	162.6	286.6		23.0	23.0	263.6	17.3	1.4	15.9
26	2019	124.1	172.6	296.6		23.0	23.0	273.6	15.9	1.2	14.7
27	2020	124.1	182.8	306.9		23.0	23.0	283.9	14.7	1.1	13.6
28	2021	124.1	193.4	317.5	468.6	23.0	491.6	-174.1	13.5	20.9	-7.4
29	2022	124.1	204.3	328.3		23.0	23.0	305.3	12.4	0.9	11.6
30	2023	124.1	215.4	339.5	-558.6	23.0	-535.6	875.1	11.4	-18.0	29.3
	Total	3349.6	2658.5	6008.1	1801.4	621.0	2422.4	3585.7	1069.5	1069.5	-0.0

EIRR= 0.12405

6.4.2 Sensitivity Analysis

(1) Identification of Cases

Various uncertain factors may enter in the appraisal of the project when estimating costs and benefits. Therefore, sensitivity tests are made to see if the project is justifiable when some of these factors are varied. Three sensitivity tests are made as follows:

a. Case 1 in which costs increase by 10 %
b. Case 2 in which benefits decrease by 10 %
c. Case 3 in which costs increase by 10 % and benefits decrease by 10%

(2) Results of the Sensitivity Analysis

The result of the sensitivity analysis is presented in Table 6-4-2. Even in Case 3 in which EIRR is minimized, the resulting figure is nearly 10%.

Table 6-4-2 Results of the Sensitivity Analysis

	Original Case	Case 1	Case 2	Case 3
EIRR	12.4%	10.9%	10.8%	9.3%

Chapter 7 Financial Analysis

7.1 Purpose of the Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the projects proposed in the Short-Term Plan. This analysis focuses on the viability of the project and the financial soundness of the port management body during the project life.

7.2 Methodology of the Financial Analysis

7.2.1 Viability of the Project

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR. The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula;

$$\sum_{i=1}^{n} \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

n : project life
Bi: revenues in the i-the year
Ci: Costs in the i-the year
r : discount rate

Here, the revenues and the costs are the difference between those under the "with" case and the "without" case. In this study, the "without" case is set as explained in Chapter 6. The revenues and the costs in this analysis cover the following items:

Revenues:
1) Port operating revenues
2) Residual value of the fixed assets at the end of the project life

Costs:
1) Investment (initial investments and reinvestment)
2) Personnel and administration costs

The calculated FIRR is the criterion of judgment of the financial feasibility of the project.

7.2.2 Financial Soundness of the Port Management Body

The financial soundness of the port management body is appraised based on its projected financial statements (Profit and Loss Statement, Cash Flow Statement and Balance Sheet). The appraisal is made from the viewpoints of profitability and operational efficiency, using the following ratios:

(1) Profitability

Rate of Return on Net Fixed Assets:

$$\frac{\text{Net Operation Income}}{\text{Total Fixed Assets}} \times 100\ (\%)$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets.

(2) Operational Efficiency

Operating Ratio:

$$\frac{\text{Operating Expenses}}{\text{Operating Revenues}} \times 100\ (\%)$$

Working Ratio:

$$\frac{\text{Operating Expenses - Depreciation Cost}}{\text{Operating Revenues}} \times 100\ (\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port.

When the calculated operating ratios are less than 70-75%, and the working ratios are less than 50-60%, the operations of the port are efficient.

7.3 Analysis of Viability of the Project

7.3.1 Prerequisites

(1) "With" Case and "Without" Case

A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases. In other words, benefits and costs arising from the proposed investment are compared, and it is determined whether or not the net benefits generated by the project exceed the opportunity cost of capital in Thailand. Therefore, determining the "Without" case is one of the key points of the financial appraisal. "Without" case in the appraisal is the same as that of the economic analysis, namely the following conditions are adopted.

1) Number of container boxes handled at Klong Toei Wharf will be one million TEUs both for "With" and "Without" cases.
2) Project costs will not include the cost of on-going projects such as procurement of some RTGs.

(2) Project Life

Taking account of the service lives of the port facilities, the project life for the financial analysis is determined to be 30 years including 3 years of detailed design and construction of the modernization project.

(3) Base Year

For the estimation, all costs, expenditures and revenues analyzed quantitatively here are indicated in prices as of 1993, when the price survey was conducted. Neither inflation of prices nor the increase of nominal wages are considered during the project life.

(4) Revenues from the Project

The Short-Term Plan covers both the container handling and the general cargo handling. However since most of the modernization works are related to the container cargo handling, revenues which are only concerned with the container operations are to be accounted as revenues earned from the project in the FIRR calculation.

As mentioned in (1), the container handling volume handled at Klong Toei Wharf is one million TEUs for both "with" case and "without" case. Since revenue from the project is the difference of the two cases, no difference comes from the cargo handling volume.

The following items can be considered affecting revenues from the project.

(a) Deduction of revenues of berth hire through less berthing time of container vessels

Because of the modernization of the container handling operation, berthing time of container vessel would be shortened drastically from the present level. This would bring reduction of revenues of PAT because the tariff on the berth hire is charged according to berthing time of vessels.

(b) Increase of revenues from the land rent

In the Short-Term Plan, the present Import Steel Open Storage Yard outside the Checking Post 1 would be shifted into the port. So areas for the present Import Steel Open Storage Yard can be utilized for commercial use. The land rent of this area is assumed 3.75 Baht/sq. m/month which is determined by PAT regulation.

(c) Increase of revenues from container repair and cleaning which are new businesses in the Short-Term Plan

Charges on those businesses are assumed as 300 Baht/box for repair and 200 Baht/box for cleaning.

(d) Increase of revenues by increase of the port tariff

After completion of the proposed project, revenues from the port tariff related to containers are supposed to be raised considering the expected reduction of berthing times of container vessels. The increasing rate for the new tariff is proposed to make the resulting FIRR of the project narrowly exceed the criterion. For that purpose, an increase rate of 1.4 % per annum over three years, namely from 1997 to 1999 is adopted. Thus, in 1997, the

tariff will eventually be raised up to 4.2 % and after that, the new tariff will be kept at a constant level. Such an increase rate is considered to be conservative compared with the benefits for the port users to be generated from the project.

Table 7-3-1 shows revenues gained/lost by the above four items.

Table 7-3-1 Revenues Gained/Lost by Items

Unit: Baht

	(a)	(b)	(c)	(d)	Total
1997	-16,433,172	1,309,350	31,198,752	43,643,973	59,718,903
1998	-16,660,060	1,083,600	30,993,768	86,258,694	101,676,002
1999	-16,886,948	1,083,600	30,788,784	127,863,125	142,848,561
2000	-16,886,948	1,309,350	30,583,800	126,357,173	141,363,375
2001	-16,886,948	1,083,600	30,378,816	124,813,294	139,388,762
2002	-16,886,948	1,083,600	30,173,832	123,288,378	137,658,862
2003	-16,886,948	1,309,350	29,968,848	121,782,426	136,173,676
2004	-16,886,948	1,083,600	29,763,864	120,238,547	134,199,063
2005	-16,886,948	1,083,600	29,558,880	118,713,632	132,469,164
2006	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2007	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2008	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2009	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2010	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2011	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2012	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2013	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2014	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2015	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2016	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2017	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2018	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2019	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2020	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2021	-16,886,948	1,309,350	29,558,880	118,286,122	132,267,404
2022	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691
2023	-16,886,948	1,083,600	29,558,880	118,267,159	132,022,691

(5) Cost of Investment

The initial investment of the Short-Term Project is estimated in Chapter 5. The facilities and the equipment will be renewed based on their service lives. The service lives of each facility and equipment are shown in Chapter 6 of Part I.

The project costs are to include all items not only for container operations but also for conventional cargo operations in the Short-Term Plan.

(6) Maintenance, Repair and Fuel Costs

In this analysis, maintenance, repair and fuel costs for the port facilities per annum are assumed as follows.

Structures: 1 % of the original construction cost
Cargo Handling Equipment: 4 % of the original procurement cost
Others: 1 % of the original construction cost

(7) Personnel and Administration Costs

As mentioned in Chapter 3, the modernization of cargo handling operations and rationalization of official works enable PAT to reduce the number of its personnel.

In order to avoid a radical change, it is assumed that PAT would recruit a less number of personnel than that of retirement by 50 persons per year for thirty years.

The annual administration costs are calculated as 15 % of the total annual personnel costs.

7.3.2 Evaluation

The result of the calculation of FIRR of the project is shown in Table 7-3-2. The figure of 9.3 % is taken as acceptable for PAT to spend its own funds compared with the recent interest rates of bank deposits which are shown in Table 7-3-3.

Table 7-3-3 Interest Rate of Deposits at Commercial Bank

	1993 May	1993 Jun.	1993 Jul.
Saving Deposit	6.0%	6.0%	6.0%
Time Deposit			
6 months to 12 months	8.0%-9.0%	8.0%-9.0%	8.0%-9.0%
12 months	8.5%	8.5%	8.5%
12 months to 2 years	8.5%	8.5%	8.5%

Source: Bank of Thailand

Table 7-3-2 FIRR Calculation

FIRR Calculation

Unit:Baht

Assumption		
FIRR=	9.3 %	
Construction	1.00	
Cargo Volume	1.00	
Expense	1.00	
Tariff Increase	0.042	(1.4% per year from 1997 to 1999)

		Revenue			Cost				Revenue-
	Year	Cargo Handling	Ship Handling	Total	Investment	Expense(Personnel)	Administ. Cost	Maint. & Repair	Total	Cost
1	1994	0		0	101,230,000	0	0		101,230,000	-101,230,000
2	1995	0		0	192,680,000	0	0		192,680,000	-192,680,000
3	1996	0		0	904,729,064	0	0		904,729,064	-904,729,064
4	1997	76,152,075	-16,433,172	59,718,903		-5,552,500	-832,875	30,024,634	23,639,259	36,079,644
5	1998	118,336,062	-16,660,060	101,676,002		-11,260,470	-1,689,071	30,024,634	17,075,094	84,600,908
6	1999	159,735,509	-16,886,948	142,848,561		-17,128,263	-2,569,239	30,024,634	10,327,132	132,521,429
7	2000	158,250,323	-16,886,948	141,363,375		-23,160,355	-3,474,053	30,024,634	3,390,227	137,973,148
8	2001	156,275,710	-16,886,948	139,388,762	18,184,650	-29,361,344	-4,404,202	30,024,634	14,443,738	124,945,024
9	2002	154,545,810	-16,886,948	137,658,862		-35,735,962	-5,360,394	30,024,634	-11,071,722	148,730,584
10	2003	153,060,624	-16,886,948	136,173,676	8,199,624	-42,289,069	-6,343,360	30,024,634	-10,408,171	146,581,847
11	2004	151,086,011	-16,886,948	134,199,063		-49,025,663	-7,353,849	30,024,634	-26,354,878	160,553,941
12	2005	149,356,112	-16,886,948	132,469,164		-55,950,882	-8,392,632	30,024,634	-34,318,879	166,788,043
13	2006	149,154,352	-16,886,948	132,267,404	624,229,440	-63,070,008	-9,460,501	30,024,634	581,723,567	-449,456,163
14	2007	148,909,639	-16,886,948	132,022,691		-70,388,466	-10,558,270	30,024,634	-50,922,102	182,944,793
15	2008	148,909,639	-16,886,948	132,022,691		-77,911,843	-11,686,777	30,024,634	-59,573,986	191,596,676
16	2009	149,154,352	-16,886,948	132,267,404		-85,645,875	-12,846,881	30,024,634	-68,468,122	200,735,526
17	2010	148,909,639	-16,886,948	132,022,691	8,199,624	-93,596,460	-14,039,469	30,024,634	-69,411,670	201,434,361
18	2011	148,909,639	-16,886,948	132,022,691	18,184,650	-101,769,660	-15,265,449	30,024,634	-68,825,825	200,848,516
19	2012	149,154,352	-16,886,948	132,267,404		-110,171,711	-16,525,757	30,024,634	-96,672,833	228,940,237
20	2013	148,909,639	-16,886,948	132,022,691		-118,809,019	-17,821,353	30,024,634	-106,605,737	238,628,428
21	2014	148,909,639	-16,886,948	132,022,691		-127,688,171	-19,153,226	30,024,634	-116,816,763	248,839,453
22	2015	149,154,352	-16,886,948	132,267,404		-136,815,940	-20,522,391	30,024,634	-127,313,697	259,581,101
23	2016	148,909,639	-16,886,948	132,022,691	624,229,440	-146,199,286	-21,929,893	30,024,634	486,124,895	-354,102,204
24	2017	148,909,639	-16,886,948	132,022,691	8,199,624	-155,845,367	-23,376,805	30,024,634	-140,997,913	273,020,604
25	2018	149,154,352	-16,886,948	132,267,404		-165,761,537	-24,864,231	30,024,634	-160,601,133	292,868,537
26	2019	148,909,639	-16,886,948	132,022,691		-175,955,360	-26,393,304	30,024,634	-172,324,029	304,346,720
27	2020	148,909,639	-16,886,948	132,022,691		-186,434,610	-27,965,191	30,024,634	-184,375,167	316,397,858
28	2021	149,154,352	-16,886,948	132,267,404	584,164,650	-197,207,279	-29,581,092	30,024,634	387,400,914	-255,133,510
29	2022	148,909,639	-16,886,948	132,022,691	0	-208,281,583	-31,242,237	30,024,634	-209,499,186	341,521,877
30	2023	148,909,639	-16,886,948	132,022,691	-710,960,272	-219,665,967	-32,949,895	30,024,634	-933,551,500	1,065,574,191
	Total	3,958,640,011	-455,266,932	3,503,373,080	2,381,270,494	-2,710,682,648	-406,602,397	810,665,127	74,650,575	3,428,722,504

Net Present Value of Total Revunue in 1994	6,337
Net Present Value of Total Cost in 1994	12,487,690

7.4 Analysis of Financial Soundness of the Port Management Body

This analysis is carried out by making PAT's projected financial statements. Since its purpose is to evaluate the financial soundness of PAT (only Bangkok Port), it is necessary that all revenues and expenditures of PAT (only Bangkok Port) be the object of the financial statements. So, different from analysis of viability of the project, revenues and expenses related not only to container cargo handling but also to general cargo handling are taken into account.

7.4.1 Prerequisites

Prerequisites for making the financial statements are as follows.

(1) Project Life and Base Year

The project life and base year at the time of analysis of financial soundness of PAT is the same as those in section 7.3.1.

(2) Cargo Handling Volume

Based on the cargo handling volume forecast, the annual cargo handling volume is determined as shown in Table 7-4-1.

(3) Port Charges and Revenues

Revenues from port activities are calculated based on the new tariff. The rates of the new tariff would be the same as those in section 7.3.1, namely, the charges related only to container operations would be increased.

Table 7-4-2 shows the estimated revenues from port activities based on the preceding cargo handling volume.

(4) Investment Cost

Investment cost is the same as mentioned in section 7.3.1.

Table 7-4-1 Forecast of Annual Cargo Volume Handled at Klong Toei Wharf

[Container Cargo]															
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	**********	2023
(TEU)															
Import		600,000	550,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Export		600,000	550,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Total		1,200,000	1,100,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
(Box)															
Import	FCL(20')	100,810	100,534	100,511	99,776	99,766	99,756	99,746	99,736	99,726	99,716	99,706	99,696	99,696	99,696
	FCL(40')	76,048	75,842	75,824	78,823	82,429	86,035	89,641	93,248	96,854	100,460	104,066	107,672	107,672	107,672
	LCL(20')	76,091	72,745	60,789	53,080	49,561	46,041	42,522	39,002	35,483	31,963	28,444	24,924	24,924	24,924
	LCL(40')	42,801	40,919	40,526	41,933	40,056	38,179	36,302	34,426	32,549	30,672	28,795	26,918	26,918	26,918
	Reefer(20')	1,479	1,209	1,059	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060	1,060
	Reefer(40')	1,961	2,245	2,471	2,470	2,470	2,470	2,470	2,470	2,470	2,470	2,470	2,470	2,470	2,470
	Empty(20')	84,706	64,706	42,857	38,796	37,900	37,005	36,109	35,213	34,317	33,422	32,526	31,630	31,630	31,630
	Empty(40')	47,647	36,397	28,571	30,418	30,901	31,385	31,868	32,352	32,835	33,318	33,802	34,285	34,285	34,285
Export	FCL(20')	71,231	75,289	77,306	87,686	90,698	93,709	96,721	99,733	102,744	105,756	108,767	111,779	111,779	111,779
	FCL(40')	55,967	59,156	60,741	69,272	75,703	82,134	88,565	94,997	101,428	107,859	114,290	120,721	120,721	120,721
	LCL(20')	193,970	139,822	99,562	83,694	76,725	69,757	62,788	55,820	48,851	41,882	34,914	27,945	27,945	27,945
	LCL(40')	75,433	75,289	71,700	66,119	61,627	57,134	52,642	48,150	43,657	39,165	34,672	30,180	30,180	30,180
	Reefer(20')	7,412	6,794	5,874	5,874	5,874	5,874	5,874	5,874	5,874	5,874	5,874	5,874	5,874	5,874
	Reefer(40')	17,294	15,853	13,685	13,685	13,685	13,685	13,685	13,685	13,685	13,685	13,685	13,685	13,685	13,685
	Empty(20')	12,857	11,507	10,462	9,668	9,448	9,228	9,008	8,788	8,568	8,348	8,128	7,908	7,908	7,908
	Empty(40')	8,571	7,996	7,272	7,463	7,613	7,763	7,912	8,062	8,212	8,362	8,511	8,661	8,661	8,661
[Conventional Cargo]															
Import		3,661,872	3,705,092	3,794,838	3,810,443	3,791,592	3,789,509	3,791,559	3,779,113	3,813,007	3,834,698	3,865,531	3,908,992	3,908,992	3,908,992
Export		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		3,661,872	3,705,092	3,794,838	3,810,443	3,791,592	3,789,509	3,791,559	3,779,113	3,813,007	3,834,698	3,865,531	3,908,992	3,908,992	3,908,992

Table 7-4-2 Annual Revenue from Port Activities

Unit: Baht

	1994	1995	1996	1997	1998	1999
Port Dues, Berth Hire, Tug Service	428,861,183	519,773,031	543,463,431	651,028,167	664,482,395	677,936,893
Marine Survey, Garbage, Water, Tel. Service, Quay Cleaning	64,161,967	61,634,932	58,282,502	59,265,734	58,943,208	58,623,477
Container Cargo Handling	3,228,199,195	2,942,751,260	2,658,123,310	2,664,052,708	2,661,924,787	2,643,427,641
Container Cargo Storage	349,373,519	350,036,879	350,403,759	336,505,431	343,262,050	348,060,361
Container Repairing & Cleaning	0	0	0	31,635,535	31,861,594	31,897,180
General Cargo Handling	1,137,033,387	1,126,024,203	1,115,039,442	1,104,308,510	1,102,242,239	1,100,175,968
General Cargo Storage	16,943,835	17,697,434	18,451,034	19,204,633	19,266,719	19,328,805
Equipment Hire, Vehicle Admiss. Fee, Labour Stand by, Passenger, Cont. Status, Relocation, etc.	152,453,221	146,448,812	138,483,209	140,819,437	140,053,093	139,293,390
Rental Land (concerned master plan)	0	0	0	1,309,350	1,083,600	1,083,600
Other Rental Land, Office, Warehouse	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000
Interest on bank deposit	293,244,017	397,220,608	459,831,126	455,902,236	540,262,014	630,107,300
Others	84,452,504	81,126,320	76,713,720	78,007,889	77,583,368	77,162,525
Total	5,777,172,828	5,665,163,479	5,441,241,533	5,564,489,630	5,663,415,067	5,749,547,141

	2000	2001	2002	2003	2004	2005
Port Dues, Berth Hire, Tug Service	690,115,704	702,294,514	714,473,324	726,652,135	738,830,944	751,009,755
Marine Survey, Garbage, Water, Tel. Service, Quay Cleaning	58,306,541	57,984,015	57,664,284	57,347,347	57,024,821	56,705,090
Container Cargo Handling	2,619,297,455	2,579,857,843	2,540,418,230	2,500,978,617	2,461,539,004	2,422,099,392
Container Cargo Storage	352,215,485	354,354,815	356,494,145	358,633,476	360,772,806	362,912,136
Container Repairing & Cleaning	31,868,320	31,654,726	31,441,133	31,227,540	31,013,946	30,800,353
General Cargo Handling	1,098,109,697	1,096,043,426	1,093,977,155	1,091,910,884	1,089,844,613	1,087,778,342
General Cargo Storage	19,390,891	19,452,976	19,515,062	19,577,148	19,639,234	19,701,320
Equipment Hire, Vehicle Admiss. Fee, Labour Stand by, Passenger, Cont. Status, Relocation, etc.	138,540,327	137,773,984	137,014,281	136,261,218	135,494,874	134,735,171
Rental Land (concerned master plan)	1,309,350	1,083,600	1,083,600	1,309,350	1,083,600	1,083,600
Other Rental Land, Office, Warehouse	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000
Interest on bank deposit	722,030,000	816,064,896	910,961,243	1,009,258,891	1,109,100,217	1,211,688,379
Others	76,745,361	76,320,840	75,899,997	75,482,833	75,058,312	74,637,469
Total	5,830,379,131	5,895,335,634	5,961,392,454	6,031,089,438	6,101,852,372	6,175,601,006

	2006	2007	2008	2009	2010	2011
Port Dues, Berth Hire, Tug Service	762,990,836	774,971,917	786,952,998	798,934,080	810,915,160	822,896,242
Marine Survey, Garbage, Water, Tel. Service, Quay Cleaning	56,992,509	57,405,939	57,822,163	58,241,182	58,654,612	59,070,836
Container Cargo Handling	2,408,068,445	2,408,068,445	2,408,063,445	2,408,068,445	2,408,068,445	2,408,068,445
Container Cargo Storage	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303
Container Repairing & Cleaning	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353
General Cargo Handling	1,109,418,926	1,131,059,509	1,152,700,093	1,174,340,676	1,195,981,260	1,217,621,843
General Cargo Storage	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320
Equipment Hire, Vehicle Admiss. Fee, Labour Stand by, Passenger, Cont. Status, Relocation, etc.	135,418,099	136,400,436	137,389,413	138,385,031	139,367,368	140,356,345
Rental Land (concerned master plan)	1,309,350	1,083,600	1,083,600	1,309,350	1,083,600	1,083,600
Other Rental Land, Office, Warehouse	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000
Interest on bank deposit	1,316,523,819	1,377,963,305	1,490,272,301	1,609,379,470	1,733,073,542	1,860,655,391
Others	75,015,782	75,559,954	76,107,804	76,659,334	77,203,506	77,751,356
Total	6,304,555,742	6,401,331,031	6,549,214,793	6,704,135,543	6,863,165,467	7,026,322,033

	2012	2013	2014	2015	2016	2017
Port Dues, Berth Hire, Tug Service	834,877,323	846,858,404	858,839,485	870,820,567	882,801,648	894,782,730
Marine Survey, Garbage, Water, Tel. Service, Quay Cleaning	59,489,855	59,903,284	60,319,508	60,738,527	61,151,957	61,568,181
Container Cargo Handling	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445
Container Cargo Storage	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303
Container Repairing & Cleaning	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353
General Cargo Handling	1,239,262,427	1,260,903,010	1,282,543,594	1,304,184,177	1,325,824,761	1,347,465,344
General Cargo Storage	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320
Equipment Hire, Vehicle Admiss. Fee, Labour Stand by, Passenger, Cont. Status, Relocation, etc.	141,351,962	142,334,299	143,323,276	144,318,894	145,301,230	146,290,207
Rental Land (concerned master plan)	1,309,350	1,083,600	1,083,600	1,309,350	1,083,600	1,083,600
Other Rental Land, Office, Warehouse	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000
Interest on bank deposit	1,992,092,027	2,129,746,657	2,272,412,543	2,420,201,274	2,573,263,423	2,681,764,755
Others	78,302,886	78,847,058	79,394,908	79,946,437	80,490,610	81,038,460
Total	7,193,572,250	7,366,562,732	7,544,803,335	7,728,405,647	7,916,803,649	8,060,879,698

	2018	2019	2020	2021	2022	2023
Port Dues, Berth Hire, Tug Service	906,763,811	918,744,893	930,725,974	942,707,056	954,688,137	966,669,219
Marine Survey, Garbage, Water, Tel. Service, Quay Cleaning	61,987,200	62,400,629	62,816,853	63,235,872	63,649,302	64,065,526
Container Cargo Handling	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445	2,408,068,445
Container Cargo Storage	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303	365,866,303
Container Repairing & Cleaning	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353	30,800,353
General Cargo Handling	1,369,105,928	1,390,746,511	1,412,387,095	1,434,027,678	1,455,668,262	1,477,308,845
General Cargo Storage	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320	19,701,320
Equipment Hire, Vehicle Admiss. Fee, Labour Stand by, Passenger, Cont. Status, Relocation, etc.	147,285,825	148,268,162	149,257,139	150,252,756	151,235,093	152,224,070
Rental Land (concerned master plan)	1,309,350	1,083,600	1,083,600	1,309,350	1,083,600	1,083,600
Other Rental Land, Office, Warehouse	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000	22,450,000
Interest on bank deposit	2,841,123,870	3,009,221,109	3,183,294,506	3,363,397,105	3,502,967,720	3,691,864,511
Others	81,589,989	82,134,162	82,682,012	83,233,541	83,777,713	84,325,564
Total	8,256,052,394	8,459,485,486	8,669,133,600	8,885,049,779	9,059,956,248	9,284,427,756

(5) Maintenance, Repair and Fuel Costs

Future maintenance, repair and fuel costs are calculated from the estimated future cargo handling volume by analyzing the relation between the past maintenance, repair and fuel costs and the past cargo handling volume.

(6) Personnel and Administration Costs

As mentioned in section 7.3.1, the annual personnel costs are calculated based on the assumption that PAT would recruit a less number of personnel than that of retirement by 50 persons per year for thirty years.

The annual administration costs are calculated as 15 % of the total annual personnel costs.

(7) Depreciation Cost

The future depreciation costs are estimated by adding those of the newly proposed port facilities and equipment calculated by the straight line method to the depreciation cost in the fiscal year 1993 which is supposed as the base figures.

7.4.2 Evaluation (Table 7-4-3)

(1) Profitability

The rate of return on net fixed assets is sufficiently high compared with the rates mentioned before.

(2) Operational Efficiency

Both the operating ratios and the working ratios maintain favorable levels.

Table 7-4-3 PAT's Projected Financial Statements

Unit: Baht

Balance Sheet (Bangkok Port only)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Assets									
Current assets									
Cash and Account Receivable	4,965,257,595	5,747,889,075	5,698,777,950	6,753,275,171	7,876,341,248	9,025,374,395	10,200,811,200	11,387,015,532	12,615,736,139
Current other assets	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843
Total current assets	6,107,518,438	6,890,149,918	6,841,038,793	7,895,536,014	9,018,602,092	10,167,635,238	11,343,072,043	12,529,276,375	13,757,996,982
Land, Building and Facilities (incl. under construction)	4,758,806,341	4,930,472,805	5,845,659,332	5,769,726,531	5,691,813,730	5,614,960,929	5,538,078,128	5,479,375,927	5,402,497,128
Other assets	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292
Dues receivable	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total assets	11,082,016,037	12,036,313,981	12,902,339,382	13,879,553,802	14,926,137,079	15,998,288,025	17,096,841,429	18,224,347,510	19,376,185,416
Liabilities & Fund									
Current Liabilities									
Voucher payable	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893
Loan due within 1 year	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819
Accruals	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420
Deposits	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681
Refundable deposits	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150
Other creditors	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649
Total current liabilities	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613
Long term debt	34,065,303	28,113,082	22,156,461	16,199,840	10,243,219	4,286,598	0	0	0
Confiscated goods fees	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total liabilities	325,151,281	319,197,660	313,241,039	307,284,418	301,327,797	295,371,176	291,084,578	291,084,578	291,084,578
Fund									
Capital	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986
Surplus on donated capital	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935
Surplus on revaluation of assets	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445
Net earning for the year	3,390,624,153	3,265,878,928	3,092,779,735	3,086,661,261	3,151,059,555	3,220,834,861	3,293,007,769	3,366,351,424	3,441,228,774
Reserve for expansion	6,514,936,377	7,929,935,936	8,975,057,182	9,961,746,697	10,952,475,301	11,960,820,558	12,991,487,715	14,045,250,182	15,122,610,637
Total	10,756,861,756	11,717,116,320	12,589,098,343	13,572,269,384	14,624,809,282	15,702,915,849	16,805,756,850	17,933,263,032	19,085,100,838
Gain (loss) on									
Deferred exchange rate on	0	0	0	0	0	0	0	0	0
Loss on exchange rate on Loan	0	0	0	0	0	0	0	0	0
Total gain (loss)	0	0	0	0	0	0	0	0	0
Total Fund	10,756,861,756	11,717,116,320	12,589,098,343	13,572,669,384	14,624,809,282	15,702,916,849	16,805,756,850	17,933,263,032	19,085,100,838
Total Liabilities & Fund	11,082,016,037	12,036,313,980	12,902,339,382	13,879,553,802	14,926,137,079	15,998,288,025	17,096,841,428	18,224,347,510	19,376,185,416

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Assets											
Current assets											
Cash and Account Receivable	13,863,752,712	15,146,104,735	16,456,547,737	17,224,541,399	18,628,403,761	20,117,243,379	21,663,419,276	23,259,192,384	24,901,150,342	26,621,833,217	28,405,155,787
Current other assets	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843
Total current assets	15,006,013,555	16,288,365,578	17,598,808,581	18,356,802,853	19,770,664,601	21,259,501,222	22,805,680,119	24,400,453,227	26,043,411,185	27,764,094,060	29,547,417,631
Land, Building and Facilities (incl. under construction)	5,333,813,959	5,256,931,158	5,180,048,357	5,327,395,035	5,650,512,235	5,573,629,435	5,496,746,634	5,428,983,457	5,369,365,306	5,292,482,505	5,215,599,704
Other assets	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292
Dues receivable	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total assets	20,555,518,812	21,760,985,035	22,994,546,236	24,309,888,447	25,636,869,097	27,048,824,915	28,518,118,011	30,044,207,541	31,628,467,749	33,272,267,823	34,978,708,592
Liabilities & Fund											
Current Liabilities											
Voucher payable	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893
Loan due within 1 year	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819
Accruals	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420
Deposits	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681
Refundable deposits	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150
Other creditors	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649
Total current liabilities	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613
Long term debt	0	0	0	0	0	0	0	0	0	0	0
Confiscated goods fees	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total liabilities	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578
Fund											
Capital	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986
Surplus on donated capital	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935
Surplus on revaluation of assets	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445
Net earning for the year	3,519,358,962	3,595,669,117	3,680,635,181	3,818,172,338	3,923,336,640	4,079,825,869	4,243,574,687	4,411,720,718	4,581,229,896	4,761,076,403	4,943,972,723
Reserve for expansion	16,223,803,845	17,350,001,911	18,591,565,759	19,679,370,104	20,901,385,253	22,156,657,041	23,462,197,719	24,920,141,219	26,231,591,849	27,539,815,415	29,222,359,861
Total	20,264,434,233	21,469,900,456	22,703,461,658	24,018,803,869	25,345,783,519	26,757,740,336	28,227,033,432	29,753,123,363	31,337,383,171	32,981,183,245	34,687,621,014
Gain (loss) on											
Deferred exchange rate on	0	0	0	0	0	0	0	0	0	0	0
Loss on exchange rate on Loan	0	0	0	0	0	0	0	0	0	0	0
Total gain (loss)	0	0	0	0	0	0	0	0	0	0	0
Total Fund	20,264,434,233	21,469,900,456	22,703,461,658	24,018,803,869	25,345,783,519	26,757,740,336	28,227,033,432	29,753,123,363	31,337,383,171	32,981,183,245	34,687,621,014
Total Liabilities & Fund	20,555,518,812	21,760,985,034	22,994,546,236	24,309,888,447	25,636,868,097	27,048,824,914	28,518,118,010	30,044,207,541	31,628,467,749	33,272,267,823	34,978,708,592

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Assets										
Current assets										
Cash and Account Receivable	30,252,515,920	32,165,792,788	33,522,059,442	35,514,048,372	37,615,283,865	39,791,181,331	42,042,463,813	43,787,096,499	46,148,306,385	49,330,415,427
Current other assets	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843	1,142,260,843
Total current assets	31,394,776,764	33,308,053,632	34,664,320,285	36,656,309,215	38,757,521,708	40,933,442,174	43,184,724,656	44,929,357,342	47,290,567,228	50,472,676,270
Land, Building and Facilities (incl. under construction)	5,138,416,907	5,061,834,102	5,509,180,741	5,540,418,554	5,463,614,363	5,385,731,962	5,309,819,162	5,817,131,011	5,740,245,210	4,952,435,137
Other assets	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292	140,944,292
Dues receivable	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total assets	36,749,184,925	38,585,578,991	40,389,192,284	42,412,419,037	44,436,830,729	46,535,865,394	48,710,255,075	50,952,179,611	53,246,506,696	55,640,772,665
Liabilities & Fund										
Current Liabilities										
Voucher payable	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893	70,818,893
Loan due within 1 year	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819	6,157,819
Accruals	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420	37,084,420
Deposits	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681	50,694,681
Refundable deposits	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150	13,762,150
Other creditors	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649	37,819,649
Total current liabilities	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613	216,337,613
Long term debt	0	0	0	0	0	0	0	0	0	0
Confiscated goods fees	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966	74,746,966
Total liabilities	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578	291,084,578
Fund										
Capital	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986	260,124,986
Surplus on donated capital	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935	176,297,935
Surplus on revaluation of assets	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445	84,838,445
Net earning for the year	5,132,377,784	5,326,410,960	5,525,572,745	5,680,655,220	5,887,205,441	6,102,331,365	6,323,987,050	6,552,225,729	6,733,850,581	6,977,357,581
Reserve for expansion	30,821,461,135	32,446,822,027	34,151,773,531	35,919,456,813	37,737,279,283	39,621,185,024	41,573,932,021	43,597,607,877	45,591,320,111	47,851,069,035
Total	36,458,100,346	38,294,494,113	40,118,107,706	42,121,413,459	44,145,746,151	46,244,780,816	48,419,180,497	50,671,095,033	52,955,422,117	55,349,693,997
Gain (loss) on										
Deferred exchange rate on	0	0	0	0	0	0	0	0	0	0
Loss on exchange rate on Loan	0	0	0	0	0	0	0	0	0	0
Total gain (loss)	0	0	0	0	0	0	0	0	0	0
Total Fund	36,458,100,345	38,294,494,113	40,118,107,706	42,121,413,459	44,145,746,151	46,244,780,816	48,419,180,497	50,671,095,033	52,955,422,117	55,349,693,997
Total Liabilities & Fund	36,749,184,924	38,585,578,991	40,409,192,284	42,412,498,037	44,436,830,729	46,535,865,394	48,710,265,075	50,962,179,611	53,246,506,695	55,640,772,565

Profit & Loss Statement (Bangkok Port only)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Operating Revenue	5,377,026,307	5,164,366,551	4,882,245,687	4,963,650,130	4,936,761,065	4,909,857,426	4,882,950,303	4,856,041,257	4,829,137,618
Operating expenses									
Personnel Cost	1,454,423,197	1,454,423,197	1,454,423,197	1,448,570,497	1,443,162,727	1,437,291,938	1,431,252,842	1,425,061,853	1,416,687,235
Maintenance, Repair & Fuel	265,870,861	218,964,066	223,633,105	235,329,125	234,529,393	235,069,314	235,271,423	235,611,355	236,059,452
Administration & others	218,153,489	218,153,489	218,153,489	217,330,605	215,474,499	215,594,240	214,589,926	213,759,278	212,803,095
Loss from exchange rate on Loan	-44,926	44,926	-44,926	44,926	44,926	44,926	44,926	-44,926	-44,926
Depreciation	434,430,937	434,430,937	434,430,937	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Total operating expenses	2,372,833,548	2,355,035,351	2,336,695,392	2,423,296,301	2,416,242,831	2,409,624,712	2,402,859,552	2,396,193,259	2,389,236,075
Net operating revenues	3,004,182,759	2,809,329,800	2,545,610,895	2,540,473,429	2,520,521,282	2,500,230,714	2,480,065,341	2,459,935,497	2,439,901,572
Other revenues									
Interest earned	293,244,017	397,220,608	459,831,126	455,932,236	549,262,014	630,107,300	722,030,009	816,664,895	910,361,243
Profit (Loss) on sales of fixed assets	0	-31,421,000	0	0	0	0	0	0	0
Non trading revenues	106,902,524	103,576,320	99,163,720	101,757,239	101,116,969	100,695,125	100,504,711	99,851,449	99,433,537
Total	400,146,521	469,375,928	559,994,846	557,689,475	641,378,982	730,802,425	822,534,711	915,913,936	1,010,394,813
Net operating revenues and other revenues	3,404,329,280	3,278,705,728	3,104,635,741	3,098,142,904	3,161,900,263	3,231,033,139	3,302,595,051	3,375,854,833	3,450,296,412
Less Non-trading expenses	8,686,713	8,803,387	8,428,916	8,550,215	8,591,912	8,559,171	8,512,909	8,487,627	8,451,855
Interest paid on loan	4,618,414	4,022,752	3,427,090	2,831,428	2,235,765	1,640,104	1,044,442	615,782	615,782
Total	13,305,127	12,826,139	11,856,006	11,381,643	10,830,705	10,199,274	9,557,351	9,103,409	9,067,638
Net earning	3,390,624,153	3,265,878,928	3,092,779,735	3,086,661,261	3,151,059,555	3,220,834,861	3,293,007,769	3,366,351,424	3,441,228,774

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Operating Revenue	4,802,230,474	4,725,324,428	4,748,417,339	4,772,379,525	4,887,359,556	4,812,423,822	4,937,460,123	4,912,473,554	4,943,504,420	4,987,560,721	5,017,559,351
Operating expenses											
Personnel Cost	1,412,134,128	1,405,392,534	1,398,472,365	1,391,353,132	1,384,034,731	1,376,519,354	1,368,777,322	1,360,825,737	1,352,653,537	1,344,251,486	1,335,614,178
Maintenance, Repair & Fuel	236,690,692	237,496,307	238,762,025	238,762,025	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026
Administration & others	211,820,119	210,803,630	209,770,847	208,702,978	207,605,219	206,476,703	205,316,549	204,124,031	202,859,030	201,632,723	200,312,127
Loss from exchange rate on Loan	-44,926	-44,926	44,926	-44,926	44,926	44,926	44,926	44,926	44,926	-44,926	-44,926
Depreciation	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Total operating expenses	2,382,321,233	2,375,380,365	2,368,681,463	2,360,491,410	2,352,078,241	2,343,424,357	2,334,532,222	2,325,394,046	2,315,989,867	2,306,327,594	2,296,394,805
Net operating revenues	2,419,919,255	2,399,944,082	2,379,736,356	2,411,885,055	2,455,318,715	2,495,937,455	2,542,927,902	2,587,038,506	2,611,511,553	2,676,213,212	2,721,163,546
Other revenues											
Interest earned	1,009,258,851	1,109,300,217	1,211,668,379	1,316,523,819	1,377,563,305	1,450,272,391	1,609,379,479	1,733,073,542	1,850,655,391	1,992,092,027	2,129,745,657
Profit (Loss) on sales of fixed assets	0	0	0	0	0	0	0	0	0	0	0
Non trading revenues	99,242,183	99,591,912	98,171,069	98,775,132	99,093,551	99,641,454	100,418,884	100,737,106	101,264,356	102,062,236	102,380,655
Total	1,108,501,074	1,207,892,123	1,309,859,415	1,415,299,951	1,477,056,855	1,599,913,705	1,709,798,159	1,833,810,848	1,951,919,747	2,094,154,263	2,232,127,315
Net operating revenues and other revenues	3,528,420,337	3,607,836,211	3,689,595,801	3,827,184,006	3,932,375,574	4,095,911,170	4,252,726,057	4,420,639,154	4,593,454,893	4,770,367,475	4,953,290,861
Less Non-trading expenses	8,435,565	8,388,313	8,344,541	8,395,855	8,422,952	8,469,519	8,535,585	8,562,654	8,609,221	8,675,290	8,702,359
Interest paid on loan	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782
Total	9,051,357	8,996,034	8,960,323	9,011,688	9,038,734	9,085,301	9,151,370	9,178,436	9,225,003	9,291,072	9,318,138
Net earning	3,519,358,962	3,595,669,117	3,680,635,181	3,818,172,338	3,923,336,640	4,079,825,869	4,243,574,687	4,411,720,718	4,581,229,896	4,761,076,403	4,943,972,723

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Operating Revenue	5,052,585,018	5,087,621,319	5,122,638,750	5,157,665,617	5,192,691,918	5,227,718,349	5,262,716,216	5,297,782,517	5,332,799,918	5,367,826,815
Operating expenses										
Personnel Cost	1,326,735,025	1,317,597,257	1,308,223,518	1,298,577,830	1,288,661,660	1,278,463,837	1,267,968,587	1,257,215,318	1,246,141,611	1,234,757,220
Maintenance, Repair & Fuel	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026	238,762,026
Administration & others	199,010,251	197,641,049	196,233,587	194,786,675	193,249,243	191,770,176	190,128,293	188,542,384	186,921,292	185,213,581
Loss from exchange rate on Loan	-44,926	44,926	-44,926	44,926	-44,926	44,926	44,926	-44,926	-44,926	44,926
Depreciation	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Total operating expenses	2,285,183,580	2,275,695,646	2,264,895,798	2,253,802,806	2,242,335,219	2,230,576,313	2,218,625,176	2,206,235,606	2,193,591,157	2,180,509,615
Net operating revenues	2,766,401,438	2,811,934,673	2,857,742,952	2,903,862,811	2,950,302,708	2,997,043,036	3,044,121,040	3,091,515,911	3,139,233,791	3,187,412,200
Other revenues										
Interest earned	2,272,412,593	2,420,201,274	2,573,263,423	2,681,364,755	2,841,123,870	3,009,221,103	3,183,234,596	3,363,397,105	3,502,967,720	3,691,861,511
Profit (Loss) on sales of fixed assets	0	0	0	0	0	0	0	0	0	0
Non trading revenues	102,928,505	103,705,763	104,024,210	104,572,060	105,349,339	105,657,752	106,215,612	106,992,831	107,311,313	107,859,164
Total	2,375,341,051	2,523,907,064	2,677,287,833	2,786,336,815	2,946,473,209	3,114,899,871	3,289,510,118	3,470,389,936	3,610,279,033	3,799,722,675
Net operating revenues and other revenues	5,141,742,489	5,335,841,724	5,535,030,586	5,690,199,627	5,896,775,917	6,111,931,907	6,333,631,159	6,561,935,307	6,749,517,824	6,987,141,875
Less Non-trading expenses	8,748,923	8,814,992	8,842,058	8,888,625	8,954,691	8,981,760	9,028,327	9,094,335	9,121,462	9,158,021
Interest paid on loan	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782
Total	9,364,705	9,430,774	9,457,840	9,504,407	9,570,476	9,597,542	9,644,109	9,710,178	9,737,244	9,773,811
Net earning	5,132,377,784	5,326,410,960	5,525,572,745	5,680,655,220	5,887,205,441	6,102,331,365	6,323,987,050	6,552,225,729	6,733,850,581	6,977,357,581

Cash Flow Statement (Bangkok Port only)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Cash Beginning	3,655,559,208	4,965,257,595	5,747,889,075	5,698,777,950	6,753,275,171	7,876,341,248	9,025,374,395	10,200,811,200	11,387,015,532
Cash Inflow									
Net Operating Revenue	3,004,182,759	2,809,329,800	2,545,610,895	2,540,473,429	2,520,521,282	2,500,230,714	2,480,065,341	2,459,935,497	2,439,901,572
Depreciation	434,430,937	434,430,937	434,430,937	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Long-term loan	0	0	0	0	0	0	0	0	0
Non-trading revenue	106,902,524	103,576,320	99,163,720	101,757,239	101,116,969	100,695,125	100,504,711	99,851,449	99,433,547
Fund management income	293,244,017	397,220,608	459,831,126	455,932,236	549,262,014	630,107,300	722,030,009	816,664,836	910,361,243
Cash inflow total	3,838,760,237	3,744,557,664	3,539,055,678	3,619,884,105	3,692,621,451	3,752,755,333	3,824,315,252	3,897,576,031	3,972,057,613
Cash Outflow									
Investment	565,553,400	637,518,400	1,348,587,454	444,838,400	444,838,400	444,838,400	444,838,400	453,023,056	444,838,400
Loan Repayment	5,956,620	5,956,621	5,956,621	5,956,621	5,956,621	5,956,621	4,286,598	0	0
Interest on loan	4,618,414	4,022,752	3,427,090	2,831,428	2,235,765	1,640,104	1,044,442	615,782	615,782
Non-trading expense	8,686,713	8,803,387	8,428,916	8,550,215	8,591,912	8,559,171	8,512,909	8,487,627	8,451,856
Contribution to Gov't	1,741,197,073	2,034,374,852	1,959,527,353	1,855,667,811	1,851,536,756	1,893,641,733	1,932,560,918	1,975,804,526	2,020,250,854
Bonus for commiss. & staff	232,155,610	271,249,932	261,270,319	247,422,379	245,332,301	252,085,564	257,688,789	263,440,613	269,349,114
Cash outflow total	2,539,052,830	2,961,926,184	3,588,177,823	2,565,365,884	2,569,555,336	2,603,721,593	2,649,480,918	2,710,371,702	2,743,237,008
Cash Ending	4,965,257,595	5,747,889,075	5,698,777,950	6,753,275,171	7,876,341,246	9,025,374,395	10,200,811,200	11,387,015,532	12,615,735,139
Cash Excess	4,965,257,595	5,747,889,075	5,698,777,950	6,753,275,171	7,876,341,246	9,025,374,395	10,200,811,200	11,387,015,532	12,615,735,139

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Cash Beginning	12,615,736,139	13,863,752,712	15,146,104,735	16,456,547,737	17,224,541,309	18,628,403,761	20,117,243,379	21,663,419,276	23,258,192,384	24,901,150,342	26,621,833,217
Cash Inflow											
Net Operating Revenue	2,419,919,255	2,399,944,082	2,379,736,356	2,411,885,055	2,455,318,715	2,495,937,455	2,542,927,902	2,587,038,505	2,611,511,553	2,676,213,212	2,721,153,546
Depreciation	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Long-term loan	0	0	0	0	0	0	0	0	0	0	0
Non-trading revenue	99,242,183	99,591,912	98,171,069	98,775,132	99,093,551	99,641,454	100,418,884	100,737,106	101,281,936	102,062,236	102,380,655
Fund management income	1,009,258,851	1,109,300,217	1,211,668,379	1,316,523,819	1,377,563,305	1,450,272,391	1,609,379,479	1,733,073,542	1,850,655,391	1,992,092,027	2,129,745,657
Cash inflow total	4,050,141,533	4,123,357,412	4,211,317,005	4,348,905,207	4,454,698,775	4,610,832,373	4,774,447,259	4,942,620,355	5,115,176,200	5,292,683,676	5,475,612,062
Cash Outflow											
Investment	453,038,024	444,838,400	444,838,400	1,059,052,810	444,838,400	444,838,400	444,838,400	453,038,024	453,023,050	444,838,400	444,838,400
Loan Repayment	0	0	0	0	0	0	0	0	0	0	0
Interest on loan	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,722
Non-trading expense	8,435,565	8,388,313	8,344,541	8,395,855	8,422,952	8,469,519	8,535,585	8,562,654	8,609,221	8,675,290	8,702,359
Contribution to Gov't	2,064,737,265	2,111,421,327	2,159,184,070	2,208,381,289	2,259,593,403	2,359,652,184	2,447,835,521	2,516,144,812	2,647,032,431	2,759,597,038	2,856,845,642
Bonus for commiss. & staff	275,298,302	281,549,517	287,891,209	294,450,838	305,453,787	313,556,947	326,356,069	339,485,975	352,937,657	366,739,392	380,835,112
Cash outflow total	2,702,124,958	2,847,565,393	2,900,874,002	3,580,911,635	3,059,234,324	3,121,792,153	3,228,271,361	3,347,847,247	3,472,218,144	3,571,405,801	3,691,628,192
Cash Ending	13,863,752,712	15,146,104,735	16,456,547,337	17,224,541,399	18,628,403,761	20,117,243,375	21,663,419,276	23,258,192,384	24,901,150,342	26,621,833,217	28,405,158,787
Cash Excess	13,863,752,712	15,146,104,735	16,456,547,337	17,224,541,399	18,628,403,761	20,117,243,375	21,663,419,276	23,258,192,384	24,901,150,342	26,621,833,217	28,405,156,787

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cash Beginning	28,405,156,787	30,252,515,920	32,165,792,788	33,522,059,442	35,514,048,372	37,615,283,865	39,791,181,331	42,042,463,813	43,787,096,499	46,148,306,385
Cash Inflow										
Net Operating Revenue	2,766,401,438	2,811,934,673	2,857,742,952	2,903,862,811	2,950,302,708	2,997,043,036	3,044,121,040	3,091,515,911	3,139,233,791	3,187,412,200
Depreciation	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201	521,721,201
Long-term loan	0	0	0	0	0	0	0	0	0	0
Non-trading revenue	102,928,506	103,705,763	104,024,210	104,572,060	105,349,339	105,657,752	106,215,612	106,992,831	107,311,313	107,859,164
Fund management income	2,272,412,593	2,420,201,274	2,573,263,423	2,681,364,755	2,841,123,870	3,009,221,103	3,183,234,596	3,363,397,105	3,502,967,720	3,691,861,511
Cash inflow total	5,563,462,690	5,857,552,335	6,056,757,786	6,218,920,928	6,418,437,118	6,633,653,103	6,855,352,269	7,083,657,198	7,271,233,025	7,508,862,576
Cash Outflow										
Investment	444,832,400	444,838,400	1,059,067,810	453,038,024	444,838,400	444,838,400	444,838,400	1,021,093,050	444,825,400	-266,121,822
Loan Repayment	0	0	0	0	0	0	0	0	0	0
Interest on loan	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,782	615,722	615,782
Non-trading expense	8,748,923	8,814,932	8,842,058	8,888,625	8,954,694	8,981,760	9,028,327	9,094,335	9,121,462	9,158,021
Contribution to Gov't	2,964,333,531	3,079,476,670	3,195,316,576	3,315,743,667	3,408,417,132	3,572,323,265	3,661,490,513	3,793,332,230	3,931,335,433	4,043,974,343
Bonus for commiss. & staff	355,512,818	410,550,223	426,112,877	442,045,820	458,455,618	470,976,435	488,188,749	555,918,754	524,178,955	539,157,216
Cash outflow total	3,816,101,557	3,944,285,067	4,700,485,133	4,219,921,898	4,317,281,625	4,457,735,612	4,604,069,877	5,333,029,422	4,910,083,139	4,325,753,524
Cash Ending	30,252,515,920	32,165,792,788	33,522,059,442	35,514,048,372	37,615,283,865	39,791,181,331	42,042,463,813	43,787,096,499	46,148,306,385	49,330,415,427
Cash Excess	30,252,515,920	32,165,792,788	33,522,059,442	35,514,048,372	37,615,283,865	39,791,181,331	42,042,463,813	43,787,096,499	46,148,306,385	49,330,415,427

Financial Indicators

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Working Ratio (%)	44.13	45.60	47.85	48.82	48.94	49.08	49.21	49.34	49.46	49.51
Operating Ratio (%)	36.05	37.11	35.96	39.31	38.38	38.45	38.53	38.60	38.67	38.74
Rate of Ret. on Fix. Assets (%)	63.13	55.95	43.55	44.04	44.28	44.53	44.78	41.61	45.16	45.37

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Working Ratio (%)	49.74	49.68	49.46	48.93	48.33	47.85	47.34	46.81	46.23	45.77
Operating Ratio (%)	38.82	38.99	38.53	38.07	37.62	37.17	36.72	36.27	35.82	35.37
Rate of Ret. on Fix. Assets (%)	45.65	45.94	42.11	43.45	44.84	45.25	47.55	49.01	50.57	52.17

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Working Ratio (%)	45.25	44.73	44.21	43.70	43.18	42.67	42.15	41.64	41.13	40.62
Operating Ratio (%)	34.92	34.48	34.03	33.59	33.14	32.69	32.24	31.80	31.35	30.90
Rate of Ret. on Fix. Assets (%)	53.83	55.55	59.95	52.41	54.09	55.64	57.33	53.15	54.59	66.35

7.5 Sensitivity Analysis

Sensitivity analysis is made for the following three cases.

Case I: The revenues decrease by 10 %.
Case II: The project costs increase by 10 %.
Case III: The revenues decrease by 10 % and the project costs increase by 10 %.

The FIRR of each case is as shown in Table 7-5-1. The ratio of each case keeps a favorable level judging from the range of investing interest rates like those of bank deposits.

Table 7-5-1 FIRR Sensitivity Analysis

	Base Case	Case I	Case II	Case III
FIRR	9.3%	8.4%	8.5%	7.7%
Range of Interest Rate	6.0%-9.0% (See Table 7-3-3)			

7.6 Conclusion

Judging from the above analysis, this project is financially feasible in the base case.

Chapter 8 Proposals on Measures to Implement the Project

It is proposed to take the following measures to implement the project of the Short-Term Plan:

a. Both restructuring of management and operations systems and investment in necessary physical facilities in Bangkok Port shall be put emphasis on and be implemented simultaneously.

b. The purpose of modernization of Bangkok Port is not to increase cargo throughput but to upgrade service levels of port services for its port users. The required amount of the investment is moderate judging from an average income level of PAT. Those points shall be well acquainted to the authorities concerned.

c. The port tariff is proposed to be raised slightly to cover some portion of the capital investment. In other words, the proposed increase rate is considered to be conservative compared with the benefits for the port users generated from the project. That point shall be understood by the port users.

d. Knowhow to control the container terminal under the closed terminal system shall be obtained by PAT through employment of competent yard planners along with cooperation with private companies as port users. Even in the transitional period when PAT will operate a part of the marshaling yard, it is essential that PAT take full responsibility of container-handling at that terminal.

APPENDIX

Appendix 1 Economic Analysis

A.1.1 Economic Internal Rate of Return

The internal rate of return is expressed as a discount ratio satisfying the following equation:

$$\sum_{i=1}^{n} \frac{B_i - C_i}{(1+r)^{i-1}} = 0$$

where, n : Period of cost-benefit analysis
Bi: Benefits in i-th year
Ci: Costs in i-th year
r : Discount rate (EIIR)

The benefits are calculated by comparing "With-the-project Case" and "Without-the project Case" where no investment is made.

A.1.2 Economic Pricing

(1) Methodology

Most of the collected data which are used to calculate the benefits and costs are generally expressed in market prices. The labour cost at market prices is often influenced by a minimum wage system. The local currency portion of the goods and materials at market prices often include customs duties. Therefore, in the economic analysis, market prices must be converted into economic prices which represent the true costs from the viewpoint of the national economy.

There are several ways to make the above conversion from market prices to economic prices. In this study, the market prices of domestic goods and services are converted into border prices which represent the international market value of these goods and services.

When the market prices are converted, various conversion factors such as "Standard Conversion Factor", "Conversion Factor for Consumption" and "Conversion Factor for Skilled/Unskilled Labour" as mentioned below are used.

(2) Exclusion of Transfer Items

Import duties and other taxes must be excluded from the economic costs or benefits of development. The tax on materials, for example, is a financial cost to those who pay the tax, but it does not necessarily reflect any economic cost to the country as a whole, for an increase in the tax does not mean that more economic resources are required to produce a given volume of material.

(3) Method of Applying Conversion Factors

Generally, all benefits and costs are divided into labour, traded goods and non-traded goods. Labour is further divided into skilled labour and un-skilled labour.

The economic cost of skilled labour is obtained by multiplying its market price by the conversion factor (CFC) and the economic cost of unskilled labour is calculated by multiplying its market price by a ratio of the shadow wage rate and the CFC.

Traded goods are expressed by the CIF value for imports and by the FOB for exports. As for non-traded goods, the economic price is calculated by multiplying the Standard Conversion Factor (SCF).

(4) Calculation of the Conversion Factor (SCF)

1) Standard Conversion Factor (SCF)

Economic policy items such as import duties cause a price differential between the domestic market and international market. The SCF is applied to determine the economic prices of certain non-trade goods and services that can not be directly valued at border prices.

The SCF is obtained using the following equation:

$$SCF = \frac{I+E}{I+Di+E-De}$$

where, I : Total value of imports
E : Total value of exports
Di: Total value of import duties
De: Total value of export duties

The SCF for the four years from 1988 to 1991 are listed in Table A-1-1. In this study, the mean value for the four year period is used. Thus, the SCF has a value of 0.945.

Table A-1-1 Standard Conversion Factors (SCF)

Unit: Million Baht

Item	1988	1989	1990	1991	1988-1991
Import(CIF)	513,114	662,679	844,448	958,832	2,979,073
Export(FOB)	403,570	516,315	589,813	725,630	2,235,328
Import Duties	58,664	71,173	93,218	82,809	305,864
Export Duties	870	412	69	9	1,360
SCF	0.941	0.943	0.939	0.953	0.945

2) Conversion Factor for Consumption (CFC)

This factor is used for converting the prices of consumer goods from domestic to international prices. This is particularly required to convert domestic labour prices to the corresponding international prices. The CFC is usually calculated in the same manner as the SCF, replacing total imports and total exports by imports and exports of consumer goods only. The value of foreign trade for the main consumer goods and the value of their duties in 1991 are shown in Table A-1-2. According to these figures, the CFC comes to 0.839.

Table A-1-2 Conversion Factor for Consumption (CFC)

Unit: Million Baht

Total Import Value of Consumer Goods	79,218
Total Export Value of Consumer Goods	334,501
Total Value of Import Duties for Consumer Goods	35,702
Total Value of Export Duties for Consumer Goods	0
C F C	0.839

3) Shadow Wage Rate

For the economic analysis, labour costs are usually measured in terms of their opportunity costs, that is, the value of lost marginal production for other purposes arising from the employment of labours for a given project.

(a) Conversion Factor for Skilled Labour

The opportunity cost of skilled labour is assumed to be equal to the actual wage rate, since the number of skilled labours is limited and the market mechanism is functioning property. However, since these are domestic prices, they should be converted to border prices. Wages can be measured in terms of their purchasing power of consumer goods. Therefore, the cost of skilled labour is calculated by multiplying their actual wage rate by the CFC; namely, "the Conversion Factor of Skilled Labour" is estimated as 0.839 in this study.

Conversion Factor for Skilled Labour = (Opportunity Cost of Skilled Labour/ Nominal Wage Rate of Skilled Labour) x CFC = 1 x 0.839 = 0.839

(b) Conversion Factor for Unskilled Labour

The opportunity cost of unskilled labour is generally far below the actual wage rate, since the rate is controlled by a minimum wage system and other regulations, nevertheless there are many unskilled labours. In this study, the economic cost of unskilled labour is estimated based on a simplified measure of the opportunity cost considering the productivity of the agricultural sector.

The total GDP of the agricultural sector and the total number of agricultural workers are shown in Table A-1-3. Assuming that the number of working days for agricultural workers is 200 days per annum, the opportunity cost is estimated as 70.1 Baht/day (at 1988 prices). On the other hand, the wage which is paid to unskilled labour in this project is 97 Baht/day (at 1988 prices).

Therefore, the conversion factor for unskilled labour is calculated as follows:

Conversion Factor for Unskilled Labour = (Opportunity Cost/Nominal Wage) x CFC = (70.1 Baht/day / 97.0 Baht/day) x 0.839 = 0.606

Table A-1-3 Opportunity Cost of Agricultural Workers

Item	Unit	1989	1990
1. Total GDP of Agricultural Sector (at 1988 prices)	Mil. Baht	276,729	266,414
2. Total Number of Agricultural Workers	Mil. persons	19.48	19.25
3. Opportunity Cost (at 1988 prices)	Baht/day	71.0	69.2

A.1.3 Construction Cost

Table A-1-4 Construction Costs divided into foreign and local portions

Unit: Million Baht

East Quay Facilities Description	Construction Cost (Market prices)	Foreign Portion	Local Portion				Total Economic Price
			Non Traded Goods	Skilled Labour	Unskilled Labour	Total	
1. Container Yard Demolish	4.98	2.82	0.10	0.74	0.82	1.66	4.03
on Existing Shed Slab Beam	58.03	28.54	22.05	1.50	0.90	24.45	51.18
2. RTG Passing Way	17.39	8.07	7.30	0.39	0.21	7.90	15.42
3. Container Yard (Paving)	88.47	34.16	44.23	2.15	1.90	48.28	78.91
4. RTG Repair area	2.20	0.85	1.10	0.05	0.05	1.20	1.96
5. Road Improvement Demolish	0.08	0.04	0.01	0.01	0.01	0.03	0.06
Improve	1.04	0.43	0.48	0.02	0.03	0.53	0.92
6. Checking Post 1	4.94	2.56	1.73	0.13	0.07	1.93	4.35
7. Checking Post 2	2.34	1.15	0.89	0.06	0.04	0.99	2.07
8. Checking Post 3	5.53	2.86	1.94	0.15	0.08	2.17	4.87
9. Terminal Office	8.63	4.75	2.59	0.26	0.19	3.04	7.53
10. Utilities Drainage	13.84	6.73	4.75	0.59	0.58	5.92	12.07
Eletrical	6.43	3.85	1.28	0.33	0.29	1.90	5.51
11. Reefer Container Demolish	0.24	0.13	0.01	0.03	0.05	0.09	0.19
Facilities Facilities	5.14	3.41	0.74	0.26	0.13	1.13	4.41
12. Gas Station	5.50	3.09	1.58	0.16	0.12	1.86	4.79
13. Others	2.20	1.32	0.41	0.08	0.12	0.61	1.85
Sub-Total	226.98	104.76	91.19	6.91	5.59	103.69	200.12
West Quay Facilities							
1. Maintenance Shop Building	14.79	8.72	3.75	0.45	0.33	4.53	12.84
Pavement	4.49	1.73	2.24	0.11	0.10	2.45	4.00
2. Cleaning Area	5.37	2.09	2.58	0.13	0.11	2.82	4.70
3. Main Road	23.08	8.92	11.53	0.56	0.50	12.59	20.59
4. Main Gate	7.45	3.67	2.83	0.19	0.13	3.15	6.58
5. Empty Container Gate 2,3	1.79	0.88	0.67	0.05	0.03	0.75	1.57
Yard Gate Gate 1	1.08	0.54	0.40	0.03	0.02	0.45	0.96
6. Fence	5.86	3.34	1.45	0.25	0.23	1.93	5.06
7. Demolish Building	11.92	6.77	0.23	1.77	1.96	3.96	9.66
8. Pavement(Demolished Area)	34.16	13.20	17.04	0.86	0.73	18.63	30.47
9. Parking Lot	16.88	8.61	5.82	0.42	0.36	6.60	14.68
10. Container Yard Repairing	2.37	0.54	1.03	0.22	0.25	1.50	1.85
11. Building	39.75	21.86	11.70	1.35	0.98	14.03	34.64
12. Utilities Drainage	4.91	2.38	1.69	0.21	0.21	2.11	4.28
Electrical	11.90	6.54	2.67	0.84	0.70	4.21	10.19
13. Modification Shed No1~No9	3.99	1.91	1.55	0.10	0.09	1.74	3.51
14. Modification Bridge	1.49	0.68	0.56	0.05	0.08	0.69	1.30
15. Modification Shed No13,14	22.50	10.12	8.89	0.89	0.81	10.59	19.76
16. Demolish Crane	0.23	0.11	0.02	0.04	0.04	0.10	0.19
Sub-Total	213.99	102.61	76.65	8.52	7.66	92.83	186.83
Construction cost	440.97	207.37	167.84	15.43	13.25	196.52	386.95
Engineering Fee	44.10	22.05		22.05		22.05	40.55
Physical Contingecy	44.10	20.68	16.88	1.55	1.34	19.77	38.74
Vat	37.04						
Total Construction	566.21	250.10	184.72	39.03	14.59	238.34	466.25
Equipment							
1. Rubber Tyred Gantry Crane	549.90	423.00	0.00	0.00	0.00	0.00	423.00
2. Computer Terminal	7.44	5.72	0.00	0.00	0.00	0.00	5.72
3. Package Soft-Ware	16.50	16.50	0.00	0.00	0.00	0.00	16.50
Sub-Total	573.84	445.22	0.00	0.00	0.00	0.00	445.22
Physical Contingecy	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Engineering Fee	17.22	15.50	0.00	1.72	0.00	1.72	16.94
VAT	41.37						0.00
Total Equipment	632.43	460.72	0.00	1.72	0.00	1.72	462.16
T o t a l	1198.64	710.82	184.72	40.75	14.59	240.06	928.41

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