13.2 Design of Facilities

13.2.1 Import CFS Sheds

As explained in Chapter 10, two(2) new import CFS sheds are required to be built. Each shed has the dimensions of 150 m in length and 50 m in width, with 6 m deep canopy on stripping side and 14 m deep canopy on delivery side. These canopy-covered areas function as working space even under rainy weather. The shed has 12 doors on both sides and each door is 5 m wide and 5 m high. Each shed has the floor area of 7500 m^2 for cargo store, including 600 m^2 of damaged and valuable cargo store and 300 m^2 of operators' and customs office space. This office consists of two(2) floors; the ground floor provides workers' refreshment room and toilets, and the upper floor provides operators' and customs office room. The floor level of this shed is 1.3 m above ground elevation in order to facilitate cargo handling from/to trucks and the minimum clear height inside the shed is 5.5 m.

The shed consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminum box-rib sheet roof with transparent PVC panel and reinforced concrete floor slab.
The floor slab is designed to be able to store the cargoes of 3 ton/m2. The columns and floor slab of this shed are supported by the concrete piles, since poor subsoil condition.

The floor plan and elevation of this shed are shown in Fig. 13-2-1.

13.2.2 Export CFS Sheds

Three(3) new export CFS sheds are required to be built. The dimensions of this shed are 180 m in length and 50 m in width, with 6 m deep canopy on stuffing side and 14 m deep canopy on receiving side. The shed has 16 doors of 5 m wide and 5 m high on both sides and has the floor area of 9000 m^2 for cargo store, including 600 m^2 of damaged and valuable cargo store and 300 m^2 of operators' and customs office space. The floor for cargo storage is designed to be able to store the cargoes of 3 ton/m^2.

The structural pattern of this shed is same as the Import CFS shed mentioned above. The floor plan and elevation of this shed is presented in Fig. 13-2-1.

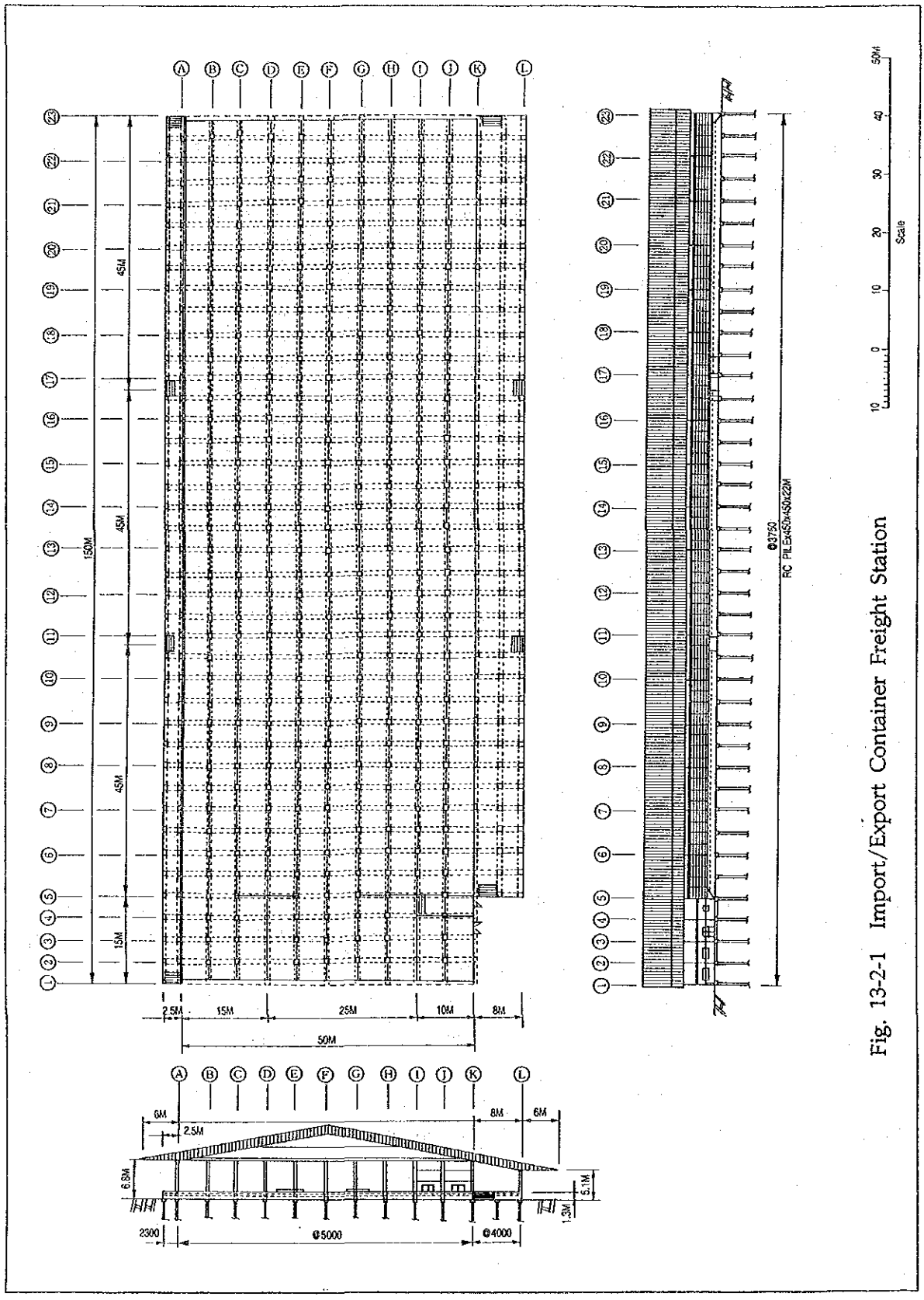


Fig. 13-2-1 Import/Export Container Freight Station

13.2.3 Container Yard around CFS Sheds

The container yard around Import CFS sheds and Export CFS sheds has a space of approximately 153,000 m^2. The yard is required to bear the surcharge of 3.0 ton/m^2. Based on the existing soil data, however, the subsoil around here is very soft clay and the settlement due to surcharge is estimated to be 110 cm. Therefore, the soil improvement by vertical drain method is recommended prior to execute the yard pavement.

There are three(3) types of pavement, namely, asphalt pavement, concrete pavement and concrete block pavement. The asphalt pavement and concrete block pavement are preferable for relatively poor subsoil and the concrete pavement is applied for good subsoil. In this design, it is recommended that the poor subsoil is improved first by using the vertical drain of plastic cardboard before the concrete pavement for tractor/trailer for 40'container is applied.

The profile of container yard pavement around CFS sheds is illustrated in Fig. 13-2-2.

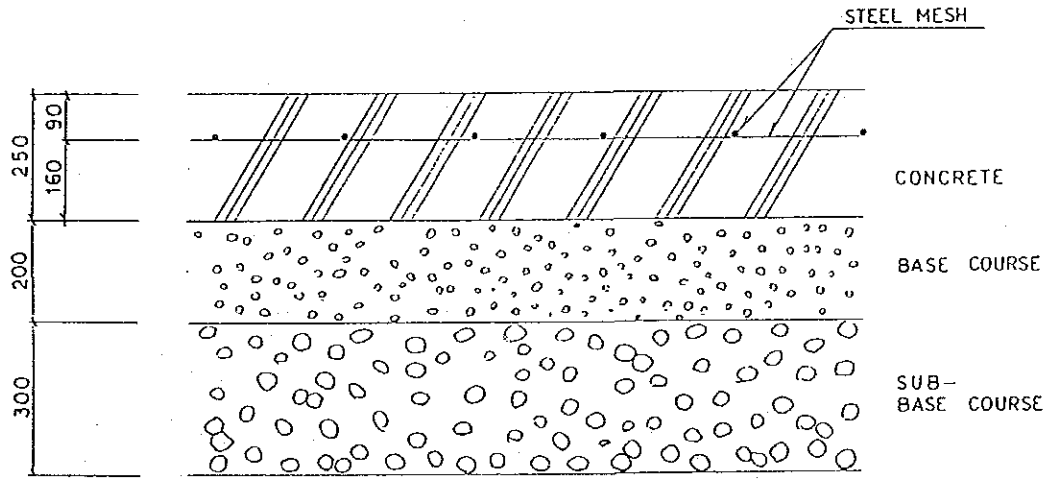


Fig. 13-2-2 Pavement of Container Yard around CFS Sheds

13.2.4 Maintenance Shop

This maintenance shop is planned mainly for the repairing of containers but also the minor repairing of forklifts, chassis, top loaders, etc. can be available. The maintenance shop has the dimension of 50 m in length and 30 m in width, and a spare parts store,

battery room and locker room for mechanics are provided in this shop. Minimum clear height inside the main-tenance shop is 6 m.

The shed consists of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminum box-rib sheet roof with transparent PVC panel and reinforced concrete floor slab.
The floor slab is designed to be able to support the equipment of 3 ton/m2.
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. Details about this open area is explained in 13.2.5 below.

The floor plan and elevation of this shop is presented in Fig.13-1-3.

13.2.5 Container Cleaning Area and Maintenance Open Area

The container cleaning area and maintenance open area are the trapezoid shape having the space of 3430 m^2 and 3750 m^2 respectively. The concrete pavement for tractor/trailer for 40'container is adopted in these areas and the closed drainage systems are 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.

13.2.6 Container Terminal Gate in West Quay

(1) Gates for Container Freight Station

One(1) gate for the import CFS and one(1) gate for the export CFS are located as shown in the Master Plan. The width of these gates is 20 m and the gate consists of sliding type doors made of steel and guard house made of reinforced concrete.

(2) Gates for Empty Container Storage Yard

Three(3) gates for the empty container storage yards are planned to be provided as shown in the Master Plan. The gate No.1 comprises a gate canopy which covers 4 traffic lanes, 2 lanes each for incoming and outgoing lanes, and a check room. The gate No.2 and No.3 comprises a gate canopy which covers 2 traffic lanes, 1 lanes for incoming and 1 lanes for outgoing lanes and a check room.

The canopy has the clear height of 4.2 m from the road level and is made of reinforced concrete columns and flat slab. The check room has a space of 25 m^2 and is made of reinforced concrete.

13.2.7 Container Yards 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. The existing buildings are supported by reinforced concrete foundation piles since subsoil there was very poor. The present subsoil conditions were checked by this study team in May 1993 and it was confirmed that the subsoil under the buildings was still very soft.

This container yard is required to bear the surcharge of 3.0 ton/m^2. Based on the subsoil data, the settlement due to surcharge is estimated to be approximately 50 cm. Therefore, some counter measures against the soft subsoil are necessary to built the container yard here. Following two(2) counter measures are considered the most practical, namely;

Method 1 is to improve the soft subsoil by the vertical drain of plastic card boards and after then ordinary concrete pavement is provided.

Method 2 is to utilize the existing reinforced concrete piles as it is. 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/m2 or the concentrated load of transtainer or top loader, are installed on the existing reinforced concrete foundation piles. In this case, the vertical load on pile becomes heavier than the existing condition but the safety factor for bearing capacity of pile is still more than 2.0 and no problem is considered.

The conceptual plans of Method 1 and Method 2 are shown in Fig. 13-2-3.

Method 1 is more flexible to utilize that yard with the adjacent area than Method 2. However, as regard to the construction cost and construction period, Method 2 requires about 10 % less cost and 6 months less time than Method 1. In this design, therefore, Method 2 is recommended.

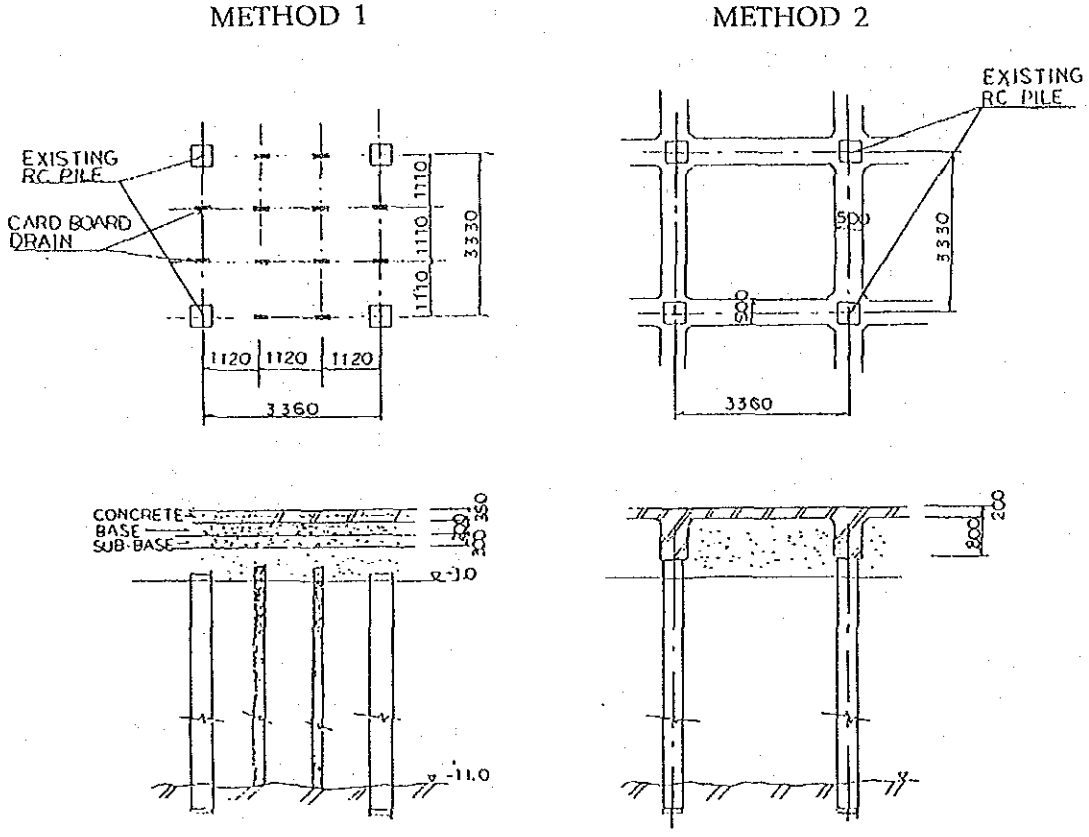


Fig. 13-2-3 Conceptual Plan of Method 1 and Method 2

(2) Surrounding Area of Existing Buildings

The surrounding area of existing cargo warehouse and transit sheds No.11 and No.12 has been used for open storage of containers or cargo handling equipment. 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.

13.2.8 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 R.T.G(4+1), and one(1) area has the dimension of 25 m in length and 15 m in width for 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.

13.2.9 Terminal Office Building

One (1) terminal office building is planned to be built for No.3 con-tainer terminal in the East Quay. The building is three(3) story reinforced concrete structure having the floor space of 600 m^2. This building com-prises container terminal operators' office room, *customs office room, workers' refreshment room, canteen and toilets etc.*

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

13.2.10 Container Terminal Gates

Gate 1 and Gate 2 both comprise of a gate canopy which covers 7 traffic lanes, 4 lanes for incoming traffic and 3 lanes for outgoing traffic, Gate 1 has 5 check rooms, 3 rooms for incoming traffic and 2 rooms for outgoing traffic while, Gate 2 has 7 check rooms, 4 rooms for incomming and 3 rooms for outgoing traffic, with an extra traffic lane without either a canopy nor check room for emergency passage. Gate 3 is the same as Gate 2 of the case 1.

The canopy has the clear height of 4.2 m from the road level and is made of reinforced concrete columns and flat slab. The canopy is mounted on the foundation supported by reinforced concrete piles.

At Gate 1 and Gate 3, 2 truck scales are installed at the incoming traffic lanes. At Gate 2, 3 truck scales has been installed already. The scale can measure the weight up to 80 tonnes.

13.2.11 *Bridge connecting East Quay and West Quay*

Existing road bridge connecting the east quay and the west quay consists of the four(4)

traffic lanes of 4.0 m wide each, a median strip of 1.0 m wide and 3.0 m wide sidewalks at both sides. The traffic capacity of this bridge is sufficient for the traffic demand of year 2005.

However, incoming traffic to Gate 3 should cross over the outgoing traffic lanes near the end of bridge. Therefore, it is assumed that traffic con-gestion will occur on this bridge. While, existing side walks are used scarcely and this situation will not change even in future.

Considering these conditions, the side walks of total 6.0 m in width is reduced to 2.5 m in width and remained 3.5 m is shifted to the incoming traffic lane.
By this modification, the loading condition for the prestressed concrete girders at both ends of bridge becomes more severe than the existing one but that new loading condition is still lower than that of middle girders.
Therefore, this bridge is structurally no problem, since the strength of end girder and middle girder is the same.

13.2.12 Main Port Road in West Quay

At present, there are three(3) main roads in the west quay, from the sea side, the first main road is outgoing traffic lane for heavy duty trucks, the second main road is two-way traffic lane for passenger cars and the third main road is in-coming traffic lane for heavy duty trucks. The traffic flow by this road network is not so smooth since the width and layout of roads around the Checking post 1 is not sufficient.

In order to improve the traffic flow, 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 sea side area of this trunk road will be used for transit cargo han-dling operations and the land side area will be used for the storage of over time cargoes, the stock yard of empty containers, the parking lots of handling equipment, etc.

13.2.13 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 each. 3 lanes are provided for outgoing traffic with the width of 4.0 m each.

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 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 con-crete. The canopy and check room are mounted on the same foundation sup-ported by reinforced concrete piles.

13.2.14 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 2800 m. This fence is made of concrete block wall of 2.8 m high and barbed wire on it up to the height of 3.3 m above ground level.

(2) Container Terminal Fence

This fence is installed at the boundary of each container terminal in the east quay and vcthe boundary of empty container storage yard in the west quay. This fence is made of wire netting with steel column and frame up to a height of 1.5 m above ground level.

13.2.15 Port Office Building

It is proposed in order to Improve the main port road that the existing offices in west side of the west quay are transferred to new complex building to be constructed the site of existing supplementary shed No.1 which is planned to be demolished.

The building is three (3) story reinforced concrete structure supported by RC piles.

The existing offices to be transferred to the new building are planned as follows.

Import Control & Immigration Office
Export Inspection Office
Harbor Service Division
Craft Service Section

13.2.16 Repair Shop and Office for Container Handling Equipment

Repair shop and office for container handling equipment in east quay is planned to be demolished, and the new repair shop and office building will be constructed in the area of demolished supplementary shed No.6

The shop with office has the dimension of 30 m in length and 25 m in width and minimum clear height is 6 m for inside, and 5 m for entrance door. The shop consist of steel columus and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminum box-rib sheet roof with transparent PVC panel and reinforced concrete floor slab. The columns and floor slab are supported by RC foundation piles.

The new office building for container handling equipment is planned to be built near the new repair shop. This building is two story reinforced concrete structure supported by RC foundation piles having the floor space of 900 m^2.

13.2.17 Parking Lots

Parking lot No.1 having a space of approximate 24000 m^2 is planned to be provided for passenger cars near the checking post No.1.

Parking lot No.2 (1) having the space of approximate 29300 m^2 will be prepared for trucks of ETO in the out side of customs fence along the Phra Kamong Canal,

Parking lot No.2 (2) for passenger cars and Parking lot No.2 (3) for trucks, having the space of approximate 22500 m^2 and 3100 m^2 respectively will be prepared in the out side of customs fence along the rail way near the checking post 2.

Parking lot No.3 having the space of approximate 13300 m^2 for trucks is planned to be provided behind the dangerous cargo storage yard.

It is considered that the subsoil condition in these areas are not so good but have an enough strength to build the parking lots for trucks without subsoil improvement. In future, however, the occurrence of settlement is inevitable. There fore, the asphalt pavement is recommended.

13.2.18 Vehicle Section Yard

Office and repair shops for vehicles will be transferred to new site in the out side of customs fence near the parking lot No.2 mentioned above.

This site has the space of approximate 46600 m^2. In this site, the office building, gas station, repair shops, canteen and parking yard for vehicles will be constructed.

The office building is reinforced concrete structure supported by RC foundation piles having the floor space of 1000 m^2.

Two repair shops have the dimension of 50 m in length and 30 m in width each, and a spare store, battery room and a locker room for mechanics are provided in each shop. The shops are made of steel columns and beams, concrete block wall with wire netting at the upper part, steel rolling shutter doors, aluminum box-rib sheet roof with transparent PVC panel and reinforced concrete floor slab supported by RC foundation piles. Trench type drainage is installed around the repair shops, 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 gas station has the space of 1200 m^2, and station office, parts store and fuel storage tanks are provided in this space.

13.2.19 Access Road and Additional Gate for Parking Lot No.2

The existing road of 580 m in length running along the rail-way near near checking post 2, planned to be widened to 20 m to way traffic lanes and 2 sidewalks. The traffic lanes are paved by asphalt concrete, and the sidewalks are paved by concrete blocks.

As explained in the Chapter 10, to connect Parking lot No.2 and the vehicle section yard with the port efficiently the short-cut, and additional gate on the customs fence will be constructed, and traffic signals are installed at the intersection.

The short-cut traffic is planned to be one way for incoming traffics only and the additional gate with a checking room (80 m^2) is installed at the port side of customs fence. The short-cut has two traffic lanes paved by asphalt concrete and the gate is made of steel frame.

13.2.20 Rail way yard

As explained in the Chapter 10, the railway operations in the east quay is planned to be transferred to the west quay.

It is necessary to installed one additional siding railway line of 110 m long along the existing siding railway line near the checking post 1.. Both sides of the new siding railway line are connected to the existing siding railway line.

13.2.21 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 in the port is conducted in this study.

A lighting system for the import and export CFS sheds and surrounding container yard, the container terminal No.3 in the east quay, the mainte-nance shop, the container terminal office, gate checking rooms, new roads and the parking area, and the power supply system for the maintenance shop and the reefer storage yards are provided.

(2) Water Supply

It is also 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 CFS sheds, the maintenance shop, the container cleaning area, the container terminal office and gate checking rooms.

The fire hydrant system is arranged for the CFS sheds, the maintenance shop and the container terminal office.

(3) Drainage System

A new drainage system is provided in the import and export CFS area, the container terminal No.3 in the east quay and the parking lots.

For the maintenance shop open area, the container cleaning area and RTG repair areas, the independent drainage systems with grease traps are con-structed.

13.3 Cost Estimates

The Project cost for the modernization of Bangkok Port is estimated based on the Master Plan presented in Chapter 10.

13.3.1 Basic Assumption for Cost Estimation

(1) Unit Price and Exchange Rate

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

(2) CFS Yards and Parking Lot

The expenses need for the proposed CFS and parking area before construction work is not included in this project cost.

(3) Demolish Work

It is assumed that demolished materials are not utilized for the new con-struction works and the cost for disposal of broken materials is not in-cluded in the Project cost. After demolished the buildings or facilities, the ground is recovered by the pavement suitable for use condition.

(4) Dredging Work

As recommended in Chapter 10, the straight part of the bar channel (0km to 3km and 7km to 18 km from river mouth) is planned to be widened from 100 m to 150 m. The required dredging volume is estimated at approximate 3.8 million m^3.

At present, the available dredgers of PAT for the dredging of bar channel are Sandon 4, 5, 6 and 7, but in near future it will be changed to Sandon 6, 7 and 8. Based on the result of maintenance dredging from 1990 to 1993, the dredging capacity of Sandon 6 and Sandon 7 were estimated at 0.5 and 2 million m^3/year respectively.
Since the new dredger Sandon 8 is a sister ship of Sandon 7, with an equal hopper capacity of 2,500 m^3, the total dredging capacity of three dredgers will be 4.5 million m^3/year.

On the other hand, the maintenance dredging volume were rainging from 3.01 m^3/year million to 6.62 million m^3/year during last 20 years.

Therefore, the proposed widening work will not be able to be done by the existing dredgers, and also, since the subsoil is hard silt, dredging will be difficult using the existing dredgers of PAT.

Thus, PAT has already planned to widen the bar channel from 100 m to 135 m by using the dredging contractor. Therefore, the widening work cost from 135 m to 150 m only is included in this project cost.

13.3.2 Construction/Procurement Cost

The Construction costs of civil and architectural works are estimated and summarized in Table 13-3-1 and the procurement costs of cargo handling equipment are presented in Table 13-3-2.

13.2.3 Project Cost

In addition to the construction and procurement costs, the engineering fee for the detailed design and construction supervision, the physical contingency, and VAT are estimated by this study. The contingency for price escalation is not included because it is difficult to predict this with accuracy, especially in the Long-range term, and therefore the price escalation is generally estimated just before the implementation of the project.

Table 13-3-1 Construction Cost (1)

* Budget by PAT : The budget allocation for the items has been completed by PAT.

East Quay				Unit Price	Cost	Budget by PAT
Description	Work Items	Unit	Quantity	Baht	Million B	Milliom B
1. Container Yard on Existing Shed	Demolishing Work	LS	1	4380000	4.98	
	Demolishing Warehouse	sq.m	5150	350	1.8	1.8
	RC Slab & Beam	sq.m	26620	2180	58.03	
Sub-Total					64.81	1.8
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	
Sub-Total					17.39	
3. Container Yard Paving without Existing Shed Area	Sub-Base & Base & Surface	sq.m	48300	1120	54.10	
					0.00	
	Base & Surface	sq.m	19000	1000	19.00	
	Base & Surface	sq.m	11500	1000	11.50	
	Surface	sq.m	4670	830	3.88	
Sub-Total					88.47	
4. RTG Repair Area						
		LS	1	2200000	2.20	
5. Road Improvement	Demolishing Walkway	sq.m	1170	70	0.08	
	Paving & Utilities	LS	1	1030000	1.03	
Sub-Total					1.11	
6. Terminal Gate 1						
		LS	1	4940000	4.94	
7. Terminal Gate 2						
		LS	1	2340000	2.34	
8. Terminal Gate 3						
		LS	1	5530000	5.53	
9. Terminal Office						
		LS	1	8630000	8.63	
10. Utilities for Container yard Facilities for Reefer Container	Drainage Work	m	3955	3500	13.84	
	Electrical Work	LS	1	9670000	9.67	3.24
	Demolishing Work	m	600	400	0.24	
	Construction New Facilities	LS	1	5141000	5.14	
Total					28.89	3.24
11.Other Facilities	Gas Station	Unit	1	5500000	5.50	
	Fence	m	1340	1800	2.41	
	Steel Gate	m	145	3900	0.57	
	Line Marking	m	8000	35	0.28	
Total					8.76	
East Quay Total					233.07	5.04

Table 13-3-1 Construction Cost (2)

* Budget by PAT : The budget allocation for the items has been completed by PAT.

West Quay & Others				Unit Price	Cost	Budget by PAT
Description	Work Items	Unit	Quantity	Baht	Million B	Million B
1. Import CFS (2 Sheds)	Piling Work	lm	12452 x 2	1050	26.15	26.15
	Foundation Work	lm	4520 x 2	1850	16.72	16.72
	RC Slab Work	sq.m	8955 x 2	900	16.12	16.12
	Building Work	unit	2	34900000	69.8	69.8
	Utilities	sq.m	7500 x 2	530	7.95	7.95
Sub-Total					136.74	136.74
2. Export CFS (3 Sheds)	Piling Work	lm	14916 x 3	1050	46.99	
	Foundation Work	lm	5424 x 3	1850	30.1	
	RC Slab Work	sq.m	10770 x 3	900	29.08	
	Building Work	unit	3	41900000	125.7	
	Utilities	sq.m	9000 x 3	530	14.31	
Sub-Total					246.18	
3. Container Yard around CFS (1: Import CFS) (2: Export CFS)	Soil Improvement 1	sq.m	65600	1600	104.96	104.96
	Soil Improvement 2	sq.m	87730	1600	140.37	
	Paving Work 1	sq.m	65600	980	64.29	64.29
	Paving Work 2	sq.m	87730	980	85.98	
	Utilities 1	sq.m	65600	350	22.96	22.96
	Utilities 2	sq.m	87730	350	30.71	
Sub-Total					449.26	192.21
4. Maintenance Shop	Maintenance Shop	LS	1	14790000	14.79	
	Yard Paving Work	sq.m	3750	980	3.68	
	Grease Trap	Set	2	23000	0.05	
	Grease Ditch	m	380	2000	0.76	
Total					19.27	
5. 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	
6. Main Port 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	
Sub-Total					23.08	
7. Checking Post 1 in West Quay		LS	1	7450000	7.45	
8. Empty Container Yard Gate 2,3 (2 Gates)		unit	2	895000	1.79	
9. Empty Container Yard Gate 1		unit	1	1080000	1.08	
10. Fence	Customs Fence	m	2250	2250	5.06	
	Yard Fence	m	2030	1800	3.65	1.46
Sub-Total					8.72	1.46
11. 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	
Sub-Total					11.92	
Sub-Total No.1~No.11					910.86	330.41

Table 13-3-1 Construction Cost (3)

Description	Work Items	Unit	Quantity	Baht	Million B	Budget by PAT
12. Parking Lots	Paving Work	sq.m	18700	880	16.46	
(No.1,No.3)						
	Line Marking	m	12000	35	0.42	
Sub-Total					16.88	
13. Empty Container	Yard Repairing	sq.m	184000	10	1.84	
Yard	Line Marking	m	15000	35	0.53	
Sub-Total					2.37	
14. Rebuilding	Repair Shop &Office	sq.m	1200	9500	11.40	
Facilities	Port Office	sq.m	3F 2300	12000	23.00	
	Gas Station	Unit	2	4000000	8.00	
	Fire Vehicle Garage	sq.m	200	6000	1.20	
	Canteen	sq.m	150	7500	1.13	
	Canteen	sq.m	750	7500	5.63	
	Rail way	m	150	3500	0.53	
Sub-Total					50.88	
15. Utilities	Drainage Work	m	1260	3500	4.41	
Road & Yard	Manhole & Others	LS	1	500000	0.50	
	Lighting Tower	Unit	7	1700000	11.90	
Sub-Total					16.81	
16. Modification	Demolishing Work	sq.m	2800	200	0.56	
of Transit Shed	Construction Work	LS	1	3430000	3.43	
No1~No9						
Sub-Total					3.99	
17. Modification	Demolishing Work	LS	1	170000	0.17	
of Bridge &	Construction Work	LS	1	1320000	1.32	
Access						
Sub-Total					1.49	
18. Modification	Demolishing Work	LS	1	1000000	1.00	
of Transit	Construction Work	LS	1	21500000	21.50	
Shed 13,14						
Total					22.50	
19. Demolishing	Dock Side Crane	set	12	50000	0.60	
Crane	Sales of Scrap Steel	ton	300	-1250	-0.38	
Sub-Total					0.23	
20. Parking Lot No.2						
(1) Parking for ETO	Paving Work	sq.m	29300	880	25.78	15.84
	Fence	lm	790	1800	1.42	
	Utilities	sq.m	29300	200	5.86	
(2) Parking for	Paving Work	sq.m	22500	880	19.80	
Passenger Car	Fence	lm	935	1800	1.68	
	Utilities	sq.m	22500	200	4.50	
(3) Parking for	Paving Work	sq.m	3073	880	2.70	
Trucks	Utilities	sq.m	3073	200	0.61	
Sub-Total					62.37	15.84
21. Vehicle Section	Yard paving Work	sq.m	41700	880	36.70	
	Office Bldg	sq.m	1000	12000	12.00	
	Gas Station	LS	1	5500000	5.50	
	Canteen	sq.m	300	7500	2.25	
	Fence & Gate	LS	1	1540000	1.54	
	Utilities	LS	1	8340000	8.34	
Sub-Total					66.33	
22. Road and Gate	Road paving	sq.m	9240	880	8.13	
for Parking Lot	Walkway	sq.m	2380	300	0.71	
No.2	Gate & Checking Room	LS	1	1000000	1.00	
	Utilities	LS	1	2500000	2.50	
Sub-Total					12.35	
23. Dredging	Dredging & Disposal	cu.m	1600000	100	160.00	
Sub-Total No.12~No.23					416.20	15.84
West Quay Total					1327.06	346.25
East Quay & West Quay Total					1560.13	351.29

Table 13-3-2 Procurement Cost of Equipment

				Unit Price	Cost	Budget by PAT
Equipment	Description	Unit	Quantity	Baht	Million B	
Cargo Handling Equipment	Rail Mounted Gantry Crane	Unit	2	140000000	280.00	280
					0.00	
	Rubber Tyred Gantry Crane(4+1)	Unit	12	42250000	507.00	507
					0.00	
	Rubber Tyred Gantry Crane(6+1)	Unit	9	61100000	549.90	
Computer Equipment	Computer(Terminal)	Set	32	240000	7.68	
	Package Soft-ware	LS	1	16500000	16.50	
Total					1361.08	787.00

Table 13-3-3 Project Cost for the Modification of Bangkok Port

Project Cost				Budget by PAT
	Unit	Quantity	Million B	Million Baht
Construction Cost	LS	1	1560.13	351.29
Engineering Fee	%	10	156.01	35.13
Physical Contingency	%	10	156.01	35.13
Sub-Total			1872.16	421.55
Procurement Cost	LS	1	1361.08	787.00
Engineering Fee	%	3	40.83	23.61
Physical Contingency	%	0	0.00	0.00
Sub-Total			1401.91	810.61
Total			3274.07	1232.16
VAT	%	7	229.18	86.25
Project Cost Total	Million Baht		3503.25	1318.41

Chapter 14 Navigation Safety

In adopting measures to promote navigation safety in the port of Bangkok, or to minimize the occurrence of sea accidents, it is useful to make a detailed examination of past records, in particular to trace the origins of past accidents. The direct causes and indirect factors in the background of sea accidents are assumed to be as follows;

1) hostile weather/sea condition
2) difficult hydrographical condition
3) negligence of maneuvering
4) malstowage
5) machinery trouble, mis-handling, defective design/materials
6) loophole of traffic regulations/control
7) lack of navigational aids
8) deficiency of weather/sea observation and dissemination system
9) lack of hydrographical information
10) deficiency of rescue force/emergency information network/sea protest
11) loophole of inspection for hull/machinery/equipment
12) overcongestion of traffic
13) lack of seafarers' training, loophole of certification system
14) unjustifiable working system for crew
15) lack of safe patrol
16) lack of tug/fire-fighting fleet
17) debris and other navigational obstacles
18) others

Based on past experience, an accident involves a variety of complex factors. However, excepting unavoidable causes such as unusual natural conditions, most of the factors can be enclosed by proper countermeasures that lead to minimizing accidents.

Although the report has already proposed to widen the stretch of the bar channel as one of improving measures for safe traffic in Bangkok port, comprehensive measures should be set up in line with the given role of each authority.

Minding that the accidents of small boats and lighters in tow frequently involve casualties, the promotion of vocational training for seafarers is extremely important as a long-range policy, and might lead to a dramatic reduction in the number of accidents caused by human error.

Furthermore, the team recommends that local traffic regulations, which are primarily the

responsibility of the port authority, be revised to set new standards in the following points;

1) Definition of vessels i.e."Large Vessel", "Miscellaneous Vessel"
2) Definition of "Fairway", "Anchorage", "Port limit"
3) Priority of large vessel to proceed on the fairway
4) Priority of vessels proceeding along the fairway
5) Restriction on anchoring within the fairway in principle
6) Restriction on overtaking/parallel proceeding within the specified fairway
7) Priority of departing vessels in possible meeting at entrance of the fairway
8) Limit on the maximum speed in specified sections of port area
9) Restriction on the length/width and operation of lighters in tow
10) Definition and showing obligation of destination flag
11) Preservation of the waterways environment

Chapter 15 Management and Operation

15.1 General Principles of Port Management and Operation

In principle, the following three points are commonly required for port management and operation around the world.

(1) Efficiency

In order to ensure efficient utilization of the port facilities and port services, and to minimize the cost of the transport through the port, efficient port management and operation are indispensable.

(2) Provision of services at reasonable charges

The following points should be considered in terms of the port tariff structure.

1) The revenue from the tariff can cover costs for construction, management, maintenance and repair.
2) The tariff should be rational in correspondence with the service provided.
3) The tariff structure should include a system which leads to more effective management and operation of the port. This implies that tariff structure provides an incentive for vessels and cargo to move efficiently through the port.
4) The tariff structure and the way of imposition should be as simple as possible.

(3) Reliability and Safety

Delivery/receiving or unloading/loading of cargo and arrival/departure of vessels must be carried out on time and correctly. Operation of cargo and vessels must be carried out in a safe manner.

Even if the above factors are given different priorities, it is impossible to attract users to ports without all of them; they are especially important for container terminals. With these factors, port activities can be promoted and a port management body can make the most use of port facilities.

15.2 Present Problems of Port Management and Operation

15.2.1 Problems in Management of Personnel and Organization

(1) General Tendency which can be seen in Mature and Large Organizations

In general, an enterprise's organization should be formed as a functional one which makes it possible to accomplish its purposes with minimum costs. To that end, rapid and clear decision making is required and matters decided should be relayed to all members of the organization. They also need to be competently executed without any delay.

However, there is a tendency for the decision-making process to become complicated and slower as an organization grows in size and as the number of persons who take part in the process increases. Orders which are given by high ranking officials become unclear as they go down to lower ranks, so that many of them are likely to be eventually postponed or disappear according to circumstances.

An organization usually works well from its beginning and achieves its initial purposes until it reaches a certain size. But once it matures and its members are fixed, those members tend to become complacent, losing their competitive drive. As a result, the organization is managed in a manner contrary to its initial purposes in many cases.

Generally speaking, in an organization which adopts a seniority system with respect to wages and personnel, internal competitions are excluded. And it likely happens that an incompetent man is put in a responsible position because every person in the same class is automatically promoted annually. Since even the most diligent and productive worlters are not always selected for promotion in this kind of organization, it is well understood that the morale of the members deteriorates. On the other hand, this system can provide its members with satisfaction and relief because they share a certain income and position in the organization without any special effort and competition. In this sense, this kind of organization tends to suffer from complacency as observed above.

The points above are the problems which can be seen in enterprise's and governmental organization in general, and are disputed among managers in Japan, too. Based on the above, present management and operation of PAT have been examined below.

(2) Present Needs for Improvement of Port Management and Operation of PAT

PAT which was established forty two years ago and has more than 7000 personnel, is

a mature organization. So it cannot be said that PAT has no worries of having the above problems.

1) Need to Improve the Incentive System for Employees to Work Efficiently

In PAT, a system for employees to work hard and to improve their own business skills according to the advancement of technology does not seem to function well as can be seen in many public organizations. For example, container handling system requires cooperative, technical, efficient, responsible and planned operations. PAT personnel who are high in rank and in the divisions related to container handling have a strong will to modernize the operations but it seems to be not necessarily well understood by other personnel as a necessary direction for PAT. As shown in Chapter 6, at Klong Toei Wharf, there is much room for improvement in container cargo handling such as the need for a marshaling plan etc.. No matter how great the Master Plan may be, it cannot succeed if employees do not learn the new system and work hard with strong incentives. Overall management system such as reformation, activation of organization, payroll and promotion etc. involving all personnel of PAT is required to be reviewed and improved from the above points of view.

2) Need to Improve Reliability and Safety

Security checks at the gate are insufficient, so that many people who are not closely related with port operations can go in and out of the port area at will. Such lax security risks accidents at the time of cargo handling and as well as crimes such as theft and smuggling of cargoes. Although passes are issued by the Security Center of PAT, it is difficult to check all who enter the gates.

One reason for the above difficulty is that many office buildings for PAT personnel whose duties are not directly related with physical port operation are located within the operating area, so that many automobiles owned by PAT personnel go in and out of the gates. Also, neighboring inhabitants are able to freely enter container terminals as a closed operation system is not adapted. In the future it is desirable that gate checking should be reinforced.

15.3 Future Port Management and Operation System at Bangkok Port

In order to manage and operate Bangkok Port more efficiently, a future management and operation system is examined as follows within the framework of the Master Plan. The following points should be taken into account at the time of examination.

(1) Management and operation system which doesn't obstruct the public interest
(2) Management and operation system which attaches importance to efficiency

These points are the same as those stated in the PAT Act. In order to achieve the said purposes, present management and operation system should be looked at again as a whole.

15.3.1 Port Management and Operation System

In this section, management and operations of container terminals are picked up and examined because container terminals are main facilities of Bangkok Port and are the main subjects of the Master Plan as a part of port modernization.

(1) Container Terminal Operations in General

There are various systems in terms of management and operation of container terminals around the world as follows.

1) At the port of Hong Kong, the private sector takes charge of everything including construction, management and operation after obtaining a licence from the port authority.
2) Main Japanese container ports are owned by semi-governmental organizations and leased to the private sector.
3) At the port of Rotterdam, Hamburg and New York & New Jersey, port facilities are leased to the private sector by the port authority.
4) At the port of Singapore and Le Havre, the cargo handling operation is done by the port authority.

There are basically two methods of terminal operations around the world. One is where a port management body takes charge of not only public duties such as port planning, construction of port facilities, maintenance and management but also cargo handling business which is of a commercial nature. The other is that the role of the port management body is limited to the public duties and commercial business like cargo handling is done by private enterprises under the general control of the port management body.

These methods of port operations, peculiar to each port, are not the results of careful selection by each port management body. Rather, they have been chosen by reasons of regional conditions like customs and historical backgrounds. So it is very dangerous to seek a common method of port operation for all ports in the world without

considering the various local conditions. The important thing to be considered is to choose the best method which enables a port management body to operate a port efficiently and effectively without sacrificing public interest, based on a detailed examination of the present situation of the study port.

(2) Present Situation of Terminal Operation at Bangkok Port

Generally, a container terminal should be operated by an operator who has sufficient skilled personnel and equipment to provide good service to port users.

However, at Bangkok Port the container terminal operation is conducted by PAT, shipping agents and stevedoring companies without such overall control. This has to be taken into account when future management and operation system is examined. The sharing of responsibility for the necessary tasks are, in principal, as follows.

1) Shipping Agent : Operation planning including vessel-stowage and marshaling, container inventory work, checking container condition, documentation, etc.
2) Stevedores : Cargo handling on board
3) PAT : Shoreside cargo handling

(3) Items to be Considered in Examination of Port Management and Operation System

The following items should be taken into consideration when a new port management and operation system is examined.

1) Terminal Operator

a) Who will be the terminal operator ?

Three candidates are considered for a terminal operator, namely, PAT, private companies and a new organization founded by PAT. Merits and demerits of each case should be examined. Especially, when PAT or the new organization become the terminal operator, how to transfer the know-how of actual terminal operation such as operation planning etc. now done by the shipping agents should be also considered.

2) Management of Berth and Yard

a) What type of berth management should be adopted ?
(public use scheme, preferential berthing right scheme or leasing to designated

users)

b) What type of yard management should be adopted ?
(licence by the port management body, leasing to designated users)

3) Users of Terminals

a) Are number of terminal users limited to the designated shipping lines/shipping agents ?

At the time of the selection, even if one direction is decided upon, a concrete process and time schedule for the chosen scheme will be the next question. It will be examined in a management and operation plan for the Short-Term Plan.

The above mentioned points are mutually related to one another. Several case studies are carried out as follows.

(4) Terminal Operator

From the long term point of view, following three bodies are considered as a terminal operator of Bangkok Port.

- PAT
  PAT would act as a terminal operator as ever, but its duties are not limited to physical cargo handling but cover all tasks necessary for a container terminal operation such as operation planning and container inventory work etc..
- Private Companies (Shipping Lines/Shipping Agents)
- New Organization founded by PAT

A new organization would be established by separating PAT's divisions related with operations and would carry out all kinds of tasks of the terminal operations.

Each case is compared and examined as follows.

1) PAT becomes the Terminal Operator (Case 1)

This case has a merit of consistent control in various aspects of port operations. For example, because PAT manages berth assignment, cargo handling can be started at the same time of berthing under an internal arrangement. And it becomes easy for PAT to arrange effective utilization of the yard according to demands from several users.

However, since this case requires PAT to operate a container terminal as a single terminal operator, there arises one question, that is, how PAT acquires know-how for the actual terminal operation. Moreover there is a fear that in this system, commercial mindset that tries to improve service level for port users might be lost because there is no competition.

2) Private Company becomes the Terminal Operator (Case 2)

In this case, the cargo handling that is presently done by PAT would be privatized. Generally speaking, merits of privatization are as follows.

a) Introduction of know-how of private enterprises
b) The private sector runs business more efficiently than public sector since in a private sector, principal of competition thrives as there is always the possibility of bankruptcy.
c) Introduction of flexible management free from budget system, seniority system, formalism, strict application of regulations which are peculiar to officialism.

The actual terminal operation including several planning works is carried out by private companies such as shipping lines/shipping agents. Since designated shipping lines (or shipping agents) or a group of them come to utilize a designated terminal exclusively, it would be very convenient and attractive for them to keep a yard where they can stack containers loading to a vessel at any time before its arrival and can handle containers easily without any application to the port management body.

However, since more than fifteen shipping lines use Bangkok Port at present, it is doubtful if they can adjust their businesses and interests well by themselves. And as this case brings about an exclusive utilization of the public wharf (Klong Toei Wharf) by designated shipping lines, it might be an obstruction for future development of the port and for entry of a new shipping line to the users' group. There also is a worry that private companies might think too much about their profits, and treat big shippers and small shippers in a different manner.

Moreover when the present situation in which a great number of PAT personnel are engaged in the physical cargo handling operation is considered, it is very dangerous to incur social problems (relocation of workers) by separating and abolishing an operation division of PAT at a stroke. This point should be seriously taken into account.

3) A New Organization Established by PAT becomes the Terminal Operator (Case 3)

This case supposes that a new organization would be established by separating PAT's divisions related to operations with 100 % of investment from PAT and would carry out all kinds of tasks of the terminal operations.

The case is the same as Case 2 on the point that PAT does not directly carry out the terminal operations. But it can be said that it has a character of both Case 1 and Case 2, because PAT allows a newly established organization closely related with PAT to carry out cargo handling while retaining its control and influence over the yard utilization.

The following merits can be expected by selecting this case: i) By establishing a new organization with the same style as a private company like a joint-stock company, a flexible management which is free from the budget system, the seniority system, formalism etc. peculiar to officialism, can be introduced, making more efficient operations possible. When an organization and mechanism changes, behavior of persons in it also changes so that a more rational management and an improvement of its service can be expected. ii) The new organization would carry out the operation not for the designated shipping lines (shipping agents) but for interests of all users in Bangkok Port.

However, in this case, the same fear mentioned in the above 1) arises again, that is, whether the principle of competition works well or not. And there remains one more question of how the know-how for the actual terminal operation is transferred from private companies to the new organization.

In order to overcome the above problems, it is necessary to take such measures as to have a joint terminal operation with private companies in the transition period and to introduce competition between terminals when they are managed separately.

In this sense, this case can be said to retain the merits of both Case 1 and Case 2 while minimizing their demerits.

4) Comparison of Three Cases

As argued in the above, it is desirable that the cargo handling is carried out in a commercial manner where business is run efficiently with a flexible management system. However, the operation by private companies (Case 2) is not realistic taking account of the situation of Bangkok Port, namely, more than fifteen shipping lines use the port where terminal space for container handling is limited and difficult to expand and the social problems (relocation of workers) derived from the abolishment of divisions of cargo

handling operation of PAT.

When Case 1 (PAT) and Case 3 (the New Organization) are compared, Case 3 is basically recommendable in order to avoid inefficiency expected from the fixed management such as budget system, seniority system and formalism.

Chapter 10 in this report recommends the three-divided controlled operation system in the east quay. In this sense, it is recommended that three terminals be operated independently by three units of the new organization under the general control of the new organization.

Container yards and terminals facilities such as cranes and CFSs etc. will be controlled independently by the units or leased/licensed for use of a terminal operator (the new organization) from PAT. But wharves might have to be for the public use under the control of PAT, since Bangkok Port is a very important facility for the stable supply of materials to Thai industries and the nation. If so, the priority berthing right scheme now taken by PAT contributes to effective terminal operation.

15.3.2 Management and Operation except Container Terminals

The berths and sheds behind them at the west quay handle only conventional cargoes in the Master Plan. The volume of the conventional cargoes handled will be 3.91 million tons in 2005 which is not a large increase compared with the present volume.

For the same reasons that the operation of the container cargo handling should be entrusted to the newly established organization, it is recommended that conventional cargo handling be also carried out by the organization. That also makes it possible to cut some costs for cargo handling equipment through the adjustment of their mutual utilization between divisions of container and conventional cargo handling.

15.4 Organization for Port Management and Operation

15.4.1 Organization of PAT

In general, because of the numerous and complicated processes of decision making, an organization faces difficulties in taking quick countermeasures against changes of business circumstances as it expands and becomes larger in size.

(1) Improvement of Headquarters' Function

In order to avoid the tendency in which nothing gets done without the agreement of all concerned (which requires complicated internal adjustments), and to activate the organization itself, it is recommended that the organization of PAT be divided into two functions, namely, headquarters' function and two individual port management functions (Bangkok Port and Laem Chabang Port).

Headquarters would be in charge of making decisions on important matters such as big projects, long-term development plans, finance (including tariff), important affairs of personnel, reformation of organization and implementation of important projects. Taking project implementation and the budget as an example, headquarters would not be in charge of actual works but check, control and manage them based on original drafts worked out by Bangkok Port and Laem Chabang Port. In case of a long-term plan, headquarters would carry out overall adjustments of original drafts made by two ports as a centeral body, taking governmental policies of Thailand and intentions of high ranking officials etc. into consideration.

In addition, it is recommended that headquarters have a team of experts who are free from the daily routine and devote all of their working hours to observation of the flows of all kinds of businesses. They identify defects through their observations and study them. After that, they propose solutions. They check all business of PAT from the global point of view and contribute to activation and efficiency of the entire PAT organization.

The following items should be reviewed.

- The long-term management concept or purpose (strategy of fundamental management, organization, personnel, finance)
- Legislation or reformation of rules of business management (systems of employees' recommendation, quality control and etc.)
- Introduction and abolishment of several systems concerning the organization (task allotment, competence rule etc.)
- Management of related companies (establishment and standards of management, inspection, instruction etc.)
- Provision of information to the top managers
- Execution of orders from top managers
- Special study instructed by top managers
- To be a bureau for improvement of management (recommendation and adjustment for problems extending through several divisions, utilization of external organs like

management consultants

The fundamental ideas and outline of the above items are examined by the expert staff according to the top managers' will, and concrete plans for execution are made by each department concerned.

Since headquarters supervise important matters of overall operation of PAT, there should be close cooperation among personnel to coordinate effectively the various tasks; sectionalism should be avoided. In this sense, headquarters should consist of a small number of competent personnel.

At the same time, it is necessary for PAT to give Bangkok Port and Laem Chabang Port powers for implementing their duties as much as possible except important matters mentioned in the above. So it is recommended that the Marine Department, Engineering Department, Project & Planning Department, Data Processing Department, Personnel Department, Financial & Account Department and Inventory Department at present be included in Bangkok Port except the parts having functions of headquarters. Also, the method of issuing orders and instructions should be unified and simplified in each port.

As an organization of headquarters, Office of Director General should be reinforced in order to fulfill these functions.

(2) Bangkok Port Office

Since terminal operation is carried out by a newly established organization as mentioned previously, divisions for actual cargo handling operation of present Bangkok Port Office would be separated from PAT. However, as mentioned in (1), Bangkok Port Office would take charge of almost all duties on the port administration such as tug service, property management, finance, personnel, planning, engineering marine etc..

On the other hand, even within Bangkok Port, it is recommended that for a smooth and efficient management, authorities for everyday routine business which does not require special and professional decisions be entrusted to lower ranking officials as much as possible. It is also recommended that regulations concerning transference of powers and authority on business be prepared in PAT.

15.4.2 Organization of the Newly Established Organization

The newly established organization would carry out cargo handling operation of both container and conventional cargoes. The functions and personnel generally required for

a modernized efficient container terminal operation are shown in Table 15-4-1. In addition, personnel and finance divisions are also to be prepared in a proper scale.

As for the conventional cargo handling, it is observed that PAT has all necessary functions and personnel at present. By the adoption of the Master Plan with abolishment of some transit sheds and enlargement of the open storage, conventional cargo handling would be rationalized as mentioned in Chapter 10. Generally speaking, standard number of personnel in one gang for conventional cargo handling on land is 4 to 6, and 10 gangs are needed to handle conventional cargoes in the west quay at the peak time. Considering the shifts formation, around 156 personnel are required for handling business. In addition to that, proper personnel should be provided for cargo storage business etc. in several kinds of sheds and warehouses.

The new organization is to take over personnel of cargo handling operation divisions of PAT.

Lastly, based on the above examinations, examples of the PAT organization and the newly established organization are shown in Figure 15-4-1 and Figure 15-4-2.

Table 15-4-1 An Example of Functions and Personnel for Container Terminal Operation

Office/Function	Division/Section	Number of Employees	Shifts
Head Office	General affaires, Accounting, Training Public relation	12	day
	Planning for handling	27	3 shifts
	Yard Control Center	30	3 shifts
	Container Inventory	9	day
	Documentation of cargo delivery/receiving	36	3 shifts
Gate	Gate check	324	3 shifts
CFS	Documentation of cargo delivery/receiving	63	3 shifts
Cargo Handling	Stuffing/Unstuffing of container (including operators of forklifts)	630	3 shifts
	Loading/Unloading and transportating containers (including operators of gantry cranes, trans-tainers, forklifts etc.)	573	3 shifts
Maintenance	Maintenance of equipment and containers	120	day
Security	Security	as needed	3 shifts
Total (excluding security)		1824	

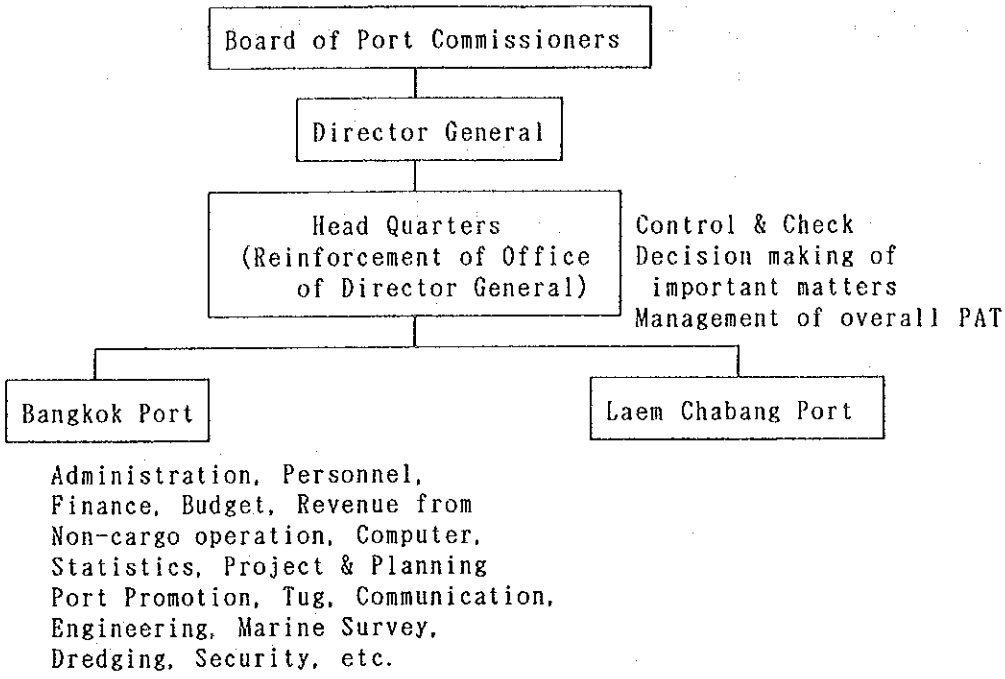


Figure 15-4-1 Outline of the PAT Organization

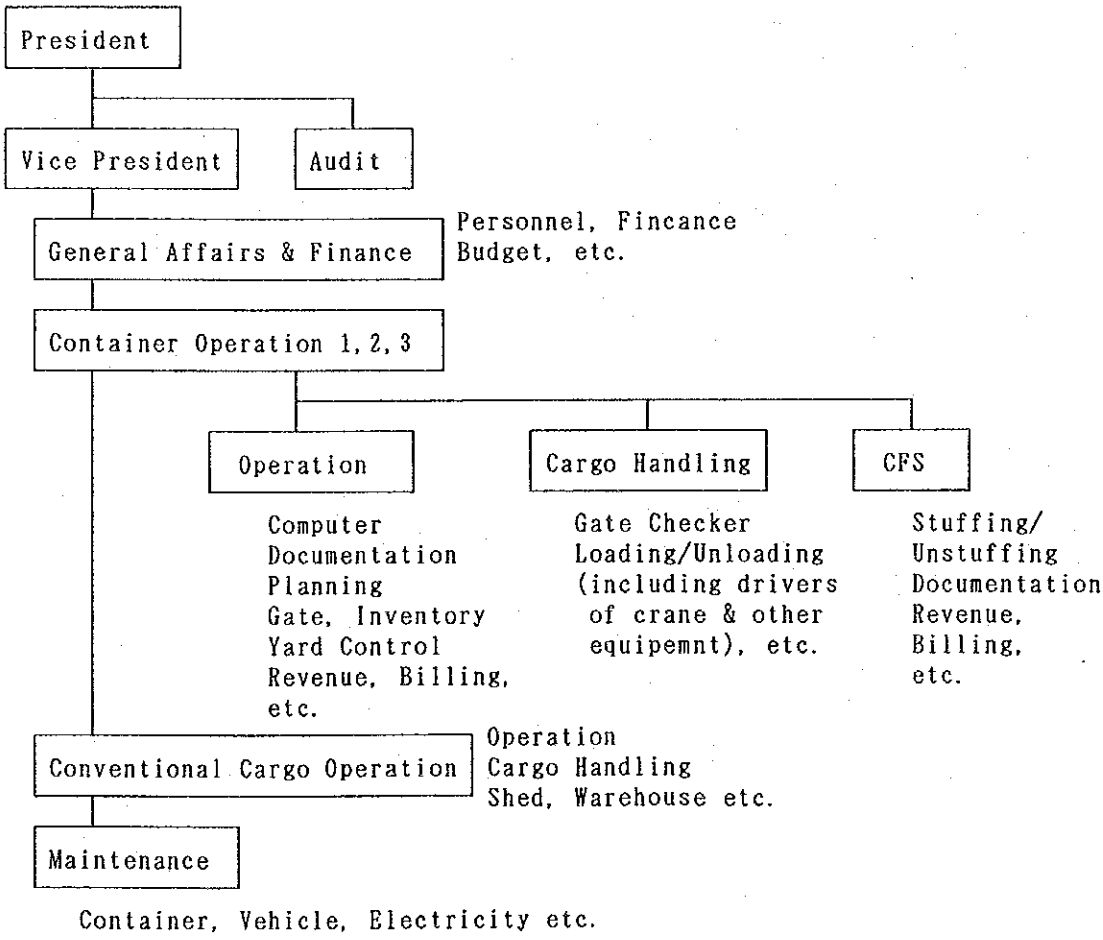


Figure 15-4-2 Outline of the Newly Established Organization

15.4.3 Management of the New Organization

Management of the newly established organization should be carried out paying attention to the following points.

(1) The new organization is formed by investment of PAT (100% at first), but gradually investment from private companies should be introduced. And at the same time, it is necessary that high-ranking personnel are also appointed from private companies if they are competent. In this way, merits of the private management can be expected.

(2) The new organization should have incentives for efficient management with a system in which the more efficient management is done, ie, cost reduction, business improvement and so on, the more profits increase. For example, when the land, port facilities and heavy cargo handling equipment such as gantry cranes and transtainers etc. are leased or licensed to the new organization by PAT, the rental or licence fee that has to be paid to PAT should be set at a certain amount or certain percentage of the operation revenues.

(3) PAT should give the organization free reign in such matters as making strategies of management, finance and personnel etc. and the PAT's control over the organization should be as small as possible.

(4) When the marshaling yard is divided into three terminals and these terminals are independently controlled by three units of this organization, it is advisable to adopt a measure promoting some competition among these units.

15.4.4 Reinforcement of Port Promoting Function of PAT

To promote use of the port, it is essential to establish a more useful and attractive port in terms of both facilities and management and operation for users such as shipping lines, shipping agents, forwarders, shippers consignees, etc.. For that purpose, it is necessary to have a real time, broad, systematic grasp of the users' needs and to reflect their needs in the practical development and management of the port. The port should be marketed positively, providing users with pertinent information.

The existing division concerning the port promotion should be reinforced. This enables PAT to collect information on users' requirements, advertise the advantages of the port and attract customers externally. Internally, this division can function as an advisory organization to other divisions by providing information collected on users' requirements. It would be very effective for this division to cooperate with headquarters

mentioned in the above. Such cross relation of divisions could revitalize PAT as a whole.

15.4.5 Improvement of Statistic System

Present port statistics are insufficient to formulate a future investment plan and effective management of port facilities. For instance, at Klong Toei Wharf the cargo volumes are not sufficiently grasped commoditywise especially in terms of export cargoes, and are not classified by origin and destination. PAT does not prepare the commoditywise cargo volume by facility, namely, PAT dolphins/buoys and private terminals.

Improvement of statistical system is quite essential to formulate the proper investment plan and effective management. Therefore, it is recommended to improve statistic system by studying required information to be submitted from port users at the time of applications for the port utilization in line with the improvement of information system proposed in Chapter 11.

15.4.6 Introduction of Measures for Activation of the Organization

For activation of the organization, not only its reformation but also the improvement of minds of its personnel toward rational and efficient management are important. For this purpose, many private companies adapt a Quality Control (QC) circle and a proposal activity by personnel.

A QC circle is an activity for improvement involving each individual employee. Normally it is carried out by a group within a single division or section. Members of the group identify problems concerning quality, safety, efficiency etc. and voluntarily try to solve the problems with everyone's cooperation. It also has an effect on the improvement of working minds of personnel since many people take part in the activity and find satisfaction in seeing their suggestions implemented. Many companies hold presentation conferences or award ceremonies in order to promote it and to learn from other activities. It is also done by a project team extending through several divisions concerned.

A proposal activities system is a system whereby top managers invite proposals on new ideas and concrete improvement measures on tasks from all employees and adopt what they consider to be the best proposals.

These kinds of activities would give all personnel a good opportunity to think over their own tasks and to contribute to their rationalization. It is recommended that PAT

introduces and develops these kinds of activities throughout its organization.

However there are many cases where these activities begin to lose their novelty and the number of proposals decreases as time goes by, although they work well at first. Therefore it is important for top managers to make quick and effective decisions.

15.4.7 Improvement of the Personnel Management System

In order to carry out the proper management and operation of the port, it is indispensable that the business ability of personnel of PAT be kept high. For that purpose, the personnel management system is required to be improved as follows.

(1) Personnel Evaluation and Management

One of the ways to improve personnel ability is to evaluate their ability properly and fairly with objective standards and reflect that evaluation in promotions and wages. Through this evaluation, the proper personnel transfer according to experience, knowledge and judgment becomes possible. Moreover it also gives personnel the incentive to work hard and to display their ability because they are satisfied with the proper evaluation of their works.

The following points should be kept in mind at the time of the evaluation.

1) Evaluation should be done not only for promotion and wages but also for the nurturing of personnel. So it is important to look at the shortcomings or promising points of each employee and to evaluate his/her efforts to rectify/cultivate them.
2) A manager of each Division should make efforts to improve abilities of personnel under him/her through training on the job or through some training courses and seminars.
3) Evaluating items should include the contribution and attitude toward efficient business.

(2) Improvement of the Training System

PAT makes much of personnel development and the Personnel Development Center(PDC) implements all of PAT training programs which cover various fields of port management. In order to cope with the new efficient management and operation system proposed in the Master Plan, it is recommended that PDC should develop and supplement its training courses in terms of the following matters.

1) To make the new port management and operation system including cargo handling and information system understood by personnel
2) To recognize the importance of correct, proper, safe, responsible and efficient operation for the enhancement of the port
3) To instill a cost consciousness in personnel

15.4.8 Improvement of Reliability and Safety

In 2005, the target year of the Master Plan, the passage of vehicles which are now used for the conveyance of documents will drastically decrease by the introduction of the information system. It is recommended that the number of vehicles unrelated to the port activities entering and leaving the port area be minimized by constructing parking lots outside of the port and promoting the removal of the offices for management departments outside of the port gate. Through this, since the gate check by Security Center would be much easier than now, improvement of reliability and safety within the port area can be expected.

15.5 Improvement of Concerned Systems

15.5.1 Customs

As shown in Chapter 9, the number of containers handled at Laem Chabang Port in 2005 is estimated at 2,190,000 TEUs. Laem Chabang Port is located about 130 kms southeast of Bangkok. If there were no sufficient Inland Container Depots (ICDs) for imports and off-dock CYs/CFSs for export containers around the Bangkok area, the shippers/consignees with LCL cargoes and those who can not accommodate stuffing/unstuffing works within their compounds would have to bring and pick up their cargoes to and from Laem Chabang Port CFSs under their own arrangement and pay for the inland transportation to and from the port. In this sense, ICDs and off-dock CYs/CFSs for export containers are expected to carry out an important role for the utilization of Laem Chabang Port.

As mentioned in Chapter 6, four ICDs for imports and fifteen off-dock CYs for export containers are in operation by the private companies at present. Customs has standards for setting up these facilities which require i) an area of more than 50 rai (8 ha) for ICDs for imports and 20 rai for off-dock CYs and CFSs, ii) a customs station with more than 40 staffs for ICDs for imports and more than 9 staffs for off-dock CYs and CFSs etc.. In order to promote utilization of Laem Chabang Port, it is recommended to encourage the establishment of these facilities by easing the standards.

In Thailand, bonded transportation is admitted when it is carried out by reliable forwarding companies with customs seals. Customs officers check the containers at the time of both departure and arrival. Since bonded transportation for both imported and exported cargoes is absolutely necessary to realize the full merits of container transport using these facilities, it is recommended that the procedure of the bonded transportation be gradually simplified.

15.5.2 Express Transportation Organization of Thailand (ETO)

As mentioned in Chapter 6, large amount of cargoes compared with the real LCL cargoes in the sense of the international definition (in which more than one shippers/consignees goods are consolidated in mixture in one box) were stuffed/unstuffed at the port area at present. One of the reasons for that was the fee rates of ETO which holds a priority for the transportation of cargoes out of Klong Toei Wharf. ETO's trailer and chassis rates were relatively higher than their truck rates which make stuffing/unstuffing of containers in port area less costly than draying containers on trailer chassis. (see Table 15-5-1 and Table 15-5-2) However, as ETO has revised its freight rate on truck since October 1993, the above situation has been improved. (see Table 15-5-3)

Table 15-5-1 ETO's Container Freight Rate

(Full Container, Single Trip, Tractor with Chassis)

(Unit: Baht/Trip)

Distance	20 Feet	40 Feet
< 5 km	1,240	1,440
< 10 km	1,413	1,653
< 15 km	1,587	1,867
< 20 km	1,633	1,967
< 25 km	1,767	2,173
< 30 km	1,833	2,283
< 35 km	1,967	2,497
< 40 km	2,000	2,514
< 45 km	2,100	2,638
< 50 km	2,200	2,762
> 50 km	23/km	28/km

Source: ETO

Table 15-5-2 ETO's Truck Freight Rate

(Before Revision)

(Unit: Baht/Trip)

Distance	6 wheel truck	10 wheel truck
< 5 km	160	300
< 10 km	250	400
< 15 km	330	500
< 20 km	370	600
< 25 km	440	700
< 30 km	490	800
< 35 km	540	850
< 40 km	590	900
< 50 km	660	1,000
< 60 km	730	1,100

Source: ETO

Table 15-5-3 ETO's Truck Freight Rate

(Revised Rate as of November 1993)

(Unit: Baht/Truck)

Distance	6 wheel truck	10 wheel truck
< 5 km	380	500
< 10 km	500	650
< 15 km	620	810
< 20 km	720	930
< 25 km	830	1,070
< 30 km	940	1,210
< 35 km	1,050	1,340
< 40 km	1,150	1,470
< 50 km	1,310	1,670
< 60 km	1,310	1,670

Source: ETO

Chapter 16 Initial Environmental Examination (IEE)

16.1 Initial Environmental Examination (IEE)

Redevelopment of Bangkok Port may have some impacts on the environment by dredging, cargo operations and other port related activities. The potential adverse effects of port redevelopment encompass water pollution, waste disposal, air pollution, noise, unhealthy socio-cultural impacts and so on.
To minimize these adverse effects, Environmental Impact Assessment (EIA) is carried out in this study.

The first step of EIA is an Initial Environmental Examination (IEE) which is a study on potential impacts which a proposed project might have on the environment.

Table 16-1 shows an environmental impact checklist for port development and results of estimated size of impacts.

Bangkok Port is now already an operating port with an annual throughput of 16 million tons. Estimated annual throughput in 2005, when the modernization project is completed, is less than 16 million tons and the maximum size of calling vessels will not be changed.
So basically the project has a positive environmental effect, reducing numbers of calling ships and induced road traffic.

According to Table 16-1, main items to be dealt with in the stage of EIA are as follows.

1. Environmental consideration when widening present bar channel

For the safety of navigation, widening of present bar channel from 100m to 150m is proposed. (cf. Chap.10.3) At present, PAT is conducting maintenance dredging by its dredgers. Dredgers with a hopper capacity of 2,500 cub.m are used and dredged soil is disposed offshore of the Gulf of Thailand.

In addition, PAT is going to start widening of the present bar channel from 100m to 135m. For this widening works, EIA was not needed.

An impact by widening the bar channel from 135m to 150m proposed in the study in considered to be small. This is because the depth of the channel itself will not be changed and the scale of widening works will be small compared with the present maintenance dredging or the widening of the bar channel from 100m to 135m.

2. Resettlement of squatters

The modernization plan of Bangkok Port contains conversion of squatters' areas to port related land use. For "Area Ⅱ", an agreement has already been reached to resettle the squatters from "Area Ⅱ" to the new residences which the Housing Authority has already prepared. For "Zone 1", on the other hand, negotiation on removal of squatters' residences is on-going among squatters, National Housing Authority and Port Authority of Thailand. It is said that considerable portion of squatters are engaged in port-related jobs such as stuffing/unstuffing container cargo and transportation services. When container throughput of Bangkok Port is reduced to one million TEUs, percentage of LCL cargo is decreased and new information system is introduced, income sources in port area for those people will be decreased. At that stage, however, it is expected that new income sources for them will be provided by other industries such as manufacturing and service industries in line with the further development of the Thai economy taking a large view of things.

3. Sewage system

Water pollution of the Chao Phraya River is a serious problem. Therefore, the installation of sewage treatment system is recommended for the proposed terminal offices and the port office.

Table 16-1 Environmental Impact Checklist for Bangkok Project

Environmental impact factors	Environmental impact	Countermeasures	Size of impact (check appropriate boxes)			
			No	Small	Moderate	Major
1. Impact from construction works						
1.1 Operation of working boats, construction machines	1.1.1 Air pollution	1.1.1 Management of construction process, selection of working hours, smoke prevention fence	X			
	1.1.2 Generation of noise/vibration	1.1.2 Selection of construction methods/machines, selection of working hours, placement of sources of noise/vibration	X			
	1.1.3 Changes in terrestrial ecosystem	1.1.3 Selection of construction methods/machines	X			
1.2 Dredging, stirring of bottom soil, soil dumping into water	1.2.1 Pollution of water and bottom sediments (SS, hazardous materials)	1.2.1 Settling pond, sedimentation coagulant, selection of construction methods/machines, silt curtains		X		
	1.2.2 Offensive odor	1.2.2 Selection of construction methods/machines, introduction of odor treatment methods	X			
	1.2.3 Reduction of aquatic lives	1.2.3 Settling pond, sedimentation coagulant, selection of construction methods/machines, silt curtains, selection of construction period, monitoring of alternative habitats	X			
	1.2.4 Pollution of marine products	1.2.4 Settling pond, sedimentation coagulant, selection of construction methods/machines, silt curtains, selection of construction period, monitoring pollution of fishery products	X			
	1.2.5 Devaluation of tourism resources (water color, coral reef)	1.2.5 Settling pond, sedimentation coagulant, selection of construction methods/machines, silt curtains	X			

Environmental impact factors	Environmental impact	Countermeasures	Size of impact (check appropriate boxes)			
			No	Small	Moderate	Major
1.3 Soil removal	1.3.1 Changes in topography, underground water system	1.3.1 Prior elucidation of underground water system	X			
	1.3.2 Extinction of terrestrial ecosystem	1.3.2 Transplantation of important species/vegetation	X			
1.4 Generation of surplus soil, wastes, dumping of dredged soil on ground	1.4.1 Pollution of water/bottom sediments	1.4.1 Treatment site planning		X		
	1.4.2 Impact on terrestrial ecosystem	1.4.2 Disposal site planning	X			
1.5 Employment of laborers	1.5.1 Inflow of alien cultures	1.5.1 Employment planning, disclosure of information	X			
	1.5.2 Change in economic activities	1.5.2 Employment planning, vocational training	X			
1.6 Congestion of work vehicles and boats	1.6.1 Economic loss (traffic jam)	1.6.1 Construction of access roads	X			
	1.6.2 Devaluation of fishing ground	1.6.2 Alternative fishing grounds	X			
2. Impact from port facilities and site						
2.1 Emergence of site (including landfill)	2.1.1 Pollution of water and bottom sediments	2.1.1 Change of face lines, dredging sludge, promotion of sea water exchange	X			
	2.1.2 Beach erosion and accretion	2.1.2 Change of face lines, construction of breakwaters against beach erosion,littoral nourishment	X			
	2.1.3 Changes in coastal currents	2.1.3 Change of face lines, construction of breakwaters, selection of type of offshore structure	X			
	2.1.4 Decrease of habitats for aquatic lives	2.1.4 Transplant, discharge of seeds & saplings	X			
	2.1.5 Decrease of habitats for terrestrial lives	2.1.5 Change of face lines, designation of nature conservation areas, artificial tidal flats, transplant	X			
	2.1.6 Change in scenic beauty	2.1.6 Location of facilities, selection of color, plantation	X			
	2.1.7 Resettlement of local residents and culture	2.1.7 Transfer planning, information disclosure			X	
	2.1.8 Extinction of fishing grounds	2.1.8 Expansion of functions of fishing ports, marine products transportation functions	X			

Environmental impact factors	Environmental impact	Countermeasures	Size of impact (check appropriate boxes)			
			No	Small	Moderate	Major
2.2 Emergence of external facilities	2.2.1 Pollution of water and bottom sediments	2.2.1 Change of face lines, dredging sludge, promotion of sea water exchange	X			
	2.2.2 Beach erosion and accretion	2.2.2 Change of face lines, construction of breakwaters against beach erosion, littoral nourishment	X			
	2.2.3 Change in coastal current	2.2.3 Change of face lines, construction of breakwaters for wave prevention, selection of type of offshore structure	X			
	2.2.4 Decrease of habitats for aquatic lives	2.2.4 Transplant, discharge of seeds and saplings	X			
	2.2.5 Change of scenic beauty	2.2.5 Changes in shape of facilities and selection of colors	X			
2.3 Emergence of sea route	2.3.1 Change in coastal currents	2.3.1 Change of face lines, construction of breakwaters for wave prevention	X			
	2.3.2 Decrease of habitats for aquatic lives	2.3.2 Transplant, discharge of seeds and saplings	X			
2.4 Emergence of anchorage	2.4.1 Change in coastal current	2.4.1 Change of face lines, construction of breakwaters for wave prevention, selection of type of offshore structure	X			
	2.4.2 Decrease of habitats for aquatic lives	2.4.2 Transplant, discharge of seeds and saplings	X			

Environmental impact factors	Environmental impact	Countermeasures	Size of impact			
			No	Small	Moderate	Major
3. Impact from utilization of facilities in water area and anchorage						
3.1 Impact from boats	3.1.1 Air pollution	3.1.1 Reduction of stoppage time in ports, *compulsory use of high* quality oil	X			
	3.1.2 Water pollution (bilge)	3.1.2 Strengthening of laws and regulations	X			
	3.1.3 Beach erosion caused by furrow wave	3.1.3 Speed limit, beach protection structure	X			
	3.1.4 Generation of wastes (dredged material included)	3.1.4 Strengthening of laws and regulations, recycling/disposal system	X			
	3.1.5 Obstruction to fisheries activities	3.1.5 Alternative fishing ground and artificial fishing sites, expansion of function of fishing ports and transportation of marine products	X			
4. Impact from cargo loading and utilization of storage facilities						
4.1 Cargo loading activities and utilization of storage facilities	4.1.1 Air pollution (dust)	4.1.1 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines	X			
	4.1.2 Pollution of water and bottom sediments	4.1.2 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines, shape of apron	X			
	4.1.3 Generation of noise	4.1.3 Zoning, soundproof fence/ hood	X			
	4.1.4 Generation of offensive odor	4.1.4 Zoning, sealing of storage facilities, deodorization facilities	X			
	4.1.5 Change in coastal ecosystem	4.1.5 Establishment of buffer zone, enclosure, surface treatment, selection of loading machines, shape of apron, monitoring of pollution of marine products	X			
	4.1.6 Generation of wastes	4.1.6 Planning for collection, treatment and disposal of wastes	X			
	4.1.7 Employment effect	4.1.7 Vocational training		X		

Environmental impact factors	Environmental impact	Countermeasures	Size of impact			
			No	Small	Moderate	Major
5. Impact from operation of facilities handling hazardous materials						
5.1 Operation of oil distribution base and facilities handling hazardous materials	5.1.1 Air pollution	5.1.1 Reduction of air pollutants (dust collection, desulfurization, denitrification), promotion of dispersion	X			
	5.1.2 Pollution of water and bottom sediments (oil)	5.1.2 Facilities for waste oil treatment, oil fence	X			
	5.1.3 Generation of offensive odor	5.1.3 Change of zoning, containment of offensive odor, deodorizer	X			
	5.1.4 Change in coastal ecosystem	5.1.4 Facilities for waste oil treatment, oil fence, monitoring of pollution of marine products	X			
	5.1.5 Change in terrestrial ecosystem	5.1.5 Facilities for waste oil treatment, oil fence, establishment of nature conservation area	X			
	5.1.6 Decrease in amount of agricultural products, fisheries products and price	5.1.6 Facilities for waste oil treatment, oil fence, monitoring of pollution of marine products	X			
6. Impact from waste treatment and disposal						
6.1 Operation of waste treatment/facility	6.1.1 Air pollution	6.1.1 Reduction of air pollutants (dust collection, desulfurization, denitrification)	X			
	6.1.2 Pollution of water and bottom sediments	6.1.2 Reduction of discharge, drainage treatment facilities	X			
	6.1.3 Generation of offensive odor	6.1.3 Zoning, containment of offensive odor, deodorizer	X			
	6.1.4 Change in coastal ecosystem	6.1.4 Prevention of water pollution	X			
	6.1.5 Change in terrestrial ecosystem	6.1.5 Prevention of air/water pollution	X			
6.2 Impact from waste disposal facility	6.2.1 Air pollution (dust)	6.2.1 Establishment of buffer zone, surface treatment, fence	X			
	6.2.2 Pollution of water and bottom sediments	6.2.2 Sheet cover (rain prevention), settling pond, selection of bulkhead structure	X			
	6.2.3 Generation of offensive odor	6.2.3 Zoning	X			
	6.2.4 Change in coastal ecosystem	6.2.4 Prevention of water pollution	X			
	6.2.5 Change in terrestrial ecosystem	6.2.5 Prevention of air/water pollution	X			
	6.2.6 Formation of slums	6.2.6 Management plans for disposal site	X			

Environmental impact factors	Environmental impact	Countermeasures	Size of impact			
			No	Small	Moderate	Major
7. Impact from traffic function						
7.1 Road traffic	7.1.1 Air pollution	7.1.1 Improvement of transportation system/routes, establishment of buffer zone, road pavement, green belt, cover on a bed of trucks	X			
	7.1.2 Generation of noise/vibration	7.1.2 Correction of routes, establishment of buffer zone, selection of roads/trackage, structure, road pavement, soundproof fence	X			
	7.1.3 Change in terrestrial ecosystem	7.1.3 Correction of routes, establishment of buffer zone/nature conservation areas, prevention of air pollution	X			
	7.1.4 Change in local population distribution	7.1.4 Information disclosure, enlightening the local people on the concerned project	X			
	7.1.5 Traffic jam/accidents	7.1.5 Relocation of routes, overpass	X			
8. Impact from industrial production activities						
8.1 Operation of factories and plants	8.1.1 Air pollution	8.1.1 Reduction of air pollutant (dust collection, desulfurization, denitrification), promotion of dispersal	X			
	8.1.2 Pollution of water/bottom sediments	8.1.2 Reduction of discharge, drainage treatment facilities	X			
	8.1.3 Generation of noise/vibration	8.1.3 Zoning, establishment of buffer zone, soundproof fence, soundproof hood	X			
	8.1.4 Generation of offensive odor	8.1.4 Zoning, containment of offensive odor, deodorization facilities	X			
	8.1.5 Ground subsidence	8.1.5 Regulation on the use of underground water	X			
	8.1.6 Change in coastal ecosystem	8.1.6 Prevention of water pollution, dredging of sludge	X			
	8.1.7 Change in terrestrial ecosystem	8.1.7 Establishment of nature conservation area	X			
	8.1.8 Generation of wastes	8.1.8 Planning for collection treatment and disposal of wastes	X			
	8.1.9 Change in local population distribution	8.1.9 Establishment of employment planning, information disclosure	X			
	8.1.10 Employment effect	8.1.10 Vocational training	X			

Environmental impact factors	Environmental impact	Countermeasures	Size of impact			
			No	Small	Moderate	Major
9. Impact from distribution and storage functions						
9.1 Storage functions (including outdoor storage)	9.1.1 Air pollution (dust)	9.1.1 Zoning, establishment of buffer zone, containment, sprinkling, sheet cover, surface treatment	X			
	9.1.2 Pollution of water and bottom sediments	9.1.2 Zoning, containment, sheet cover, establishment of drains and settling pond	X			
	9.1.3 Generation of offensive odor	9.1.3 Zoning, containment of offensive odor, deodorizer	X			
9.2 Cargo handling	9.2.1 Generation of noise	9.2.1 Zoning, establishment of buffer zone, selection of machines, soundproof fence, soundproof hood	X			
	9.2.2 Employment effect	9.2.2 Vocational training		X		
10. Impact from operation of recreational facilities						
10.1 Utilization of hotels, marinas, artificial beaches	10.1.1 Pollution of water and bottom sediments	10.1.1 Water quality control through laws and regulations, water quality improvement, in the shallow coastal area including artificial beaches	X			
	10.1.2 Change in coastal ecosystem	10.1.2 Prevention of pollution of water and bottom sediments	X			
	10.1.3 Generation of wastes	10.1.3 Planning for collection, treatment and disposal of wastes	X			
	10.1.4 Inflow of alien cultures	10.1.4 Selection of project location information disclosure, enlightening to the local people on the concerned project	X			
	10.1.5 Employment effect	10.1.5 Employment planning, vocational training	X			
	10.1.6 Obstruction to fishing activities	10.1.6 Securing of alternative fishing grounds	X			

16.2 Implementation of MARPOL 73/78 in Thailand

As was stated in Chap.2.3.2, Thai Government is studying the MARPOL 73/78 convention and plans to sign it in the near future.

In the case of Bangkok Port (Klong Toei Wharves) which does not receive oil tankers but ocean going cargo vessels, it's necessary to handle only engine room wastes.
Quantity of engine room wastes from a ship is usually a few tons and in many cases these engine room wastes are separated by oil/water separator and oil portion is burned on board.

If need be, engine room wastes could be collected and transported by tank trucks or barges in the port.

Because the area of Klong Toei Wharves is very limited and dangerous goods storage area is in close proximity, reception facilities for engine room wastes from ocean-going and domestic vessels should be prepared along the Chao Praya River excluding Klong Toei Wharves.

The whole system to satisfy requirements of MARPOL 73/78 should be studied by Thai Government.
It should include a study on which sectors should be responsible for collecting and treating oily wastes and a study on the location of treatment plant.
PAT will not be primarily responsible for the system, but as a public sector which manages Klong Toei Wharves and as the biggest port operator, PAT will have to take responsibility for backing up the system to some extent.

APPENDIX

APPENDIX 1

Borehole Location and Soil Profile

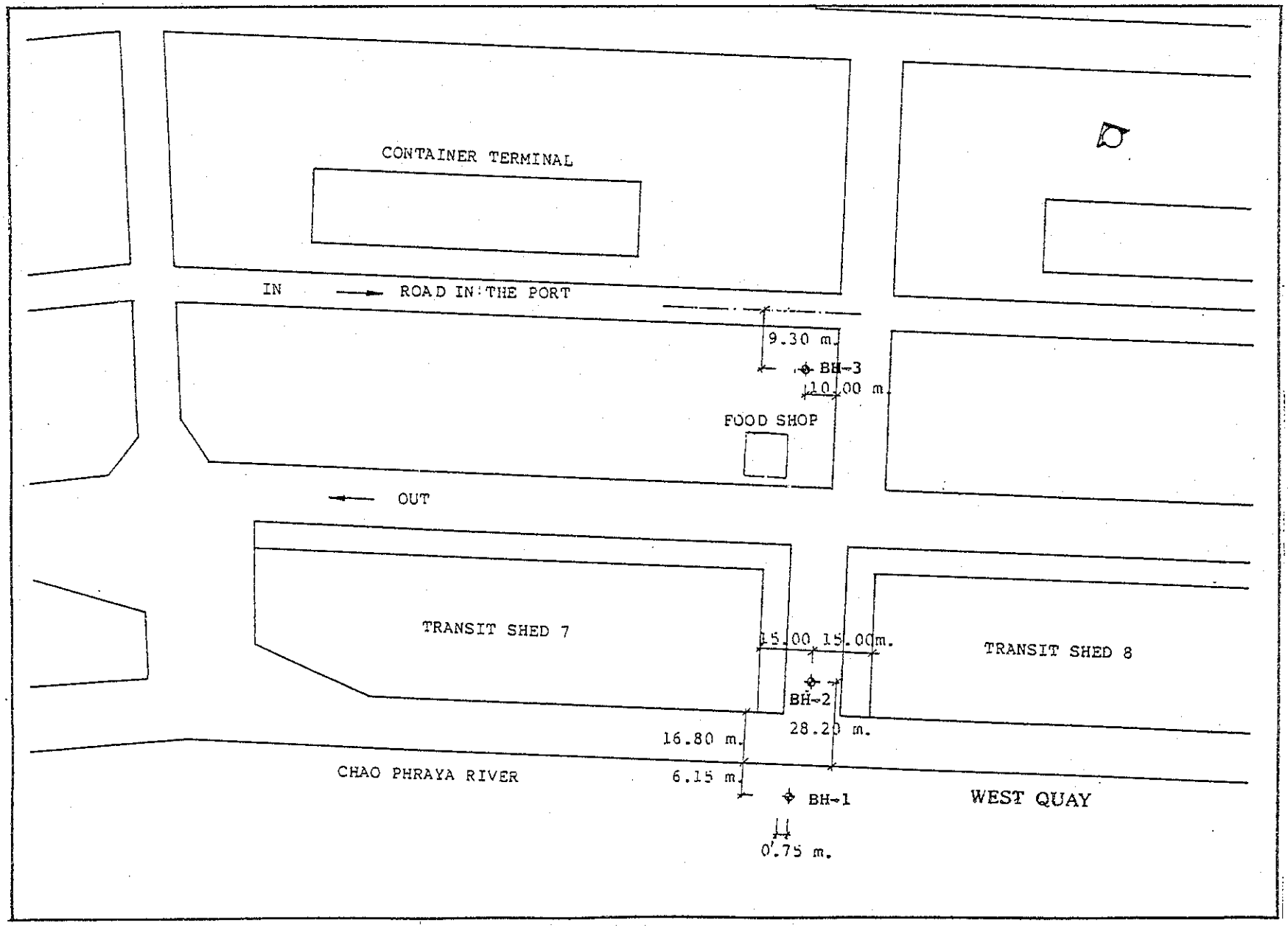


Fig. A-1-1 Location of Borehole BH-1, BH-2, BH-3

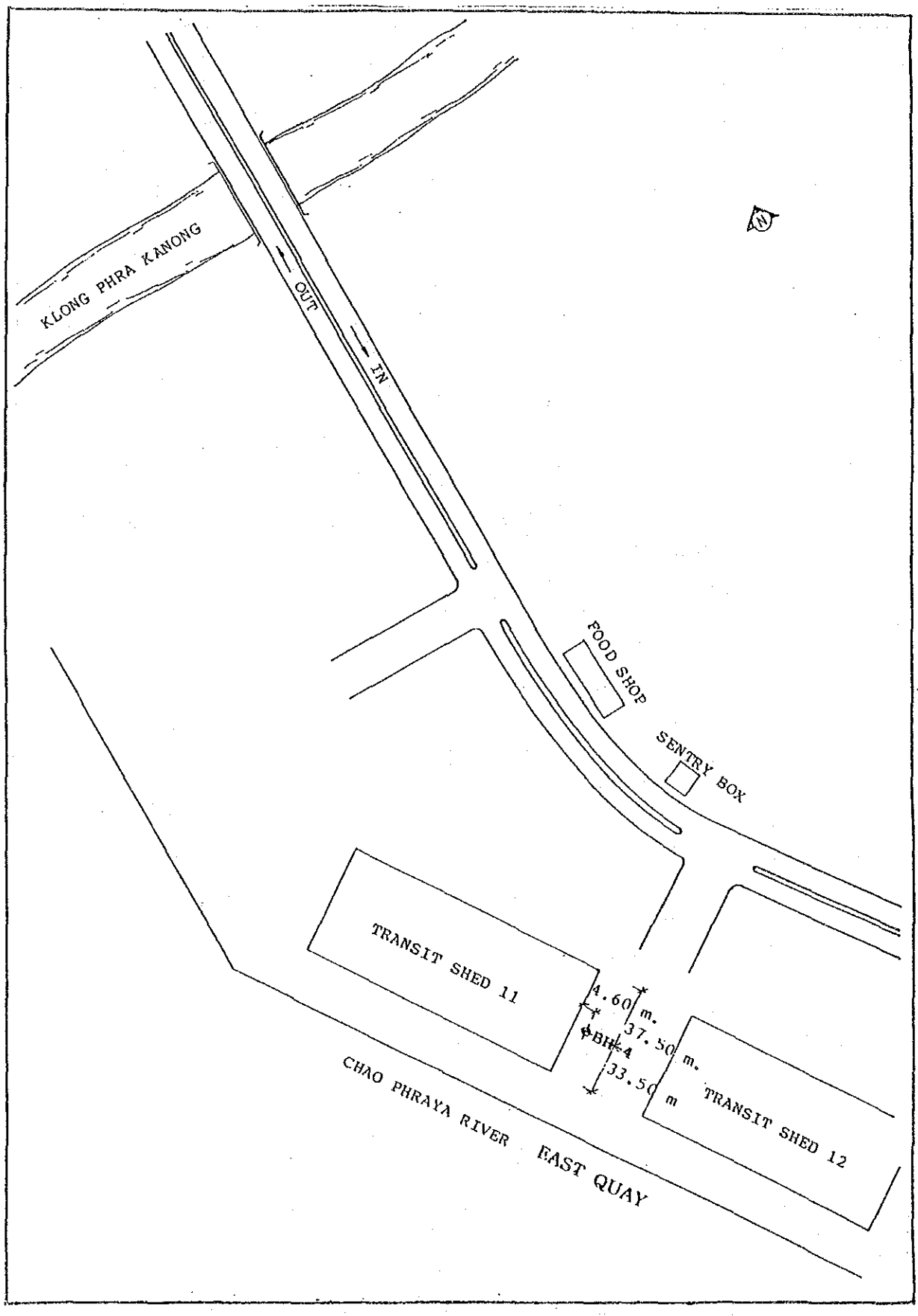


Fig. A-1-2 Location of Borehole BH-4

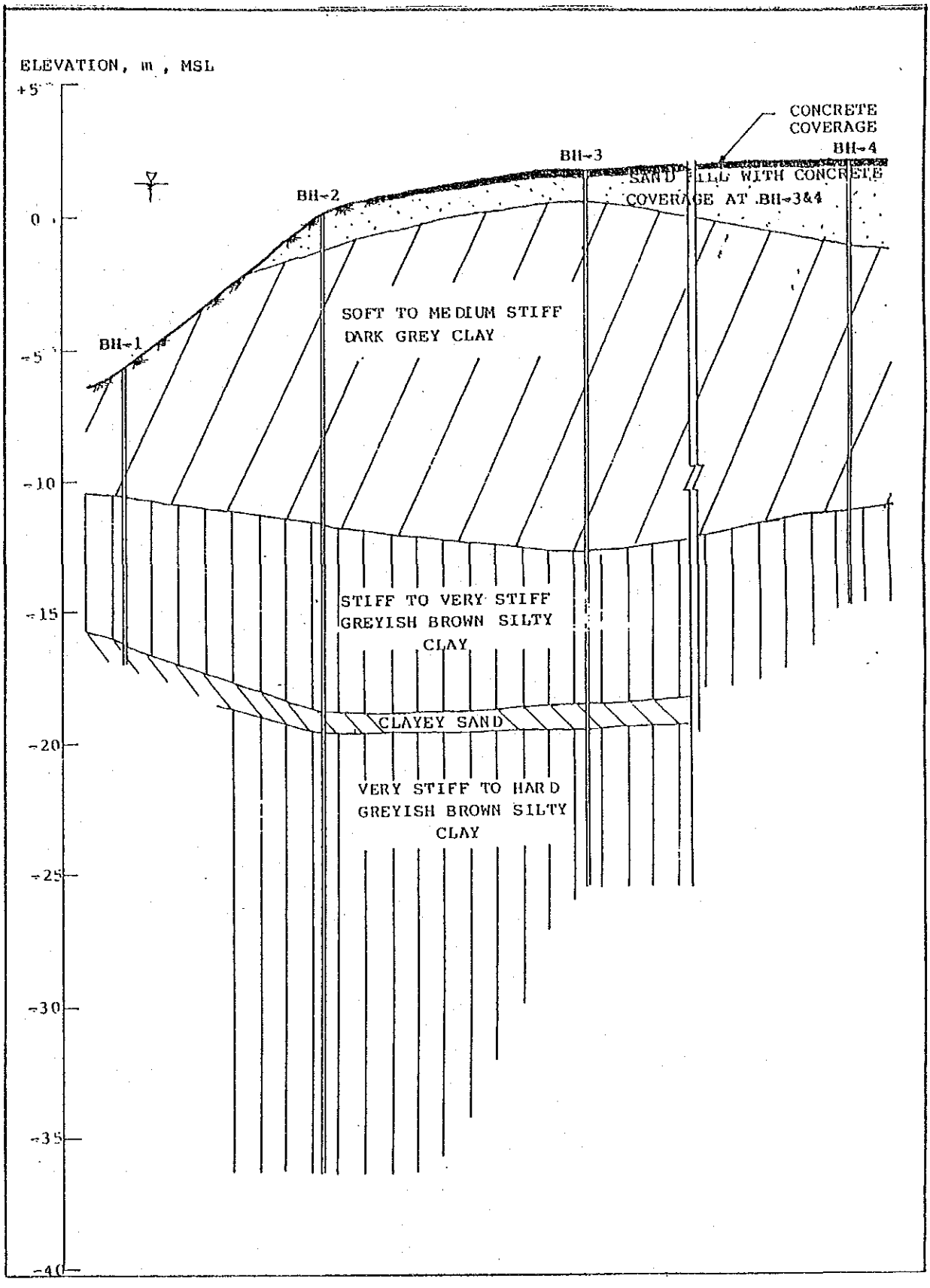


FIg. A-1-3 Soil Stratum

Table A-1-1 Summary of Test Result of BH-1

STS ENGINEERING CONSULTANTS CO.,LTD.
SUMMARY OF TEST RESULTS

PROJECT	THE STUDY ON MODERNIZATION OF BANGKOK PORT	LOCATION	BANGKOK.
DATE	29/05/93	BORING No.	BH-1
JOB No.	4072	BY	CK
GROUND LEVEL, ELEVATION	-5.85 m. MSL		

SAMPLE No.	DEPTH M. FROM	DEPTH M. TO	WATER CONTENT %	ATTERBERG LIMIT % LL.	ATTERBERG LIMIT % PL.	ATTERBERG LIMIT % PI.	WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER No. 3/8"	No. 4	No. 10	No. 40	No. 200	CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m² UNCONFINED SHEAR Qu/2	Qu'/2	FIELD VANE SHEAR Qv'	Qv'	UU TEST Su	POCKET PENETRATION 1/2Qp	STANDARD PENETRATION(N) (blow/30cm)	SPECIFIC GRAVITY TEST
SPT-01	8.30	9.30	161.50	93.50	36.40	57.10					100	99	CH							0	2.64
ST-02	9.80	10.30		(No Recovery)									(CH)								
ST-03	11.30	11.80		(No Recovery)									(CH)								
ST-04	12.80	13.30	22.50	50.50	22.80	27.70	1.95					100	CH	6.82					7.5		2.63
SPT-05	13.40	13.80											CH						10.0	10	
SPT-06	14.30	14.70											CH						13.80	12	
SPT-07	15.80	16.20											CH						15.0	17	
SPT-08	17.30	17.70											CH						16.3	19	
SPT-09	18.80	19.20											SC							30	

Note : The depth at 8.30 m means the ground elevation at -5.85 m. MSL

Table A-1-2(1) Summary of Test Result of BH-2

STS ENGINEERING CONSULTANTS CO.,LTD.
SUMMARY OF TEST RESULTS

PROJECT THE STUDY ON MODERNIZATION OF BANGKOK PORT | LOCATION BANGKOK.

DATE 29/05/93 | BORING No. BH-2 | JOB No. 4072 | BY CK | GROUND LEVEL: ELEVATION + 0.21 m.MSL

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m²						POCKET PENETRATION	STANDARD PENETRATION(N) (blow/30 cm)	SPECIFIC GRAVITY TEST
														UNCONFINED SHEAR		FIELD VANE SHEAR		UU TEST				
	FROM	TO		LL.	PL.	PI.		No. 3/8"	No. 4	No. 10	No. 40	No. 200		Qu/2	Qu'/2	Qv	Qv'	Su				
SPT-01	1.90	2.23		(No Recovery)									(SM)								5	
ST-02	3.40	4.20	63.30	72.30	32.10	40.20	1.54			100	99	99	CH	1.85								2.63
SPT-03	4.90	5.90											CH								0	
ST-04	6.40	7.20		(No Recovery)									(CH)									
SPT-05	7.20	7.70											CH								0	
SPT-06	7.90	8.40											CH								0	
ST-07	9.40	10.20	66.70	89.10	34.20	54.50	1.55			100	99	95	CH	1.31					1.3			2.62
SPT-08	10.90	11.40											CH						1.3		0	
ST-09	12.40	13.20											CH						3.8			
SPT-10	13.90	14.20											CH						7.5		8	
ST-11	15.40	15.75	25.70	54.10	26.60	27.50	2.04					100	CH	9.34					15.0			2.65
SPT-12	15.75	16.15											CH						16.3		14	
SPT-13	16.90	17.30											CH						17.5		17	
SPT-14	18.40	18.80											CH						13.8		11	
SPT-15	19.90	20.30											CL								24	
SPT-16	21.40	21.80	22.30	54.00	22.60	31.40	2.05	100	99	97	96	81	SC/CH						20.0		18	2.66
SPT-17	22.90	23.30											CH						20.0+		31	
SPT-18	24.40	24.80											CH						20.0		28	
SPT-19	25.90	26.30											CH						17.5		18	
SPT-20	27.40	27.80											CH						20.0		25	
SPT-21	28.90	29.30											CH								38	

Note : The depth at 1.90 m. means the ground elevation at + 0.21 m. MSL

Table A-1-2(2) Summary of Test Result of BH-2

STS ENGINEERING CONSULTANTS CO.,LTD.
SUMMARY OF TEST RESULTS

PROJECT THE STUDY ON MODERNIZATION OF BANGKOK PORT | LOCATION BANGKOK.

DATE 29/05/93 | BORING No. BH-2 | JOB No. 4072 | BY CK | GROUND LEVEL ELEVATION + 0.21 m.MSL

SAMPLE No.	DEPTH M. FROM	DEPTH M. TO	WATER CONTENT %	ATTERBERG LIMIT % LL.	ATTERBERG LIMIT % PL.	ATTERBERG LIMIT % PI.	WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER No. 3/8"	No. 4	No. 10	No. 40	No. 200	CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m² UNCONFINED SHEAR Qu/2	Qu'/2	FIELD VANE SHEAR Qv	Qv'	UU TEST Su	POCKET PENETRATION 1/2Qp	STANDARD PENETRATION(N60) (blow/30 cm)	SPECIFIC GRAVITY TEST
SPT-22	30.40	30.80	20.40	55.80	21.30	34.50	2.05	100	96	91	89	87	CH						17.5+	27	2.70
SPT-23	31.90	32.30											CH						12.5	27	
SPT-24	33.40	33.80											CH						20.0	26	
SPT-25	34.90	35.30											CL							50	
SPT-26	36.40	36.80	16.20	47.50	21.20	26.30	2.17				100	98	CL							61	2.65
SPT-27	37.90	38.30											CL							41	

Table A-1-3 Summary of Test Result of BH-3

STS ENGINEERING CONSULTANTS CO.,LTD.
SUMMARY OF TEST RESULTS

PROJECT THE STUDY ON MODERNIZATION OF BANGKOK PORT | LOCATION BANGKOK

DATE 29/05/93 | BORING No. BH-3 | JOB No. 4072 | BY CK | OBSERVED W.L. -1.53 M.

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m²							STANDARD PENETRATION (blow/30 cm)	SPECIFIC GRAVITY TEST
														UNCONFINED SHEAR		FIELD VANE SHEAR		UU TEST	POCKET PENETRATION			
	FROM	TO		LL.	PL.	PI.		No. 3/8"	No. 4	No. 10	No. 40	No. 200		Qu/2	Qu'/2	Qv	Qv'	Su	I/2Qp			
SPT-01	1.50	1.90											CH						2.5		0	
ST-02	3.00	3.80	66.40	82.60	34.30	48.30	1.58					100	CH	7.64					1.3			2.63
SPT-03	4.50	5.20											CH								0	
ST-04	6.00	6.80	70.80	81.20	34.50	46.70	1.57				100	99	CH	2.24					3.8			2.64
SPT-05	7.50	8.20											CH						2.5		0	
ST-06	9.00	9.80	77.20	89.50	35.80	53.70	1.54		100	96	94	82	CH	2.56					2.5			2.63
SPT-07	10.50	11.30											CH						1.3+		0	
SPT-08	12.00	12.70											CH						3.8		0	
SPT-09	13.50	14.20											CH						6.3		0	
SPT-10	15.00	15.40											CH						10.0		12	
SPT-11	16.50	16.90	31.80	59.50	29.00	30.50	1.93				100	99	CH						11.3		8	2.65
SPT-12	18.00	18.40											CH						13.8		14	
SPT-13	19.50	19.90											CH						12.5		14	
SPT-14	21.00	21.40											SC								18	
SPT-15	22.50	22.90	25.60	53.80	24.70	29.10	1.99		100	98	98	94	CH						18.8		23	2.64
SPT-16	24.00	24.40											CH						22.5+		31	
SPT-17	25.50	25.90											CH						17.5		22	
SPT-18	27.00	27.40	26.10	53.40	29.60	33.80	2.03				100	97	CH						16.3		22	2.66

Table A-1-4 Summary of Test Result of BH-4

STS ENGINEERING CONSULTANTS CO.,LTD.
SUMMARY OF TEST RESULTS

PROJECT THE STUDY ON MODERNIZATION OF BANGKOK PORT | LOCATION BANGKOK

DATE 29/05/93 | BORING No. BH-4 | JOB No. 4072 | BY CK | OBSERVED W.L. -1.50 M.

SAMPLE No.	DEPTH M.		WATER CONTENT %	ATTERBERG LIMIT %			WET UNIT WEIGHT t/m³	SIEVE ANALYSIS % FINER					CLASSIFICATION	UNDRAINED SHEAR STRENGTH t/m²							STANDARD PENETRATION (blow/30cm)	SPECIFIC GRAVITY TEST
														UNCONFINED SHEAR		FIELD VANE SHEAR		UU TEST	POCKET PENETRATION			
	FROM	TO		LL.	PL.	PI.		No. 3/8"	No. 4	No. 10	No. 40	No. 200		Qu/2	Qu'/2	Qv	Qv'	Su	1/2Qp			
SPT-01	1.50	1.90		(No Recovery)									(SM)								11	
SPT-02	3.00	3.40											SM/CH								3	
SPT-03	4.50	5.40											CH						1.3		0	
ST-04	6.00	6.80	66.50	79.50	32.70	46.80	1.62	100	95	92	90	89	CH	1.03								2.64
SPT-05	7.50	8.40											CH						1.3		0	
SPT-06	9.00	9.90											CH						1.3		0	
ST-07	10.50	11.30	73.80	78.00	32.50	46.00	1.61			100	99	97	CH	2.62					2.5			2.62
SPT-08	12.00	12.70											CH						1.3		0	
SPT-09	13.50	13.90											CH						7.5		7	
SPT-10	15.00	15.40											CH						12.5		10	
SPT-11	16.50	16.90											CH						18.8		15	

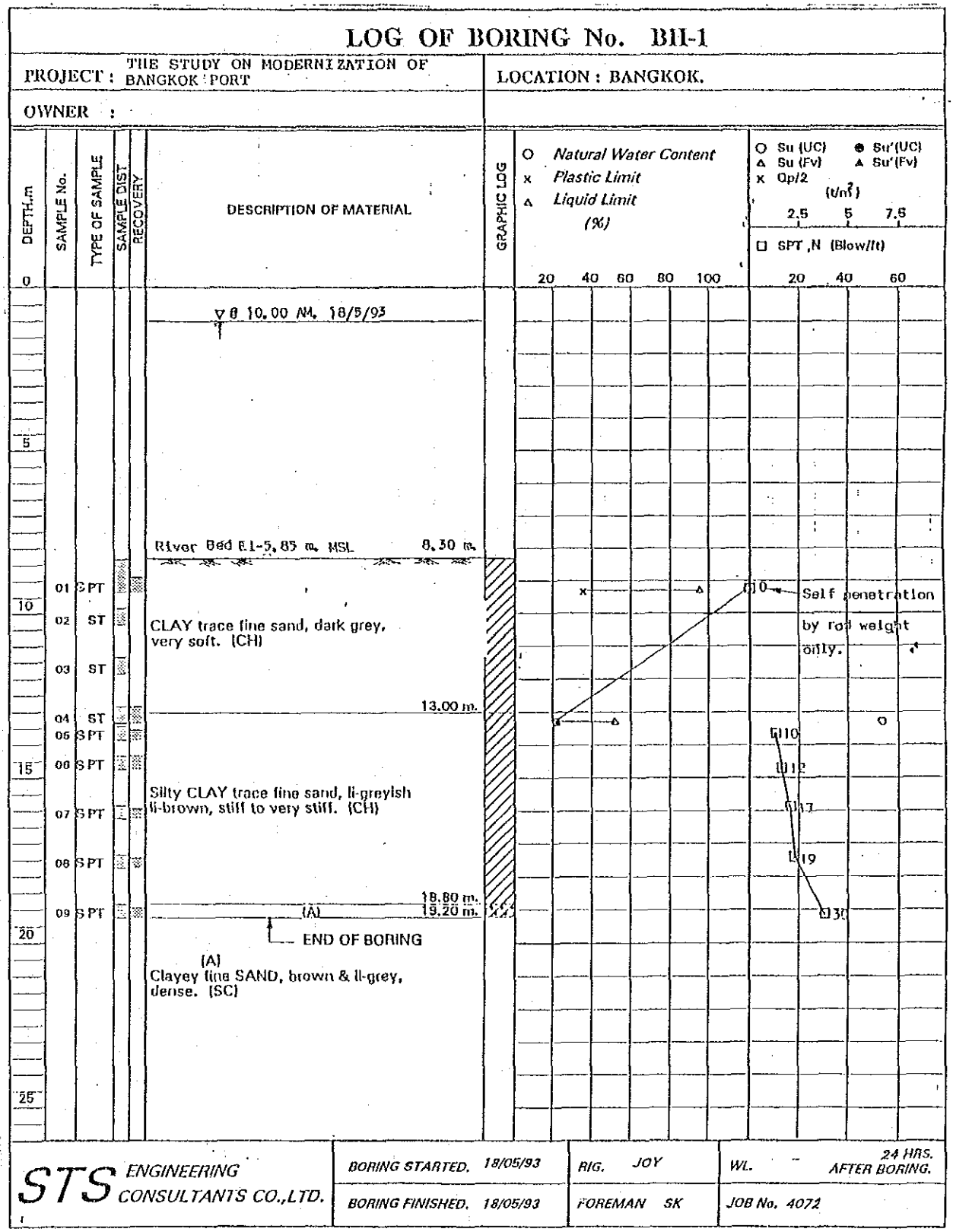


Fig. A-1-4 Log of Boring BH-1

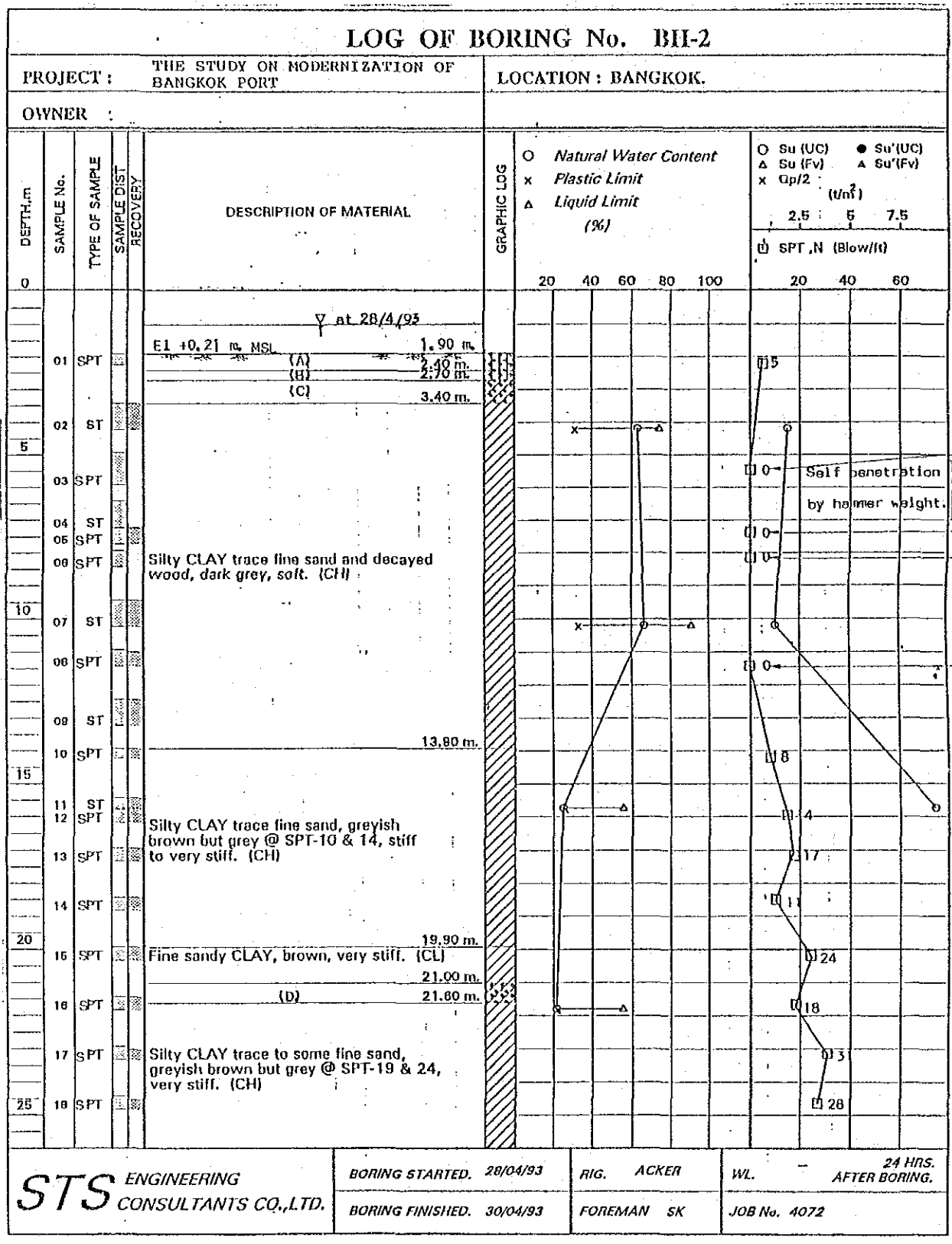


Fig. A-1-5(1) Log of Boring BH-2

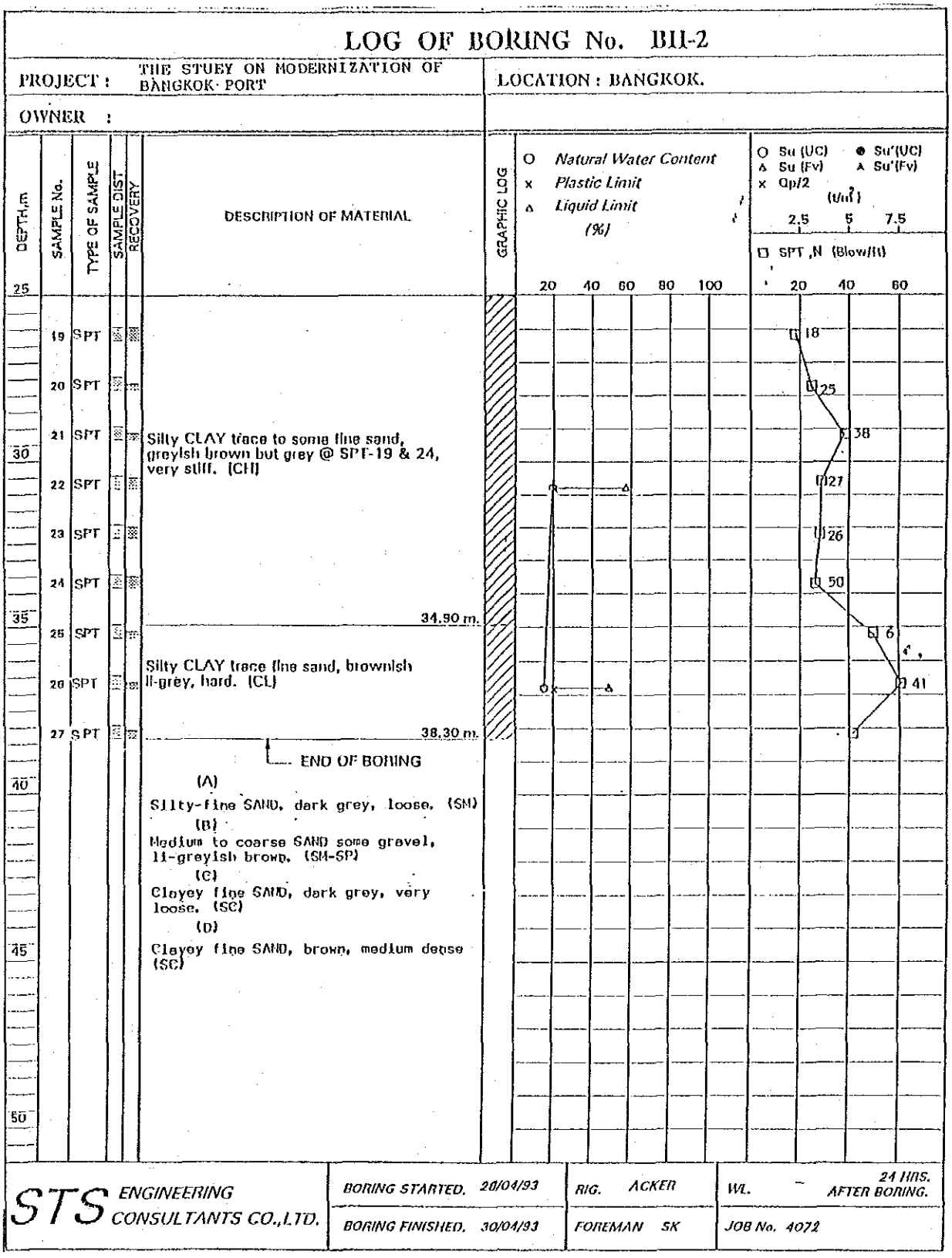


Fig. A-1-5(2) Log of Boring BH-2

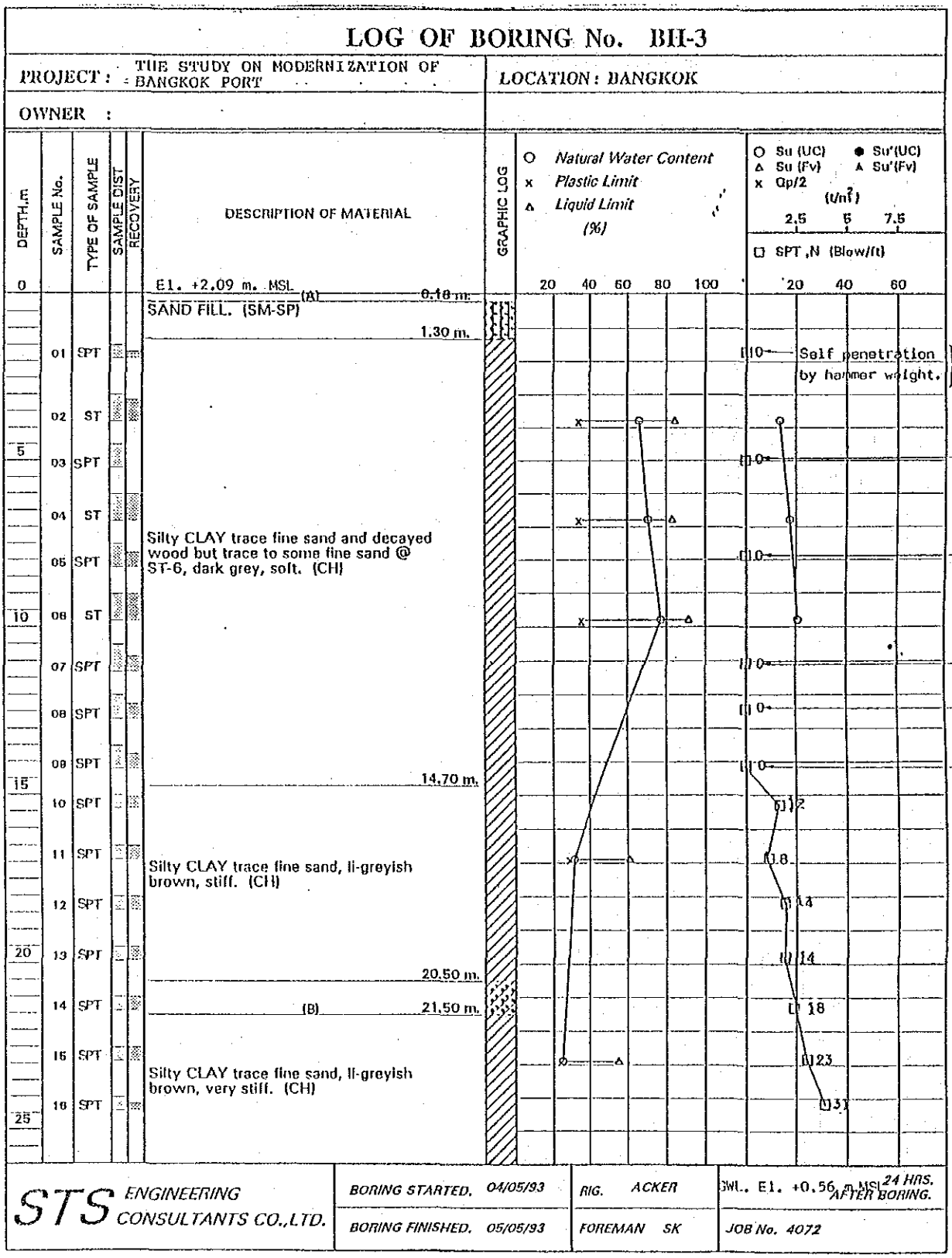


Fig. A-1-6(1) Log of Boring BH-3

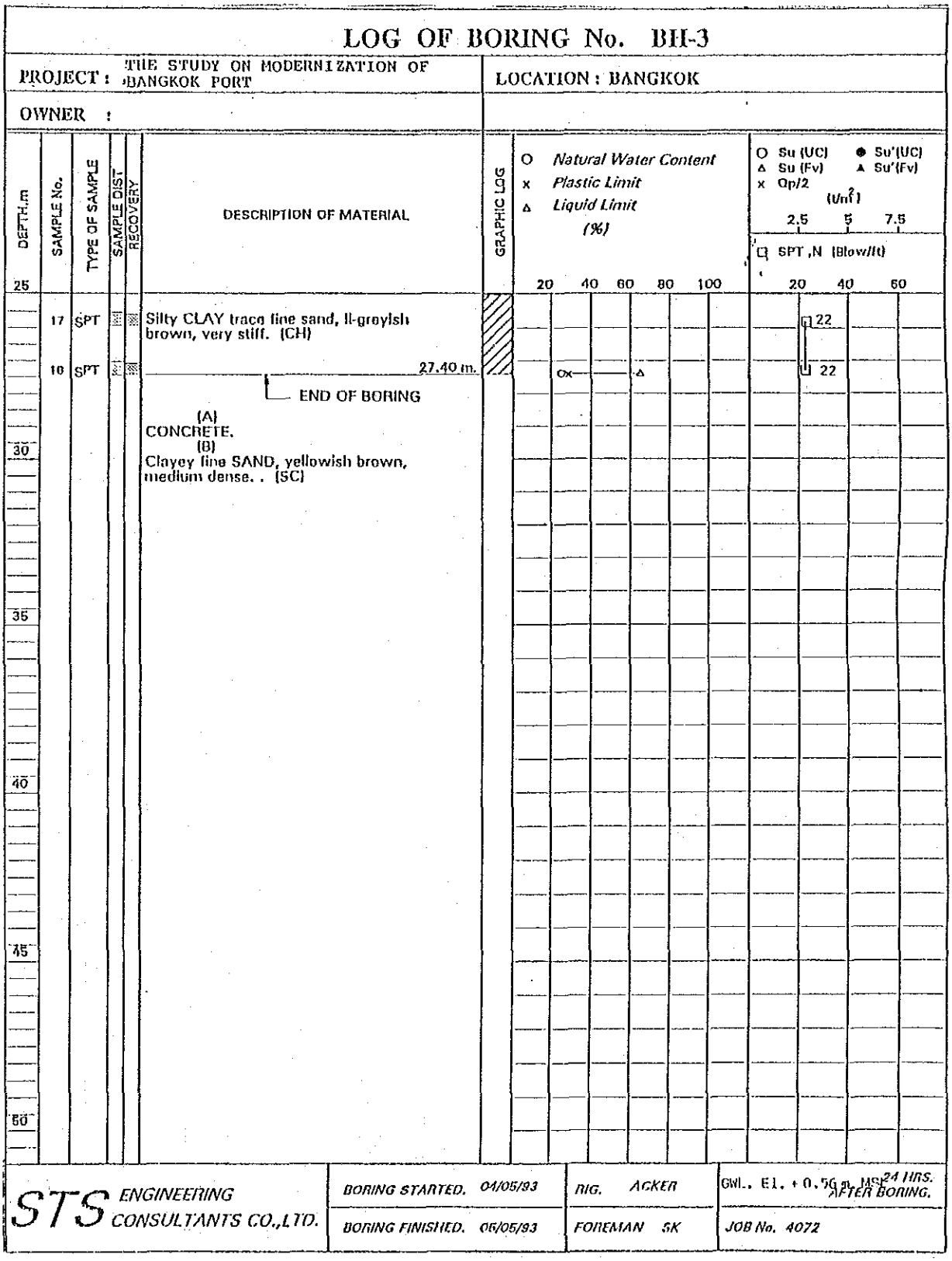


Fig. A-1-6(2) Log of Boring BH-3

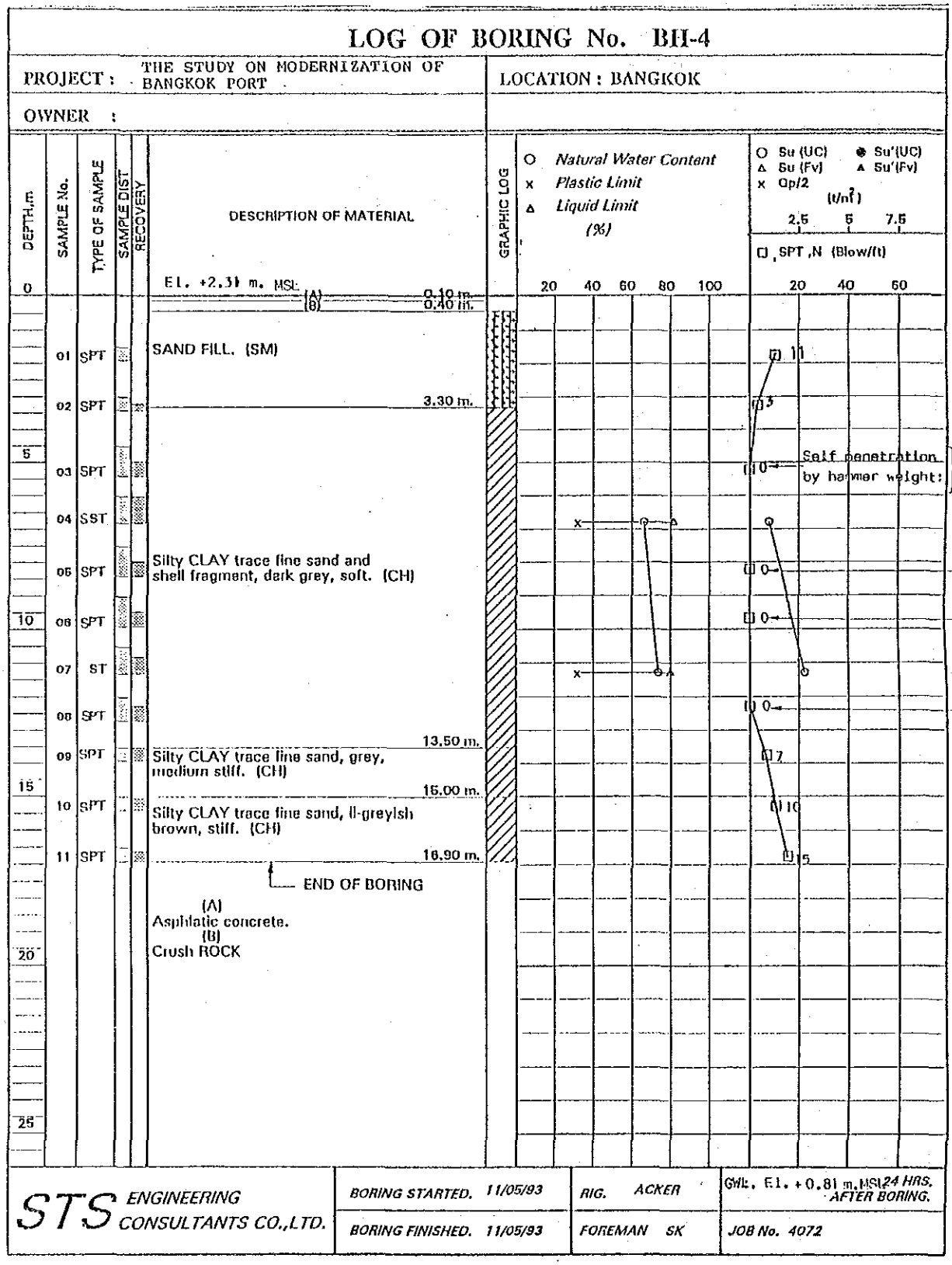


Fig. A-1-7 Log Boring BH-4

APPENDIX 2

Road Traffic Investigation

Appendix 2 Road Traffic Investigation

A.2.1 General

On May 12th, 1993, a road traffic survey was conducted to grasp the data of present traffic condition in and around Bangkok Port. The traffic survey composed of 2 types ; one was a road side traffic survey in which that traffic volume of 5 vehicle types was recorded each hour, the other was an interview survey to truck drivers at two checking posts that included O/D interview.Incidentally, PAT has traffic control regulation at gates and in Bangkok Port as follows.

a. Gate Control

Bangkok Port has 2 gates(west gate, east gate). The Security Division is responsible for managing passenger vehicles (passenger cars, motorcycles) while the General Administration Division controls the gates for cargo trucks during the following times.

a.1 West Gate (only import cargo)
Time: 8:00a.m.-18:00 ------- 3 lanes for import cargo
Time: 18:00 -8:00a.m ------- 1 lane (reduced from 3 lanes to lane)for import cargo

b.2 East Gate (import cargo and export cargo)
Time: 8:00a.m.-24:00 ------- 3 lanes for import cargo (after 24:00 closing 3 lanes)
Time: 24 hours ---------- 3 lanes for export cargo

b. Port Police regulation in Bangkok Port

Traffic control is managed by port police in Bangkok Port. Two par-ties of police patrol west and east quay.Depend on traffic conges-tion, Port Police conduct traffic control. On regulation of port police, maximam speed in Bangkok Port is 30km/hour for cargo trucks,40km/hour for passenger car. In addition, Bangkok Port has a one way road in the west quay and passenger vhicles are prohibited along the apron of both quays.

A.2.2 Execution of work

a. Location map of all traffic count stations is presented in Fig.A-2-1.

b. Interview survey was made to both truck and trailer truck drivers at the entrances of PAT's checking post from 8:00a.m - 6:00p.m of May 12, 1993. The number of samplings totalled 4,042.Survey data were recorded into Table A-2-2. The results were tallied and converted to percentage of O/D by classified regional province and districts in Bangkok (as shown in Figure A-2-5, A-2-6).

A.2.3 Results of Traffic Volume Investigation

The total number of vehicles that passed by the gate was 51,129 within 24 hours (See Table A-2-1). Concerning vehicle type, 75% at the west gate,73% at the east were passenger car and 2-wheeled vehicles (See Fig A-2-3). In the terms of movement of traffic volume by time of day,commuter traffic volume was concentrated in the morning and evening for a duration of one or two hours. However, a large percentage of 2-wheeled vehicles were observed during working hours because the majority of 2-wheeled vehicles are used for transfer of documents. Obviously, the large percentage of passenger cars and 2-wheeled vehicles is one of negative factors which hinders the smooth transport factor of cargo.

A.2.4 Impact to Expressway

Impact from/to Expressway is converted to PCU (passenger car unit). From this calculation, percentage of traffic volume from/to Expressway to/from Bangkok Port was 2-4%, which means that related vehicles of Bangkok Port represent only a small percentage of the total vehicles on Expressway. Percentage of each points, and traffic PCU volume is shown as follows.

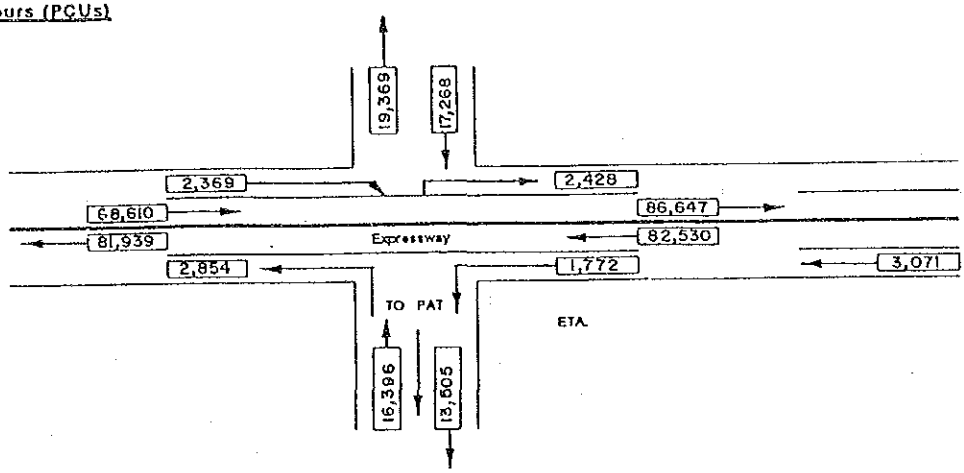
a. Effect from Expressway = (2,369+1,772)/13,505*100
= 30.7%
b. Effect to Expressway = (2,854+81,939)*100
= 3.5%
c. Effect to Expressway = (2,428/86,647)*100
= 2.8%
d. Effect to Expressway (Truck out of PAT at Gate No.2 only)
= (3,071/82,530)*100
= 3.7%

e. Effect from PAT. to Main Road

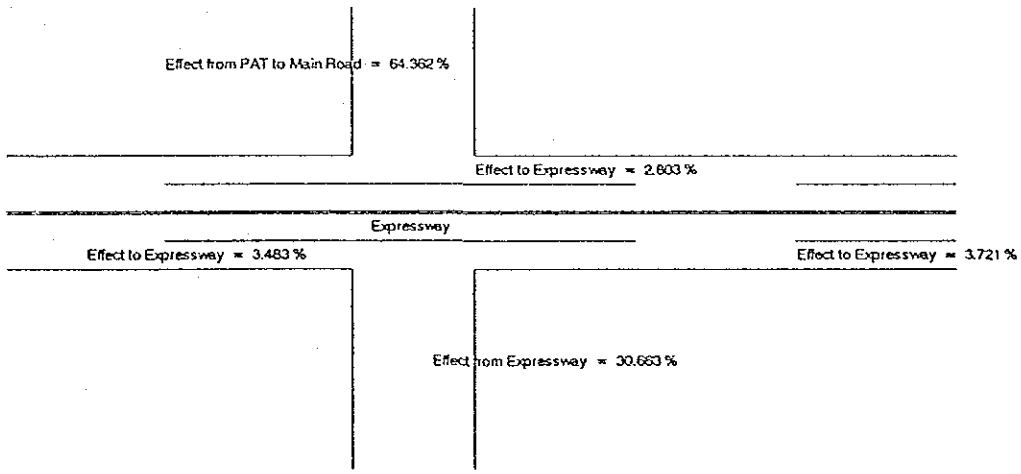
= (11,114/19,369)*100

= 64.3%

Traffic Flow 12 hours (PCUs)



Effect to Expressway and Main Road (PCUs)



PCU Equivalent;

Passenger Car = 1.0

P/U & L/Truck = 1.5

H/Truck & Trailer = 3.0

Motorcycle= 1.0

Other = 0.25

A.2.5 Results of truck Interview

Based on the interviews with truck drivers, present situation of container trucks, i.e. kind of container, status and No. of container, was analyzed on Table A-2-2. According to the analysis of the O/D interview, 86% of the total interview of both gates were destined for Bangkok Metropolis and Central region. On the other hand, 85% of the total originated from Bangkok Metropolis and Central region (See Fig A-2-5, A-2-6).

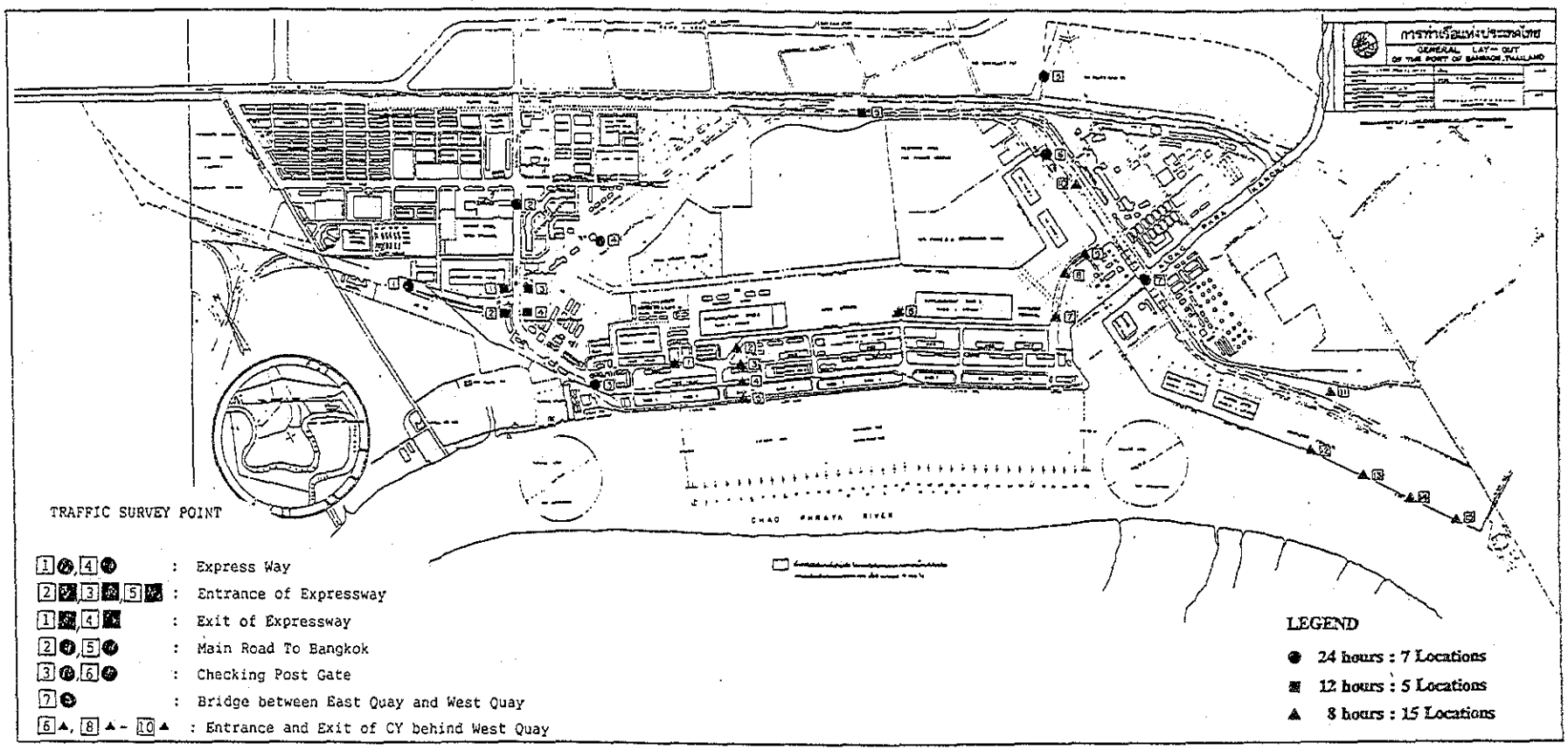
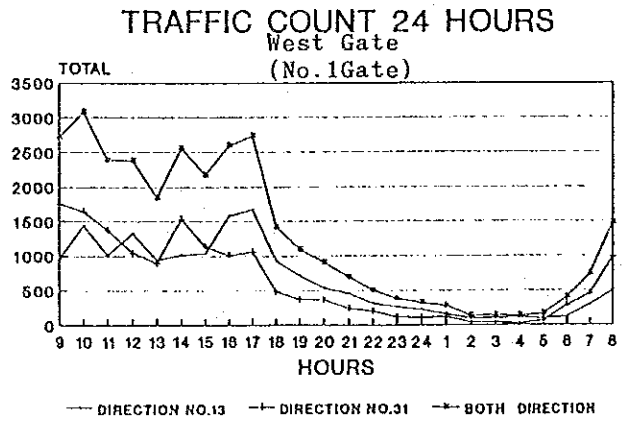
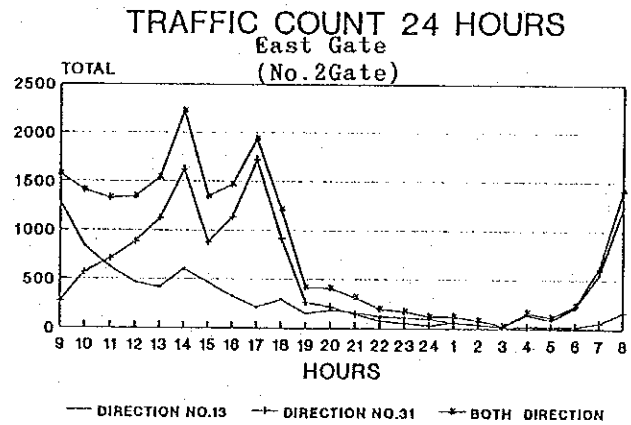


Fig. A-2-1 Location of Traffic Survey

Table A-2-1 Total Traffic Volumes of Gates and Bridge by type

Location No.	Hours	In or Out	Passenger Car Bus Van	Pick Up L/Truck	Trailer Heavy Trauck	Motorcycle	Other	Total
West Gate (No.1 Gate)	24	Out(13)	4,982	1,957	2,248	6,667	68	15,922
		%	31.29	12.29	14.12	41.87	0.43	100
		In(31)	4,998	2,242	1,112	6,929	76	15,357
		%	32.55	14.6	7.24	45.12	0.49	100
		Total	9,980	4,199	3,360	13,596	144	31,279
		%	31.91	13.42	10.74	43.47	0.46	100
East Gate (No.2 Gate)	24	Out(31)	1,776	1,100	1,621	6,432	142	11,071
		%	16.04	9.94	14.64	58.10	1.28	100
		In(13)	1,899	727	1,510	4,352	291	8,779
		%	21.63	8.28	17.20	49.57	3.31	100
		Total	3,675	1,827	3,131	10,784	433	19,850
		%	18.51	9.20	15.77	54.33	2.18	100
Gates Total	24	Out	6,758	3,057	3,869	13,099	210	26,993
		%	25.04	11.33	14.33	48.53	0.78	100
		In	6,897	2,969	2,622	11,281	367	24,136
		%	28.58	12.30	10.86	46.74	1.52	100
		Total	13,655	6,026	6,491	24,380	577	51,129
		%	26.71	11.79	12.70	47.68	1.13	100
Bridge	24	From E/Quay(24)	1,317	1,174	2,459	4,055	275	9,280
		%	14.19	12.65	26.50	43.70	2.96	100
		To E/Quay(24)	1,473	1,312	2,402	4,455	313	9,955
		%	14.80	13.18	24.13	44.75	3.14	100
		Total	2,790	2,486	4,861	8,510	588	19,235
		%	14.50	12.92	25.27	44.24	3.06	100





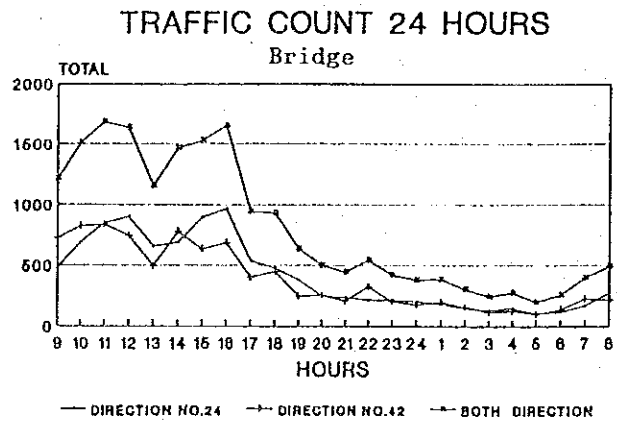


Fig. A-2-2 Traffic Volume of Gates and Bridge by Time

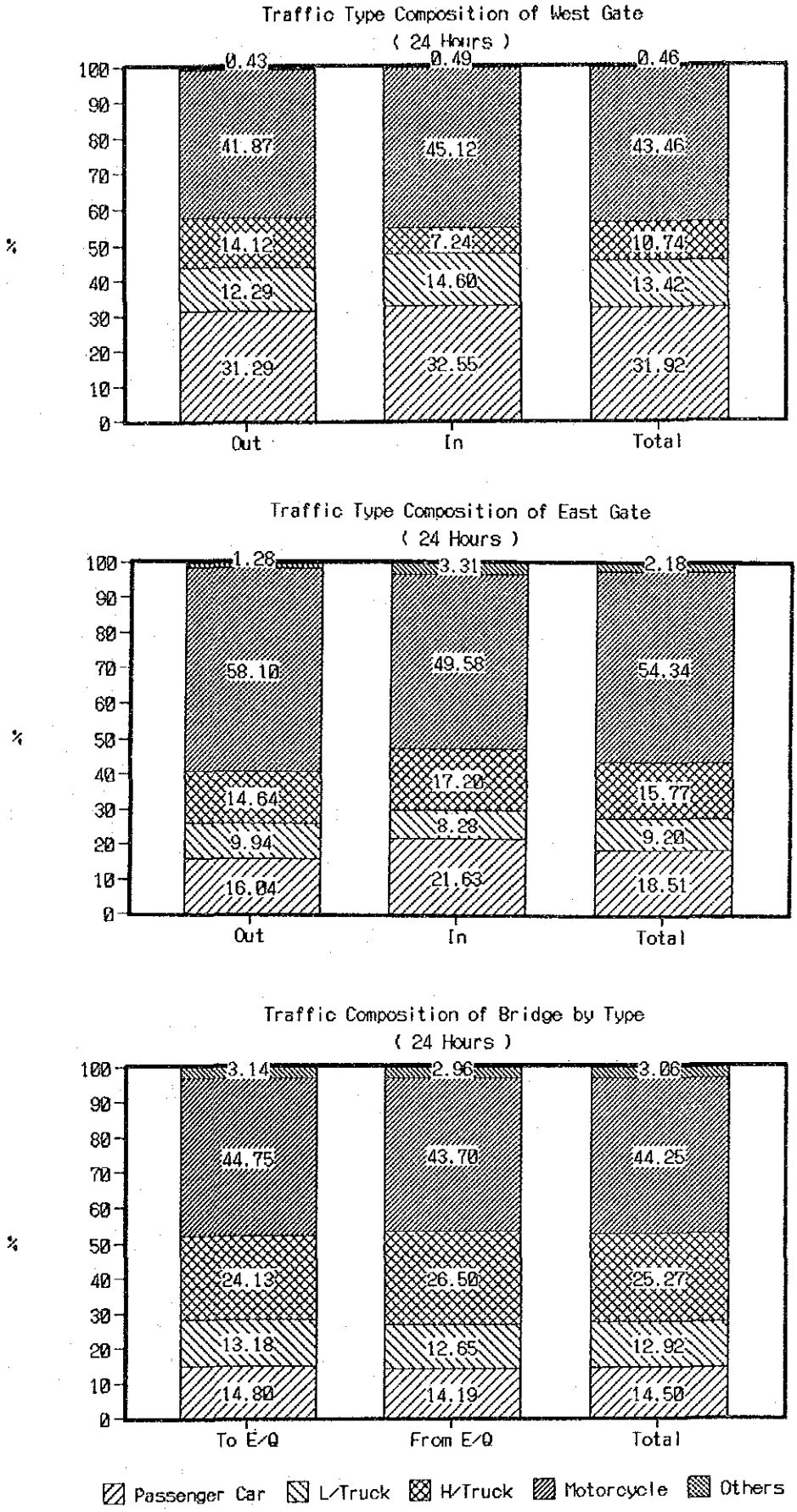


Fig. A-2-3 Traffic Volume of Gates and Bridge by type

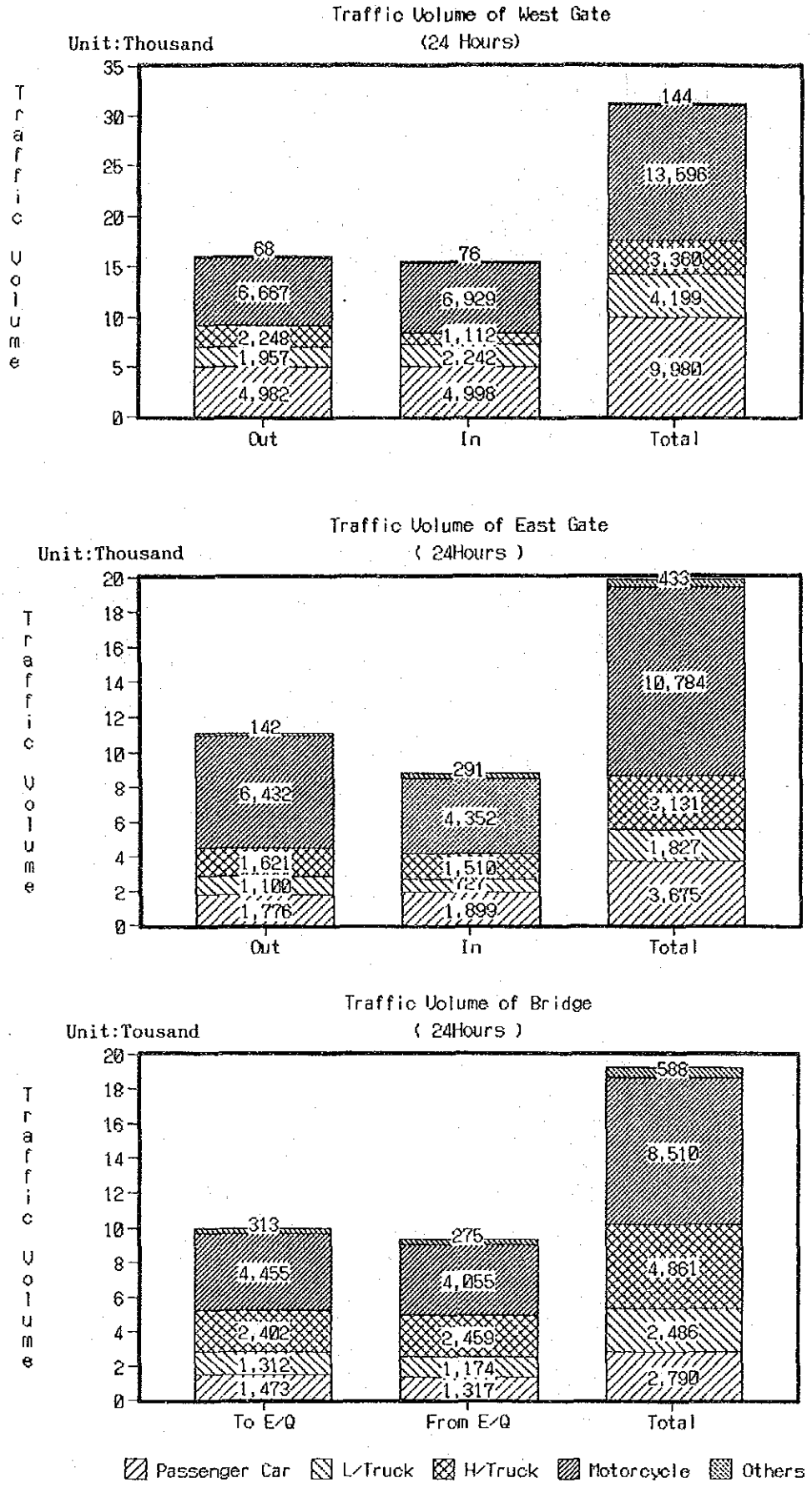


Fig. A-2-4 Percentage of Vehicle Type at Gates and Bridge

Table A-2-2 Analysis of Roadside Interview

1) Passing In(West Gate and East Gate)

Total of Traffic OD Survey Data (Volume and Percent)

	Volume	%		Volume	%		Volume	%
Truck	1,461	74.62	Trailer	497	25.38	Total	1,958	100.00

Kind of Trailer

Trailer Truck											
No.of Container Load			Container Size			Kind of Container			Status of Container		
	Volume	%		Volume	%		Volume	%		Volume	%
1 Con.	386	77.67	20 Feet	207	41.65	General	463	93.16	Loaded	282	56.74
2 Con.	111	22.33	40 Feet	290	58.35	Reefer	16	3.22	Empty	215	43.26
						Tank	14	2.82			
						Others	4	0.80			
Total	497	100.00	Total	497	100.00	Total	497	100.00	Total	497	100.00

2) Passing Out(West Gate and East Gate)

Total of Traffic OD Survey Data (Volume and Percent)

	Volume	%		Volume	%		Volume	%
Truck	1,898	91.07	Trailer	186	8.93	Total	2,084	100.00

Kind of Trailer

Trailer Truck											
No.of Container Load			Container Size			Kind of Container			Status of Container		
	Volume	%		Volume	%		Volume	%		Volume	%
1 Con.	144	77.42	20 Feet	90	48.39	General	171	91.94	Loaded	137	73.66
2 Con.	42	22.58	40 Feet	96	51.61	Reefer	8	4.30	Empty	49	26.34
						Tank	7	3.76			
						Others	0	0.00			
Total	186	100.00	Total	186	100.00	Total	186	100.00	Total	186	100.00

3) Passing In and Out(West Gate and East Gate)

Total of Traffic OD Survey Data (Volume and Percent)

	Volume	%		Volume	%		Volume	%
Truck	3,359	83.10	Trailer	683	25.38	Total	4,042	100.00

Kind of Trailer

Trailer Truck											
No.of Container Load			Container Size			Kind of Container			Status of Container		
	Volume	%		Volume	%		Volume	%		Volume	%
1 Con.	530	77.60	20 Feet	297	43.48	General	634	92.83	Loaded	419	61.35
2 Con.	153	22.40	40 Feet	386	56.52	Reefer	24	3.51	Empty	264	38.65
						Tank	21	3.07			
						Others	4	0.59			
Total	683	100.00	Total	683	100.00	Total	683	100.00	Total	683	100.00

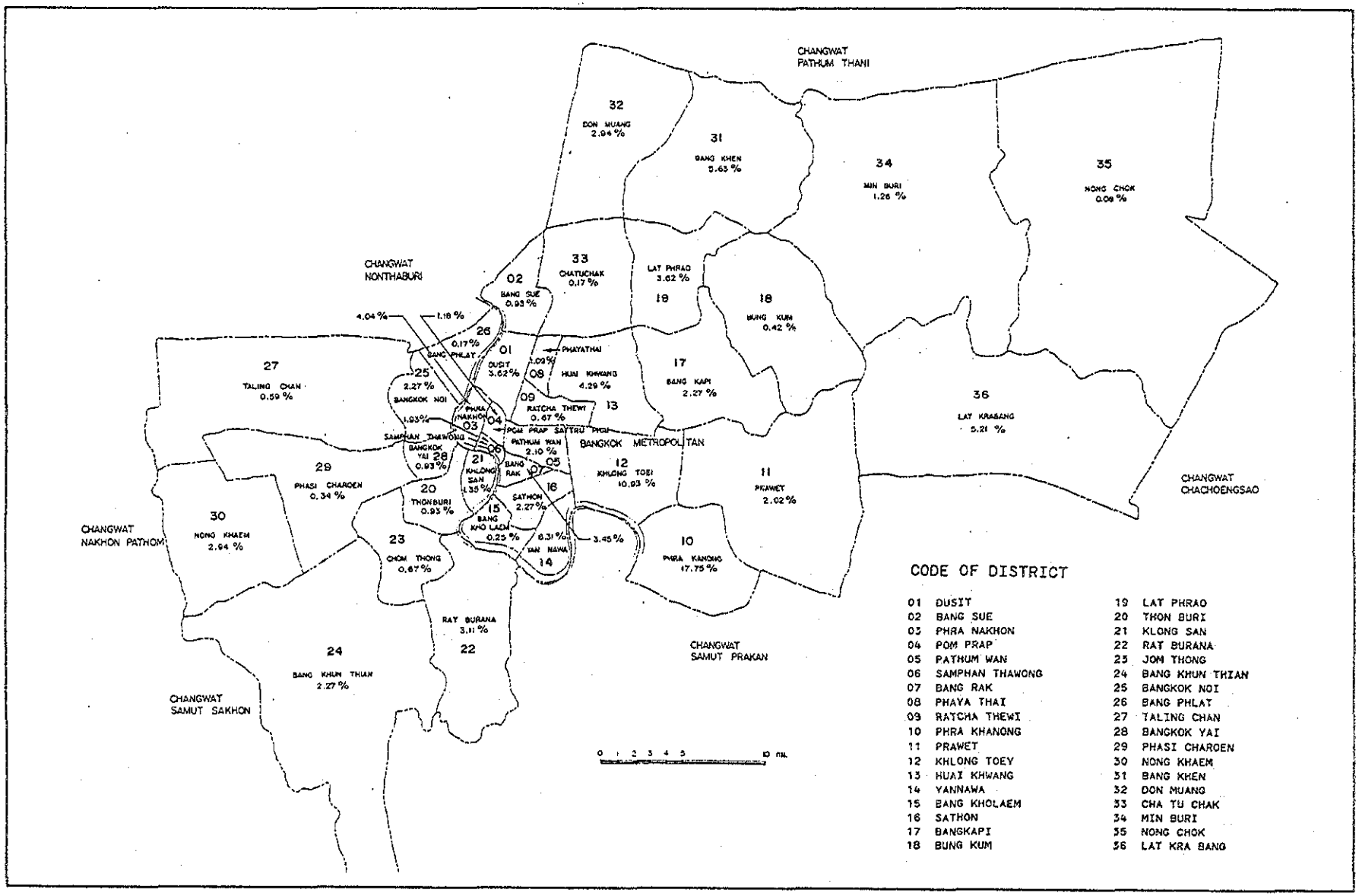


Fig. A-2-5 Percentage of O/D Interview By District of Bangkok

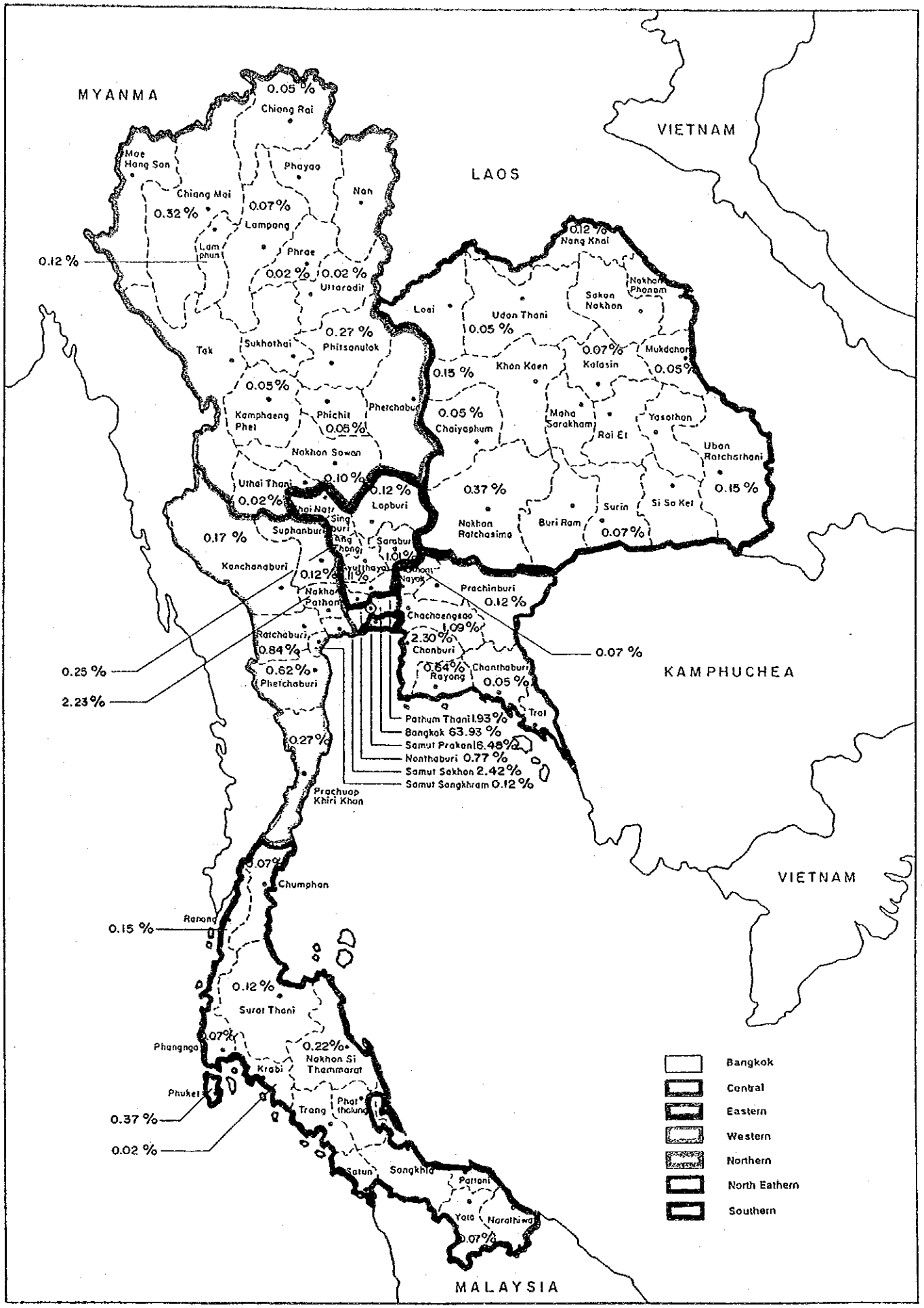


Fig. A-2-6 Percentage of O/D Interview By Province

APPENDIX 3

Railway projects

Appendix 3 Railway Projects

A.3.1 Double Track Railway Projects

(1) Routes

Construction of Double - track railway covering 2744 kms. At first, Double - track railway will be constructed around Bangkok as follows :

North	:	Rangsit - Lop Buri	104 kms.
East	:	Huamak - Cha Choeng Sao	45 kms.
South	:	Bang sue - Nakorn Patom	41 kms.
North-east	:	Ban Pa Chee - Mab Ka Bao	44 kms.
		Total	234 kms.

The remaining is considered to be constructed later.

(2) Implementation

Construction of Double - Track railway will start in 1994 and it is expected that some part can be used in 1995. These 4 railways will be completely finished in 1996.

(3) Benefits

When this project is finished, people throughout the country will enjoy wider, faster, and safer rail service.

A.3.2 Elevated Way Project

(1) Railway Transportation and Elevated way System

Railway transportation and elevated highway system are included in the same elevated way. (See attached Fig. A-3-1)

Top : Lane divides into 2 directions, each direction has 3 lanes.

Middle : The SRT's (State Railway of Thailand) railways is 2-3 lanes in center. And community trains are left and right sides as one lane. Stations will be located at 0.7-1.2 km intervals.

Ground : Local Road, each side 2-4 lanes will be connected to the other concerning project.

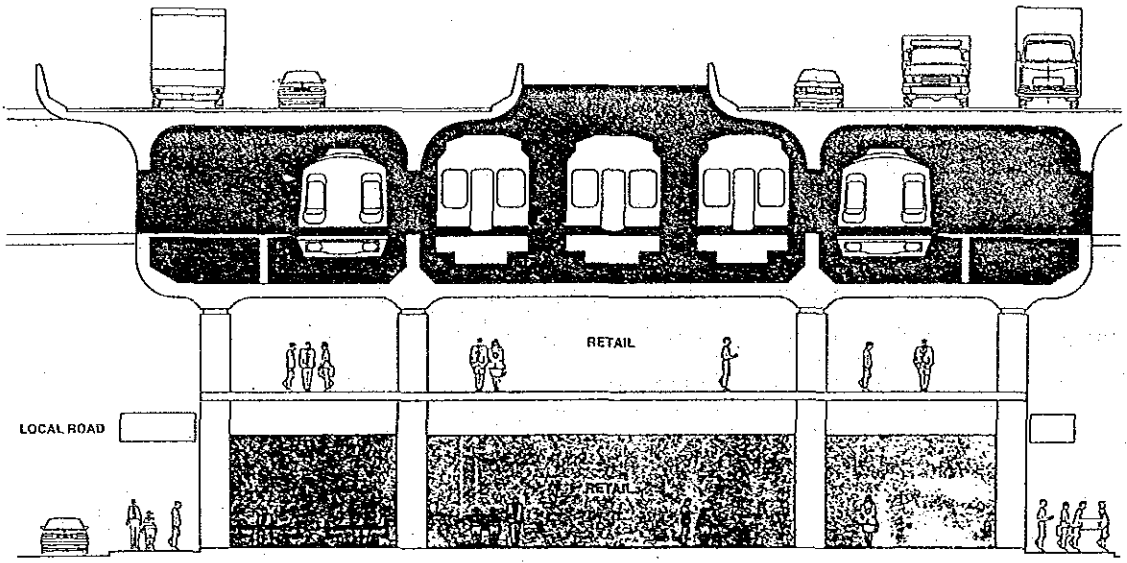


Fig. A-3-1 Section of Elevated Way

(2) Direction

The concession routes consist of 60.1 kms of railway split into two dis - tinct lines.

North - South
Ponimit - Wong Wien Yai - Khlong Ton (cross Chao Phraya River) Hualumpong - Yummaraj - Bangsue - Donmuang - Rangsit (Total distances are 34.2 kms)

East-West
Huamark - Makkasan - Yummaraj - (cross Chao Phraya River) - Bangkok Noi - Taringchan, Makkason station - Bangkok Port station (Total distances are 25.9 kms)

(3) Community Train's Fare

Hopewell Company has set fare rate of 0.60 Baht per km.

Expressway's rate	
- Vehicle 4 wheels	1.25 Baht/km.
- Vehicle 6 wheels	2.50 Baht/km.
- Vehicle 8-10 wheels	3.75 Baht/km.
-Container's car 40 ft. or longer	5.25 Baht/km.

(4) Standard of Community Train's Service

Community train is an electricity driven train which contains 12 air conditioned compartments and there are 5 doors in one compartment. During rush hour it will operate headway within 2 minutes and is expected to have a capacity of more than 3 million passengers per day.

(5) Surrender

The project mostly used SRT's land and the first stage construction of Hualumpong-Rang sit and Yummarat-Huamark will not be surrendered.

(6) Construction Period

The elevated way project will be constructed in 8 years as follows :

North - South

	Railway	Express way for community train	Construction Ended period (year) year
1. Yummaraj-Dongmuang	18.8	18.8	4 1995
2. Hualumpong-Yummaraj	2.2	2.2	4 1996
3. Donmuang-Rangsit	7.0	7.0	4 1997
4. Wong Wien Yai-Hualumpong	3.2	3.2	4 1998
5. Phonimit-Wong Wien Yai	3.0	3.0	4 1999
Total distance	34.2	34.2	

East - West

1. Yummaraj-Huamark	13.0	13.0	4 1996
2. Makkasan-Maenam	3.3		4 1996
3. Thonburi-Yummarat	3.5	3.5	4 1998
4. Tharingchan-Thonburi	6.1	6.1	4 1999
Total distance	25.9	22.6	

(7) SRT's Land Development

Hopewell company has tried to make use of this land as follows :

Location	Description	Quantity (rai)
1. Hualumpong	Hualumpong station, office	112.0
	and railway platform	4.5
2. Bangsue	Red lodging colony	120.0
	Gathering and maintenance community train section	80.0
	Main station	40.0
3. Makkasan	Gathering and maintenance community train section	80.0
4. Makkasan	Railway hospital and lodging colony	112.0
5. Yummaraj	Lodging colony at Jitratda triangle	40.0
6. Bangkok Noi	Bangkok Noi station	45.0
	Total	633.5

(8) Public Benefits

Society and environment

- To ease Bangkok's traffic congestion especially where railway and road meet and to create a positive social environment
- To reduce air pollution

Economic

- To reduce wasteful energy, oil and conveyance
- Increase efficiency of community transportation
- Increase income and work opportunities

(9) Background

The problem of traffic congestion in Bangkok is now more serious. The government has tried to solve it by encouraging the development of a community transportation project, railway project, etc.

Ministry of Communication and State Railway of Thailand signed the contract with Hopewell (Thailand) Co. on November 9, 1990. According to the contract, Hopewell will be the investor, manager and be responsible for maintenance of entire railway system. This project cost is 80 billion baht. SRT gives 633.5 rai to Hopewell to make use them in 30 years since December 6, 1991.

APPENDIX 4

Present Situation of Each Port

Appendix 4 Present Situation of Each Port

A.4.1 Laem Chabang Port

(1) Outline

Laem Chabang Port is situated halfway down the eastern gulf coast, about 130km southeast of Bangkok and 15km north of the international resort city Pataya. The port was designed to render services to large container ships and bulk carriers which cannot be accommodated at Bangkok Port and was opened in January 1991 (see Fig. A-4-1).

(2) Port Facilities

Port facilities of the initial stage include:

1) Terminals

Berths	Length/Depth	Capacity
1 Multi-Purpose Terminal	300m. each/14m.MSL	-General cargo ship of 30,000 D.W.T. -Cargo throughput 0.51 million tons/year
3 Container Terminals	300m. each/14m.MSL (a berth box of 50m wide, 1,200 m long and 15m MSL deep)	-Container ships of 30,000-50,000 D.W.T. -Cargo throughput 4.5 million tons/year -Terminal:300m x 350m -CFS :115.5m x 40m
1 Coastal Terminal	200m/6.5m.MSL	-Domestic ship of 1,000 D.W.T. -Cargo throughput 0.163 million tons/year
1 Service Boat Berth	100m/6.5m.MSL	-Service boat of 1,000 D.W.T.
2 Agri-bulk Terminals	approx.650m./ 14m.MSL	-Tapioca ship of 70,000 D.W.T. -Sugar-molasses ship of 40,000 D.W.T.

-Cargo throughput 2.08 million tons/year

Total capacity: 7,253 million tons/year

2) Dredging

A dredged channel of 14m.MSL in depth, 2.5km in length

3) Breakwater

Total breakwater length is 1,300m.

4) Others

Transit sheds, open storage area, office buildings, roads, railway and other utilities.

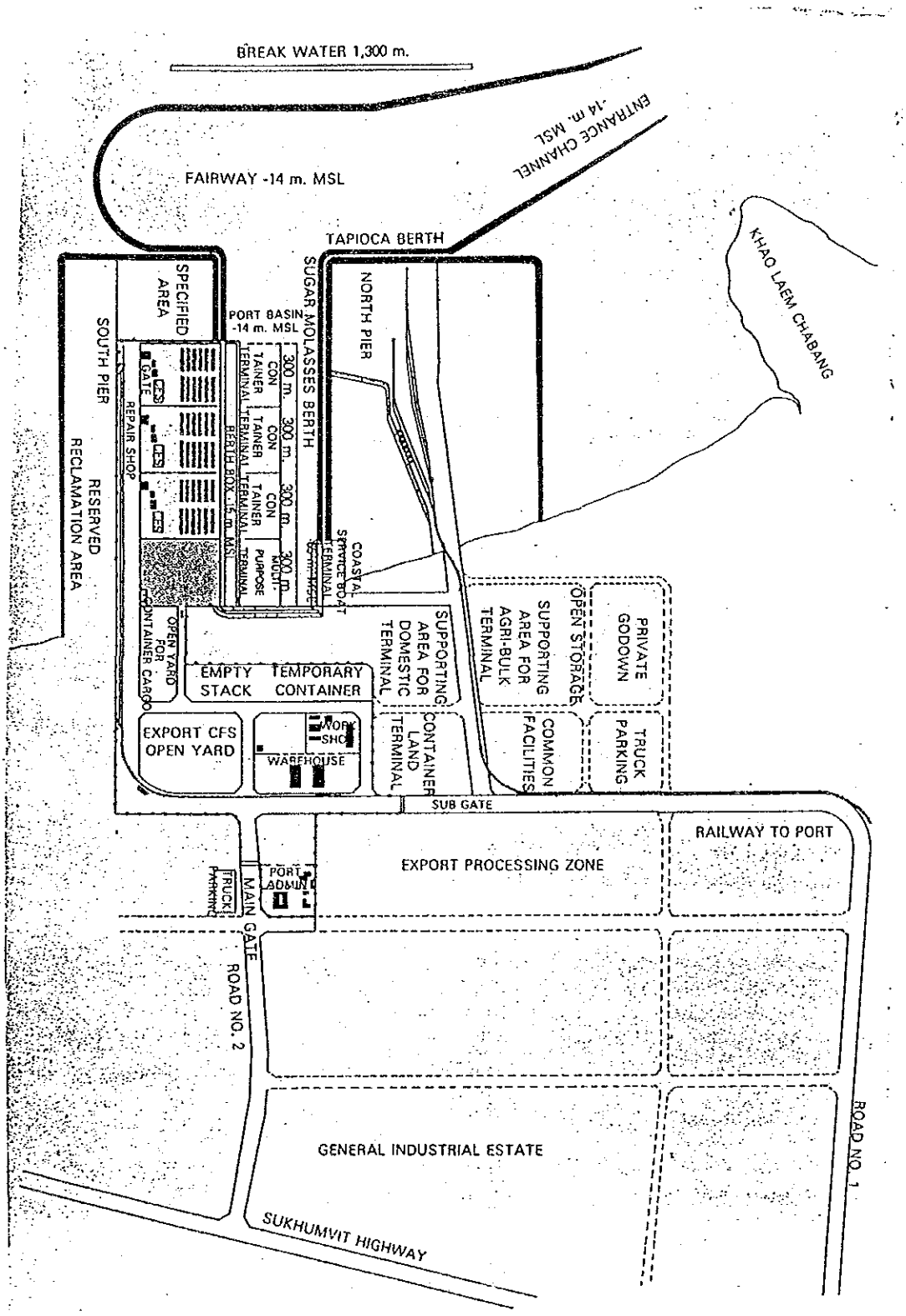


Fig. A-4-1 Facility Layout of Laem Chabang Port

(3) Terminal Operators

Terminal IV started operation in November 1991. The terminal is operated by TIPS Co., Ltd., which is a consortium of N.Y.K., M.O.L. and Ngow Hock.

Terminal III started operation in January 1992. The terminal is operated by Eastern Sea Laem Chabang Terminal Co., Ltd. (ESCO), a Thai-Japanese joint-venture which consists of Thai Cranes International Co., Ltd., Kamigumi Co., Ltd. and Marubeni Corporation.

Terminal II started operation just recently in May 1993. The terminal is operated by the local affilated company of Evergreen.

Terminal I is operated by PAT Laem Chabang Commercial Port Office as a multi-purpose terminal.

(4) Connection by Land

In September 1992, the railway which connects Laem Chabang Port and Sattahip-Chachoengsao line was completed. The port is connected with Bangsu railway terminal in Bangkok.

The port is connected with Bangkok Metropolitan Area by Sukhumvit Road.
Construction of by-pass road is on going.

(5) Cargoes Handled at each Terminal in Laem Chabang Port

1) Containers

Presently, almost all containers through Laem Chabang Port are handled at Terminals II-IV. On the other hand, in terms of container-handling very small portion is handled at Terminal I. The actual result of container-handling at Terminals III and IV since January, 1992 is shown in Table A-4-1 and Fig. A-4-2. According to the table, the number of containers has been gradually increasing. In 1993, the number of containers handled at the three terminals are expected to be over 150,000 TEUs in total.

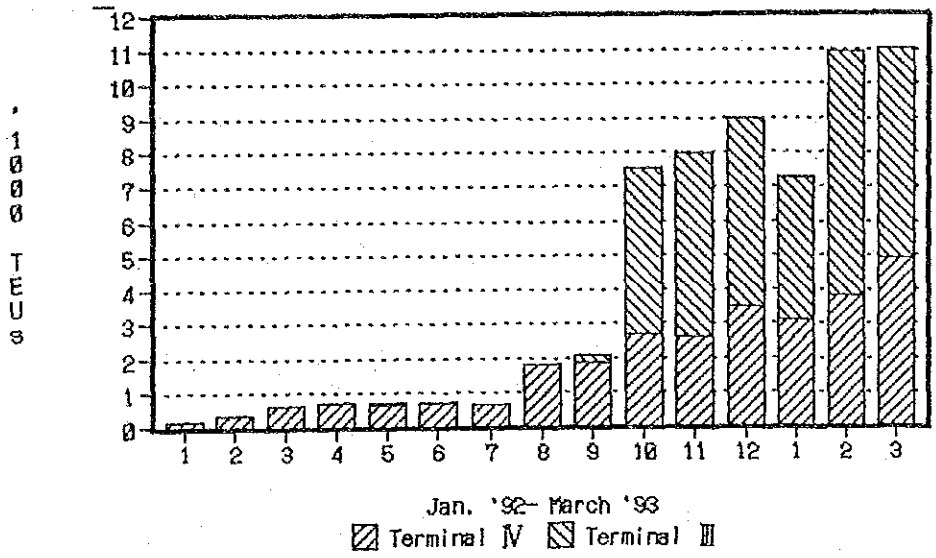


Fig. A-4-2 Number of Containers Handled at Laem Chabang Port

Table A-4-1 Record of Containers Handled at Terminals III and IV in Laem Chabang Port Since the start of Operations

Year	Month	Monthly Total			Average per Vessel			No. of Vessel
		Total (TEU)	Loaded (TEU)	Unloaded (TEU)	Total (TEU)	Loaded (TEU)	Unloaded (TEU)	
Terminal IV								
92	1	176	161	15	25	23	2	7
	2	376	228	148	47	29	19	8
	3	641	427	214	80	53	27	8
	4	709	351	358	79	39	40	9
	5	671	437	157	67	44	16	10
	6	701	540	161	78	60	18	9
	7	661	415	246	73	46	27	9
	8	1,828	698	1,130	102	39	63	18
	9	1,849	920	929	103	51	52	18
	10	2,685	1,601	1,084	112	67	45	24
	11	2,614	1,266	1,348	114	55	59	23
	12	3,502	1,107	2,395	125	40	86	28
93	1	3,090	1,590	1,500	129	66	63	24
	2	3,796	2,029	1,767	141	75	65	27
	3	4,926	2,854	2,071	145	84	61	34
Subtotal		28,224	14,623	13,524	1,419	770	641	256
Terminal III								
92	5	50	0	50	50	0	50	1
	9	236	0	236	118	0	118	2
	10	4,826	2,234	2,592	965	447	518	5
	11	5,360	3,007	2,353	1,072	601	471	5
	12	5,495	2,508	2,987	1,374	627	747	4
93	1	4,173	1,721	2,451	596	246	350	7
	2	7,143	3,722	3,422	1,429	744	684	5
	3	6,103	3,041	3,063	1,017	507	510	6
Subtotal		33,386	16,232	17,154	6,621	3,172	3,449	35
Terminal III & IV								
92	1	176	161	15	25	23	2	7
	2	376	228	148	47	29	19	8
	3	641	427	214	80	53	27	8
	4	709	351	358	79	39	40	9
	5	721	437	207	66	40	19	11
	6	701	540	161	78	60	18	9
	7	661	415	246	73	46	27	9
	8	1,828	698	1,130	102	39	63	18
	9	2,085	920	1,165	104	46	58	20
	10	7,511	3,835	3,676	259	132	127	29
	11	7,974	4,273	3,701	285	153	132	28
	12	8,997	3,615	5,382	281	113	168	32
93	1	7,262	3,311	3,952	234	107	127	31
	2	10,939	5,750	5,189	342	180	162	32
	3	11,029	5,895	5,134	276	147	128	40
Grand Total		61,610	30,856	30,677	212	106	105	291

Source: Laem Chabang Port Office of PAT

2) Conventional Cargoes

Since the opening of Laem Chabang Port, Terminal I has been used mainly for conventional cargoes. Terminal II had been also used for conventional cargoes until the terminal was leased to the local affiliated company of Evergreen for container-handling. An actual result of cargo-handling at Terminals I and II is shown in Table A-4-2 and Fig. A-4-3 According to the result, those termnals mainly received trampers which transported the respective mono-commodities without mixed stowage. Main cargoes discharged from Jan., 1992 to March, 1993 are cement (80.0% of the total discharged), equipment (5.0%), maize (4.8%) and steel products (4.0%). On the other hand, main loaded cargoes are vehicles (71.9% of the total loaded), steel products (15.8%) and equipment (6.7%) (see Table A-4-3).

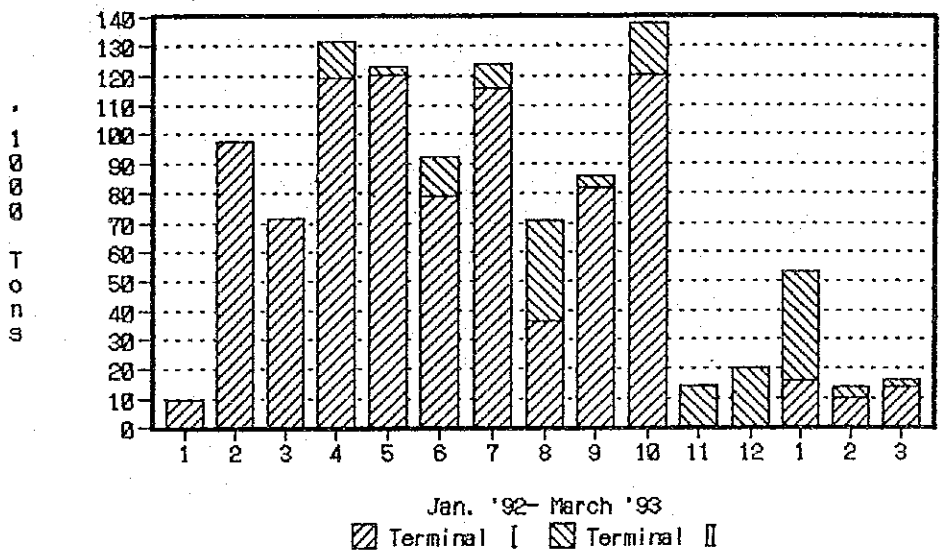


Fig. A-4-3 Volume of Conventional Cargo Handled at Terminals I and II

Table A-4-3 Conventional Cargoes Handled at Laem Chabang Port (Jan. '92~ Mar. '93)

Unit: Metric Tons

Commodity	Total		Loaded		Unloaded	
	Volume	Share	Volume	Share	Volume	Share
Cement	832,847	78.4%	0	0.0%	832,847	80.0%
Equipment	53,940	5.1%	1,485	6.7%	52,455	5.0%
Maize	50,290	4.7%	0	0.0%	50,290	4.8%
Steel Products	44,744	4.2%	3,499	15.8%	41,245	4.0%
Vehicles	20,144	1.9%	15,935	71.9%	4,209	0.4%
Chemical Products	4,183	0.4%	0	0.0%	4,183	0.4%
Log	1,971	0.2%	0	0.0%	1,971	0.2%
Air Spare Parts	408	0.0%	0	0.0%	408	0.0%
Others	54,332	5.1%	1,247	5.6%	53,085	5.1%
Total	1,062,859	100.0%	22,166	100.0%	1,040,693	100.0%

Source: Laem Chabang port Office of PAT

Table A-4-2 Record of Containers Handled at Terminals I and II in Laem Chabang Port since the Start of Operations

Year	Month	General Cargo			Containers			No. of Vessel
		Total (MT)	Loaded (MT)	Unloaded (MT)	Total (TEU)	Loaded (TEU)	Unloaded (TEU)	
Terminal I								
92	1	9,514	833	8,681	0	0	0	10
	2	97,382	787	96,595	126	96	30	14
	3	71,319	277	71,042	21	0	21	7
	4	119,465	0	119,465	0	0	0	3
	5	120,161	0	120,161	0	0	0	3
	6	78,933	0	78,933	0	0	0	2
	7	115,938	0	115,938	0	0	0	3
	8	36,197	0	36,197	0	0	0	1
	9	81,419	0	81,419	0	0	0	2
	10	120,506	0	120,506	0	0	0	3
	11	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0
93	1	15,734	0	15,734	17	0	17	10
	2	9,868	0	9,868	11	0	11	6
	3	13,274	0	13,274	3	0	3	9
Subtotal		889,710	1,897	887,813	178	96	82	73
Terminal II								
92	4	12,178	0	12,178	50	0	50	3
	5	2413	727	1686	0	0	0	5
	6	13,639	740	12,899	0	0	0	6
	7	8,356	1,398	6,958	115	34	81	5
	8	34,361	0	34,361	16	0	16	8
	9	3,989	186	3,803	20	0	20	4
	10	17,604	776	16,828	216	216	0	7
	11	14,170	6,049	8,121	52	0	52	11
	12	20,117	7,052	13,065	5	0	5	16
93	1	37,913	737	37,176	9	0	9	8
	2	3,710	1,066	2,644	0	0	0	4
	3	2,729	1,539	1,190	0	0	0	4
Subtotal		171,179	20,270	150,909	483	250	233	81
Terminal I & II								
92	1	9,514	833	8,681	0	0	0	10
	2	97,382	787	96,595	126	96	30	14
	3	71,319	277	71,042	21	0	21	7
	4	131,643	0	131,643	50	0	50	6
	5	122,574	727	121,847	0	0	0	8
	6	92,572	740	91,832	0	0	0	8
	7	124,294	1,398	122,896	115	34	81	8
	8	70,558	0	70,558	16	0	16	9
	9	85,408	186	85,222	20	0	20	6
	10	138,110	776	137,334	216	216	0	10
	11	14,170	6,049	8,121	52	0	52	11
	12	20,117	7,052	13,065	5	0	5	16
93	1	53,647	737	52,910	26	0	26	18
	2	13,578	1,066	12,512	11	0	11	10
	3	16,003	1,539	14,464	3	0	3	13
Grand Total		1,060,889	22,167	1,038,722	661	346	315	154

Source: Laem Chabang Port Office of PAT