3.3 Structural Survey at South Harbor

3.3.1 General

The Port of Manila is comprised of North Harbor for domestic trade and South Harbor for foreign trade, and the Manila International Container Terminal (MICT). All the harbor facilities in the Port of Manila were constructed shortly after World War II. The facilities are seriously deteriorated and some parts of the facilities have reached very dangerous conditions for normal port operation because of lack of proper maintenance and repair works. Considering the unsatisfactory situation, the Study Team conducted a series of structural survey/inspection of the existing harbor facilities.

The survey covered piers including port-related facilities in South Harbor and part of North Harbor.

3.3.2 Field Surveys at South Harbor

3.3.2.1 Scope of the Surveys

The field surveys and laboratory tests shown in Table 3.3.1 were carried out on the structures in South Harbor to determine the degrees to which the facilities are damaged and their members are deteriorated. An overall evaluation was then made on the damage and deterioration of the structures in accordance with the results of the investigation. The investigation/survey flow is shown in Appendix 3.3.1.

Table 3.3.1 Survey Items

Facilities	Survey method	Description	Remarks
Piers	Visual inspection	Direct visual inspection by boat and underwater inspection by diver	P-3,5,9, 13 and 15
	In-situ test	Chipping test, Schmidt Hammer, Potential difference measurement, Pile depth probing	- do -
	Laboratory tests	Compressive strength, Salt content, Estimated mix proportion Cavity ratio, Carbonization	- do -
Transit sheds and warehouses	Visual inspection	Exterior and interior equipment	Port area
Container yard and road	Visual inspection	Width, length and condition of pavement	- do -
Drainage system	Visual inspection	Drainage condition	- do -

3.3.2.2 Piers

South Harbor has five large piers perpendicular to the shore. They are reinforced concrete structures with piles, beams, and slabs. A lowered passageway for cargo handling vehicles runs along the center of Piers 3, 5, 9 and 15.

Pier 13 is, according to an interview, supported by two types of piles; the upper part consists of reinforced concrete with square sections from the slab to the sea bottom and the lower part consists of wooden piles.

Pier 3 also has a substructure made up of two types of piles; they are mainly so-called monotube piles and partially H-section steel piles.

The piers have piles spanning about 4.6 m to 6.1 m along the axes and about 3.1 m to 3.4 m in the transverse direction. Pier 13 has a slab of 25 - 35 cm thickness and the other piers have slabs of 25 cm thickness.

1) Visual Inspection

a. Visual inspection standard

Deterioration of the structures was surveyed by inspecting all the slabs, beams and piles of the piers visually for individual evaluation of the structures. A three-category evaluation method was employed for quick and accurate visual assessment. Functionally sound piles were distinguished from considerably damaged ones, and slightly damaged piles were distinguished as an intermediate category. The criteria of the visual inspection are shown in Table 3.3.2. Slabs and beams were also evaluated using the terms listed in Table 3.3.3.

More detailed information is shown in Appendix 3.3.2.

Table 3.3.2 Criteria of Visual Inspection

Structures	Sound	Slightly Damaged	Seriouly Damaged
Piles	Functionally sound	Slight cracks and damage in pile head coping are visible, but piles are still reliable enough to support vertical loads.	Damage or deterioration is too severe for functional soundness.
Slabs and beams	Functionally sound	Partial loss of concrete surface, exposure of reinforcement and slight cracks are visible, but the structures are still reliable enough to bear vertical loads.	Loss of concrete, exposure of reinforcement or chipping is too severe for functional soundness.

Table 3.3.3 Evaluation Terms

Symbol	Description
LC	Loss of concrete
ER	Exposure of reinforcement
FL	Free lime
HC	Honeycombing
RU	Rust
CR	Crack

b. Results of Visual Inspection

Fig. 3.3.1 is a colored chart showing the degrees of damage as estimated from the visual inspection. Judging from the figure, Pier 5 is the most sound, raising no problems if used as it is. Next, Piers 3 and 9 are mostly sound with about the same level of damage. All the piles are almost sound while the beams and slabs are damaged severely here and there. Repair of this damage will, however, assure their long-term service in the future.

Considerable damage at Pier 15 was observed particularly in the beams and slabs although the piles are mostly sound. Repair of this severe damage is relatively easy since most of it occurs along the lowered passage in the center. The pier could become quite serviceable if the beams and slabs were repaired.

Pier 13 is the most severely damaged, to the extent that even its utilization under the present conditions is dangerous for normal port operation, as overall deterioration of the piles, beams and slabs has developed throughout the pier. Moreover, repair is very difficult because of the deteriorated piles.

The bearing capacity of the piles seems to be sufficient for all piers and no structural deformation or cracks due to differential settlement caused by insufficient bearing capacity were perceived although some piles have lost the pile heads just under the slabs.

According to the results of the item-by-item investigation, all the piers have cracks and resulting free lime and exposure of reinforcement is common, but in addition to such damage Pier 15 shows much more honeycombing than the other piers.

The results of the visual inspection of each pier are summarized as follows:

① Pier 3

Pier 3, constructed in the 1960's, consists partially of an older pier left unrenewed. Most of the monotube piles are generally sound although pile head coping losses are found in the lowered passage. Beams are also relatively sound in spite of a concentration of serious damage around the end of the pier. Slabs are damaged all over the older section. In general, this pier will have no significant problems if repaired partially because the piles and beams are sound.

② Pier 5

Pile head coping losses were observed in the lowered passage but they bring no particular functional problems to the structure. Beams and slabs are quite sound with only slight damage at the end of the pier.

③ Pier 9

The outermost one-sixth of the pier is supported by monotube piles, while the inshore part has a structure of reinforced concrete columns integrated into the slab. The columns are connected to monotube piles at almost ± 0 MLLW.

Piles towards the end of the pier are deteriorated/damaged to such an extent as to be totally unreliable and the affected area requires prompt repair or some loading control measures. Piles in other parts are reliable and reinforced concrete columns are quite sound.

Damage to the beams in the lowered passage and at end of the pier is generally not serious.

Damage to the slab is found in the aprons on both sides of the pier with serious damage concentrated on the side facing Pier 13.

④ Pier 13

The piles are of reinforced concrete with a rectangular cross section. Deterioration of piles is particularly severe at their splash zones with serious loss of concrete suface and exposure of reinforcement. Such deterioration is distributed all over the pier amounting to 60% of the total piles. However, the very large cross-sectional area of the piles (two or three times as large as that of a monotube pile) may well withstand the vertical load upon them for the time being.

Beams and slabs are damaged almost throughout the pier with severe damage concentrated around the end of the pier. Soundness is partially found where the beams and slabs have been repaired.

Deterioration of beams and slabs is mostly due to cracks and exposure of reinforcement, and the exposed reinforcement is considerably corroded with a reduced diameter in many cases.

The severe degree of damage found in slabs, beams, and piles alike indicates that this pier is in a critical condition for operation.

⑤ Pier 15

The piles are quite reliable although pile head coping losses are conspicuous at the lowered passage and the entrance to the pier.

As for the beams, serious damage is concentrated around the entrance to the pier, the lowered passage and part of the end of the pier.

Slab damage is particularly serious at the entrance to the pier.

Further, slight damage is distributed all over the southern part of this pier except for the part not used so frequently at present.

Relatively heavy damage to beams and slabs was found along the lowered passage compared with other similar structures.

This is probably attributable not only to its location, liable to be affected by waves, but also to improper construction work in view of the relatively large amount of heavy honeycombing occurring at this pier.

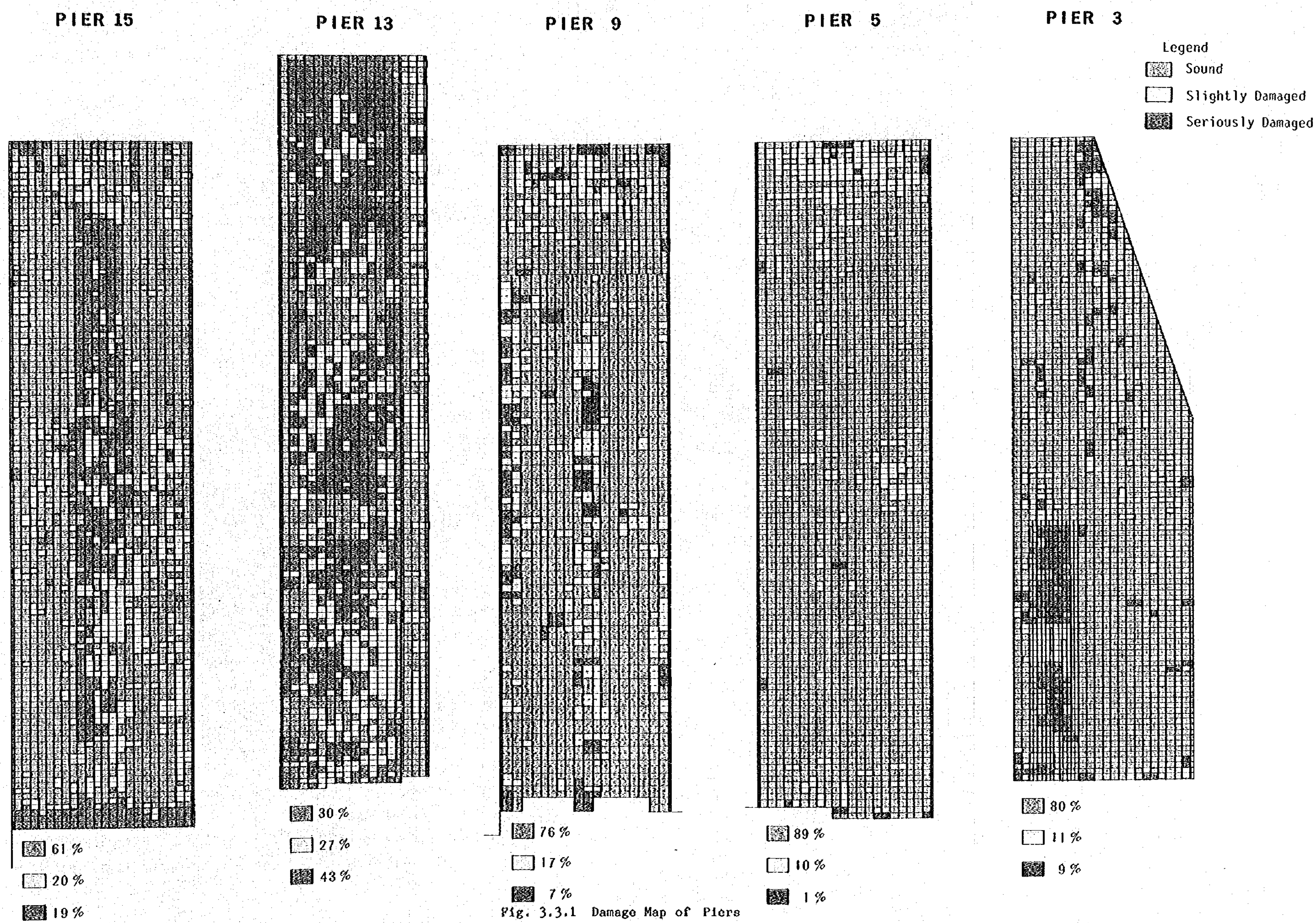


Fig. 3.3.1 Damage Map of Piers

2) Results of Tests

Table 3.3.4 shows the general description of the investigation/ inspection items, followed by the test results for the individual items. More detailed information is shown in Appendix 3.3.3.

Table 3.3.4 Investigation Items

Item	Investigation Method	Purpose
Investigation of cross-section	Chipping test Reinforcement probing	To measure the shape of cross-section and the ratio of reinforcement
Pile length probing	Elastic wave test	To investigate the pile length
Concrete strength test	Compression test, Schmidt Hammer Test Estimation of mix propotion	To measure the compressive strength of concrete
Steel strength test	Tensile strength test	To measure the tensile strength of reinforcement and steel monotubes
Corrosion of reinforcement	Potential difference, Carbonization, Salt content, Estimation of mix proportion	To investigate reinforcement corrosion and its causes

a. Cross-Sectional Investigation (Refer to Appendix 3.3.3-1)

The cross section of beams and slabs and the ratio of reinforcement were investigated at the portions chipped from each of the piers. The volume of reinforcement in the slabs was checked by using a Pachometer metal detector (a non-destructive measuring instrument).

b. Pile Length Investigation (Refer to Appendix 3.3.3-2)

Pile lengths for each pier were investigated using the elastic wave probing method. Piles at each pier proved to have almost reached the supporting stratum as indicated by the geological survey results. The results for Pier 13 showed shorter pile lengths because only Pier 13 has a different type of pile foundation and the foundation might prevent the elastic waves from reaching the wooden pile underneath by reflecting the wave at the lower end of the reinforced concrete piles.

c. Concrete Strength Test (Refer to Appendix 3.3.3-3)

The results of compression tests showed that the concrete used for piles is very strong with relatively little variation (average compressive strength of 330 kgf/cm^2).

Slab concrete strength meets the requirements for ordinary reinforced concrete structures (210 kgf/cm^2) in spite of considerable variation.

The Schmidt Hammer Test, a non-destructive compression test, had similar results to the direct compression test for slab concrete, but showed lower figures for piles.

This is probably because of the monotube pile surface conditions; that is, the Schmidt Hammer struck the heat-damaged surface of the piles irregularly.

Estimated mix proportion results indicate that the unit amount of cement (kg/m^3) contained in the pile concrete is larger than in slabs and beams, and the results indicate that better concrete was used for the piles than for the slabs and beams. The concrete used for these structures is better than that commonly used for typical reinforced concrete structures.

d. Steel Material Strength Test (Refer to Appendix 3.3.3-4)

① Reinforcement Tensile Test

The reinforcement at each pier is of various shapes: deformed, round, square, and twisted.

Although the test results show considerable variations in yield stress (22 kgf/mm^2 - 38 kgf/mm^2), more than 70% of the test pieces were measured at some 30kgf/mm^2. The elongation rate was 20% or more for all the pieces, showing typical values for average reinforcement.

② Monotube Tensile Test

The test results showed very few variation. The yield stress for all test pieces ranged between 40 kgf/mm^2 and 45 kgf/mm^2. The very small difference between the yield point and the ultimate strength indicates characteristics distinct from steel materials used for ordinary structures.

e. Reinforcement Corrosion (Refer to Appendix 3.3.3-5)

The tests using sophisticated instruments revealed that although corrosion of the reinforcement was not observed by visual inspection, some of the piers were corroded, but the corrosion was insufficient to cause significant damage to the relevant structures.

There is also no problem at present in the amount of salt contained in the reinforced concrete and the degree to which that might affect the corrosion of the reinforcement. The amount of cement used for the reinforced concrete roughly meets the requirements in view of corrosion resistance although watertightness is problematical.

3) Overall Assessment of Structural Soundness/Reliablility of the Piers

The following Table 3.3.5 is the overall assessment of the structural soundness/reliability of the individual piers based on the various investigations and inspections presented in the sections above. The test results were not obtained from specimens/samples extracted at random, but rather from the apparently/structurally sound parts. Therefore, structural evaluation of the piers relied more on visual inspection than on the results of the laboratory tests.

Table 3.3.5 Overall Evaluation of the Piers

Pier	Evaluation
3	Aged but still usable with some partial minor repair works to slabs/beams and fenders.
5	The most sound pier, but full repair of fenders and minimum repair works to slabs/beams required.
9	Aged but still usable with some partial minor repair works to slabs/beams and fenders.
13	Most deteriorated pier, very dangerous and in almost critical condition for normal cargo handling operation without overall repair works to superstructure including fenders.
15	Second most deteriorated pier, but still usable with some repair works to slabs/beams and fenders.

3.3.2.3 Roads and Container Yards

Wide San Francisco Street (with an effective width of about 35 m), Boston Street (with an effective width of about 16 m) and Chicago Street (with an effective width of about 14 m) are the main roads running at right angles to the Piers. Connecting these streets are 13th Ave. (with an effective width of about 30m) and 25th Ave. (with an effective width of about 20m) and numerous other small roads, some of which do not function properly as they are dead-ends used as parking lots for cargo vehicles (Refer to Appendix 3.3.4).

The roads are paved with concrete, but San Francisco Street and 25th Avenue have many cracks and potholes some of which have been repaired with asphalt-concrete overlays. The cracking may be attributable primarily to insufficient pavement thickness including the sub-base course (actually 58 cm), far below the 75 cm deemed to be the minimum thickness necessary for the present volume of traffic in view of the k value (5 kgf/cm^3) obtained from the plate bearing test.

South Harbor has two container yards in its northern and southern parts (CY-1 and CY-2). Cargo shifter lanes made of reinforced concrete are now under construction in CY-1 and a part of San Francisco Street (in the neighborhood of Pier 13 and Pier 9) is being used as a container yard.

CY-2 is mostly paved with asphalt but not to a sufficient extent while CY-1 is generally unpaved, and the insufficient drainage system also inconveniences cargo handling.

3.3.2.4 Drainage System

The harbor area has a separate drainage system, but the sewer does not lead to a sewage treatment works. The rainwater drainage system is a combination of surface drainage and subsequent underground drainage leading to the sea. The surface drainage, consisting of L-type road-side gutters and gutter traps, remains almost intact, but it is not clear where the flow from the traps reaches finally. Several drainage pipes (RC ø 350 mm) lie across San Francisco Street running directly to the sea, but they are functioning unsatisfactorily due to clogging. No definite drainage systems drainage were observed on the other roads, and even along San Francisco Street, the lower part of the road surface south of Gate 2 and in front of Metroport Terminal Inc. and the Customs experience persistent flooding even though they are located near the sea. Construction of new drainage routes and maintenance thereof are. Therefore, indispensable. Also for the CY-2 container yard to operate at its full capacity, CY-2 requires additional installation of catch basins and drains for more efficient drainge. Water inflow from outside the area into CY-2 should be diverted and disposed of properly by other drainage system.

3.3.3 Structural Analysis of the Existing Piers at South Harbor

3.3.3.1 General

The evaluation of the piers in South Harbor is presented in this section, while other facilities in North and South Harbors are evaluated in previous sections.

From the structural survey, it is concluded that Pier 13 is the least sound of the 5 piers in South Harbor, and the slabs and beams of this pier are severely damaged. As for Pier 15, the entrance and the lowered passageway which are close to the surface of the sea are the most damaged sections. The other piers are sound compared with Piers 13 and 15.

To evaluate the piers structually, the damaged portions are assumed to have been repaired or rebuilt as initially constructed.

3.3.3.2 Design Criteria and Premises

1) Strength of Material

The laboratory tests were conducted on the concrete cores, reinforcing bars and steel plates of piles taken from piers which are judged visually sound.

From the tests, the following values were determined for evaluating the structural soundness.

a. Compression Strength of Concrete	ck =	210 kgf/cm^2
b. Yield Strength of Reinforcing Bars	sy =	3000 kgf/cm^2
c. Tensile Strength of Steel Plate	sl =	4100 kgf/cm^2

2) Load

Design loads are considered as follows:
(Refer to Appendix 3.3.5)

a. Live Loads

Transfer Crane	(for 40 ft container)	Max. Load:	30.0 tf/wheel
Trailer	(for 40 ft container)	Max. Load:	5.8 tf/wheel
Straddle Carrier	(for 40 ft container)	Max. Load:	12.0 tf/wheel

b. Container Load (40 ft) Max. Load: 30.5 tf

c. Earthquake Load(count back from the existing structural condition)

Allowable lateral seismic coefficient (Kh): 0.15

Surcharge : 0.5 tf/m^2

3) Structural Analysis Model

The structural models were assumed as follows:

a. Slabs

Rectangular plates with four sides supported continuously at the inside of the beams.

b. Beams

Continuous beams with equal spans.

c. Piles

Projected piles with free heads.

4) Structural Size for Analysis

The structural sizes were set up as follows based on the results of the survey and the chipping investigation.

Pier No.		Beam Span (m) *1 Prep. to axis	Beam Span (m) *1 Axis	Dimensions (m) Perp. to axis Width	Dimensions (m) Perp. to axis Height	Dimensions (m) Axis Width	Dimensions (m) Axis Height	Slab Thickness (m)	Pile
P-3		4.6	3.1	0.40	0.75	0.40	0.70	0.25	Mono-tube
P-5		4.6	3.1	0.40	0.75	0.35	0.70	0.25	Mono-tube
P-9	Case 1 (land side)	6.1	3.85	0.40	1.15	0.65	1.20	0.25	Mono-tube
	Case 2 (sea side)	4.6	3.1	0.40	0.75	0.45	0.70	0.25	Mono-tube
P-13	Case 1	5.0	3.4	0.45	1.15	0.50	1.05	0.35	*2
	Case 2	4.7	3.4	0.45	0.90	0.50	1.05	0.35	*2
P-15		4.7	3.2	0.40	0.75	0.35	0.70	0.25	Mono-tube

*1) Perp. means perpendicular.
*2) Concrete rectangular column with a pedestal underneath.

The reinforcing steel volume was applied as obtained from the chipping investigation.

3.3.3.3 Structural Safety Level

The following is the structural evaluation of the existing structures based on the design criteria and premises shown in Section 3.3.3.2.

1) Pier 3, Pier 5 and Pier 15

Operation using shifters or straddle carriers is difficult. Trailers are usable and containers with full loads can be stacked up to two high. As for the stability in earthquakes, the lateral seismic coefficient of 0.15 is no sufficient.

2) Pier 9

The land side of 300 m and the sea side of 60 m have beams with different spans. The land side has wider spans than the sea side, 1.3 times in the direction normal to the axis of the pier, and 2.5 times in the direction of the axis of the pier. The evaluation was made in two directions.

a. Land side (Long Span)

Operation using shifters or straddle carriers is difficult. Trailers can be used, but it is not recommended to stack fully-loaded containers two high. As for the stability in earthquakes, the lateral seismic coefficient of 0.05 is in the dangerous range.

b. Sea side (Short Span)

Fully-loaded containers can be piled up to three high and the lateral seismic coefficient of 0.15 is sufficient. The other evaluation results are the same as those of the sea side.

3) Pier 13

Operation using shifters is not recommended, but operation using trailers or straddle carriers presents no problems. Fully-loaded containers can be stacked up to three high. As for the stability in earthquakes, no clear conclusion could be reached, because the details of the foundation could not be determined in this survey. However, since many braces are used, this pier seems able to resist minor earthquakes.

As described above, in terms of operational aspects, Pier 13 is the best of the five piers, assuming that all the members are made structurally sound with sufficient maintenance and renovation. However, it is a clear fact that Pier 13 is the most severely damaged pier in South Harbor, and it is dangerous for cargo handling operation even at present as shown in Section 3.3.2. It is highly recommended that Pier 13 should be given the minimum reconstruction necessary to accomodate vessels requiring no cargo handling operations.

3.4 Structural Survey at North Harbor

3.4.1 Scope of Survey

Among the five (5) piers (Pier 8 - 16) which were subject to the engineering investigation at North Harbor, Pier 16 has been troublesome since its completion in the 1960's. Despite various remedial measures, the apron has settled.

As for the other piers, although people concerned say that the quaywall is made of concrete sheet piles, no design document has been found anywhere and the details of the structure are obscure. The following surveys were conducted to obtain the basic infomation on the quaywalls so as to check their structural stability.

1) Excavation of Quaywall Backfilling

The structural type of Piers 8 through 14 is said to be the same. With regared to Pier 16, the design drawing for its structural improvement still exists, and the structure is quite different from Piers 8 through 14. Therefore, Piers 8 and 16 were selected for trial excavation for engineering investigation. The trial excavation was executed to investigate the present condition of the tie-rods and concrete wall anchorages at Piers 8 and 16.

2) Underwater Survey for Sheet Piles

An underwater survey using divers was executed to investigate the present condition of the concrete sheet piles. The objective of the survey was to check the possibility of soil leakage toward the outside of the piers through gaps between the sheet piles. Damage to the sheet piles was recorded at intervals of every 1 or 2 m along the perimeter of Piers 8 through 16.

3) Diagonal Borings

Since the sheet pile length of Pier 8 is unknown and this is essential for the evaluation of structual stability, several diagonal borings were made to determine the sheet pile length.

3.4.2 Results of the Survey

The most reliable sections were traced based on the results of the survey and relevant documents. Sections of Piers 8 and 16 are presented in Figs. 3.4.1 and 3.4.2 respectively. The historical stages of structural countermeasures are shown in Fig. 3.4.3 according to the investigation and interviews with MPWH and PPA personnel.

The results of the underwater survey are shown in Figs.3.4.4 and 3.4.5 Fig. 3.4.4 shows the location where damage including gaps between the sheet piles was found. Fig. 3.4.5 shows the distribution of gap width at Piers 8 through 16.

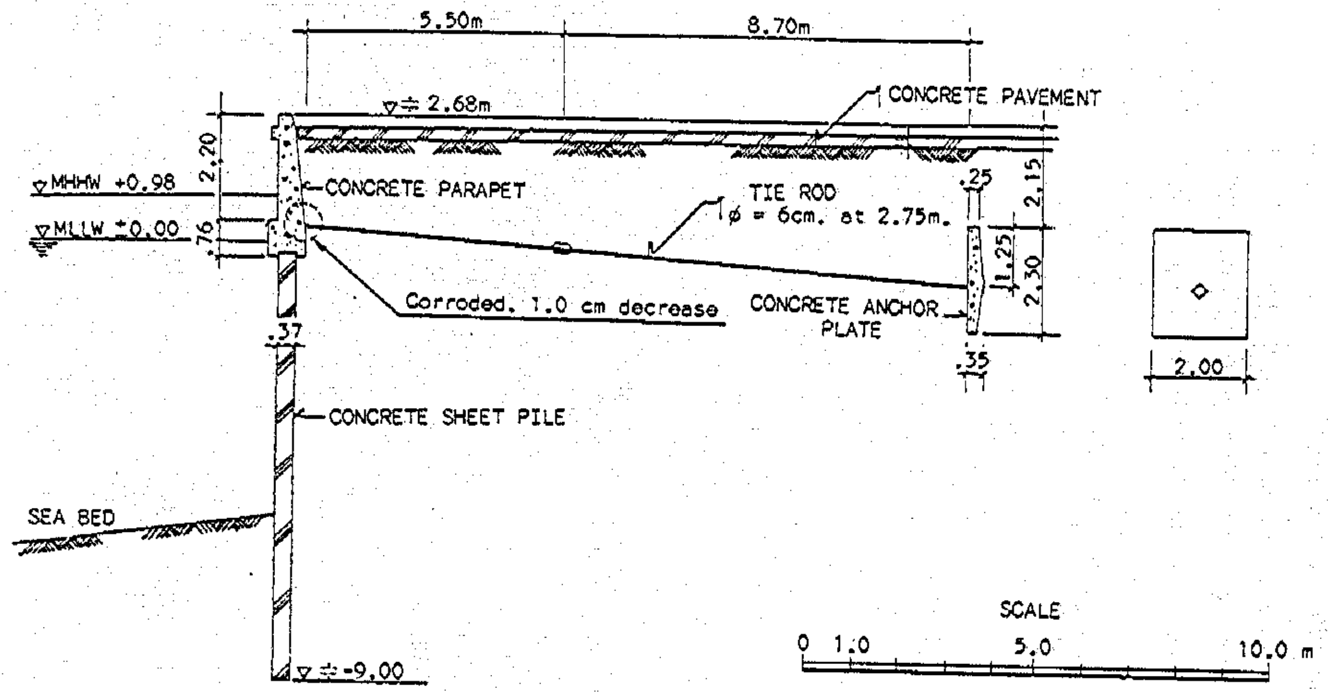


Fig. 3.4.1 Surveyed Section of Pier 8

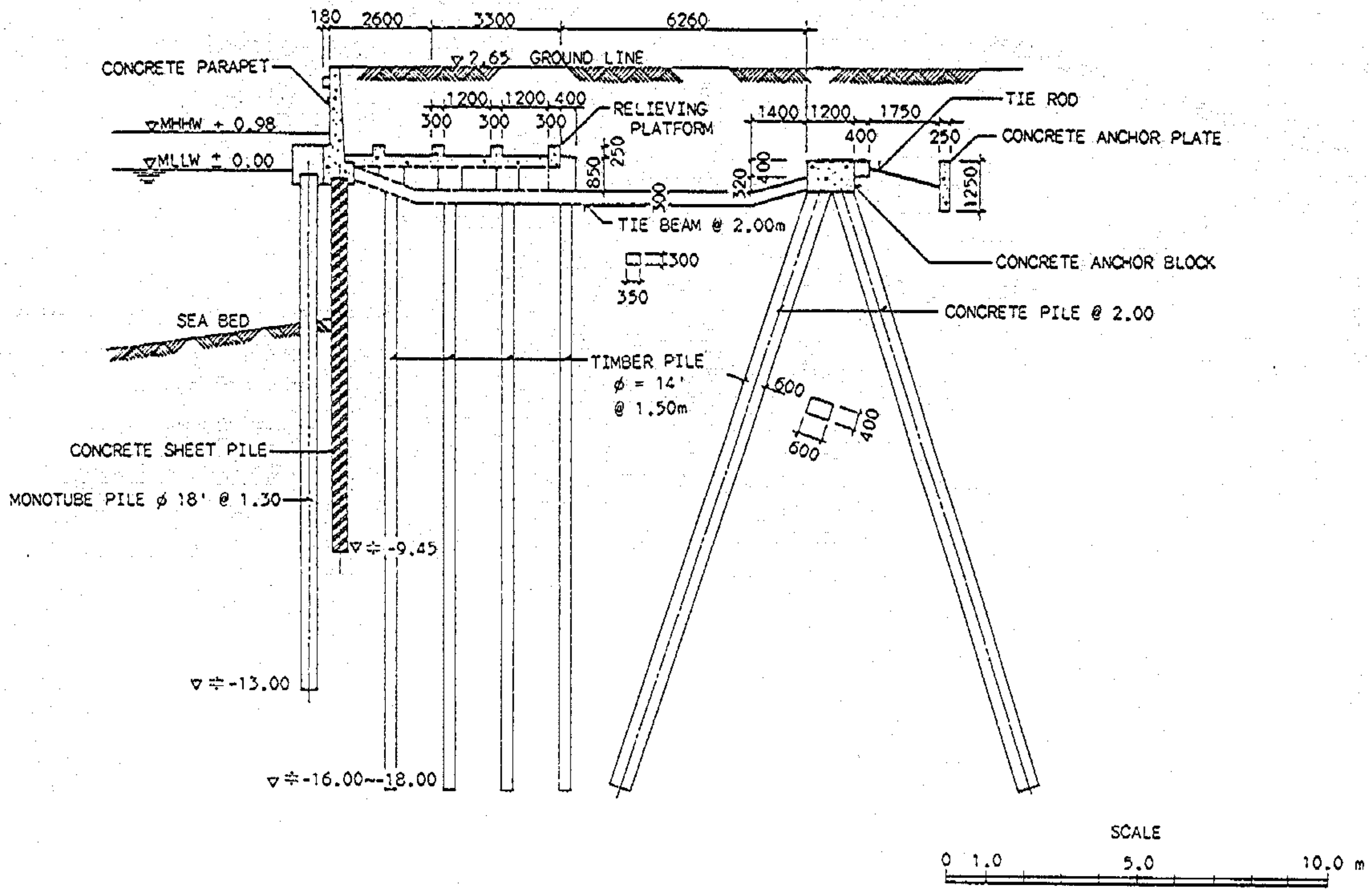
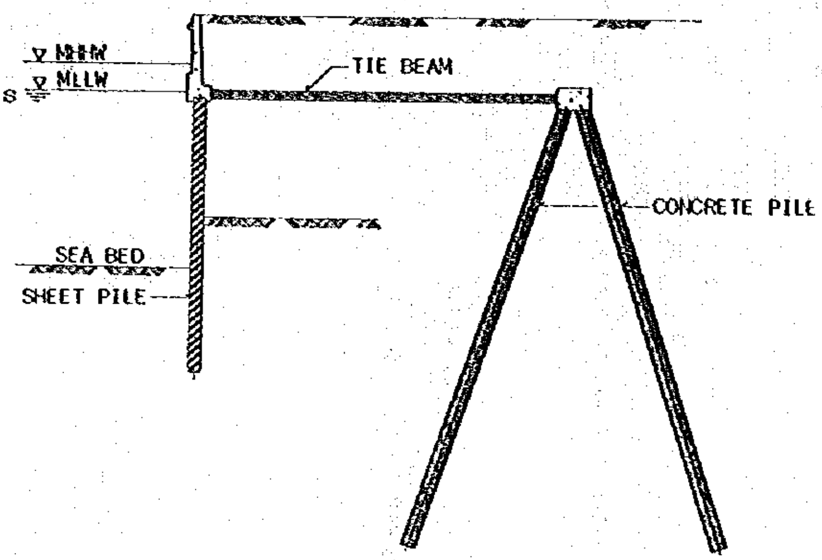
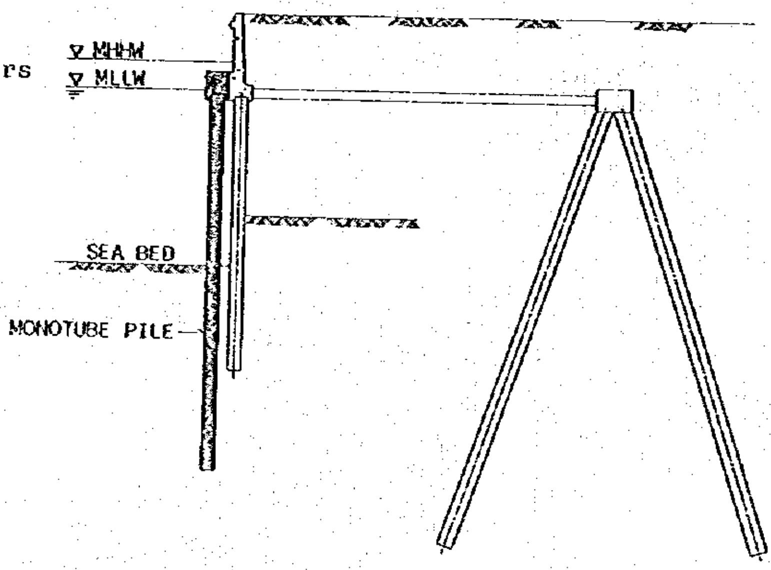


Fig. 3.4.2 Surveyed Section of Pier 16

1. Original Design
Constructed in the 1960's



2. First Remedial Measure
Improved one or two years later after 1st stage



3. Second Remedial Measure
Designed in March 1970

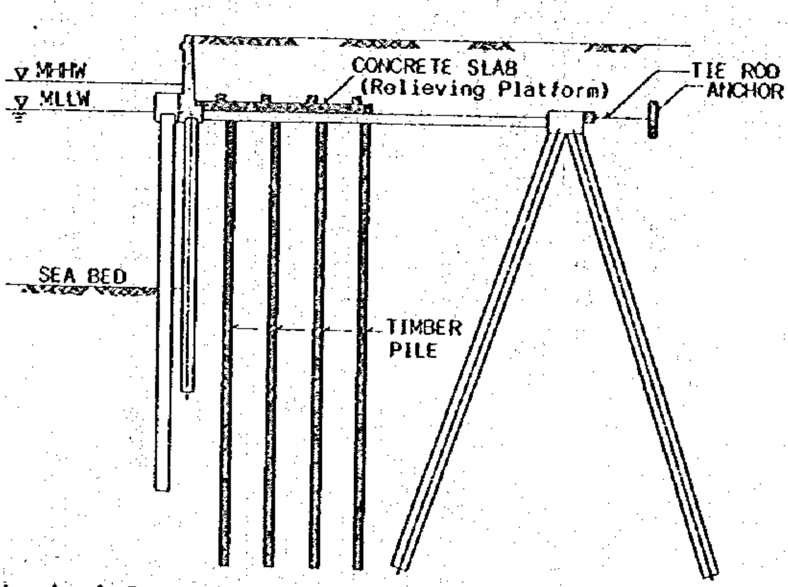
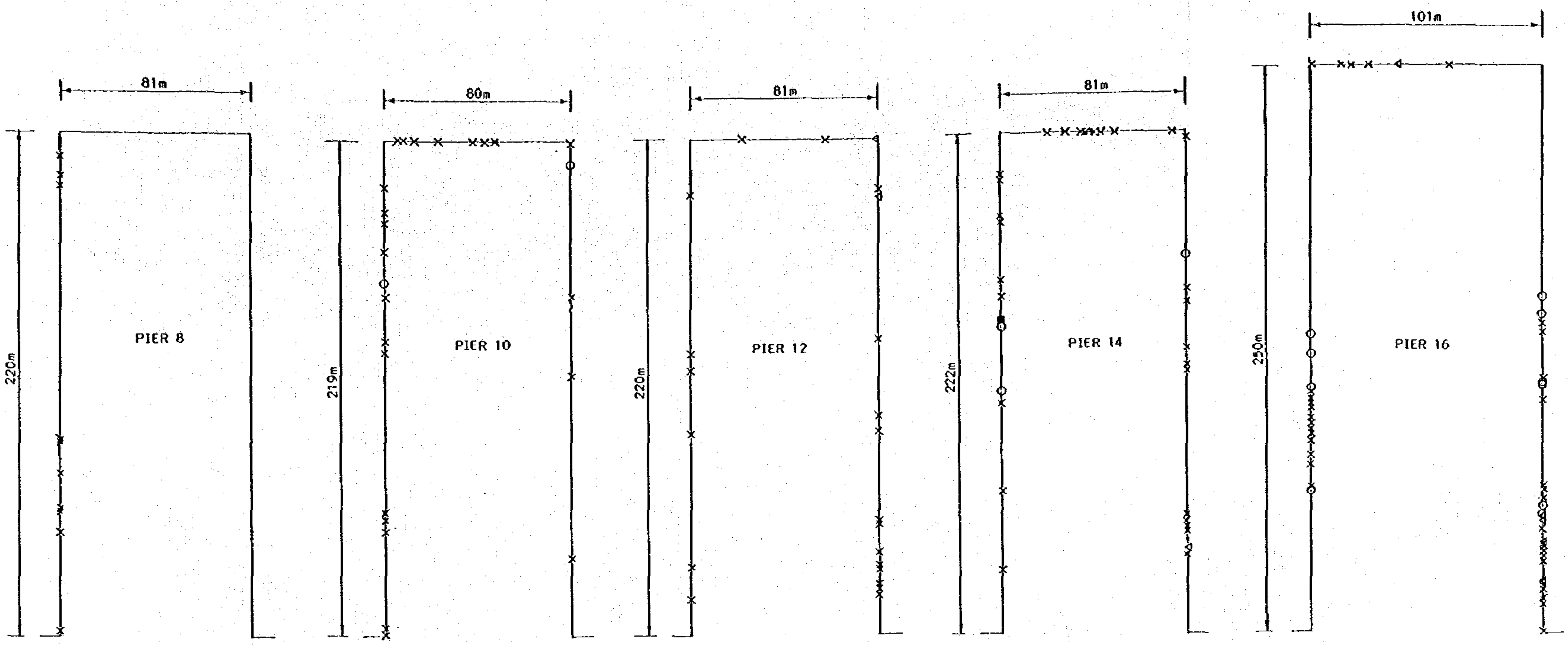


Fig. 3.4.3 Historical Stages of Remedial Measures



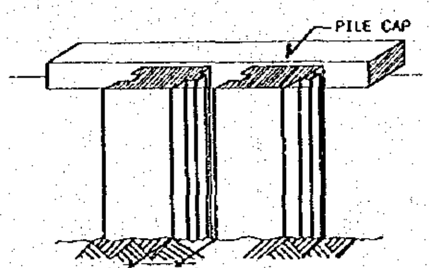
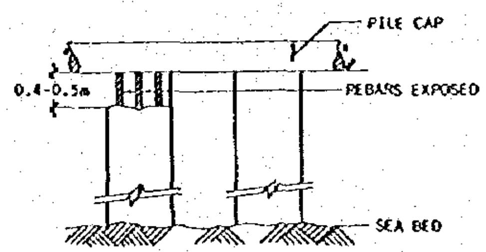
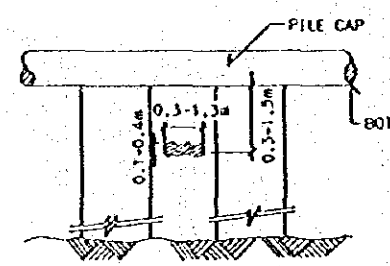
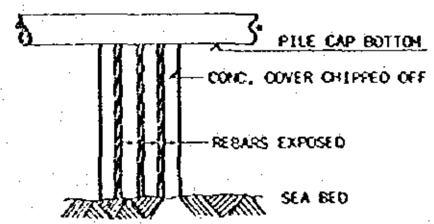
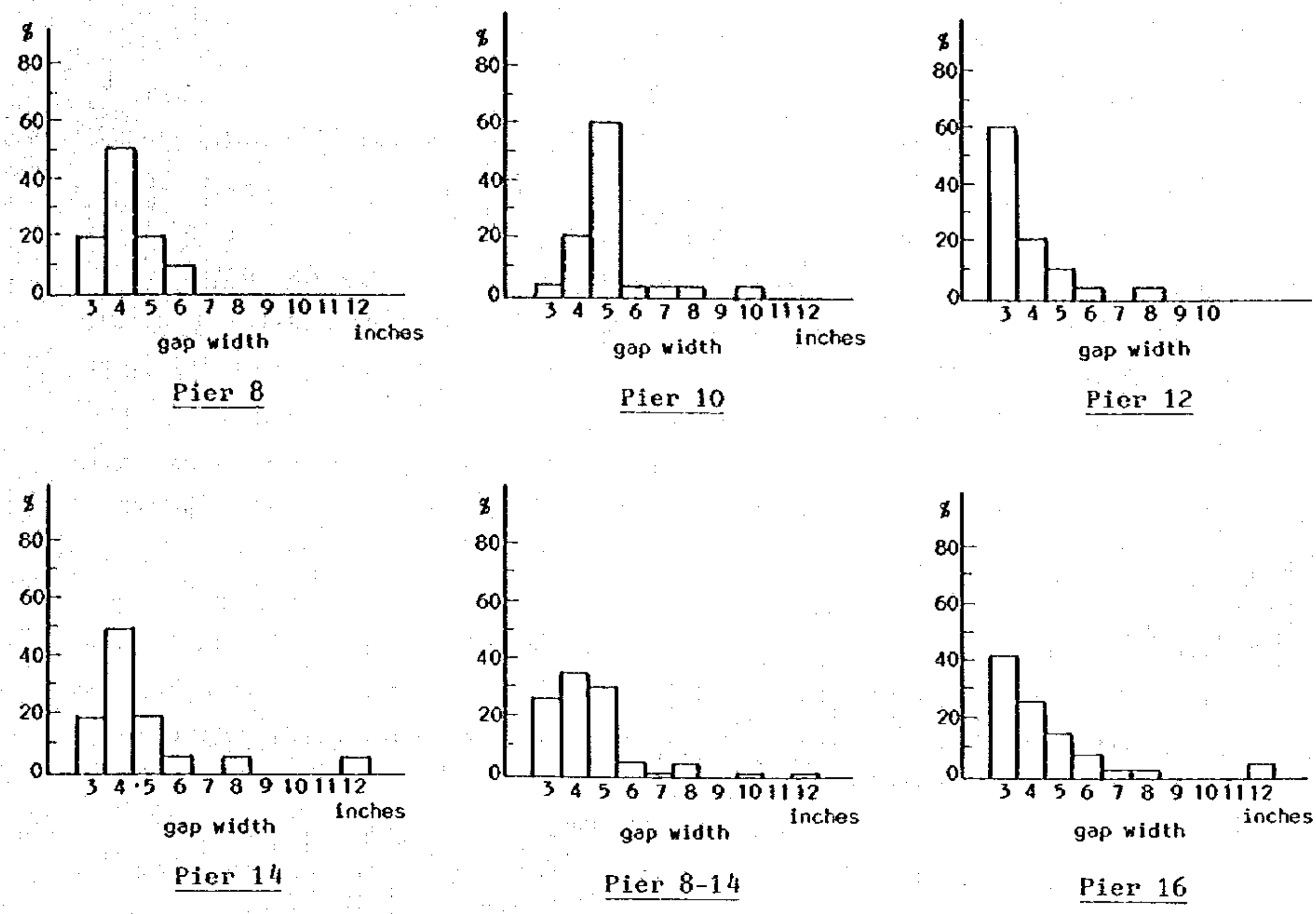
Pier No.	Sampling Number	TYPES OF CONCRETE SHEET PILE DAMAGE			
		TYPE-1 (Symbol-X)	TYPE-2 (Symbol-Δ)	TYPE-3 (Symbol-O)	TYPE-4 (Symbol-■)
		0.075 to 0.3m wide opening between piles from piles cap to sea bed. 	Rebars exposed at specified distance from bottom of pile cap. Concrete removed. 	Rectangular/horizontal/vertical crack with specified dimensions and distance from pile cap bottom. 	Cracked entirely (whole pile) or concrete covering dropped out and rebars already exposed from pile cap bottom to sea bed. 
P-8	520 Nos.(@1.0m)	10 Nos. (1.9%, Max=0.15m)	0	0	0
P-10	520 Nos.(@1.0m)	24 Nos. (4.6%, Max=0.25m)	0	2 Nos.(0.4%)	0
P-12	520 Nos.(@1.0m)	20 Nos. (3.8%, Max=0.2 m)	3 Nos.(0.6%)	0	0
P-14	520 Nos.(@1.0m)	29 Nos. (5.6%, Max=0.3 m)	2 Nos.(0.4%)	3 Nos.(0.6%)	1 No. (0.2%)
P-16	602 Nos.(@2.0m)	36 Nos. (6.0%, Max=0.3 m)	6 Nos.(1.0%)	10 Nos.(1.7%)	0

Fig. 3.4.4 Underwater Survey of Concrete Sheet Piles in North Harbor



Pier / gap width (inches)	P-8		P-10		P-12		P-14		P-8~14		P-16	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
3	2	20	1	4	12	60	5	19	20	25	15	41
4	5	50	5	21	4	20	13	50	27	34	9	25
5	2	20	14	59	2	10	5	19	23	29	5	14
6	1	10	1	4	1	5	1	4	4	5	3	8
7			1	4					1	1	1	3
8			1	4	1	5	1	4	3	4	1	3
9												
10			1	4					1	1		
11												
12							1	4	1	1	2	6
Total	10	100	24	100	20	100	26	100	80	100	36	100

Fig. 3.4.5 Distribution of Gap Width in North Harbor Piers 8-16

3.4.3 Evaluation of Survey Results

1) Pier 8

The sheet piles themselves were not significantly damaged, and the gaps between the sheet piles were very small, on average about 10 cm. Therefore, there is no possibility of soil leakage through the gaps. The results of the diagonal boring showed the sheet piles were embedded about 3 m into the sea bed, and driven into a sand layer having an N-value of 20 - 30 according to the soil investigation. The results of the trial excavation showed the concrete wall anchorages were sound, and the tie rods were almost sound except that the joint portions with the sheet piles were corroded, and the diameter of tie rods showed a decrease of about 1.0 cm.

2) Pier 16

Damage to the sheet piles was confirmed at 16 points, which is a little greater than at the other piers. However, because the damage is very small compared with the total length of the perimeter of the pier, there is no problem of structural stability.

Gaps about 30 cm wide were found at 2 points between sheet piles and the other gaps were about 10 cm wide. According to PPA personnel, these gaps caused the leakage or dropout of the backfilling which brought about the settlement. If their claim is accurate, the settlement must be concentrated at a certain area in the backfilling behind the end of the relieving platform.

But there was no locally marked settlement in the backfilling and no trace of leakage or dropout of the backfilling material was found in the sea bottom during the underwater survey.

According to the underwater survey, Pie 16 has a backfilling of gravel, and these materials are supposed to form a kind of a tight barrier which prevents the backfilling material from squeezing through the gaps between the sheet piles, even if the gaps are 30 cm wide.

The trial excavation shows that the reinforced concrete tie-beams are broken and the reinforcing bars are exposed.

The failure of the tie-beams may have been brought about by the initial settlement of the backfilling material shortly after the completion of the structure. The existing tie-beams cannot be expected to transfer the reaction of the sheet piles to the anchor plates. Thus, this pier is very unstable from the structural point of view.

3.4.4 Structural Evaluation

1) Pier 8

The stability of the pier was studied by analysing a structural model having a water depth of - 6 m from MLLW (the actual water depth) based on the structural survey and soil investigation.

The results of the analysis shows that the stress in the tie-rods exceed the allowable limit when the pier is used under the supposed design condition because of the reduced area caused by corrosion. However, it was concluded that this pier has no problem of stability if an area 5 m wide behind the sheet piles is not used as a strorage space.

According to the study on the increase of the water depth in front of the quay, it was found that it was not possible to increase the water depth to more than - 6 m below MLLW.

2) Pier 16

The stability of the pier was studied by analysing a structural model having a water depth of - 5 m below MLLW. In the model, the monotube piles at the front and the sheet piles are considered, while the tie-beams are neglected. The study shows that this pier has almost no problem at the present water depth, even though the stress of the monotube piles slightly exceeds the specified allowable stress. Also, it is desirable that the container storage area be a minimum of 5 m behind the quaywall.

As for the settlement of the apron, the settlement due to consolidation was calculated for the clay layer below the soil backfilling using the soil parameters obtained from the soil investigation. The study showed that the settlement of the clay layer is about 20 cm, and the consolidation has already finished.

3.4.5 Structural Improvement

1) Urgent Structural Countermeasure for Pier 16

The existing surface condition of the backfilling is not necessarily good and this condition is assumed to have been caused by the rutting of vehicles and the constant flow of backfilling material by rainwater.

Therefore, it is adequate for the ground surface to be paved with concrete as shown in Fig. 3.4.6 in order to prevent it from partially sinking any further.

According to the results of the underwater survey and visual inspection of the backfilling, the Team obtained no definite finding for the said settlement, which PPA personnel claim still continues and is attributable mainly to the leakage of the backfilling material.

The settlement due to the consolidation of the clay layer below the backfilling has already finished as mentioned above. It is, therefore, thought that the partial settlement was caused not by consolidation but by compaction of the backfilling.

At this moment under normal port operation there is no fear about leakage of the backfilling material, which is quite stable because of the protectve barrier composed of the filling material.

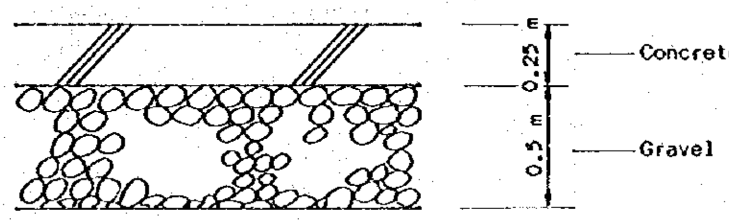
But it is recommendable to put some type of covering over gaps more than 6 inches wide between the sheet piles. This is because the backfilling material, which has not spilled out yet, might be squeezed out if there were a severe earthquake which would possibly break the existing stable condition of the backfilling material.

Fig. 3.4.7 shows a suggested remedial countermeasure for the gaps between the sheet piles.

2) Proposal of Renovated Piers with Deeper Water Depths

Domestic vessels have recently been getting bigger and begger in the Philippines. At present the water depths of North Harbor are -5m below MLLW for Pier 16 and -6m below MLLW for Piers 8 through 14.

Figs. 3.4.8 and 3.4.9 show plans for renovated Piers with deeper water depths.



Detail of Pavement

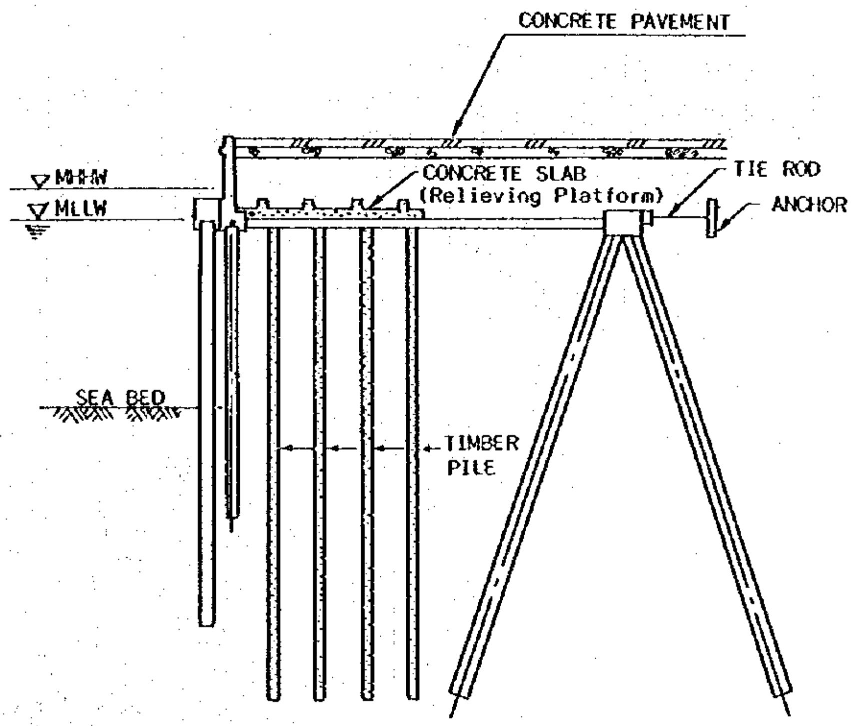
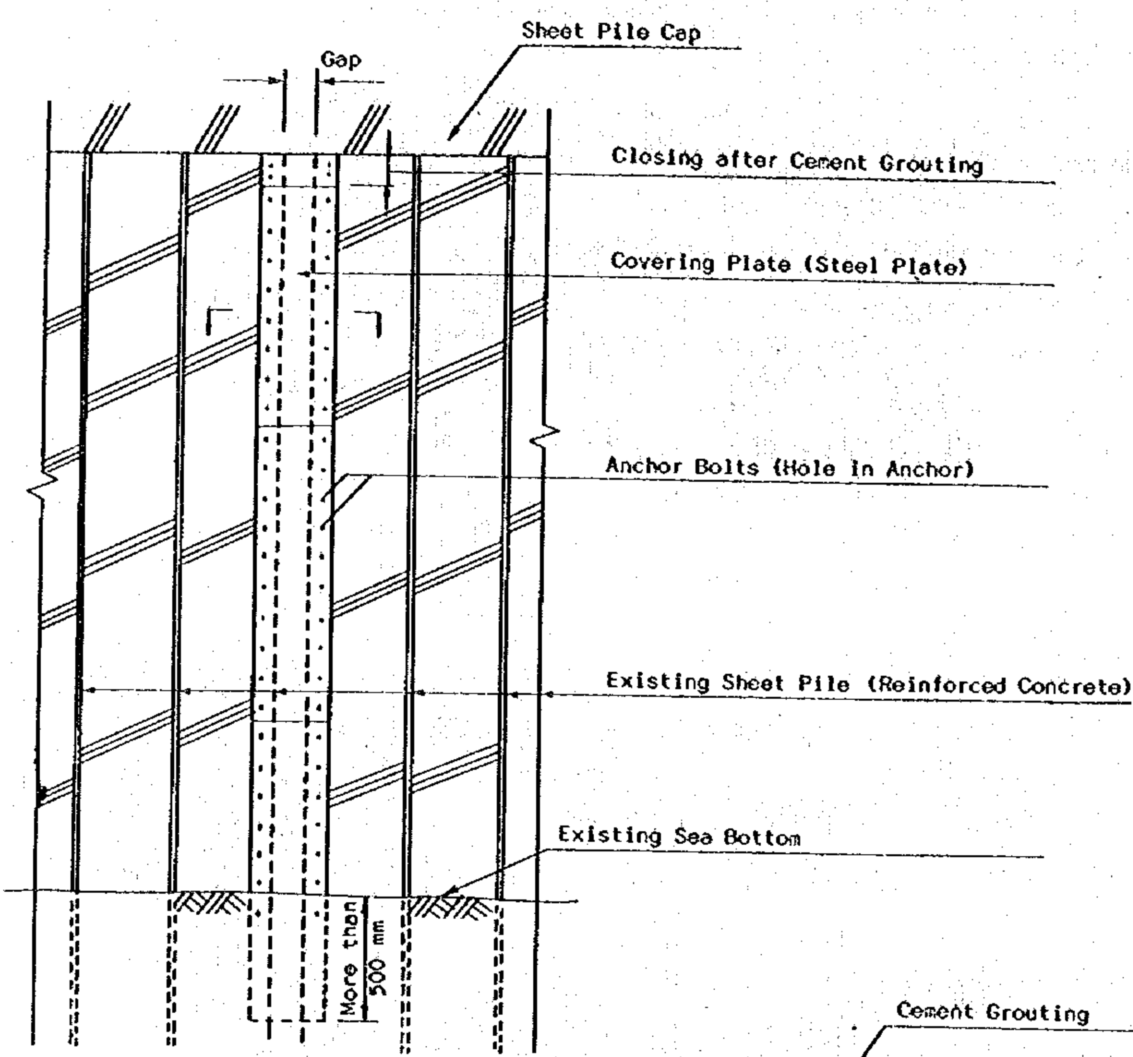
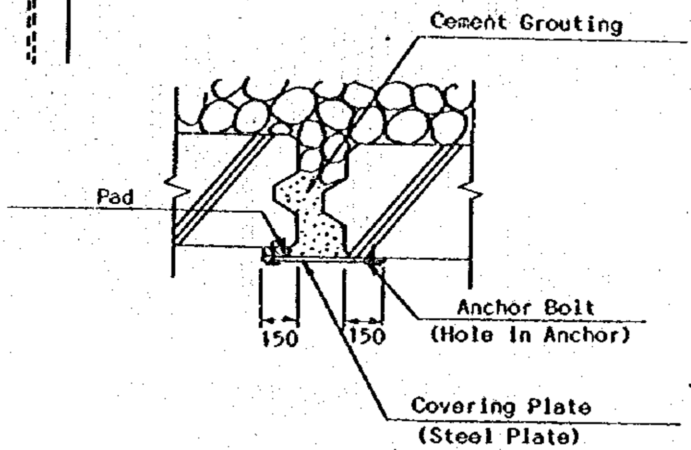


Fig. 3.4.6 Proposed Structural Improvement for Pier 16



Front View (S=1/50)



Section (S=1/30)

Fig. 3.4.7 Proposed Renovation Works for Sheet Pile Gaps

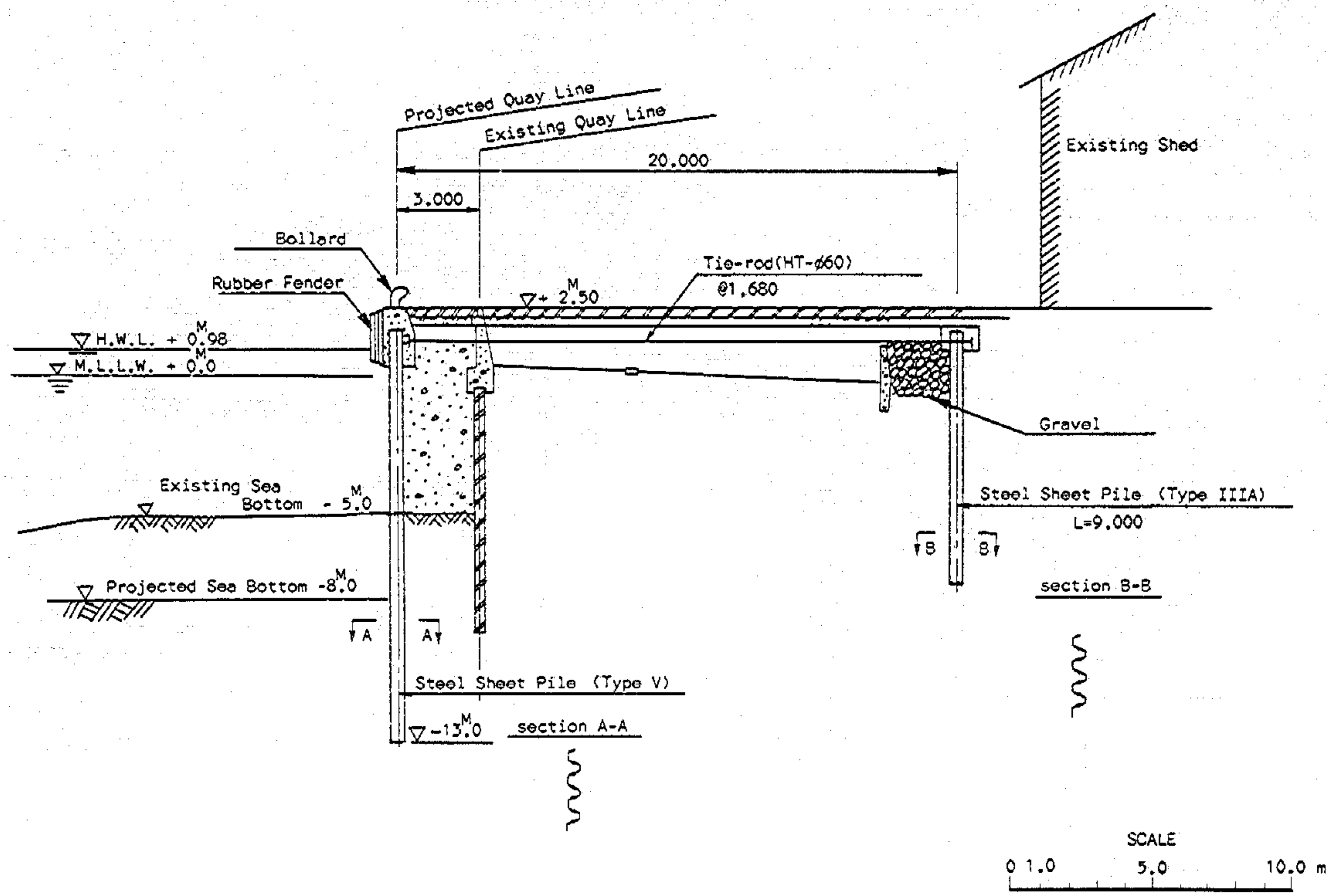


Fig. 3.4.8 Proposed Section for Piers 8-14 (Projected Deptn is MLLW -8.0M)

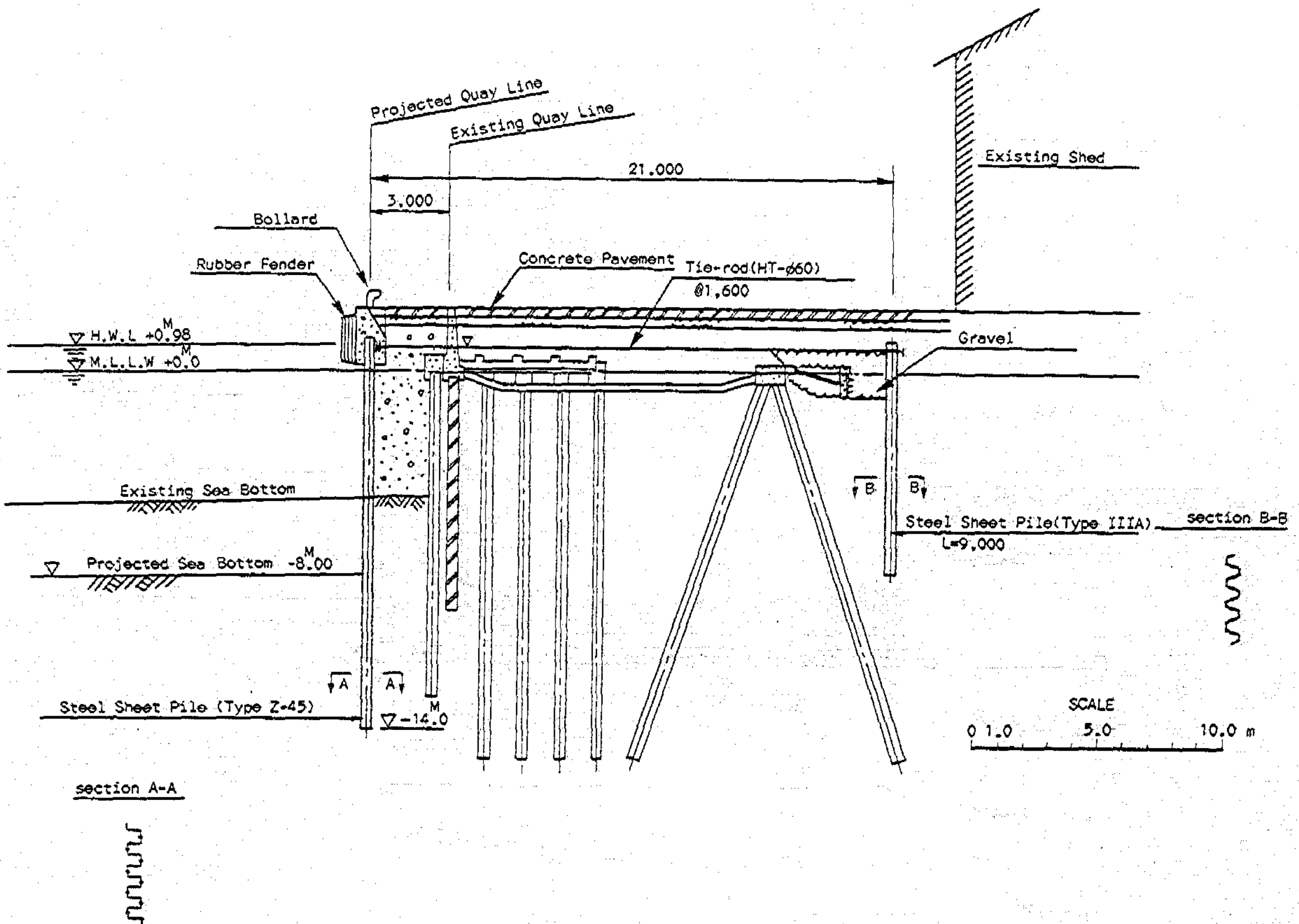


Fig.3.4.9 Proposed Section for Pier 16 (Projected Depth is MLLW -8.0M)

CHAPTER 4
PRESENT SHIPPING AND CARGO THROUGHPUT

CHAPTER 4 PRESENT SHIPPING AND CARGO THROUGHPUT

4.1 General

The published statistics of the Port of Manila are not sufficient to serve as a statistical basis for a comprehensive analysis of the shipping and cargo movement of the port. Therefore, the study team conducted a further study on the shipping and cargo movement by facility and by commodity for foreign trade in 1985.

The additional study was carried out using a microcomputer to process the raw data recorded in the PPA "Worksheet per Vessel Activity" and the ships' manifests with the assistance of PPA statisticians.

The computed total number of ships and cargo volume for South Harbor covered about ninety six percent (96%) of that of the published PPA statistics, and 65% of that for MICT. The output table of ship and cargo statistics is shown in Table 4.1.1. The data is classified by mooring facility and by zone (South Harbor, MICT and Total Manila Port).

Table 4.1.1 List of Output Table

A. Cargo Movement
1. Cargo volume by commodity by ship type.
2. Cargo volume by commodity by packing type.
3. Cargo volume by commodity by type of service.
4. Cargo volume by commodity by month.
5. Cargo volume by packing type by ship type.
6. Cargo volume by type of ship by G.R.T.
7. Cargo volume by type of ship by D.W.T.
B. Vessel Movement
1. Number of calling ships by ship type by days of stay at port.
2. Number of calling ships by ship type by mooring hours at berth.
3. Number of calling ships by ship type by D.W.T..
4. Number of calling ships by ship type by G.R.T..
5. Number of calling ships by ship type by L.O.A.
6. Monthly number of calling ships by ship type.
7. Number of calling ships by ship type by type of service.

The Port of Manila, the major commercial port in the Philippines, handled about 11.4 million tons of cargo including 4.406 million tons of foreign trade in 1985.

During the five year period from 1978 to 1983 the total throughput at the port increased at an average annual growth rate of 4.3%, but the throughput dropped sharply in 1984, a 23% decrease from the previous year, due to the drop in the national economy.

However, in 1985 the cargo volume recovered with a roughly 12% increase from 1984.

With regards to foreign trade, the Port of Manila handles about eighty percent (80%) of all the import cargo and fifty percent (50%) of all the exports passing through Philippine government commercial ports. Thus, the hinterland of the Port of Manila is not limited to Metro Manila and its vicinity, but actually covers the entire nation.

The volume of cargo handled at the Port of Manila since 1978 is shown in Table 4.1.2 and Fig. 4.1.1.

The shipping and cargo statistics of the Port of Manila presented in this report refer to the totals for South Harbor, M.I.C.T. and North Harbor, except as noted otherwise.

In 1985, 2053 ocean going vessels and 5,278 vessels for domestic trade called at the Port of Manila as shown in Table 4.1.3.

The total number of calling ships has been decreasing at an average annual rate of 4.8% over the last six years. However, the average G.R.T. per ship has been increasing for both foreign and domestic trade ships.

The total number of passengers embarked/disembarked at the Port of Manila was about 2.5 million in 1985.

Table 4.1.2 Volume of Cargo Handled at the Port of Manila

Unit: 1,000 tons

Year	Grand Total	Foreign Trade			Domestic Trade		
		Export	Import	Total	Out	In	Total
1978	10735	1086	4194	5280	2895	2560	5455
1979	11543	1005	4840	5849	2939	2755	5694
1980	11180	1153	4139	5292	2876	3012	5888
1981	11003	1028	4244	5272	2874	2857	5731
1982	11836	913	4632	5545	3037	3254	6291
1983	13253	1147	4900	6047	3286	3920	7206
1984	10183	1044	3337	4381	2129	3673	5802
1985	11394	1056	3350	4406	2872	4116	6988

Source: PPA

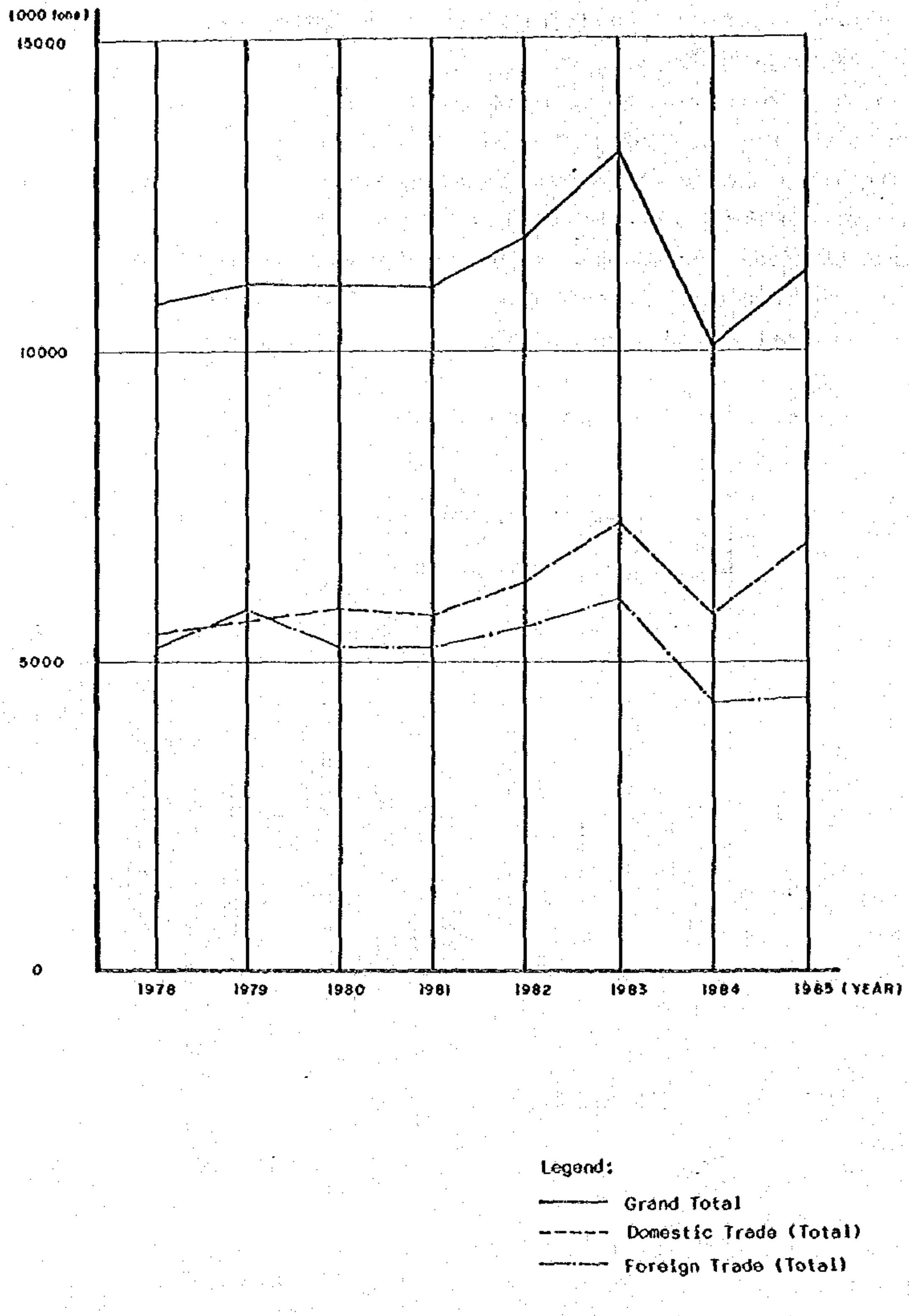


Fig. 4.1.1 Volume of Cargo Handled at the Port of Manila

Table 4.1.3 Ship Arrivals at the Port of Manila

	Foreign Trade		Domestic Trade	
	No. of Ships Calling	Total GRT ('000 tons)	No. of Ships Calling	Total GRT ('000 tons)
1980	2,797	19,252 (6,883)	6,564	8,047 (1,226)
1981	2,555	18,728 (7,330)	5,644	7,710 (1,366)
1982	2,457	19,641 (7,994)	5,233	8,347 (1,595)
1983	2,469	20,619 (8,351)	5,312	9,073 (1,708)
1984	1,888	15,385 (8,149)	4,957	9,086 (1,833)
1985	2,053	17,126 (8,342)	5,278	9,247 (1,752)

Source: PPA
Note: Figures in parentheses show the average GRT per ship.

4.2. Present Shipping

4.2.1 International Shipping

4.2.1.1 General

The historical statistics of oceangoing ships calling at the Port of Manila are presented in Table 4.2.1 and Fig. 4.2.1. Almost all oceangoing ships moored at the South Harbor and M.I.C.T. berthing facilities and in the anchorage area.

About sixty-five percent (65%) of the calling ships moored at berth in 1985, but the percentage of berthing ships to total calling ships was around seventy percent (70%) until 1984. The average G.R.T. and loading/discharging cargo volume per ship moored at anchorage dropped sharply in 1985.

The number of mooring ships at M.I.C.T. was around 360 in 1985, basically unchanged from 1982. The ratio of vessels berthing at M.I.C.T. to the total number of berthing vessels was twenty-seven percent (27%) in 1985.

Table 4.2.1 Arrival of Oceangoing Ships at the Port of Manila

	1980	1981	1982	1983	1984	1985
1. FOREIGN TRADE						
1-1 AT BERTH						
Number of Ships	1976 (1691)	1826 (1583)	1809 (1454)	1728 (1356)	1316 (973)	1339 (975)
Average GRT (tons)	7055 (6779)	7173 (6661)	7765 (6773)	8087 (7041)	8184 (7228)	9192 (8071)
Average LOA (m)	230 (130)	130 (127)	133 (128)	136 (128)	140 (132)	137 (132)
Average Loading/ Discharging Cargo Vol. (tons)	1792 (1865)	1919 (1952)	2121 (2130)	2194 (2073)	2027 (1804)	2153 (2085)
1-2 AT ANCHORAGE						
Number of Ships	821 (803)	729 (716)	848 (641)	741 (739)	572 (572)	714 (713)
Average GRT (tons)	6469 (6386)	7723 (7705)	8633 (8650)	8991 (8972)	8069 (8069)	6764 (6731)
Average LOA (m)	113 (112)	108 (108)	122 (122)	120 (120)	120 (120)	101 (101)
Average Loading/ Discharging Cargo Vol. (tons)	2133 (2084)	2424 (2420)	2636 (2644)	3051 (3037)	2984 (2984)	2133 (2135)

Note: Figures in parentheses ( ) show the data at South Harbor.
Source: PPA

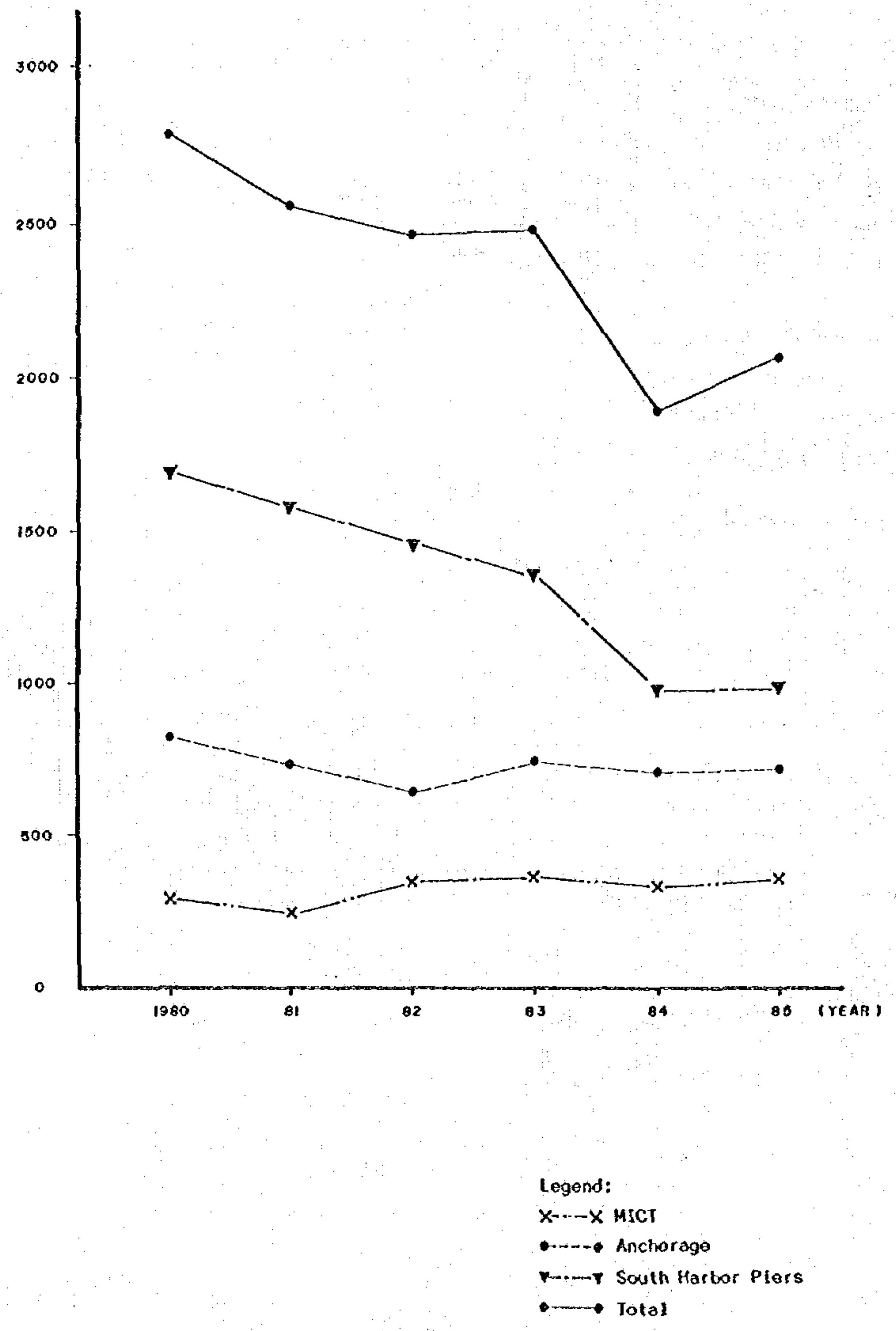


Fig. 4.2.1 Number of Oceangoing Ships Arriving at the Port of Manila

4.2.1.2 Ship Types and Characteristics

There are no adequate statistics on calling vessels by ship type available in the Philippines. The study team processed the raw data of PPA using a microcomputer and obtained the following results.

The number of oceangoing ships which called at the Port of Manila in 1985 is estimated as follows:

	No. of Ships Calling	Percentage
Container Ships	882	43.0
Conventional Gen. Cargo Ships	459	22.4
Tankers	220	10.7
Bulk Carriers	202	9.8
Semi Container Ships	85	4.1
Passenger Ships	49	0.9
Ro-Ro Ships	19	0.9
Others	137	6.7

According to the above figures, container ships accounted for the largest share of all the calling ships.

Almost all of the container ships are moored at berthing facilities. On the other hand, tankers, other ships and bulk carriers are generally moored at Anchorage. The percentage of vessels which are moored at Anchorage by ship type is as follows:

Tankers	98%
Others	79.6%
Bulk Carriers	62.9%
Conventional General Cargo Ships	43.8%

The distribution of ships that called at South Harbor by size is shown in Fig. 4.2.2. The predominant size of conventional general cargo ships calling at South Harbor is in the range of 5,000 - 10,000 DWT. As for container vessels, about 60% of them are below the 10,000 DWT class; however, 17,500 - 20,000 DWT class ships account for 20% of the container ships. Most of th container ships that call at the Port of Manila are feeder vessels connecting with line haul vessels at Hong Kong and Taiwan.

A list of liner service at the Port of Manila is presented in Appendix 4.2.1.

The distribution of the bulk carriers shows two distinctly different categories of ships: vessels less than 10,000 DWT and large vessels of the 25,000 - 40,000 DWT class.

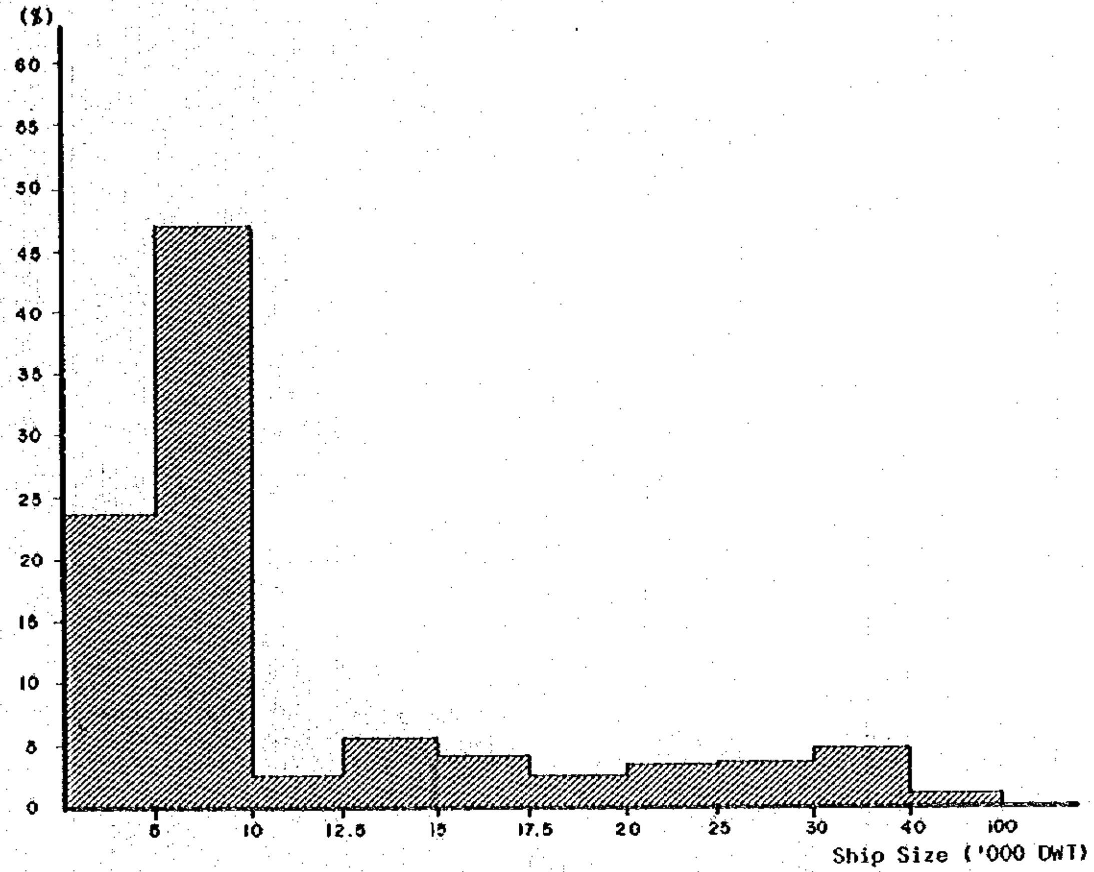
The number of tankers and vessels classified under the "others" category is large, but the size of these vessels is relatively small. About 80% of them are less than 10,000 DWT.

4.2.1.3 Shipping Activity

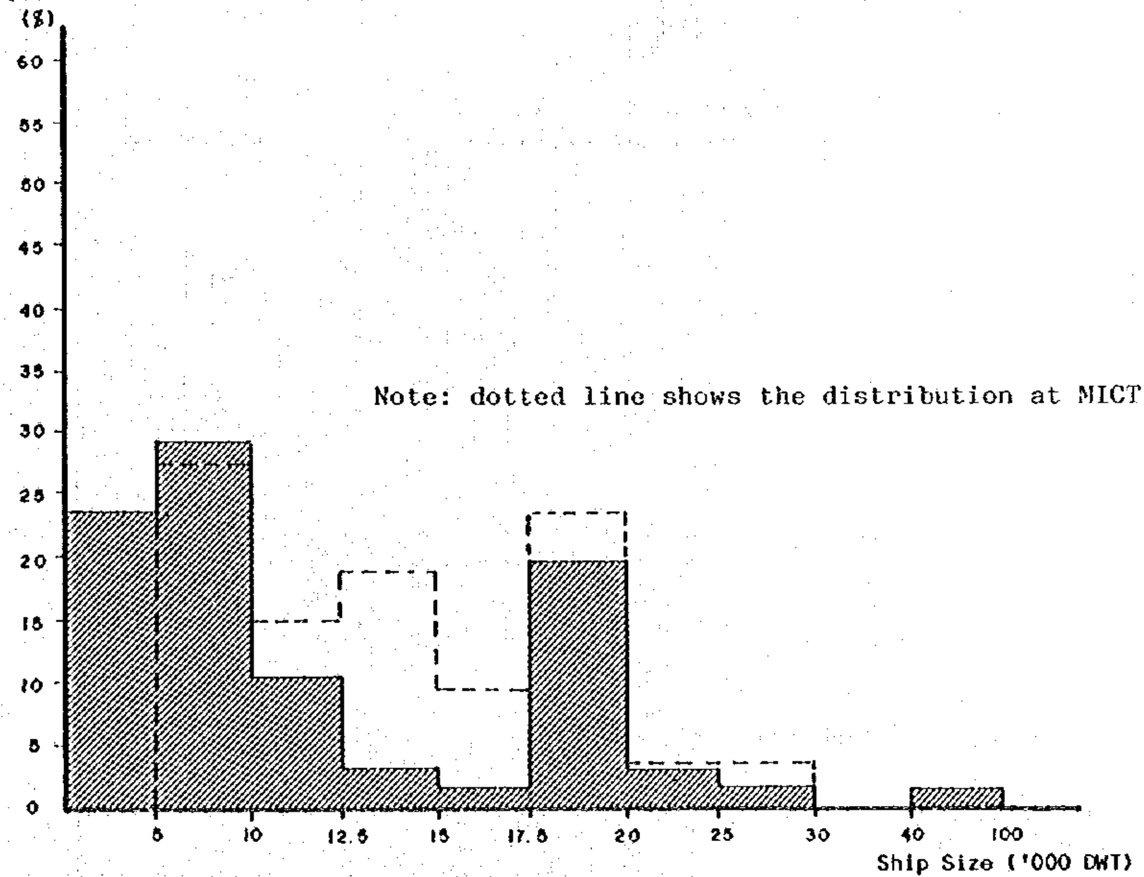
The monthly ship calls at South Harbor by type of ship are presented in Fig. 4.2.3. The total number of ship calls increased in the latter half of 1985. The fluctuation of total ship calls by month was not so large: less than 15% of the average. However, the range of fluctuation in ship calls of passenger ships and of bulk carriers was larger. Over 80% of the passenger ships called at Manila between November and March. Around one-third of the bulk carriers called from July to September.

Based on PPA statistics, the average mooring time per ship is estimated at 57 hours for berthing ships and 115 hours for ships at Anchorage in South Harbor, and 23 hours for the ships berthing at M.I.C.T. in 1985. Table 4.2.2 shows the indicators of shipping activity at the Port of Manila. The average mooring time of container vessels is not significantly influenced by rain. However, the mooring time of ships moored at South Harbor, mainly bulk carriers and conventional general cargo ships, is influenced heavily by the weather. The average mooring time at South Harbor increased to 62 hours (9% above the annual average) for berthing ships and 132 hours (15% increase) for Anchorage ships during the rainy season (May to October). Fig. 4.2.4 shows the monthly fluctuation of the average mooring time per ship in 1985.

According to PPA statistics, the total waiting time for berthing amounted to 3,700 hours, or 3.8 hours per ship at South Harbor in 1985. This figure seems to be unreasonable considering the low berth occupancy ratio at South Harbor, 22% in average in 1985.

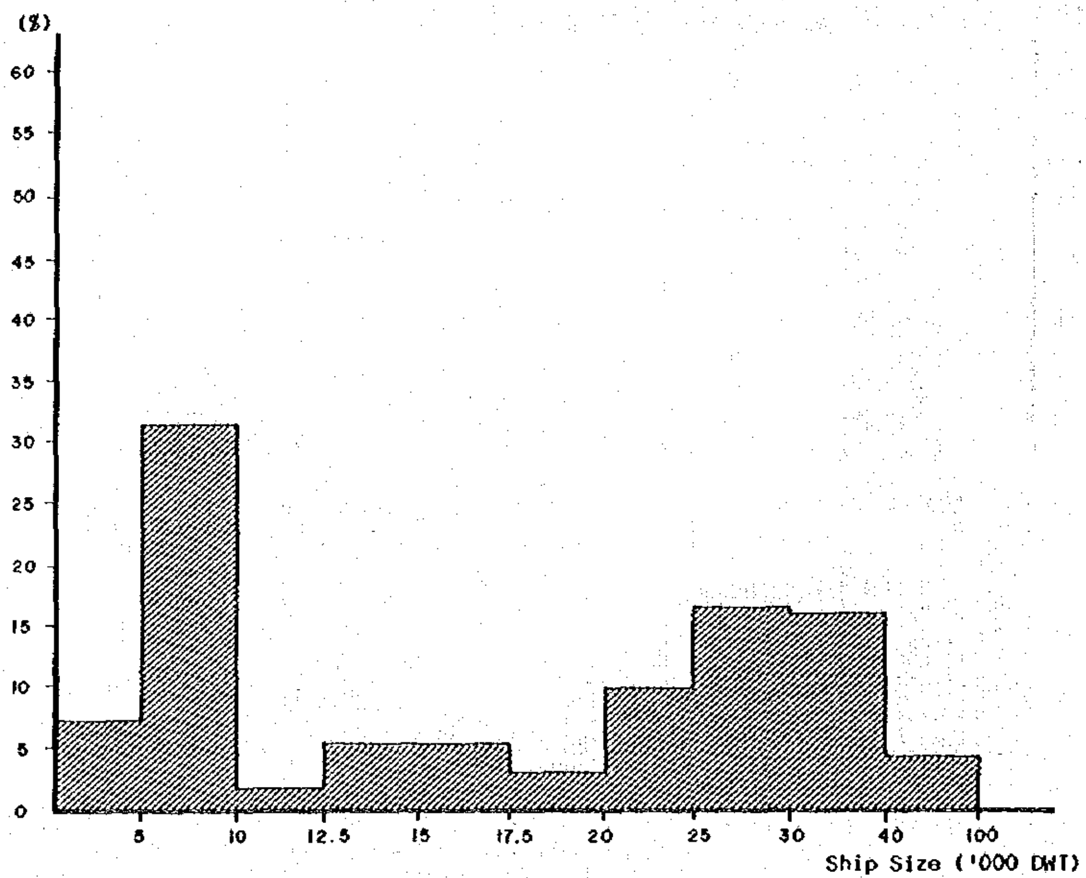


(1) Conventional General Cargo Ships



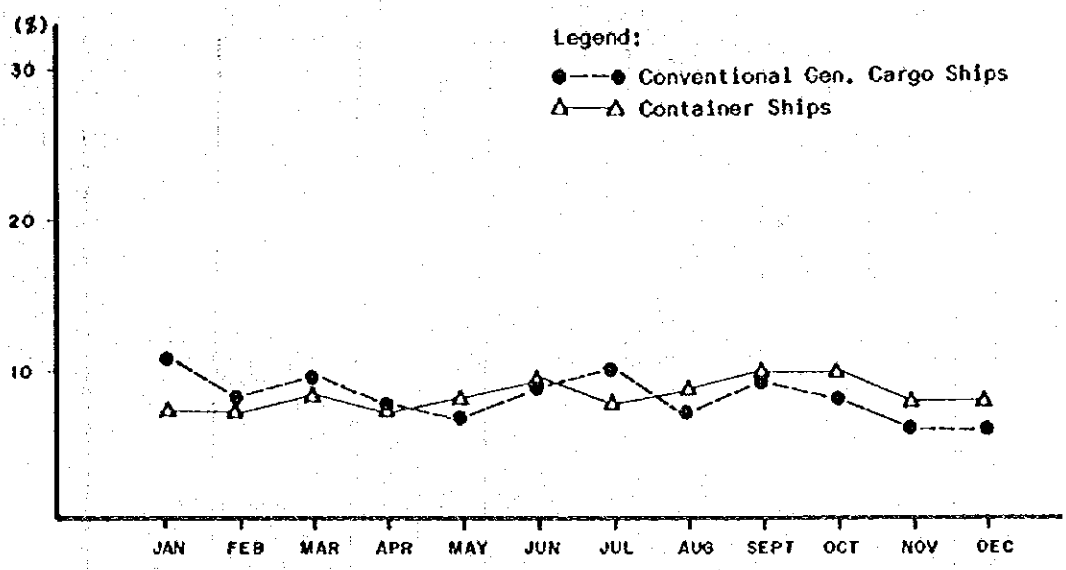
(2) Container Ships

Fig. 4.2.2 Distribution of Vessels Calling at South Harbor by Vessel Size

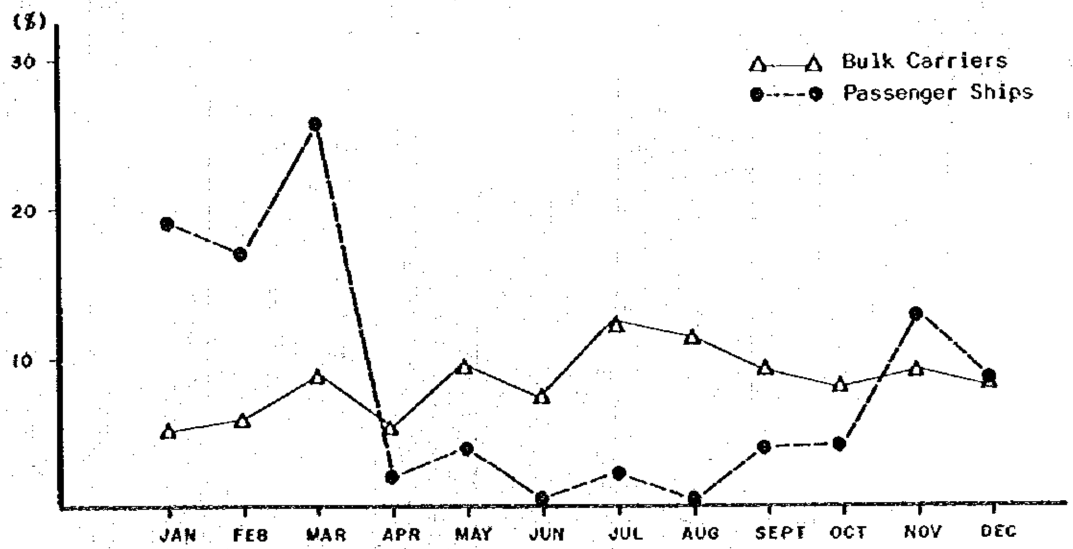


(3) Bulk Carriers

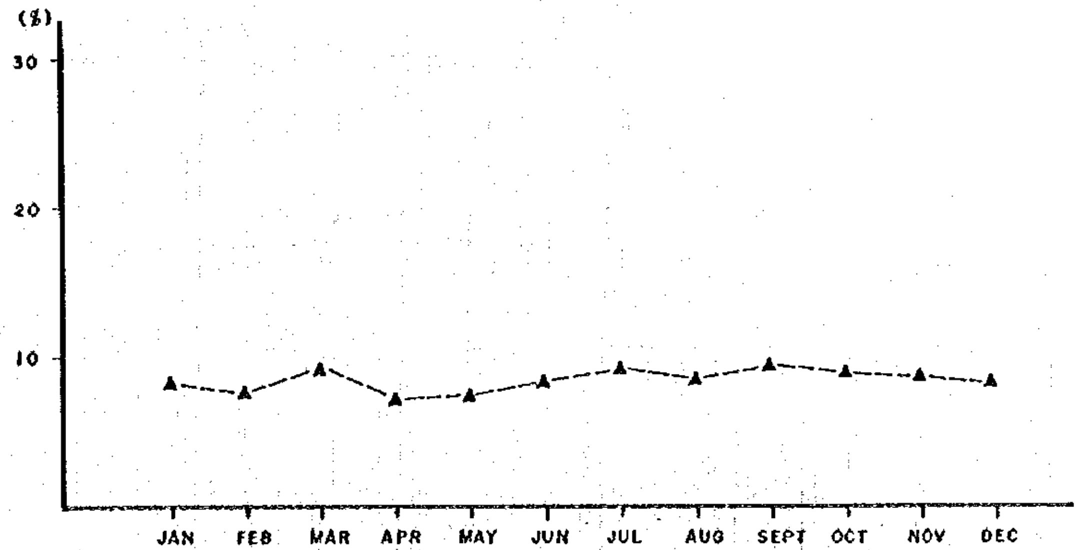
Fig. 4.2.2 Distribution of Vessels Calling at South Harbor by Vessel Size (continued)



(1) Conventional General Cargo Ships and Container Ships



(2) Bulk Carriers and Passenger Ships



(3) Total Ship Calls

Fig. 4.2.3 Monthly Ship Calls at South Harbor by Ship Type

Table 4.2.2 Shipping Activity at the Port of Manila (1985)

Ship Type	No. of Ship Calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Staying Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading /Unloading Volume (tons/ship)	Avg. Handling Volume per Mooring Ship hour (tons/ship hour)	Avg. Handling Volume per Ship Stay Day (tons/ship day)
Conventional										
Pier	249	117	94.5		242	7	9,825	2,299	23.5	
Anchorage	192	113		5.6	91	101	10,114	5,394		963
Total	441	115			333	108	9,951	3,145		
Semi-container										
Pier	78	146	46.8		78	0	10,678	1,761	38.6	
Container										
Pier 3	283	138	25.6		283	0	11,533	1,896	74.0	
Pier 5 - 15	201	124	35.2		200	1	9,029	2,052	57.6	
MICT	307	159	23.1		307	0	14,316	1,821	79.0	
Bulk Carrier										
Pier	72	151	105.0		69	3	21,572	3,417	32.2	
Anchorage	123	140		8.7	93	30	15,235	8,436		970
Total	195	144			162	33	17,575	6,298		
Tanker										
Anchorage	208	114		1.8	185	23	9,554	1,210		672
Passenger Ship										
Pier	47	157	23.8							
Others										
Pier	27	99	98.7							
Anchorage	105	27		4.6						
Total	132									

Note: Figures in the table only show available data based on PPA statistics.

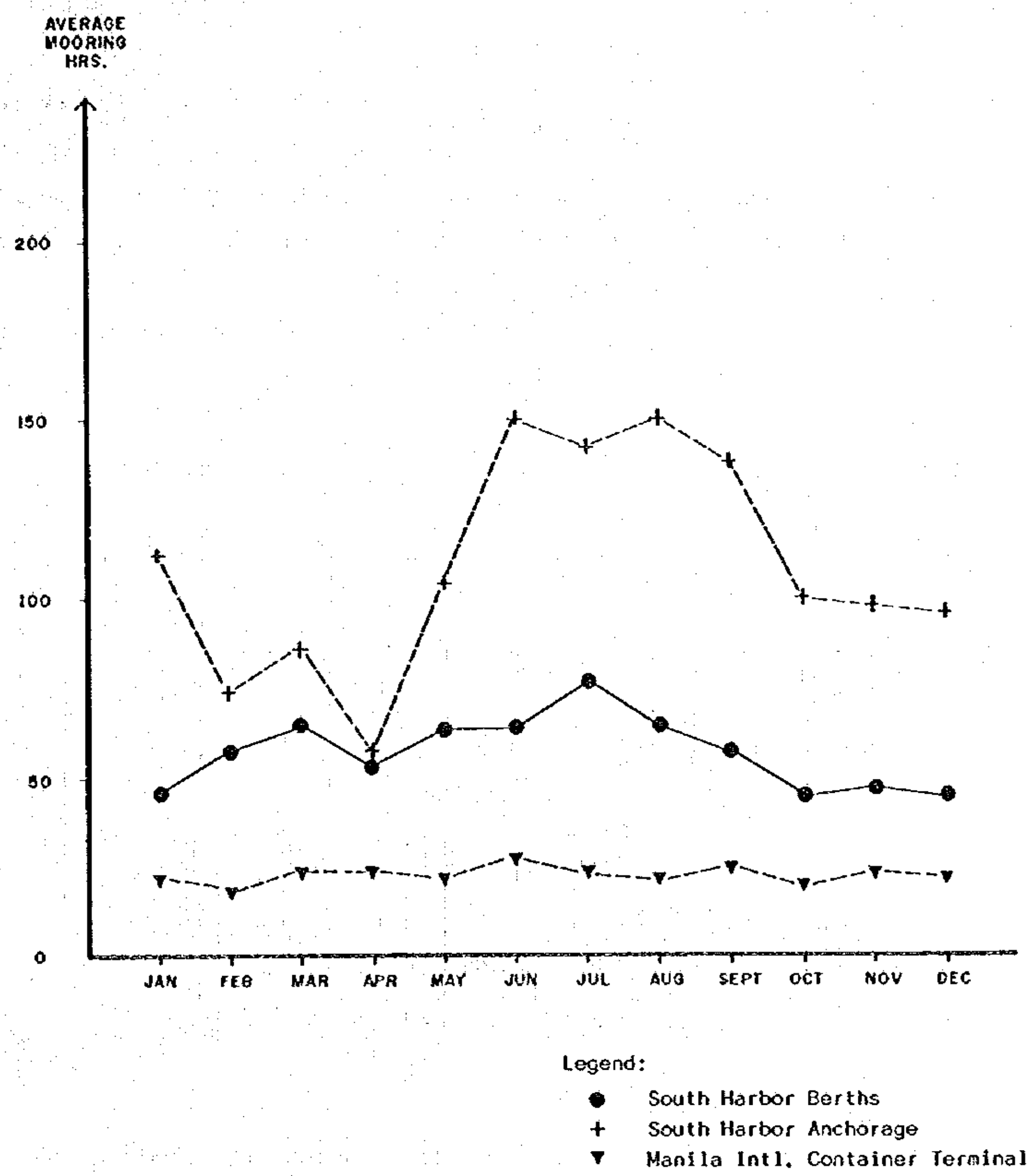


Fig. 4.2.4 Monthly Fluctuation of Average Mooring Time in 1985

4.2.2 Domestic Shipping

Major domestic ships use the North Harbor facilities. Twenty-four national shipping lines call at North Harbor and operate 103 ships for domestic cargo and passenger transportation. The following four routes are the main shipping routes in the Philippines: Manila-Cebu, Manila-Iloilo, Manila-Cagayan de Oro and Manila-Davao.

The historical trend of the number of ship calls and their characteristics are presented in Table 4.2.3.

Table 4.2.3 Arrival of Domestic Ships at the Port of Manila

(Year)	1980	1981	1982	1983	1984	1985
Number of Ships	6564	5644	5233	5312	4957 (12)	5278 (48)
Average GRT (tons)	1226	1366 (5141)	5959	1708	1833 (3843)	1752 (3367)
Average LOA (m)	65	67 (66)	72	74	77 (99)	77 (88)
Average Loading/Discharging Cargo Volume (tons)	939	1072 (186)	1202	1356	1172 (2716)	1324 (2806)

Note: Figures in parentheses show the data at South Harbor.
Source: PPA

The number of ships calling has decreased by around 1,300 ships (20%) over the last five years. On the other hand, the average GRT has increased by 43% in the same period. The tendency of enlargement of ship size is clear in domestic shipping as well as in international shipping.

The average mooring time per ship was 84 hours in 1984, according to PPA statistics. The fluctuation by month was not so large because the containerization of domestic shipping is already advanced. The number of vessels calling at North Harbor by vessel type is as follows:

	Number of Ships	Share
Container Ships	38	37%
Conventional Gen. Cargo Ships	32	31%
Combos	20	19%
Ro-Ro	6	6%

4.3 Cargo and Passenger Traffic

The total volume of foreign trade cargo handled at the Port of Manila dropped sharply in 1984, a 28% decrease from the previous year, due to a sharp decrease in import cargo. The total volume of foreign trade cargo in 1985 remained low, a mere 0.6% increase from 1984, because the national economy was still weak.

The historical trend of foreign trade cargo volume is presented in Table 4.3.1 and Fig. 4.3.1.

At the Port of Manila, the foreign trade cargo is handled in three different zones: the piers of South Harbor, the Anchorage of South Harbor and the Manila International Container Terminal (M.I.C.T.).

The percentage of the total foreign trade cargo handled in each zone is as follows:

	Berths of S.H.	Anchorage	M.I.C.T.
1980	60%	31%	9%
1981	59	33	8
1982	56	31	13
1983	47	37	16
1984	40	39	21
1985	46	35	19

The percentage of foreign trade cargo handled at the berths of South Harbor has been decreasing along with the increase at M.I.C.T. due to the advance of containerization. On the other hand, the percentage of foreign cargo handled at Anchorage has remained constant at over 30%. The major cargoes handled at Anchorage are bulk and homogeneous cargoes.

The cargoes handled at M.I.C.T. are mostly containerized cargo; only 5,000 tons of break bulk cargoes were handled at M.I.C.T. in 1985.

Among the piers of South Harbor, Piers 3 and 13 handle a large volume of containerized cargoes.

The majority of the special cargoes such as bulk coal, iron & steel, wood and machinery which are heavy cargoes or have unusual shapes are handled at Piers 9 and 15 because these piers have the necessary open space to handle and store such cargoes. Appendices 4.3.1(1) - (3) show the estimated volume of foreign trade cargo handled at South Harbor by commodity in 1985.

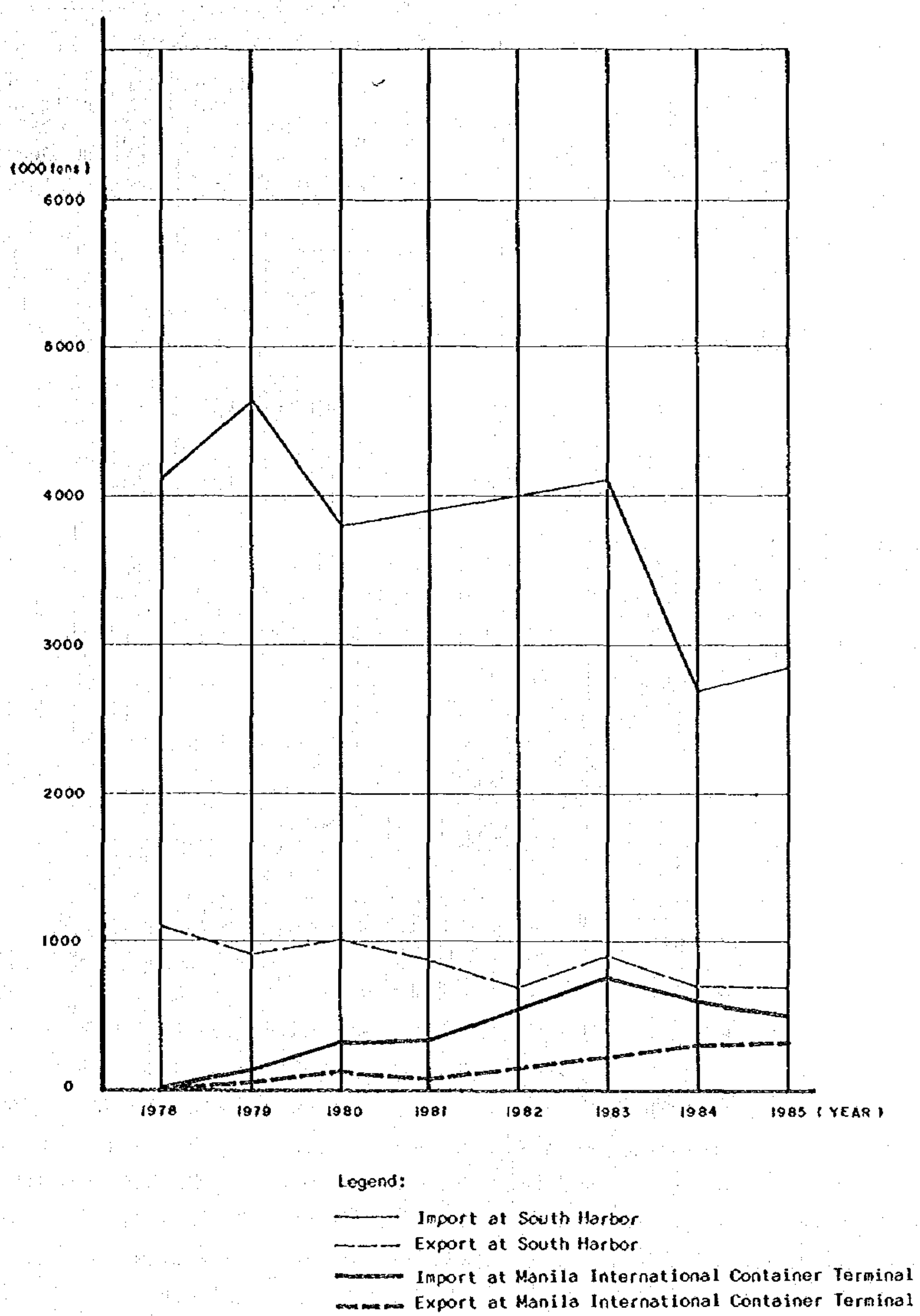


Fig. 4.3.1 Historical Trend of Foreign Trade Cargo Volume Handled at the Port of Manila

Table 4.3.1 Historical Trend of Foreign Trade Cargo Volume Handled at the Port of Manila

Unit: 1,000 tons

Year	GRAND TOTAL			SOUTH HARBOR			M.I.C.T.		
	Export	Import	Total	Export	Import	Total	Export	Import	Total
1978	1,086	4,194	5,280	1,085	4,192	5,277	1	2	3
				(345)	(1,260)	(1,650)			
1979	1,005	4,844	5,849	949	4,733	5,682	56	111	167
				(248)	(1,730)	(1,978)			
1980	1,153	4,139	5,292	1,003	3,825	4,828	150	314	464
				(207)	(1,467)	(1,674)			
1981	1,028	4,244	5,272	900	3,923	4,823	128	321	449
				(105)	(1,627	(1,737)			
1982	913	4,632	5,545	729	4,063	4,792	284	569	753
				(115)	(1,583)	(1,698)			
1983	1,147	4,900	6,047	928	4,123	5,051	291	777	996
				(193)	(2,045)	(2,238)			
1984	1,044	3,337	4,381	743	2,726	3,469	301	611	912
				(167)	(1,540)	(1,707)			
1985	1,956	3,350	4,406	733	2,821	3,554	323	529	852
				(136)	(1,386)	(1,522)			

Source: PPA, PMU Manila

Note: Figures in parentheses show the volume of cargo handled at Anchorage.

As for the balance of foreign trade cargo volume, imports account for 75-80%, and exports for 25-20%. As for imports, grains and chemicals including fertilizer are the most important commodities, while wood & wood products and coconut products are the leading exports in 1985. The Port of Manila does not prepare total foreign trade cargo statistics by commodity. Foreign trade statistics are produced for only two areas, MICT and Anchorage. On the other hand, National Census and Statistics Office (NCSO) prepares foreign trade cargo statistics of the Port of Manila by commodity.

However, NCSO's statistics are somewhat questionable. Moreover, the foreign trade volumes recorded by NCSO and PPA are somewhat different.

There was an approximately 7% difference in 1985. Herein NCSO's statistics by commodity are only used as a guideline to note the historical tendency of trade by commodity. Based on the NCSO statistics, however, iron and steel products were the most important import commodity with a 17% share until 1983. The import volume of iron and steel dropped drastically in 1984, a 73% decrease from the previous year. The movement of iron and steel is a very important factor for forecasting the future throughput at the Port of Manila.

Among the major commodities handled at the Port of Manila, the commodities which have increased their volume since 1980 are only fertilizer, a 36% increase, and other cereals (96%) due to an increase in rice imports in 1985 for imports, and miscellaneous manufactured articles (6%) and other food (4%) for exports. Appendix 4.3.2 shows the historical trends of import and export cargo volume by major commodity handled at the Port of Manila prepared by NCSO. These trends are presented graphically in Appendix 4.3.3.

The volume of cargo handled at the Port of Manila by packing type in 1985 is presented in Table 4.3.2. The share of loose cargo was 25%. Loose cargo was mainly handled at Anchorage, Pier 9 and Pier 5, as shown in Fig. 4.3.2. Other cereals (mainly rice) and bagged fertilizer were the main "loose" cargo handled. About 33% of the imports were bulk cargo. However, the export volume of bulk cargo was small, and 85% of it was handled at Anchorage. Table 4.3.3 shows the percentage of cargo by packing type by commodity in 1985.

The volume of imported containerized cargo had been increasing until 1983, with an average annual growth rate of 10%. However, the volume dropped sharply in 1984 along with the total import volume, and did not recover completely in 1985. On the other hand, the volume of exported containerized cargo increased favorably and recorded 771 thousand tons in 1985, with an annual average growth rate of 9.0% since 1978.

The percentage of containerized cargo in total foreign trade cargo is 35.7% for imports and 73.0% for exports in 1985. Around 43% of the total containerized cargoes are handled at MICT in 1985. 57% of the containerized cargo is handled at South Harbor, mainly at Pier 3 and Pier 13.

The statistics for the containerized cargo are presented in Tables 4.3.4 and 4.3.5 and in Fig. 4.3.3.

The number of passengers disembarked/embarked at the Port of Manila are shown in Table 4.3.6.

Table 4.3.2 Estimated Volume of Cargo Handled at the Port of Manila by Packing Type 1985

(Unit: 1,000 M/T)

	Import		Export		Total	
	Volume	%	Volume	%	Volume	%
Loose (Break Bulk) Cargo	941 (3)	28.3	141 (2)	13.4	1,082 (5)	25
Containerized Cargo	1,196 (526)	35.7	771 (321)	73.0	1,967 (847)	44
Bulk (Dry) Cargo	1,105	32.7	52	4.8	1,157	26
Liquid	108	3.3	92	8.8	200	5
Total	3,350	100.0	1,056	100.0	4,406	100.0

Estimated volume based on study team analysis

Note: Figures in parentheses show the volume at MICT.

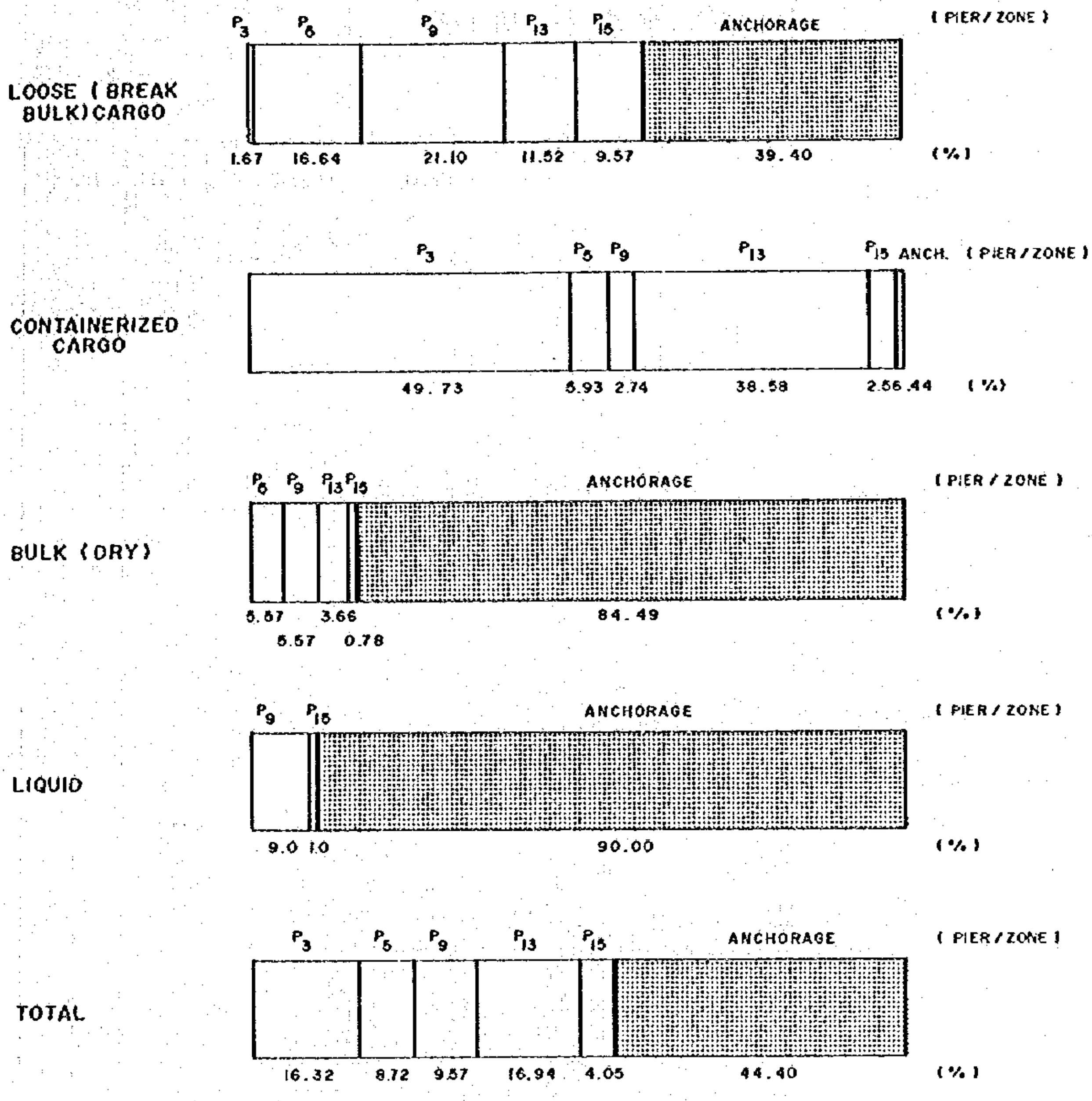


Fig. 4.3.2 Percentage of Cargo Volume Handled at Each Pier / Zone in South Harbor by Packing Type

Table 4.3.3 Estimated Percentage of Cargo by Packing Type by Commodity at Manila in 1985

(1) Import

(Unit: %)

Commodity	Loose (break bulk)	Containerized	Dry bulk	Liquid
Dairy Products	3.1	96.9	0.0	0.0
Fish & Fish Products	73.5	26.5	0.0	0.0
Wheat & Wheat Products	15.4	2.2	82.4	0.0
Other Cereals	52.7	2.4	44.9	0.0
Feed	31.6	9.3	59.1	0.0
Other Food	9.2	72.5	18.3	0.0
Tobacco	6.4	93.6	0.0	0.0
Wood & Wood Products (excluding furniture)	25.2	74.8	0.0	0.0
Paper and Pulp	19.9	80.1	0.0	0.0
Textile Fibers	38.9	61.1	0.0	0.0
Crude Fertilizers & Crude Minerals	36.4	17.7	45.9	0.0
Metalliferous Ores & Metal Scrap	39.3	24.6	36.2	0.0
Mineral Fuels	3.7	10.6	50.1	35.6
Coconut Oil	0.0	100.0	0.0	0.0
Other Coconut Products	1.0	56.9	0.0	42.1
Other Animal & Vegetable Oil	21.7	27.6	0.0	50.7
Fertilizer	49.2	0.3	50.4	0.1
Chemicals	10.6	54.1	21.7	13.6
Textiles & Garments	9.4	90.6	0.0	0.0
Iron & Steel	77.7	22.2	0.0	0.1
Non-Ferrous Metals	40.3	58.8	0.0	0.9
Manufactures of Metal, n.e.s	35.3	64.7	0.0	0.0
Machinery & Transport Equipment	39.0	61.0	0.0	0.0
Miscellaneous Manufactured Articles	8.5	91.5	0.0	0.0
Others	14.4	57.5	28.2	0.0

2) Export

(Unit: %)

Commodity	Loose (break bulk)	Containerized	Dry bulk	Liquid
Dairy Products	0.0	100.0	0.0	0.0
Fish & Fish Products	0.3	99.7	0.0	0.0
Wheat & Wheat Products	0.0	100.0	0.0	0.0
Other Cereals	22.1	5.8	72.2	0.0
Feed	0.0	100.0	0.0	0.0
Other Food	0.4	97.3	0.9	1.5
Tobacco	10.3	89.1	0.6	0.0
Wood & Wood Products (excluding furniture)	83.5	16.5	0.0	0.0
Paper and Pulp	0.4	99.6	0.0	0.0
Textile Fibers	0.1	97.6	0.0	2.2
Crude Fertilizers & Crude Minerals	11.2	88.8	0.0	0.0
Metalliferous Ores & Metal Scrap	0.8	97.2	0.0	0.0
Mineral Fuels	0.9	99.1	0.0	0.0
Coconut Oil	0.0	4.0	0.0	96.0
Other Coconut Products	0.7	55.7	42.8	0.8
Other Animal & Vegetable Oil	0.8	44.0	0.0	55.3
Fertilizer	41.7	58.3	0.0	0.0
Chemicals	2.0	85.4	0.1	12.5
Textiles & Garments	3.2	96.8	0.0	0.0
Iron & Steel	20.8	79.2	0.0	0.0
Non-Ferrous Metals	1.6	78.4	0.0	0.0
Manufactures of Metal, n.e.s.	3.5	96.5	0.0	0.0
Machinery & Transport Equipment	10.2	89.8	0.0	0.0
Miscellaneous Manufactured Articles	2.8	97.1	0.1	0.0
Others	5.7	94.3	0.0	0.0

Table 4.3.4 Historical Trend of Containerized Cargo Volume of Foreign Trade Handled at the Port of Manila

(Unit: 1,000 tons,%)

Year	Grand Total			South Harbor			M.I.C.T.		
	Export	Import	Total	Export	Import	Total	Export	Import	Total
1978	421	1,062	1,483	420 (99.8)	1,060 (99.8)	1,480 (99.8)	1 (0.2)	2 (0.2)	3 (0.2)
1979	483	1,384	1,867	445 (92.1)	1,282 (92.6)	1,727 (92.5)	38 (7.9)	102 (7.4)	140 (7.5)
1980	523	1,266	1,789	421 (80.5)	990 (78.2)	1,411 (78.9)	102 (19.5)	276 (21.8)	378 (21.1)
1981	555	1,373	1,928	470 (84.7)	1,075 (78.3)	1,545 (80.1)	85 (15.3)	298 (21.7)	383 (19.9)
1982	561	1,570	2,131	400 (71.3)	1,026 (65.4)	1,426 (67.0)	161 (28.7)	544 (34.6)	705 (33.1)
1983	574	1,707	2,281	356 (62.0)	954 (55.9)	1,310 (57.4)	218 (38.0)	753 (44.1)	971 (42.6)
1984	646	1,229	1,875	345 (53.4)	626 (50.9)	971 (51.8)	301 (46.6)	603 (49.1)	904 (48.2)
1985	771	1,196	1,967	450 (58.4)	670 (56.0)	1,120 (56.9)	321 (41.6)	526 (44.0)	847 (43.1)

Source: PPA

Note : Figures in parentheses show percentage of each harbor district.

Table 4.3.5 Percentage of Containerized Cargo in Total Foreign Trade Cargo at The Port of Manila

Year	1978	1979	1980	1981	1982	1983	1984	1985
IMPORT	25.3	28.6	30.6	32.4	33.9	34.8	36.8	35.7
EXPORT	38.7	48.1	45.4	54.0	61.4	50.5	61.9	73.0
TOTAL	28.1	31.9	33.8	36.6	38.4	37.7	42.8	44.6

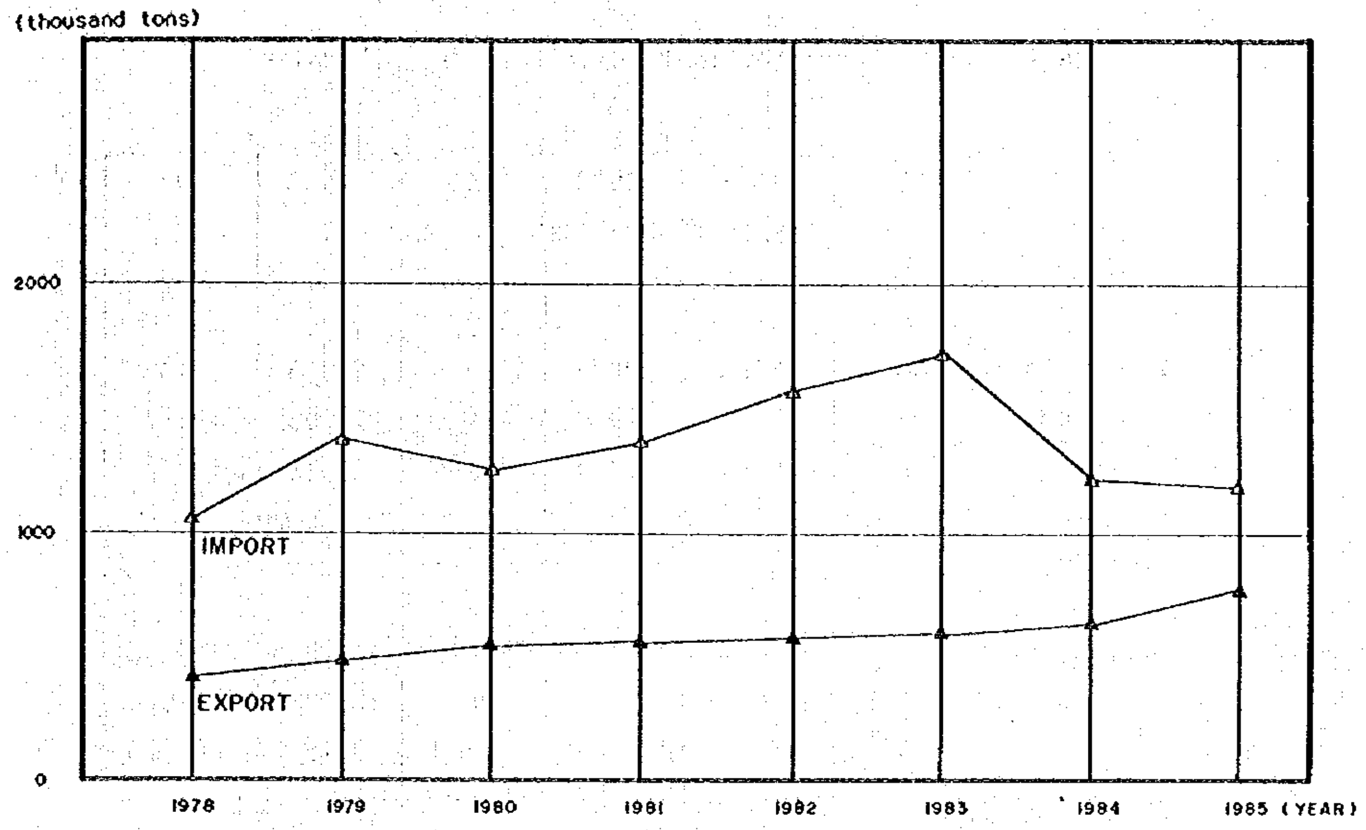


Fig. 4.3.3.(1) Volume of Containerized Cargo in Foreign Trade at Manila Port

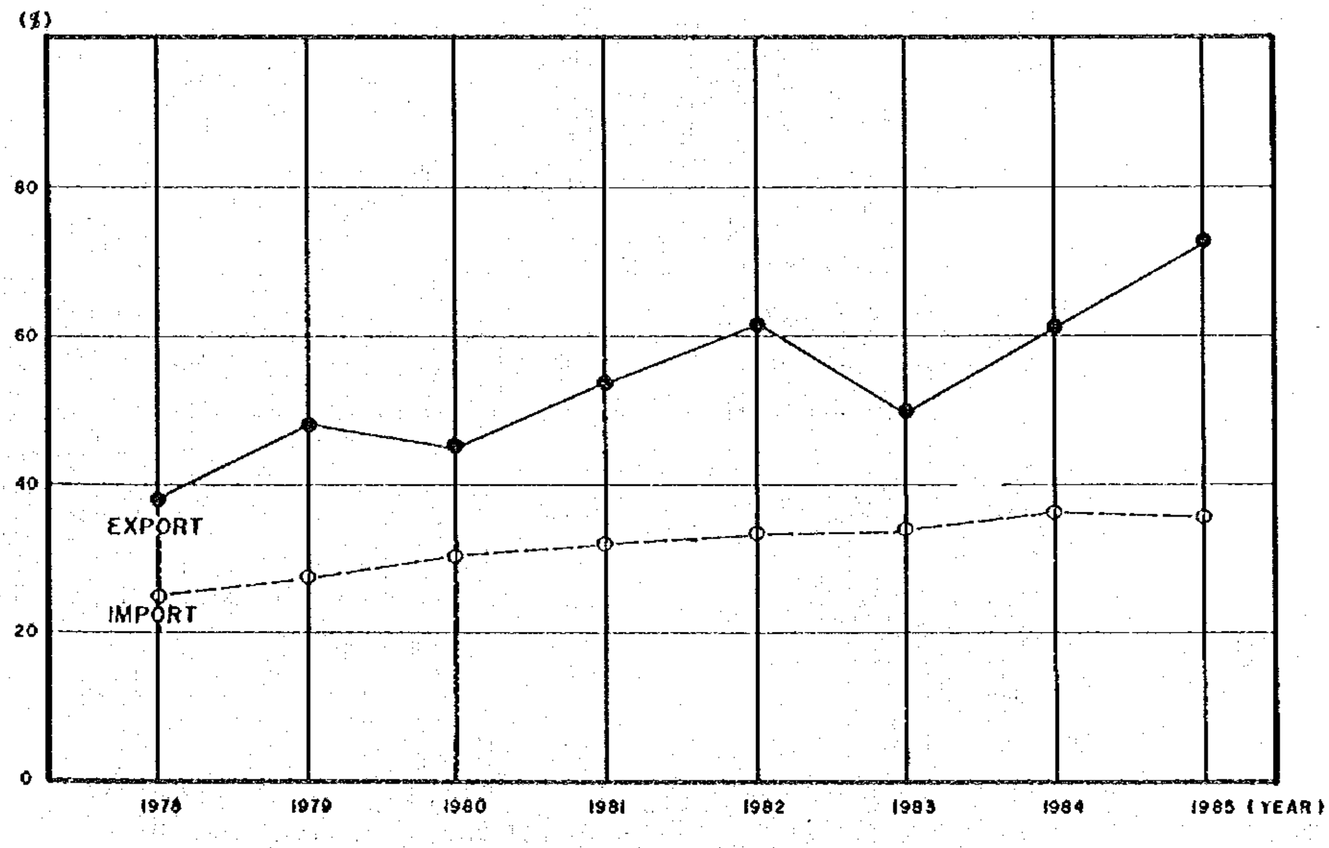


Fig. 4.3.3.(2) Containerization Ratio for Foreign Trade (%)

Table 4.3.6 Passenger Traffic at the Port of Manila

	1980	1981	1982	1983	1984	1985
SOUTH HARBOR						
Passenger Traffic	38019	33663	22883	31245	29756	39153
Disembarked	19190	17100	11990	16059	15085	19947
Embarked	18829	16563	10893	15186	14671	19206
NORTH HARBOR						
Passenger Traffic	2295945	22280476	2503790	2797215	2047799	2429400*
Disembarked	1125731	1146197	1271392	1420120	1090223	1222925
Embarked	1170214	1134279	1232398	1377095	957576	1206475

Note: * estimated

Source: PPA

4.4 Utilization of Port Facilities

4.4.1 Utilization of Mooring Facilities

There are five finger piers in South Harbor. The piers accommodate different types of vessels depending on the physical condition of each pier. For example, Pier 3 and Pier 13 are used mainly for containerized cargo, Pier 5 and Pier 9 for loose cargo and Pier 15 for specialized ships (combo, timber, etc.) and non-cargo vessels.

The average berth occupancy rate of all South Harbor was 22% in 1985, and the average tonnage handled per meter run per year was estimated at 504 t/m. These values are relatively low compared with the figures for North Harbor, with a berth occupancy of 62% and a tonnage handled per meter run per year of 944 t/m. in 1984.

The number of ships berthing, berth occupancy rate and tonnage handled per meter run of each zone are presented in Fig. 4.4.1.

Analyzing the port statistics of South Harbor for the seven month period from June to December 1985, the berth occupancy rate of Pier 9 was the highest among the five piers at South Harbor. However, as for the tonnage handled per meter run, Pier 3 was the highest followed by Pier 13 because the majority of the containerized cargoes were handled at these two piers. The utilization of the piers at South Harbor is shown in Fig. 4.4.2.

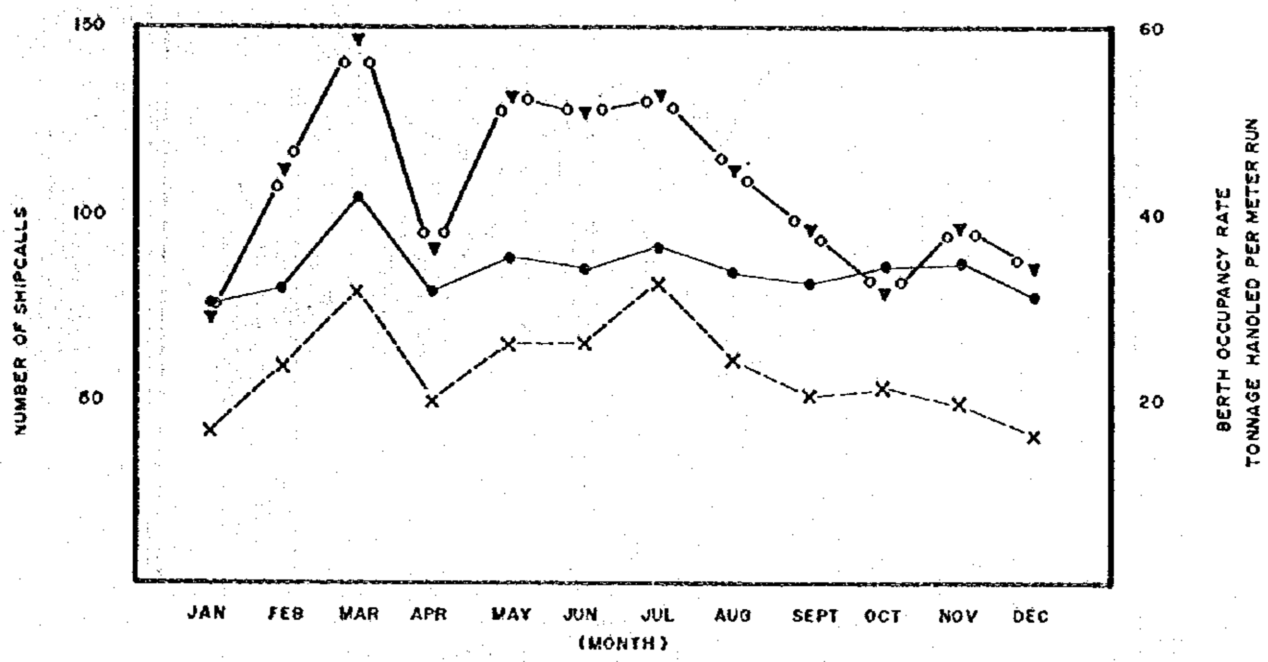
Based on PPA's worksheet per vessel activity for the three month period from Oct. to Dec. 1985, the utilization of the mooring facilities at South Harbor by berth is estimated as shown in Table 4.4.1.

As shown in the table, the berth occupancy ratios of the berths fluctuated over time. Berths No. 3-3, 9-1, 13-1 and 15-2 are relatively well-used. However, the highest berth occupancy ratio is only 45.6%. The berth occupancy ratio (R) is computed as follows:

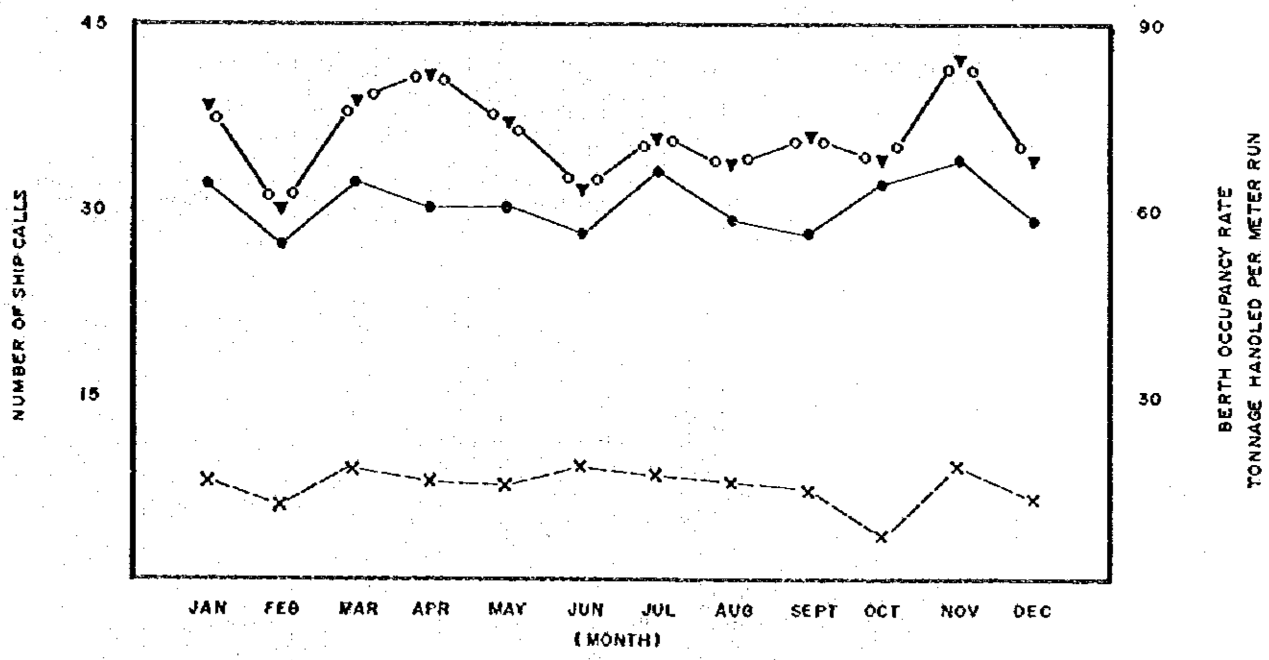
$$R = \text{Mooring time}/24^{h} \times 92^{days} \text{ (3 months)}$$

The quay lengths of the piers except Pier 13 at South Harbor are too short to accommodate two oceangoing ships simultaneously. When vessels over 10,000 D.W.T. moor at a quaywall, it is impossible to use the neighboring berth, only two small ships, less than 10,000 DWT, can be accommodated at same time.

The berth occupancy of berths No. 5-4, 5-5, 13-6 and 13-7 are lower due to poor physical conditions such as the narrow apron width and the poor fender system, and also due to the existing operational conditions of the transit sheds behind the quaywall, sheds No. I and E. These sheds are actually used as a CFS for the containerized cargoes which are handled at the other berths in South Harbor.



(1) South Harbor Utilization in 1985



(2) Manila International Container Terminal Utilization in 1985

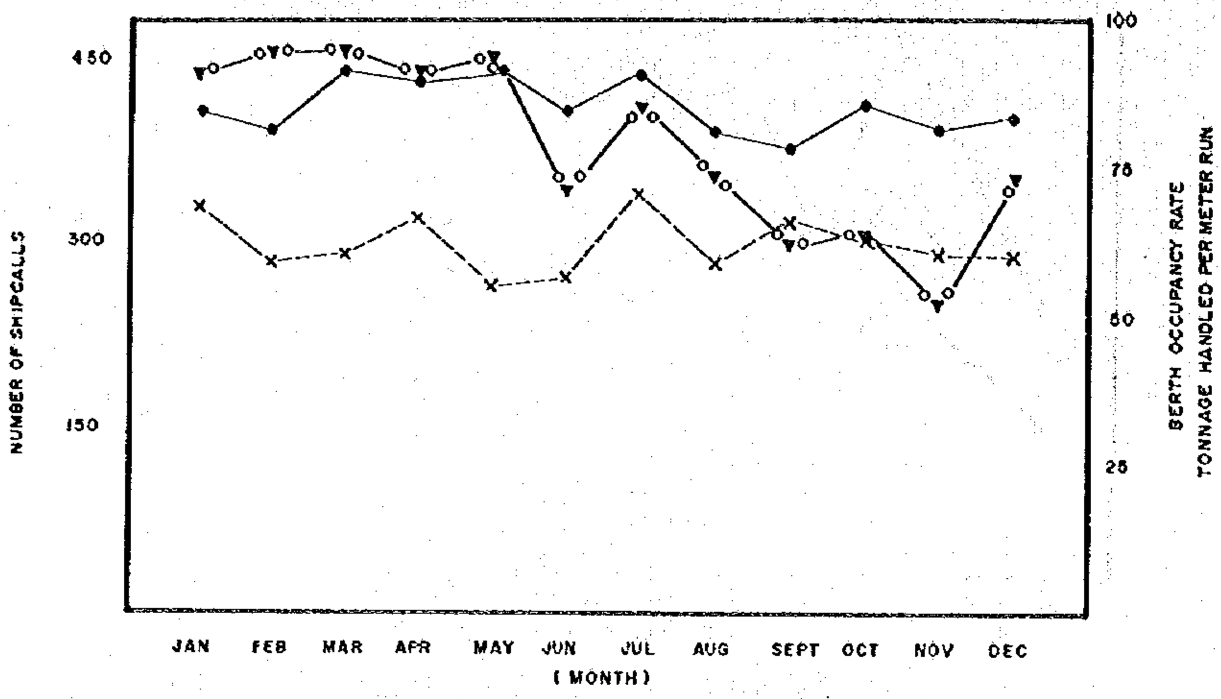
Legend:

●——● No. of Ship Calls

×----× Berth Occupancy Rate (%)

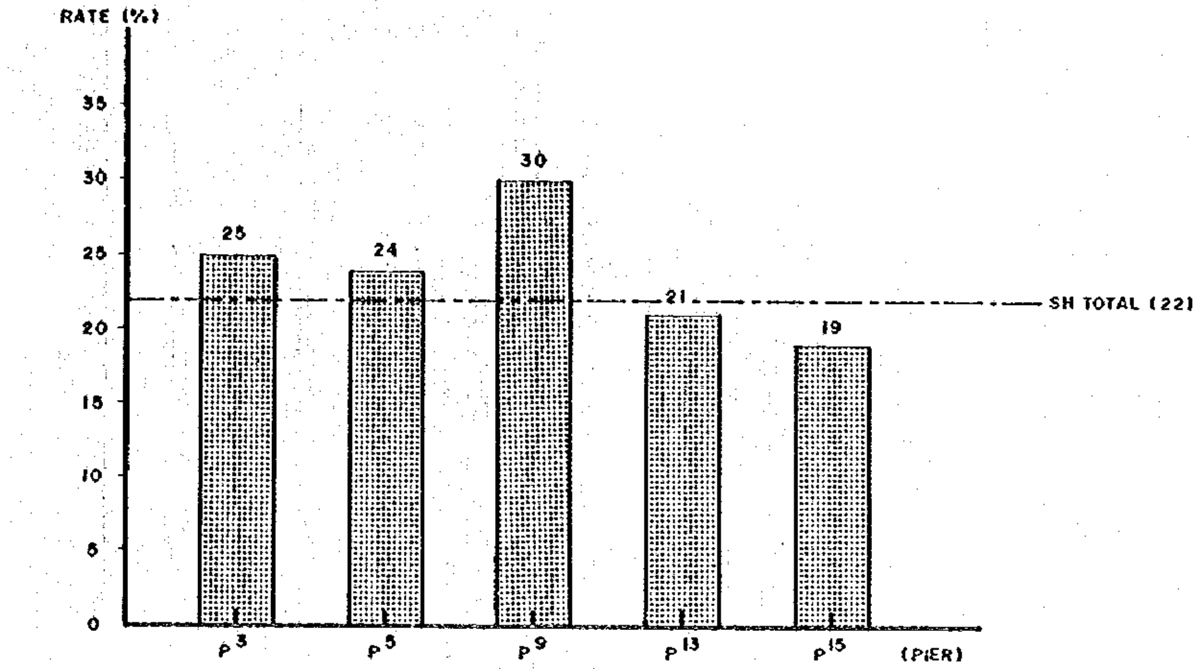
▼○—○▼ Tonnage Handled per Meter Run Per Month (ton/m)

Fig. 4.4.1 Utilization of Mooring Facilities

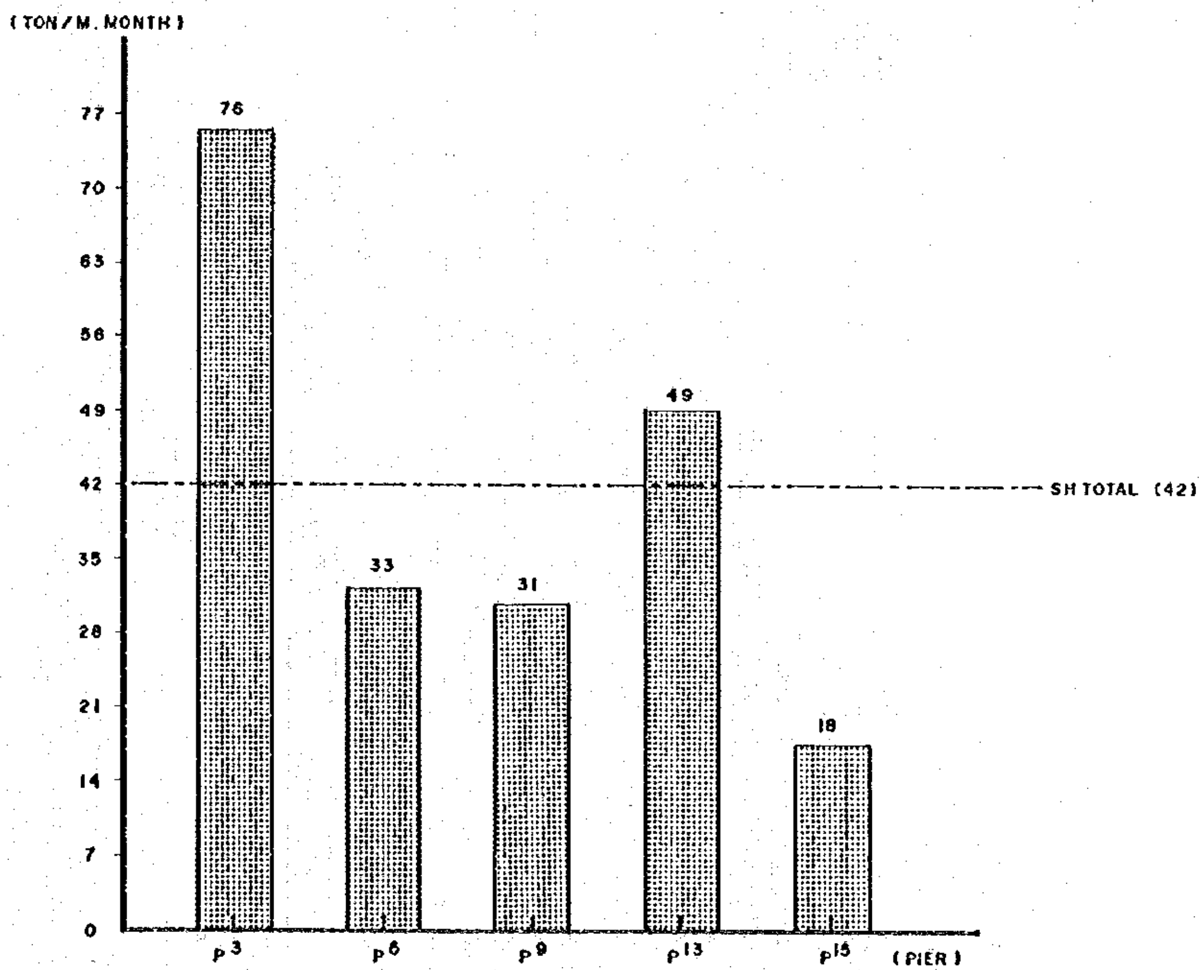


(3) North Harbor Utilization in 1984

Fig. 4.4.1 Utilization of Mooring Facilities (Continued)



(1) Berth Occupancy



(2) Tonnage Handled Per Meter Run

Fig. 4.4.2 Utilization of Piers at South Harbor (June - Dec. 1985)

Table 4.4.1 Mooring Facility Use (Oct. - Dec. 1985)

Pier-Berth	Quay Length (m)	No. of Calling Ships	Avg. Ship Size (DWT)	Volume of Cargoes Handled (tons)	Average Cargo Vol. per Ship (t/ship)	Estimated Cargo Vol. per Meter Run per year (t/m)	Mooring Time per 3 months (hrs)	Avg. Mooring Time per Ship (h/ship)	Berth Occupancy Ratio (%)	Remarks
3-1	161.6									Used for captured vessels
3-2	158.6	16	6,502	22,980 (11,174)	1,436	580	664	41.5	30.1	container handling
3-3	163.1	40	16,709	95,159 (92,007)	2,379	2,332	1,007	25.1	45.6	"
3-4	163.1	30	5,284	56,787 (56,378)	1,893	1,392	203	23.4	31.8	"
5-1	163.1	5	8,718	8,114 (2,279)	1,628	200	122	24.4	5.5	
5-2	163.1	5	14,612	18,914 (4,020)	3,783	464	538	107.6	24.4	
5-3	103.7	4	4,995	3,383 (567)	846	132	240	60	10.9	
5-4	163.1	1	5,808	3,300 (0)	3,300	80	73	73	3.3	
5-5	163.1	3	719	2,189 (0)	730	52	152	50.7	6.9	
9-1	167.7	12	6,929	17,722 (4,504)	1,477	424	809	67.4	36.6	
9-2	167.7	12	20,249	12,860 (1,034)	1,072	308	663	55.3	30.0	bulk handling
9-3	100.6	3	4,040	2,421 (0)	807	96	174	58	7.9	
9-4	167.7	9	7,757	17,061 (5,309)	1,896	408	423	47	19.2	semi-container
9-5	167.7	8	14,711	6,910 (0)	864	164	640	80	29.0	
13-1	127.0	21	9,819	44,968 (43,093)	2,141	1,416	822	39.1	37.2	container handling
13-2	127.0	7	13,450	11,424 (11,411)	1,632	360	220	31.4	10.0	"
13-3	127.0	22	18,065	61,733 (61,205)	2,806	1,944	748	34	33.9	"
13-4	82.7	0		0	-	0	-	-	0.0	use prohibited
13-5	127.0	6	15,539	4,090 (3,121)	682	128	256	42.7	11.6	
13-6	127.0	2	10,744	4,430 (3,267)	2,215	140	75	37.5	3.4	
13-7	127.0	5(4)		21,515 (0)	21,515	676	146	29.2	6.6	passenger ship
15-1	163.1	12(8)	4,985	5,535 (815)	1,384	136	494	41.2	22.4	passenger ship
15-2	163.1	11(2)	7,645	19,292 (3,169)	2,144	472	795	72.3	36.0	
15-3	100.6	4	2,937	3,068 (271)	767	120	394	98.5	17.8	
15-4	152.4	7	23,285	7,788 (713)	1,113	204	583	83.3	26.4	wood handling
15-5	173.8									mooring berth for presidential yacht

Source: Estimation based on PPA statistics.
Note : (1) Figures in parentheses in the column for volume of cargoes handled show the volume of containerized cargo.
(2) Figures in parentheses in the column for of calling ships show the of ships which did not load or unload any cargoes.

4.4.2 Sorting and Storage Facilities

There are some sorting and storage facilities with a low utilization rate in the South Harbor area. Table 4.4.2 shows the average figures in 1985 on the utilization of sorting and storage facilities such as CFS, CY, sheds, warehouses and outside storage facilities in South Harbor. Sheds C, K and L were not used at all in 1985 due to a lack of cargo to be stored and to their dilapidated condition.

Fig. 4.4.3 shows the actual utilization of the existing facilities in South Harbor.

According to the data from arrastre, the modal split of cargo traffic at the wharves of South Harbor is as shown in Table 4.4.3. As shown in the table, around 85% of the loose cargo is stored inside the sheds and warehouses. However, the percentage of direct delivery is generally very small except for special cargo like hazardous cargo and dry bulk. Hazardous cargo should be stored in a special storage facility to be prepared at the North Harbor area.

Table 4.4.2 Monthly Average Utilization of Sorting and Strage Facilities in 1985 South Harbor (1985)

Shed	Stacking Capacity	1	2	3	4	5	6
Pier 3 O/S	10000			63	7	1000	10.0
Pier 5 O/S	3400			50	7	2	0.0
Shed I	3000	2 days	4 days	2800	520	1711	57.0
Shed J	3000			2431	430	1200	40.0
Shed K	3000			0	0	0	
Shed L	3000			0	0	0	
Baggage	1500			1450	324	1082	72.1
Pier 9 O/S	5000			2777	14	2047	40.9
Shed A	3500			838	5	1239	35.4
Shed B	3500			1862	157	1885	53.9
Shed C	3500			-	-	88	2.5
Shed D	3500			2852	112	2089	59.7
Pier 13 O/S	10000incl CY Sn Fr'co	4-6 day	4-6 day	* 33960	435	8700	87.0
Shed E	3000			*	507	2600	86.7
Pier 15 O/S	10000			6416		3275	32.8
Shed M	3000			1339	857	478	15.9
Shed N	3000			2143		986	32.8
Whse 1	6000			-	-	2258	37.6
Whse 2	5000	Non-Operation					
Whse 3	5000	3 days	5 days	2143	650	3300	30.0
Whse 6	10000	Leased to FILSOV Shipping					
Whse 7	10000	Storage Area for Seized Cargoes					
Whse 8	10000		- do -				
Whse 9	5000		- do -				
Whse 10	10000		- do -				
Whse 11	6000			*	0	2200	36.7
Stalag Area	6000			68	7	4052	67.5

LEGEND:
1. CFS Avg. Dwell Time Last Discharge to Shipping
2. CFS Avg. Dwell Time Shipping to Delivery
3. Tonnage Delivered for the Month
4. Number of Permits Processed/Completed
5. Avg. Tonnage Stored Daily
6. Avg. Occupancy

Note: * Shed E, Pier 13 OS/CY and Warehouse 11 is under the Terminal Area Pier 13.

Source: PPA

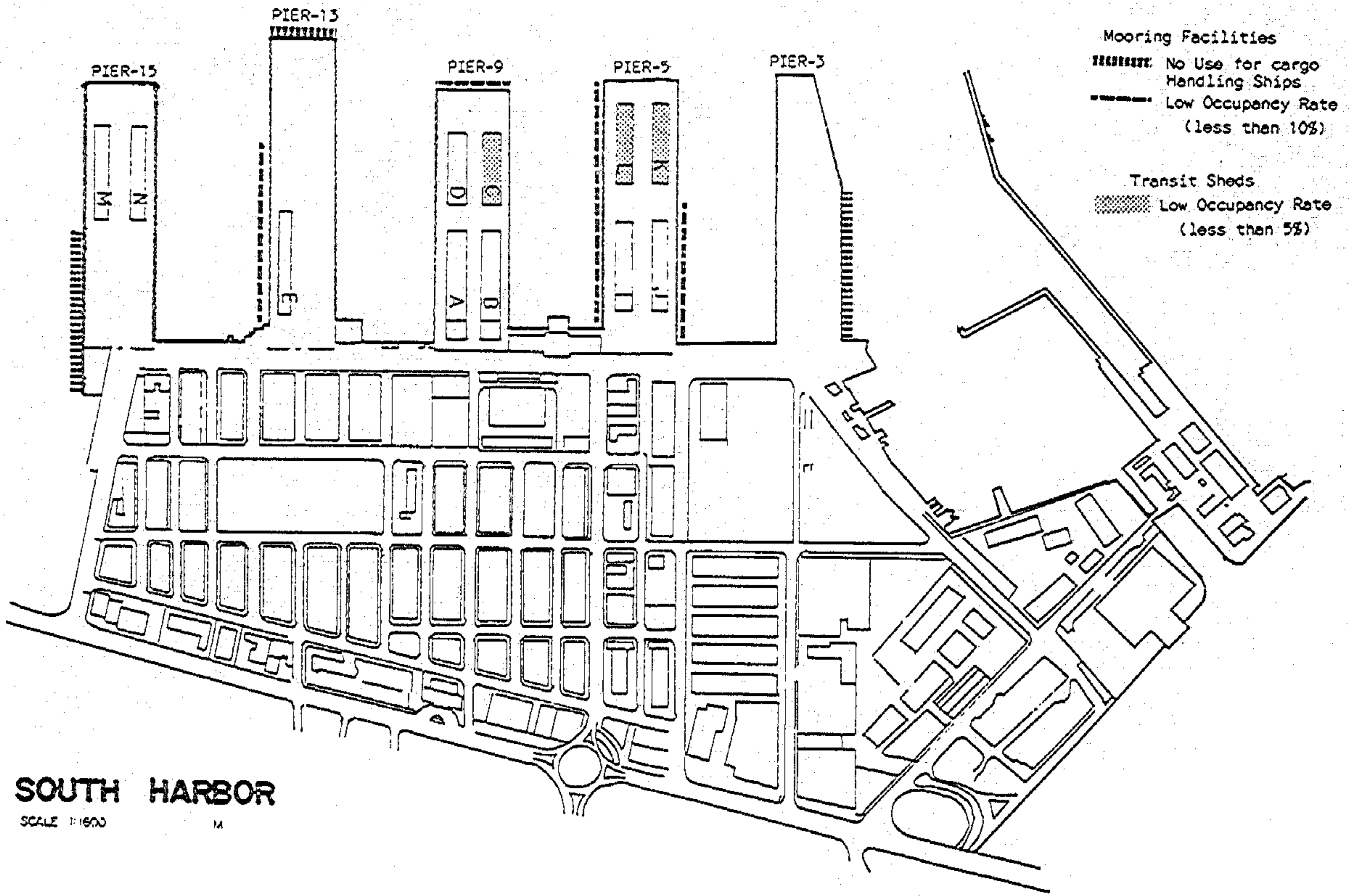


Fig. 4.4.3 Actual Utilization of Existing Facilities

Table 4.4.3 Cargo Flow at the Wharves of South Harbor

	Cargo Type	Inside Storage	Open Storage	Direct to Truck
1.	Break-bulk Palletized	85	13	2
2.	Containers		98	2
3.	Roll-on/Roll-off			
	Containers		100	
	Rolling Stock		100	
	Break-bulk	60	40	
4.	Heavy Lift		100	
5.	Timber	15	70	15
6.	Hazardous		5	95
7.	Dry Bulk	10		90

CHAPTER 5
PORT MANAGEMENT AND FINANCE

CHAPTER 5 PORT MANAGEMENT AND FINANCE

5.1 Port Organization and Management

5.1.1 General Port Administration

Port administration and operations in the Philipines are undertaken by the Philippine Ports Authority (PPA) which was created in 1974 by Presidential Decree (P.D.) 505. The establishment of PPA was also a World Bank condition for a loan in 1973.

PPA implements the objectives outlined below based on P.D. 505 as amended by P.D. 857 in 1975. By virtue of P.D. 857, PPA is attached to the Ministry of Transportation and Communications (MOTC) for policy and program coordination.

The general objective of PPA is to implement state port policy: an integrated program for the planning, development, financing, operation, and maintenance of ports and port districts throughout the country. (The detailed objectives of PPA are listed in Appendix 5.1.1).

The policy formulation level is the PPA Board of Directors. The Board consists of the Minister of Transportation and Communications as the Chairman and the PPA General Manager as Vice Chairman. The other members are the Director-General of the National Economic Development Authority, the Ministers of Public Works and Highways, Finance, Trade and Industry, and Natural Resources, the Administrator of MARINA and a representative of the private sector.

Policies are implemented by the General Manager as the Chief Executive Officer, his Assistant Executive Officer and three line offices, namely: Finance and Administration, Operations and Planning, and Engineering. Each of the line offices is headed by an Assistant General Manager. (Table 5.1.1 shows the Organization Chart of PPA).

Operationally, the Port Management Units (PMUs) which are semi-autonomous regional offices report to the General Manager concerning the activities of the various ports. At present PPA has 19 PMUs, each headed by a Port Manager. Each PMU is responsible for the supervision of government and private ports within its area of operations.

As of August 14, 1986 the total number of PPA employees is 1,969 persons. Table 5.1.2. shows the number of PPA Head Office workers and the total number of PMU employees.

Governmental functions related to port administration and operations that are not the responsibility of PPA, however, are provided by other government agencies in close coordination with PPA.

The following agencies are vital to the administration and operation of the Port of Manila and all other major ports in the country.

- Bureau of Customs (BOC)
- Maritime Industry Authority (MARINA)
- Philippine Coast Guard (PCG)
- Bureau of Quarantine
- Bureau of Animal Industry
- Bureau of Immigration

Their functions are briefly explained in Appendix 5.1.2.

Table 5.1.1 Philippine Ports Authority Organization Chart

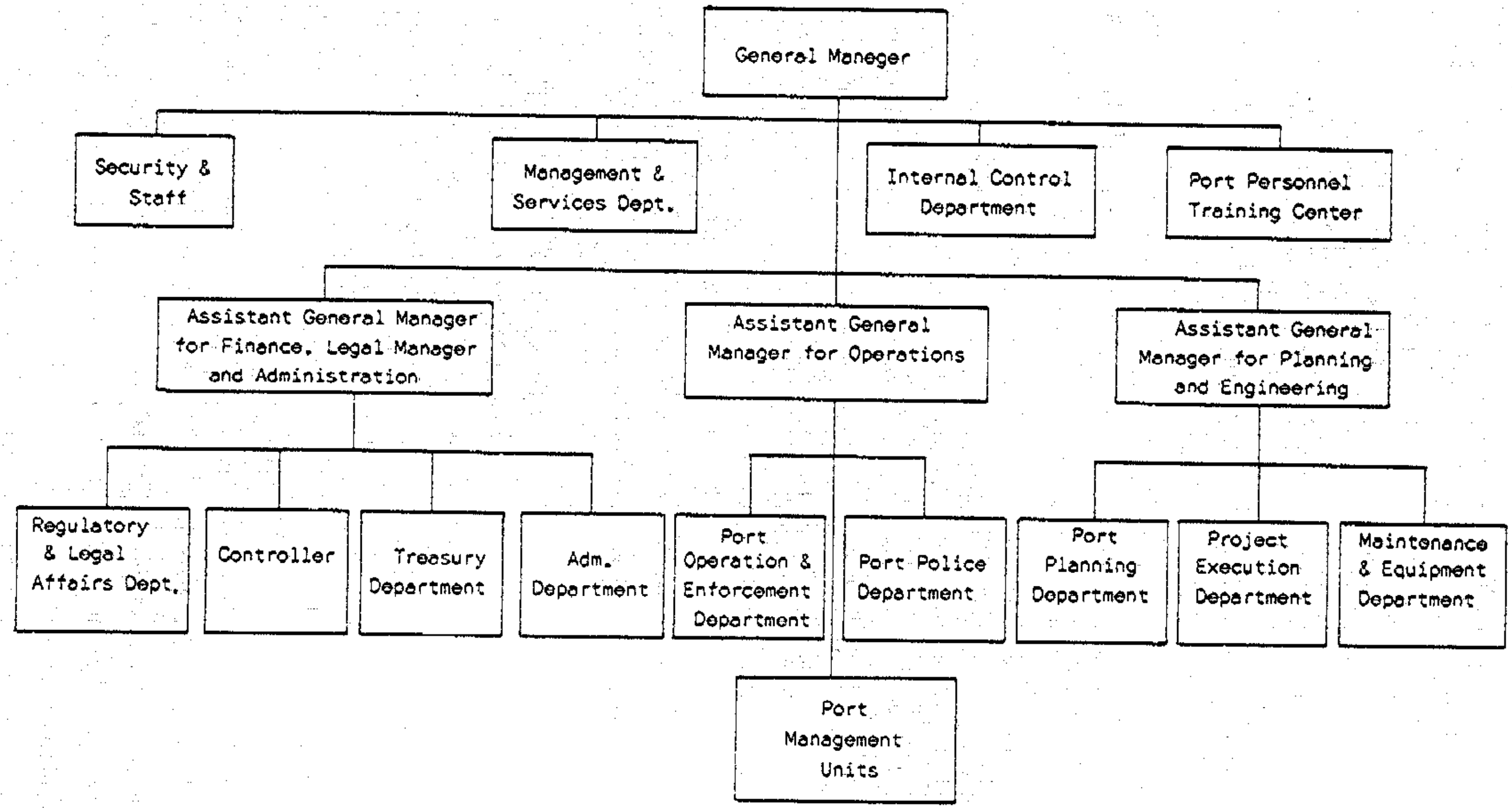


Table 5.1.2 Number of PPA Head Office Workers and Total Number of PMU Employees

	PPA Head Office	PMUs	Total
Managers	31	95	126
Other workers	409	1,434	1,843
Total	440	1,529	1,969

5.1.2 Organization and Personnel at the Port of Manila

PPA's administrative and operational functions are implemented by Port Management Units (PMUs), so PMUs operate as the arms of PPA. Though the PMUs are under the control of PPA, they are granted a commensurate degree of autonomy and authority to effectively manage their ports which are treated as independent fiscal centers. The Port Managers are held responsible for the performance of their PMUs.

PMU Manila is divided into three (3) operational units: South Harbor, Manila International Container Terminal, and North Harbor. Each of these operational units is headed by an Assistant Port Manager who reports directly to the Port Manager. (Appendix 5.1.3 shows the Organizational Chart of PMU Manila).

There are 528 regular employees at PMU Manila as of June 30, 1986. The employees are divided into four (4) operational units as follow:

(Operational Unit)	(Number of Workers)
South Harbor	251
MICT	78
North Harbor	180
Sub-ports	19
Total	528

There are also many port services such as arrastre, stevedoring, pilotage, tug assistance and so on. Such services are generally conducted by the private sector under the supervision of PPA. PPA encourages private parties to undertake such port-related services in accordance with established measures and standards.

The principal port services provided at South Harbor are briefly explained in Appendix 5.1.4.

There are a total of 5,654 arrastre and stevedoring workers at South Harbor as of June 30, 1986. There is only one arrastre company and one stevedoring company serving South Harbor: Marina Port Sevices, Inc. and Ocean Terminal Services, Inc. (OTSI). The number of workers at each company is presented below.

Marina Port Services, Inc.	:	2,277
OTSI	:	3,377
Total		5,654

5.1.3 Existing Port Operations

5.1.3.1 Berthing Procedure

The Port of Manila is operated under a "common-use" policy. Therefore, there are no public port facilities for the exclusive use of any port user, but rather all the port facilities are assigned on a first-come first-served basis. However, berthing priority is granted to vessels owned and operated by shipping companies having special arrangements with PPA. For example, APL's container ships are preferentially berthed at Pier 3. Container ships as well as pasenger ships are also berthed at berths which are specifically designated for such operations. The following guideline is used at present for berthing allotment at South Harbor:

① Container handling ships are berthed at Piers 3 and 13.
② Break bulk handling ships are berthed at Piers 5 and 9.
③ Passenger ships and foreign government vessels on official business are berthed at Pier 15.

The operational unit which includes the terminal operations section and the marine operations section is responsible for the actual port operations. The Harbor Master, who is the chief of the marine operations section, determines where incoming vessels are to be docked. The terminal operations section supervises and coordinates the planning of vessel reception and all cargo handling operation.

The berthing procedure and the operation flow of the Port of Manila are shown in Table 5.1.3

Table 5.1.3 Berthing Procedure and Operation Flow

(Pre-arrival)

① Shipping agent files Notice of Arrival and Application for Berth, including cargo manifest, to the Assistant Port Manager through the Harbor Master, the chief of the marine operation unit, 48 hours in advance.

② The Harbor Master conducts a Berthing Meeting with representatives of shipping agents, pilots, arrastre, stevedoring, BOC, Coast Guard and other port users to arrange daily berthing order.

③ After consultations, the Harbor Master determines berth assignments based on the estimated time of arrival, priorities, type of cargo and vessel characteristics.

④ The Terminal Operations Officer coordinates with the arrastre superintendent in planning the cargo receiving, including preparation of storage space, manpower and equipment requistion and coordination with other agencies/port users.

(Arrival)

⑤ The vessel stays at Quarantine for Quarantine clearance. After clearance from Quarantine, other parties board the vessel to finish formalities.

⑥ The pilot boards the vessel to guide the vessel to its designated berth with tug assistance.

⑦ Vessel docking under PPA supervision

⑧ Arrastre/stevedoring cargo handling under PPA supervision

⑨ Shipside barge, lighter, ship provisioning, watering chandling and other marine service operations under PPA supervision.

⑩ Shipping agent secures PPA clearance and other formalities prior to vessel's departure.

(Departure)

5.1.3.2 Working Conditions

(1) Working time

The official working holidays of the Port are only two days a year, Good Friday and Christmas.

Cargo handling in South Harbor is carried out in two shifts: the day shift (from 7 a.m. to 7 p.m.) and the night shift (from 7 p.m. to 7 a.m.).

(2) Stevedoring Operations

The existing stevedoring work is ordinarily conducted using ship gear in South Harbor except for container handling at Pier 3 where a "tango" crane is used for loading and unloading.

The average number of gangs and laborers per gang for stevedoring work by cargo type are estimated, according to the stevedoring perfomance report, as follows:

	Average No. of gangs	Avg. No. of laborers
Break bulk	3 gangs/ship	9 laborers/gang
Container		
Pier 3 (with "tango" crane)	2	6
Others	2	9
Heavy cargo	2-3	9
Timber	2-3	9
Dry bulk	3-4	9

(3) Arrastre operations

The present situation of the shore side cargo operations at South Harbor is as follows:

① Break bulk, heavy cargo and timber

Mainly, cargo is transfered using forklifts (2-6 tons) from the apron to sheds or open storage areas at the same pier.

After clearance of customs inspection and completion of necessary formalities, the cargo is transfered outside of the port area. However, when the customs approves the consignee's application to conduct the customs inspection at an outside bonded area, the cargo is directly delivered from the apron to the outside area.

However, this very seldom occurs at the Port of Manila at present.

② Containers

Container chassis with tractor heads shuttle between the apron and the open yards. A 35 ton shifter and a large capacity forklift (20-40 ton) are used to lift the containers on and off the trailers.

③ Dry bulk

The majority of the cargo is discharged on a truck and directry delivered from the apron to the consignee's storage area outside of the port.

These homogeneous cargoes are inspected by customs prior to berthing.

The formation of arrastre work by cargo type is shown as follows:

	Avg. No.of gangs (No. of laborers per gang)	Handling equipment used per ship
Break bulk	3-4 gangs/ship (10 laborers/gang)	3-5 forklifts (2-5 tons)
Container		
Non-self-sustaining	2 gangs (6 laborers/gang)	8-10 trailers 2-4 shifters/forklifts
Self-sustaining	2 gangs (6 laborers/gang)	6-8 trailers 2-4 shifters/forklifts
Heavy cargo	1-2 gangs (6 laborers/gang)	mobile crane or 20 ton forklift
Timber	3 gangs (6 laborers/gang)	3 forklifts
Dry bulk	3-4 gangs (6 laborers/gang)	1 payloader

5.1.4 Cargo Handling Productivity

Based on a review of PPA worksheets for the three months from October to December 1985 and the on site survey, the standard productivity rate of arrastre and stevedoring companies, and the average actual cargo handling productivity in South Harbor by cargo type are presented below.

Table 5.1.4 Actual Cargo Handling Productivity

(Unit: tons/gang/hour)

	Quayside	Anchorage
Containerized Cargo		
non-sustaining	14-16 Units	
self-sustaining	7- 8 Units	
Loose (break bulk) Cargo	15	*
Timber	15	*
Iron & Steel	18	
Bags	*	20
Bulk	26	22

Note:* Data not available.

Handling of containerized cargo at Pier 3 for vessels without ship gear is consistently conducted by arrastre companies. However, the other cargo handling work is executed by two different types of companies at South Harbor, stevedoring firms on board and arrastre firms at quay side. Sometimes the working speed of the two are different, so the overall productivity declines. Moreover, insufficient coordination among the firms related to the handling and transport of cargoes causes a lot of lost time. The percentage of standby/lost time to the total working time for bulk handling at Anchorage was estimated at 40% for the period from October to December, 1985. One of the major causes was the delays caused by barges. Table 5.1.5 shows the actual average rate of standby/lost time at the Port of Manila, based on the working sheet per vessel activity prepared by PPA.

Table 5.1.6 shows the causes of standby/lost time in July and October 1985 estimated from Foreman's Reports prepared by arrastre.

In general, cargo handling rates vary by several factors including commodity, packing type, handling equipment, loading situation on board, physical condition of the port facilities and technical capacity of the workers. Sample cargo handling rates and other indicators on port performance at major Philippine ports in 1982-83 are presented in Fig. 5.1.1.

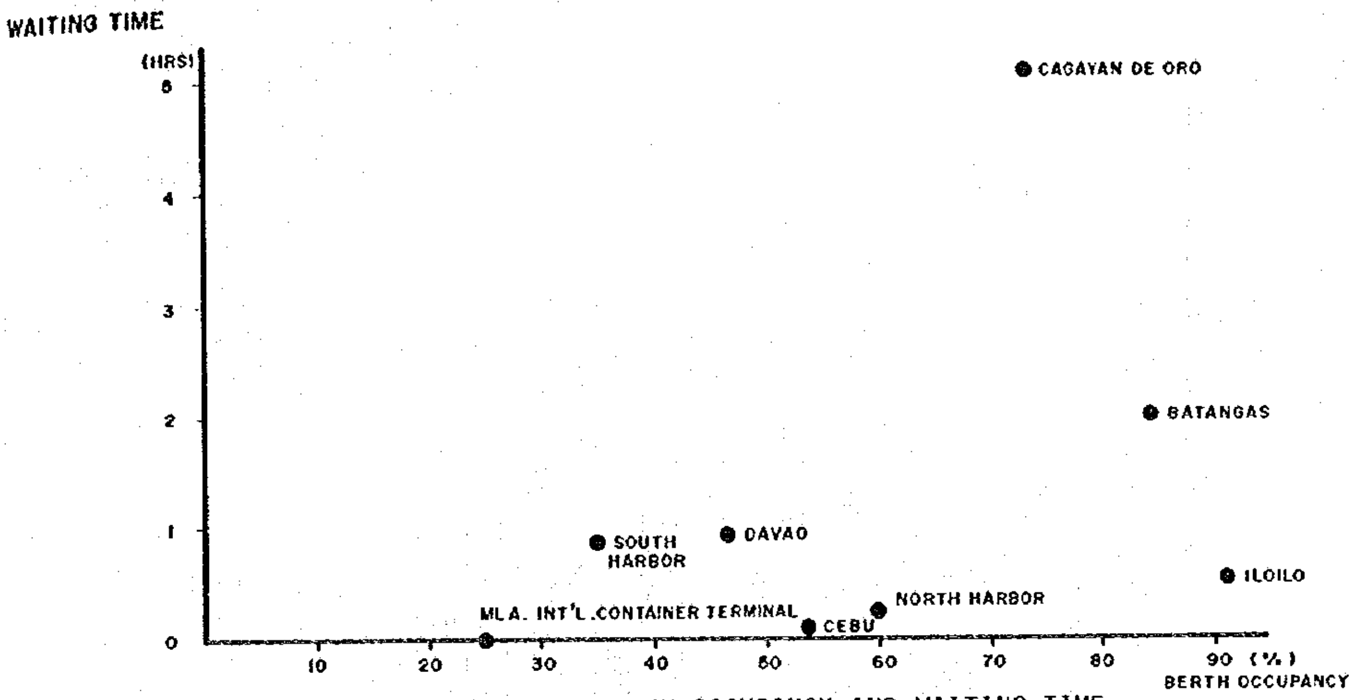
Table 5.1.5 Actual Average Rate of Standby/Lost Time

Cargo Mode	Average Rate	
Loose (break bulk)	0.19	
Bags	0.25	at anchorage
Containerized	0.27	
Timber	0.13	
Iron & Steel	0.23	
Bulk	0.40	at anchorage
Total average at pier	0.22	

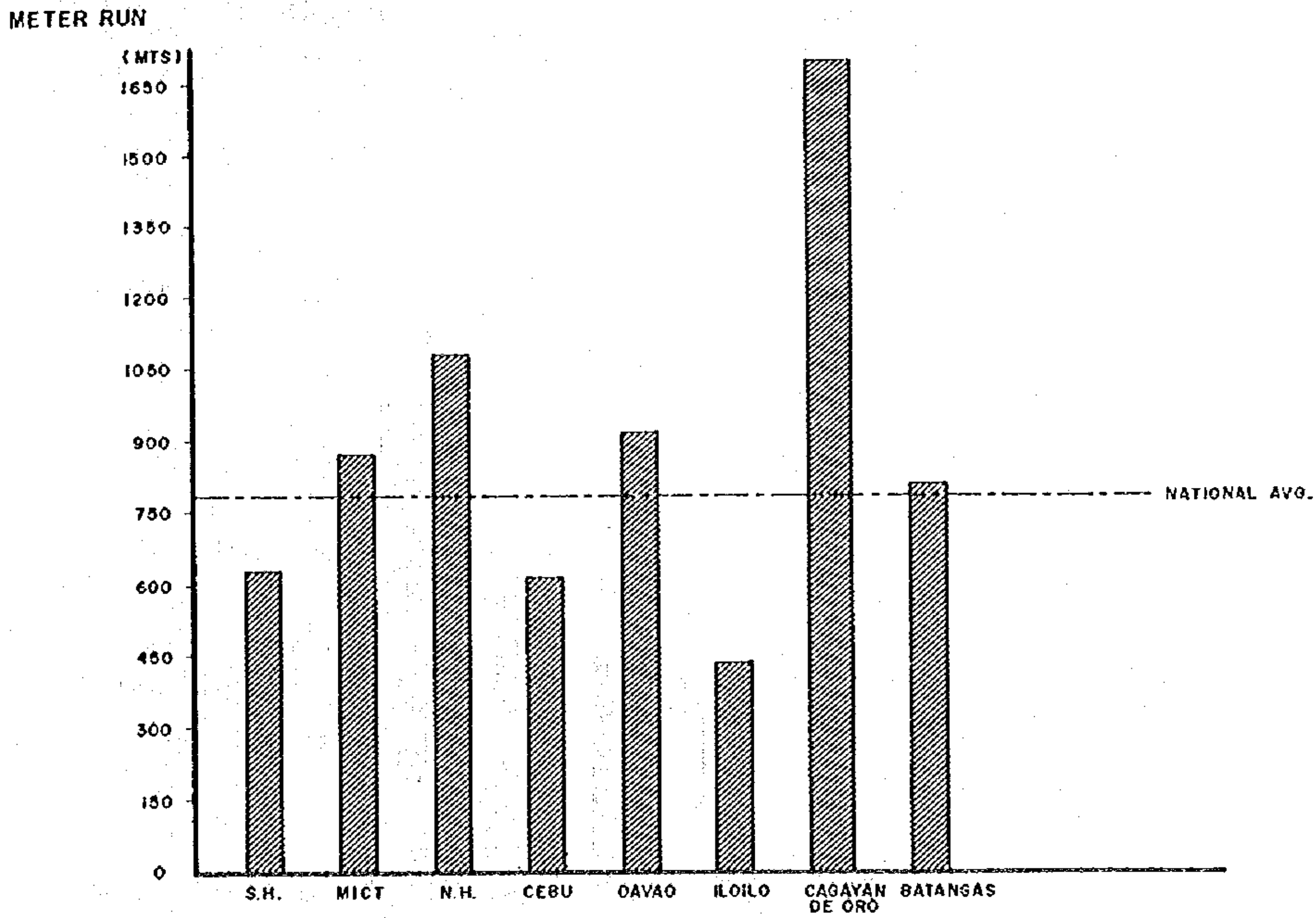
Table 5.1.6 Cause of Standby/Lost Time

Cause	July	Oct.	Avg.
1) Preparatory Work	38%	18%	30%
2) Standby Time	30%	50%	38%
Waiting for work setting	(6)	(21)	(12)
Waiting for arrival of vessel	(9)	(17)	(12)
Waiting for Cargo/Truck/equipment	(14)	(9)	(12)
Other standby time	(1)	(3)	(2)
3) Stoppage	27%	27%	27%
Due to rain	(25)	(24)	(25)
Equipment trouble/accident	(2)	(3)	(2)
4) Others	5%	6%	5%

Note: Estimated from Foreman's Reports



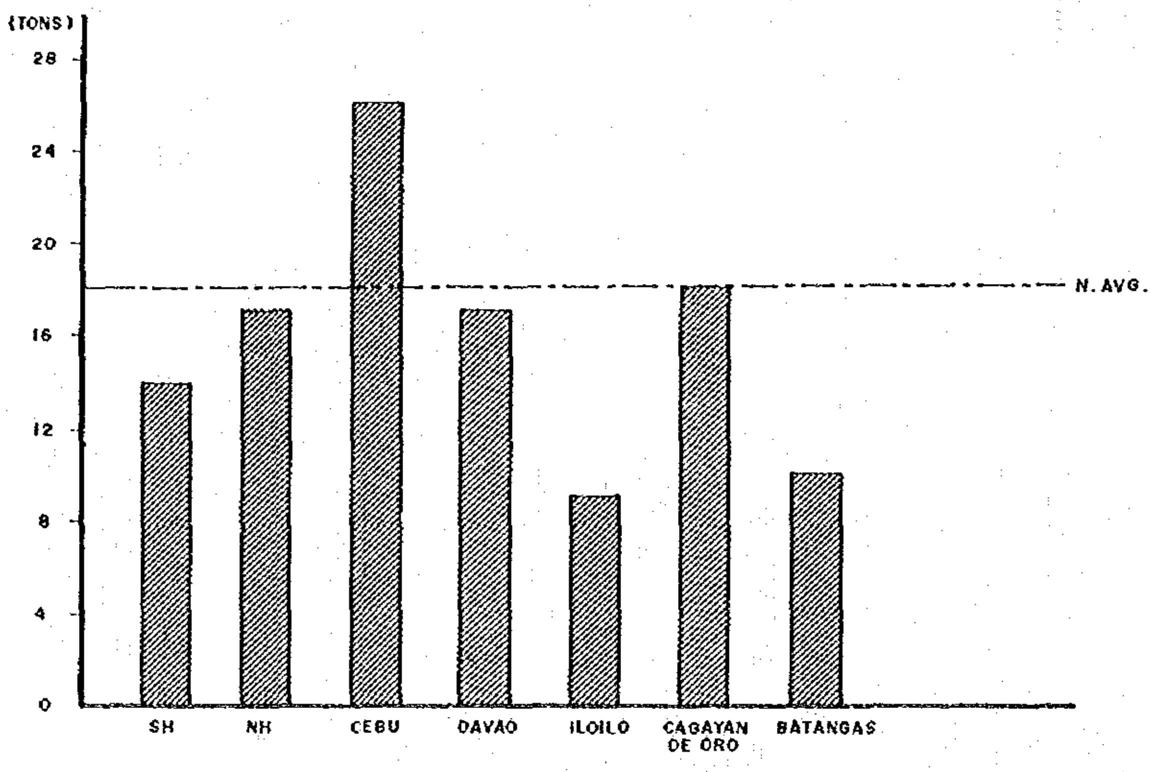
(1) RELATION BETWEEN BERTH OCCUPANCY AND WAITING TIME



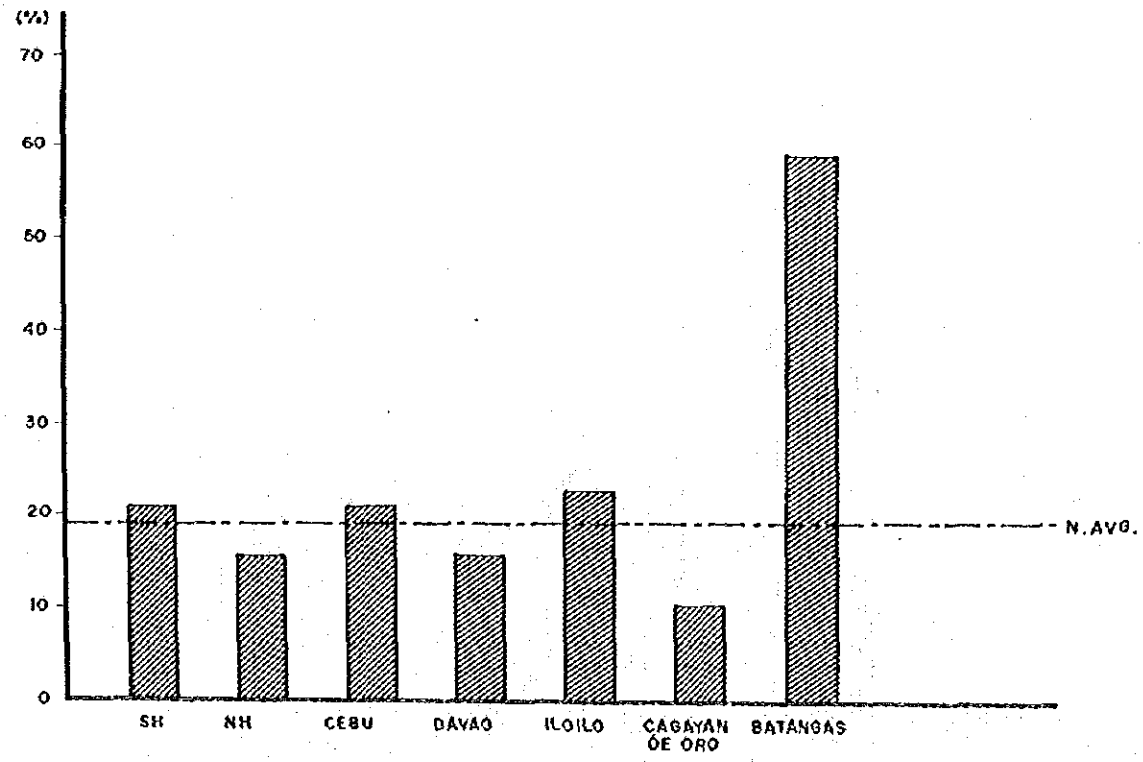
(2) CARGO THROUGHPUT PER METER RUN

Source : PPA STATISTICS

Fig. 5.1.1 Port Performance of Major Ports and National Average (1982-83)



(3) CARGO AVERAGE TONNAGE PER GANG HOUR



(4) IDLE TIME RATIO