Appendix 3.3.3 Results of Various Tests

Fig. A shows the places at which the in situ tests were carried out.

1. Cross-sectional Investigation

   a. Chipping Test

      The results of the chipping test for beams and slabs are tabulated in Tables A and B.

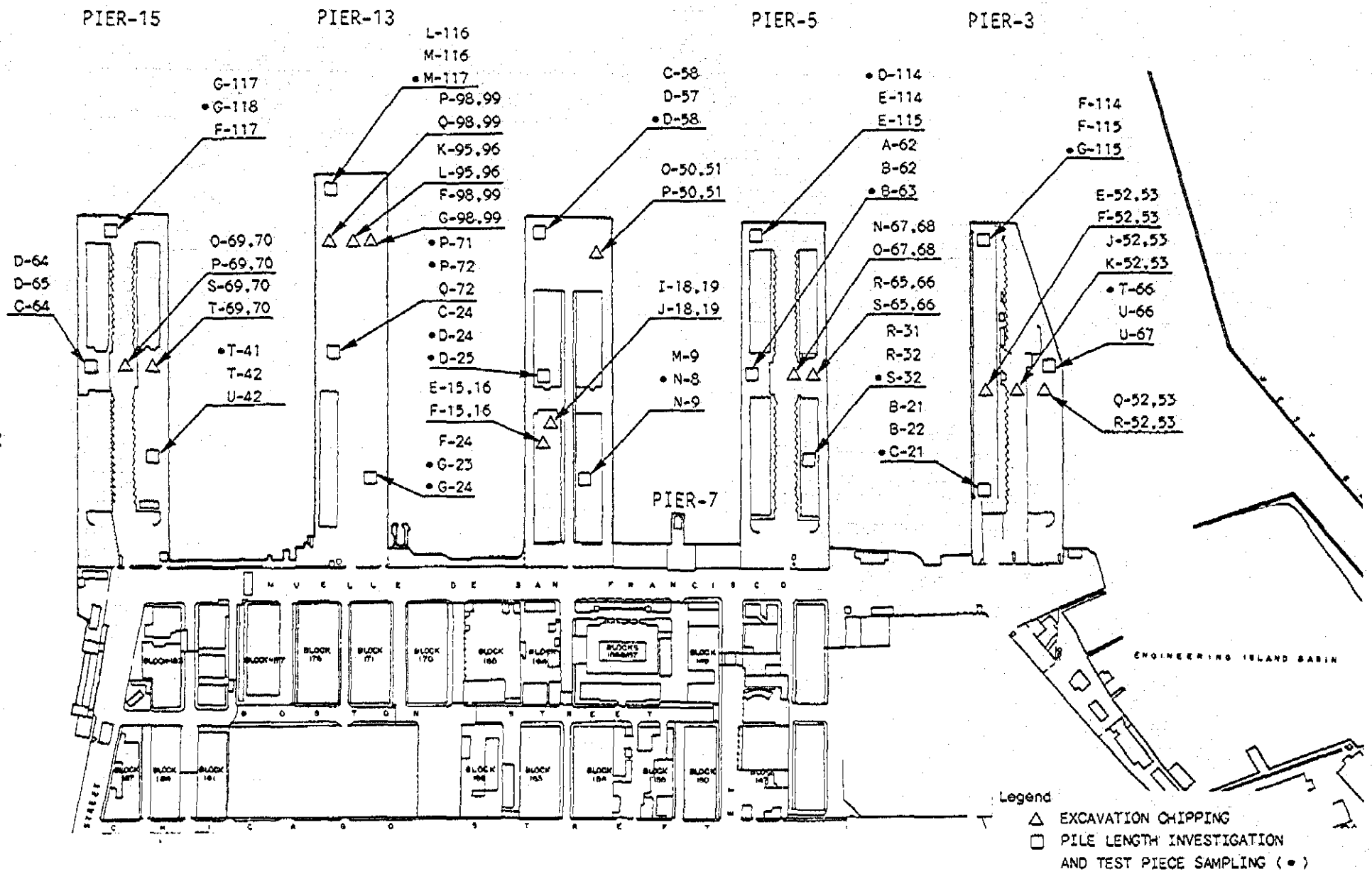
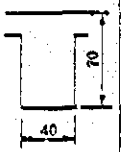
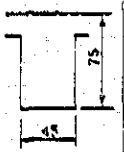
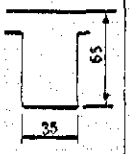
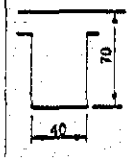
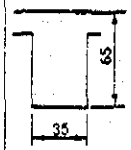
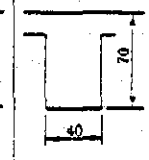
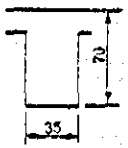
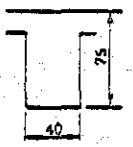
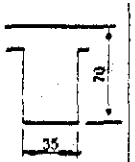
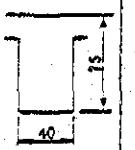


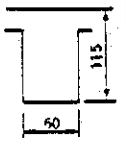
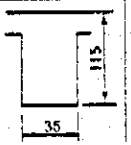
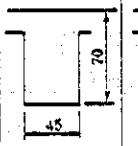
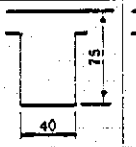
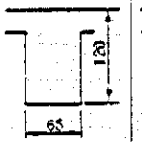
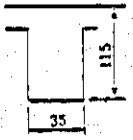
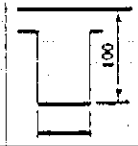
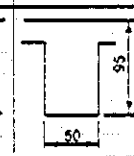
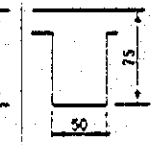
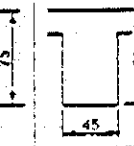
Fig. A Location Map of In-situ Inspection/Investigation

Table A-1 Beam List (1)

Item \ Pier No.			3						5			
Location			E-52,53 F-52,53		Q-52,53 R-52,53		J-52,53 K-52,53		R-65,66 S-65,66		N-67,68 O-67,68	
Beam No.			E	52	R	52	K	52	S	65	N	67
Dimensions of Section (cm)												
Sectional Area (cm^2)			2,800	3,375	2,275	2,800	2,275	2,800	2,450	3,000	2,450	3,000
Span (m) (face to face)			2.60	4.25	2.65	4.20	2.65	4.20	2.70	4.30	2.05	4.25
Main Reinforcements	Number of Reinforcements	Top	3	3	3	3	3	3	4	3	4	3
		Bottom	3	5	3	5	3	5	4	5	4	5
	Diameter (mm)	Top	2-#5 1-#7	2-#8 1-#9	2-#5 1-#8	2-#8 1-#9	2-#5 1-#7	2-#7 1-#9	4-#5	1-DS25 2-#8	4-#5	1-DS25 2-#8
		Bottom	3-#7	5-#9	3-#7	5-#9	3-#7	3-#9 2-#6	4-#5	1-DS25 4-#8	4-#5	1-DS25 4-#8
	Protective Covering (cm)	Top	5		8	8	6	6				
		Bottom	10	10	10	8	6	5	7.5	8.5	7.5	8
	Sectional Area (cm^2)	Top	7.87	16.65	9.10	16.65	7.87	14.19	8.00	16.45	8.00	16.45
		Bottom	11.61	32.25	11.61	32.25	11.61	25.03	8.00	26.65	8.00	26.65
	Steel Ratio (%)	Top	0.28	0.49	0.40	0.59	0.35	0.51	0.33	0.55	0.33	0.55
		Bottom	0.41	0.96	0.51	1.15	0.51	0.89	0.33	0.89	0.33	0.89
Stirrup (mm)			#3-@150	#3-@150	#3-@150	#3-@100-150	#3-@150	#3-@100-150	#3-@150	#3-@150	#3-@150	#3-@150

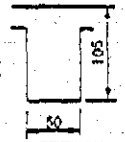
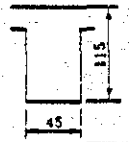
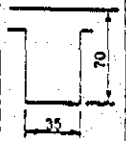
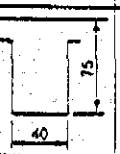
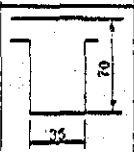
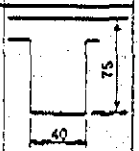
#...ASTM SIZE (Deformed Bar)
D...Deformed Bar (mm)
S...Square Bar (mm)
W...Screwed Bar (mm)
R...Round Bar (plane) (mm)

Table A-2 Beam List (2)

Item \ Pier No.			9				13					
Location			I-18,19 J-18,19		O-50,51 P-50,51		E-15,16 F-15,16		F-98,99 G-98,99		K-95,96 L-95,96	
Beam No.			J	18	0	51	E	15	F	98	R	96
Dimensions of Section (cm)												
Sectional Area (cm^2)			6,900	4,025	3,150	3,000	7,800	4,025	4,500	4,750	3,750	3,600
Span (m) (face to face)			3.45	5.45	2.60	4.25	3.45	3.95	2.80	5.45	2.70	4.90
Main Reinforcements	Number of Reinforcements	Top	6	3	4	3	5	3	2	4	7	4
		Bottom	5	3	6	3	5	3	3	5	12	4
	Diameter (mm)	Top	6-#11	3-#9	4-#5	2-#10 1-#11	5-#11	3-#9	2-S25	4-S25	7-S13	2-DW30 2-S25
		Bottom	5-#11	3-#8	6-#5	3-#8	5-#11	2-#9 1-#7	3-DW19	5-S25	12-S13	2-DW30 2-S25
	Protective Covering (cm)	Top										
		Bottom	14	13	7.5	7	12	11	11	8	10	7
	Sectional Area (cm^2)	Top	60.36	19.35	8.00	26.44	50.30	19.35	12.50	25.00	11.83	30.50
		Bottom	50.30	15.30	12.00	15.30	50.30	16.77	10.83	31.25	20.28	30.50
	Steel Ratio (%)	Top	0.87	0.48	0.25	0.88	0.64	0.48	0.28	0.53	0.32	0.85
		Bottom	0.73	0.38	0.38	0.51	0.64	0.42	0.24	0.66	0.54	0.85
Stirrup (mm)			#4-@300	#4-@300	#2-@150	#3-@150	#4-@300	#4-@300	#4-@350	#4-@200	S13-@150	#4-@150

#...ASTM SIZE (Deformed Bar)
D...Deformed Bar (mm)
S...Square Bar (mm)
W...Screwed Bar (mm)

Table A-3 Beam List (3)

Item \ P1 Pier No.			13		15			
Location			P-98,99 Q-98,99		S-69,70 T-69,70		O-69,70 P-69,70	
Beam No.			P	99	S	69	O	69
Dimensions of Section (cm)								
Sectional Area (cm^2)			5,250	5,175	2,450	3,000	2,450	3,000
Span (m) (face to face)			3.00	5.00	2.60	4.15	2.70	4.00
Main Reinforcements	Number of Reinforcements	Top	2	4	3	3	3	5
		Bottom	2	5	3	2	3	2
	Diameter (mm)	Top	2-S25	4-S25	2-#5 1-#8	1-#8 2-#10	2-#5 1-#8	1-DS25 4-#8
		Bottom	2-S25	5-S25	3-#8	2-S25	3-#8	2-DS25
	Protecting Covering (cm)	Top						
		Bottom	10	10	8	10	8	8
	Sectional Area (cm^2)	Top	12.50	25.00	9.10	21.48	9.10	26.65
		Bottom	12.50	31.25	15.30	12.50	15.30	12.50
	Steel Ratio (%)	Top	0.24	0.48	0.37	0.72	0.37	0.89
		Bottom	0.24	0.60	0.62	0.41	0.62	0.42
Stirrup (mm)			#4-@300	#5-@250	R9-@150	R9-@150	R9-@150	R9-@150

#...ASTM SIZE (Deformed Bar)
D...Deformed Bar (mm)
S...Square Bar (mm)
W...Screwed Bar (mm)
R...Round Bar (plane) (mm)

Table B-1 Slab List (1)

Item \ Pier No.					3			5		9	
Location					E-52,53 F-52,53	Q-52,53 R-52,53	J-52,53 K-52,53	R-65,66 S-65,66	N-67,68 O-67,68	E-15,16 F-15,26	I-18,19 J-18,19
Slab		Thickness (cm)			25	20	21 + AS (9)	23 + AS (2)	25	25	25
		Length and Width (cm)			425 x 262	422 x 265	420 x 265	423 x 268	423 x 203	397 x 345	543 x 345
Main Reinforcements	Center of Slab	Toward Off-Shore	Top	Reinforcement/Space(cm)	D15 at 20	D15 at 20	D15 at 20	D15 at 20	D15 at 20	D25 at 25	D21 at 25
				Area (cm^2)	8.84	8.84	8.84	8.84	8.84	19.63	13.85
				Steel Ratio (%)	0.4	0.4	0.4	0.4	0.4	0.8	0.6
			Bottom	Reinforcement/Space(cm)	D12,D15 at 10	D15 at 10	D15 at 10	D15 at 10	D15 at 10	D25 at 12.5	D21 at 12.5
				Area (cm^2)	14.49	17.67	17.67	17.67	17.67	39.26	27.70
				Steel Ratio (%)	0.6	0.9	0.8	0.8	0.7	1.5	1.1
		Transverse	Top	Reinforcement/Space(cm)	D12 at 25	D12 at 25	D12 at 25	D12 at 25	D12 at 25	D13 at 25	D13 at 25
				Area (cm^2)	4.52	4.52	4.52	4.52	4.52	5.31	5.31
				Steel Ratio (%)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			Bottom	Reinforcement/Space(cm)	D12 at 12.5	D12,D15 at 12.5	D12,D15 at 12.5	D12,D15 at 12.5	D12,D15 at 12.5	D13 at 12.5	D13 at 25
				Area (cm^2)	9.05	11.59	11.59	11.59	11.59	10.62	4.52
				Steel Ratio (%)	0.4	0.5	0.6	0.5	0.5	0.4	0.2
	End of Slab	Toward Off-shore	Top	Reinforcement/Space(cm)	D15 at 10	D15 at 10	D15 at 10	D15 at 10	D15 at 10	D25 at 12.5	D21 at 12.5
				Area (cm^2)	17.67	17.67	17.67	17.67	17.67	39.26	27.70
				Steel Ratio (%)	0.7	0.9	0.8	0.7	0.7	1.6	1.1
			Bottom	Reinforcement/Space(cm)	D12 at 20	D15 at 20	D15 at 20	D15 at 20	D15 at 20	D25 at 25	D21 at 12.5
				Area (cm^2)	5.66	8.84	8.84	8.84	8.84	19.63	27.7
				Steel Ratio (%)	0.2	0.4	0.4	0.4	0.4	0.8	1.1
		Transverse	Top	Reinforcement/Space(cm)	D12,D15 at 12.5	D12,D15 at 12.5	D12,D15 at 12.5	D11-D15 at 12.5	D11,D15 at 12.5	D13 at 12.5	D13 at 25
				Area (cm^2)	11.59	11.59	11.59	10.87	10.87	10.62	5.31
				Steel Ratio (%)	0.5	0.6	0.6	0.5	0.5	0.4	0.2
			Bottom	Reinforcement/Space(cm)	D12 at 25	D12 at 25	D12 at 25	D12 at 25	D12 at 25	D13 at 25	D13 at 25
				Area (cm^2)	4.52	4.52	4.52	4.52	4.52	5.31	5.31
				Steel Ratio (%)	0.2	0.2	0.2	0.2	0.2	0.2	0.2

D...Deformed Bar (mm)
AS..Asphalt

Table B-2 Slab List (2)

Item \ Pier No.					9	13			15	
Location					0-50,51 P-50,51	F-98,99 G-98,99	K-95,96 L-95,96	P-98,99 Q-98,99	S-69,70 T-69,70	Q-69,70 P-69,70
Slab		Thickness (cm)			25	$35 + \frac{AS}{8}$	$25 + \frac{AS}{4}$	$35 + \frac{AS}{10}$	25	25
		Length and Width (cm)			425 x 260	460 x 282	491 x 269	500 x 300	415 x 262	400 x 268
Main Reinforcements	Center of Slab	Toward Offshore	Top	Reinforcement/Space(cm)	R16 at 20	D15 at 15	DS19 at 30	D15 at 15	D13 at 30	D13 at 12
				Area (cm^2)	10.06	11.78	12.03	11.78	6.63	11.06
				Steel Ratio (%)	0.4	0.3	0.5	0.3	0.3	0.4
			Bottom	Reinforcement/Space(cm)	R 16 at 10	D15 at 7.5	DS19 at 15	D15 at 7.5	D16 at 10	D13 at 24
				Area (cm^2)	20.11	23.56	24.06	23.56	20.11	5.53
				Steel Ratio (%)	0.8	0.7	0.9	0.9	0.8	0.2
		Transverse	Top	Reinforcement/Space(cm)	D12 at 20	D13 at 25	DS10 at 45	D12 at 30	D13 at 20	D13 at 12
				Area (cm^2)	5.65	5.31	2.22	3.77	6.64	11.06
				Steel Ratio (%)	0.2	0.2	0.1	0.1	0.3	0.4
			Bottom	Reinforcement/Space(cm)	D12-R16 at 10	D12 at 12.5	DS10 at 45	D12 at 45	D16 at 10	D13 at 24
				Area (cm^2)	15.71	9.05	2.22	2.51	20.11	5.53
				Steel Ratio (%)	0.6	0.3	0.1	0.1	0.8	0.2
	End of Slab	Toward Offshore	Top	Reinforcement/Space(cm)	R16 at 10	D15 at 7.5	DS19 at 15	D15 at 7.5	D16 at 10	D15 at 12
				Area (cm^2)	20.11	23.56	24.07	13.33	20.11	14.73
				Steel Ratio (%)	0.8	0.7	0.9	0.4	0.8	0.6
			Bottom	Reinforcement/Space(cm)	R16 at 20	D15 at 15	DS19 at 30	D15 at 15	D16 at 20	D13 at 25
				Area (cm^2)	10.06	11.78	12.03	11.78	10.06	5.31
				Steel Ratio (%)	0.4	0.3	0.5	0.3	0.4	0.2
		Transverse	Top	Reinforcement/Space(cm)	D12 at 10	D13,D12 at 12.5	DS10 at 45	D12 at 30	D13 at 10	D13 at 10
				Area (cm^2)	11.31	9.83	2.22	2.84	13.27	13.27
				Steel Ratio (%)	0.5	0.3	0.1	0.1	0.5	0.5
			Bottom	Reinforcement/Space(cm)	D12 at 20	D12 at 25	DS10 at 45	D12 at 45	D16 at 20	D13 at 25
				Area (cm^2)	5.65	4.52	2.22	2.51	10.06	5.31
				Steel Ratio (%)	0.2	0.1	0.1	0.1	0.4	0.2

D...Deformed Bar (mm)
S...Square Bar (mm)
As..Asphalt

b. Reinforcement probing

Reinforcement probing was carried out using a pachometer (metal detector) for the purpose of checking the re-bar arrangement in other slabs except for the sections where the chipping tests were excuted.

Table C shows almost the same re-bar spacing as found in the chipping test except for a large difference in reinforcement perpendicular to the axis of Pier 13.

Table C Results of Pachometer Survey

(Unit: centimeters)

Pier No.	Pier Axis				Perpendicular to Pier Axis			
	Pachometer survey		Chipping test		Pachometer survey		Chipping test	
3	19 19 18 20	19	26 28 22 20	24	20 20 20	20	21 26 24 27	25	23 27 17 22	22	25 25 25	25
5	16 22 21 24	21	29 23 32 27	28	20 20	20	22 24 25 24	24	23 24 26 32	26	25 25	25
9	21 23 21 21	22	22 23 28 24	24	25 20 25	23	22 26 20 26	24	22 21 32 29	26	25 20 25	23
13	25 18 26 20	22	25 30 25 30	28	15 30 15	20	22 23 21 19	21	24 22 20 19	21	25 45 30	33
15	26 25 22 24	24	19 20 21 18	20	20 24	22	19 18 18 23	20	21 20 16 22	20	20 25	23

2. Pile Length Investigation

The sonic pile test is a nondestructive test based on wave theory. Signals caused by an impact applied to the pile head go and return through the pile while being affected by the ground base or a discontinuous plane of the pile and are measured by a transducer installed at the pile head. Table D compares the in situ measurements (average values) with boring survey results.

The table shows piles except for those at Pier 9 and part of Pier 13 have almost reached the bearing strata or its vicinity, raising no particular problems. The estimation of pile length for g and h at Pier 9 and f at Pier 13 is not necessarily reliable as it is only based on the signals.

Considering the result of the soil boring, figures in the parentheses probably refer to the actual pile lengths.

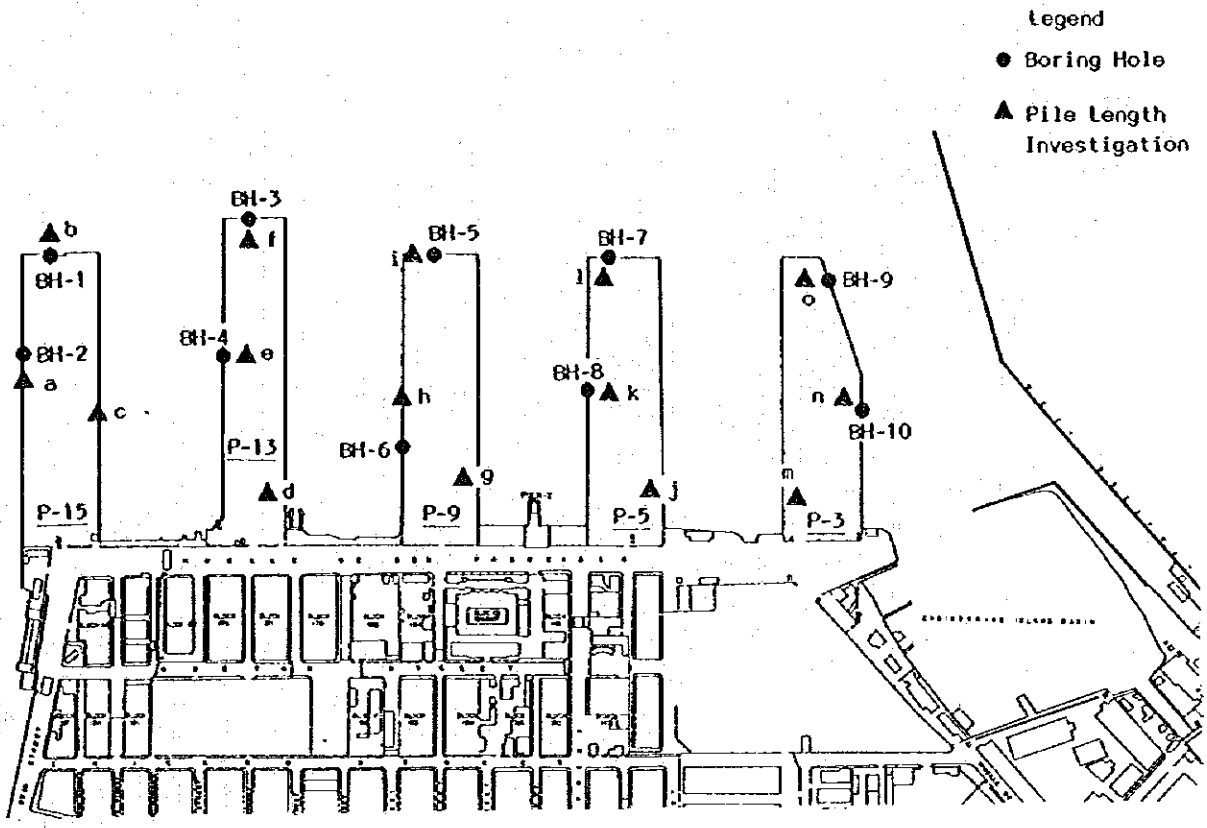
Locations where the pile length investigation and the soil boring were carried out are shown in Fig. B and the results of the pile length investigation are presented in Table E.

Table D Results of Pile Length Probing

(Unit: meters)

Pier No.	Average value of length for three piles		Nearest Bore Hole	
			No.	Depth of Bearing Stratum
3	m	24.2	10	25
	n	26.8	10	25
	o	18.6	9	20 - 25
5	j	46.2	8	44
	k	43.1	8	44
	l	36.7	7	39
9	g	7.0 (19.8)	6	24
	h	6.5 (20.9)	6	24
	i	16.1	5	21
13	d	23.7	4	17
	e	18.9	4	17
	f	3.7 (37.7)	3	43
15	a	27.4	2	26
	b	30.4	1	38
	c	28.3	2	26

Figures in parentheses are alternative values.



PIER-15		PIER-13		PIER-9				PIER-5		PIER-3	
a	D-65	d	G-24	g	N-8	i	C-58	j	R-31	m	B-21
	D-64		G-23		N-9		D-58		R-32		B-22
	C-64		F-24		M-9		D-57		S-32		C-21
b	G-118	e	P-71	h	D-25			k	A-62	n	T-66
	G-117		P-72		D-24				B-62		U-66
	F-117		Q-72		C-24				B-63		U-67
c	T-41	f	M-117					l	D-114	o	F-114
	T-42		M-116						E-114		F-115
	U-42		L-116						E-115		G-115

Fig. 8 Location of Pile Length Investigation and Bore Holes

Table E-1 Pile Length Investigation

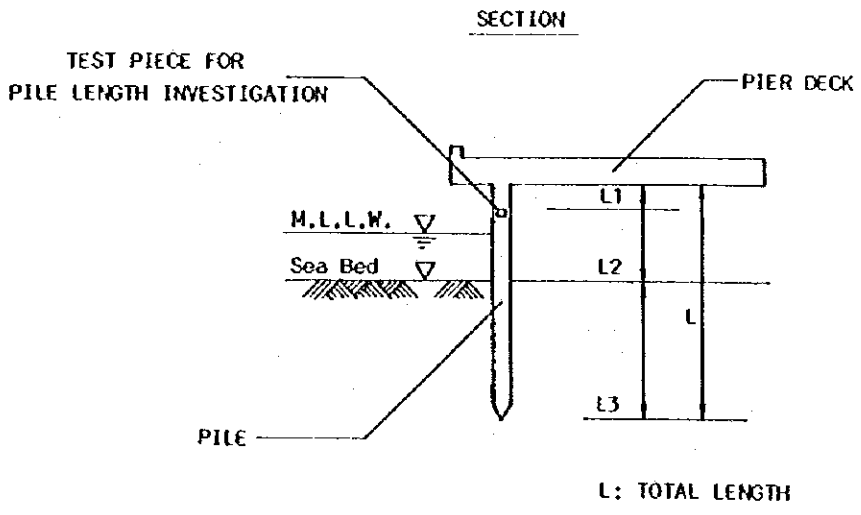
(Unit: m)

Pier No.		Pile No.	L_1	L_2	L_3	Total Length
3	m	B - 21	2.2	3.4	22.2	27.8
		B - 22	2.2	3.4	23.8	29.4
		C - 21	1.9	3.0	26.6	31.5
	n	T - 66	2.0	4.5	24.3	30.8
		U - 66	1.9	4.4	26.0	32.3
		U - 67	1.9	4.5	30.0	36.4
	o	F - 114	1.9	7.9	16.9	26.7
		F - 115	2.1	7.9	17.8	27.8
		G - 115	2.1	7.8	21.1	31.0
5	j	R - 31	2.1	4.5	48.3	54.9
		R - 32	1.9	5.7	43.9	51.5
		S - 32	2.0	5.7	46.3	54.0
	k	A - 62	2.1	8.1	41.5	51.7
		B - 62	2.1	7.0	45.0	54.1
		B - 63	2.1	6.8	42.8	51.7
	l	D - 114	1.9	6.9	39.5	48.3
		E - 114	1.9	6.7	39.7	48.3
		E - 115	2.0	6.7	30.9	39.6
9	g	M - 9	3.2	4.7	8.1(26.5)	16.0(34.4)
		N - 8	3.2	4.4	6.0(15.6)	13.6(23.2)
		N - 9	3.4	4.3	6.9(17.3)	14.6(25.0)
	h	C - 24	1.8	6.6	7.0(20.6)	15.4(29.0)
		D - 24	1.9	6.5	6.3(21.5)	14.7(29.9)
		D - 25	1.8	6.6	6.3(20.7)	14.7(29.1)
	i	C - 58	2.0	7.8	14.2	24.0
		D - 57	2.0	7.7	14.7	24.4
		D - 58	2.0	7.7	19.5	29.2

Table E-2 Pile Length Investigation

(Unit: m)

Pier No.		Pile No.	L_1	L_2	L_3	Total Length
13	d	F - 24	1.7	3.7	22.7	28.1
		G - 23	1.5	3.9	24.2	29.6
		G - 24	1.7	3.8	24.2	29.7
	e	P - 71	1.9	4.7	19.3	25.9
		P - 72	2.2	5.0	19.0	26.2
		Q - 72	1.8	4.8	18.5	25.1
	f	L - 116	1.7	5.1	4.5(40.5)	11.3(47.3)
		M - 116	1.7	5.2	2.8(38.0)	9.7(44.9)
		M - 117	1.7	5.3	3.9(34.7)	10.9(41.7)
15	a	C - 64	1.2	6.2	27.4	34.8
		D - 64	1.7	5.8	26.2	33.7
		D - 65	1.7	5.7	28.7	36.1
	b	F - 117	1.8	8.1	32.0	41.9
		G - 117	1.8	8.0	27.2	37.0
		G - 118	1.7	8.2	31.9	41.8
	c	T - 41	1.7	6.3	28.2	36.2
		T - 42	1.7	6.3	31.3	39.3
		U - 42	1.6	6.8	25.3	33.7



3. Concrete Compressive Strength Test

a. Compression Test

Table F shows the average values of the concrete compression test. These values are obtained from the test results of slabs and piles shown in Table G and H and Figs. C, D and E.

As seen from the tables, the highest compressive strength for pile core samples was 400 kgf/cm^2 at Pier 5 and the lowest 160 kgf/cm^2 at Pier 15, while for slabs 328 kgf/cm^2 at Pier 15 and Pier 5 were the highest and 185 kgf/cm^2 at Pier 5 and Pier 13 were the lowest. In both cases, there are considerable variations in concrete compressive strength. Such variations are also large in the same pier from place to place, particularly in the case of slabs.

Pier by pier comparison between slabs and piles shows 50 - 140 kgf/cm^2 larger values for pile concrete.

Each pier, however, satisfies σck = 210 kgf/cm^2, the standard strength for designing reinforced concrete structures stipulated by "Concrete Design Manual", a Japanese standard, apparently raising no problems in concrete strength.

Table F Average Value of Concrete Compressive Strength

(Unit: Kgf/cm^2)

Pier No. / Classification	3	5	9	13	15	Average
Slabs	231	239	270	235	239	241
Piles	294	379	284	320	244	311

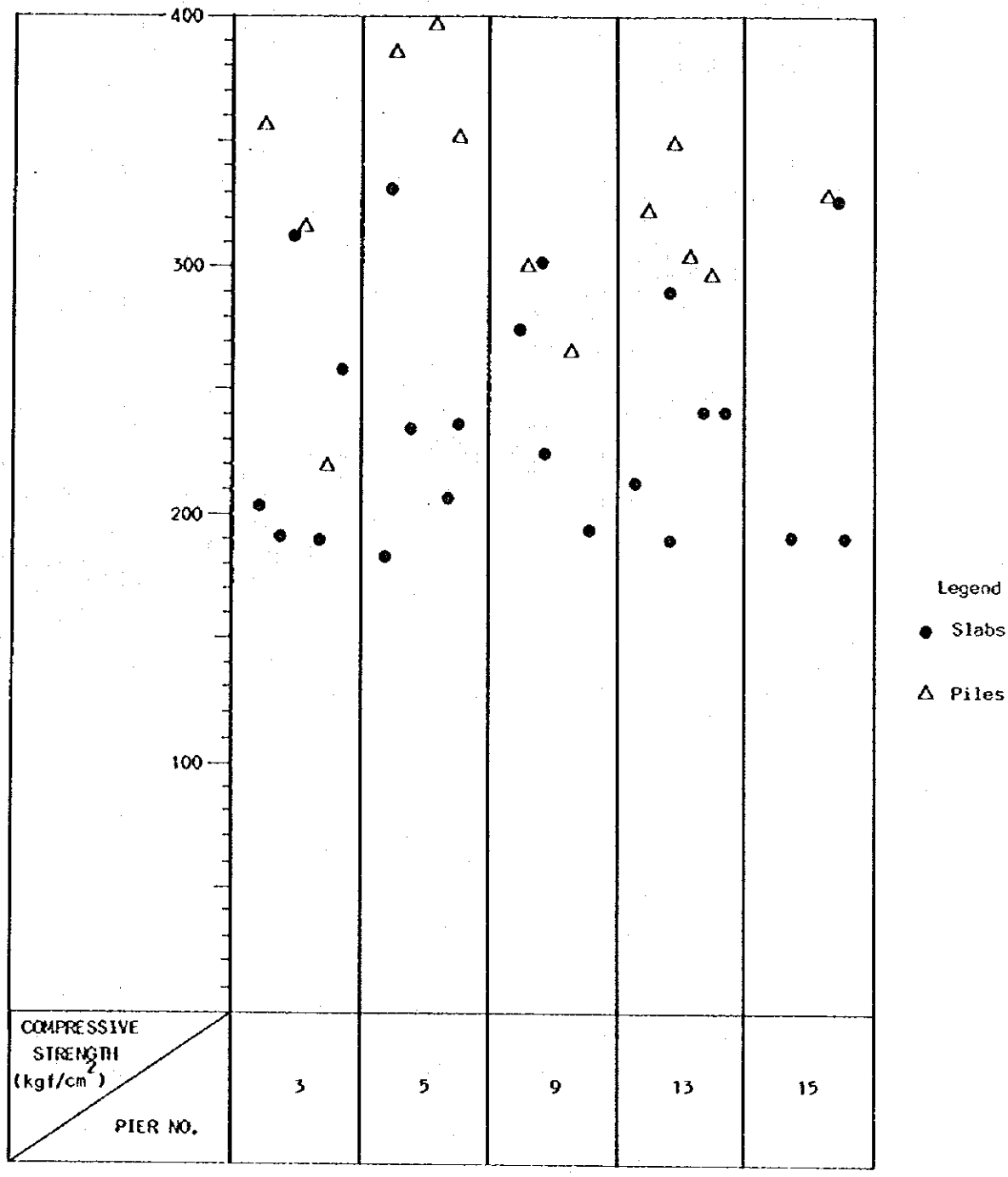


Fig.C Summary of the Concrete Compressive Strength

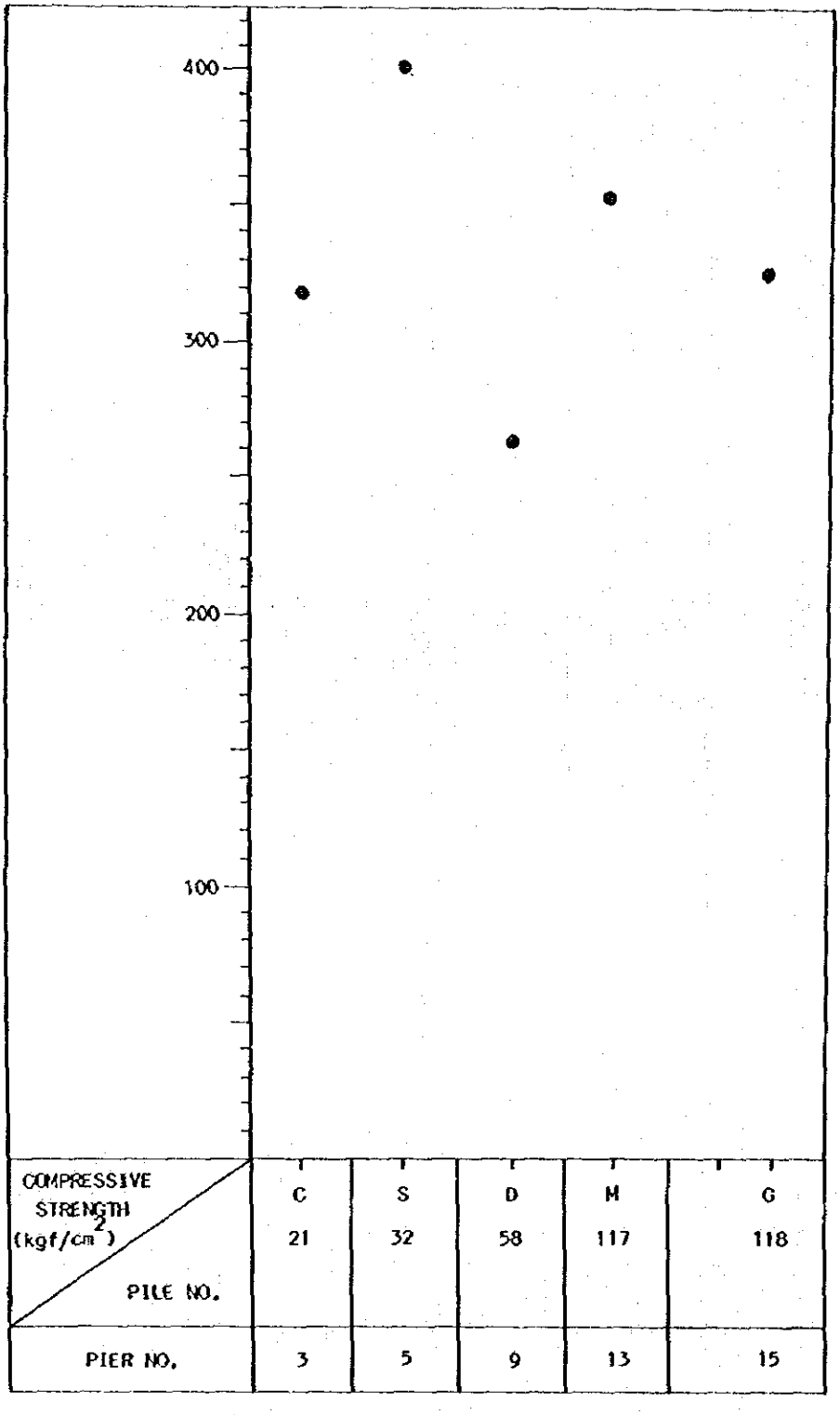


Fig. D-1 Results of Compression Test for Pile Concrete Samples (in Japan)

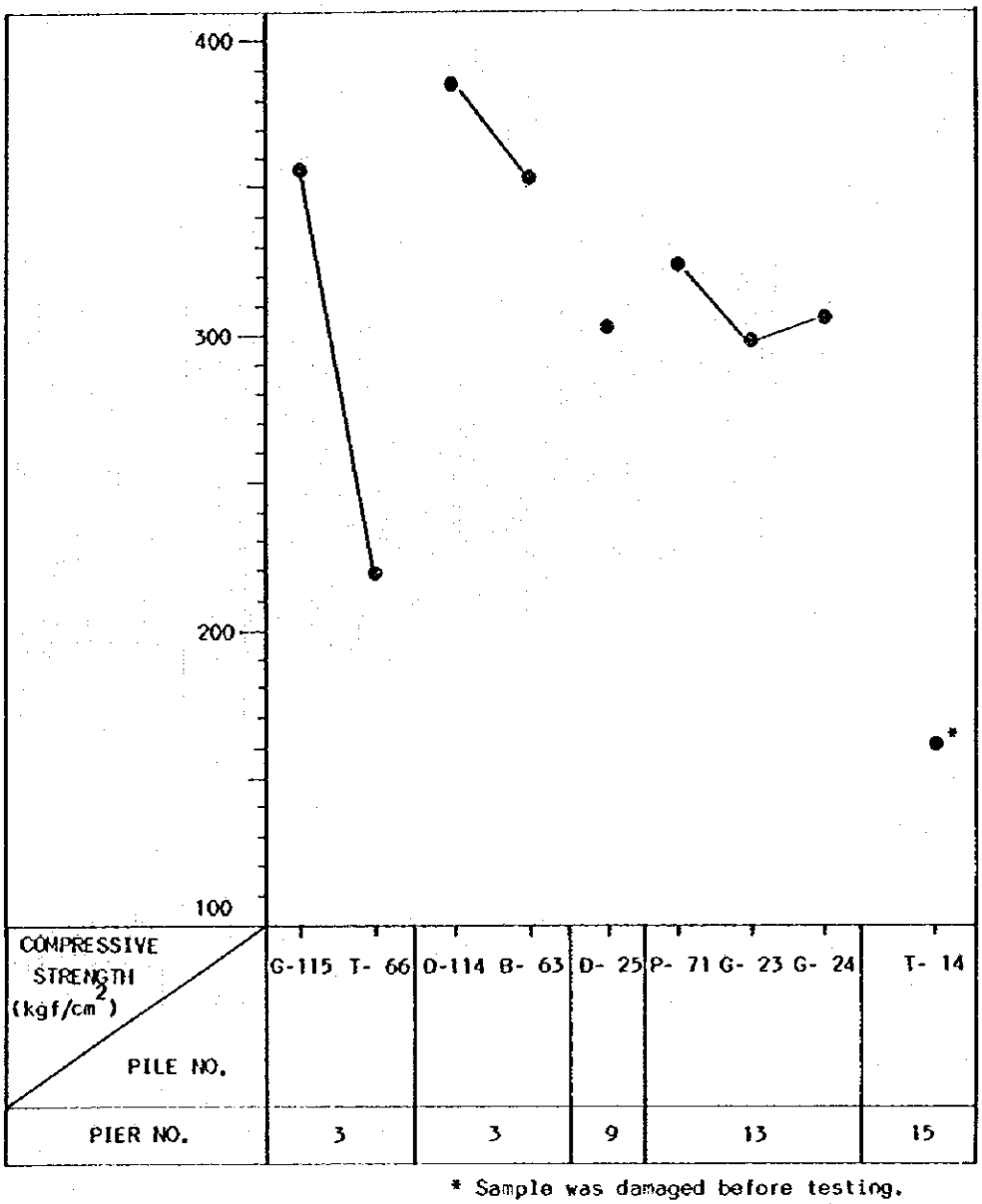
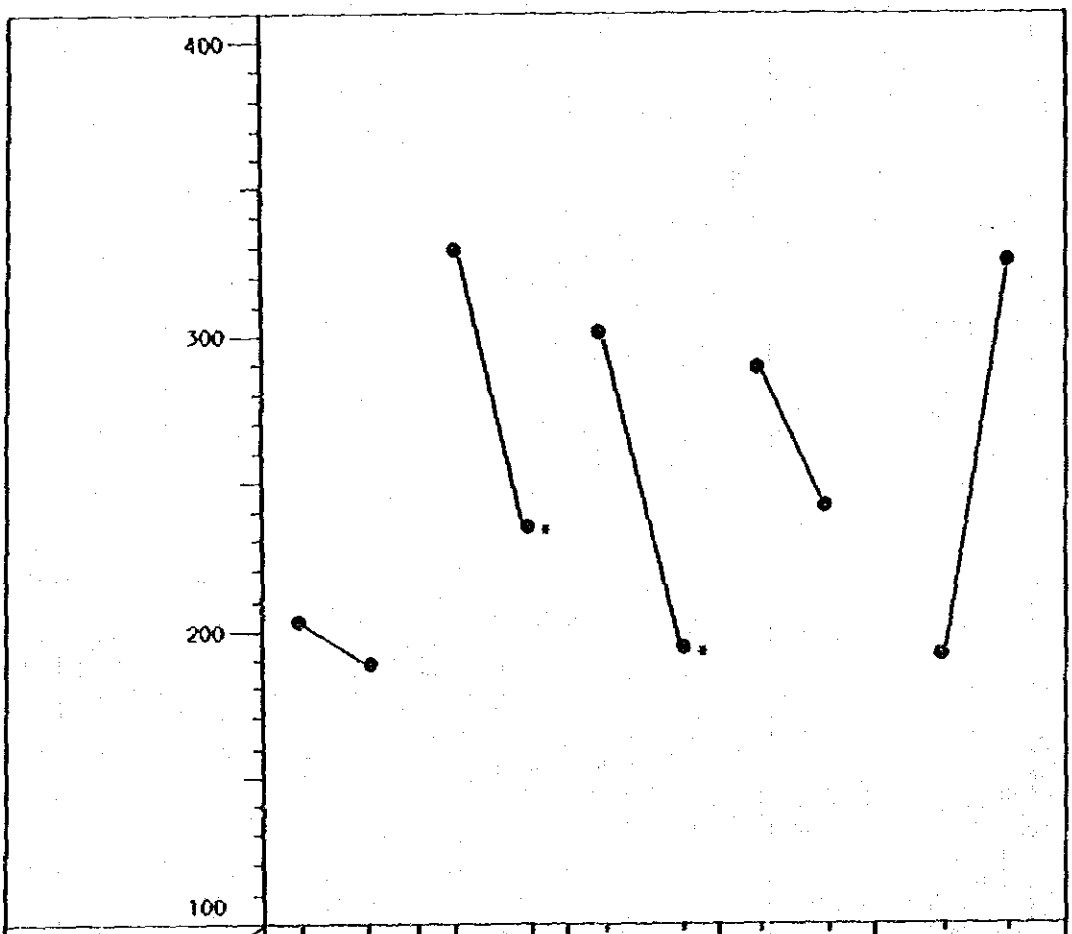


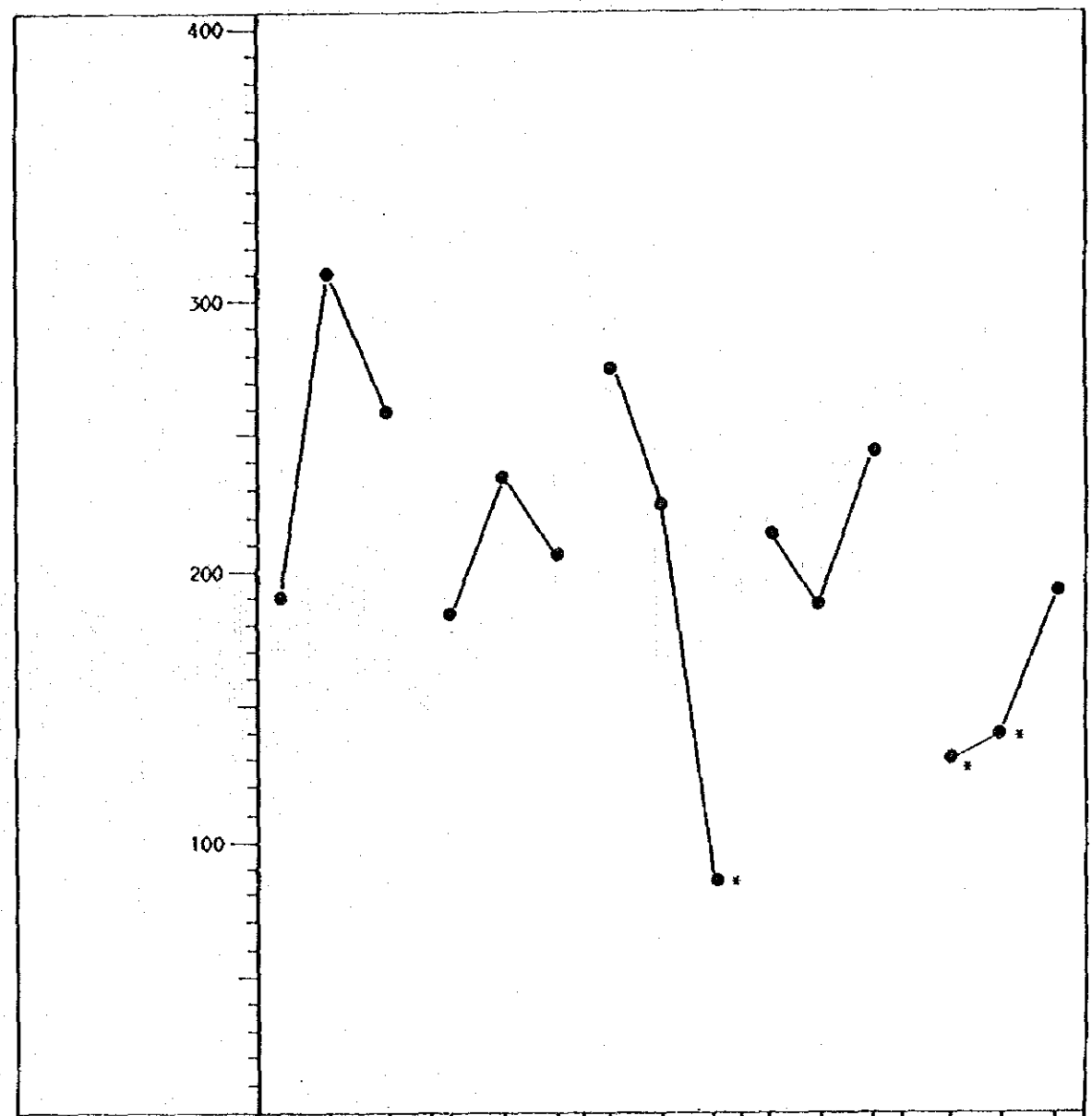
Fig. D-2 Results of Compression Test for Pile concrete Samples (by UP)



COMPRESSIVE STRENGTH (kgf/cm^2) / PILE NO.	E,F	Q,R	Q,R	N,O	J,K	O,P	F,G	P,Q	O,P	S,T
	52	52	65	67	18	50	98	98	69	69
	53	53	66	68	19	51	99	99	70	70
PIER NO.	3		5		9		13		15	

* Sample was damaged before testing.

Fig. E-1 Results of Compression Test for Slab Concrete Samples (in Japan)



COMPRESSIVE STRENGTH (kgf/cm^2) / PILE NO.															
	Q,R	J,K	E,F	M,N	C,O	T,U	J,K	I,J	D,E	K,L	F,G	K,L	N,O	O,E	S,T
	14	52	110	15	112	112	6	29	40	14	22	95	12	114	116
	15	53	111	16	113	113	7	30	51	15	23	96	13	115	117
PIER NO.	3			5			9			13			15		

* Sample was damaged before testing.

Fig. E-2 Results of Compression Test for Slab Concrete Samples (by UP)

Table G-1 Results of Compression Test for Pile Concrete Samples

(IN JAPAN)

Pier No. / Item / Location	Diameter (D) X Length (H) (cm)	Maximum Load (tf)	Compressive Strength (kgf/cm2)	H/D	Coefficient of Correction	Corrected Compressive Strength (kgf/cm2)	Existence of Rein-forcement	Full Length (cm)
3 C-21	9.9 X 12.84	26.00	338	1.30	0.94	316	none	23.3
5 S-32	9.9 X 15.22	32.30	416	1.53	0.96	400	none	24.7
9 D-58	10.0 X 16.68	21.10	271	1.67	0.97	264	none	26.2
13 M-117	10.0 X 10.98	30.20	388	1.10	0.91	352	none	20.5
15 G-118	9.9 X 17.89	25.70	332	1.80	0.98	327	none	25.1

Table C-2 Results of Compression Test for Pile Concrete Samples

(By-UP)

Pier No.	Location	Diameter(D) x Length(H) (cm)	Maximum Load (tf)	Compressive Strength (kgf/cm2)	H/D	Coefficient of Correction	Corrected Compressive Strength (kgf/cm2)	Existence of Reinforcement	Full Length (cm)
3	G-115	10.0 x 18.42	27.53	350.5	1.842	0.987	345.9	Exist	19.05
	T-66	10.0 x 20.32	17.33	220.7	2.032	1.00	220.7	None	21.75
5	D-114	10.0 x 20.32	30.14	383.8	2.032	1.00	383.8	None	20.88
	B-63	10.0 x 16.19	28.55	363.5	1.619	0.970	352.6	None	16.83
9	D-25	10.0 x 20.32	23.79	303.0	2.032	1.00	303.0	Exist	20.88
13	P-71	10.0 x 13.99	26.75	340.6	1.399	0.947	322.5	None	14.21
	G-23	10.0 x 18.10	23.79	303.0	1.810	0.985	298.5	None	18.49
	G-24	10.0 x 19.68	24.02	305.8	1.968	0.997	304.9	Exist	20.40
15	T-14*	10.0 x 22.50	12.58	160.3	2.250	1.00	160.3	None	23.01

* Sample was damaged before testing.

Table H-1 Results of Compression Test for Slab Concrete Samples

(IN JAPAN)

Pier No. / Item: Location	Diameter (D) X Length (H) (cm)	Maximum Load (tf)	Compressive Strength (kgf/cm2)	H/D	Coefficient of Correction	Corrected Compressive Strength (kgf/cm2)	Existence of Reinforcement	Full Length (cm)
3	E,F-52,53	9.9 X 20.44	15.70	203	2.06	1.00	203	2 nos.	24.8
	Q,R-52,53	10.0 X 16.31	15.20	195	1.64	0.97	189	1 no.	21.0
5	Q,R-65,66	10.0 X 14.55	26.65	342	1.46	0.96	328	2 nos.	21.7
	N,O-67,68*	10.0 X 16.94	18.70	240	1.70	0.98	235	5 nos.	23.4
9	J,K-18,19	10.0 X 17.05	24.25	309	1.71	0.98	303	3 nos.	22.4
	O,P-50,51*	10.0 X 16.09	15.80	202	1.61	0.97	196	3 nos.	20.6
13	F,G-98,99	10.0 X 13.54	24.15	310	1.36	0.94	291	1 no.	22.6
	P,Q-98,99	10.0 X 16.21	19.60	252	1.63	0.97	244	3 nos.	23.3
15	O,P-69,70	10.0 X 17.20	15.40	198	1.73	0.98	194	1 no.	21.4
	S,T-69,70	10.0 X 16.12	26.30	338	1.62	0.97	328	2 nos.	20.3

* Sample was damaged before testing.

Table H-2 Results of Compression Test for Slab Concrete Samples

(by UP)

Pier No.	Location \ Item	Diameter (D) x Length (H) (cm)	Maximum Load (tf)	Compressive Strength (kgf/cm2)	H/D	Coefficient of Correction	Corrected Compressive Strength (kgf/cm2)	Existence of Reinforcement	Full Length (cm)
3	Q,R-14,15	10.0 x 20.32	15.19	193.4	2.032	1.00	193.4	None	21.11
	J,K-52,53	10.0 x 21.11	24.49	311.8	2.111	1.00	311.8	None	21.75
	E,F-110, 111	10.0 x 17.62	20.73	264.0	1.762	0.981	259.0	None	18.42
5	M,N-15,16	10.0 x 20.80	14.50	184.6	2.080	1.00	184.6	None	21.75
	C,D-112,113	10.0 x 20.48	18.36	233.8	2.048	1.00	233.8	None	21.27
	T,U-112,113	10.0 x 17.94	16.54	210.6	1.794	0.984	207.2	None	18.89
9	J,K-6,7	10.0 x 22.86	21.76	277.0	2.286	1.00	277.0	None	23.65
	I,J-29,30	10.0 x 17.46	18.36	233.8	1.746	0.980	229.1	None	18.10
	D,E-50,51*	10.0 x 16.99	6.90	87.9	1.699	0.976	85.8	None	17.62
13	K,L-14,15	10.0 x 20.48	16.76	213.4	2.048	1.00	213.4	None	20.96
	F,G-22,23	10.0 x 22.07	14.50	184.6	2.207	1.00	184.6	None	23.02
	K,L-95,96	10.0 x 19.05	19.16	244.0	1.905	0.992	242.0	None	21.11
15	N,O-12,13*	10.0 x 21.59	10.30	131.1	2.159	1.00	131.1	None	22.23
	D,E-114,115*	10.0 x 18.73	11.32	144.1	1.873	0.990	142.7	None	19.21
	S,T-116,117	10.0 x 16.83	15.62	199.0	1.683	0.975	194.0	None	17.46

* Sample was damaged before testing.

b. Schmidt Hammer Test

1) Fig. F summarizes the results of the Schmidt Hammer Test. The test results for slabs, beams and piles are also presented in Figs. F and G and Table J.

2) The compressive strength F was estimated from the standard hardness RO using the following formula:

$$\sigma ck = -184 + 13 \times RO \ (kgf/cm^2),$$

where the standard hardness RO was calculated by adding a compensation value ΔR to the repulsive hardness R (average value in twenty places) in accordance with:

$$RO = R + \Delta R$$

and the value for aged dry concrete was further adjusted by using the following equation:

$$Fn = \alpha n \times F$$

where Fn : Estimated strength of material n days old

αn : Adjusted value from material age test (constant 0.63 for all materials more than 3,000 days old)

3) Table I shows the average values for piles, slabs and beams at each pier from the Schmidt Hammer Test.

The Schmidt Hammer Test showed about 10% higher values for slabs than those obtained from the concrete compression test which is discussed later.

On the other hand, the values for piles obtained from the Schmidt Hammer test were uniformly about 55% lower than those obtained by the compression tests. This may be attributable to the numerous air cavities in the concrete surface after monotube steel plates are removed preventing proper hardness measurement.

According to the test results, the value increases from piles to beams to slabs.

Table I Average Value of Compressive Strength Measured by Schmidt Hammer Test

(Unit: Kgf/cm^2)

Pier No. / Classification	3	5	9	13	15	Average
Slabs	266	265	273	262	252	265
Beams	259	279	250	243	189	246
Piles	171					

In terms of Fn (0.63 x F)

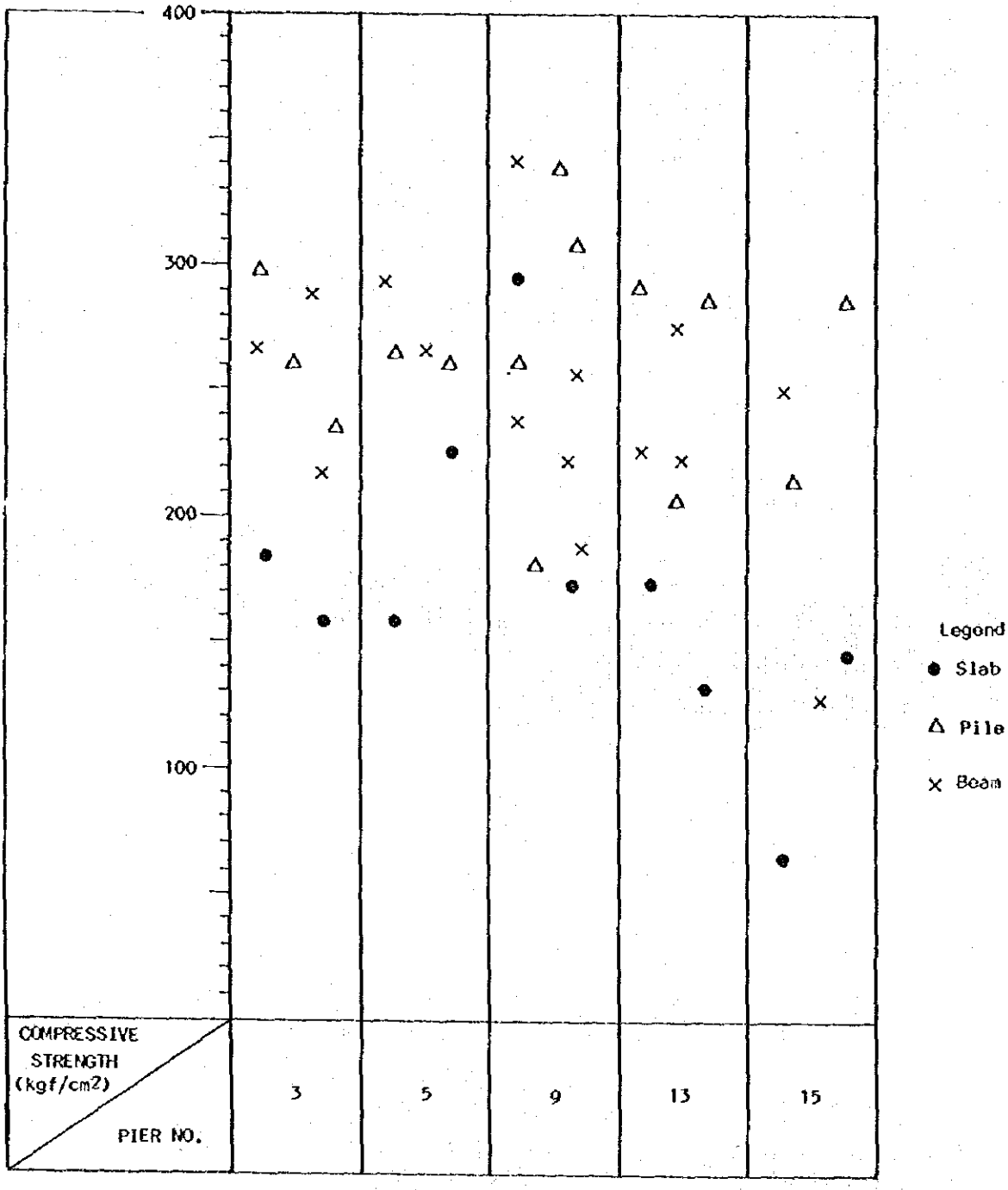
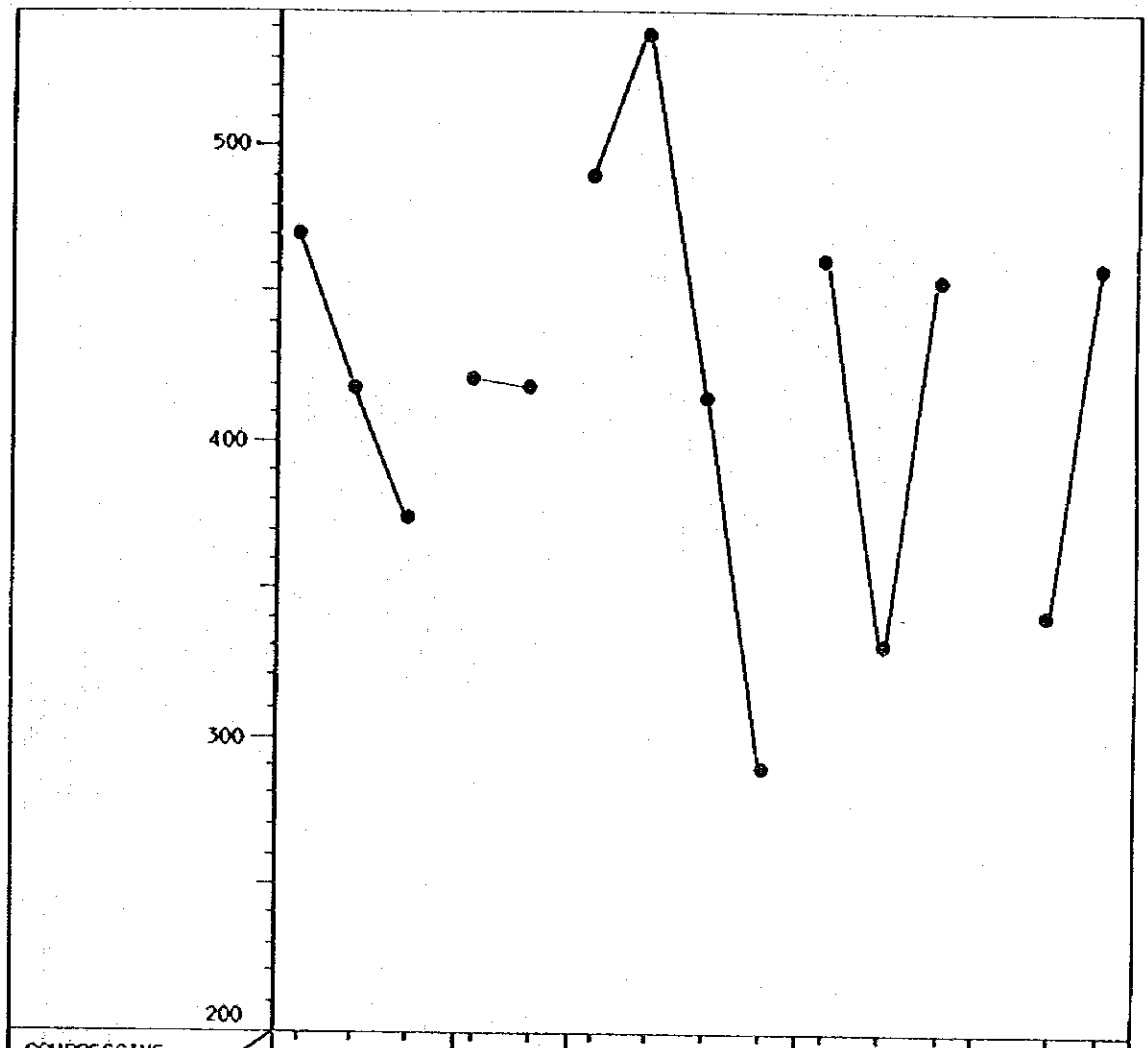
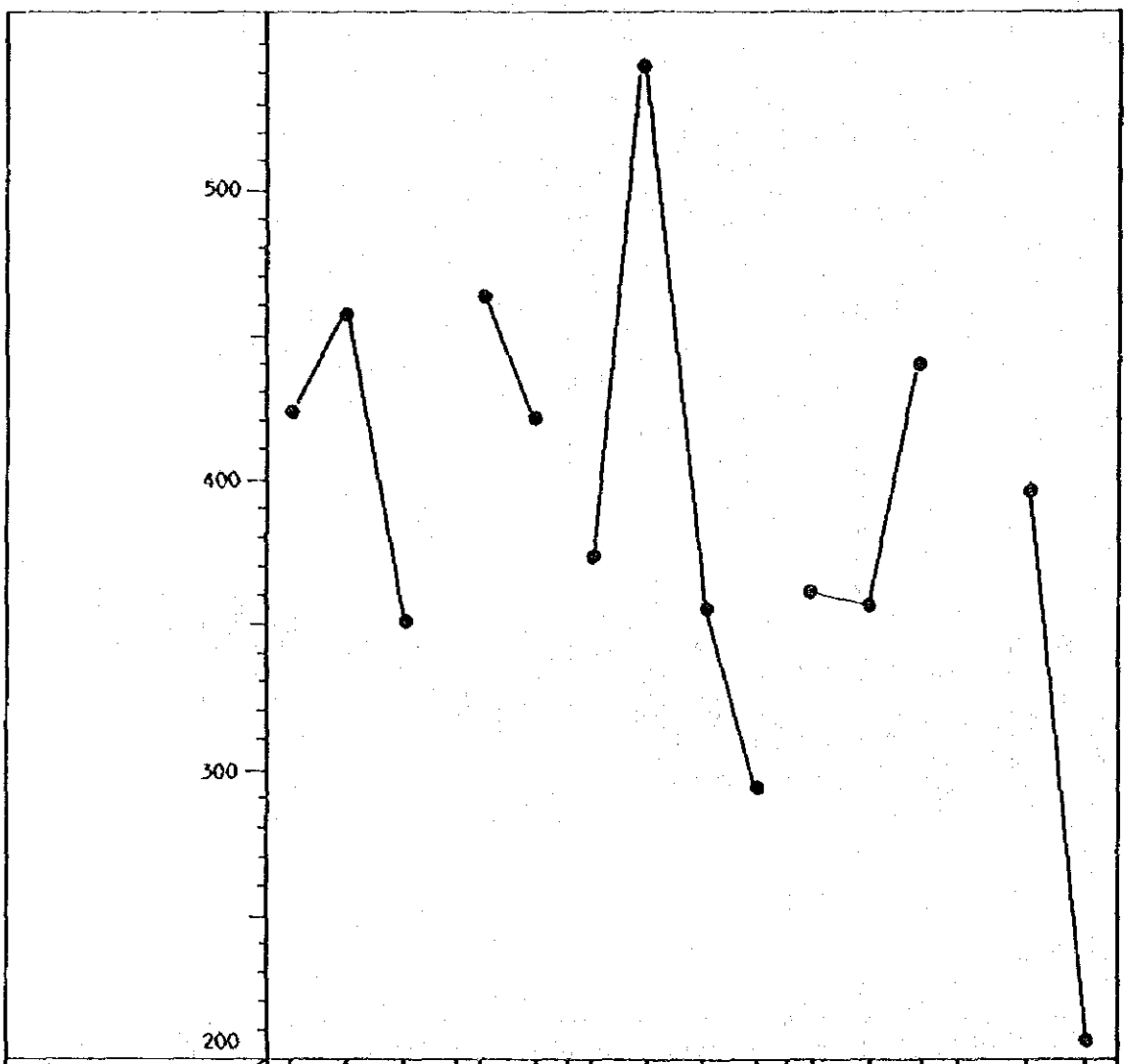


Fig. F Summary of Schmidt Hammer-Compression Test (Piles, Slabs, Beams)



COMPRESSIVE STRENGTH (kgf/cm^2) / SLAB NO.	E,F	Q,R	J,K	R,S	N,O	I,J	I,J	E,F	E,F	F,G	K,L	P,Q	S,T	O,P
	52	52	52	65	67	18	18	15	15	98	95	98	6969	6969
	53	53	53	66	68	19	19	16	16	99	96	99	7070	7070
PIER NO.	3			5		9				13			15	

Fig. G-1 Results of Schmidt Hammer-Compression Test for Slabs



COMPRESSIVE STRENGTH (kgf/cm^2) / BEAM NO.	E,F	Q,R	J,K	R,S	N,O	I,J (1)	I,J (2)	E,F (1)	E,F (2)	F,G	K,L	P,Q	S,T	O,P
	52	52	52	65	67	18	18	15	15	98	95	98	6969	6969
	53	53	53	66	68	19	19	16	16	99	96	99	7070	7070
PIER NO.	3			5		9				13			15	

Fig. G-2 Results of Schmidt Hammer-Compression Test for Beams

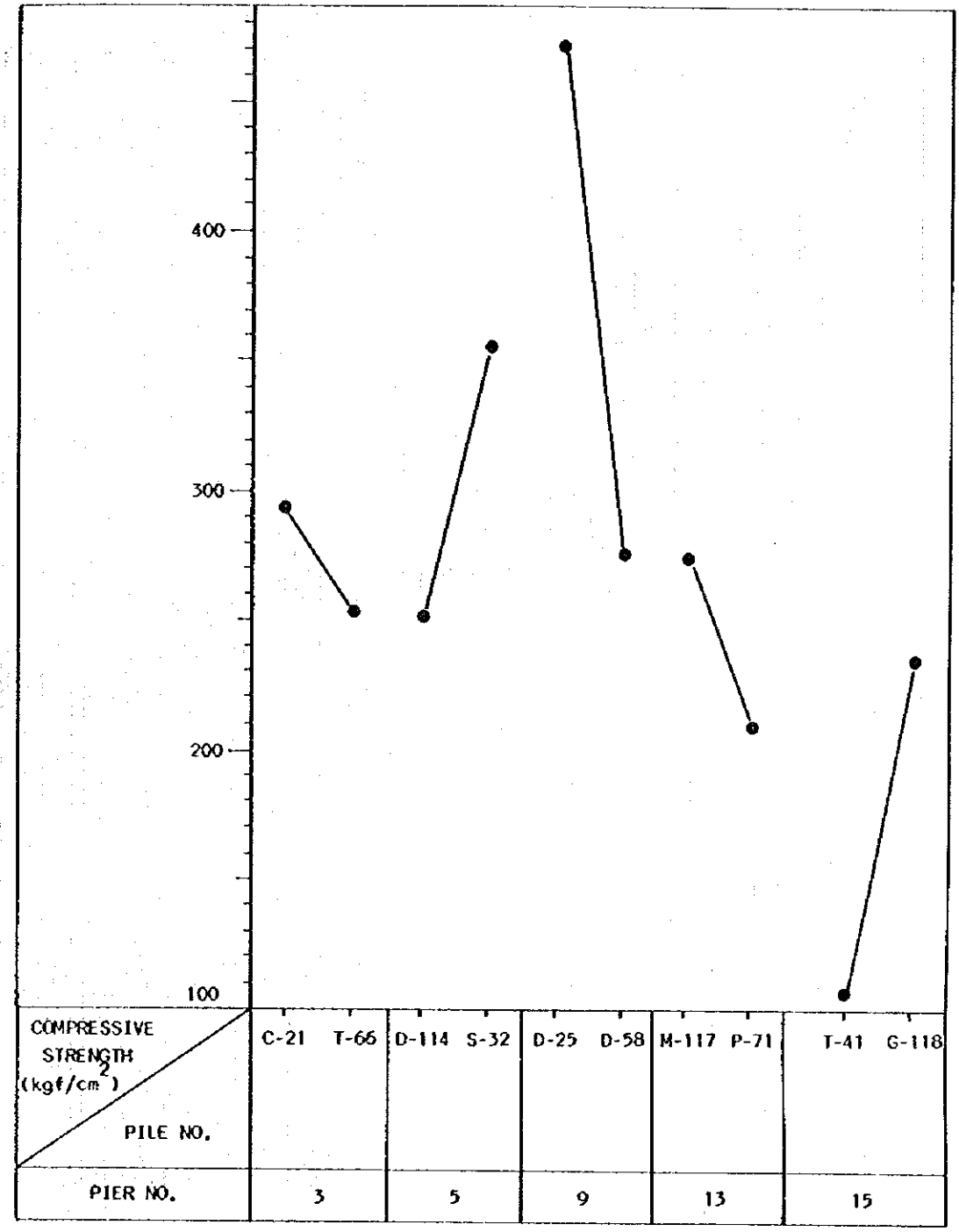


Fig. G-3 Results of Schmidt Hammer-Compression Test for Pile Concrete

Table J-1 Results of Schmidt Hammer - Compression Test for Slabs and Beams (1 of 2)

Pier No.	Symbol	Location	Coefficient of Repulsion (RO)	Compressive Strength (kgf/cm2)	Coefficient of Correction	Design Standard Strength (kgf/cm2)	Note
3	S	E,F-52,53	50.5	472.5	0.63	297.7	S: Slab
	B	ditto	46.8	424.4	ditto	267.4	B: Beam
	S	Q,R-52,53	46.4	419.2	ditto	264.1	
	B	ditto	49.5	459.5	ditto	289.5	
	S	J,K-52,53	43.1	376.3	ditto	237.1	
	B	ditto	41.2	351.6	ditto	221.5	
5	S	R,S-65,66	46.8	424.4	ditto	267.4	
	B	ditto	49.9	464.7	ditto	292.8	
	S	N,O-67,66	46.4	419.2	ditto	264.1	
	B	ditto	46.7	423.1	ditto	266.6	
9	S-1	I,J-18,19	51.9	490.7	ditto	309.1	
	S-2	ditto	55.7	540.1	ditto	340.3	
	B-1	ditto	43.0	375.0	ditto	236.2	
	B-2	ditto	56.0	544.0	ditto	342.7	
	B	O,P-50,51	46.3	417.9	ditto	263.3	
	S-1	E,F-15,16	46.1	415.3	ditto	261.6	
	S-2	ditto	36.4	289.2	ditto	182.2	
	B-1	ditto	41.7	358.1	ditto	225.6	
	B-2	ditto	36.9	295.7	ditto	186.3	

Table J-1 Results of Schmidt Hammer - Compression Test for Slabs and Beams (2 of 2)

Pier No.	Symbol	Location	Coefficient of Repulsion (RO)	Compressive Strength (kgf/cm2)	Coefficient of Correction	Design Standard Strength (kgf/cm2)	Note
13	S	F,G-98,99	49.8	463.4	0.63	291.9	S: Slab
	B	ditto	42.0	362.0	ditto	228.1	B: Beam
	S	K,L-95,96	39.6	330.8	ditto	208.4	
	B	ditto	41.7	358.1	ditto	225.6	
	S	P,Q-98,99	49.4	458.2	ditto	288.7	
	B	ditto	48.0	440.0	ditto	277.2	
15	S	S,T-69,70	40.4	341.2	ditto	215.0	
	B	ditto	44.7	397.1	ditto	250.2	
	S	O,P-69,70	49.5	459.5	ditto	289.5	
	B	ditto	29.8	203.4	ditto	128.1	

Table J-2 Results of Schmidt Hammer - Compression test for Pile Concrete

Pier No.	Symbol	Location	Coefficient of Repulsion (RO)	Compressive Strength (kgf/cm2)	Coefficient of Correction	Design Standard Strength (kgf/cm2)	Note
3	P	C-21	36.7	293.1	0.63	184.7	P:Pile
	P	T-66	33.6	252.8	ditto	159.3	
5	P	D-114	33.5	251.5	ditto	158.4	
	P	S-32	41.5	355.5	ditto	224.0	
9	P	D-25	50.1	467.3	ditto	294.4	
	P	D-58	35.3	274.9	ditto	173.2	
13	P	M-117	35.1	272.3	ditto	171.5	
	P	P-71	30.3	209.9	ditto	132.2	
15	P	T-41	22.2	104.6	ditto	65.9	
	P	G-118	32.0	232.0	ditto	146.2	

C. Compressive Strength Estimated from Concrete Mix Proportion

Table K shows the concrete compressive strength estimated from the water-cement ratio in accordance with the Japan Construction Society Chart of the relation between water-cement ratio and concrete compressive strength by assuming cement strength K as about 420 kgf/cm^2 in reference to the current performance results of ordinary Portland cement.

This table shows an overall average decrease in strength of 81-83% of the samples except those at Pier 5 and part of Pier 9 (pile sample) which showed strengths larger than at the time of construction.

Table K Estimated Concrete Compressive Strength

Pier No.	Item	Core No.	Water-Cement Ratio W/C (%)	Estimated Concrete Compressive Strength F_1 (kgf/cm^2)	Compression Test Results F_2 (kgf/cm^2)	Ratio of Compressive Strength to Estimated Strength F_2/F_1	Average
3	Slab	E,F-52,53	70.6	220	203	0.92	0.81
		Q,R-52,53	54.2	330	189	0.57	
	Pile	C-21	53.1	340	316	0.93	
5	Slab	Q,R-65,66	57.4	305	328	1.07	1.14
		N,O-67,68	53.6	335	235*	-	
	Pile	S-32	54.1	330	400	1.21	
9	Slab	J,K-18,19	54.5	325	303	0.93	0.98
		O,P-50,51	58.0	300	196*	-	
	Pile	D-58	64.4	255	264	1.04	
13	Slab	F,G-98,99	54.7	320	291	0.91	0.83
		P,Q-98,99	47.2	400	244	0.61	
	Pile	M-117	51.1	357	352	0.98	
15	Slab	O,P-69,70	63.7	260	194	0.75	0.82
		S,T-69,70	46.7	410	328	0.80	
	Pile	G-118	50.3	365	327	0.90	

* Cores with cracks.

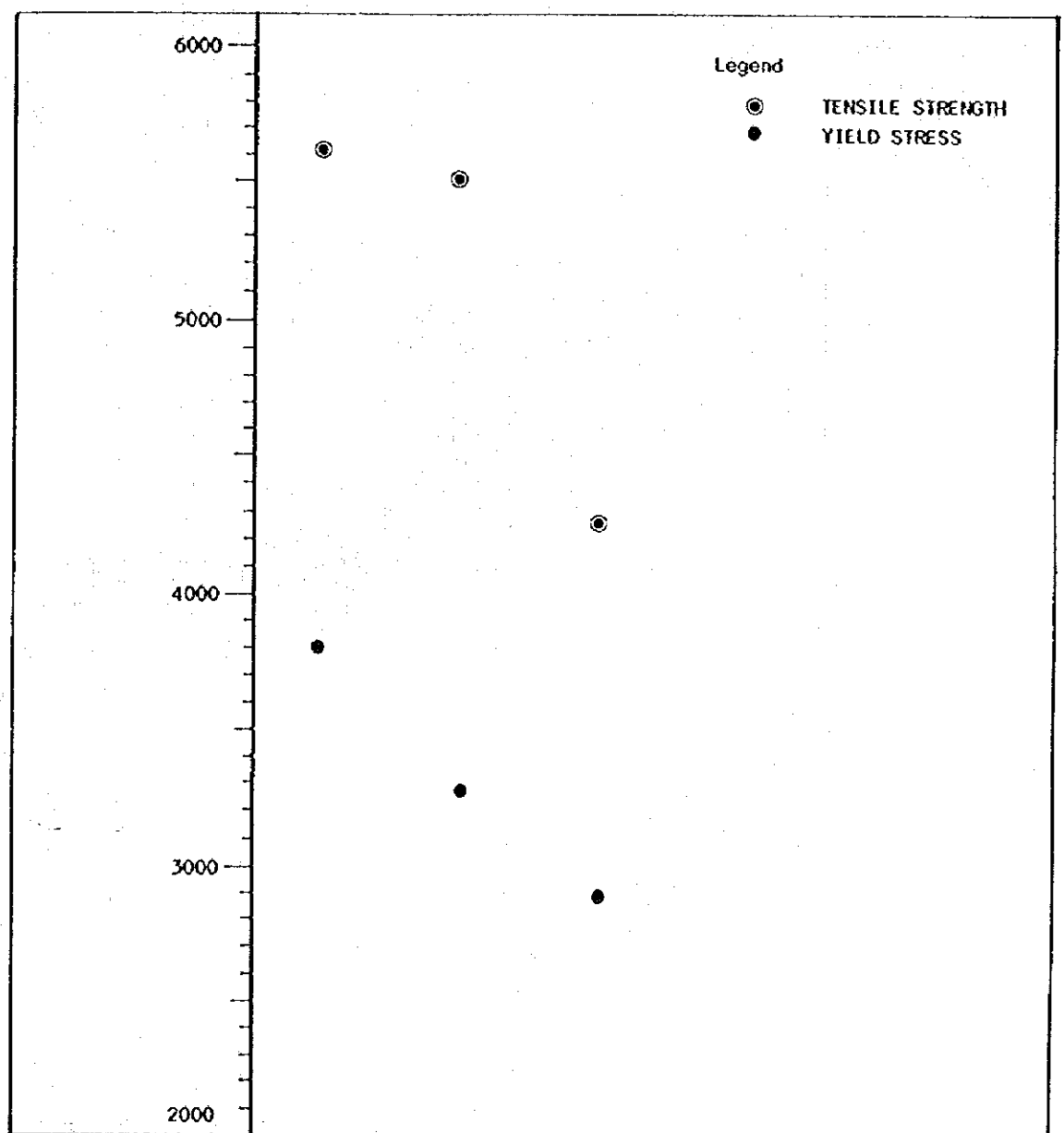
4. Reinforcement/Steel Piece Tensile Test

Figs H and I and Table M show the results of the tensile tests of reinforcements which showed the highest yield point of 34.9 kgf/mm^2 at Pier 9 and the lowest of 22.3 kgf/mm^2 at Pier 15 with an average value of 30.5 kgf/mm^2.

The results of the tensile tests of steel pieces (steel monotubes) are further shown in Table L, where the mechanical properties specified by the JIS standards (25 kgf/mm^2 or higher yeild stress, 41 kgf/mm^2 or higher tensile strength and 17% or higher elongation rate for Class B SS41) are satisfied indicating a quality equivalent to Class B SS41.

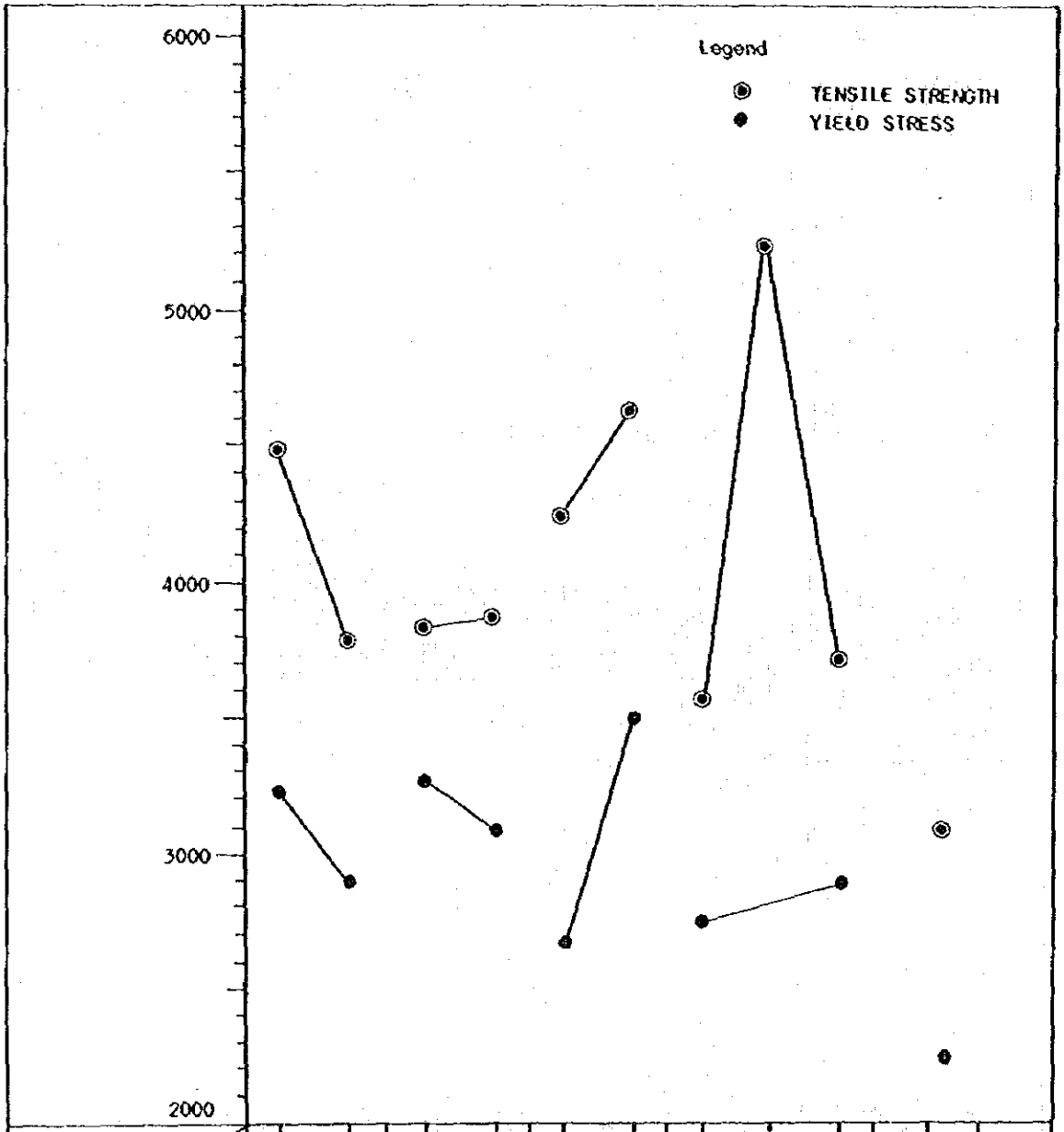
Table L Results of Steel Tube Tensile Test Results

Sample No.	Thickness (mm)	Yield Point stress (kgf/mm^2)	Tensile Strength (kgf/mm^2)	Elongation (%)
1	6.24	43.7	45.6	26.4
2	5.99	44.9	46.2	22.6
3	6.14	40.7	45.5	26.8
4	6.09	42.7	43.8	23.0
5	6.14	44.1	45.3	24.8



TENSILE STRESS (kgf/cm^2) / SLAB NO.	K,L	E,F	S,T
	52	15	69
	53	16	70
PIER NO.	9	13	15

Fig. II-1 Results of Tension Test for Reinforcement Bar (by UP)



TENSILE STRESS (kgf/cm²) / SLAB NO.	E,F	Q,R	R,S	N,O	I,J	O,P	F,G	K,L	P,Q	O,P
	52	52	65	67	18	50	98	95	98	69
	53	53	66	68	19	51	99	96	99	70
PIER NO.	3		5		9		13			15

Fig. II-2 Results of Tension Test for Reinforcement Bar (in Japan)

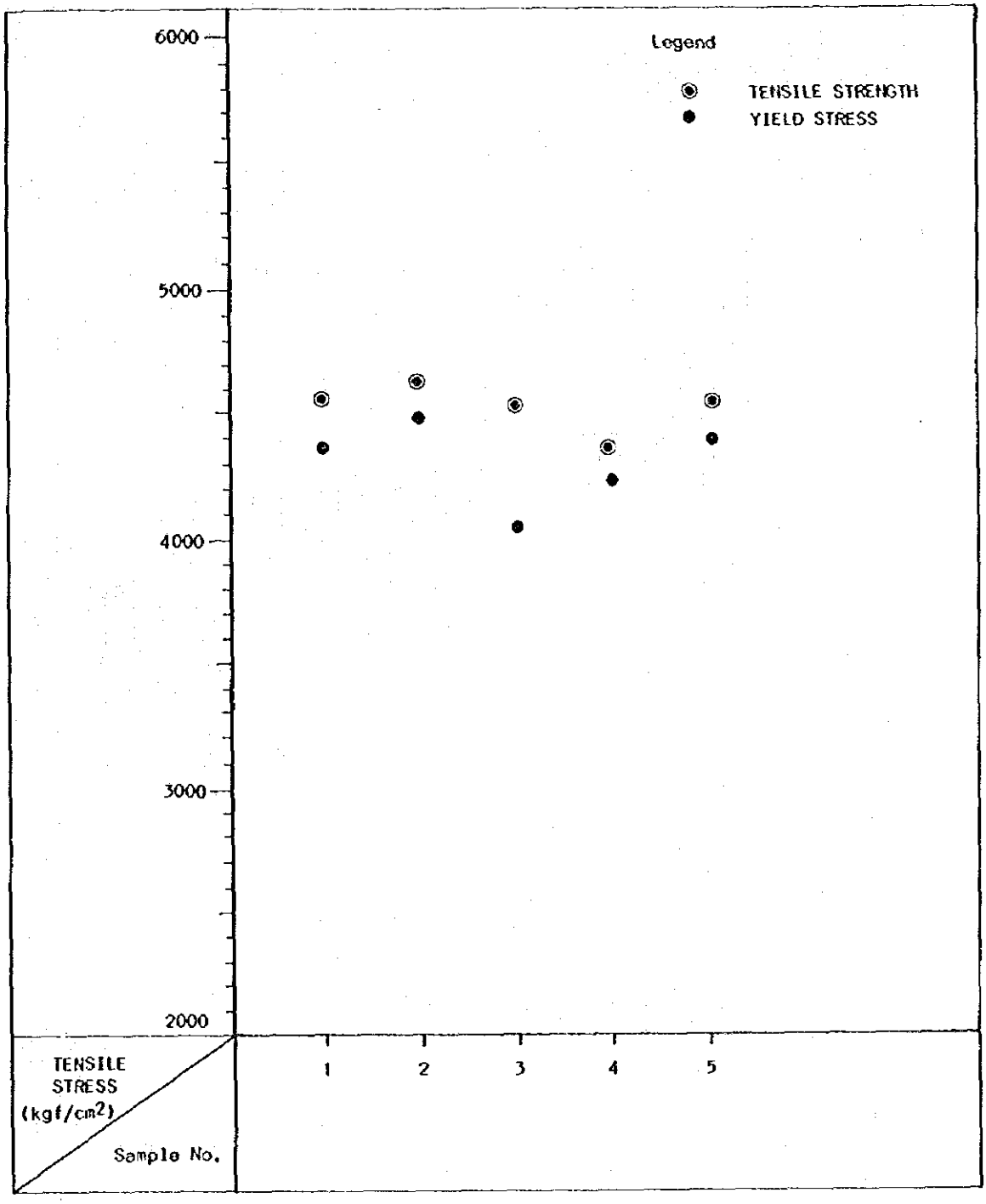


Fig. I Results of Tension Test for Steel Section of Monotube Pile (in Japan)

Table M-1 Results of Tension Test for Reinforcement Bar (by UP)

Pier No. / Head / Location	Size (mm)	Cross Sectional Area (cm2)	Kind of Reinforcement	Tensile Strength (kgf/cm2)	Yield Point Stress (kgf/cm2)	Elongation (%)	Note
3 K,L-52,53	15.9	1.99	Deformed	(4895)	(2804)	(10.0)	( ): Minimum
				5619	3792	23.4	
9 E,F-15,16	22.2	3.86	ditto	(4895)	(2804)	(10.0)	
				5509	3273	21.9	
15 S,T-69,70	15.8	1.96	"	(3977)	(2345)	(18.0)	
				4242	2874	25.6	

Tabele M-2 Results of Tension Test for Reinforcement Bar (in Japan)

Pier No. / Item / Location	Size (mm)	Cross Sectional Area (cm2)	Kind of Reinforcement	Tensile Strength (kgf/cm2)	Yield Point Stress (kgf/cm2)	Elongation (%)	Note
3 E,F-52,53	12.5	1.227	Deformed	4480	3420	25.8 (26.2)	( ): Elongation (mm)
Q,R-52,53	17.3	2.351	ditto	3790	2890	22.7 (28.9)	
5 R,S-65,66	16.3	2.087	ditto	3830	3260	30.1 (38.3)	
N,O-67,68	14.2	1.584	ditto	3850	3090	26.5 (26.9)	
9 I,J-18,19	24.5	4.714	ditto	4240	2650	23.8 (39.3)	
O,P-50,51	16.2	2.061	Round	4610	3490	28.6 (36.4)	
13 F,G-98,99	14.6	1.674	Deformed	3580	2750	26.5 (26.9)	
K,L-95,96	21.2	3.530	Twisted Square	5240	Judgement is impossible	8.4 (14.9)	
P,Q-98,99	14.6	1.674	Deformed	3700	2870	25.2 (25.6)	
15 O,P-69,70	16.9	2.243	ditto	3080	2230	22.6 (28.8)	

5. Reinforcement Corrosion

a. Potential Difference Measurement

Table N shows the survey results based on the cumulative frequency chart.

The angle of the cumulative frequency chart in the table refers to the slope angle of a straight line approximately placed through the measurement points plotted in the chart, and a steeper slope is generally recognized as more electro-chemically active, indicating the reinforcement corrosion is greater at the points of measurement.

In the table, "active" is distinguished from "inactive" with the degree of reinforcement corrosion estimated from the results of potential difference measurement classfied as follows:

-85 mV < E (inactive)	:	Occurrence of corrosion is more than 90% improbable.
- 235 mV ≦ E ≦ -85 mV (Medium value)	:	Uncertain
E < -235 mV (Active)	:	Occurrence of corrosion is more than 90% probable.

(According to Japan Concrete Industrial Association "Corrosion Resistance Guideline")

Table N Results of Reinforcement Potential Measurement

Pier	15			13			9						5		3		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Place of Measurement	S,T 69 70 (1)	S,T 69 70 (2)	O,P 69 70	F,G 98 99	K,L 95 96	P,Q 98 99	I,J 18 19 (1)	I,J 18 19 (2)	O,P 50 51 (1)	O,P 50 51 (2)	E,F 15 16 (1)	E,F 15 16 (2)	P,S 65 66	N,O 67 68	E,F 52 53	Q,R 52 53	J,K 52 53
Angle of Cumulative Frequency Chart	14.5	15	18	20	17.5	20.5	19.5	6.5	13.5	6.5	9.0	3.5	24	22	22.5	22	10.5
Active or Inactive	M	M	A	M	M	M	M	A	M	M	A	A	M	M	A	M	A

A: Active
M: Medium value (between active and inactive)

b. Carbonization Test

Results of the carbonization test are shown in Table $\bar{0}$. As shown in Table $\bar{0}$, no carbonization was recognized in five pile cores, while slab cores have been considerably carbonized to depths of concrete covering 25 mm and 19.6 mm at Pier 9, 22.6 mm at Pier 15 and 18.0 mm at Pier 3, and those values are comparatively large in the test. Although slabs at the same pier have different carbonized depths, the portions where the above deep-carbonized slabs are found are relatively liable to be affected by sea water because these affected area are located at the lowered passageways.

Judging from the result of the inspection, pier by pier carbonization is most developed at Pier 9 and the value decreases in order from Pier 15 to Pier 3 to Pier 5 and then to Pier 13.

The 0 mm depth of carbonization found in some pile cores may be attributable to the monotube steel protecting the concrete surface.

The carbonized depth is found to increase along with an increasing water to-cement ratio and a decreasing unit amount of cement.

Table $\bar{0}$ Result of Carbonization Tests

Pier No.	Item	Core No.	Depth of carbonization (Average) (mm)
3	Slab	E, F - 52, 53	8.3
		Q, R - 52, 53	18.0
	Pile	C - 21	0.0
5	Slab	Q, R - 65, 66	10.6
		N, O - 67, 66	7.9
	Pile	S - 32	0.0
9	Slab	J, K - 18, 19	25.0
		O, P - 18, 19	19.6
	Pile	D - 58	0.0
13	Slab	F, G - 98, 99	0.0
		P, Q - 98, 99	5.5
	Pile	M - 117	0.0
15	Slab	O, P - 69, 70	22.6
		S, T - 69, 70	11.9
	Pile	G - 118	0.0

c. Salt Content

Test results are shown in Table P, and the relationship between the distance from the concrete surface of a slab or a pile and the salt content (%) are shown in Fig. J. The amount of NaCl increases with decreasing depth from the core surface and decreases with increasing depth from the core surface.

The amount of NaCl contained in the concrete is, however, generally small except for two samples, one collected from Pier 13 (pile core) and the other from the lowered passageway at Pier 15 (slab). In these sample, the content of NaCl exceeded 0.1%.

Pile cores except those at Pier 13 showed low values of null or almost near 0, and this is probably because the surface is covered with steel monotube.

After all, the salt content tends to increase as the core is more liable to be affected by waves. Fig. K shows the survey results on the amount of salt contained in the slabs of piers with piles constructed about twenty years ago in Japan. When compared with the results in the figures, the rate at which the salt content is increasing in South Harbor is relatively slow in view of the time elapsed after construction, although the slab levels above the sea and the climatic conditions are different. Such trace amounts of salt at 5 cm from the surface (0-0.066%) may have little influence on the structure considering possible reinforcement corrosion. For reference, the corrosion of reinforcement allegedly starts when the salt content exceeds 0.4%.

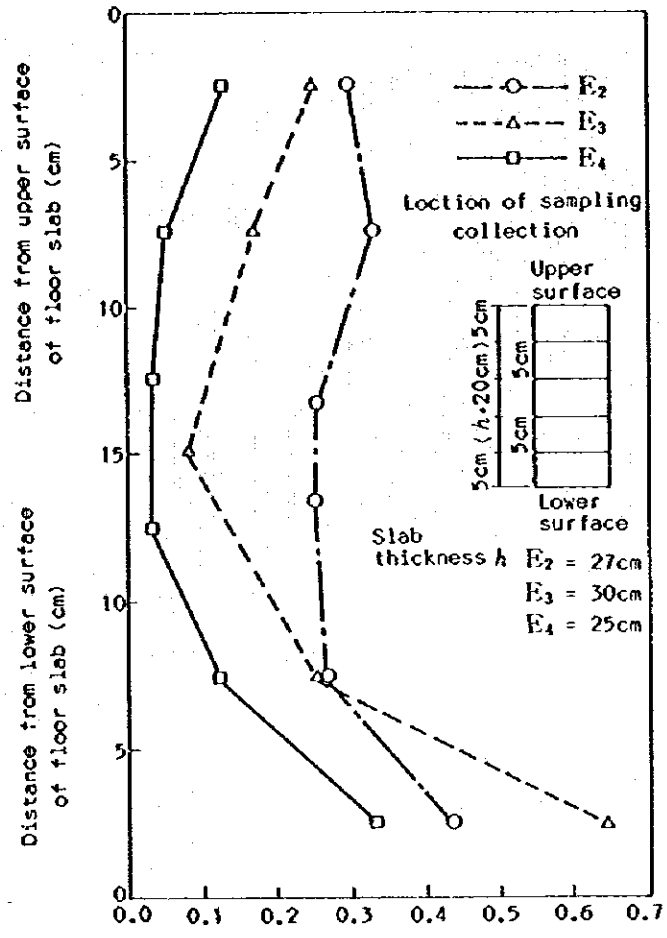
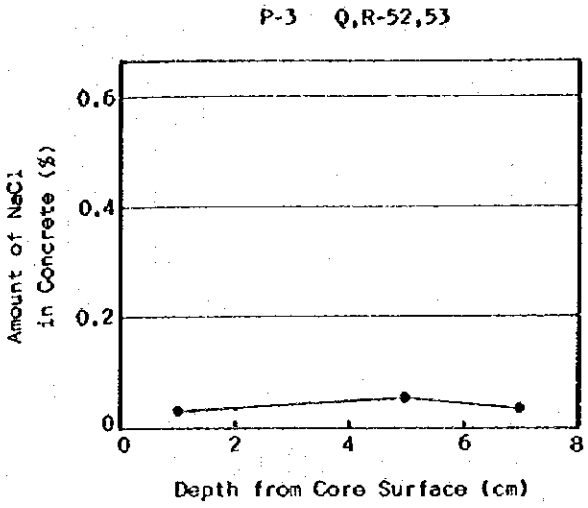
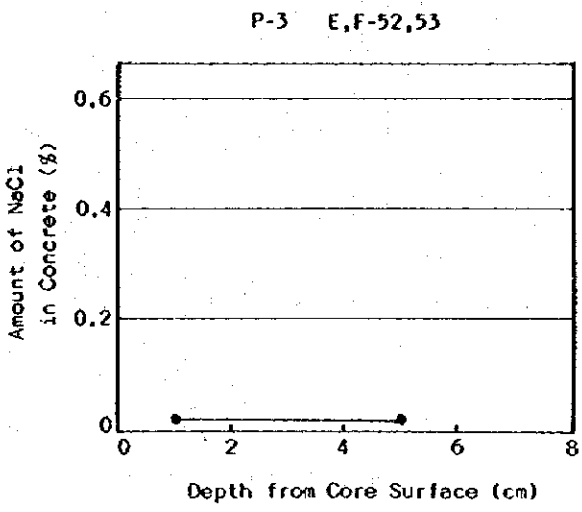


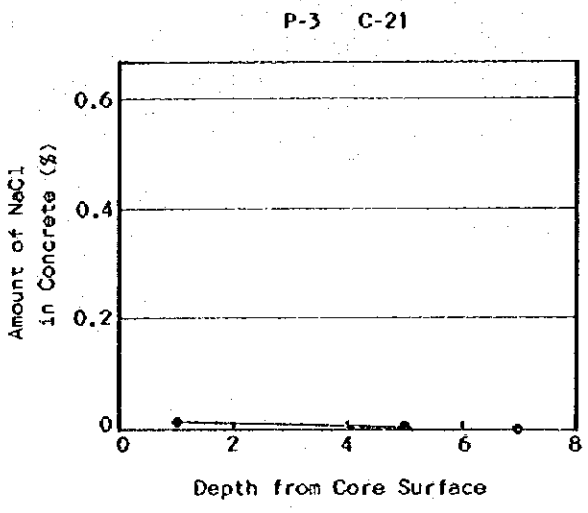
Fig. K Example of the Salt Content in Slabs (%) (Japan)

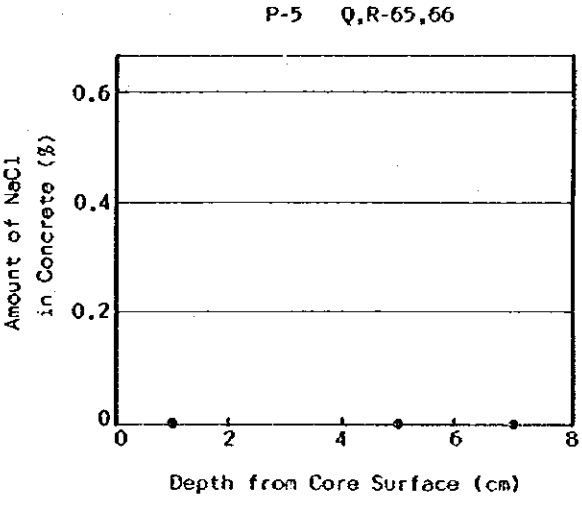
Table P Salt-Content in Concrete

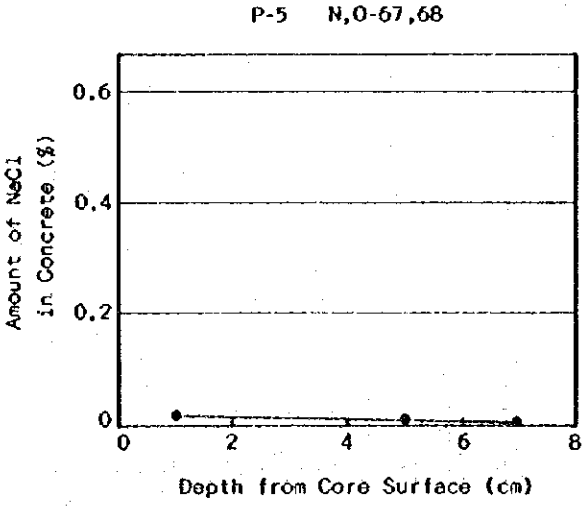
Pier No.	Item	Core No.	Depth from core surface (cm)	Amount of salt in concrete			Amount of salt in sand
				Cl (%)	NaCl (%)	NaCl (kg/m3)	NaCl (%)
3	Slab	E,F-52,53	1	0.014	0.023	0.49	0.069
			5	0.015	0.025	0.56	0.079
			7	0.009	0.015	0.31	0.043
		Q,R-52,53	1	0.020	0.033	0.72	0.101
			5	0.040	0.066	1.47	0.206
			7	0.025	0.041	0.93	0.130
	Pile	C-21	1	0.010	0.016	0.37	0.052
			5	0.005	0.008	0.19	0.027
			7	0.000	0.000	0.00	0.000
5	Slab	Q,R-65,66	1	0.004	0.007	0.16	0.022
			5	0.000	0.000	0.00	0.000
			7	0.000	0.000	0.00	0.000
		N,O-67,68	1	0.012	0.020	0.47	0.066
			5	0.009	0.015	0.35	0.049
			7	0.006	0.010	0.23	0.032
	Pile	S-32	1	0.000	0.000	0.00	0.000
			5	0.000	0.000	0.00	0.000
			7	0.000	0.000	0.00	0.000
9	Slab	J,K-18,19	1	0.050	0.082	1.81	0.254
			5	0.009	0.015	0.34	0.048
			7	0.006	0.010	0.23	0.032
		O,P-50,51	1	0.009	0.015	0.31	0.043
			5	0.002	0.003	0.07	0.010
			7	0.001	0.002	0.04	0.006
	Pile	D-58	1	0.000	0.000	0.00	0.000
			5	0.000	0.000	0.00	0.000
			7	0.000	0.000	0.00	0.000
13	Slab	F,G-98,99	1	0.000	0.000	0.00	0.000
			5	0.000	0.000	0.00	0.000
			7	0.000	0.000	0.00	0.000
		P,Q-98,99	1	0.035	0.058	1.33	0.186
			5	0.016	0.026	0.60	0.084
			7	0.010	0.016	0.35	0.049
	Pile	M-117	1	0.350	0.577	12.90	1.809
			5	0.265	0.437	9.77	1.370
			7	0.115	0.190	4.26	0.597
15	Slab	O,P-69,70	1	0.144	0.237	5.23	0.734
			5	0.026	0.043	0.94	0.132
			7	0.016	0.026	0.58	0.081
		S,T-69,70	1	0.020	0.033	0.74	0.104
			5	0.010	0.016	0.37	0.052
			7	0.006	0.010	0.24	0.034
	Pile	G-118	1	0.000	0.000	0.00	0.000
			5	0.000	0.000	0.00	0.000
			7	0.000	0.000	0.00	0.000











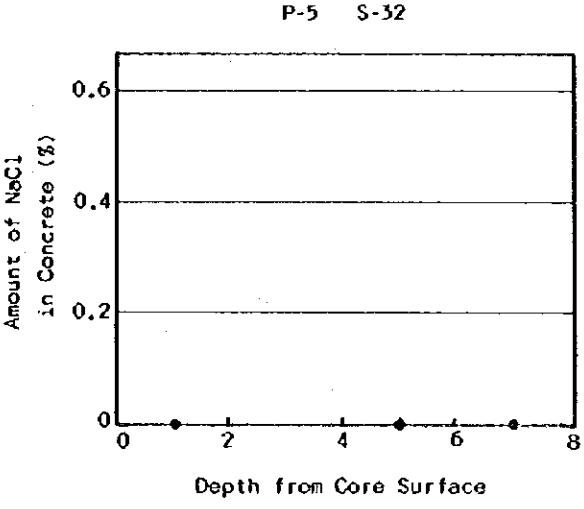


Fig. J-1 Salt-Content in Samples (1)

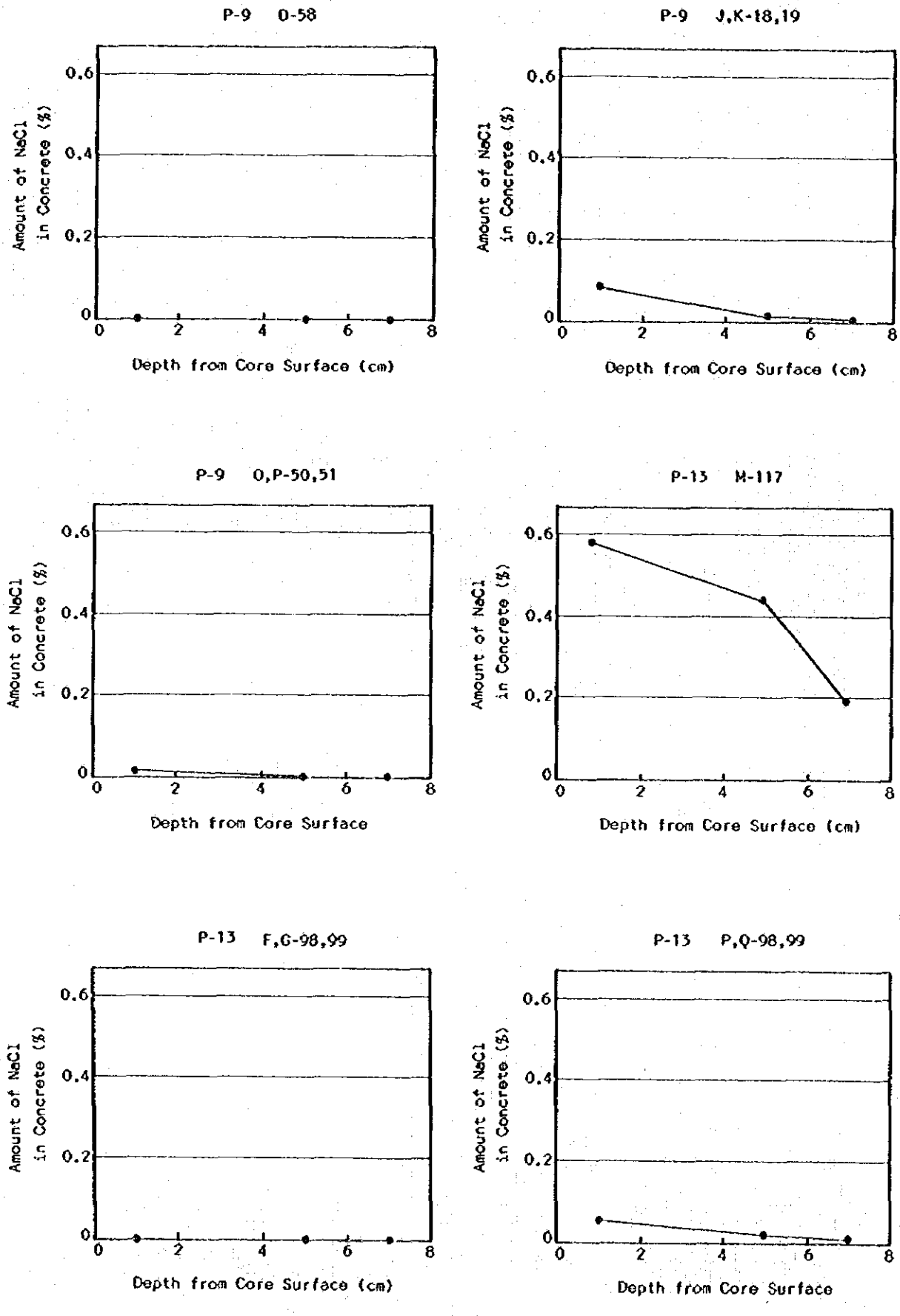


Fig. J-2 Salt-Content in Samples (2)

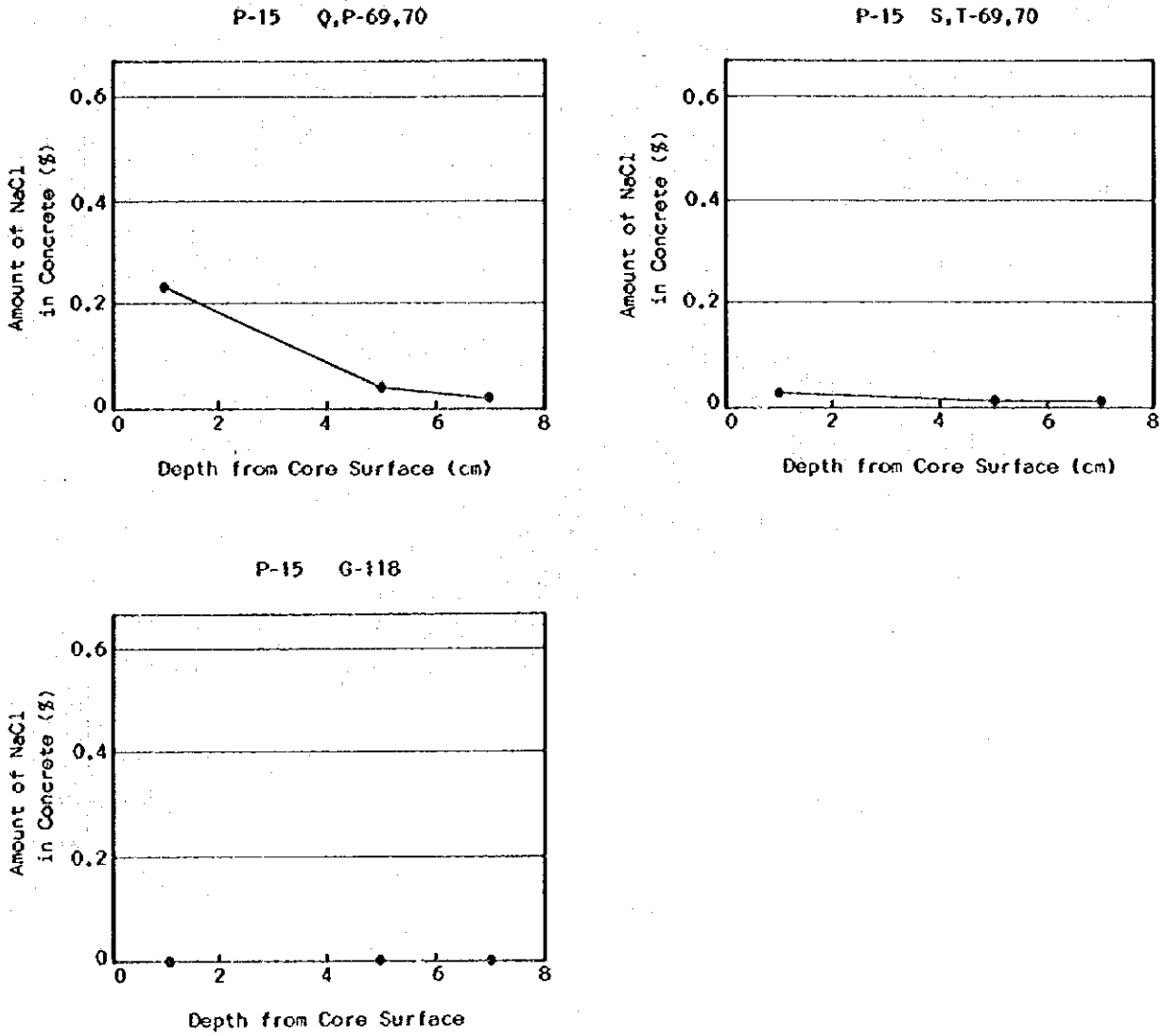


Fig. J-3 Salt-Content in Samples (3)

d. Estimated Concrete Mix Ratio

The test results are summarized in Table S, which shows considerable variations in both the water-to-cement ratio and the unit amount of materials (kg/cm^3).

The lowest possible ratio of water to cement allegedly improves the concrete corrosion resistance because of increased watertightness. Table Q shows the maximum standard value of water-to-cement ratio stipulated by "The Marine Concrete Structure Corrosion Resistance Guideline", a Japanese standard. Each value for piles resulted from the test is 5-10% higher if constructed under favorable conditions than the 45% set forth in the table. Above all, the value for Pier 9 is extraordinarily high. The 50% standard for Class B is 4-20%, exceeding by all values for the slabs except for two sample from Pier 15 and Pier 13.

On the other hand, all piles except those at Pier 15 and Pier 9 and all slabs satisfy the minimum unit amounts of cement of 350 kg/m^3 and 325 kg/cm^3 stipulated by the same "Corrosion Resistance Guideline" for piles and slabs respectively (Refer to Table R).

Table Q Maximum Standard Value of Water-to-Cement Ratio (%)

Classification	Under Favorable Construction Conditions	Under Unfavorable Construction Conditions
Class A	45	40
Class B	50	45
Class C	50	45

Table R Minimum Standard Value of Unit Amount of Cement (kg/m^3)

Construction Conditions	Favorable		Unfavorable	
Maximum Coarse Aggregate Size	25	40	25	40
Classification				
Class A	375	350	400	375
Class B	350	325	375	350
Class C	325	300	350	325

Table S Estimate of Concrete Proportion

Pier No.	Item	Core No.	Air Content (%)	Water-cement ratio w/c (%)	Fine aggregate ratio s/a (%)	Cement content C(kg/m^3)	Water content W(kg/m^3)	Fine aggregate S(kg/m^3)	Coarse aggregate G(kg/m^3)
3	Slab	E,F-52,53	4.0	70.6	45.0	347	245	711	869
		Q,R-52,53	4.0	54.2	45.0	343	186	782	956
	Pile	C-21	4.0	53.1	45.0	371	197	759	927
5	Slab	Q,R-65,66	4.0	57.4	45.0	324	186	788	964
		N,O-67,68	4.0	53.6	45.0	388	208	739	904
	Pile	S-32	4.0	54.1	45.0	375	203	750	916
9	Slab	J,K-18,19	4.0	54.5	45.0	378	206	746	911
		O,P-50,51	4.0	58.0	45.0	355	206	754	922
	Pile	D-58	4.0	64.4	45.0	329	212	756	925
13	Slab	F,G-98,99	4.0	54.7	45.0	384	210	738	903
		P,Q-98,99	4.0	47.2	45.0	352	166	801	980
	Pile	M-117	4.0	51.1	45.0	370	189	769	939
15	Slab	O,P-69,70	4.0	63.7	45.0	325	207	764	933
		S,T-69,70	4.0	46.7	45.0	336	157	819	1000
	Pile	G-118	4.0	50.3	45.0	298	150	841	1028

e. Reinforcement inspection

Table T shows the inspection results of protective covering, the degree of corrosion and the salt content of the reinforcement in the concrete core samples.

Protective covering of the reinforcement in the piles averages 52.3 mm with a maximum of 77.1 mm and a minimum of 29.3 mm while for slab cores the average covering is 58.1 mm with maximum and minimum values of 92.1 mm and 35.0 mm respectively, showing generally thicker covering for slab cores than for piles.

Reinforcement has undergone almost no corrosion as its corrosion level is classified as grade I in Table U and the salt amount contained in the reinforcement is also ranked in the lowest category at 400 ppm according to Table V.

Table U Corrosion Grade

Grade	Development of Corrosion Observed by Visual Inspection
0	Remaining as it was originally built, no corrosion is perceived.
I	Slight corrosion is perceived here and there.
II	Most of the surface is corroded. Cross-sectional loss is perceived here and there.
III	Cross-sectional loss is perceived all over the reinforcement.
IV	1/2 - 2/3 of the original reinforcement is lost.

Table V Degree of Salt Content by the Salt Check Test Method

(Chloride contents in terms of NaCl)

Contained in concrete (g/m^3)	160	320	800	1,200	1,600
Contained in fine aggregate (%)	0.02	0.04	0.1	0.15	0.2
Supernatant liquid concentration (ppm)	400	800	2,000	3,000	4,000

Table 7 Result of Reinforcement Inspection in Concrete Core Samples

Pier No.	Item	Core No.	Degree of Corrosion	Protective covering of re-bar		Salt content of re-bar (ppm)	Depth of carboni-zation (Average) (mm)
				Nominal diameter of re-bar (mm)	Pro-tective covering (mm)		
3	Slab	E,F-52,53	I	D 16	53.3	400	8.3
		Q,R-52,53	I	D 16	35.0	400	18.0
	Pile	C-21	I	R 9	77.1	-	0.0
			I	D 19	69.2	400	
5	Slab	Q,R-65,66	I	D 16	92.1	400	10.6
		N,O-67,68	I	D 13	67.2	400	7.9
			I	D 16	53.0	400	
	Pile	S-32	I	R 9	46.0	-	0.0
			I	D 19	52.3	400	
9	Slab	J,K-18,19	I	D 13	62.0	400	25.0
			I	D 22	35.5	400	
		O,P-50,51	I	R 16	52.5	400	19.6
	Pile	D-58	I	R 9	44.3	-	0.0
			I	D 9	49.6	400	
13	Slab	F,G-98,99	I	D 16	45.0	400	0.0
		P,Q-98,99	I	D 10	75.8	400	5.5
			I	D 16	75.8	400	
	Pile	M-117	-	-	-	-	0.0
15	Slab	O,P-69,70	I	D 16	64.0	400	22.6
		S,T-69,70	I	D 16	44.8	400	11.9
	Pile	G-118	I	R 9	29.3	-	0.0
			I	D 19	51.0	400	

D: Deformed Bar (mm)

R: Round Bar (mm)

Appendix 3.3.4 Road and Container Yard Survey

The survey results are summarized in Table A, and repair work has to be carried out on much of the pavement of the roads and the container yards in the port area.

Paved areas requiring repair work comprise 50.2% of the total area. In the following table, A means "no damage is recognized", B "damage, though significant, requires no immediate repair work" anc C "major repair work is necessary".

Table A Evaluation of Roads and Container Yards in South Harbor

Location	Overall Evaluation	Area (m^2)	Ratio (%)
Roads	A	22,500	32.0
	B	28,900	41.0
	C	19,000	27.0
	Total	70,400	100
Container Yards	A	0	0
	B	27,700	31.3
	C	60,900	68.7
	Total	88,600	100

Fig. A shows the location of the surveyed areas and the results are summarized in Table B.

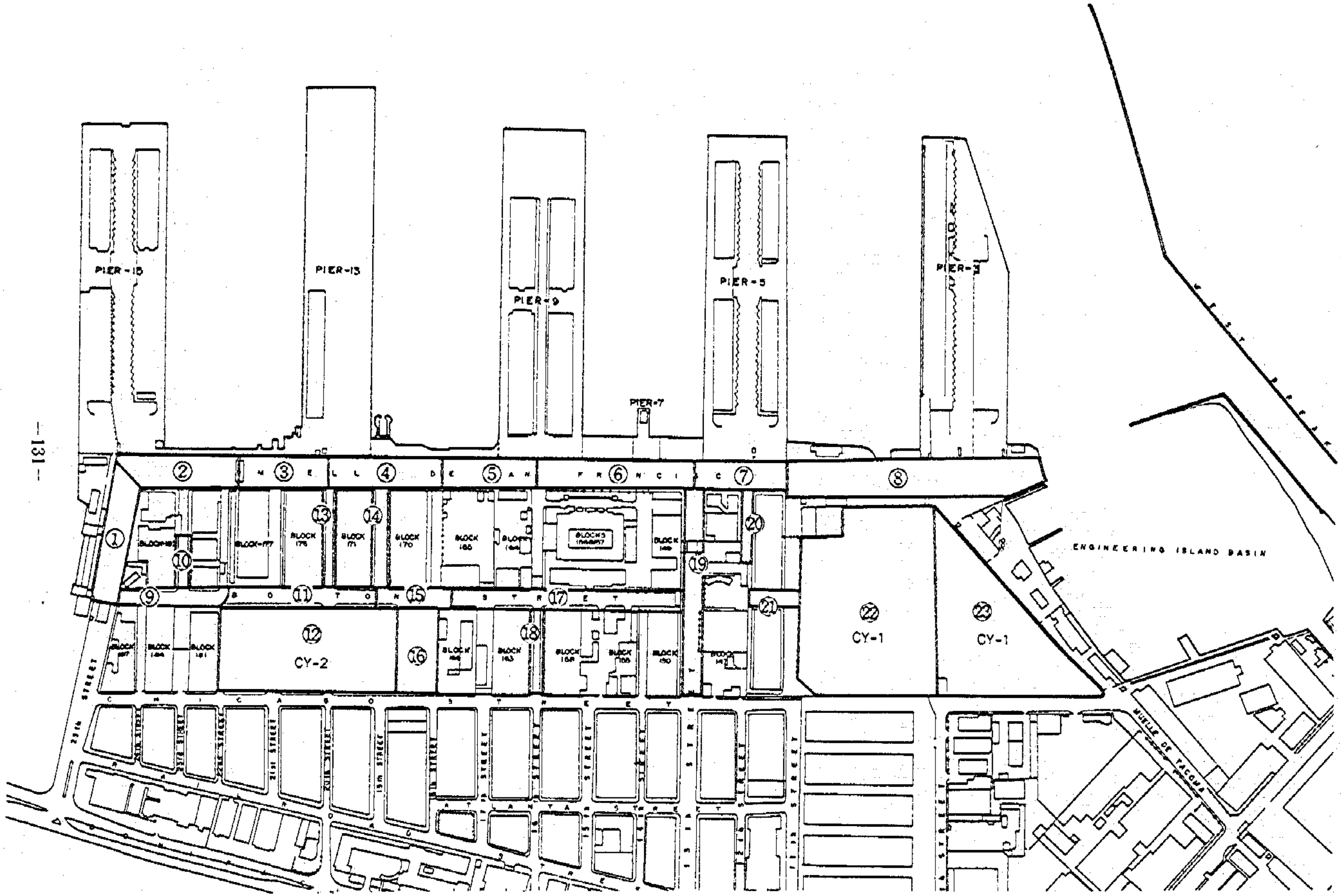


Fig. A Location of Container Yards and Roads

Table B Results of Visual Investigation of Roads and Container Yards (1 of 2)

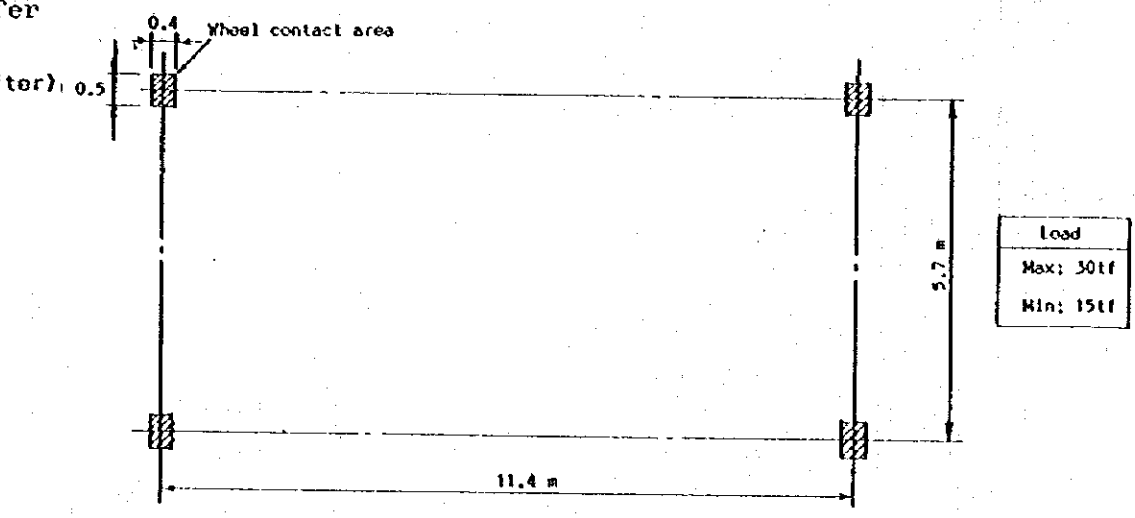
No.	Width and Length (m)	Area (m2)	Pavement		Condition of Pavement				Overall Appraisal	Note
			Kind	Thickness (cm)	Uniformity of Surface	Deformation	Cracks	Loss of Pavement		
1	25.3 x 155	4,000	Concrete	20	B	A	B	A	B	Sidewalk 2.0m x 2
2	35.5 x 135	4,800	-do-	20	B	A	B	B	B	
3	35.5 x 110	3,900	-do-	20	B	A	B	B	B	
4	35.5 x 135	4,800	-do-	20	B	A	B	B	B	
5	35.5 x 120	4,300	-do-	20	B	A	B	B	B	
6	36.5 x 195	7,100	-do-	20	B	A	B	B	B	Sidewalk 2.5m x 1
7	36.5 x 195	3,900	-do-	20	C	B	B	C	C	
8	45.0 x 310	13,900	-do-	20	C	C	B	C	C	
9	16.6 x 130	2,200	-do-	20	A	A	A	A	A	Sidewalk 4.4m x 1
10	20.0 x 60	1,200	Asphalt	--	C	B	B	C	C	
11	16 x 180	2,900	Concrete		A	A	A	A	A	Sidewalk 4.0m x 2 APL(CY-2)
12	215 x 105	22,500	Asphalt	5	B	B	C	B	B	
13	11.6 x 112	1,300	Concrete		A	A	B	A	A	
14	12.0 x 115	1,400	-do-		A	A	B	A	A	Sidewalk 4.0 + 3.0m
15	16.1 x 92	1,500	-do-		A	A	A	A	A	

Table B Results of Visual Investigation of Roads and Container Yards (2 of 2)

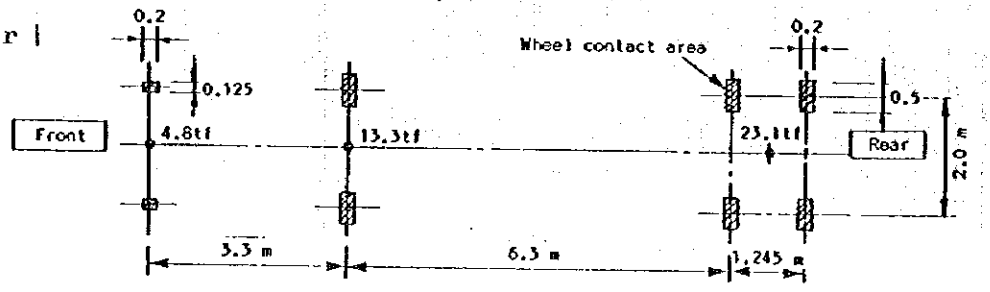
No.	Width and Extension (m)	Area (m2)	Pavement		Condition of Pavement				Overall Appraisal	Note
			Kind	Thickness (cm)	Uniformity of Surface	Deformation	Cracks	Loss of Pavement		
16	50 x 105	5,200	Asphalt		B	B	B	B	B	DCA
17	16.1 x 278	4,500	Concrete	20	A	A	B	A	A	
18	10.6 x 105	1,100	Asphalt		A	A	A	A	A	Sidewalk 2.5m + 2.8m
19	24.0 x 245	5,900	Concrete		A	A	A	A	A	Sidewalk
20	11.3 x 95	1,100	-do-		A	A	B	A	A	
21	15.0 x 40	600	Concrete		A	A	B	A	A	Dead End (Yard)
22	160 x 230	36,800	Asphalt	5	C	C	B	C	C	CY-1
23	210 x 230 x 1/2	24,100	No Pavement		C	C	-	-	C	CY-2

Appendix 3.3.5 Wheel Load

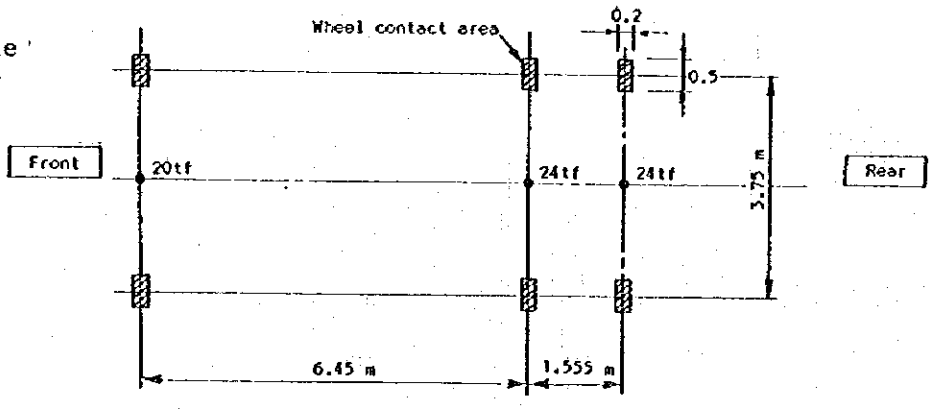
a. Transfer crane (Shifter)



b. Trailer



C. Straddle Carrier



Appendix 4.2.1 Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Ceylon Shipping Co.	N.Agate	Container (Feeder)	connects at Hong Kong to Colombo, India, Middle East and East-coast of Africa	Weekly		
United States Lines	Integra	Container (Feeder)	connects at Kaohsiung to/from USA, Panama, Canada, Europe, S.America, Middle East and Caribbean	Weekly		
United Arab Shipping Co.	N.Agate	Container (Feeder)	connects at Hong Kong to Arabian Gulf and Red sea Ports (Jeddah, Aqaba) and Colombo	Weekly		
Safmarine	N.Agate	Container (Feeder)	connects at Hong Kong to South Africa	Weekly		
Dynamic Freight Services			to/from Hong Kong	Weekly		
Eastern Shipping Lines	Eastern Universe	Container and Break bulk	to/from Kobe, Yokohama and Nagoya	Weekly	7,737	101
	Eastern Jupiter				7,707	108
	Eastern Challenger				7,500	108
	Eastern Galaxy					
	Eastern Polaris					

Note: The Table is prepared using the sailing schedule printed in newspapers.

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship)	
					DWT	LOA
EAC Lines	S.Asia	Container (Feeder)	connects at Hong Kong to US/Canada, PNSL-West Australia	Weekly	4,500	101
Scandutch	Nihon Ned. Dejima Bunga Suria Selandia Toyama	Container (Feeder)	connects at Hong Kong to Europe, Red Sea, Mediterranean	Weekly		
Maersk Line	Tempo	Container (Feeder)	connects at Hong Kong to/from USA/Canada, to/from US Pacific Northwest/MLB, to/from Europe, to Korea, Japan, Indonesia, Middle East, West Africa	Weekly		
Yang Ming Line		Container (Feeder)	connects at Kaohsiung to US West Coast, East Coast, Gulf and Canada, Continental Europe, Mediterranean and Scandinavia	Weekly		
Kyowa Line	MV "Oceania Queen" MV "Kyowa Orchid"	Break bulk	from/to Guam, Saipan, Honolulu, US Trust Territories	Once a month		
ZEFAL	ZMN 11	Container (Feeder)	connects at Hong Kong to Australia-Sydney, Melbourne, Brisbane, Adelaide	Weekly	2,175	87

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Gold Star Line	ZMN 11	Container (Feeder)	connects at Hong Kong to West, East and South Africa, Sri Lanka, Colombo, India Bombay, South America	Weekly	2,175	87
Shofuku Line	Clipper Ace Bonita Ace Asia Ace	Container	from/to Taiwan and Japan; Yokohama, Osaka, Nagoya and Naha	Weekly	5,600 5,678	110 110
Nantai Line Co., Ltd.	B.Ace N.Agate A.Ace C.Ace	Container (Feeder)	connects at Hong Kong to South Africa and Port Lauis (Mauritius Is.)	Weekly	5,600 5,678	110 110
Showa Line	Bonita Ace Asia Ace Clipper Ace	Container (Feeder)	connects at Hong Kong to Far East, U.S. Pacific, Gulf Ports, Canada, Inner cities of Mexico, U.S. Atlantic(MLB), U.S. Gulf(MLB)	Weekly	5,600 5,678	110 110
Lloyd Triestino	N.Agate	Container (Feeder)	connects at Hong Kong to/from Genoa, Barcelona and Trieste	Weekly		

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Australian National Line	A.Explorer		from/to Brisbane, Australia	Bi-monthly	24,354	186
	A.Jade				17,607	169
	O.Expert					
	O.Ambassador				14,258	187
	M.Hope				24,354	186
	A.Pearl					
Everett Orient Line	Brad Everett	Container/Break bulk	from/to Moji, Yokohama, Nagoya, Kobe, Moji, Manila, Cebu, Davao, Tokyo	Twice a week	7,400	143
	Ross Everett				9,400	155
	Fernando Everett				3,555	150
Pan Ocean Shipping Co. Ltd.	MV Pan Riser V-E28		from/to Rotterdam, Antwerp, U.K.(Tilbury), Bremen Sefe, Middle East/Mediterranean	Monthly		
	MV Haiwoo No.2 V-106					
Nedloyd	N.Agate		connects at Hong Kong to West Africa, East Africa, Mauritius, Seychelles, South Africa, Mexico, Central America, Peru, Chile, Panama, Carribean Sea, Brasil, Agentina, Uruguay and Paraguay	Twice a week	4,500	101
	S/Asia					
	A/Asia					
OOCL	T.Tubtim	Container (Feeder)	connects at Kaohsiung to North America, Far East - Australia and Middle East, PNW, PSW	Weekly	3,587	88

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Franco Belgian Services	N.Agate	Container (Feeder)	connects at Hong Kong to/from Europe, Felextowe, Birmingam; London and Leeds	Weekly		
Hapang-Lloyd	Pegasus Plenty	Container (Feeder)	connect at Kaohsiung to/from Europe	Weekly	5,600	118
Ro-Ro Royal	Bonita Ace Asia Ace	Container (Feeder)	connects at Keelung to Middle East, USA and Canada	Weekly	5,600 5,678	110 110
MAK Freight International Inc.		Container (Feeder)	connects at Hong Kong to United Kingdom, West Germany, Belgium, Cyprus, Holland, France	Weekly		
WILLINE	S.Asia	Container (Feeder)	connects at Hong Kong to Dubai, Damman, Sharja, Kuwait, Muscat, Riyadh, Bahrain	Weekly	4,500	101

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
China Ocean Shipping Company (COSCO)	N.Agate	Container (Feeder)	connects at Hong Kong to Europe, Arabian Gulf, Mediterranean, China	Weekly		
Mitsui OSK Lines		Container (Feeder)	connects at Korea to US/Canada, West Coast, East Coast, Europe, Mediterranean, Arabian Gulf, Australia, Africa, South America, China	Weekly		
Stolt Tankers	M/T"Stolf Sunrise" M/T"Southern Queen" M/T"Stolt Spirit" M/T"Stolt Energie" M/T"Crane Phenix" M/T"Stolt Jade" M/T"Stolt Eagle"	Container (Feeder)	connects at Jakarta to Japan, Korea Australia, Rotterdam Via Straits, USEC Via Singapore, USWC, USEC Via Straits	Weekly		
Y.S. Line	C.Ace Integra B.Ace	Container (Feeder)	connects at Hong Kong to U.S.Pacific Southwest, U.S. Pacific Nothwest	Twice a week/weekly	5,600	110
	A.Ace				5,678	110
	ZM 11				2,175	87
Pan Asia Line Ltd.	Bonita Ace	Container	connects at Hong Kong to Japan	Weekly	5,600	110
	Asia Ace				5,678	110
	Clipper					

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Hong Kong Islands Line	MV Green Island MV Island Container	Container	connects at Brisbane to USA/Canada and Australia	Weekly	6,699	126
Ben Line	P.Plenty	Container (Feeder)	connects at Kaohsiung and Keelung to/from Europe	Weekly	5,600	118
Ben Asia	N.Agate	Container (Feeder)	connects at Hong Kong to Jeddah	Weekly		
AFEA Line Ltd.	N.Agate	Container (Feeder)	connects at Hong Kong to Lagos, Apapa and P.Harcourt	Weekly		
Neptune Orient Lines Ltd.	N.Agate	Container (Feeder)	connects at Hong Kong to/from USWC, Gulf, USEC, Canada, IPI, South-east Asia, South Asia, Indonesia, Far East and China	Weekly		
Krutsen Line	Bonita Ace Asia Ace N.Agate	Container (Feeder)	connects at Hong Kong to/from West Australia, Japan, Korea, Taiwan	Weekly	5,600 5,678	110 110
Overseas Containers Limited (OCL)		Container (Feeder)	connects at Kaohsiung to/from United Kingdom, Europe, to Far East, Gulf	Weekly	5,600	

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Evergreen		Container (Feeder)	connects at Kaohsiung to Far East, US West Coast, inland points via base ports, US East Coast, Caribbean, Houston, New Orleans, Europe, West and East Mediterranean, Adriatic	Weekly	11,857	
Uniglory Line		Container (Feeder)	connects at Kaohsiung to/from Southeast Asia, to A/Persian Gulf	Weekly	11,857	
Sealand		Container (Feeder)	connect at Kashsiung to Asia, USA, Caribbean, Central America, Canada	Weekly	19,286	
Asia Australia Express Limited		Container	from/to Brisbane, Australia		25,615	
American President Lines	President Kennedy	Container (Feeder)	connects at Kaohsiung to Seattle, Los Angeles, Oakland, New York	Weekly	19,286	
Barber Blue Sea		Container (Feeder)	connects at Kaohsiung to Panama, California, Los Angeles, San Dieafo, San Francisco, Stockton, Oakland, New Orleans, Houston, Mobile, South Atlantic, U.S.Gulf, East Canada, Montreal, Toronto, St.John, N.Atlantic		5,050	

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Fullspeed Maritime Ltd. Hkg		Container (Feeder)	connects to Mainland China, Middle East	Weekly		
Jebsen Line	Elbe J.Napier Thea-S J.Southland	Container (Feeder)	connects at Hong Kong to Far East, Pacific Islands, Papua New Guinea, New Zealand, Wellington, Dunedin, New Plymouth, Madang, Wewak, Honiara, Rabaul	Bi-monthly		
Lloyd Brasileiro	N.Agate	Container (Feeder)	connects at Hong Kong to/from Brazil, to Colombo, Sri Lnaka	Weekly		
K. Line		Container (Feeder)	connects at Singapore to Malaysia, Singapore, India, Pakistan, Taiwan, Japan, West Coast, East Coast	Weekly		
Pakistan National Shipping Corp.		Container (Feeder)	connects at Singapore to Colombo, Karachi, Keelung	Weekly		
Crest Express Lines, Ltd.		Container (Feeder)	connects to USA, Canada, Europe, Australia, Southeast Asia, Japan, Taiwan	Weekly		
Cavn Venequelan National Line FMG Colombia National Line	N.Agate	Container (Feeder)	connects at Hong Kong to Venezuela, Panama, Trinidad and Tobago, Guyana, Surinam, Colombia, Caribbean, Central America	Bi-monthly		

Liner Service at the Port of Manila

Shipping Company	Name of Vessel	Type	Route	Service Frequency	Remarks (Size of Ship) DWT	LOA
Odessa Ocean Lines	N.Tikhono KH.Prorokv	Container (Feeder)	connects to Far East, Mediterranean and all inland destinations including Trieste, Milan, and Venice	Weekly		
Mon Lines	Bonita Ace Asia Ace Clipper Ace	Container (Feeder)	connects at Hong Kong to Japan	Weekly	5,600 5,678	110 110
Unicon System (HK) Ltd.	Unicon	Container (Feeder)	connects at Hong Kong to Mainland China	Weekly		
New Zealand Unit Express (NZUE)	Kwelin Ned Marseilles Tendai Maru	Container	connects at Hong Kong to Fiji, Auckland, Wellington, Napier, Lyttelton, Dunedin, Mt. Maunganui, Palmerston North, Hamilton, Rotorua, New Plymouth, Masterson	Once a month		
Compania Chilena de Navegacion Interoceanica (Chilean National Line)	N.Agate	Container (Feeder)	connects at Hong Kong to Chile-Iquique, San Antonio/Valparaiso	Weekly		
Norasia Line		Container (Feeder)	connects at Hong Kong to Europe, Mediterranean	Weekly		
National Shipping Corp.	N.Dignity N.Honor N.Pride	Container	connects at Bangkok to/from US West Coast, Asia	3 times a month		
Hanjin Container Lines, Ltd.	A.Agate	Container (Feeder)	connects at Hong Kong to US West Coast, US East Coast	Weekly		

Appendix 4.2.2 Shipping Activity at the Port of Manila by Type of Ship in 1985

CONVENTIONAL SHIPS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading /Unloading Volume* (tons)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay day (tons/ship d)
Per 3	13	138	77.9		13	0	18,227	997	12.8	
5	73	121	109.5		71	2	10,349	2,757	25.2	
9	79	110	81.4		76	3	8,411	1,341	16.5	
13	22	146	200.5		22	0	16,147	6,383	31.8	
15	62	108	59.3		60	2	7,004	1,755	29.6	
Pier Total	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		

Note: * Average loading/unloading volume per ship is estimated using the data of cargo handling ships (excluding non-cargo handling ships).

SEMI-CONTAINER SHIPS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (tons)	Avg. Handling Volume per Ship Mooring Hour (ton/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3	2	107	21.0		2	0	6,974	990	47.1	
5	31	143	42.1		31	0	10,013	1,282	30.5	
9	30	151	58.9		30	0	9,077	2,139	36.3	
13	15	149	35.8		15	0	15,248	2,093	58.6	
15	0									
Pier Total	78	146	46.8		78	0	10,678	1,761	38.6	
Anchorage										
MICT										

CONTAINER SHIPS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (tons)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3	288	138	15.6		283	0	11.533	1.896	74.4	
5	29	140	25.1		29	0	13,243	1,275	50.8	
9	1	166	15.0		1	0	26,320	370	24.7	
13	170	122	37.2		170	0	8.257	2,195	59.0	
15	1	47	4.0		0	1	837			
Pier Total	484	132	29.6		483	1	10,493	1,961	67.2	
Pier 5-15										
Sub-Total	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

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (tons)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3	0									
5	7	133	108.4		7	0	16.121	4.306	39.7	
9	42	155	102.7		40	2	22,137	3,993	38.9	
13	3	133	163.3		3	0	13,184	5,928	36.3	
15	20	150	99.9		19	1	23,553	1,480	14.8	
Pier Total	72	141	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		

TANKERS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (ton)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3										
5										
9										
13										
15										
Pier Total										
Anchorage	208	114		1.8	185	23	9,554	1,210		672

PASSENGER SHIPS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (tons)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3	0									
5	0									
9	0									
13	20	147	24.9				7,419			
15	27	164	23.0				3,664			
Pier Total	47	157	23.8				5,262			
Anchorage										

OTHERS

Ship Type	No. of Ship calls	Avg. Ship Length (m)	Avg. Mooring Time (hrs)	Avg. Stay Time (days)	No. of Cargo Handling Ships	No. of Non-Cargo Handling Ships	Avg. DWT	Avg. Loading/ Unloading Volume per Ship (tons)	Avg. Handling Volume per Ship Mooring Hour (tons/ship h)	Avg. Handling Volume per Ship Stay Day (tons/ship d)
Pier 3	1	37	719.0		0	1	-	-	-	
5	1	50	78.0		1	0	602	320	4.1	
9	2	81	24.5		2	0	1,770	213	8.7	
13	2	116	41.5		2	0	1,955	-	-	
15	21	105	82.7		11	10	91	275	3.3	
Pier Total	27	99	98.7		16	11	383	-		
Anchorage	105	27		4.6	17	88	757	60		

Appendix 4.3.1 (1) Estimated Volume of Foreign Trade Cargo Handled at South Harbor by Commodity (1985)

(Import) (Unit: '000 TONS)

COMMODITY	Pier 3	Pier 5	Pier 9	Pier 13	Pier 15	Anchorage	Total
Dairy Products	37 (48.39)	9 (11.65)	2 (2.14)	29 (37.81)	(0)	0	76 (2.68)
Fish & Fish Products	- (5.70)	2 (29.27)	- (2.73)	1 (21.41)	1 (20.86)	1 (20.03)	5 (0.18)
Wheat & Wheat Products	4 (1.03)	3 (0.87)	3 (0.79)	2 (0.63)	- (0.06)	356 (96.63)	368 (13.06)
Other Cereals	6 (0.99)	99 (17.09)	89 (15.33)	95 (16.26)	5 (0.95)	288 (49.37)	582 (20.61)
Feeding Stuff	9 (5.03)	4 (2.15)	4 (1.92)	12 (6.15)	3 (1.50)	157 (83.25)	189 (6.69)
Other Food	25 (41.69)	8 (12.65)	- (0.79)	26 (43.39)	1 (1.47)	0	60 (2.14)
Tobacco	9 (75.21)	1 (6.92)	- (0.13)	2 (15.82)	- (1.92)	0	12 (0.44)
Wood & Wood Manufactures (excluding furniture)	3 (31.32)	- (0.04)	4 (36.81)	3 (26.31)	- (0.38)	1 (5.13)	11 (0.38)
Paper and Pulp	28 (35.62)	6 (7.19)	8 (10.08)	36 (46.13)	1 (0.98)	0	79 (2.78)
Textile Fibers	11 (30.94)	15 (40.88)	2 (5.54)	5 (14.52)	3 (8.13)	0	36 (1.32)
Crude Fertilizers & Crude Minerals	2 (2.68)	21 (38.52)	7 (12.50)	3 (5.52)	- (0.74)	22 (40.04)	55 (1.95)
Metalliferous Ores & Metal Scrap	- (4.64)	- (7.97)	2 (26.31)	1 (11.51)	1 (9.92)	2 (39.65)	6 (0.23)
Mineral Fuels	2 (2.89)	7 (10.52)	46 (71.04)	1 (1.85)	2 (2.77)	7 (10.92)	65 (2.29)
Coconut Oil	- (1.03)	- (46.15)	- (33.33)	- (19.49)	-0	- 0 -	- (0.01)
Other Coconut Products	- (23.83)	0	- (17.32)	- (22.24)	0	- (36.61)	1 (0.03)
Other Animal & Vegetable Oil	1 (7.41)	3 (21.07)	1 (3.87)	1 (10.13)	- (1.63)	8 (55.89)	14 (0.50)
Fertilizer	1 (0.22)	3 (0.91)	2 (0.61)	- (0.06)	- (0.01)	340 (98.21)	346 (12.27)
Chemicals	97 (21.67)	53 (11.79)	31 (6.86)	82 (18.45)	17 (3.86)	167 (37.37)	447 (15.80)
Textile & Garment Products	24 (45.00)	2 (3.26)	2 (4.35)	21 (39.29)	4 (8.08)	- (0.03)	53 (1.88)
Iron & Steel	6 (5.95)	4 (3.98)	34 (35.09)	8 (8.43)	19 (19.90)	26 (26.64)	98 (3.48)
Non-Ferrous Metals	8 (31.29)	5 (19.29)	1 (4.55)	4 (15.72)	4 (14.57)	4 (14.58)	27 (0.96)
Manufactures of Metal, n.e.s.	5 (19.06)	2 (7.49)	6 (25.03)	5 (20.08)	5 (20.08)	2 (8.26)	25 (0.89)
Machinery & Transport Equipment	22 (22.13)	7 (7.02)	20 (20.58)	18 (18.59)	30 (30.27)	1 (1.42)	99 (3.51)
Miscellaneous Manufactured Articles	19 (41.28)	2 (4.43)	5 (10.39)	15 (32.07)	5 (11.73)	- (0.09)	46 (1.64)
Others	28 (22.76)	6 (4.73)	3 (2.74)	20 (16.72)	10 (8.08)	54 (44.97)	121 (4.28)
TOTAL	347 (12.30)	261 (9.25)	272 (9.66)	392 (13.88)	113 (4.00)	1436 (50.91)	2821 (100.00)

Note: The totals do not equal the sums of the individual values due to rounding errors.

Appendix 4.3.1 (2) Estimated Volume of Foreign Trade Cargo Handled at South Harbor by Commodity (1985)

(Export)

(Unit: '000 TONS)

COMMODITY	Pier 3	Pier 5	Pier 9	Pier 13	Pier 15	Anchorage	Total
Dairy Products	- (32.26)	- (13.01)	0	1 (54.72)	0	0	1 (0.08)
Fish & Fish Products	14 (61.08)	1 (2.88)	- (0.08)	8 (35.76)	- (0.11)	- (0.09)	23 (3.09)
Wheat & Wheat Products	- (100.00)	0	0	0	0	0	- (0.00)
Other Cereals	1 (23.89)	0	2 (73.29)	- (2.81)	0	0	3 (0.47)
Feeding Stuff	1 (75.09)	- (13.07)	- (1.82)	- (9.88)	- (0.15)	0	1 (0.19)
Other Food	34 (25.42)	7 (4.86)	- (0.34)	89 (66.08)	- (0.08)	4 (3.22)	135 (18.40)
Tobacco	8 (52.84)	- (2.24)	1 (4.14)	6 (39.07)	- (0.07)	- (1.64)	16 (2.20)
Wood & Wood Manufactures (excluding furniture)	20 (15.72)	21 (16.50)	52 (40.25)	10 (7.45)	26 (19.97)	- (0.11)	129 (17.63)
Paper and Pulp	2 (73.26)	- (1.29)	- (0.20)	- (24.98)	- (0.27)	0	2 (0.21)
Textile Fibers	3 (29.32)	1 (6.22)	1 (5.11)	6 (59.10)	- (0.24)	0	11 (1.46)
Crude Fertilizers & Crude Minerals	6 (50.59)	2 (14.67)	2 (18.32)	1 (9.83)	1 (6.59)	0	12 (1.66)
Metalliferous Ores & Metal Scrap	2 (62.24)	- (14.38)	- (21.72)	- (1.46)	- (0.20)	0	2 (0.28)
Mineral Fuels	1 (54.55)	- (10.96)	0	1 (31.92)	- (2.58)	0	2 (0.28)
Coconut Oil	- (0.22)	- 0	0	- (0.21)	- -	84 (99.57)	84 (11.49)
Other Coconut Products	26 (29.06)	1 (1.0)	- (0.16)	15 (17.50)	- (0.05)	45 (52.23)	88 (12.0)
Other Animal & Vegetable Oil	- (19.16)	- (0.06)	- (0.24)	- (18.98)	- (0.91)	2 (60.64)	2 (0.23)
Fertilizer	- (35.92)	- (15.53)	- (48.54)	0	0	0	- (0.01)
Chemicals	13 (50.50)	1 (3.81)	1 (2.80)	5 (21.46)	- (0.88)	5 (20.55)	25 (3.48)
Textile & Garment Products	15 (47.37)	2 (6.71)	1 (2.90)	13 (41.55)	- (1.15)	- (0.33)	31 (4.21)
Iron & Steel	2 (40.84)	1 (19.06)	- (11.96)	1 (27.55)	- (0.59)	0	4 (0.57)
Non-Ferrous Metals	5 (51.69)	1 (14.06)	- (0.72)	3 (32.35)	- (1.18)	0	9 (1.26)
Manufactures of Metal, n.e.s.	3 (43.10)	1 (10.64)	1 (14.19)	2 (27.78)	- (4.03)	- (0.27)	6 (0.80)
Machinery & Transport Equipment	8 (58.60)	1 (5.03)	2 (12.35)	2 (18.13)	1 (5.13)	- (0.77)	13 (1.77)
Miscellaneous Manufactured Articles	36 (54.76)	3 (4.78)	2 (3.66)	24 (36.38)	- (0.20)	- (0.21)	65 (8.88)
Others	35 (51.30)	6 (9.17)	1 (2.12)	22 (31.82)	3 (3.81)	1 (1.78)	68 (9.33)
TOTAL	233 (31.77)	49 (6.66)	68 (9.22)	210 (28.66)	31 (4.26)	142 (19.43)	733 (100.00)

Note: The totals do not equal the sums of the individual values due to rounding errors.

Appendix 4.3.1 (3) Estimated Volume of Foreign Trade Cargo Handled at South Harbor by Commodity (1985)

(Total)

(Unit: '000 M/T)

COMMODITY	Pier 3	Pier 5	Pier 9	Pier 13	Pier 15	Anchorage	Total
Dairy Products	37 (48.26)	9 (11.68)	1 (2.12)	29 (37.94)	- (0)	0	76 (2.15)
Fish & Fish Products	14 (51.12)	2 (7.63)	- (0.56)	9 (33.18)	2 (3.84)	1 (3.68)	28 (0.78)
Wheat & Wheat Products	4 (1.04)	3 (0.87)	3 (0.79)	2 (0.63)	- (0.06)	356 (96.62)	368 (10.36)
Other Cereals	7 (1.13)	99 (16.99)	92 (15.68)	94 (16.18)	5 (0.95)	287 (49.08)	584 (16.44)
Feeding Stuff	10 (5.55)	4 (2.23)	4 (1.92)	12 (6.18)	3 (1.49)	157 (82.63)	190 (5.35)
Other Food	60 (30.43)	14 (7.26)	1 (0.48)	116 (59.09)	1 (0.51)	4 (2.23)	196 (5.51)
Tobacco	18 (62.52)	1 (4.27)	1 (2.40)	8 (29.01)	- (0.87)	- (0.93)	28 (0.80)
Wood & Wood Manufactures (excluding furniture)	24 (16.91)	21 (15.24)	56 (39.99)	12 (8.88)	26 (18.48)	1 (0.49)	140 (3.95)
Paper and Pulp	29 (36.34)	6 (7.08)	8 (9.89)	36 (45.72)	1 (0.96)	0	80 (2.25)
Textile Fibers	15 (30.57)	16 (33.12)	2 (5.45)	12 (24.50)	3 (6.36)	0	48 (1.35)
Crude Fertilizers & Crude Minerals	8 (11.40)	23 (34.18)	9 (13.56)	4 (6.30)	1 (1.80)	22 (32.76)	67 (1.89)
Metalliferous Ores & Metal Scrap	2 (18.51)	1 (9.51)	2 (25.20)	3 (9.09)	1 (7.58)	3 (30.11)	9 (0.24)
Mineral Fuels	3 (4.49)	7 (10.53)	46 (68.84)	2 (2.79)	2 (2.77)	7 (10.58)	67 (1.87)
Coconut Oil	- (-0.23)	- (0.11)	- (0.08)	- (-0.25)	-0 -	85 (99.33)	85 (-2.38)
Other Coconut Products	26 (29.01)	1 (0.99)	- (0.33)	16 (17.55)	- (0.05)	46 (52.08)	89 (2.51)
Other Animal & Vegetable Oil	1 (8.69)	3 (18.79)	1 (3.47)	2 (11.09)	- (1.55)	9 (56.40)	16 (0.44)
Fertilizer	1 (0.23)	3 (0.91)	2 (0.62)	- (0.06)	- (0.01)	340 (98.18)	346 (9.73)
Chemicals	109 (23.24)	53 (11.35)	31 (6.64)	88 (18.61)	17 (3.69)	172 (36.46)	471 (13.25)
Textile & Garment Products	38 (45.87)	4 (4.53)	3 (3.81)	34 (40.12)	5 (5.53)	- (0.14)	84 (2.37)
Iron & Steel	7 (7.39)	5 (4.60)	35 (34.14)	9 (9.22)	19 (19.11)	26 (25.55)	102 (2.88)
Non-Ferrous Metals	13 (36.51)	6 (17.95)	1 (3.57)	7 (19.98)	4 (11.14)	4 (10.85)	36 (1.02)
Manufactures of Metal, n.e.s.	7 (23.64)	2 (8.09)	7 (22.97)	7 (21.54)	5 (17.02)	2 (6.73)	31 (0.87)
Machinery & Transport Equipment	29 (26.38)	8 (6.79)	22 (19.62)	21 (18.53)	31 (27.34)	1 (1.35)	112 (3.15)
Miscellaneous Manufactured Articles	55 (49.14)	5 (4.63)	7 (6.45)	39 (34.64)	6 (4.98)	- (0.16)	112 (3.14)
Others	62 (33.10)	12 (6.34)	5 (2.51)	42 (22.19)	13 (6.54)	55 (29.32)	189 (5.33)
TOTAL	580 (16.33)	310 (8.71)	340 (9.57)	602 (16.94)	144 (4.05)	1578 (44.39)	3554 (100.00)

Note: The totals do not equal the sums of the individual values due to rounding errors.

Appendix 4.3.2 (1) Historical Trend of Import and Export Cargo Volume by Major Commodity Handled at the Port of Manila (NCSO Statistics)

(Unit: 1,000 Tons)

COMMODITY	1980	1981	1982	1983	1984	1985
Dairy Products	110** (3%)	101 (3%)	134 (3%)	111 (2%)	69 (2%)	87 (3%)
Fish & Fish Products	39** (1%)	41 (1%)	60 (1%)	11 (0%)	1 (0%)	5 (0%)
Wheat & Wheat Products	424 (11%)	471 (12%)	533 (12%)	447 (10%)	413 (14%)	384 (12%)
Other Cereals	302 (8%)	319 (8%)	433 (10%)	617 (14%)	422 (14%)	593 (19%)
Feeding Stuff	289 (7%)	256 (6%)	454 (10%)	317 (7%)	361 (12%)	272 (9%)
Other Food	40 (1%)	52 (1%)	67 (1%)	56 (1%)	17 (1%)	35 (1%)
Tobacco	16 (0%)	18 (0%)	15 (0%)	15 (0%)	9 (0%)	13 (0%)
Wood & Wood Manufactures (excluding furniture)	2 (0%)	1 (0%)	1 (0%)	1 (0%)	0 (0%)	0 (0%)
Paper and Pulp	186 (5%)	172 (4%)	197 (4%)	200 (4%)	142 (5%)	156 (5%)
Textile Fibers	68** (2%)	68 (2%)	62 (1%)	66 (1%)	44 (1%)	56 (2%)
Crude Fertilizers & Crude Minerals	106 (3%)	114 (3%)	128 (3%)	116 (3%)	77 (3%)	111 (4%)
Metalliferous Ores & Metal Scrap	24 (1%)	24 (1%)	11 (0%)	9 (0%)	8 (0%)	12 (0%)
Mineral Fuels	49 (1%)	44 (1%)	47 (1%)	44 (1%)	94 (3%)	109 (3%)
Coconut Oil	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other Coconut Products	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other Animal & Vegetable Oil	27 (1%)	31 (1%)	30 (1%)	38 (1%)	25 (1%)	19 (1%)
Fertilizer	239 (6%)	455 (11%)	247 (6%)	259 (6%)	254 (9%)	324 (10%)
Chemicals	520 (13%)	585 (14%)	590 (13%)	697 (16%)	498 (17%)	445 (14%)
Textile & Garment Products	28 (1%)	29** (1%)	29 (1%)	37 (1%)	30 (1%)	32 (1%)
Iron & Steel	641 (17%)	630 (16%)	778 (17%)	765 (17%)	203 (7%)	132 (4%)
Non-Ferrous Metals	55 (1%)	58 (1%)	67 (1%)	66 (1%)	36 (1%)	28 (1%)
Manufactures of Metal, n.e.s.	63 (2%)	57 (1%)	55 (1%)	60 (1%)	24 (1%)	35 (1%)
Machinery & Transport * Equipment	360 (9%)	297 (7%)	320 (7%)	320 (7%)	101 (3%)	103 (3%)
Miscellaneous Manufactured Articles	31 (0%)	30 (1%)	32 (1%)	29 (1%)	12 (0%)	17 (1%)
Others	236** (7%)	186** (5%)	186 (4%)	171 (4%)	142 (5%)	159 (5%)
TOTAL	3,882	4,039	4,476	4,452	2,982	3,127

Source: NCSO Foreign Trade Statistics

Note : * Excluding Imported Ships in Machinery & Transport Equipment.

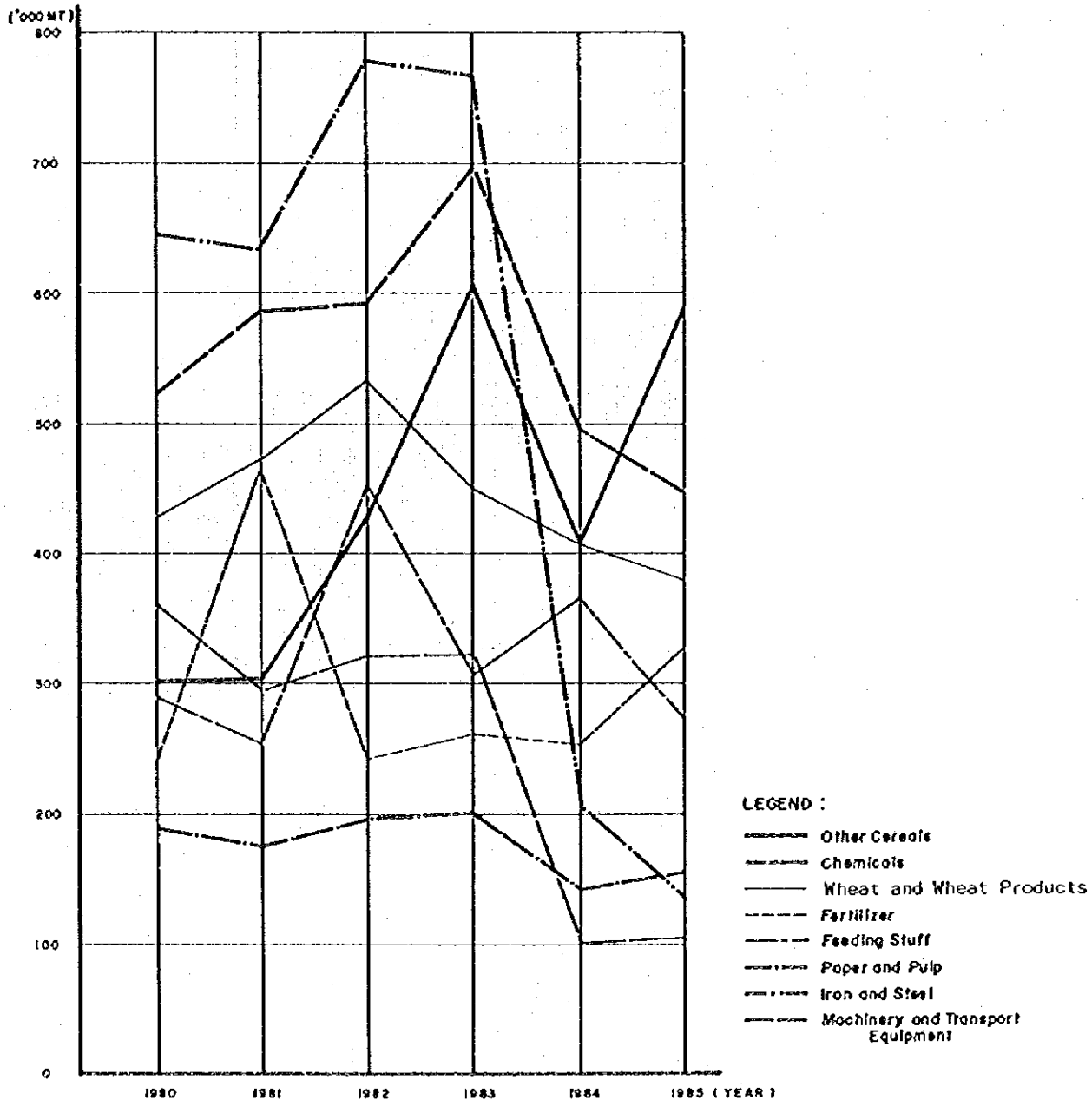
** Estimated by Consultant

Appendix 4.3.2 (2) Historical Trend of Import and Export Cargo Volume by Major Commodity Handled at the Port of Manila (NCSO Statistics)

(Unit: 1,000 Tons)

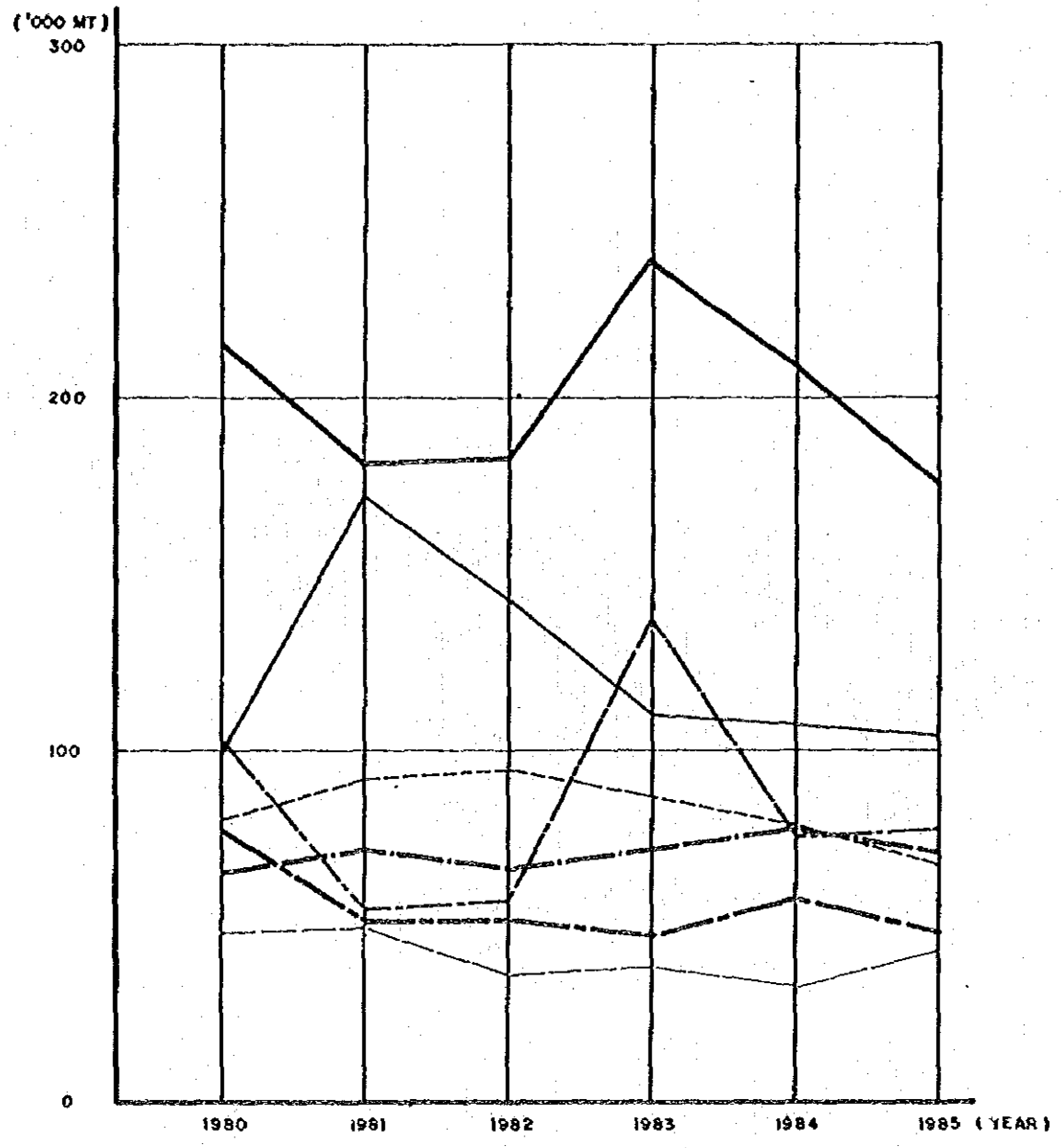
COMMODITY	1980	1981	1982	1983	1984	1985
Dairy Products	4 (0%)	3 (0%)	3 (0%)	4 (0%)	1 (0%)	0 (0%)
Fish & Fish Products	49 (4%)	50 (5%)	37 (4%)	38 (4%)	33 (4%)	43 (5%)
Wheat & Wheat Products	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other Cereals	171 (14%)	37 (4%)	4 (0%)	45 (4%)	6 (1%)	5 (0%)
Feeding Stuff	79 (6%)	50 (5%)	52 (6%)	58 (5%)	59 (6%)	47 (5%)
Other Food	100 (8%)	173 (16%)	143 (16%)	110 (10%)	108 (12%)	104 (12%)
Tobacco	20 (2%)	30 (3%)	28 (3%)	24 (2%)	20 (2%)	21 (2%)
Wood & Wood Manufactures (excluding furniture)	216 (18%)	181 (17%)	183 (20%)	238 (22%)	209 (23%)	176 (20%)
Paper and Pulp	6 (0%)	11 (1%)	7 (1%)	7 (1%)	6 (1%)	7 (1%)
Textile Fibers	33 (3%)	30 (3%)	32 (4%)	30 (3%)	34 (4%)	26 (3%)
Crude Fertilizers & Crude Minerals	7 (0%)	20 (2%)	16 (2%)	18 (2%)	18 (2%)	21 (2%)
Metalliferous Ores & Metal Scrap	5 (0%)	6 (0%)	6 (1%)	13 (1%)	6 (0%)	16 (2%)
Mineral Fuels	2 (0%)	11 (1%)	2 (0%)	5 (0%)	3 (3%)	2 (0%)
Coconut Oil	103 (8%)	54 (5%)	57 (6%)	137 (13%)	75 (8%)	77 (7%)
Other Coconut Products	80 (7%)	92 (9%)	95 (10%)	87 (8%)	79 (9%)	66 (7%)
Other Animal & Vegetable Oil	5 (0%)	2 (0%)	2 (0%)	2 (0%)	6 (0%)	4 (0%)
Fertilizer	2 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0%)	0 (0%)
Chemicals	37 (3%)	43 (4%)	28 (3%)	32 (32%)	29 (3%)	38 (4%)
Textile & Garment Products	30 (2%)	24 (3%)	18 (2%)	16 (2%)	15 (2%)	17 (2%)
Iron & Steel	4 (0%)	11 (1%)	4 (0%)	8 (1%)	3 (0%)	7 (1%)
Non-Ferrous Metals	5 (0%)	4 (0%)	6 (1%)	4 (0%)	9 (1%)	14 (2%)
Manufactures of Metal, n.e.s.	10 (0%)	8 (1%)	8 (1%)	6 (1%)	4 (0%)	4 (0%)
Machinery & Transport Equipment	29 (2%)	15 (1%)	11 (1%)	13 (1%)	17 (2%)	20 (2%)
Miscellaneous Manufactured Articles	67 (6%)	73 (7%)	66 (7%)	71 (7%)	78 (8%)	71 (8%)
Others	167 (14%)	132 (13%)	107 (12%)	103 (10%)	112 (12%)	113 (13%)
TOTAL	1,231	1,060	915	1,069	931	899

Appendix 4.3.3 (1) Historical Trend of Selected Foreign Trade Commodities



Source : NCSO Foreign Trade Statistics

Appendix 4.3.3 (2) Historical Trend of Selected Foreign Trade Commodities



Source : NCSO Foreign Trade Statistics

LEGEND :

- Wood and Wood Manufacturers
- Other Food
- Coconut Oil
- Other Coconut Products
- Miscellaneous Manufactured Articles
- Feeding Stuff
- Fish and Fish Preparation

Appendix 5.1.1

OBJECTIVES OF PPA

The statuatory objectives of PPA area as follows:

a) To coordinate, streamline, improve and optimize the planning, development, financing, construction, maintenance and operation of ports, port facilities, port physical plants, and all equipment used in connection with the operation of ports.

b) To ensure the smooth flow of waterborne commerce passing through the country's ports whether public or private, in the conduct of international and domestic trade.

c) To promote regional development through the dispersal of industries and commercial activities throughout the different regions.

d) To foster inter-island seaborne commerce and foreign trade.

e) To redirect and reorganize port administration beyond its specific and traditional functions of harbor development and cargo handling operations to the broader function of total port district development, including encouraging the full and efficient utilization of port hinterlands and tributary areas.

f) To ensure that all income and revenue accruing out of dues, rates, and charges for the use of facilities and services provided by the Authority are properly collected and accounted for by the Authority, that all such income and revenues are adequate to defray the costs of providing the facilities and services (inclusive of operating, maintenance, administration, and overhead costs) of the Port Districts, and that a reasonable return on the assets employed shall be realized.

Appendix 5.1.2 Government Agencies Providing Port-Related Services

1. Bureau of Customs (BOC)

Functions:

- assessment and collection of the lawful revenues from imported articles and all other dues, fees, charges, fines and penalties accruing under the tariff and customs laws.
- prevention and suppression of smuggling and other frauds upon the Customs.
- supervision and control over the entrance and clearance of vessels and aircraft engaged in foreign commerce.
- enforcement of the tariff and customs laws and all other laws, rules and regulations relating to tariff and customs administration.
- supervision and control over the handling of foreign mail arriving in the Philippines for the purpose of the collection of lawful duty on dutiable articles thus imported and the prevention of smuggling through the mail.
- assess and collect the export duty on dutiable Philippine export products and all other fees, duties and charges accruing therefrom.

2. Maritime Industry Authority (MARINA)

Objectives:

- to increase the production and productivity of the various islands and regions of the archipelago through the provision of effective sea linkages;
- to provide for the economical, safe, adequate and efficient shipment of raw materials, products, commodities and people;
- to enhance the competitive position of Philippine flag vessels in the carriage of foreign trade;
- to strengthen the balance of payment position by minimizing the outflow of foreign exchange and increasing dollar earnings; and
- to generate new and additional job opportunities.

To attain the goals and objectives of the government, MARINA has the following functions and responsibilities:

The adoption and implementation of a practicable and coordinated Maritime Industry Development Program that includes the following:

- the early replacement of obsolescent and uneconomic vessels;
- modernization and expansion of the Philippine merchant fleet;
- enchancement of the domestic capability for shipbuilding, repairs and

maintenance; and

- the development of a reservoir of trained maritime manpower.

3. The Philippine Coast Guard (PCG)

Functions:

- to enforce all applicable laws upon the high seas and waters under Philippine jurisdiction;
- to promulgate and administer regulations for the promotion of safety of life and property within the Philippine maritime jurisdiction;
- to develop,establish, maintain and operate aids to maritime navigation and rescue facilities for safety at sea, pursuant to IMO, SOLAS and the Maritime Pollution Convention.

4. The Bureau of Quarantine

Quarantine regulations for all ports of entry in the Philippines are promulagated and enforced by the Bureau of Quarantine.

In all ports of entry of the Philippines, all vessels are required to fly the yellow flag and drop anchor at the usual quarantine anchorage and wait for quarantine inspection. Foreign vessels that have been cleared in one port of the Philippines are not required to undergo another quarantine clearance at succeeding ports of call.

The quarantine clearance is pre-requisite to Customs and Immigration clearances. The examination at the ports of entry of the Philippines of incoming and outgoing vessels, the necessary surveillance over their sanitary conditions as well as their cargoes, passengers, crews and all personal effects and the issuance of quarantine certificates, bills of health or other equivalent documents are vested in and conducted by the Brueau of Quarantine.

5. The Bureau of Animal Industy

The Bureau of Animal Industry, through the Animal Control Division, supervises the importation into the country of domestic animals. To prevent the entry or spread within the Philippines of domestic animal diseases, the bureau enforces quarantine and restrictive orders which prohibit and regulate the importation or inter-provincial movement of these animals.

Domestic animals may only be admitted through the ports of entry upon the issuance of permits by the Director of the Bureau of Animal Industry or his authorized representative and after inspection by the respective veterinarians assigned for the purpose.

6. The Bureau of Immigration

The functions of the Bureau are the administration of the laws relating to the admission, exclusion, and deportation of aliens and also the fingerprinting of aliens in the Philippines.

The Master, agent, owner or consignee of any vessel arriving in the Philippines from a foreign port or departing from the Philippines for a foreign port upon arrival or departure must provide such crew lists and passenger manifests and such other information concerning the regulations prescribed by the Commissioner of Immigration.

7. Bureau of Forest Development (BFD)

Function:

- to check and monitor incoming/outgoing local forest products
- to issue commodity clearance on transported local forest products

8. National Cottage Industry Development Authority (NACIDA)

Function:

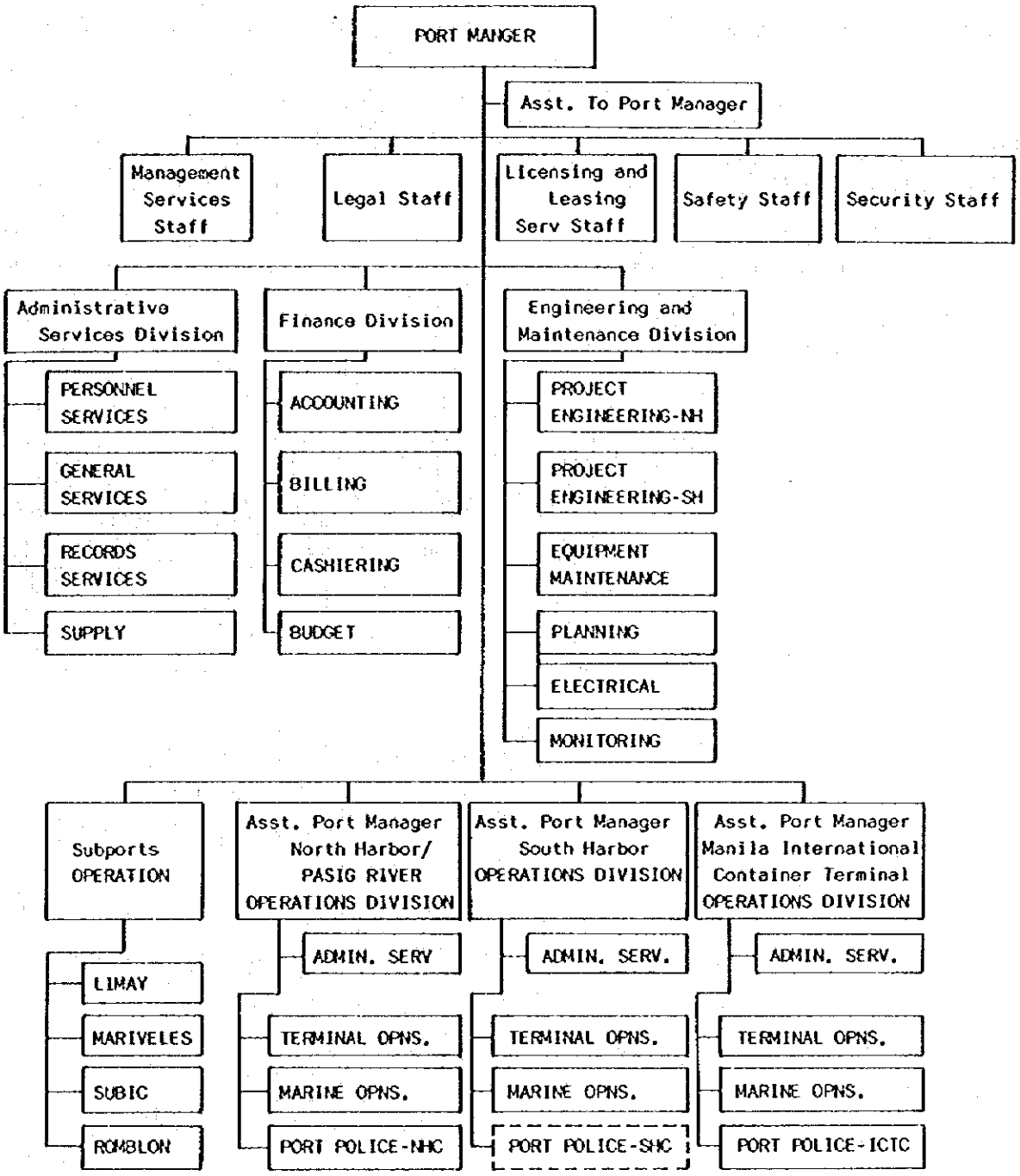
- inspection of items (cottage industry products) to be exported
- processing and issuance of export commodity clearance
- conducting visual inspection of goods to be exported

9. Bureau of Fisheries & Aquatic Resources (BFAR)

Function:

- inspection of fishery products for export
- processing and issuance of export commodity clearance

Appendix 5.1.3 Organizational Chart
of the Port Management Unit of the Port of Manila



Appendix 5.1.4 Principal Port Services Provided at South Harbor, Port of Manila.

Following is a brief description of the principal port services provided at South Harbor.

** Arrastre

-- refers to the dockside aspect of port cargo handling. It complements stevedoring and comprises the handling of cargo on the wharf or between the consignee/shipper's establishment or trucks's tail-end and the ship's tackle.
Present Contractor: Marina Port Services, Inc.

** Stevedoring

-- Refers to cargo handling on board the vessel. Present Contractor: Ocean Terminal Services, Inc. (OTSI)

** Pilotage

-- Refers to the provision of pilotage services. This service is compulsory for all foreign vessels. This is exclusively offered by the Manila Harbor Pilots Association.

Port ancillary services and the number of operations authorized by PPA to operate at the South Harbor of the Port of Manila as of December 1985 are as follows:

** Brokerage

-- the business of assisting port users in complying with port and Customs laws, rules and regulations and expediting the processing of documents in the import/export business, and other similar facilitative services.
Number: 590

** Bunkering

-- the business of supplying and delivering oil, gasoline, lubricants, and

other oil products and materials to ships, tug boats and other water craft. Numbor: 10

** Canteen/Carinderia/Restaurant/Snack Counter

--the business of maintaining public eating places with more or less fixed or semi-fixed locations including mobile canteens, selling food items, refreshments and other consumables except wine, liquor and other similarly intoxicating beverages. Number 21

** Cargo Checking

-- the business of inspecting and determining the quantity, condition, packing numbers, marks and countermarks of cargoes for insurance and other related purposes. Number: 22

** Chassis and Container Repair

-- any work performed on equipment used in the handling of materials and goods so as to bring back its usefulness/worthiness. Number: 1

** Equipment Rental/Container Leasing

-- Equipment rental means the business of leasing equipment/machine parts used in the handling of materials and goods for a given period of time; container leasing is the business of renting any structure designed to hold/keep articles, materials and products inside the form of boxes, tanks and the like for singular or unit handling with a volume or capacity of not less than one (1) cubic meter. Number: 1

** Ferry Boat

-- the business of ferry ship's crew/agents, provisions and passengers to and from a vessel at berth or anchorage by means of small water craft. Number: 14

** Food Catering

-- the business of supplying food, refreshments and other consumables

except wine, liquor and other similarly intoxicating beverages to port workers, users and others by a duly licensed food caterer. As differentiated from a canteen/restaurant operator, a caterer does not maintain a fixed or semi-fixed location on the port premises. Number: 3

** Handicraft Selling

-- business, service or activity of engaging in the display/selling of handicraft and other souvenir items whenever there is a tourist/passenger vessel at the pier. Number: 12

** Laundry

-- the business of providing laundry service like washing linen, curtains and similar items used in the vessel and the clothing of the vessel's crew. Number 2

** Lighterage

-- the business of providing lighters (flat-bottomed boats) or barges for the transport of cargoes to and from vessels at berth or anchorage within the port, usually towed by a tugboat. Number: 31

** Maritime Surveying/Adjusting

-- the business of negotiating for or effecting the settlement of claims for damages or losses of cargoes in port. Number: 54

** Maritime Waste and Garbage Collection

-- means the collection of two types of refuse from vessels: garbage including solid waste from kitchens, and Oil Sludge, a precipitate or settling from oils as a result of oxidation that has taken place in the engine. Number: 4

** Ship and Cargo Salvaging

-- means the rescue of a ship and/or crew or the towing, breaking, scrapping or refloating of a ship, or any object to a safe place and/or the

removal of a sunken ship or other hazard from the sea or any body of water within the territorial jurisdiction of the country. Number: 1

** Ship Chandling

-- the business of supplying food items, groceries, consumables and other provisions to vessels and other seagoing craft docking at the piers, wharves and anchorages.. Number: 35

** Ship Cleaning and Barge Chipping

-- refers to vessel cleaning, chipping and painting services carried out manually but with the use of the necessary materials and tools. Vessels' tanks as well as holds and hulls are cleaned manually using brushes and other materials necessary to the operations. On the other hand, chipping services are rendered through the use of scraping or chipping implements. Marine paint is then applied to the space chipped to complete the maintenance operations. Number: 5

** Ship Equipment Repair

-- the business of undertaking minor repairs and upkeep of vessels and their cargo gear and equipment, either simultaneous with loading/unloading operations while at berth or at anchorage. Number: 10

** Shipping/Shipping Agents

-- are establishments that own and/or operate a vessel or a number of vessels for the purpose of waterborne commerce. Number: 77

** Tank Cleaning

-- refers to the cleaning/washing of tanks, normally oil tanks, either manually or by means of special tools/machines. Number: 1

** Trucking

-- the business of hauling or transporting cargoes to and from the port zone using trucks and similar motorized transport vehicles.

** Tug Assistance

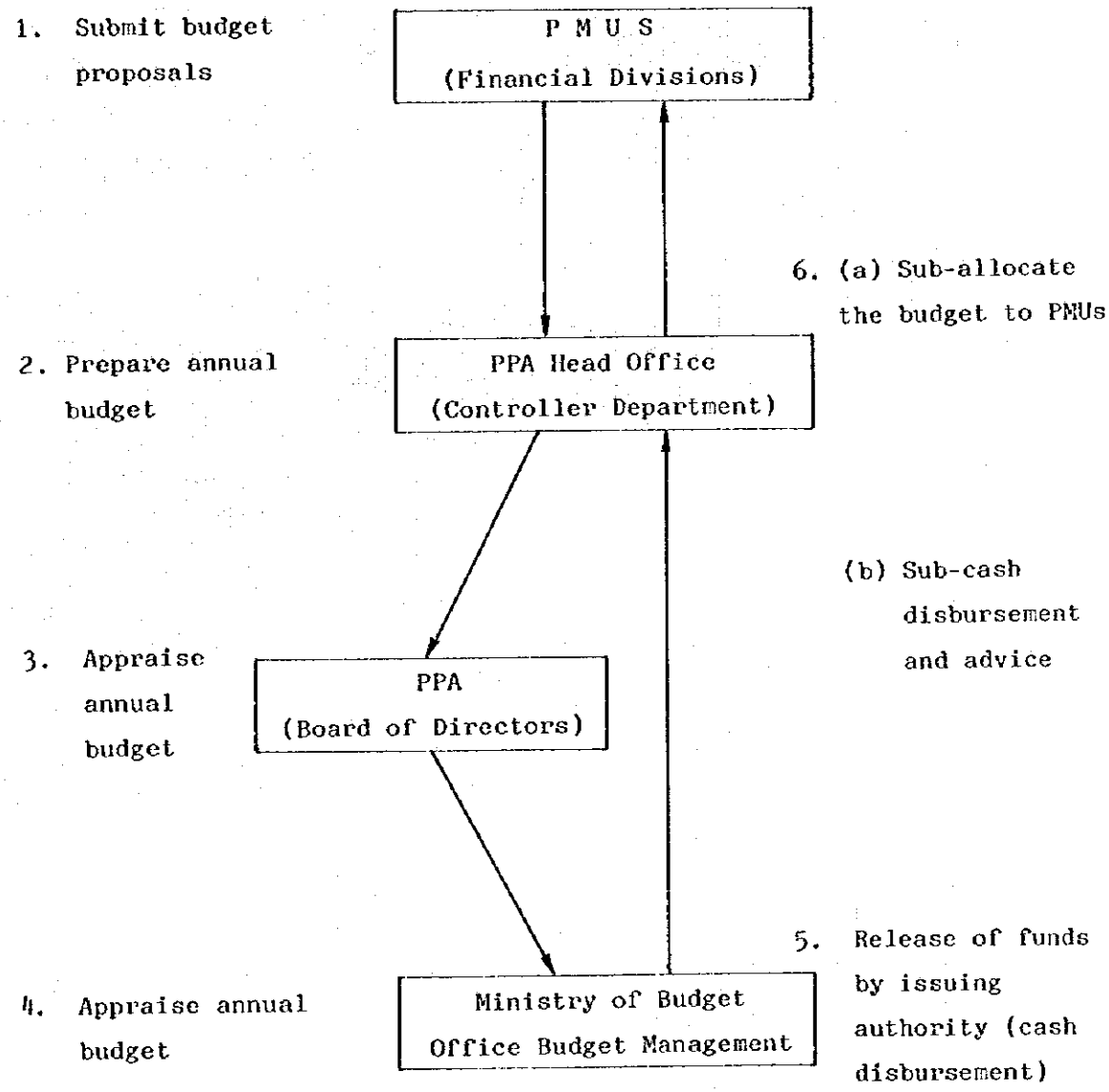
-- the service rendered by a tugboat in the docking of a vessel from outer anchorage to pier side and vice versa. It includes untwisting, mooring, unmooring, and shifting. Number: 5

** Water Supply

-- the business of providing fresh potable water to vessels docked at the piers, wharves and anchorages. Number: 3

Appendix 5.2.1

FLOW CHART OF BUDGET EXECUTION



Appendix 5.2.2 Port Tariff

A. CHARGES ON VESSELS

1. Vessels engaged in international (foreign) trade that enter any port whether private or government shall be charged a HARBOR FEE on each call based on GRT, as follows:

1985	
April 1	October 1
$0.054/GRT	$0.062/GRT

2. Vessels engaged in international (foreign) trade that berth at any port of call shall also be charged a BERTHING FEE per GRT per calendar day or fraction, as follows, provided that, for purposes of computation, a maximum of 30,000 GRT shall be used:

	1985	
	April 1	October 1
At a Government Port	$0.026/GRT	$0.030/GRT
At a Private Port	$0.019/GRT	$0.021/GRT

3. Vessels engaged in international (foreign) trade that do not berth but drop anchor at either a government or privately-owned port shall be charged an ANCHORAGE FEE of one-half (1/2) of the corresponding berthing fee at a government port subject to the same maximum 30,000 GRT, as follows:

1985	
April 1	October 1
$0.013/GRT	$0.015/GRT

4. Vessels engaged in coastal (domestic) trade that berth or drop anchor at any port whether government or privately-owned shall be charged a port USAGE FEE, as follows:

	1985	
	April 1	October 1
Up to 5 GRT	NO CHARGE	
6 to 100 GRT per calender day or fraction	P 16.40	P 18.80
Over 100 GRT per GRT per calendar day or fraction	P 0.164	P 0.188

PROVIDED that the USAGE FEE shall also apply on those vessels authorized to engage in the socalled "Barter Trade" and, PROVIDED FURTHER that registered bay and river trade vessels shall pay one-half (1/2) of the required USAGE FEE but in no case less than or more than the following charges for a calendar day or fraction:

	1985	
	April	October
Not less than	P 16.40	P 18.80
Not more than	P 82.00	P 94.00

5. Vessels engaged in coastal (domestic) trade that are authorized to temporarily lay up and anchor at any port shall be charged a LAY UP FEE corresponding to one-half of the applicable USAGE FEE.

	1985	
	April 1	October 1
6 - 100 GRT per calendar day or fraction	P 8.20	P 9.40
Over 100 GRT per GRT per calendar day or fraction	P 0.082	P 0.094

B. CHARGES ON CARGOES

6. All non-containerized foreign cargoes coming from (imported), going out (exported) or transshipped through a government-owned wharf shall be charged a WHARFAGE FEE for the use of port facilities on the basis of the total revenue tonnage rounded off to the nearest ton, as follows:

	1985	
	April 1	October 1
If Imported, per revenue ton	P 20.50	P 23.50
If Exported, per revenue ton	P 10.25	P 11.75
Foreign Transshipment a single charge per revenue ton payable by the shipping/line agent	$ 0.466	$ 0.534

PROVIDED that the minimum charge shall be P5.00.

7. All containerized foreign cargoes wholly owned by a single shipper/consignee (FCL) shall be charged a WHARFAGE FEE per box, as follows:

	1985	
	April 1	October
If Imported		
20 - ft	P 348.50	P 399.50
35 - ft	440.75	505.25
40 - ft	522.75	599.25
45 - ft	615.00	705.00
If Exported		
20 - ft	P 174.25	P 199.75
35 - ft	221.40	253.80
40 - ft	262.40	300.80
45 - ft	307.50	352.50

Foreign Transhipment

20 - ft	$ 8.01	$ 9.18
35 - ft	10.06	11.53
40 - ft	11.92	13.67
45 - ft	13.97	16.02

PROVIDED THAT if cargoes in a box are owned by more than one (1) shipper/consignee, that is LCL containers, the WHARFAGE FEE for non-containerized cargoes shall apply; and PROVIDED FURTHER that NO WHARFAGE FEE shall be charged on empty containers, i.e. without contents of any sort. Empty containers are clarified as follows:

1. Empty containers which are imported or brought into th Philippines for use in the exportation of Philippine products shall be exempt from wharfage fee.
2 Empty containers used in coastwise trade and transported by a vessel of a shiping company which owns said containers or by a vessel of a sister company or brought by a vessel of another shipping company when the container owner does not have a vessel calling at the place of shipment are also exempt from wharfage.
3 All other empty containers not falling under paragraphs No. 1 and 2 hereof shall be subject to wharfage in accordance with the rates prescribed in paragraph 7 and 9 of PPA Memorandum Circular No. 06-85.

8. All non-containerized domestic cargoes shall be charged a WHARFAGE FEE as they enter or leave a government-owned wharf on the basis of their total revenue tonnage rounded off to the nearest ton at rates as follows:

	1985	
	April 1	October 1
Per revenue ton	P 1.44	P 1.65

PROVIDED that the minimum charge shall be P 1.00.

9. Domestic containerized cargoes wholly owned by a single shipper/ consignee (FCL) shall be charged a WHARFAGE FEE on a box basis as the box enters or leave a government-owned wharf at the following rates

	1985	
	April 1	October 1
10 - ft box or shorter	P 11.48	P 13.16
20 - ft	22.96	26.32
35 - ft	28.70	32.90
40 - ft	34.44	39.48
45 - ft	40.18	46.06

PROVIDED that if cargoes in a box are owned by more than one shipper/consignee (LCL), the wharfage fee for non-containerized cargo shall apply. PROVIDED FURTHER, that no wharfage fee shall be charged on an empty box, i.e., without contents of any sort. Empty containers clarified as follows:

1 Empty containers which are imported or brought into the Philippines for use in the exportaion of Philippine products shall be exempt from wharfage fee.

2 Empty containers used in coastwise trade and transported by a vessel of a shiping company which owns said containers or by a vessel of a sister company or brought by a vessel of another shipping company when the container owner does not have a vessel calling at the place of shipment are also exempt from wharfage.

3 All other empty containers not falling under paragraphs No. 1 and 2 hereof shall be subject to wharfage in accordance with the rates prescribed in paragraph 7 and 9 of PPA Memorandum Circular No. 06-85.

10. The WHARFAGE FEE for all foreign and domestic cargoes whether containerized or not that are loaded or discharged at a privately-owned wharf or at an anchorage area shall be one-half (1/2) of the corresponding charge for one that is government-owned, as follows:

	1985	
	April 1	October 1
a) Foreign		
Non-Containerized		
If Imported/R.T.	P 10.25	P 11.75
If Exported/R.T.	P 5.13	P 5.88
Transhipment/R.T.	$ 0.23	$ 0.27
Containerized (FCL) (Per Box)		

If Imported:		
20 - ft	P 174.25	P 199.75
35 - ft	221.40	253.80
40 - ft	262.40	300.80
45 - ft	307.50	352.50
If Exported:		
20 - ft	P 88.15	P 101.05
35 - ft	110.70	126.90
40 - ft	131.20	150.40
45 - ft	153.75	176.25

	1985	
	April 1	October 1
Foreign Transshipment:		
20 - ft	S 3.91	S 4.49
35 - ft	5.03	5.77
30 - ft	5.96	6.84
45 - ft	6.89	7.90
b) Domestic		
Non-Containerized	P 0.72	P 0.82
Containerized (FCL) (Per Box)		
10 - ft	P 5.74	P 6.58
20 - ft	11.48	13.16
35 - ft	14.35	16.45
40 - ft	17.22	19.74
45 - ft	20.09	23.03

11. The WHARFAGE FEE for all foreign and domestic cargoes whether containerized or not that are loaded or discharged from a vessel at anchor without using any wharf of a government or privately-owned port shall be one-half (1/2) of the corresponding charge for one that is government-owned. (Same as No. 10).

12. A STORAGE FEE shall be charged on cargoes that remain in any government-owned port beyond the "free storage period".

The said period is defined for all types of cargoes as follows:

a)	For Imported cargoes	8 calendar days after the day that the last item of cargo is discharged from the carrying vessel.
b)	For Export Cargoes	5 calendar days from the day that the cargo is received at the port.
c)	For Foreign Transshipment	a total of 15 calendar days from the day of arrival to the day of departure.
d)	For Domestic Cargoes Entering any port	2 calendar days prior to the day that the carrying vessel is scheduled to arrive as announced and approved by the PPA Port Manager.
e)	For Domestic Cargoes Discharged at any Port and Export Shutout Cargoes	2 calendar days after the day that the last item of cargo is unloaded from the carrying vessel.
f)	For Domestic Cargoes that are "Shutout" (not loaded on their scheduled vessel)	2 calendar days after vessel's departure.

PROVIDED that if the cargo is not loaded as scheduled due to the fault of the vessel or its owner/agent, the resulting fee shall be paid for by the vessel or its owner/agent.

13. The STORAGE FEE for non-containerized cargoes shall be determined on the basis of the number of calendar days that the cargo stays in port after the "free storage period" and the total revenue tonnage of the cargo according to the following schedule per revenue ton per day or fraction, as follows:

	1985	
	April 1	October 1
Imported Cargoes	P 6.56	P 7.52
Cargoes for Export	3.28	3.76
Foreign Transhipment	$ 0.164	$ 0.171
Domestic Cargoes	4.92	5.64

14. The STORAGE FEE of a container whether or not it contains cargo shall be determined on the basis of the number of calendar days the cargo stays in port after the prescribed "Free Storage Period", as follows:

	1985	
	April 1	October 1
Foreign Imported Box		
20 - ft	P 209.92	P 240.64
35 - ft	367.36	421.12
40 - ft	419.84	481.28
45 - ft	472.32	541.44

	1985	
	April 1	October 1
Foreign Exported Box		
20 - ft	P 52.48	P 60.16
35 - ft	91.84	105.28
40 - ft	104.96	120.32
45 - ft	117.26	134.42

	1985	
	April 1	October 1
Foreign Transhipped Box		
20 - ft	$ 4.77	$ 5.47
35 - ft	8.35	9.57
40 - ft	9.54	10.94
45 - ft	10.66	12.22
Domestic Box		
10 - ft	P 55.35	P 63.45
20 - ft	157.44	180.48
35 - ft	274.70	314.90
40 - ft	314.88	360.96

15. For those ports declared as congested by the PPA Board of Directors from time to time, the STORAGE CHARGE for the first 7 calendar days after the "Free Storage Period" shall be the rates prescribed above and thereafter shall be escalated, as follows:

a) From 8th to the 15th calendar day, twice the prescribed rates.

b) From the 16th to the 30th calendar day, thrice the prescribed rates.

c) From the 31st day onward, four times the prescribed rates.
PROVIDED that foreign transhipment containers shall not be subject to the said escalation.

16. Extension of the prescribed "free storage period" will be allowed only in the following cases:

a) For reasons of force majeure as authorized by the Port Manager concerned and confirmed by the PPA General Manager or his duly authorized representative.

b) For reasons of delay in the processing of the required entry or exit documents by the Bureau of Customs as formally atttested to by the Commissioner of Customs or his duly authorized representative.

c) For reasons beyond the control of cargo owner/consignee and found meritorious in accordance with rules and procedures issued by the PPA Board of Directors.

EXEMPTIONS FROM PORT CHARGES

17. Notwithstanding the above provisions, cargoes of duly BOI-registered firms as well as those granted special exemptions by Presidential issuances decreed after 1 January 1976 shall be exempted from payment of port charges until otherwise revoked or amended.

Appendix 5.2.3 (1) Balance Sheet (PPA)

(Unit: Million Pesos)

	1980	1981	1982	1983	1984	1985
Current Assets	448.0	508.7	571.0	690.3	774.6	1177.2
Temporary Investments	267.6	110.9	173.5	228.0	183.4	621.0
Other Current Assets	180.4	397.8	397.5	462.3	591.2	556.2
Bond Sinking Funds	10.9	11.2	9.7	10.3	10.6	10.6
Fixed Assets	2278.4	2533.3	2830.3	3167.6	3333.8	3768.4
Land	730.8	604.7	604.7	604.7	604.7	604.7
Construction in progress	369.5	638.0	418.2	716.7	948.1	1372.7
Total Net Dep'ble Assets	1178.1	1290.6	1807.4	1846.2	1781.0	1791.0
Bldg.,Struct.,Land Impr.	1923.4	1824.5	2254.3	2253.8	2253.2	2254.5
Furn.,Fixtures & Eqpt.	23.1	270.1	441.0	555.5	578.2	676.7
Less Accum. Depreciation	768.4	804.0	887.9	963.1	1050.4	1140.2
Other Assets	151.8	172.0	139.3	131.5	3.7	3.0
Total Assets	2889.1	3225.2	3550.3	3999.7	4122.7	4959.2
Current Liabilities	112.5	85.3	104.7	254.0	228.5	362.4
Long-term Liabilities	186.4	486.7	645.9	854.9	1052.8	1512.4
Total Liabilities	298.9	572.0	750.6	1108.9	1281.3	1875.4
Capital Contribution	2349.5	2320.3	2395.8	2390.8	2390.8	2391.1
Surplus Reserves	-	-	3.5	3.8	4.2	3.7
Retained Earnings - Beg	157.5	240.7	330.9	400.4	496.2	446.4
Additional Collections of PY	5.5	6.8	10.4	13.0	118.6	18.5
Net Income	88.7	98.9	79.9	108.8	68.8	224.0
Retained Earnings - End.	240.7	332.9	400.4	496.2	446.4	689.0
Total Net Worth	2590.2	2653.2	2799.7	2890.8	2841.4	3083.8
Liabilities & Net Worth	2889.1	3225.2	3550.3	3999.7	4122.7	4959.2
Debt Ratio (%)	10.3	17.7	21.1	27.7	31.1	37.9

Appendix 5.2.3 (2) Income Statement (PPA)

(Unit: Million Pesos, %)

	1980	1981	1982	1983	1984	1985
Revenue from Operations	223.1	279.6	341.7	391.2	444.5	612.1
Berthing Charges	22.0	29.5	37.3	27.3	45.9	66.3
Anchorage Fees	-	-	-	2.6	10.2	13.2
Wharfage Dues	94.3	128.5	160.8	175.1	181.5	270.4
Storage Charges	23.7	24.3	26.7	34.1	26.7	23.6
Arrastre Income	60.2	67.7	79.7	84.4	85.9	121.0
Port Usage Fees	-	-	-	21.8	27.6	31.7
Harbor Fees	-	-	-	18.9	33.3	47.5
Other Income	22.9	29.6	37.2	27.0	33.4	38.4
Operating Expenses	173.3	198.0	232.1	228.2	284.8	302.5
Personnel Services	54.2	58.0	59.2	58.8	62.9	73.9
Maintenance & Operating Exp.	119.1	140.0	172.9	169.4	221.9	228.6
Repairs & Maintenance	14.3	24.3	32.7	19.7	41.8	35.0
Depreciation Expenses	45.1	47.4	71.4	78.5	81.2	88.0
Dredging Expenses	33.9	34.8	34.3	33.0	50.8	29.7
Other Administrative Costs	25.8	33.5	34.5	38.2	48.1	149.8
Net Operating Income	49.8	81.6	109.6	163.1	159.7	309.6
Additional Fund Management Income	58.6	51.9	33.5	36.9	58.8	102.1
Less Other Expenses in Excess of Appreciation	19.7	34.6	63.2	91.3	149.7	187.6
Interest on Loans	13.5	21.8	36.1	80.4	128.2	141.7
Others	6.2	12.8	27.1	10.9	21.5	45.9
Net Income (Loss) from Operations	88.7	98.9	79.9	108.8	68.8	224.0
Working Ratio (%)	57.5	53.9	47.0	38.3	45.8	35.0
Operating Ratio (%)	77.7	70.8	67.9	58.3	64.1	49.4

Appendix 5.2.3 (3) Cash Flow (PPA)

(Unit: Million Pesos)

	1980	1981	1982	1983	1984	1985
Cash Balance January 1	396.1	366.9	350.6	406.3	519.7	601.7
(Add) Cash Inflow	314.4	637.7	541.4	656.3	695.4	1145.7
Port Operating Revenue	219.9	271.6	339.3	386.3	440.0	579.6
Interest Income	58.5	51.9	33.6	36.9	52.5	114.6
Foreign Loan Availments	36.0	314.2	168.5	233.1	202.9	451.5
Cash Available	710.5	1004.6	892.0	1062.6	1215.1	1747.4
(Less) Cash Outflow	343.6	654.0	485.7	542.9	613.4	762.4
Operating Expenses	94.5	115.9	126.4	115.9	145.8	168.2
Debt Service	30.0	35.9	42.6	82.6	114.5	31.4
Interest	13.5	21.7	36.1	57.9	47.5	15.7
Principal	16.5	14.2	6.5	24.7	67.0	15.7
Infrastructure Project	156.0	331.4	254.0	296.6	289.3	526.5
Dredging Project	30.0	74.0	31.4	22.1	50.8	29.7
EQ Transfer to NDC	-	-	39.0	5.0	-	-
Others	33.1	96.8	7.7	20.7	13.0	6.6
Cash Balance December 31	366.9	350.6	406.3	519.7	601.7	985.0

Appendix 5.2.4 (1) Balance Sheet (PMU-Manila)

	1980	1981	1982	1983	1984	1985
Current Assets	19.5	21.0	19.3	32.6	32.9	70.9
Fixed Assets	1006.1	979.4	1087.0	1264.5	1230.7	1195.6
Land	421.3	425.3	425.3	425.3	508.5	425.3
Construction in Progress	3.4	-	-	-	-	0.2
Total Net Dep'ble Assets	581.4	554.1	661.7	839.2	720.6	770.1
Bldgs.,Struct.,Land Impr.	1098.6	1098.8	1173.9	1394.2	1310.3	1393.5
Office,Furn.,Fix.& Eqpt.	4.0	15.0	73.0	72.4	73.2	78.6
Less Accum. Depreciation	521.2	547.7	585.2	627.4	662.9	702.0
Other Assets	64.1	97.4	69.6	47.8	1.6	1.7
Total Assets	1089.7	1089.7	1175.9	1344.9	1263.6	1268.2
Current Liabilities	16.4	12.0	10.0	8.9	8.2	18.1
Other Liabilities	-	-		1.9	1.6	3.1
Total Liabilities	16.4	12.0	10.0	10.8	9.8	21.2
Net Income for the Year	55.2	73.3	91.2	123.0	108.2	189.0
CO/PMU Clearing Account	1018.1	1012.5	1074.7	1211.1	1145.6	1058.0
Total Net Worth	1073.3	1085.8	1165.9	1334.1	1253.8	1247.0
Total Liabilities & Networth	1089.7	1097.8	1175.9	1344.9	1263.6	1268.2
Debt Ratio (%)	1.5	1.1	0.9	0.8	0.8	1.7

Appendix 5.2.4 (2) Income Statement (PMU-Manila)

(Unit: Million Pesos)

	1980	1981	1982	1983	1984	1985
Revenue from Operations	120.2	149.0	187.0	213.5	213.3	297.4
Berthing Charges	8.5	10.3	14.5	15.0	25.0	33.5
Anchorage Fees	5.7	7.8	8.9	0.2	0.6	4.9
Wharfage Dues	46.1	62.2	80.2	88.2	75.3	112.2
Storage Charges	19.2	20.2	23.8	30.9	23.1	21.6
Arrastre Income	34.4	43.1	48.8	50.8	46.9	74.0
Port Usage Fees	-	-	-	7.5	7.8	7.4
Harbor Fees	0.7	0.8	1.2	9.7	12.7	19.2
Other income	12.0	14.8	19.7	17.4	21.9	24.6
Operating Expenses	49.9	67.9	79.7	85.8	91.7	93.8
Personnel	5.7	6.0	9.6	14.8	15.8	18.4
Maintenance & Operating Expenses	37.0	53.6	65.2	71.0	75.9	75.4
Repairs & Maintenance	5.7	12.1	8.1	4.9	4.1	11.7
Depreciation-Operating Assets	20.3	20.1	27.2	31.6	30.6	30.2
Amortization - Dredging	4.6	10.4	20.6	23.1	30.0	17.2
Other Administrative Costs	6.4	11.0	9.3	11.4	11.2	16.3
Net Operating Income	70.3	86.3	107.3	133.7	121.6	203.6
Other Charges	15.1	13.0	13.7	9.0	13.4	14.6
Depreciation - Non-operating Assets	5.7	5.8	6.4	6.4	6.4	6.4
Interest on Loans	3.8	1.6	1.7	2.6	7.0	8.2
Amort. Pre-Operating Expenses	5.6	5.6	5.6	-	-	-
Net Income	55.2	73.3	93.6	124.7	108.2	189.0
Working Ratio (%)	24.6	31.0	28.1	24.7	28.6	21.4
Operating Ratio (%)	41.5	44.1	42.6	39.1	43.0	31.5

Appendix 5.2.4 (3) Cash Flow (PMU-Manila)

			1984	1985
Collections	Current Revenue		190.9	255.3
		Port Charges	129.3	180.8
		Arrastre/Stevedoring Income	47.9	57.7
		Other Income	13.6	16.5
		Fund Management Income	0.1	0.3
	Prior Years Receivables		11.2	6.9
	Unearned Income/Deposits		-	1.6
	For Other PMUs		4.5	8.4
	Total Collections		206.6	272.2
Disbursements		Personnel	13.8	16.0
		Maintenance/Other Operating Exp.	9.1	13.1
		R/M of Port Facilities	2.7	3.4
		Accounts Payable-Prior Years	4.9	3.9
	Sub-total		30.5	36.4
	Non-budgetary Disbursements		-	3.1
	ATPs disbursed from H.O.		-	0.4
	Total Disbursements		30.5	39.9
Surplus (Deficit)			176.1	232.3

Appendix 6.2.1 Future Socio-Economic Framework Projection

Low assumption:

"World Development Report - 1985" (World Bank) estimates a 4% annual growth rate from 1985 to 1990 for medium income oil importing countries like the Philippines. It is assumed that the 4% annual growth rate will continue through 2005. The sectoral shares are assumed to remain the same as in 1985.

High assumption:

NEDA established the "Medium-Term Philippine Development Plan, 1987-1992" in December, 1986. NEDA estimates a 5.5 % annual growth rate from 1985 to 1990. This growth rate is also used for 1990. It is also assumed that the 6% annual growth rate from 1990 to 1992 forecast by NEDA will continue through 2005. The sectoral shares are assumed equal to those forecast for 1990 by NEDA.

Medium assumption:

Annual growth rates are assumed based on NEDA's projections, interviews with experts at international agencies and the annual growth rates of the ASEAN countries which have similar sectoral GDP shares. The sectoral shares in 1990 are assumed equal to those in NEDA's preliminary estimate (as of 27 June, 1986). The sectoral shares from 1995 to 2005 are estimated based on the elasticity of each sector to GDP as follows:

Elasticity of each sector to GDP

(Unit: %)

	Agriculture	Industry	Services
1990 - 1995	0.90	1.10	1.00
1995 - 2000	0.90	1.05	1.00
2000 - 2005	0.90	1.05	1.00

Country	Period	Target Annual GDP Growth Rate
Thailand	1986 - 1991	5%
Malaysia	1986 - 1995	6.4%
Indonesia	1984/85 - 88/89	5%

Sectoral GDP of ASEAN Countries

		1975		1980		1984		1985	
	GDP	68,361	100.0	92,706	100.0	94,214	100.0	90,469	100.0
Philippines	Agriculture	18,361	26.6	23,732	25.6	25,439	27.0	26,010	28.8
(Million Pesos)	Industry	22,690	33.2	33,471	36.1	32,159	34.1	28,880	31.9
1972 prices	Services	27,453	40.2	35,503	38.3	36,616	38.9	35,579	39.3
	GDP	204,056	100.0	292,852	100.0	363,563	100.0		
Thailand	Agriculture	62,080	30.4	72,784	24.8	84,297	23.2		
(Million Baht)	Industry	51,312	25.2	87,513	29.9	106,901	29.4		
1972 prices	Services	90,664	44.4	132,555	45.3	172,365	47.4		
	GDP	*17,365	100.0	44,702	100.0	57,706	100.0		
Malaysia	Agriculture	4,804	27.7	10,189	22.8	11,623	20.1		
(Million Riaggit)	Industry	4,661	26.8	16,125	36.1	21,627	37.5		
1978 prices	Services	7,900	45.5	18,388	41.1	24,456	42.4		
	GDP	7,631		11,169	100.0	**77,967	100.0		
Indonesia	Agriculture	2,811	36.8	3,425	30.7	18,747	24.1		
(Billion Rupiah)	Industry	2,082	27.3	2,818	25.2	29,346	37.6		
1973 prices	Services	2,738	35.0	4,926	44.1	29,874	38.3		
	GDP	8,044	100.0	12,161	100.0	16,604	100.0	16,302	100.0
Singapore	Agriculture	136	1.7	159	1.3	154	0.9	138	0.9
(Million SS)	Industry	2,436	30.3	3,922	32.3	3,902	23.5	3,674	22.5
1968 prices	Services	5,472	68.0	8,080	66.4	12,548	75.6	12,490	76.6

* 1970 prices ** 1983 prices

Appendix 6.3.1 Supply and Consumption of Dairy Products in the Philippines

(1000 MT, kg/capita)

Year	Import		Production		(Moving Avg. every 3 years)	
	Actual	Moving Avg. every 3 years	Actual	Moving Avg. every 3 years	Total Supply	Per capita Consumption
1970	106		2.3			
1971	100	95	2.5	2.5	98	2.59
1972	79	81	2.6	2.6	84	2.16
1973	64	72	2.8	2.6	75	1.87
1974	73	64	2.6	6.6	67	1.63
1975	56	70	2.5	2.5	73	1.73
1976	82	80	2.3	2.3	82	1.89
1977	102	90	2.3	2.3	92	2.06
1978	87	104	2.5	2.5	107	2.34
1979	122	106	2.5	2.5	109	2.32
1980	109	108	2.5	2.5	111	2.30
1981	93	107	2.6	2.6	110	2.22
1982	118	106	2.6	2.6	109	2.15
1983	106	97	2.6	2.6	100	1.92
1984	66	85	2.5	2.5	88	1.65
1985	83					

Sources: (1) Import Volume: NCSO

(2) Production: BAEcon

Appendix 6.3.2 Harvest Area of Corn

Year	Yellow corn		White corn and Others		Total	
	Actual	Moving Avg. every 3 years	Actual	Moving Avg.	Actual	Moving Avg.
1975	281		2,729		3,010	
1976	365	336	2,828	2,812	3,193	3,149
1977	363	376	2,879	2,822	3,243	3,198
1978	400	410	2,758	2,808	3,158	3,218
1979	467	436	2,786	2,786	3,252	3,204
1980	440	461	2,761	2,770	3,201	3,231
1981	475	492	2,763	2,775	3,239	3,267
1982	560	531	2,800	2,721	3,361	3,253
1983	557	588	2,600	2,675	3,158	3,263
1984	646	676	2,624	2,571	3,270	3,248
1985	825		2,490		3,315	

Source: BAEcon

Appendix 6.3.3 Mean Yield of Corn

Year	Yellow Corn		White and Other Corn		Total Corn	
	Actual	Moving Avg. every 3 years	Actual	Moving Avg.	Actual	Moving Avg.
1975	0.94		0.82		0.84	
1976	0.71	0.81	0.87	0.85	0.85	0.85
1977	0.78	0.82	0.86	0.87	0.86	0.82
1978	0.96	0.85	0.88	0.91	0.89	0.90
1979	0.80	0.89	0.98	0.95	0.95	0.94
1980	0.92	0.85	0.98	0.98	0.98	0.96
1981	0.84	0.93	0.98	0.98	0.96	0.97
1982	1.03	0.99	0.97	0.97	0.98	0.98
1983	1.10	1.14	0.97	0.97	0.99	1.00
1984	1.29	1.30	0.96	0.94	1.02	1.02
1985	1.50		0.88		1.04	

Source: BAEcon

Appendix 6.3.4 Corn Yields in Other Asian Countries (1984)

	(t/ha)
Asian average	2.8
Thailand	2.5
Indonesia	1.6
Malaysia	1.6
Vietnam	1.2
Burma	1.8

Source: FAO "Production Year Book 1984"

Appendix 6.3.5 Corn Production in the Philippines

Crop Year	Production ('000 mt)		Area ('000 ha.0)		Yield (mt/ha.)	
	Actual	Avg. 3 years	Actual	Avg. 3 years	Actual	Avg. 3 years
1969/1970	2,008		2,420		0.83	
1971	2,012	2,015	2,428	2,434	0.83	0.83
1972	2,024	1,960	2,454	2,411	0.83	0.81
1973	1,843	2,042	2,351	2,510	0.78	0.81
1974	2,258	2,205	2,726	2,696	0.83	0.82
1975	2,514	1,496	3,010	2,976	0.84	0.84
1976	2,717	2,669	3,193	3,149	0.85	0.85
1977	2,775	2,763	3,243	3,198	0.86	0.87
1978	2,796	2,887	3,158	3,218	0.89	0.90
1979	3,090	3,003	3,252	3,204	0.95	0.94
1980	3,123	3,108	3,201	3,231	0.98	0.96
1981	3,110	3,174	3,239	3,267	0.96	0.97
1982	3,290	3,175	3,361	3,253	0.98	0.98
1983	3,126	3,254	3,158	3,263	0.99	1.00
1984	3,346	3,304	3,270	3,248	1.02	1.02
1985	3,439		3,315		1.04	

Source: BAEcon

Average Annual Growth Rate

	Production	Area	Yield
1970/71 - 1974/75	5.50%	5.15%	0.30%
1974/75 - 1979/80	4.48	1.66	2.71
1979/80 - 1983/84	1.54	0.13	1.53

Appendix 6.3.6 Domestic Use of Corn in the Philippines

Crop Year (July-June)	Seed[1]	Feed and[2] Waste	Other Non-Food[3]	Food Use		Ending Stocks
				Total[4]	Per Capita	
	thousand metric tons				kilograms	Thousand metric tons
1960/70	39	651	53	1,205	33,19	120
1970/71	39	671	52	1,253	33.50	148
1971/72	40	754	73	1,257	32,70	241
1972/73	38	684	89	1,267	32.07	96
1973/74	43	738	90	1,317	32.43	257
1974/75	49	832	97	1,709	40.95	243
1975/76	52	884	103	1,822	42.48	153
1976/77	53	1,123	112	1,646	37.36	154
1977/78	51	1,202	119	1,559	34.45	153
1978/79	65	1,288	122	1,560	33.56	264
1979/80	64	1,573	136	1,559	32.65	148
1980/81	65	1,687	146	1,536	31.32	175
1981/82	67	1,802	155	1,544	30.71	172
1982/83	63	1,893	165	1,479	28.69	104
1983/84	65	1,877	171	1,477	27.95	181

1 1969/70-1977/78 seed is at the rate of 16.24 kgs./ha.;
1978/799 onwards at 20 kgs./ha.
2 Based on feed demand equation.
3 Manufacture is based on trend.
4 Food demand equation/disappearance method.

Source: Policy Analysis Staff, MAF based on data from BAEcon, NFA and NFAC.

Appendix 6.3.7 Population of Poultry and Hogs (thousand heads)

Year	Poultry		Hogs	
	Actual Population	5 year Average	Actual Population	5 year Average
1973	49,965		8,627	
1974	47,818		6,605	
1975	46,745	47,098	6,647	6,813
1976	45,671	48,883	6,489	6,469
1977	45,289	49,184	5,696	6,637
1978	58,893	50,387	6,910	6,895
1979	49,321	52,798	3,445	7,149
1980	52,761	55,682	7,934	7,568
1981	57,724	56,354	7,758	7,782
1982	59,711	58,331	7,795	7,816
1983	62,255		7,980	
1984	59,205		7,612	

Source: BAEcon

Appendix 6.3.8 Trend of Feed Use of Corn and Feed Requirement for Poultry and Hogs

Year	Feed use of Corn (Average every 5 years)	Feed Requirement for Poultry and Hogs (Average every 5 years)
1975	852	6,932
1976	956	6,7006
1977	1,066	6,852
1978	1,214	7,097
1979	1,375	7,375
1980	1,510	7,800
1981	1,649	7,994
1982	1,767	8,081

Appendix 6.3.9 Supply and Use of Soybean Meal

(Unit: Thousand tons)

Year	Local Production Actual Volume	Import	Total Use	
			Actual	Avg. every 5 years
1975	9.9	41	51	68
1976	8.9	76	85	85
1977	10.9	96	107	105
1978	6.2	116	122	134
1979	9.3	124	133	163
1980	9.6	215	224	225
1981	12.8	218	231	260
1982	25.1	387	413	308
1983	24.5	275	299	
1984	-	375	375	
1985		226		

Source: BAEcon

Appendix 6.3.10 Population of Commercial Poultry and Hogs

(Thousand heads)

Year	Commercial Poultry		Commercial Hogs	
	Actual	Avg. every 5 years	Actual	Avg. every 5 years
1972	9,670		554	
1973	9,641		559	
1974	8,297	8,847	564	461
1975	8,308	9,440	569	615
1976	8,320	11,008	574	749
1977	12,636	11,650	808	906
1978	17,477	12,602	1,228	1,072
1979	11,511	14,762	1.351	1,278
1980	13,068	16,233	1,400	1,442
1981	19,116	16,780	1,605	1,497
1982	19,992	18,266	1,628	1,477
1983	20,214		1,500	
1984	18,939		1,253	

Source: BAEcon

Appendix 6.3.11 Estimation of Local Production of Soybean Meal

The future consumption of soybeans is estimated below.

Based on MAF statistics, the per capita use of soybeans in the Philippines increased at an average annual growth rate of 12.7% from 1975 to 1982 using 3 year running averages, and reached 0.76 kg/capita in 1982.

However, the per capita soybean consumption of the Philippines is relatively low compared with the other ASEAN countries; 2.2 kg in Thailand, 4.7 kg in Indonesia and 6.2 kg in Malaysia according to FAO statistics (1979-1981).

Therefore, the high growth rate of the per capita use of soybeans in the Philippines will likely continue.

The following average annual growth rates are assumed for the study period.

Year	Estimated growth rate	Estimated per capita use (kg/capita)	Estimated total consumption of soybeans (thousand tons)
1982		0.76 *	38.6*
	12%		
1990		1.9	117
	10%		
1995		3.1	212
	8%		
2000		4.6	346
	5%		
2005		5.9	481

*average of 3 years (1981-1983)

From 1975 to 1983, the food use of soybeans (the consumption as unprocessed beans) increased at an average annual growth rate of 6.8% and recorded 8.6 thousand tons in 1983. However the per capita figures were erratic.

So the future volume of the food use of soybeans is estimated assuming an average growth rate of 6%.

The estimated local production of soybean meal is equal to 80% of the total consumption of soybeans minus the estimated food use.

The forecast local production volume of soybean meal is as follows:

(Year)	1990	1995	2000	2005
Estimated local production of soybean meal (thousand tons)	66	123	204	285

Soybeans: Domestic Use

Year	Crush		Food Use (Per capita)		Total Use Per capita	
	Actual	Avg. every 5 years	Actual	Avg. every 3 years	Actual	Avg. every 3 years
1970	1.64		1.14		2.84	
1971	1.06	1.60	1.32 (0.04)	1.18 (0.03)	2.44	
1972	2.11	2.70	1.07 (0.03)	1.21 (0.03)	3.24	
1973	4.92	3.02	1.25 (0.03)	1.46 (0.04)	6.23	
1974	2.04	6.46	2.07 (0.05)	2.86 (0.07)	4.25	
1975	12.42	8.54	5.27 (0.13)	5.06 (0.12)	18.08	14.0 (0.33)
1976	11.15	12.39	7.84 (0.18)	6.91 (0.16)	19.55	19.8 (0.46)
1977	13.61	10.84	7.61 (0.17)	7.36 (0.17)	21.74	18.7 (0.42)
1978	7.76	11.02	6.64 (0.15)	7.29 (0.16)	14.86	18.8 (0.41)
1979	11.68	10.46	7.61 (0.16)	7.72 (0.17)	19.71	18.6 (0.40)
1980	11.94	13.21	8.92 (0.19)	8.69 (0.18)	21.34	22.4 (0.46)
1981	16.00	19.95	9.54 (0.19)	9.79 (0.20)	26.06	30.1 (0.61)
1982	31.42	26.03	10.92 (0.22)	9.38 (0.19)	42.89	38.6 (0.76)
1983	30.66		7.67 (0.15)	8.58 (0.17)	46.76	
1984	-		7.16 (0.14)		7.54	

Source: BAEcon
Note: *Figures in parentheses show per capita use.*