APPENDIX VI-1 INCOME AND EXPENDITURE OF THE PROJECT

Income and expenditure in the target year of the project

(1) Income and expenditure items

1) Annual landing quantity : 30,475 tonnes
2) Daily average number of fishing boats that land their catch : 48 boats/day
3) Berthing charge : 100 Taka/boat-day
4) Annual fish distribution volume : 39,690 tonnes
5) Market utilization charge : 2% of the transaction sum
6) Average fish price : 22 Taka/kg (Average wholesale price of Hilsa, which accounts for 50% of the marine fish production)
7) Rent of the auctioneer's room : 900 Taka/month
8) Production capacity of the ice-making plant : 32 tonnes/day
9) Selling price of ice : Average 550 Taka/tonne
10) Payroll : (Refer to Section 4-3-5 Manning Plan)
11) Power charge : 2.01 Taka/KWH
12) Water charge : 14 Taka/m^3

(2) Annual income : 25,981,200 Taka/year

1) Berthing charge
48 boats/day x 360 days x 100 Taka/boat-day = 1,728,000 Taka/year

2) Market utilization charge
39,690 tonnes/year x 22 Taka/year x 2% = 17,463,600 Taka/year

3) Auctioneer's room rent
42 rooms x 900 Taka/months = 453,600 Taka/year

4) Ice block selling income

32 tonne/day x 550 Taka/tonne x 360 day = 6,336,000 Taka/year

(3) Annual expenditures 19,299,400 Taka/Year

1) Payroll : Annual sum : 2,135,000 Taka/Year

(Breakdown)

a) General Manager's room : 149,500 Taka/year
b) Administrative section : 780,000 Taka/year
c) Accounting section : 247,000 Taka/year
d) Market section : 188,500 Taka/year
e) Ice-making section : 338,000 Taka/year
f) Temporary hiring : 432,000 Taka/year
(24 persons/day x 50 Taka/day x 360 days)

2) Power charge : Annual sum : 3,169,400 Taka

a) Ice-making plant & cold store facilities :
4,080 KWH/day x 360 days x 2.01 Taka/KWH = 2,952,300
b) Ligthing : 50KW/hour x 6 hours/day x 360 day x 2.01 Taka/KWH = 217,100

3) Water charge
100 m^3/d x 360 days x 14 Taka/m^3 = 504,000 Taka/year

4) Maintenance costs : Annual sum : 4,800,000 Taka

a) Building maintenance : 3,000m^2 x 100 Taka/m^2 year = 300,000 Taka/year
b) Maintenance of the ice-making facilities : 2,500,000 Taka/year
- Refrigerator oil and refrigerant cost : 2,000,000 Taka
- Repair and spare parts cost : 500,000 Taka

c) Floating pontoon maintenance cost :
2,000,000 Taka/year (1,000,000 Taka/unit)

5) Office expenditures : Annual sum : 1,000,000 Taka

6) Depreciation cost : 7,691,000 Taka

a) Ice-making facilities :
35,000,000 Taka ÷ 10-year depreciation = 3,500,000 Taka/year
b) Floating pontoon : 12,000,000 ÷ 20-year depreciation x 3 units = 1,800,000 Taka/year
c) Fish box replacement cost : 1,830 boxes x 1,200 Taka/box = 2,196,000 Taka/year
d) Hand cart replacement cost : 39 units ÷ 2-year depreciation x 10,000 Taka/unit = 195,000 Taka/year

APPENDIX VI-2

Study on the capacity of the facilities designed against the demands of fish landing and distribution in the year of 2000.

(1) Forecast of the demands in 2000 (Refer to Chapter 4-3-2)

1) Annual fish landing by mechanized fishing boats

by gill-net fishery	47,990
by set bag net fishery	18,327
by long line fishery	1,971
	68,288 tonnes/year

2) Annual fish distribution in the project site

fish landing	68,288
collection from Kaptai lake	2,034
collection from inland capture	3,973
collection from inland culture	3,629
	77,924 tonnes/year

(2) Landing Facilities

1) Fish landing demands

a) Expected landing quantity : 68,288 tonnes/year

b) Average daily landing quantity : 190 tonnes/day (68,288 tonnes/year ÷ 360 days)

c) Daily number of fishing boats landing their catch : 76 boats (190 tonnes/day ÷ 2.5 tonne/boat)
(Fish landing of 2.5 tonnes/boat will be expected by utilizing its original fish holding capacity.)

APPENDIX VI-2

Study on the capacity of the facilities designed against the demands of fish landing and distribution in the year of 2000.

(1) Forecast of the demands in 2000 (Refer to Chapter 4-3-2)

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(2) Landing Facilities

1) Fish landing demands

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c) Daily number of fishing boats landing their catch : 76 boats (190 tonnes/day ÷ 2.5 tonne/boat)
(Fish landing of 2.5 tonnes/boat will be expected by utilizing its original fish holding capacity.)

2) Capability of the facilities to cope with the demand

a) Landing hours :
Landing will be carried out during the 6-hour period from 1:30 to 7:30 AM.

b) Landing rate :
Landing of the catch will be carried out at a rate of 1.4 hour/boat (2,500 kg ÷ 30 kg/min. = 83 min.)

c) Number of fishing boats that can land their catches :
69 boats (4 ÷ 1.4 hour x 16 boats/turn)

It is presumed that the capacity of the facilities of this project will be slightly insufficient for demands of the year of 2000. However, through the utilization of hand carts and fish boxes introduced under this project, it will be perfectly possible to make up for this insufficiency.

(2) Fish distribution facilities

1) Fish distribution demand

a) Expected fish distribution quantity : 77,924 tonnes/year

b) Daily average distribution demand : 216 tonnes/d (77,924 ÷ 360 days)

2) Capacity of the facilities

a) Distribution hours
Fish distribution will be carried out during the 6-hour period from 3:00 to 9:00 AM.

b) Number of rotations in the use of the wholesale market : 3 turns

c) Standard handling quantity per unit area in the wholesale market : 70 kg/m^2.
(Possible to realize 70 kg/m^2 through the use of stacking fish boxes)

d) Effective area of the wholesale space : 1,000 m^2

e) Handling capacity : 210 tonnes/day (1,000 m^2 x 70 kg/m^2 x 3 turns)

Then, the Capacity the facilities of this project is presumed to correspond to the quantity of fish distributed in the year of 2000.

Appendix VII-1 Annual wind direction

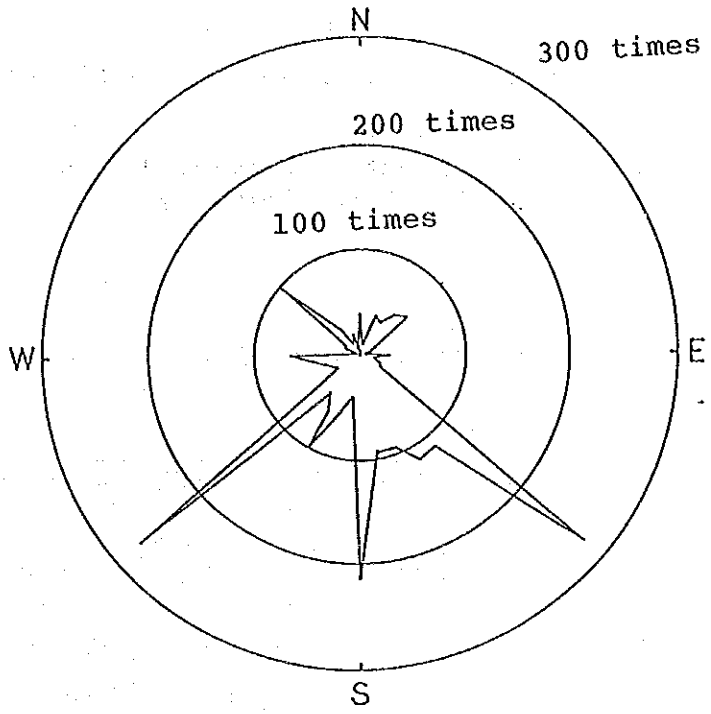


Diagram of annual wind direction (1989, 8 times measurement/day)

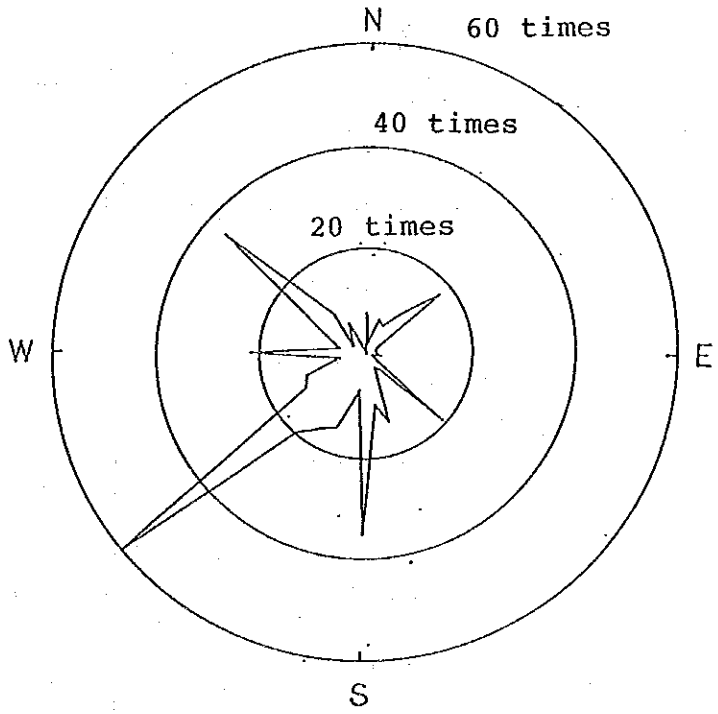


Diagram of daily maximum wind velocity and wind direction

Appendix VII-2

Results of harmonic analysis of tidal current and tidal level.

Harmonic analysis of tidal current and tidal level was performed for two days from 14:00 of February 6.

1. Tidal current

Harmonic coefficients of tidal current are shown as follows;

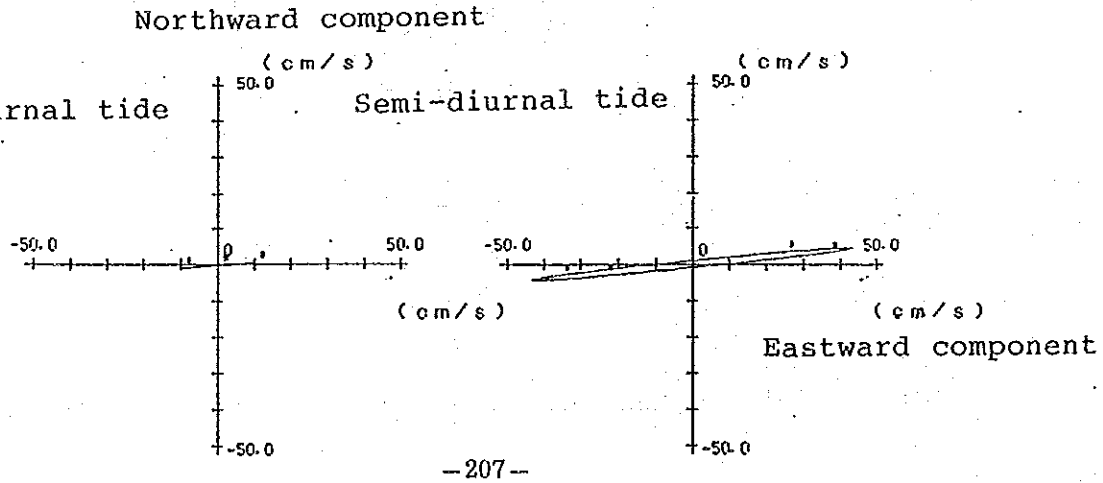
	Eastward component		Northward component	
	Velocity (cm/sec)	Lag (rad)	Velocity (cm/sec)	Lag (rad)
Diurnal tide	10.0	0.047	0.8	0.139
Semi-diurnal tide	43.6	0.592	4.5	0.804

2. Tidal level

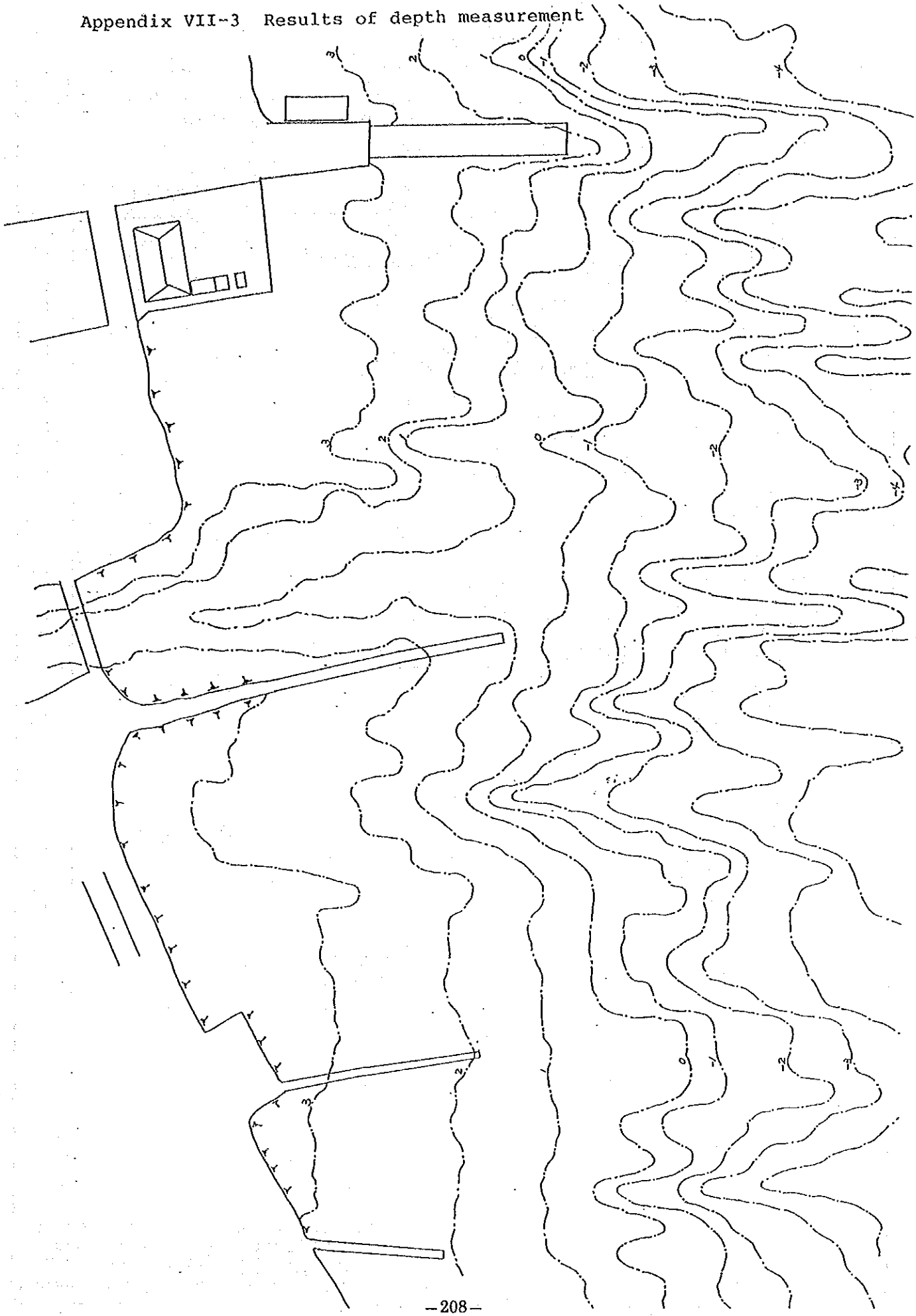
Harmonic coefficients of tidal level are shown as follows;

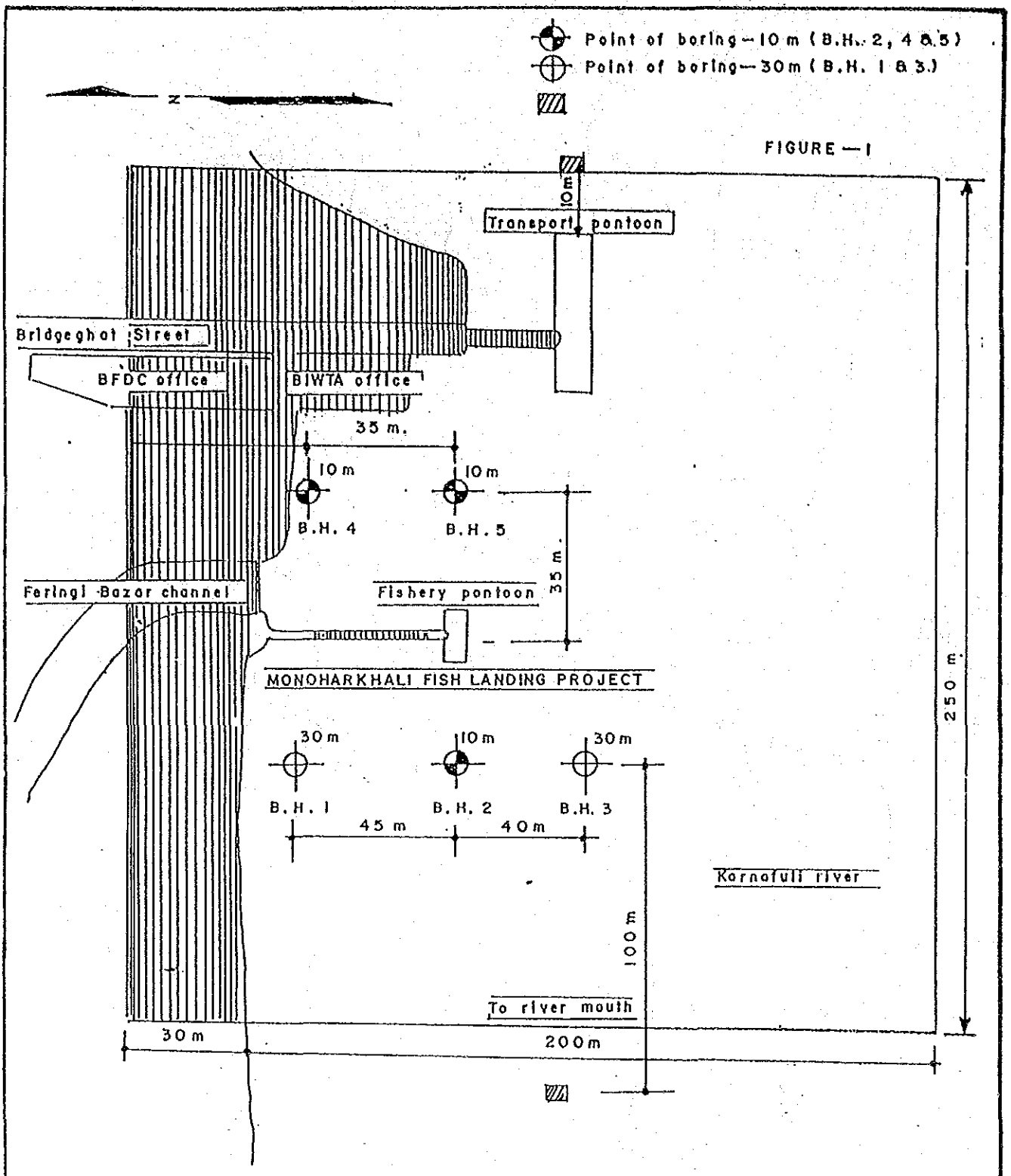
	Tidal level (cm/sec)	Lag (rad)
Diurnal tide	27.2	1.104
Semi-diurnal tide	110.4	1.941

Elliptic diagram of tidal current



Appendix VII-3 Results of depth measurement





LAY OUT PLAN OF BORE HOLES
PROPOSED FISH LANDING PROJECT
AT MONOHARKHALI, CHITTAGONG.
TECHNOCONSULTANT LTD. DHAKA

TECHNOCONSULT INT'L LTD. DHAKA.

CLIENT:- JICA., JAPAN.

PROJECT FISH LANDING PROJECT

Location MONOHORKHALI, CHITTAGONG

LOG OF BORING NO. 1 Date 3-2-91

G.W.T _____ Date _____

R.L. 3·33

GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			WATER CONTENT %		Density PCF (g/cm³)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA				S.P.T. Blows/M	ASPT Blows/0·33	Depth M	LOG	PROJECT FISH LANDING PROJECT Location MONOHORKHALI, CHITTAGONG LOG OF BORING NO. 1 Date 3-2-91 G.W.T _____ Date _____ R.L. 3·33	M
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In Place	Bulk	Dry		Void Ratio e_o	Compr. Index C_c	Type	Lateral Stress PSF	At Failure Strain %	At Failure Applied Stress PSF (kN/m²)		0 10 20 30 40				
																	3		+3·33		Grey soft clayey SILT	2
																	3		+2			
																	3		+1			
16	64	20															6		0		D_{60} = 0·025 mm. Grey medium sandy clay-SILT	4
																	9		-1			
																	5		-2		Grey medium clayey SILT with sand	6
38	48	14				36		116 (1·85)	85 (1·36)	2·67	0·7350	0·7511					10		-3		D_{60} = 0·005 mm.	
11	65	24				24		126 (0·02)	102 (1·63)				UC	0	5·5	12229 648	82	for 9"	-4		D_{60} = 0·014 mm. Grey very hard laminated sandy SILT with clay (Laminated SILTSTONE and SHALE)	8
																	95	for 8"	-5			
																	60	for 6"	-6			10
	61	35				32		119 (1·90)	99 (1·5)	2·67	0·673	0·284					51	for 3"	-7		D_{60} = 0·0062 mm.	
																	60	for 3"	-8			12
																	40	for 2"	-9			
5	74	21															46	for 3"	-10		D_{60} = 0·011 mm. Grey very hard SILT with clay little to trace sand	
																	46	for 2"	-11			14
																	34	for 1"	-12		(SHALE and SILTSTONE)	
7	69	24															60	for 2"	-13		D_{60} = 0·011 mm.	16
																	60	for 6"	-14			
																	68	for 6"	-15			18
																	86	for 6"	-16		Grey very hard sandy to clayey SILT (SILTSTONE)	
14	66	20															80	for 6"	-17		D_{60} = 0·016 mm.	20

DRAWN BY ..... DATE..... CHECKED BY. ..... DATE..... APPROVED BY ..... DATE .....

TECHNOCONSULT INT'L LTD. DHAKA.

GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			WATER CONTENT %		Density PCF (g/cm³)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA				S.P.T Blows/M	ASPT Blows/0-33	Depth M	LOG	PROJECT: FISH LANDING PROJECT Location: MONOHORKHALI, CTG. LOG OF BORING NO. 1 Date 6-2-91 G.W.T ____ Date ____
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In Place	Bulk	Dry		Void Ratio e_o	Compr. Index C_c	Type	Lateral Stress PSF	At Failure: Strain %	At Failure: Applied Stress PSF kN/m²		0 10 20 30 40	M		
																	90 for 6"		-18		
																			-19		(SILTSTONE)
																	48 for 2"		-20		22
11	73	16															30 for 1"				D_{60} = 0.016 mm.
																	45 for 2"		-22		24
																	46 for 3"				
7	67	26															50 for 3"		-24		D_{60} = 0.01 mm.
																	48 for 3"				Grey very hard SILT with clay trace sand.
4	66	30															48 for 2"		-26		D_{60} = 0.0075 mm.
																	46 for 3"				28
																	42 for 2"		-28		30

DRAWN BY ..... DATE..... CHECKED BY..... DATE..... APPROVED BY ..... DATE.....

TECHNOCONSULT INT'L LTD. DHAKA.

GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			WATER CONTENT %		Density PCF (g/cm³)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA			S.P.T Blows/M	ASPT Blows/0·33	Depth M	LOG	PROJECT FISH LANDING PROJECT Location MONOHORKHALI, CTG. LOG OF BORING NO. 2 Date 8-2-91 G.W.T HIGH TIDE 1·6 m LOW TIDE 0·0 m Date	M
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In Place	Bulk	Dry		Void Ratio ea	Compr. Index Cc	Type	Lateral Stress PSF	At Failure Strain %	At Failure Applied Stress PSF (kN/m²)		0 16 20 30 40			
31	51	18															5		+1·152 0		D_{60} = 0·042 mm. Dark grey medium to very soft clayey SILT with sand.	2
																	1-5 2		1 2			
11	63	26															8		3		D_{60} = 0·012 mm. Grey stiff sandy clay SILT.	4
5	66	29				23		128 (2·05)	104 (1·67)	2·7	0·6430	0·1231	UC	0	10	8921 436	76		4		D_{60} = 0·009 mm. Grey very hard laminated SILT with clay trace sand.	6
4	61	35															52 for 6 50 for 5" 60 for 6 50 for 3"		5 6 7 8		D_{60} = 0·0064 mm. (SILTSTONE and SHALE)	8
4	65	31				23		127 (2·03)	104 (1·67)	2·67			UC	0	8·5	4364 213	52 for 3"		9		D_{60} = 0·0085 mm.	10

DRAWN BY ..... DATE CHECKED SY. ..... DATE. ..... APPROVED BY..... DATE.

TECHNOCONSULT INT'L LTD. DHAKA.

GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			WATER CONTENT %		Density PCF (g/cm³)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA				S.P.T Blows/M	ASPT Blows/0-33	Depth M	LOG	PROJECT FISH LANDING PROJECT Location MONOHORKHALI, CHITTAGONG LOG OF BORING NO. 3 Date 9-2-91 G.W.T HIGH TIDE-6m Date LOW TIDE-4.2 m, R.L. 3.679	M
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In-Place	Bulk	Dry		Void Ratio e_o	Compr. Index Cc	Type	Lateral Stress PSF	At Failure Strain %	At Failure Applied Stress PSF (kN/m²)		0 10 20 30 40				
4	65	31															74		+3·679		D_{60} = 0·007 mm.	
																			+3			
6	65	29															86		+2		D_{60} = 0·0085 mm.	2
																	50 for 6"		+1			
8	67	25															60 for 6"		0		Grey very hard SILT with clay (Laminated SILTSTONE and SHALE)	4
																	66 for 6"				D_{60} = 0·014 mm.	
																			−2			
8	65	27															55 for 4"					6
																	50 for 4"				D_{60} = 0·011 mm.	
																			−4			8
																	45 for 3"					
																	50 for 3"					
24	62	14				20		131 (2·10)	109 (1·75)	2·67	0·6784	0·162	UC	0	7·5	3065 / 248			−6		D_{60} = 0·032 mm.	10
																	60 for 4"					
																	70 for 6"				Grey very hard clayey SILT with sand (SILTSTONE and SHALE)	
																			−8			12
																	60 for 6"					
																	40 for 2"					
																			−10			14
5	64	31															50 for 3·5				D_{60} = 0·008 mm.	
																	56 for 4"				Grey very hard SILT with clay little to trace sand.	
																			−12			16
																	52 for 4"				(Laminated Siltstone and Shale)	
																	50 for 3"					
																			−14			18
6	65	29															56 for 6"				D_{60} = 0·0095 mm.	
																	56 for 6"					
4	67	29																	−16		D_{60} = 0·01 mm.	20
																	60 for 6"					

DRAWN BY .....DATE..... CHECKED BY. .....DATE..... APPROVED BY .....DATE.....

TECHNOCONSULT INT'L LTD. DHAKA.

GRAIN SIZE ANALYSIS			ATTERBERG LIMITS			WATER CONTENT %		Density PCF (g/cm^3)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA				S.P.T Blows/ft	ASPT Blows/0-33	Depth M	LOG	PROJECT FISH LANDING PROJECT
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In Place	Bulk	Dry		Void Ratio e_o	Compr. Index Cc	Type	Lateral Stress PSF	At Failure Strain %	At Failure Applied Stress PSF kN/m^2		0 10 20 30 40			Location MONOHORKHALI, CHITTAGONG
																					LOG OF BORING NO. 3 Date 11-2-91
																					G.W.T HIGH TIDE- 6m Date
																					LOW TIDE- 4·2m RL. 3·679 M
																	66 for 6"		-18		22
																	52 for 6"				
6	62	32															51 for 6"		-20		D_{60} = 0·0082 mm.
																	60 for 6"				24
																	56 for 3"		-22		Grey very hard SILT with clay little sand
																					(Laminated Siltstone and Shale)
																	42 for 6"				26
																	102 for 4"		-24		
6	63	31															56 for 4"				D_{60} = 0·0078 mm.
																	50 for 6"		-26		28
																	80 for 6"				30

DRAWN BY .....DATE..... CHECKED BY. .....DATE..... APPROVED BY .....DATE.....

TECHNOCONSULT INT'L LTD. DHAKA.

PROJECT FISH LANDING PROJECT
Location MONOHORKH, CHITTAGONG
LOG OF BORING NO. 4 Date 13-2-91
G.W.T 20 cm. Date 15-2-91
RL. 3·977

GRAIN SIZE ANALYSIS Sand %	Silt %	Clay %	ATTERBERG LIMITS L.L.	P.I.	S.L	WATER CONTENT % At Test	In Place	Density PCF (g/cm³) Bulk	Dry	Specific Gravity	CONSOLIDATION Void Ratio e_o	Compr. Index Cc	SHEAR TEST DATA Type	Lateral Stress PSF	At Failure Strain %	Applied Stress PSF (kN/m²)	S.P.T Blows/H	ASPT Blows/0·33	Depth M	LOG	M	Description
8	67	25															3		+3·977			Grey soft clay — SILT little sand. D_{60} = 0·01 mm.
																			+3			
10	69	21				30		121 (1·94)	92 (1·47)	2·65			UC	0	17	1087 52	5 12		+2		2	Grey medium to stiff sandy clay-SILT D_{60} = 0·017 mm.
																			+1			
78	22	—				29		120 (1·92)	94 (1·5)	2·65	0·6978	0·067	UC	0	2	871 43	9 5		0		4	Grey loose SAND with silt D_{60} = 0·12 mm.
																			−1			
7	73	20															4 7		−2		6	Grey medium clayey SILT. little sand. D_{60} = 0·018 mm.
																			−3			
7	67	26															50 for 4"		−4		8	D_{60} = 0·01 mm.
																	50 for 6"		−5			Grey very hard SILT with clay little to trace sand (Shale)
4	66	30				25		126 (2·01)	100 (1·60)	2·68			UC	0	6·5	8393 410	50 for 4"		−6		10	D_{60} = 0·003 mm.

DRAWN BY ..... DATE..... CHECKED BY. ..... DATE..... APPROVED BY ..... DATE .....

−215−

TECHNOCONSULT INT'L LTD. DHAKA.

GRAIN SIZE ANALYSIS			ATTEPBERG LIMITS			WATER CONTENT %		Density PCF (g/cm³)		Specific Gravity	CONSOLIDATION		SHEAR TEST DATA				S.P.T Blows/M	ASPT Blows/0·33	Depth M	LOG	PROJECT FISH LANDING PROJECT Location MONOHORKHALI, CHITTAGONG LOG OF BORING NO. 5 Date 12-2-91 G.W.T HIGH TIDE 80 cm Date RL. 2·71	M
Sand %	Silt %	Clay %	L.L.	P.I.	S.L	At Test	In Place	Bulk	Dry		Void Ratio e_o	Compr. Index C_c	Type	Lateral Stress PSF	At Failure Strain %	At Failure Applied Stress PSF kN/m2		0 10 20 30 40				
[illegible]	68	13															5		2·71		Dark grey medium clayey to sandy SILT D_{60}= 0·029 mm.	2
21	67	12				28		123 (1·97)	95 (1·52)	2·69	0·8273	0·147	UC	0	15	1669 32	4 5				D_{60} = 0·022 mm. Grey medium clayey SILT with sand.	4
79	21	–								2·65							2 4 4				Grey very loose SAND with silt D_{60}= 0·1 mm.	6
4	85	11															80 86				Grey hard clayey SILT trace sand. D_{60}= 0·01 mm. (SILTSTONE)	8
7	60	33								2·67							88 50	10 7 11 7 7 16			Grey very hard SILT with clay little sand. D_{60}= 0·0092 mm. (Shale)	10

DRAWN BY .....DATE..... CHECKED BY.....DATE..... APPROVED BY.....DATE.....

APPENDIX VII-4 (Table 1)

RESULTS OF SOIL TEST OF SAMPLES

SURFACE GROUND (N-Value)

		BH-1	BH-4		BH-5	
CDL basis		-3 m	+0.65m	-1.35m	-0.6m	1. PSF=4.88kgf/m^2 2. PCF=16.0kgw/m^3
grading (%)	Sand	38	10	78	21	
	Silt	48	69	22	67	
	Clay	14	21	—	12	
Water content		36	30	29	28	
Density (T/m^3)	Wet	1.856	1.936	1.920	1.968	
	Dry	/1.360	/1.472	/1.504	/1.520	
Specific gravity		2.67	2.65	2.65	2.66	
Consolidation test	eo	0.735	—	0.698	—	
	Cc	0.151	—	0.067	—	
Uni-axis compression	Strength (T/m^2)	2.13	5.30	4.25	8.14	
	Distortion (%)	15	17	2	15	

(Quoted from : Boring survey of the site)

APPENDIX VII-4 (Table 2)

RESULTS OF SOIL TEST OF SAMPLES

BED ROCK (N-Value)

		BH-1		BH-5		BH-3	BH-4
CDL basis		-4 m	-8 m	-4 m	-9 m	-14 m	-6.35 m
grading (%)	Sand	11	4	5	4	24	4
	Silt	65	61	66	65	62	66
	Clay	24	35	29	31	14	30
Water content		24	32	23	23	20	25
Density (T/m^3)	Wet	2.016	1.904	2.048	2.032	2.096	2.016
	Dry	/1.362	/1.584	/1.664	/1.664	/1.744	/1.600
Specific gravity		2.67	2.67	2.67	2.67	2.68	2.68
Consolidation test	eo	--	0.673	0.643	—	--	--
	Cc	--	0.284	0.123	—	--	--
Uni-axis compression	Strength (T/m^2)	64.7	--	43.5	21.3	24.7	41.0
	Distortion (%)	5.5	--	10	8.5	7.5	6.5

(Quoted from : Boring survey of the site)

Appendix VII-5 Quality of the Materials Available in Bangladesh

(1) Earth for Embankment

It was found, as a result of compaction tests (refer to Table A-5-1) carried out at the earth pit for construction of the fertilizer plant at the opposite bank of the project site, that even silt mixed with clay (close to mud sedimented on the river bed surface) can be compacted to a day unit weight of the order of 1.7 ton/m^3 (1.8 ton/m^3 for sand). Since results of soil test carried out with samples collected at the project site (Appendix VII-4) indicate that river overburden around the project site is sandy silt with clay content lower than this value (under 20%), it is concluded that this soil can be dehydrated with ease and that it can be used as embankment material by mixing it with sand.

(2) Stones, etc.

The following materials to be used as backfilling of retaining walls, foundation rubble mound and subbase course material for paving are available in Bangladesh.

For backfilling materials
Light weight brick chips are available in Bangladesh.

For foundation rubble mound materials
Hard rubble crushed by hand (diameters of 20 to 40 mm) that are resistant to abrasion are available in Bangladesh.

For subbase course materials for paving
Grading adjusted materials consisting of "sand + brick chips" or "sand + crushed stone" are being used for this.

For armor stone

River cobble-stone produced in Sylhet, squarish rocks produced at Cox's Bazar and Kaptai and slag are available in Bangladesh. Rocks produced at Cox's Bazar and Kaptai have been used frequently in CPA projects.

(3) Aggregates for Concrete

Concrete aggregates used in Bangladesh consist mostly of brick chips in buildings and crushed cobble-stone in civil engineering applications. Since aggregates crushed by hand tend to have uniform particle size, it is necessary to classify them by size and to remix them to obtain the prescribed grading distribution.

Sand produced at Sylhet has coarse grading (FM = 3.8) and both river and hill sand produced in Chittagong have fine grading (FM under 1.9) and contain some silt (under 5%). Sand produced at Sylhet and at Chittagong are mixed at appropriate proportions to adjust the grading distribution to the standard curve. (Refer to Table A-5-2).

(4) Quality of Cement

The state-owned Chittagong Cement Clinker Grinding Co., Ltd. imports clinker from countries such as Indonesia, Jordan, Pakistan, China, etc., and grind it, packing the product in jute bags and supply it for domestic consumption. The quality of clinker is not stable, the fineness of the obtained product is rather coarse, and there are problems related to both quantity and quality due to weathering and loss through permeable bags that are used to pack the cement.

The results of quality test (refer to Table A-5-3) meet the international standards {BS-12/1978, JIS-R5210 (186)} but the unit cement quantity exceeds 400 kg/m^3 when the concrete

with design standard strength exceeding 280 kg/cm^2 is required. It will be necessary either to import cement or to import concrete products when high-strength concrete is required.

(5) Quality of Concrete

Comparing the concrete mixing proportion standards of Japan with examples of mixing proportions being used in Chittagong, one observes that the mix volume (VG) of coarse aggregate is remarkably low (44% to 50%) comparing with the standard values (62% to 72%) adopted in Japan, and this difference is presumably attributable to the fact that coarse aggregates consist of hand-crushed stone. Under the circumstances, the actual strength of the concrete obtained is not so high in spite of the large consumption of cement. This must be taken into consideration in the design.

(6) Reinforcing Bars and Steel Materials (Steel Plates and Shapes)

Reinforcing bars and steel materials are being manufactured at the state-owned Chittagong Steel Mills.

Both round and deformed reinforcing bars are manufactured, and the unit cost is approximately twice as expensive as in Japan. The quality of these materials meet the BS, ASTM and JIS standards. Steel plates (3.2 to 6.0 mm thick) manufactured in Bangladesh, but they are very expensive in the same way as reinforcing bars. These materials are manufactured for the order of 100 tonnes/lot, and they take 1 to 2 months to be delivered. Both the quality and the accuracy of steel plates manufactured in Bangladesh are rather inferior, and Lloyd class steel materials for shipbuilding rely on imports.

The state-owned Chittagong Dry Dock manufactures such products as steel pipe piles (500 to 600 mm in diameter, plate thickness under 9 mm), floating pontoons, prefabricated bridges and elevated water tanks.

Table A-5-1 Results of compaction test (Soiltech/Kafco site)

SAMPLE NO.	1	2	3	4	5	6
DEPTH OF SAMPLE	Below - 1m	Below - 1m	Below - 1m	Below - 1m	Below - 1m	Below - 1m
MOISTURE CONTENT (%)	--	--	--	29.18	27.22	24.62
MAXIMUM DENSITY (TON/m³)	1.84	1.82	1.78	1.68	1.69	1.72
OPTIMUM MOISTURE CONTENT (%)	14.50	13.80	17.50	18.00	20.60	18.00
FINENESS MODULUS (F.M.)	1.51	1.83	1.65	—	—	—
GRAIN SIZE ANALYSIS SAND(2mm~0.06)	95	97	96	2	—	2
GRAIN SIZE ANALYSIS SILT	5	3	4	69	57	59
GRAIN SIZE ANALYSIS CLAY(2μ以下)	—	—	—	29	43	39

(Source : Soitech)

TABLE A-5-2 EVALUATION OF LOCAL AGGREGATE

	Crushed Stone				SAND			
	JIS	Japan	Bangla-desh	crushed brick	JIS	Japan	Sylhet	Pit sand/ river sand
Specific gravity under oven dry condition	more than 2.5	2.5 - 2.7		2.0	more than 2.5	2.3 - 2.65		
Water absorption rate	less than 3	0.3 - 2.5		less than 20	less than 3	0.6 - 6.0	4.5	
Stability	less than 12	—		—	less than 10	—	—	
Lost amount by washing test	less than 1	—		—	less than 7	—	—	5
Weight reduction, due to abrasion	less than 40	—	small	middle	—	—	—	
Ratio on grain diameter	less than 55	55 - 60		56	more than 53	62 - 67	—	
Unit volumetric weight	—	1.45 - 1.55		1.13 (light)	—	1.60 - 1.75	—	
Salinity	less than 0.1	—		—	—	—	—	

(Note : JIS A5004, JIS A5005, JIS A5308)

TABLE A-5-3 QUALITY ASSESSMENT OF CEMENT/REGULAR PORTLAND CEMENT

		Unit	JIS-R5210('86)	Standard (Japan)	Bangladesh
0) Specific gravity		—	—	3.16	—
1) Specific surface		cm /g	> 2,500	3.360	2,600-3,300
2) Setting time start		min.	> 60	2hr. 34min.	130-180 min.
	end	hr.	< 10 by	3hr. 32min.	170-220 min.
3) Stability		—	expansion no crack, distortion	—	0.5 - 2.0
4) Compressive	3 days	kg/cm^2	> 70	150	232 - 281
	7 days	kg/cm^2	> 150	245	295 - 352
	28 times	kg/cm^2	> 300	407	387 - 457
5) Chemical	Cao	% not	—	63.7	62.5 - 65.0
	SiO		—	21.6	20.5 - 22.0
	Al O		—	5.1	4.5 - 6.5
	Fl O		—	3.0	2.5 - 4.0
	MgO		< 5	1.7	1.0 - 3.0
	SO		< 3	2.0	1.5 - 3.0
	lg Loss		< 3	1.0	1.0 - 3.0
6) Universal composition	C S		—	50	16 - 52
	C S		—	26	20 - 19
	C S		—	9	7 - 10
	LSF			—	0.88 - 0.94
Admixture		%	< 5	—	—

(NOTE : Chittagong Cement Clinker Grinding Co., Ltd. (BS-12.1978)