APPENDIXES
Vol. (IV)

Details of Data for Master Plan and Feasibility Study for the Port of Anzali

Appendix (IV)-1 Wind Data - Direction, Speed, Percent

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1951	315	315	45	360	45	315	45	45	360	315	270	315	315	Prevail direct
	9.9	10.0	4.8	4.7	5.6	8.1	6.0	5.3	7.5	13.3	3.4	7.0	9.0	Prevail speed
	24.6	28.1	19.8	22.9	34.7	21.3	27.4	26.6	21.7	41.1	24.2	33.1	19.9	Prevail percent
	0.4	0.0	0.8	1.7	0.0	0.0	1.6	0.8	0.4	0.4	0.0	0.0	0.5	Calms percent
	248	224	248	240	248	240	248	248	240	248	240	248	2920	Wind obserb. No.
1952	315	315	45	45	45	45	45	45	45	360	315	315	45	Prevail direc
	7.0	6.5	4.8	5.2	4.4	5.7	4.6	4.1	8.1	9.2	11.8	5.4	4.9	Prevail speed
	34.3	26.7	21.4	25.4	32.7	47.5	34.7	38.7	24.2	21.0	23.8	21.4	23.9	Prevail percent
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	0.4	0.0	0.0	0.1	Calms percent
	248	232	248	240	248	240	248	248	240	248	240	248	2928	Wind obser. No.
1953	315	315	315	45	45	45	225	45	315	315	315	315	315	Prevail direct
	5.1	5.9	7.7	3.6	4.8	4.1	3.0	3.3	7.0	4.9	9.5	9.2	7.0	Prevail speed
	24.6	19.6	43.5	21.3	27.0	30.4	27.4	36.7	26.3	28.2	48.3	37.9	24.9	Prevail percent
	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	0.2	Calms percent
	248	224	248	240	248	240	248	240	240	248	240	248	2920	Wind obser.No.
1954	315	315	315	315	45	45	45	45	315	180	***	***	315	Prevail direct
	6.1	5.7	3.3	4.0	4.4	4.9	5.2	6.2	7.5	1.8	****	****	5.1	Prevail speed
	31.5	59.8	37.9	37.9	35.1	21.7	21.0	19.0	18.3	22.2	*****	*****	24.1	Prevail percent
	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	*****	*****	0.2	Calms percent
	248	224	248	240	248	240	248	248	240	248	****	****	2432	Wind obser No.

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1955	315	45	45	45	45	45	45	45	315	180	225	315	45	Prevail direct
	4.3	3.9	3.0	4.0	3.4	3.6	4.6	4.5	10.9	1.3	1.9	7.6	3.9	Prevail speed
	31.9	30.4	24.8	35.0	42.0	47.1	26.2	27.4	17.1	25.4	25.4	20.2	24.2	Prevail percent
	0.0	0.4	0.4	0.0	0.0	0.0	0.0	1.2	0.4	1.2	1.3	1.6	0.6	Calms percent
	248	224	242	240	238	240	248	248	240	248	240	248	2904	Wind obser No.
1956	315	315	315	45	45	45	360	45	360	180	180	315	315	Prevail direct
	10.5	8.6	12.8	3.8	4.5	5.8	6.6	4.8	7.8	1.8	2.2	10.7	8.7	Prevail speed
	29.0	97.9	44.4	21.7	26.6	27.5	28.6	92.3	90.0	25.8	29.2	30.2	21.1	Prevail percent
	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	Calms percent
	248	232	248	240	248	240	248	248	240	248	240	248	2928	Wind obser No.
1957	315	915	360	45	360	180	45	180	45	315	315	315	315	Prevail direct
	8.4	4.9	5.8	3.6	5.0	1.8	4.7	2.2	4.9	12.7	7.0	6.7	7.0	Prevail speed
	32.7	90.8	27.8	33.8	40.3	22.9	41.5	28.6	33.8	28.6	22.9	26.2	19.5	Prevail percent
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	Calms percent
	248	224	248	240	248	240	248	248	240	248	240	248	2929	Wind obser.No.
1958	270	180	315	315	315	180	225	45	225	315	225	270	315	Prevail direct
	4.0	2.9	4.4	6.2	5.2	2.1	2.6	4.6	2.1	8.6	2.5	2.8	5.8	Prevail speed
	29.0	31.7	31.5	30.4	27.0	42.5	17.7	18.1	21.3	31.9	25.0	26.6	22.4	Prevail percent
	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	0.0	0.0	0.0	0.0	0.1	Calms percent
	248	224	248	240	248	240	248	248	240	248	240	248	2920	Wind obser.No.
1959	225	315	315	45	45	45	45	180	225	315	315	270	315	Prevail direct
	1.8	6.6	5.5	3.7	4.0	4.3	3.9	1.6	1.7	7.4	13.6	3.1	6.3	Prevail speed
	29.0	28.7	33.2	28.5	26.7	26.4	20.6	19.0	23.4	25.1	29.3	29.6	20.7	Prevail percent
	0.0	0.0	0.0	0.0	0.0	0.8	0.4	0.4	0.4	0.4	0.0	0.0	0.2	Calms percent
	248	223	247	239	247	239	247	247	239	247	239	247	2909	Wind obser. No.

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1960	315	315	315	360	45	360	360	360	360	360	360	270	360	Prevail direct
	3.1	5.7	7.0	2.6	3.6	3.0	5.7	3.2	3.6	3.7	4.2	5.0	3.8	Prevail speed
	21.5	18.1	22.7	31.8	27.5	17.6	16.6	25.9	20.1	21.5	23.3	29.2	18.8	Prevail percent
	0.0	0.9	2.8	9.6	4.5	7.1	7.3	9.3	26.4	15.3	18.6	3.7	8.4	Calms percent
	247	216	247	239	247	239	247	247	239	177	172	242	2759	Wind obser No.
1961	315	315	360	360	45	45	45	45	270	270	225	225	45	Prevail direct
	7.1	8.4	4.9	4.0	4.6	3.9	6.1	6.6	6.8	4.8	3.0	2.6	5.1	Prevail speed
	23.5	25.1	19.4	21.3	27.5	28.0	25.5	21.5	22.2	18.6	18.4	24.3	16.3	Prevail percent
	2.2	4.9	8.5	13.0	7.7	10.9	11.3	9.7	9.6	9.3	11.3	11.3	9.2	Calms percent
	230	223	247	239	247	239	247	247	239	247	239	247	2891	Wind obser. No.
1962	270	315	45	45	45	45	45	45	225	225	225	225	45	Prevail Direct
	0.9	8.1	4.0	4.3	4.5	4.4	4.8	4.4	1.8	2.0	1.8	3.5	4.5	Prevail speed
	25.5	17.9	18.6	15.5	29.6	23.4	28.3	23.5	19.7	24.3	19.7	24.7	16.6	Prevail percent
	10.9	14.8	13.8	14.6	9.7	11.7	13.8	14.6	15.9	14.6	18.0	9.7	13.5	Calms percent
	247	223	247	239	247	239	247	247	239	247	239	247	2908	Wind obser. No.
1963	315	315	360	45	45	45	225	225	225	315	225	225	315	Prevail direct
	6.4	4.5	6.9	3.0	3.3	4.1	2.7	1.7	1.9	8.6	2.0	2.0	6.5	Prevail speed
	23.0	27.4	18.6	27.2	23.9	25.9	20.2	23.5	23.8	23.1	22.6	21.5	16.2	Prevail percent
	16.9	17.5	17.4	10.9	10.9	12.1	13.4	12.6	17.2	14.2	25.9	19.4	15.7	Calm percent
	248	223	247	239	247	239	247	247	239	247	239	247	2909	Wind obser. No.
1964	225	315	315	45	45	45	225	225	225	225	225	225	225	Prevail direct
	2.1	7.1	4.8	3.1	3.6	4.3	1.8	1.9	1.9	2.3	2.6	1.7	2.0	Prevail speed
	32.0	26.0	19.0	19.8	26.3	25.1	24.3	20.7	21.3	29.6	24.3	25.5	20.0	Prevail percent
	20.6	20.3	22.7	20.9	15.8	10.0	8.5	13.4	15.9	11.3	15.1	19.0	16.1	Calms percent
	247	231	247	239	247	239	247	247	239	247	239	247	2916	Wind obser. No.

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1965	270	225	45	360	45	45	45	45	225	315	225	225	225	Prevail Direct
	4.5	2.8	2.8	4.1	2.9	3.5	3.1	3.7	1.7	8.7	1.6	1.9	1.8	Prevail speed
	29.1	19.3	22.7	18.0	26.7	28.0	16.6	20.2	22.2	24.3	19.7	24.7	15.5	Prevail percent
	18.6	17.0	19.4	15.9	15.4	18.0	21.1	15.8	15.1	19.8	27.6	13.8	18.1	Calms percent
	247	223	247	239	247	239	247	247	239	247	239	247	2908	Wind obser. No.
1966	315	315	315	45	45	45	45	225	225	225	225	315	45	Prevail Direct
	4.7	4.5	4.7	2.7	2.6	3.1	2.3	1.9	2.1	1.7	1.5	5.8	2.9	Prevail speed
	18.2	18.8	23.9	17.2	25.9	28.5	20.6	22.3	16.3	15.8	20.5	24.3	15.4	Prevail percent
	25.9	25.6	27.5	20.9	18.2	19.7	18.6	19.8	24.3	36.0	23.0	13.4	22.7	Calms percent
	247	223	247	239	247	239	247	247	239	247	239	247	2908	Wind obser. No.
1967	315	315	315	45	45	45	45	225	45	225	315	225	225	Prevail Direct
	5.7	5.9	7.7	2.5	3.1	3.7	3.1	1.9	3.9	1.6	8.2	1.8	1.8	Prevail speed
	17.8	32.7	29.6	19.2	21.1	18.0	23.0	28.3	20.9	19.8	21.8	27.1	16.5	Prevail percent
	24.3	21.1	17.0	18.0	23.5	17.6	19.0	15.8	18.0	35.2	21.3	26.7	21.5	Calms percent
	247	223	247	239	247	239	248	247	239	247	239	247	2909	Wind obser. No.
1968	225	315	45	45	45	45	45	225	45	225	270	270	315	Prevail direct
	6.4	8.7	4.6	3.4	3.6	4.3	3.1	1.8	3.7	1.7	3.3	2.5	5.9	Prevail speed
	23.9	33.0	17.8	20.5	22.3	27.2	24.9	19.8	15.1	19.4	23.8	28.7	15.3	Prevail percent
	16.6	20.9	20.2	22.2	22.3	19.2	15.0	17.4	20.9	21.5	23.4	17.0	19.7	Calms percent
	247	230	247	239	247	239	247	247	239	247	239	247	2915	Wind obser. No.
1969	315	315	315	45	45	45	45	225	225	315	225	225	315	Prevail direct
	8.4	10.2	2.9	4.0	6.2	6.7	7.6	1.8	2.0	6.2	1.9	3.4	6.9	Prevail speed
	42.9	40.4	25.5	27.2	19.0	29.7	21.9	23.5	17.2	16.2	17.2	16.1	15.4	Prevail percent
	15.4	18.8	23.1	18.8	18.2	24.3	18.6	17.8	18.8	19.4	40.6	19.0	21.0	Calms percent
	247	223	247	239	247	239	247	247	239	247	239	248	2909	Wind obser. No.

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1970	315	225	315	45	45	225	225	225	225	225	225	225	225	Prevail direct
	4.6	3.0	4.1	5.1	6.3	3.4	3.3	2.6	3.0	2.8	2.5	3.4	3.0	Prevail speed
	20.8	13.0	15.0	18.8	18.2	26.8	33.1	26.3	28.9	26.7	22.6	27.8	21.6	Prevail percent
	17.1	15.7	16.2	18.8	15.0	10.5	11.7	11.7	9.2	5.7	11.3	5.1	12.3	Calms percent
	245	223	247	239	247	239	248	247	239	247	239	234	2894	Wind obser. No.
1971	225	270	45	45	45	45	45	225	45	45	225	225	45	Prevail direct
	3.5	4.6	5.8	5.2	6.6	7.1	6.3	3.2	7.9	7.1	3.8	5.8	6.7	Prevail speed
	23.1	15.7	16.2	22.2	25.1	24.3	22.3	22.7	24.9	21.3	24.7	29.0	17.9	Prevail percent
	10.5	14.3	12.1	8.4	12.1	7.1	9.7	6.5	12.9	5.8	22.7	10.3	10.8	Calms percent
	247	223	247	239	247	239	247	247	217	155	150	155	2613	Wind obser. No.
1972	315	270	45	45	45	45	45	45	45	45	225	225	45	Prevail direct
	11.3	7.2	7.7	6.7	7.2	8.2	8.8	8.2	8.6	9.2	4.7	4.1	8.1	Prevail speed
	32.9	24.1	20.6	27.2	30.9	33.3	28.1	24.4	22.4	18.9	25.7	25.3	19.4	Prevail percent
	5.8	20.7	14.8	13.6	14.3	10.5	14.3	13.4	9.5	23.0	13.3	6.0	13.2	Calms percent
	155	145	155	169	217	210	217	217	210	217	210	217	2339	Wind obser No.
1973	315	45	45	45	45	45	45	45	45	45	315	225	45	Prevail direct
	9.6	5.5	7.0	5.7	7.2	8.2	6.8	6.5	8.9	8.5	15.9	4.2	7.1	Prevail speed
	29.9	19.0	28.0	25.6	33.9	33.3	30.1	29.0	23.9	21.3	20.0	22.4	22.7	Prevail percent
	12.3	26.2	10.8	13.9	16.1	7.8	8.1	7.0	12.2	11.6	14.7	14.7	12.8	Calms percent
	187	168	186	180	186	180	186	186	180	155	150	170	2114	Wind obser No.
1974	315	315	315	45	45	45	45	45	225	45	225	225	45	Prevail direct
	12.4	9.0	7.6	7.0	8.1	9.0	9.2	5.6	2.7	4.8	3.1	3.6	7.0	Prevail speed
	33.3	36.3	34.9	23.3	35.5	38.9	30.6	23.1	18.3	22.6	17.2	25.8	19.8	Prevail percent
	5.4	11.9	13.4	13.3	12.4	8.9	11.8	9.1	11.1	11.8	18.3	17.2	12.1	Calms percent
	186	168	186	180	186	180	186	186	180	186	180	186	2190	Wind obser No.

Port of Anzali

Data processing Center
Prevailling Wind Direction, Speed and Percent

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual	
1975	225	315	45	45	45	45	45	45	45	225	270	225	45	Prevail direct
	2.7	9.2	7.0	5.5	4.9	5.3	4.9	5.2	7.4	2.9	3.2	3.5	5.6	Prevail speed
	22.6	30.4	21.9	31.1	31.2	31.7	27.4	26.9	19.4	18.8	21.0	23.8	18.6	Prevail percent
	9.1	12.5	11.2	13.3	16.1	12.2	11.3	10.8	11.7	19.9	20.1	16.5	13.9	Calms percent
	186	168	187	180	186	180	186	186	180	186	229	248	2302	Wind obserb No.
1951-1975														
	315	315	315	45	45	45	45	45	45	315	225	225	45	Prevail direct
	7.4	7.0	6.2	4.3	4.8	5.3	5.0	4.9	5.5	8.8	2.6	2.8	4.8	Prevail speed
	24.8	26.2	22.8	22.6	27.3	27.6	23.7	22.3	17.5	17.3	18.3	21.0	16.9	Prevail percent
Mean	8.6	10.2	10.0	9.7	9.1	8.3	8.5	8.3	10.0	11.0	13.3	9.3	9.7	Calms percent
Mean	235.7	214.6	236.1	229.4	238.4	231.1	238.9	238.8	230.2	231.1	225.0	235.8	2785.1	Wind obserb No.

Appendix (IV)-2 Sub-Soil Boring Result (by JICA)

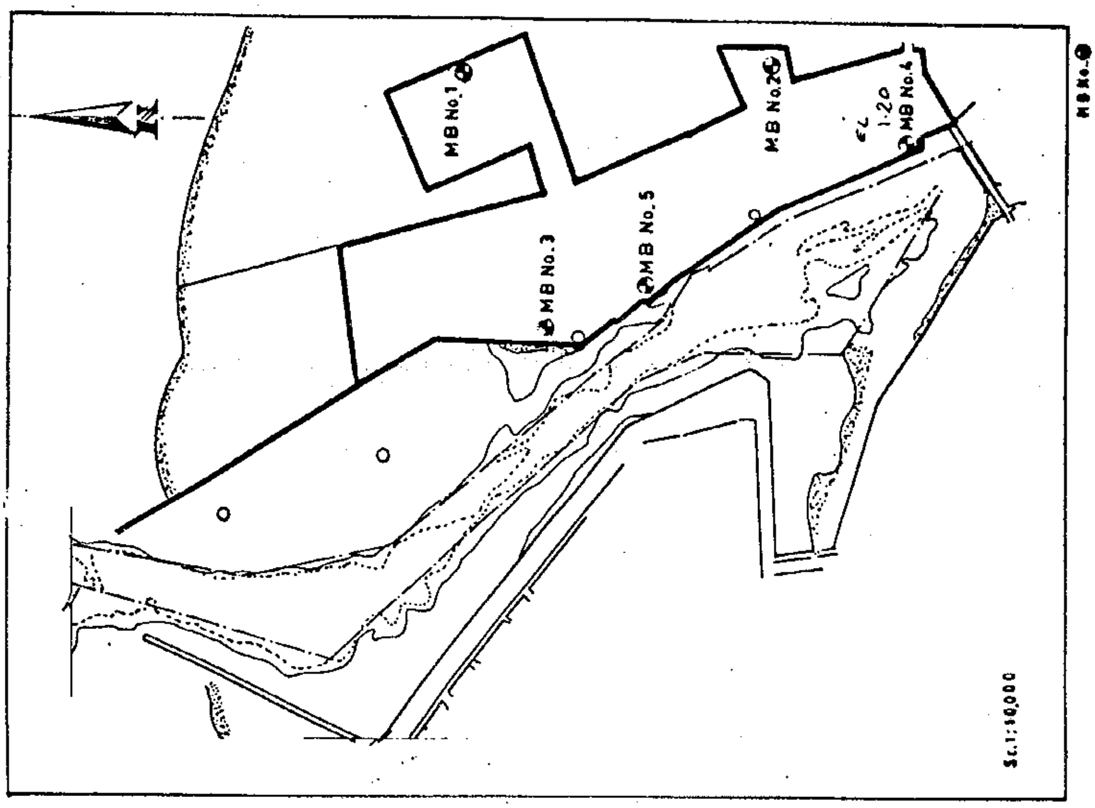


Fig. No. 1 : Location of Boreholes

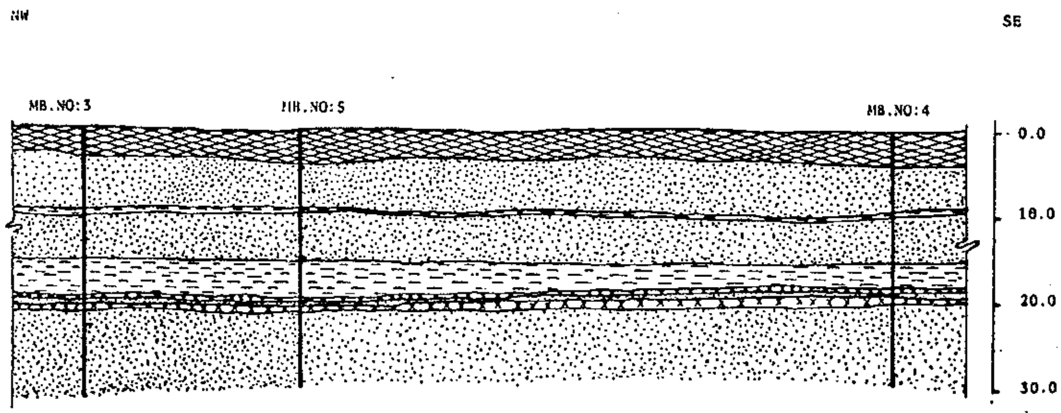


Fig. No. 2 : Geological cross section between BH. No. 3, 4.5

Fill Material

Sand

Silty Clay

Clayey Silt

SC : H: 1:5000 / V: 1:500

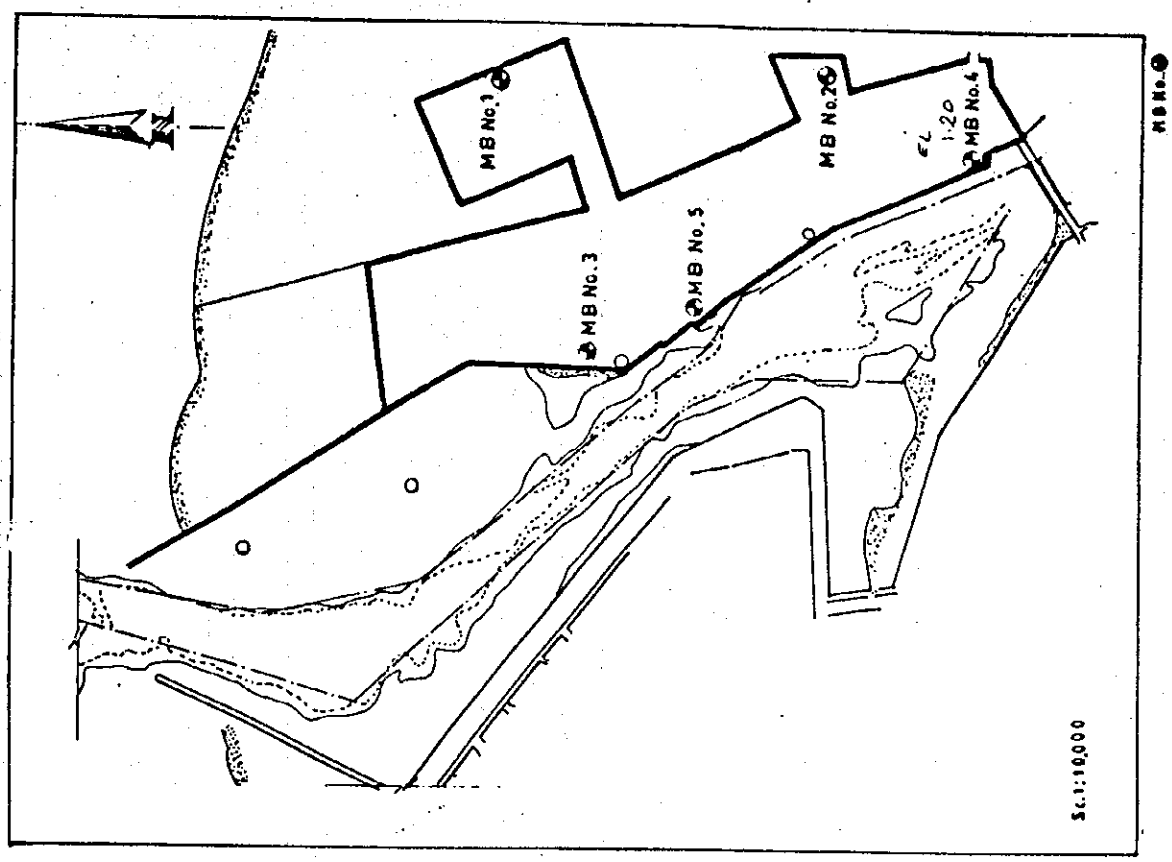


Fig. No. 1 : Location of Boreholes

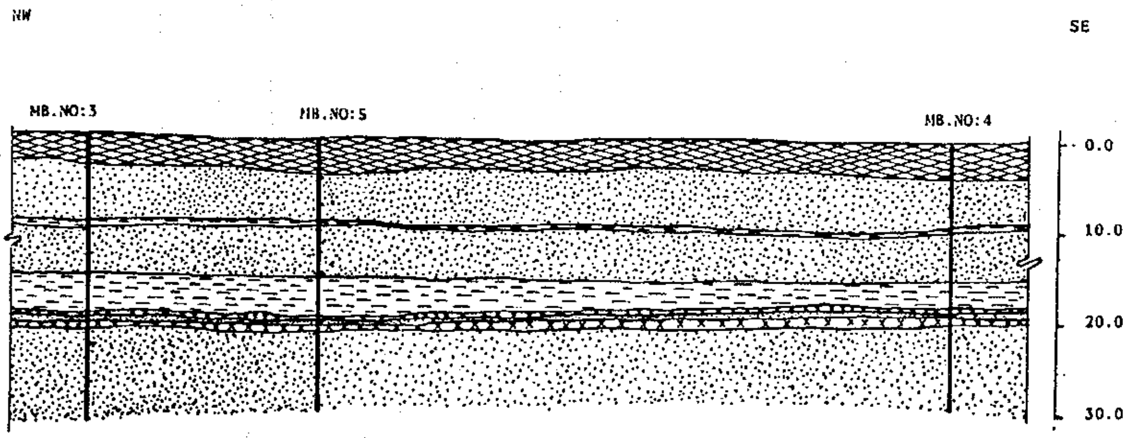


Fig. No. 2 : Geological cross section between BH. No. 3, 4.5

SC : H: 1:5000 / V: 1:500

Fill Material	
Sand	
Silty Clay	
Clayey Silt	

GEOLOGICAL LOG REPORT

CLIENT: P.C.I
PROJECT: Port of Anzali
BORING No: No. 1
WATER LEVEL: 0.3 m.
START DATE: 24, Nov. 1993
LOCATION: Bandar Anzali
DRILLING METHOD: Rotary
DRILLING END DATE: 28, Nov.,93
INSPECTOR: M. Hasegawa
GROUND LEVEL:
CASING DEPTH: 30 m.
TOTAL DEPTH: 30 m.
SITE ENGINEER: M. Dorgahi

SAMPLE	LITHOLOGY DESCRIPTION	SPT No. of blows per 7.5cm / No. of blows per 30cm
	0.0-0.3 m. Fill Material	
●	0.3-6.50 Grey, fine SAND, loose to medium dense.	2-2-2-5-2-3 / 10
		1-2-4-3-5-4 / 16
●		2-2-4-8-5-7 / 20
●	The same as above	2-5-4-5-6-6 / 21
	Medium dense to dense	2-3-5-8-8-8 / 29
●	From 6.50 to 12.0 m. Dark grey fine sand with shell fragments, dense to very dense	3-4-5-8-8-7 / 28
●		3-3-5-6-6-5 / 22
●		5-6-8-9-8-10 / 35
●		5-7-8-14-20-16 / 50
●		7-6-8-7-8-11 / 35
●	Dark grey fine SAND with shell fragments, medium dense	2-3-3-3-6-6 / 18
●	12.0-14.0 m. Greenish grey very fine SAND with pieces of plant's root	3-4-4-5-5-6 / 20
		3-3-4-5-6-8 / 23
●	14.0-18.50 m. Greenish grey fine SAND with little silt, medium dense	4-3-4-5-5-7 / 21
●		4-6-7-8-6-7 / 28
●		4-4-5-5-6-5 / 20
●	The same as above, loose	2-2-3-3-2-3 / 11
●		1-1-2-1-2-2 / 7
●	18.5-19.50 m. Greenish grey silty CLAY, soft	1-1-1-2 / 5
■	19.80-20.0 m. Dark grey sandy silt, very Soft to soft.	
	Dark grey fine SAND	
	Brown clayey silt, soft	
●	Dark grey fine SAND, loose	2-2-2-3-3-2 / 10
	Brown clayey silt, soft	
●	22.0-30.0 m. Dark grey fine SAND, medium dense	1-1-2-2-3-9 / 16
●		4-10-6-6-9 / 27
		5-5-6-7-8-6 / 27
●	The same as above.	6-6-7-7-8-8 / 30
●		9-5-6-8-8-9 / 31
●	Dark grey fine SAND, dense	6-5-7-8-8-10 / 33
●		4-6-8-9-8-10 / 35
●	Dark grey fine SAND, dense	5-6-8-8-9-10 / 35
■		6-6-8-8-9-11 / 37

GEOLOGICAL LOG REPORT

CLIENT: P.C.I
PROJECT: Port of Anzali
BORING No: No. 2
WATER LEVEL: 1.50 m.
START DATE: 30. Nov., 1993
LOCATION: Bandar Anzali
DRILLING METHOD: Rotary
DRILLING END DATE: 4, Dec., 93
INSPECTOR: M. Hasegawa
GROUND LEVEL:
CASING DEPTH: 30.0m.
TOTAL DEPTH: 30.0 m.
SITE ENGINEER: M. Dorgahi

SAMPLE	LITHOLOGY DESCRIPTION	SPT No. of blows per 7.5cm / No. of blows per 30cm
●	0.0-0.1 m. Asphalt; 0.1-0.4 m. Fill material (sand & gravel); 0.4-3.0 m. Fill material (grey sand & some brick, fragments of concrete)	7-9-6-5-4-4 / 19
●		10-11-6-4-4-4 / 18
	3.0-5.5 m. Grey fine SAND with pieces of shell & plant's root, medium dense.	1-2-2-2-1-1 / 6
●		2-7-6-6-7-8 / 27
●		3-6-4-4-6-5 / 19
●	5.5-14.0 Dark grey fine SAND with shell fragments, medium dense.	3-4-2-2-2-5 / 11
		2-3-4-3-2-3 / 12
●	The same as above dense.	2-2-3-3-3-3 / 12
●	The same as above.	4-8-8-10-10-12 / 40
●		5-6-7-7-9-6 / 29
●	Dark grey fine SAND with shell fragments, medium dense	4-6-6-7-6-6 / 25
●		4-6-6-5-6-6 / 23
●		4-5-5-4-6-7 / 22
●	14.0 to 19.30 Greenish gray fine SAND with little silt, dense.	5-5-6-7-7-8 / 26
●		6-7-9-9-11-13 / 42
●		7-13-13-14-15-5 / 50
●		7-9-11-12-13-11 / 47
		5-8-9-9-10-12 / 40
■	19.30-21.50 Greenish grey silt CLAY, stiff.	
●		1-5-3-3-3-2 / 11
●		1-2-2-2-2-2 / 8
●	21.50-22.0 m. Brown clayey silt, medium to stiff. 22.0-23.30 m. Greenish grey silty CLAY, stiff.	2-3-4-3-4-4 / 15
●		2-4-4-4-4-4 / 12
●	23.5-25.50 Dark grey fine SAND.	4-5-6-6-5-6 / 26
●		4-6-7-9-7-8 / 30
●	The same as above, dense.	4-6-9-8-10-8 / 35
●		5-7-8-9-9-9 / 35
●	Dark grey fine SAND, dense.	7-6-8-10-9-11 / 38
		6-7-9-9-11-11 / 40
●		5-6-8-10-12-12 / 42

GEOLOGICAL LOG REPORT

CLIENT: P.C.I
PROJECT: Port of Anzali
BORING NO: NO. 3
WATER LEVEL: 5.0 m.
START DATE: 4, Dec., 1993
LOCATION: Bandar Anzali
DRILLING METHOD: Rotary
DRILLING END DATE: 6, Dec., 93
INSPECTOR: M. Hasegawa
GROUND LEVEL: +2.5
CASING DEPTH: 30.0 m.
TOTAL DEPTH: 30.0 m.
SITE ENGINEER: M. Dargahi
PAGE 1 OF 1

LITHOLOGY DESCRIPTION	DENSITY	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SPT (No. of blows per 7.5cm / No. of blows per 30cm)	REMARKS
0.0-0.3 m. Asphalt 0.3-0.3 Fill material (Sand & gravel). 0.3-3.50 m. Fill material (Sand with angular fragments of rock)					2.8.7.6.5.4 / 22	
					4-3-4-4-3-4 / 15	
					2-2-3-4-3-4 / 13	
3.50-5.50 m. Grey fine SAND with pieces of shell & plant's root, medium dense.					7-8-8-7-7-7 / 29	
					3-4-3-4-4-3 / 15	
5.50-9.50 m. Dark grey fine SAND with shell fragments, loose.					2-2-2-3-3-3 / 11	
					2-2-1-2-1-2 / 6	
					2-2-2-1-3-3 / 9	
					2-2-2-4-5 / 13	
9.50-9.30 m. Greenish grey silty CLAY, stiff					2-3-2-3-4-5 / 14	
9.80-15.50 m. Dark grey fine SAND with shell fragments, medium dense					5-4-3-3-5-5 / 16	
					4-5-5-5-10-15 / 34	
The same as above.					5-6-6-5-6-7 / 24	
					4-4-5-6-5-4 / 20	
					4-6-4-4-4-5 / 17	
15.50-19.50 Greenish grey silty CLAY, stiff.					2-2-3-2-1-2 / 8	
					1-2-2-2-3-3 / 10	
					2-1-2-2-3-4 / 11	
					2-2-3-3-2-2 / 10	
19.5-20.0 m. Brown clayey silt, stiff.					3-2-2-2-3-3 / 10	
20.0-20.30 m. Dark grey fine sand. 20.30-21.50 m. Brown clayey silt, stiff.					3-2-2-3-3-3 / 11	
21.50-22.80 m. Dark grey fine SAND, dense.					4-5-5-6-6-7 / 24	
22.80-32.0 m. Very dark grey fine SAND with compacted shell fragments, dense to very dense					5-6-9-10-12-21 / 50 52	
					5-6-8-10-13-14 / 45	
					4-7-9-11-10-12 / 42	
					6-12-15-20-15 / 50 62	
					4-6-11-17-16 / 50	
The same as above, very dense					5-13-15-19-3 / 50	
					5-14-19-17 / 50 55	
					6-15-17-18 / 50	
Very dark grey fine SAND with compacted shell fragment.						
End of BH.					7.11-19.19.2 / 50 55	

CLIENT: P.C.I
PROJECT: Port of Anzali
BORING NO: NO. 4
WATER LEVEL: 2.0 m.
START DATE: 7, Dec., 1993
LOCATION: Bandar Anzali
DRILLING METHOD: Rotary
DRILLING END DATE: 9, Dec., 93
INSPECTOR: M. Hasegawa
GROUND LEVEL: +1.20 m
CASING DEPTH: 30.0 m.
TOTAL DEPTH: 30.0 m.
SITE ENGINEER: M. Dargahi
PAGE 1 OF 3

LITHOLOGY DESCRIPTION	DENSITY	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SPT (No. of blows per 7.5cm / No. of blows per 30cm)	REMARKS
0.0-0.2 m. Asphalt 0.2-2.0 m. Fill material (brick, concret & sand).					2-3-3-2-3-2 / 10	
2.0-4.30 m. Fill material sand & tore gravel					1-2-3-2-1-1-2 / 5	
					2-2-2-3-2-2 / 8	
					2-3-4-4-3-2 / 12 13	
4.30-6.40 m. Grey fine SAND with pieces of shell & plant's root, loose to medium dense.					1-2-3-2-4-1 / 10 11	
					3-2-2-3-4-3 / 12	
6.40-9.30 m. Dark grey fine SAND, medium dense.					2-3-4-4-3-3 / 14	
					2-2-3-5-4-3 / 17	
					1-1------1 / 3	
9.50-9.70 m. Greenish grey silty CLAY, very soft to soft					1-1-1-2-2-2 / 7	
9.70-15.40 m. Dark grey fine SAND, loose					2-2-3-2-2-3 / 10	
					3-3-3-5-7-6 / 22 25	
The same as above, medium dense.					2-3-6-6-7-4 / 27	
					2-3-8-9-27-6 / 50	
					5-7-7-3-12-23 / 50	
15.40-15.30 m. Greenish grey silty CLAY, medium to stiff.					2-2-1-2-3-2 / 8	
					1-3-2-3-3-4 / 12	
16.30-18.70 Brown clayey silt, stiff. 18.70-19.0 m. Dark grey SAND, medium dense					2-2-1-2-3-2 / 8	
					2-3-3-4-5-5 / 17	
19.0-21.0 m. Brown clayey SILT. 21.0-24.0 m. Dark grey fine SAND, dense to very dense.					2-4-3-3-3-4 / 13	
					2-4-5-9-9-12 / 38	
					5-6-9-13-19-9 / 50	
24.0-30.0 m. Very dark grey fine SAND with compacted shell fragments, very dense.					5-9-10-23-9 / 50	
					5-14-19-17 / 50 55	
					8-13-22-19 / 50 58	
					6-19-19-17 / 50 55	
					11-22-19-9 / 50 61	
The same as above.					8-14-17-14 / 50	
					11-21-19-11	

GEOLOGICAL LOG REPORT

PAGE 1 OF 1

CLIENT: P.C.I
PROJECT: Port of Anzali
BORING NO: NO. 5
WATER LEVEL: 2.0 m.
START DATE: 10, Dec., 1993

LOCATION: Bandar Anzali
DRILLING METHOD: Rotary
DRILLING END DATE: 12, Dec., 93
INSPECTOR: M. Hasegawa

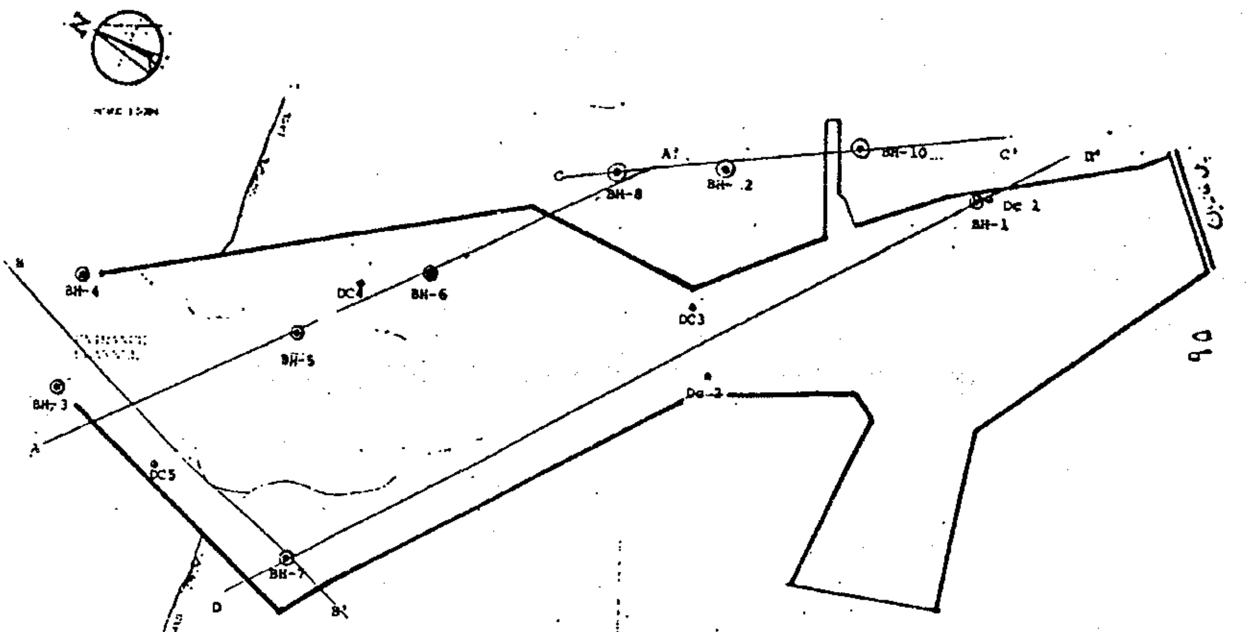
GROUND LEVEL:
CASING DEPTH: 30.0 m.
TOTAL DEPTH: 30.0 m.
SITE ENGINEER: M. Dargahi

MEASURED DEPTH (M.)	SAMPLE	LITHOLOGY DESCRIPTION	GEOLOGIC PROFILE	DENSITY	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	S.P.T. No. of blows for 15cm / No. of blows for 30cm	REMARKS
		0.0-0.80 m. Fill material sand & grave							
	●	0.8-4.0 m. Grey fine SAND, with some fine gravel, pieces of brick.						1-2-1-2-2-3 / 6	
	●							1-1-2-1-1-2 / 6	
	●							1-1-2-2-3-2 / 9	
	●	4.0-5.5 m. Grey fine SAND with shell fragments, very loose to loose.						1-1-1-1-1-1 / 4	
	●							2-1-2-2-3-2 / 9	
	●	5.50-9.30 m. Dark grey fine SAND, medium dense.						2-3-2-3-4-2 / 12	
	●							2-2-3-4-5 / 14 12	
	●							2-1-2-3-3-3 / 11	
	●							2-3-3-2-4-4 / 13	
	●	9.30-9.60 m. Greenish grey silty CLAY, stiff.						2-4-3-4-5-4 / 16	
		9.60-15.00 m. Dark grey fine SAND, medium dense.							
	●							3-4-4-5-4-6 / 19	
11	●							3-5-5-4-5-6 / 20	
	●	The same as above, medium dense to dense						4-4-5-6-6-7 / 24	
	●							3-3-5-9-13-21 / 48	
	●	15.00-19.50 m. Greenish grey silty CLAY, medium to stiff.						1-2-2-1-2-3 / 8	
	■								
	●							1-2-2-1-3-2 / 8	
	■								
	■								
	●							2-3-4-2-2-4-10 / 20 18	
		19.50-19.80 m. Brown clayey silt, very stiff							
	●	19.80-20.30 Dark grey fine SAND.						2-3-3-4-4-2 / 14	
	●	20.30-21.40 m. Brown clayey silt, stiff						1-2-3-2-2-3 / 10	
21	●	21.40-25.5 m. Dark grey fine SAND, dense to very dense.						3-3-7-8-8-11 / 34	
	●							5-9-15-17-13 / 50	
	●							5-11-13-19-18 / 50 61	
	●	25.5-30.0 Very dark grey fine SAND with compacted shell fragments, very dense.						5-6-11-17-16 / 44 50	
	●							7-17-19-14 / 50 57	
	●							5-19-21-10 / 50 55	
	●							7-17-22-11 / 50 57	
	●							8-12-18-20-2 / 50	
	●							5-17-19-15 / 50 56	

NOTE
W.R.: WATER RETURN
W.C.: WATER COLOR
C.D.: CASING DEPTH
● DISTURBED SAMPLE

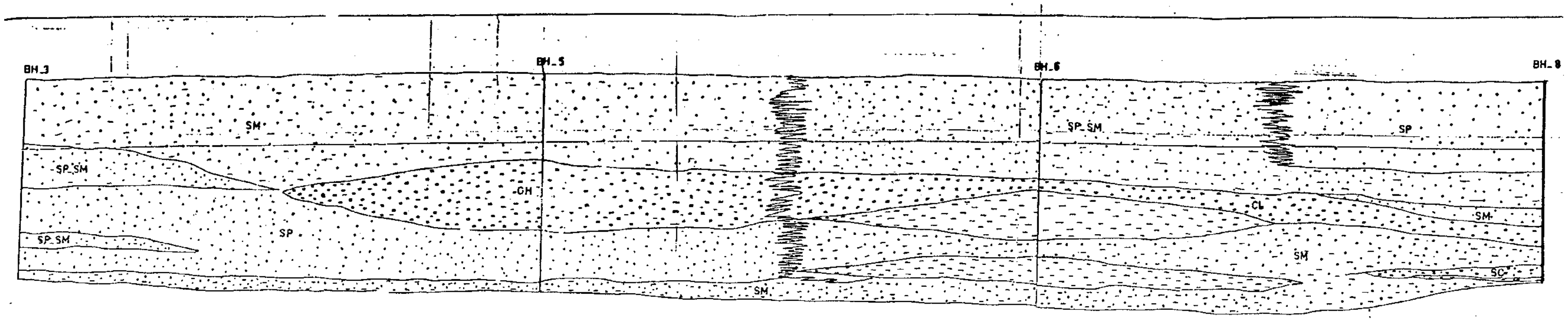
MANDRO CO. LTD.

Appendix (IV)-3 Sub-Soil Boring Result (by PSO)



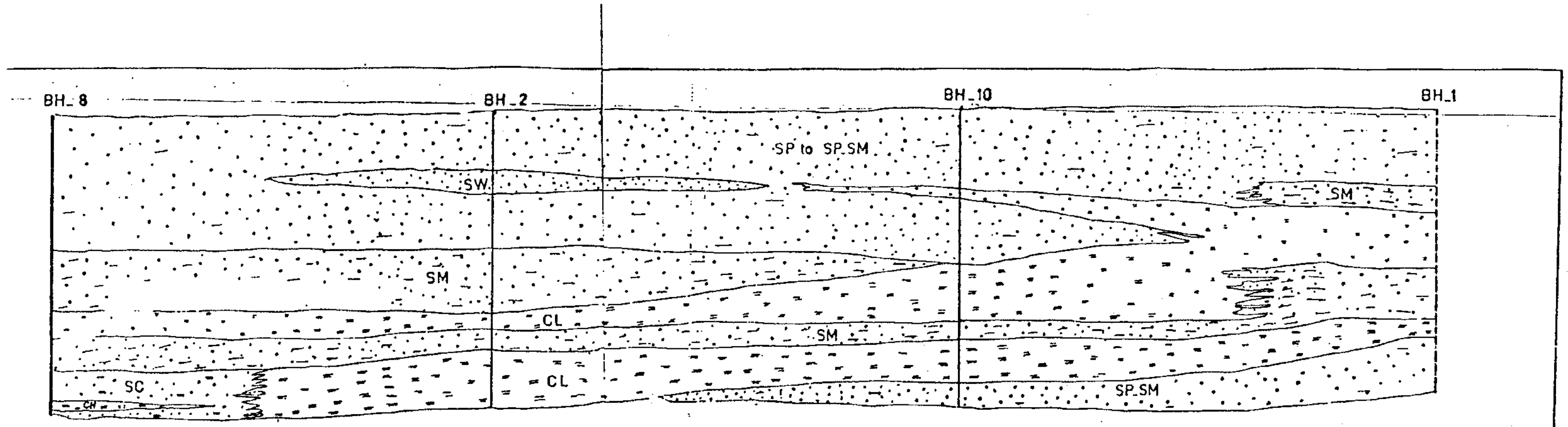
Location Map of Sub-soil Boring by IRAN KHAK

کروکی محل حفرگمانه‌ها وانجام آزمایشات Dutch Cone ـ پروژه طرح ترمیم وتکمیل حوضچه، اسکله‌ها وموج شکنهای بندر انزلی



SECTION A_A'

GEOTECHNICAL SECTION
PORT OF ANZALI PROJECT
IRAN KHAK CONSULTING ENGINE



SECTION C_C'

GEOTECHNICAL SECTION
PORT OF ANZALI PROJECT
IRAN KHAK CONSULTING ENGINEERS

Borehole No. 1

SUMMARY OF TEST RESULTS

Sample No.	Type	Depth m.	Description	76 mm	4.8 mm	75 μ	2 μ	LL	PL	PI	W	γwt g/cm³	γd g/cm³	γs g/cm³	N
	SPT	0.0	very loose poorly graded SAND with silt SP-SM												1
	SPT	1.5	As above												4
	SPT	3.0	loose poorly graded SAND with silt SP-SM												5
	SPT	4.5	As above												10
101	SPT	6.0	D. Gr. medium poorly graded SAND with silt SP-SM	100	100	11	-								16
010	SPT	7.5	D. Gr. medium silty SAND with shell SM												17.0
010	SPT	9.0	D. Gr. very stiff lean CLAY with shell CL	00	100	100	12	49	25.5	22.5					16.0
104	Undisturbed Sample	10.5	D. Gr. medium fat CLAY CH	100	100	100	30	64	30	34	46	1.75	1.2	.74	
105	SPT	11.0	As above but very stiff												17.0
106	SPT	12.0	As above												18.0
107	SPT	13.5	D. Gr. very stiff fat CLAY CH	100	100	100	32	52	22	30					19.0
	Vane test	14.0													
108	SPT	15.0	Medium poorly graded SAND SP												17.0
	SPT	16.5													18.0
109	SPT	18.0	D. Gr. very stiff sandy lean CLAY CL	100	100	68	7								27.0
0110	SPT	19.5	As above												28.0
	SPT	21.0	D. Gr. medium poorly graded SAND SP												17
0111	SPT	22.5	As above	100	100	4	-								25.0
	SPT	24.0	As above												25.0
0112	SPT	25.0	As above												26.0

IDENTIFICATION: Sample, Depth, Description, Symbol Log. CLASSIFICATION: Partical Size Distribution % Passing; Atterberg Limits Per %; % Nat Moisture. DENSITY: BULK, DRY, SP-GR. S.P.T Blows per 30 cm.

● SPT · Undisturbed Sample · ∇ Water level · O Gravel · Sand · — Silt

Borehole No. 2

SUMMARY OF TEST RESULTS

Table No.

Sample No.	Type	Depth m.	Description	76 mm	4.8 mm	75 μ	2 μ	LL	PL	PI	W	γwt g/cm³	γd g/cm³	γs g/cm³	N	Q.U. Triaxial φ Deg.	Q.U. Triaxial c Kg/cm²	Effective Stress φ' Deg.	Effective Stress c' Kg/cm²	Pressure Range Kg/cm²	m_v cm²/Kg	C_v cm²/sec	PH	Sulphate % SO_3
		0.2	Asfalt																					
	SPT	1.5	D. Gr. medium well graded SAND SW												17									
0201	SPT	3.0	D.Gr. loose well graded SAND with shell and wood SW	100	94	4									9								7.4	0.5
0202	SPT	4.5	D. Gr. medium silty SAND SM	100	96	32	-	-	-	N.P	19.1	2.07	1.74	2.68	16									0.6
	SPT	6.0	D. Gr. medium well graded SAND SW												19									
0203	SPT	7.5	D. Gr. medium poorly graded SAND with silt SP-SM	00	100	6									15									0.1
0204	SPT	9.0	As above but with shell & wood	100	100	8									20									0.3
0205	SPT	10.5	As above	100	100	9									12									0.20
0206	SPT	12.0	D. Gr. dense poorly graded SAND with silt and shell SP-SM	100	100	5									37									
0207	SPT	13.5	D. Gr. dense silty SAND with shell SM	100	100	26									32									0.1
	Undisturbed Sample / SPT	15.0	D. Gr. dense poorly graded SAND SP												46									0.1
0208	SPT	16.5	D. Gr. very dense silty SAND with shell SM	100	91	21									50									0.1
	Vane test	17.5	D. Gr. stiff lean CLAY CL																					
0209	Undisturbed Sample	18.0		100	100	91	14	34	19	15	28	1.96	1.53	2.74		22.0	0.19			.25-.5 .5-1 1-2 2-4 4-8	4.67 2.60 2.08 1.50 1.37	0.37 0.62 0.75 0.99 1.01		
0210	SPT	18.5	D. Gr. very stiff fat CLAY CH	100	100	86	28	57	30	27				2.74	21									
0211	SPT	19.5	D. Gr. medium silty SAND with shell SM	00	100	38	-								16									0.29
0212	SPT	21.0	D. Gr. medium to stiff lean CLAY CL	100	100	90	12	31	16	15				2.74	8									
	Vane test	21.5																						
0213	Undisturbed Sample	21.8	D. Gr. soft lean CLAY CL	100	100	93	16	34	17	17	30.0	1.92	1.48	2.74		11.5	0.35	20.0	0.21					1.22
0214	SPT	22.5	D. Gr. medium to stiff lean CLAY CL	100	100	87	14	33.5	17	16.5				2.74	8									
0215	SPT	24.0	D. Gr. very stiff lean CLAY CL	00	100	96	19	33	16	17				2.74	23									1.02
0216	SPT	25.5	D. Gr. hard lean CLAY CL	100	100	92	21	35	14	16				2.74	30									

IDENTIFICATION: Sample, Depth, Description, Symbol Log. CLASSIFICATION: Partical Size Distribution % Passing; Atterberg Limits Per %; % Nat Moisture. DENSITY: BULK, DRY, SP-GR. STRENGTH: S.P.T Blows per 30 cm; Q.U. Triaxial Tests; Effective Stress Tests. Consolidation. CHEMICA.

● SPT · Undisturbed Sample · ∇ Water level · O Gravel · Sand · — Silt · Clay · Vane test

SUMMARY OF TEST RESULTS

Borehole No. 3

Sample No.	Type	Depth m.	Description	76 mm	4.8 mm	75µ	2µ	LL	PL	PI	w	γwt	γd	γs	S.P.T N
	●	0.0													6
	●	1.5	Gr. loose silty SAND SM												10
	●	3.0	As above												2
	●	4.5	As above												2
	●	6.0	Gr. medium silty SAND SM												18
	●	7.5	Gr. medium silty SAND SM												19
D301	●	9.0	D. Gr. medium poorly graded SAND with silt SP-SM	100	100	7	—								29
D302	●	10.5	Gr. dense poorly graded SAND with silt & shell SP-SM												34
	●	12.0	Gr. medium poorly graded SAND with silt and shell SP-SM												23
D303	●	13.5	Gr. medium poorly graded SAND with silt and shell SP-SM												30
D304	●	15.0	D. Gr. medium poorly graded SAND SP	100	100	4	-								29
D305	●	16.5	As above												12
D306	●	18.0	As above	100	100	1									19
	●	19.5													17
D307	●	21.0	D. Gr. medium poorly graded SAND with silt SP-SM												21
D308	●	22.5	D. Gr. dense poorly graded SAND SP	100	100	—	—								33
D309	●	24.0	As above												30
D310	●	25.5	D. Gr. very dense silty SAND SM	100	100	17	—								50

● SPT ▆ Undisturbed Sample ∇ Water level O Gravel • Sand

موج شکنهای بندرانزلی

SUMMARY OF TEST RESULTS

Borehole No. 4

Sample No.	Type	Depth m.	Description	76 mm	4.8 mm	75µ	2µ	LL	PL	PI	w	γwt	γd	γs	S.P.T N
	●	0.0													5
	●	1.5	loose poorly graded SAND with silt SP-SM												8
	●	3.0	As above												8
D401	●	4.5	D. Gr. medium Silty SAND SM	100	100	17									29
D402	●	6.0	As above but with shell												11
D403	●	7.5	D. Gr. medium Silty SAND SM	100	99	13									14
D404	●	9.0	As above												21
D405	●	10.5	As above	100	98	21									24
	●	12.0	loose Silty SAND SM												6
D406	●	13.5	D. Gr. medium Silty SAND -SM	100	100	24									12
D407	●	15.0	As above												20
	●	16.5	As above												10
	●	18.0	As above												17
	●	19.5	As above												11
	●	21.0	D. Gr. medium Silty SAND -SM												19
D408	●	22.5	As above	100	100	15									21
D409	●	24.0	As above	100	99.5	14									27
D410	●	25.0	D. Gr. dense Silty SAND SM	100	100	29									34

● SPT ▆ Undisturbed Sample ∇ Water level, O Gravel • Sand — SM Clay

Borehole No.: 5

Sample No.	Type	Depth m.	Description	Partical Size Distribution % Passing 76 mm	4.8 mm	75µ	2µ	Atterberg Limits Per % LL	PL	PI	% Nat Moisture w	BULK g/cm³ γ_{wt}	DRY g/cm³ γ_d	SP-GR g/cm³ γ_s	S.P.T Blows per 30cm N
0501	●	0.0	Gr. loose silty SAND SM												5
0502	●	1.5	Gr. medium silty SAND with shell SM												18
0502	●	3.0	As above	100	99	16	-							2.68	29
0503	●	4.5	As above												25
0504	●	6.0	As above												22
0505	●	7.5	Gr. medium silty SAND with shell SM												26
7506	●	9.0	As above	100	100	13	-							2.68	18
	●	10.5	As above												15
0507	▬	12.0	D. Gr. stiff fat CLAY CH								37.2	1.85	1.35	2.74	
0508	●	13.5	D. Gr. stiff fat CLAY CH	100	100	90	25	52	22	30				2.74	15
0509	●	15.0	As above												15
	✦	16.5	D. Gr. soft fat CLAY CH												
0510	▬	17.0									44	1.77	1.23	2.74	
0511	●	18.5	D. Gr. stiff fat CLAY CL	100	100	86	28	64	29	35				2.74	15
	●	20.0	D. Gr. stiff fat CLAY CH												30
0512	●	21.5	Gr. medium poorly graded SAND with silt SP-SM	100	99	10	-								25
0513	●	23.0	As above												27
0514	●	25.0	As above												29
0515	●	26.5	Gr. medium poorly graded SAND with silt SP-SM	100	98	11	-								23
0516	●	27.5	D. Gr. dense silty SAND SM												45

CONSULTING ENGINEERS

SUMMARY OF TEST RESULTS

Borehole No. 6

Sample No.	Type	Depth m.	Description	Partical Size Distribution % Passing 76 mm	4.8 mm	75µ	2µ	Atterberg Limits Per % LL	PL	PI	% Nat Moisture w	BULK g/cm³ γ_{wt}	DRY g/cm³ γ_d	SP-GR g/cm³ γ_s	S.P.T Blows per 30cm N	STRENGTH Q.U. Triaxial Tests Deg. φ	Kg/cm² c	Effective Stress Tests Deg. φ'	Kg cm² c'	Consolidation Pressure Range Kg/cm² σ_1		
	●	0.0	D. Gr. medium well graded SAND SW												15							
0601	●	1.5	D. Gr. medium poorly graded SAND SP												19							
0602	●	3.0	D. Gr. medium poorly graded SAND with silt SP-SM												22							
0603	●	4.5	D. Gr. medium silty SAND SM	100	100	45									22							
	●	6.0	Green medium well graded SAND SW												24							
	●	7.5	Green medium well graded SAND SW												22							
0604	●	9.0	D. Gr. medium silty SAND SM	100	100	23									24							
0605	●	10.5	D. Gr. medium well graded SAND SW												24							
	▬	11.0																				
0606	●	12.0	D. Gr. loose to medium silty SAND SM	00	100	47									10							
	✦	12.5	D. Gr. soft to medium lean CLAY CL																			
0607	▬	12.8		00	100	97	16	33	17.5	15.5	30	1.91	1.47	2.74		21.0	0.37	19.0	0.22	.25-5 .5-1 1-2 2-4 4-8	2.80 2.40 2.25 2.10 2.01	1.1[illegible] 1.2[illegible] 1.2[illegible] 1.3[illegible] 1.3[illegible]
	●	13.5	D. Gr. stiff lean CLAY CL												10							
0608	●	15.0	D. Gr. very stiff sandy SILT ML	100	100	60	-	-	-	-	N.P		1.66	2.71	25			26.0	0.0			
	✦ ●	16.5													19							
0609	●	18.0	As above	100	100	73								2.71	17							
	▬	18.8																				
	●	19.5	As above												15							
0610	✦ ●	21.0	D. Gr. medium silty SAND SM	00	100	21	-								28							
0611	●	22.5	As above	00	100	22									18							
0612	●	24.0	D. Gr. hard sandy SILT ML	00	100	57									>30							
	●	25.5													30							
0613	●	27.0	D. Gr. medium silty SAND SM	00	100	18	-								28							
	●	28.5																				
		29.5													>50							

Project: طرح ترسیم وتکمیل توسعه اسکله‌ها و موج شکنهای بندرانزلی **IRAN KHAK CONSULTING ENGINEERS**

SUMMARY OF TEST RESULTS

Borehole No: 7

Sample No.	Type	Depth m.	Description	Symbol Log	% Passing 76 mm	% Passing 4.8 mm	% Passing 75µ	% Passing 2µ	LL	PL	PI	% Nat Moisture W	BULK γ_{wt} g/cm³	DRY γ_d g/cm³	SP-GR γ_s g/cm³	S.P.T Blows per 30cm N
0700	SPT	0.0	Gr. loose poorly graded SAND with silt SP-SM													8
0701	SPT	1.5	Gr. medium poorly graded SAND with silt SP-SM		100	100	6	-								17
0702	SPT	3.0	As above													21.0
0703	SPT	4.5	As above		100	100	5	-								22.0
0704	SPT	6.0	As above													22.0
0705	SPT	7.5	Gr. loose poorly graded SAND with silty SP-SM		100	100	7	-								9
0706	SPT	9.0	Gr. medium poorly graded SAND with silt SP-SM		100	100	10	-								13
	SPT	10.5														14
0707	Undisturbed	12.0	D. Gr. very soft fat CLAY shell CL		100	100	100	51	66	32.5	33.5	45	1.59	1.1	2.74	
		12.4														
0708	SPT	13.5	L. Br. stiff lean CLAY with sand CL													15
0709	SPT	15.0	As above		100	98	75	6	29	16	13				2.73	12
		16.5	Br. very stiff lean CLAY CL													
0710	SPT	16.8			100	100	89	6	31	16	15				2.74	19
0711	Undisturbed	17.1														
0712	SPT	18.0	As above		100	100	91	8	33	17	16					23
0713	SPT	19.5	Gr. dense poorly graded SAND with silt SP-SM		100	100	7	-								36
	SPT	21.0														19
0714	SPT	22.5	Gr. dense poorly graded SAND with silt SP-SM		100	100	9	-								44
0715	SPT	24.0	As above													38
0716	SPT	25.5	Gr. medium poorly graded SAND with silt SP-SM		100	100	9	-								28
0717	SPT	27.0	Gr. dense poorly graded SAND with silt SP-SM													30
0718	SPT	28.5	As above													38
0719	Undisturbed	30.0	D. Gr. very dense poorly graded SAND with silt SP-SM		100	100	7	-								>50

Project: طرح ترسیم وتکمیل توسعه اسکله‌ها و موج شکنهای بندرانزلی **IRAN KHAK CONSULTING ENGINEERS**

SUMMARY OF TEST RESULTS

Borehole No: 8

Sample No.	Type	Depth m.	Description	Symbol Log	% Passing 76 mm	% Passing 4.8 mm	% Passing 75µ	% Passing 2µ	LL	PL	PI	% Nat Moisture W	BULK γ_{wt} g/cm³	DRY γ_d g/cm³	SP-GR γ_s g/cm³	S.P.T Blows per 30cm N	U.U. Triaxial Tests Ø Deg.	U.U. Triaxial Tests C Kg/cm²	Effective Stress Tests Ø' Deg.	Effective Stress Tests C' Kg/cm²	Pressure Range Kg/cm² P_1	m_v cm²/Kg ×10⁻²	C_v cm²/sec ×10⁻³
		0.3	Fill Material	▽																			
0801	SPT	1.5	D. Gr. medium poorly graded SAND with wood SP		100	100	3									14							
	SPT	3.0	As above													10							
0802	SPT	4.5	D. Gr. medium poorly graded SAND with shell SP		100	100	-									24							
0803	SPT	6.0	As above		100	100	-									22							
0804	SPT	7.5	D. Gr. medium poorly graded SAND with silt SP-SM		100	100	7					19.5	2.08	1.74	2.66	16			27.0	0.0			
0805	SPT	9.0	As above		100	100	11									13							
0806	SPT	10.5	D. Gr. very dense poorly graded SAND with silt SP-SM		100	100	6									50							
0807	SPT	12.0	D. Gr. dense D. Gr. dense silty SAND SM		100	100	92									41							
0808	SPT	13.5	D. Gr. dense silty SAND SM		100	89	17									39							
0809	SPT	15.0	D. Gr. medium silty SAND SM		100	85	29									22							
	SPT	16.5	As above													22							
		17.2	D. Gr. stiff lean CLAY CL																				
0810	Undisturbed	17.5			100	100	94	17	30.5	19	11.5	28.5	1.95	1.52	2.74		12.0	0.30	21.0	0.2	.25-.5 .5-1 1-2 2-4 4-8	3.50 3.10 2.12 1.80 1.66	0.532 0.570 0.670 0.730 0.71
0811	SPT	18.0	As above		100	100	89	13	29	18	11				2.74	29							
0812	SPT	19.5	D. Gr. dense silty SAND SM		100	91	35									31							
		20.5	D. Gr. stiff to very stiff lean CLAY with sand CL																				
0813	SPT	21.0			100	100	81	13	28.5	18.5	10.	20.6			2.73	30							
0814	Undisturbed	21.5	As above		100	100	76	14	30	18	12	25.7	2.0	1.59	2.73		14.0	0.15					
0815	SPT	22.5	D. Gr. dense clayey SAND SC		100	100	36	-	26	17	9				2.69	44							
0816	SPT	24.0	D. Gr. hard fat CLAY CH		100	100	89	31	55	24	31	23.3			2.74	30							
	SPT	25.5	Gr. medium clayey SAND SC													13							

● SPT ▬ Undisturbed Sample ▽ Water level ○ Gravel • Sand — Silt ═ Clay

IRAN KHAK CONSULTING ENGINEERS

موج شکنهای بندرا نزلی

SUMMARY OF TEST RESULTS

Project:

Borehole No.: 9

Sample No.	Type	Depth m.	Description	Particle Size Distribution % Passing 76 mm	4.8 mm	75µ	2µ	Atterberg Limits Per % LL	PL	PI	% Nat Moisture W	Bulk γ_{wt} g/cm³	Dry γ_d g/cm³	SP-GR γ_s g/cm³	S.P.T Blows per 30cm N
		0.5	Asfalt												
0901	SPT	1.5	Gr. medium poorly graded SAND SP	100	100	2									26
0902	SPT	3.0	As above	100	100	4									18
0903	SPT	4.5	As above	100	100	3									17
	SPT	6.0	Medium well graded SAND with shell SP												13
	SPT	7.5	Medium well graded SAND with shell SP												15
0904	SPT	9.0	D. Gr. medium poorly graded SAND SP	100	100	2									13
	SPT	10.5	Medium well graded SAND SM												14
0905	SPT	12.0	D. Gr. medium silty SAND with shell & wood SM	100	98	25					17.0	2.11	1.82	2.67	22
0906	SPT	13.5	Gr. dense silty SAND SM	100	97	22									47
0907	SPT	15.0	Gr. very dense silty SAND SM	100	100	22									50
0908	SPT	16.5	Gr. medium poorly graded SAND with silt SP-SM	100	100	9									16
	Undisturbed	17.0	Medium lean CLAY CL												
	Sand	17.5													
	SPT	18.0													14
0909	SPT	19.5	D. Green hard lean CLAY CL	100	100	91	16	34.5	19.5	15	22.9			2.74	30
0910	SPT	21.0	Gr. medium lean CLAY CL	100	100	88	14	32	18.5	13.5				2.74	5
0911	Undisturbed	21.8	As above	100	100	94	16	37	21.5	15.5	30	1.95	1.50	2.74	
0912	Sand / SPT	22.5	Gr. very stiff fat CLAY CH	100	100	92	22	54	23	31				2.74	30
0913	SPT	24.0	D. Gr. very stiff sandy lean CLAY CL	100	100	67	10	28	16	12				2.73	23
0914	SPT	25.5	As above	100	100	62	13	27	14.5	12.5				2.73	28

● SPT — Undisturbed Sample — ∇ Water level — O Gravel — • Sand

IRAN KHAK CONSULTING ENGINEERS

SUMMARY OF TEST RESULTS

Project:

Borehole No.: 10

Sample No.	Type	Depth m.	Description	Particle Size Distribution % Passing 76 mm	4.8 mm	75µ	2µ	Atterberg Limits Per % LL	PL	PI	% Nat Moisture W	Bulk γ_{wt} g/cm³	Dry γ_d g/cm³	SP-GR γ_s g/cm³	S.P.T Blows per 30cm N	C.U. Triaxial Tests Deg. ϕ	Kg/cm² C	Effective Stress Tests Deg. ϕ'	Kg/cm² c'
		0.4	Asfalt																
1001	SPT	1.5	Gr. medium poorly graded SAND with silt SP-SM	100	100	11									23				
1002	SPT	3.0	As above	100	100	6									23				
1003	SPT	4.5	D. Gr. medium poorly graded SAND with silt SP-SM	100	100	8									22				
1004	SPT	6.0	D.Gr. medium poorly graded SAND with silt and shell SP-SM	100	100	9									18				
1005	SPT	7.5	D. Gr. dense poorly graded SAND with silt SP-SM	100	100	92	30	52	23	29				2.74	18				
1006	SPT	9.0	D. Gr. dense poorly graded SAND with silt SP-SM	100	100	8	-				4.5	2.2	1.92	2.66	37			28.5	0.0
1007	SPT	10.5	As above	100	100	9									46				
1008	SPT	12.0	As above	100	100	7									45				
1009	SPT	13.5	As above	100	100	10									37				
	Sand	14.0	CL																
	Undisturbed	15.2	D. Gr. medium clayey SAND SC																
1010	SPT	15.5		100	100	41	9	25	15	10					13				
1011	Undisturbed	16.0	D. Gr. medium to stiff lean CLAY with sand CL	100	100	78	13	28.5	16	12.5	27	1.97	1.55	2.73					
	SPT	17.0	As above but soft																
	Sand	17.8	D.Gr. very loose poorly graded SAND with silt SP-SM												2				
1012	SPT	18.2		100	100	6									5				
1013	SPT	19.2	D. Gr. dense silty SAND SM	100	100	35									39				
1014	SPT	20.2	Gr. stiff lean CLAY CL	100	100	93	17	31.5	19.5	12				2.74	11				
1015	SPT	21.0	Br. soft to medium lean CLAY CL												4				
1016	Undisturbed	21.5	As above																
1017	SPT	23.0	Gr. stiff lean CLAY CL	100	100	88	14	29	18	11				2.74	12				
1018	SPT	24.0	Gr. dense poorly graded SAND with silt SP-SM	100	100	7									42				
1019	SPT	25.0	Gr. very dense poorly graded SAND with silt SP-SM	100	100	11									50				

Consolidation (sample 1011):

Pressure Range kg/cm²	a_v	C_v
.25-.5	2.10	1.14
.5-1	1.90	1.26
1-2	1.65	1.40
2-4	1.16	1.50
4-8	1.10	1.54

● SPT — Undisturbed Sample — ∇ Water level — O Gravel — • Sand — Silt — Clay

Appendix (IV)-4 Stability against Liquefaction

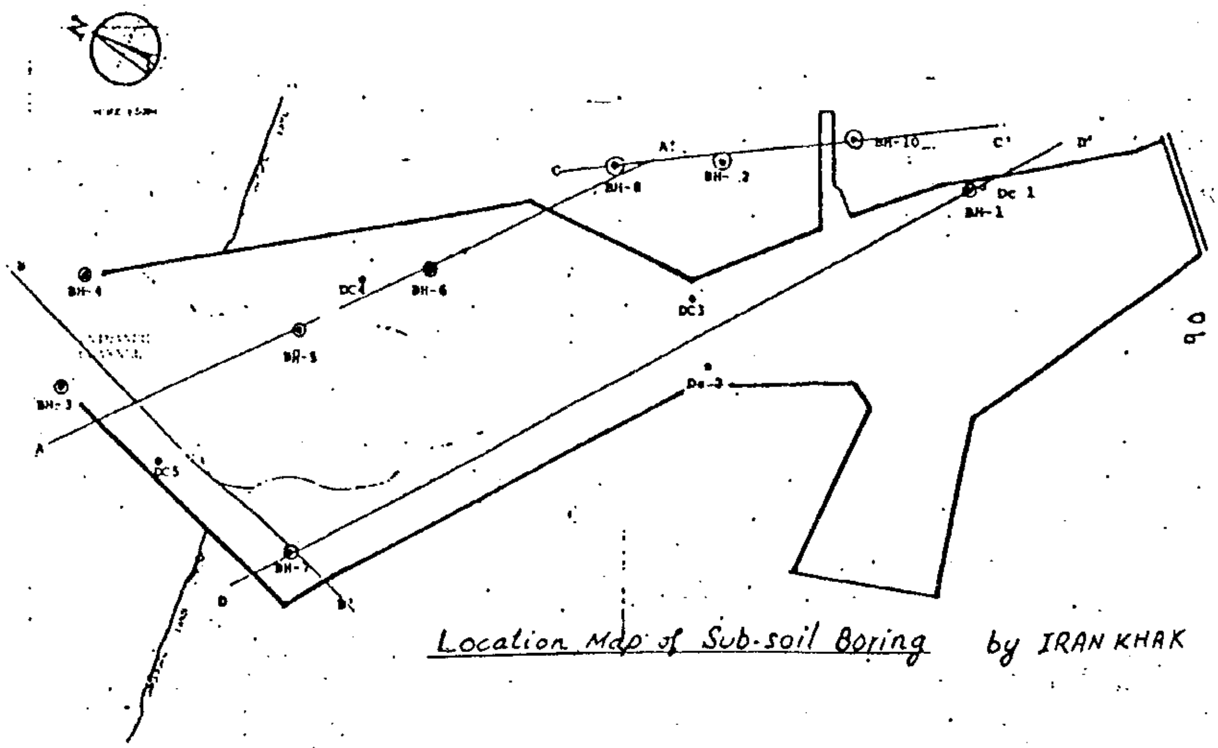
Appendix IV-3 Stability against Liquefaction

Preface: The sub-soil strata in the Anzali port area and its surroundings are consist of mainly sedimented sandy materials caused by the rivers, even it is containd a few the silty/calyey layers in some parts.

The Elborz mountain chains behind the area are formed the volcanic zone belt, it is remained as a serious diaster that many people were dead and many housings are destroied at Rudbar town in several years ago by the earthquake with the magnitude 8.0 class.

It is commonly known that The saturated loose sandy deposits tend to liquefy during earthquakes,causing damage to structures. Liquefaction, if a relevant factor, should be taken into consideration in design and construction of structures.

The results of the sub-soil borings as shown in figure below are referred to the data to be studied for the stability against liquefaction.



Location Map of Sub-soil Boring by IRAN KHAK

Possibility study for stability against liquefaction at Anzali

The study is based on the data prepared by the results of sub-soil boring by I.Khak and JICA, and on the standards by Japan Ports Assosiation and Japan Roads Assosiation.

1. Conditions to be settled:

1) Bore hole No. to be studied: No.1 to No.10

2) Unit weight of soil: Wet gravity wt= 2.0 tf/m3
Gravity in water: w= 1.0 tf/m3

Bore hole No.	1	2	5	6	7	8	9	10
1	1.75	2.00	1.85	1.91	1.68	2.08	2.12	2.20
2		1.96	1.77	2.02	1.81	1.95	1.95	1.97
3		1.92				2.00		
mean value	32.94/17= 1.94							

3) Standard/condition

3-1 Technical standards for port and harbour facilities in Japan

a) Assumed maxmum accellation of earth: 300 Gal
Assumed maxmum accellation on surface of soil: 350 Gal

b) Ajustment of vertical direction: 1 to 0.015 z

c) Designed horizontal seismic coeffiecient:

kh= 1/3 x (Smax/g) = 1/3(350/980) = 0.236= 0.25

3-2 Standard for bridges with earthquake

a) Designed horizontal seismic coeffiecient:

ks= 0.15 x 1.0 x 1.2 x 1.0 = 0.

3-3 Guideline for foundation structures of Buildings

a) Assumed design horizontal accellation of ground:

max= 200 Gal

b) Magnitude: M= 8

2. Result of Analysis

1) Almost all of the soil are not liquefied or there are a few possibilities to liquefy i.e. in the surface layer of 3 to 5 m in the seabed.

2) When the structures are poposed on the surface area of the seabed, it is required to strengthen the surface soil.

Results of liquefaction study

Bore hole No. / Standard	1	2	3	4	5	6	7	8	9	10
Port Association	G	G	G	E	E	E	G	G	M	E
Road Association	G	E	G	G	E	E	E	E	E	E
Building Society	G	E	G	G	E	E	E	E	G	E
Jugement	G	E	G	G	E	E	G	E	G	E

[Abbreviation] G: Good (it has a few possibility)
E: Exelent (it has no liquefied)
M: Midium (it has partially possibility)

Sample for English Veresion

Standard by: MOT(Ministry of Transportation)
Ports and Harbours Association of Japan

* Applicable range: 2 < N.6 < 40
0 < v < 3 kgf/sq.cm

* N value: Coefficient of decreasing / range

FC < 5 % : 1.0
5 % < FC < 15 % : 1.25~0.05 FC
15 % < FC : 0.5

BH. No.1 * Water level in undergroud : 0 m

	Basic data										Judgement on Liquefaction										
No	A	B	C	D	E	F	G	H	I	J	K	-	L	-	M	O	P	Q	R	S	T

[Note] A: Elevation
B: Depth
C: Thickness of layer
D: N value
E: Wet dencity γt
F: Dencity in water $\gamma t'$
G: Average diameter of particle D50 (mm)
H: Content ratio of fine particles Fc %
I: Average ratio Uc
J: Plastic index Ip
K: Range of particle's diameter
L: Total surcharged load σz
M: Effective surchrged load $\sigma z'$
N: Equivalent N value
O: Decreasing index of fine particles β
P: Ajusted N value
Q: Equivalent accellated force α
R: Classification of soil layer
S: Thickness of layer m
T: Judgement

Standard by MOT.
Ports and Hoabours Association of Japan : 2 ≦ N.6 ≦40
Applicable Renge 0 ≦ σ'v ≦3 kgf/ ㎠

N Value coefficient of decreasing rate
FC≦ 5% :1.0
5%< FC< 15% :1.25-0.05FC
15%≦ FC :0.5

BH. NO: 1 Water level in underground : 0m

NO	A	B	C	D	E	F	G	H	I	J	K	—	L	—	M	N	O	P	Q	R	S	T
Basic data											Judgement on Liquefaction											
0																						
0																						
1		0.00	0.00	1	2.00	1.00	0.110	11	1.7		A	0.000	0.00	0.000	0.00	3.0	0.70	4.3	350	I		
2		1.50	1.50	4	2.00	1.00	0.110	11	1.7		A	0.300	0.30	0.150	0.15	6.2	0.70	8.8	342	I	3.8	×
3		3.00	1.50	5	2.00	1.00	0.110	11	1.7		A	0.300	0.60	0.150	0.30	6.6	0.70	9.4	334	I		
4		4.50	1.50	10	2.00	1.00	0.110	11	1.7		A	0.300	0.90	0.150	0.45	11.3	0.70	16.2	326	Ⅲ	1.5	△
5		6.00	1.50	16	2.00	1.00	0.110	11	1.7		A	0.300	1.20	0.150	0.60	16.5	0.70	23.6	319	Ⅳ		
6		7.50	1.50	17	2.00	1.00	0.110	11	1.7		A	0.300	1.50	0.150	0.75	16.3	0.70	23.2	311	Ⅳ		
7		9.00	1.50	16	2.00	1.00	0.022	100	16.0	22.5	Bf	0.300	1.80	0.150	0.90	14.2	1.00	14.2	303	Ⅳ		
8		11.00	2.00	17	2.00	1.00	0.013	100	---	34.0	Bf	0.400	2.20	0.200	1.10	13.8	1.00	13.8	292	Ⅳ	9.0	○
9		12.00	1.00	18	2.00	1.00	0.013	100	---		Bf	0.200	2.40	0.100	1.20	14.0	1.00	14.0	287	Ⅳ		
10		13.50	1.50	19	2.00	1.00	0.012	100	---		Bf	0.300	2.70	0.150	1.35	13.9	1.00	13.9	279	Ⅳ		
11		15.00	1.50	17	2.00	1.00	0.110	11	1.7		A	0.300	3.00	0.150	1.50	11.6	0.70	16.5	271	Ⅲ		
12		16.50	1.50	18	2.00	1.00	0.110	11	1.7		A	0.300	3.30	0.150	1.65	11.6	0.70	16.6	263	Ⅲ	3.0	△
13		18.00	1.50	27	2.00	1.00	0.040	68	17.0		A	0.300	3.60	0.150	1.80	17.1	0.50	34.3	256	Ⅳ		
14		19.50	1.50	28	2.00	1.00	0.040	68	17.0		A	0.300	3.90	0.150	1.95	16.9	0.50	33.9	248	Ⅳ	3.0	○
15		21.00	1.50	17	2.00	1.00	0.250	4	1.6		A	0.300	4.20	0.150	2.10	9.1	1.00	9.1	240	I	1.5	×
16		22.50	1.50	25	2.00	1.00	0.250	4	1.6		A	0.300	4.50	0.150	2.25	13.5	1.00	13.5	232	Ⅲ		
17		24.00	1.50	25	2.00	1.00	0.250	4	1.6		A	0.300	4.80	0.150	2.40	12.9	1.00	12.9	224	Ⅲ	4.5	○
18		25.00	1.00	26	2.00	1.00	0.250	4	1.6		A	0.200	5.00	0.100	2.50	13.1	1.00	13.1	219	Ⅲ		

BH. NO: 2 Water level in underground : -1.8m

NO	A	B	C	D	E	F	G	H	I	J	K	—	L	—	M	N	O	P	Q	R	S	T
Basic data											Judgement on Liquefaction											
0																						
0		0																	350			
1		1.50	1.50	17	2.00	2.00	0.610	4	6.5		A	0.300	0.30	0.300	0.30	20.6	1.00	20.6	342	Ⅳ	1.5	○
2		3.00	1.50	9	2.00	1.20	0.610	4	6.5		A	0.300	0.60	0.180	0.48	10.1	1.00	10.1	334	I	1.5	×
3		4.50	1.50	16	2.00	1.00	0.110	32	7.5		A	0.300	0.90	0.150	0.63	16.2	0.5	32.5	326	Ⅳ	1.5	○
4		5.00	0.50	19	2.00	1.00	0.270	6	1.9		A	0.100	1.00	0.050	0.68	18.8	0.95	19.8	324	Ⅲ	0.5	
5		7.50	2.50	15	2.00	1.00	0.270	6	1.9		A	0.500	1.50	0.250	0.93	13.1	0.95	13.8	311	Ⅱ	2.5	
6		9.00	1.50	20	2.00	1.00	0.140	8	2.1		A	0.300	1.80	0.150	1.08	16.5	0.85	19.4	303	Ⅲ	1.5	△
7		10.50	1.50	12	2.00	1.00	0.120	9	1.3		A	0.300	2.10	0.150	1.23	8.9	0.80	11.2	295	I	1.5	
8		12.00	1.50	37	2.00	1.00	0.120	5	1.3		A	0.300	2.40	0.150	1.38	27.7	1.00	27.7	287	Ⅳ		
9		13.50	1.50	32	2.00	1.00	0.150	28	6.0		A	0.300	2.70	0.150	1.53	22.6	0.50	45.1	279	Ⅳ		
10		15.00	1.50	46	2.00	1.00	0.210	21	8.4		A	0.300	3.00	0.150	1.68	31.4	0.50	62.7	271	Ⅳ	8.0	○
11		16.50	1.50	50	2.00	1.00	0.210	21	8.4		A	0.300	3.30	0.150	1.83	32.6	0.50	65.3	263	Ⅳ		
12		18.50	2.00	21	2.00	1.00	0.020	86	---		Bf	0.400	3.70	0.200	2.03	12.0	1.00	12.0	253	Ⅳ		
13		19.50	1.00	16	2.00	1.00	0.100	38	9.6		A	0.200	3.90	0.100	2.13	8.4	0.50	16.8	248	Ⅲ	1.0	△
14		21.00	1.50	8	2.00	1.00	0.017	90	22.0		Bf	0.300	4.20	0.150	2.28	3.1	1.00	3.1	240	Ⅳ	1.5	○
15		22.50	1.50	8	2.00	1.00	0.030	87	---		A	0.300	4.50	0.150	2.43	2.8	0.50	5.6	232	I	1.5	×
16		24.00	1.50	23	2.00	1.00	0.015	96	---		Bf	0.300	4.80	0.150	2.58	11.0	1.00	11.0	224	Ⅳ		
17		25.50	1.50	30	2.00	1.00	0.015	92	----		Bf	0.300	5.10	0.150	2.73	14.4	1.00	14.4	216	Ⅳ	3.0	○

Standard by MOT.
Ports and Hoabours Association of Japan
Applicable Renge

: 2 ≦ N.6 ≦40
0 ≦ σ'v ≦3 kgf/ ㎠

N Value coefficient of decreasing rate
FC≦ 5% :1.0
5%<FC<15% :1.25-0.05FC
15%≦FC :0.5

BH.NO: 3 Water level in underground : 0m

NO	Basic data										Judgement on Liquefaction											
	A	B	C	D	E	F	G	H	I	J	K	–	L	—	M	N	O	P	Q	R	S	T
0																						
0																						
1		0.00	0.00	6	2.00	1.00	0.250	7	2.8		A	0.000	0.00	0.000	0.00	9.8	0.90	10.9	350	I	0.8	
2		1.50	1.50	10	2.00	1.00	0.250	7	2.8		A	0.300	0.30	0.150	0.15	13.7	0.90	15.3	342	II	1.5	
3		3.00	1.50	2	2.00	1.00	0.250	7	2.8		A	0.300	0.60	0.150	0.30	3.1	0.90	3.4	334	I		×
4		4.50	1.50	2	2.00	1.00	0.250	7	2.8		A	0.300	0.90	0.150	0.45	2.6	0.90	2.9	326	I	3.0	
5		6.00	1.50	18	2.00	1.00	0.250	7	2.8		A	0.300	1.20	0.150	0.60	18.6	0.90	20.6	319	IV		
6		7.50	1.50	19	2.00	1.00	0.250	7	2.8		A	0.300	1.50	0.150	0.75	18.2	0.90	20.2	311	IV		
7		9.00	1.50	29	2.00	1.00	0.250	7	2.8		A	0.300	1.80	0.150	0.90	26.1	0.90	29.0	303	IV		
8		10.50	1.50	34	2.00	1.00	0.250	7	2.8		A	0.300	2.10	0.150	1.05	28.8	0.90	32.0	295	IV	10.5	○
9		12.00	1.50	23	2.00	1.00	0.250	7	2.8		A	0.300	2.40	0.150	1.20	18.1	0.90	20.1	287	IV		
10		13.50	1.50	30	2.00	1.00	0.250	7	2.8		A	0.300	2.70	0.150	1.35	22.5	0.90	25.0	279	IV		
11		15.00	1.50	29	2.00	1.00	0.250	4	2.8		A	0.300	3.00	0.150	1.50	20.6	1.00	20.6	271	IV		
12		16.50	1.50	12	2.00	1.00	0.250	4	2.8		A	0.300	3.30	0.150	1.65	7.3	1.00	7.3	263	I	1.5	
13		18.00	1.50	19	2.00	1.00	0.250	1	1.6		A	0.300	3.60	0.150	1.80	11.6	1.00	11.6	256	II	1.5	
14		19.50	1.50	17	2.00	1.00	0.250	1	1.6		A	0.300	3.90	0.150	1.95	9.7	1.00	9.7	248	I	1.5	×
15		21.00	1.50	21	2.00	1.00	0.250	4	1.6		A	0.300	4.20	0.150	2.10	11.7	1.00	11.7	240	II	1.5	
16		22.50	1.50	33	2.00	1.00	0.230	0	1.7		A	0.300	4.50	0.150	2.25	18.4	1.00	18.4	232	IV	1.5	○
17		24.00	1.50	30	2.00	1.00	0.230	0	1.7		A	0.300	4.80	0.150	2.40	15.8	1.00	15.8	224	III	1.5	△
18		25.50	1.50	50	2.00	1.00	0.180	17	4.2		A	0.300	5.10	0.150	2.55	26.5	0.50	53.1	216	IV	1.5	○

BH.NO: 4 Water level in underground : 0m

NO	Basic data										Judgement on Liquefaction											
	A	B	C	D	E	F	G	H	I	J	K	–	L	—	M	N	O	P	Q	R	S	T
0																						
0																			350			
1		0	0.00	5	2.00	1.00	0.160	17	4.4		A	0.000	0.00	0.000	0.00	8.4	0.50	16.9	350	III	0.8	○
2		1.50	1.50	8	2.00	1.00	0.160	17	4.4		A	0.300	0.30	0.150	0.15	11.2	0.50	22.4	342	IV		
3		3.00	1.50	8	2.00	1.00	0.160	17	4.4		A	0.300	0.60	0.150	0.30	10.1	0.50	20.2	334	IV		
4		4.50	1.50	29	2.00	1.00	0.160	17	4.4		A	0.300	0.90	0.150	0.45	32.1	0.50	64.1	326	IV		
5		6.00	1.50	11	2.00	1.00	0.160	17	4.4		A	0.300	1.20	0.150	0.60	11.4	0.50	22.8	319	IV	10.5	○
6		7.50	1.50	14	2.00	1.00	0.150	13	2.4		A	0.300	1.50	0.150	0.75	13.4	0.60	22.3	311	IV		
7		9.00	1.50	21	2.00	1.00	0.150	13	2.4		A	0.300	1.80	0.150	0.90	18.8	0.60	31.3	303	IV		
8		10.50	1.50	24	2.00	1.00	0.120	21	3.8		A	0.300	2.10	0.150	1.05	20.2	0.50	40.3	295	IV		
9		12.00	1.50	6	2.00	1.00	0.120	21	3.8		A	0.300	2.40	0.150	1.20	4.1	0.50	8.2	287	I	1.5	
10		13.50	1.50	12	2.00	1.00	0.150	24	5.6		A	0.300	2.70	0.150	1.35	8.4	0.50	16.8	279	III	1.5	△
11		15.00	1.50	20	2.00	1.00	0.150	24	5.6		A	0.300	3.00	0.150	1.50	13.8	0.50	27.7	271	IV	1.5	○
12		16.50	1.50	10	2.00	1.00	0.150	24	5.6		A	0.300	3.30	0.150	1.65	5.9	0.50	11.7	263	II	1.5	△
13		18.00	1.50	17	2.00	1.00	0.150	24	5.6		A	0.300	3.60	0.150	1.80	10.3	0.50	20.5	256	IV	1.5	○
14		19.50	1.50	11	2.00	1.00	0.150	24	5.6		A	0.300	3.90	0.150	1.95	5.7	0.50	11.4	248	II	1.5	△
15		21.00	1.50	19	2.00	1.00	0.150	24	5.6		A	0.300	4.20	0.150	2.10	10.4	0.50	20.8	240	IV		
16		22.50	1.50	21	2.00	1.00	0.150	15	3.0		A	0.300	4.50	0.150	2.25	11.1	0.50	22.1	232	IV	4.5	○
17		24.00	1.50	27	2.00	1.00	0.180	14	3.7		A	0.300	4.80	0.150	2.40	14.1	0.55	25.6	224	IV		

Standard by MOT.
Ports and Hoabours Association of Japan : $2 \leqq N.6 \leqq 40$
Applicable Renge $0 \leqq \sigma'v \leqq 3$ kgf/ cm²

N Value coefficient of decreasing rate
FC≦ 5% :1.0
5%＜FC＜15% :1.25-0.05FC
15%≦FC :0.5

BH.NO: 5 Water level in underground : 0m

NO	Basic data A	B	C	D	E	F	G	H	I	J	Judgement on Liquefaction K	–	L	—	M	N	O	P	Q	R	S	T
0																						
0																						
1		0.00	0.00	5	2.00	1.00	0.210	16	5.6		A	0.000	0.00	0.000	0.00	8.4	0.50	16.9	350	Ⅲ	0.8	○
2		1.50	1.50	18	2.00	1.00	0.210	16	5.6		A	0.300	0.30	0.150	0.15	23.8	0.50	47.5	342	Ⅳ		
3		3.00	1.50	29	2.00	1.00	0.210	16	5.6		A	0.300	0.60	0.150	0.30	34.6	0.50	69.3	334	Ⅳ		
4		4.50	1.50	25	2.00	1.00	0.210	16	5.6		A	0.300	0.90	0.150	0.45	27.7	0.50	55.4	326	Ⅳ		
5		6.00	1.50	22	2.00	1.00	0.210	16	5.6		A	0.300	1.20	0.150	0.60	22.7	0.50	45.3	319	Ⅳ		
6		7.50	1.50	26	2.00	1.00	0.140	13	2.3		A	0.300	1.50	0.150	0.75	24.9	0.60	41.6	311	Ⅳ		
7		9.00	1.50	18	2.00	1.00	0.140	13	2.3		A	0.300	1.80	0.150	0.90	16.0	0.60	26.7	303	Ⅳ	17.0	○
8		10.50	1.50	15	2.00	1.00	0.140	13	2.3		A	0.300	2.10	0.150	1.05	12.4	0.60	20.6	295	Ⅳ		
9		13.50	3.00	15	2.00	1.00	0.020	90	----	37.2	Bf	0.600	2.70	0.300	1.35	10.8	1.00	10.8	279	Ⅳ		
10		15.00	1.50	15	2.00	1.00	0.020	90	----	37.2	Bf	0.300	3.00	0.150	1.50	10.1	1.00	10.1	271	Ⅳ		
11		18.50	3.50	15	2.00	1.00	0.019	86	----		Bf	0.700	3.70	0.350	1.85	8.7	1.00	8.7	253	Ⅳ		
12		20.00	1.50	10	2.00	1.00	0.019	86	----		Bf	0.300	4.00	0.150	2.00	4.9	1.00	4.9	245	Ⅲ	1.5	△
13		21.50	1.50	25	2.00	1.00	0.230	10	3.0		A	0.300	4.30	0.150	2.15	14.0	0.75	18.6	237	Ⅳ		
14		23.00	1.50	27	2.00	1.00	0.230	10	3.0		A	0.300	4.60	0.150	2.30	14.5	0.75	19.3	229	Ⅳ	5.0	○
15		25.00	2.00	29	2.00	1.00	0.230	10	3.0		A	0.400	5.00	0.200	2.50	14.8	0.75	19.7	219	Ⅳ		
16		26.50	1.50	23	2.00	1.00	0.230	11	3.0		A	0.300	5.30	0.150	2.65	10.8	0.70	15.4	211	Ⅲ	1.5	△
17		27.50	1.00	45	2.00	1.00	0.230	11	3.0		A	0.200	5.50	0.100	2.75	22.5	0.70	32.1	206	Ⅳ	1.0	○
18																						

BH.NO: 6 Water level in underground : 0m

NO	Basic data A	B	C	D	E	F	G	H	I	J	Judgement on Liquefaction K	–	L	—	M	N	O	P	Q	R	S	T
0																						
1		0.00	0.00	15	2.00	1.00	0.160	45	----		A	0.000	0.00	0.000	0.00	22.0	0.50	44.0	350	Ⅳ		
2		1.50	1.50	19	2.00	1.00	0.160	45	----		A	0.300	0.30	0.150	0.15	25.0	0.50	50.0	342	Ⅳ		
3		3.00	1.50	22	2.00	1.00	0.160	45	----		A	0.300	0.60	0.150	0.30	26.5	0.50	52.9	334	Ⅳ		
4		4.50	1.50	22	2.00	1.00	0.160	45	----		A	0.300	0.90	0.150	0.45	24.4	0.50	48.9	326	Ⅳ		
5		6.00	1.50	24	2.00	1.00	0.160	45	----		A	0.300	1.20	0.150	0.60	24.7	0.50	49.4	319	Ⅳ		
6		7.50	1.50	22	2.00	1.00	0.160	45	----		A	0.300	1.50	0.150	0.75	21.1	0.50	42.2	311	Ⅳ		
7		9.00	1.50	24	2.00	1.00	0.270	23	----		A	0.300	1.80	0.150	0.90	21.5	0.50	43.0	303	Ⅳ		
8		10.50	1.50	24	2.00	1.00	0.270	23	----		A	0.300	2.10	0.150	1.05	20.2	0.50	40.3	295	Ⅳ		
9		12.00	1.50	10	2.00	1.00	0.080	47	1.9		Bc	0.300	2.40	0.150	1.20	7.4	1.00	7.4	287	Ⅳ		○
10		13.50	1.50	10	2.00	1.00	0.010	97	14.0	15.5	Bf	0.300	2.70	0.150	1.35	6.9	1.00	6.9	279	Ⅳ		
11		15.00	1.50	25	2.00	1.00	0.052	60	1.9		Bc	0.300	3.00	0.150	1.50	17.6	1.00	17.6	271	Ⅳ		
12		16.50	1.50	19	2.00	1.00	0.052	60	1.9		Bc	0.300	3.30	0.150	1.65	12.3	1.00	12.3	263	Ⅳ		
13		18.00	1.50	17	2.00	1.00	0.050	73	1.6		Bc	0.300	3.60	0.150	1.80	10.3	1.00	10.3	256	Ⅳ		
14		19.50	1.50	15	2.00	1.00	0.050	73	1.6		Bc	0.300	3.90	0.150	1.95	8.3	1.00	8.3	248	Ⅳ		
15		21.00	1.50	28	2.00	1.00	0.210	21	6.3		A	0.300	4.20	0.150	2.10	16.1	0.50	32.2	240	Ⅳ		
16		22.50	1.50	18	2.00	1.00	0.200	22	6.3		A	0.300	4.50	0.150	2.25	9.2	0.50	18.5	232	Ⅳ		
17		24.00	1.50	30	2.00	1.00	0.057	57	2.9		Bc	0.300	4.80	0.150	2.40	15.8	1.00	15.8	224	Ⅳ		
17		25.50	1.50	30	2.00	1.00	0.057	57	2.9		Bc	0.300	5.10	0.150	2.55	15.1	1.00	15.1	216	Ⅳ		

Standard by MOT.
Ports and Hoabours Association of Japan : 2 ≦ N.6 ≦40
Applicable Renge 0 ≦ σ'v ≦3 kgf/ ㎠

N Value coefficient of decreasing rate
FC≦ 5% :1.0
5%< FC< 15% :1.25-0.05 FC
15%≦ FC :0.5

BH.NO: 7 Water level in underground : 0m

Basic data											Judgement on Liquefaction										
NO	A	B	C	D	E	F	G	H	I	J	K	–	L	—	M	N	O	P	Q	R	S	T
0																					
0																					
1		0.00	0.00	8	2.00	1.00	0.190	6	2.6		A	0.000	0.00	0.000	0.00	12.5	0.95	13.2	350	II	0.8	
2		1.50	1.50	17	2.00	1.00	0.190	6	2.6		A	0.300	0.30	0.150	0.15	22.5	0.95	23.7	342	IV		
3		3.00	1.50	21	2.00	1.00	0.190	6	2.6		A	0.300	0.60	0.150	0.30	25.3	0.95	26.6	334	IV		
4		4.50	1.50	22	2.00	1.00	0.180	5	2.6		A	0.300	0.90	0.150	0.45	24.4	1.00	24.4	326	IV	6.0	○
5		6.00	1.50	22	2.00	1.00	0.180	5	2.6		A	0.300	1.20	0.150	0.60	22.7	1.00	22.7	319	IV		
6		7.50	1.50	9	2.00	1.00	0.140	7	2.0		A	0.300	1.50	0.150	0.75	8.5	0.90	9.5	311	I	1.5	
7		9.00	1.50	13	2.00	1.00	0.150	10	2.3		A	0.300	1.80	0.150	0.90	11.5	0.75	15.3	303	II		×
8		10.50	1.50	14	2.00	1.00	0.150	10	2.3		A	0.300	2.10	0.150	1.05	11.5	0.75	15.3	295	II		
9		13.50	3.00	15	2.00	1.00	0.008	100	----		外	0.600	2.70	0.300	1.35	10.8	1.00	10.8	279		3.0	
10		15.00	1.50	12	2.00	1.00	0.038	75	13.0		A	0.300	3.00	0.150	1.50	7.8	0.50	15.7	271	III	3.0	○
11		16.80	1.80	19	2.00	1.00	0.034	89	9.5		A	0.360	3.36	0.180	1.68	12.2	0.50	24.4	262	IV	1.5	○
12		18.00	1.20	23	2.00	1.00	0.030	91	13.3		A	0.240	3.60	0.120	1.80	14.4	0.50	28.8	256	IV		
13		19.50	1.50	36	2.00	1.00	0.270	7	1.9		A	0.300	3.90	0.150	1.95	22.2	0.90	24.7	248	IV	4.5	○
14		21.00	1.50	19	2.00	1.00	0.270	7	1.9		A	0.300	4.20	0.150	2.10	10.4	0.90	11.6	240	II	1.5	△
15		22.50	1.50	44	2.00	1.00	0.250	9	3.8		A	0.300	4.50	0.150	2.25	25.1	1.00	25.1	232	IV		
16		24.00	1.50	38	2.00	1.00	0.250	9	3.8		A	0.300	4.80	0.150	2.40	20.6	1.00	20.6	224	IV	3.0	○
17		25.50	1.50	28	2.00	1.00	0.210	9	3.1		A	0.300	5.10	0.150	2.55	14.0	1.00	14.0	216	III	1.5	△
18		27.00	1.50	30	2.00	1.00	0.210	9	3.1		A	0.300	5.40	0.150	2.70	14.5	0.50	29.0	208	IV	1.5	○

BH.NO: 8 Water level in underground : -0.8m

Basic data											Judgement on Liquefaction										
NO	A	B	C	D	E	F	G	H	I	J	K	–	L	—	M	N	O	P	Q	R	S	T
0																					
0		0.00																	350			
1		1.50	1.50	14	2.00	1.53	0.300	3	2.9		A	0.300	0.30	0.230	0.23	17.9	1.00	17.9	342	III		
2		3.00	1.50	10	2.00	1.00	0.300	3	2.9		A	0.300	0.60	0.150	0.38	11.8	1.00	11.8	334	III	3	△
3		4.50	1.50	24	2.00	1.00	0.800	0	3.3		A	0.300	0.90	0.150	0.53	25.6	1.00	25.6	326	IV		
4		6.00	1.50	22	2.00	1.00	0.750	0	4.5		A	0.300	1.20	0.150	0.68	21.8	1.00	21.8	319	IV	3	○
5		7.50	1.50	16	2.00	1.00	0.110	7	1.6		A	0.300	1.50	0.150	0.83	14.7	0.90	16.3	311	III	1.5	
6		9.00	1.50	13	2.00	1.00	0.110	11	1.8		A	0.300	1.80	0.150	0.98	11.0	0.70	15.7	303	II	1.5	△
7		10.50	1.50	50	2.00	1.00	0.120	6	1.6		A	0.300	2.10	0.150	1.13	41.4	0.95	43.6	295	IV		
8		12.00	1.50	41	2.00	1.00	0.100	22	2.4		A	0.300	2.40	0.150	1.28	32.0	0.50	63.9	287	IV		
9		13.50	1.50	39	2.00	1.00	0.220	17	6.2		A	0.300	2.70	0.150	1.43	28.8	0.50	57.5	279	IV		
10		15.00	1.50	22	2.00	1.00	0.450	29	90.0		A	0.300	3.00	0.150	1.58	14.9	0.50	29.7	271	IV		
11		16.50	1.50	22	2.00	1.00	0.450	29	90.0		A	0.300	3.30	0.150	1.73	14.0	0.50	28.1	263	IV		
12		18.00	1.50	29	2.00	1.00	0.018	89	28.0		Bf	0.300	3.60	0.150	1.88	18.0	1.00	18.0	256	IV		○
13		19.50	1.50	31	2.00	1.00	0.250	35	63.0		A	0.300	3.90	0.150	2.03	18.4	0.50	36.9	248	IV		
14		21.00	1.50	30	2.00	1.00	0.037	81	----		Bf	0.300	4.20	0.150	2.18	16.9	1.00	16.9	240	IV		
15		22.50	1.50	44	2.00	1.00	0.100	36	8.0		A	0.300	4.50	0.150	2.33	24.6	0.50	49.2	232	IV		
16		24.00	1.50	30	2.00	1.00	0.008	89	----		外	0.300	4.80	0.150	2.48	15.5	1.00	15.5	224	○		
17		25.50	1.50	13	2.00	1.00	0.008	89	----		外	0.300	5.10	0.150	2.63	5.3	1.00	5.3	216	○		

Standard by MOT.
Ports and Hoabours Association of Japan : 2 ≦ N.6 ≦40
Applicable Renge 0 ≦ σ'v ≦3 kgf/㎠

N Value coefficient of decreasing rate
FC≦ 5% :1.0
5%＜FC＜15% :1.25−0.05FC
15%≦FC :0.5

BH.NO: 9 Water level in underground : -2.0m

NO	Basic data										Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H	I	J	K	—	L	—	M	N	O	P	Q	R	S	T
0																						
0		0.00																				
1		1.50	1.50	26	2.00	2.00	0.120	2	1.9		A	0.300	0.30	0.300	0.30	31.1	1.00	31.1	342	IV	2.0	○
2		3.00	1.50	18	2.00	1.33	0.120	4	1.8		A	0.300	0.60	0.200	0.50	19.5	1.00	19.5	334	III		
3		4.50	1.50	17	2.00	1.00	0.140	3	2.1		A	0.300	0.90	0.150	0.65	17.1	1.00	17.1	326	III	3.3	△
4		6.00	1.50	13	2.00	1.00	0.140	3	2.1		A	0.300	1.20	0.150	0.80	12.1	1.00	12.1	319	II		
5		7.50	1.50	15	2.00	1.00	0.140	3	2.1		A	0.300	1.50	0.150	0.95	13.0	1.00	13.0	311	II	3.0	×
6		9.00	1.50	13	2.00	1.00	0.140	2	2.0		A	0.300	1.80	0.150	1.10	10.4	1.00	10.4	303	I		
7		10.50	1.50	14	2.00	1.00	0.140	2	2.0		A	0.300	2.10	0.150	1.25	10.5	1.00	10.5	295	I	3.0	×
8		12.00	1.50	22	2.00	1.00	0.110	25	----		A	0.300	2.40	0.150	1.40	15.9	0.50	31.9	287	IV		
9		13.50	1.50	47	2.00	1.00	0.150	22	----		A	0.300	2.70	0.150	1.55	33.5	0.50	67.0	279	IV	4.5	○
10		15.00	1.50	50	2.00	1.00	0.140	22	3.8		A	0.300	3.00	0.150	1.70	34.0	0.50	68.0	271	IV		
11		16.50	1.50	16	2.00	1.00	0.210	9	3.5		A	0.300	3.30	0.150	1.85	9.4	0.80	11.7	263	II	1.5	△
12		18.00	1.50	14	2.00	1.00	0.032	91	----		Bf	0.300	3.60	0.150	2.00	7.5	1.00	7.5	256	IV		
13		19.50	1.50	30	2.00	1.00	0.032	91	----	15.0	Bf	0.300	3.90	0.150	2.15	17.1	1.00	17.1	248	IV	3.0	○
14		21.00	1.50	5	2.00	1.00	0.040	88	----	13.5	A	0.300	4.20	0.150	2.30	1.2	0.50	2.4	240	I	1.5	×
15		22.50	1.50	30	2.00	1.00	0.026	92	----	31.0	Bf	0.300	4.50	0.150	2.45	15.6	1.00	15.6	232	IV		
16		24.00	1.50	23	2.00	1.00	0.036	67	----	12.0	A	0.300	4.80	0.150	2.60	11.0	0.50	21.9	224	IV	4.0	○
17		25.00	1.00	28	2.00	1.00	0.040	62	----	12.5	A	0.200	5.00	0.100	2.70	13.4	0.50	26.8	219	IV		
18																						

BH.NO: 10 Water level in underground : -2.8m

NO	Basic data										Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H	I	J	K	—	L	—	M	N	O	P	Q	R	S	T
0																						
0		0																	350			
1		1.50	1.50	23	2.00	2.00	0.100	11	1.6		A	0.300	0.30	0.300	0.30	27.6	0.70	39.5	342	IV		
2		3.00	1.50	23	2.00	1.87	0.100	6	1.6		A	0.300	0.60	0.281	0.58	23.9	0.95	25.2	334	IV		
3		4.50	1.50	22	2.00	1.00	0.100	8	1.6		A	0.300	0.90	0.150	0.73	21.3	0.85	25.0	326	IV		
4		6.00	1.50	18	2.00	1.00	0.110	9	1.8		A	0.300	1.20	0.150	0.88	16.2	0.80	20.2	319	IV		
5		7.50	1.50	18	2.00	1.00	0.015	92	----	29.0	Bf	0.300	1.50	0.150	1.03	15.1	1.00	15.1	311	IV	13.5	○
6		9.00	1.50	37	2.00	1.00	0.100	8	1.4		A	0.300	1.80	0.150	1.18	29.8	0.85	35.1	303	IV		
7		10.50	1.50	46	2.00	1.00	0.110	9	1.3		A	0.300	2.10	0.150	1.33	35.3	0.80	44.2	295	IV		
8		12.00	1.50	45	2.00	1.00	0.110	7	1.3		A	0.300	2.40	0.150	1.48	32.8	0.90	36.4	287	IV		
9		13.50	1.50	37	2.00	1.00	0.100	10	1.6		A	0.300	2.70	0.150	1.63	25.4	0.75	33.9	279	IV		
10		15.50	2.00	13	2.00	1.00	0.090	41	25.0	10.0	A	0.400	3.10	0.200	1.83	7.4	0.50	14.8	269	III	2.0	△
11		18.20	2.70	5	2.00	1.00	0.110	6	1.3		A	0.540	3.64	0.270	2.10	1.5	0.95	1.6	254	I	2.7	×
12		19.20	1.00	39	2.00	1.00	0.090	35	2.7		A	0.200	3.84	0.100	2.20	22.4	0.50	44.8	249	IV	1.0	○
13		20.20	1.00	11	2.00	1.00	0.022	93	----	12.0	A	0.200	4.04	0.100	2.30	4.8	0.50	9.7	244	I		
14		21.00	0.80	4	2.00	1.00	0.022	93	----		A	0.160	4.20	0.080	2.38	0.5	0.50	1.0	240	I	1.8	×
15		23.00	2.00	12	2.00	1.00	0.022	88	----	11.0	Bf	0.400	4.60	0.200	2.58	4.8	1.00	4.8	229	IV		
16		24.00	1.00	42	2.00	1.00	0.250	7	2.5		A	0.200	4.80	0.100	2.68	21.2	0.90	23.6	224	IV	4.0	○
17		25.00	1.00	50	2.00	1.00	0.120	11	1.7		A	0.200	5.00	0.100	2.78	25.0	0.70	35.7	219	IV		

Standard by MOC(Ministry of Construction)
to Bridges and Roads

* Water level in underground : less 10 m
* Depth of hard layer : less 20 m
* Average diameter of particles : 0.02 mm < D50 mm < 2.0 mm
* Compressive strength : less 0.2 kg/sq.cm
* Soil index : 0

BH.NO: 9 Water level in underground : -2.0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0		0.00																		
1		1.50	1.50	26	2.00	2.00	0.120	2	×	0.300	0.300	0.300	0.300	0.176	0.450	0.105	0.000	0.554	3.151	
2		3.00	1.50	18	2.00	1.33	0.120	4	×	0.300	0.600	0.200	0.500	0.206	0.342	0.105	0.000	0.446	2.161	
3		4.50	1.50	17	2.00	1.00	0.140	3	×	0.300	0.900	0.150	0.650	0.233	0.313	0.090	0.000	0.403	1.731	
4		6.00	1.50	13	2.00	1.00	0.140	3	×	0.300	1.200	0.150	0.800	0.246	0.260	0.090	0.000	0.349	1.420	
5		7.50	1.50	15	2.00	1.00	0.140	3	×	0.300	1.500	0.150	0.950	0.252	0.266	0.090	0.000	0.356	1.409	
6		9.00	1.50	13	2.00	1.00	0.140	2	×	0.300	1.800	0.150	1.100	0.255	0.237	0.090	0.000	0.327	1.281	
7		10.50	1.50	14	2.00	1.00	0.140	2	×	0.300	2.100	0.150	1.250	0.255	0.236	0.090	0.000	0.326	1.279	○
8		12.00	1.50	22	2.00	1.00	0.110	25	×	0.300	2.400	0.150	1.400	0.253	0.286	0.113	0.000	0.399	1.575	
9		13.50	1.50	47	2.00	1.00	0.150	22	×	0.300	2.700	0.150	1.550	0.250	0.403	0.083	0.000	0.486	1.943	
10		15.00	1.50	50	2.00	1.00	0.140	22	×	0.300	3.000	0.150	1.700	0.246	0.403	0.090	0.000	0.492	1.999	
11		16.50	1.50	16	2.00	1.00	0.210	9	×	0.300	3.300	0.150	1.850	0.242	0.221	0.050	0.000	0.271	1.121	
12		18.00	1.50	14	2.00	1.00	0.032	91	×	0.300	3.600	0.150	2.000	0.237	0.201	0.190	0.204	0.595	2.514	
13		19.50	1.50	30	2.00	1.00	0.032	91	×	0.300	3.900	0.150	2.150	0.231	0.286	0.190	0.204	0.680	2.944	
14		21.00	1.50	5	2.00	1.00	0.040	88	×	0.300	4.200	0.150	2.300	0.225	0.114	0.190	0.192	0.496	2.202	
15		22.50	1.50	30	2.00	1.00	0.026	92	×	0.300	4.500	0.150	2.450	0.219	0.272	0.190	0.208	0.670	3.059	
16		24.00	1.50	23	2.00	1.00	0.036	67	×	0.300	4.800	0.150	2.600	0.213	0.233	0.190	0.108	0.531	2.496	○
17		25.00	1.00	28	2.00	1.00	0.040	62	×	0.200	5.000	0.100	2.700	0.208	0.253	0.190	0.088	0.531	2.549	

BH.NO: 10 Water level in underground : -2.8m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0		0																		
1		1.50	1.50	23	2.00	2.00	0.100	11	×	0.300	0.300	0.300	0.300	0.176	0.423	0.122	0.000	0.545	3.100	
2		3.00	1.50	23	2.00	1.87	0.100	6	×	0.300	0.600	0.281	0.581	0.178	0.374	0.122	0.000	0.496	2.793	
3		4.50	1.50	22	2.00	1.00	0.100	8	×	0.300	0.900	0.150	0.731	0.207	0.346	0.122	0.000	0.468	2.265	
4		6.00	1.50	18	2.00	1.00	0.110	9	×	0.300	1.200	0.150	0.881	0.223	0.298	0.113	0.000	0.411	1.840	
5		7.50	1.50	18	2.00	1.00	0.015	92	○	0.300	1.500	0.150	1.031	0.233	0.284	0.190	0.208	0.682	2.935	
6		9.00	1.50	37	2.00	1.00	0.100	8	×	0.300	1.800	0.150	1.181	0.237	0.391	0.122	0.000	0.514	2.164	○
7		10.50	1.50	46	2.00	1.00	0.110	9	×	0.300	2.100	0.150	1.331	0.239	0.420	0.113	0.000	0.533	2.226	
8		12.00	1.50	45	2.00	1.00	0.110	7	×	0.300	2.400	0.150	1.481	0.239	0.401	0.113	0.000	0.514	2.147	
9		13.50	1.50	37	2.00	1.00	0.100	10	×	0.300	2.700	0.150	1.631	0.238	0.351	0.122	0.000	0.474	1.993	
10		15.50	2.00	13	2.00	1.00	0.090	41	×	0.400	3.100	0.200	1.831	0.234	0.200	0.133	0.004	0.337	1.439	
11		18.20	2.70	5	2.00	1.00	0.110	6	×	0.540	3.640	0.270	2.101	0.227	0.118	0.113	0.000	0.231	1.018	
12		19.20	1.00	39	2.00	1.00	0.090	35	×	0.200	3.840	0.100	2.201	0.224	0.323	0.133	0.000	0.456	2.040	
13		20.20	1.00	11	2.00	1.00	0.022	93	×	0.200	4.040	0.100	2.301	0.220	0.169	0.190	0.212	0.571	2.591	
14		21.00	0.80	4	2.00	1.00	0.022	93	×	0.160	4.200	0.080	2.381	0.218	0.101	0.190	0.212	0.503	2.310	
15		23.00	2.00	12	2.00	1.00	0.022	88	×	0.400	4.600	0.200	2.581	0.210	0.169	0.190	0.192	0.551	2.620	○
16		24.00	1.00	42	2.00	1.00	0.250	7	×	0.200	4.800	0.100	2.681	0.206	0.311	0.033	0.000	0.344	1.666	
17		25.00	1.00	50	2.00	1.00	0.120	11	×	0.200	5.000	0.100	2.781	0.202	0.334	0.105	0.000	0.439	2.170	

Standard by MOC(Ministry of Construction)
to Bridges and Roads

* Water level in underground : less 10 m
* Depth of hard layer : less 20 m
* Average diameter of particles : 0.02 mm < D50 mm < 2.0 mm
* Commpressive strength : less 0.2 kg/sq.cm
* Soil index : 0

BH.NO: 1 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0.00	0.00	1	2.00	1.00	0.110	11	×	0.000	0.000	0.000	0.000	?0DIV	0.105	0.113	0.000	0.219	?0DIV	
2		1.50	1.50	4	2.00	1.00	0.110	11	×	0.300	0.300	0.150	0.150	0.352	0.191	0.113	0.000	0.304	0.865	×
3		3.00	1.50	5	2.00	1.00	0.110	11	×	0.300	0.600	0.150	0.300	0.344	0.197	0.113	0.000	0.310	0.903	
4		4.50	1.50	10	2.00	1.00	0.110	11	×	0.300	0.900	0.150	0.450	0.336	0.260	0.113	0.000	0.373	1.112	
5		6.00	1.50	16	2.00	1.00	0.110	11	×	0.300	1.200	0.150	0.600	0.328	0.309	0.113	0.000	0.423	1.290	
6		7.50	1.50	17	2.00	1.00	0.110	11	×	0.300	1.500	0.150	0.750	0.320	0.302	0.113	0.000	0.415	1.299	
7		9.00	1.50	16	2.00	1.00	0.022	100	×	0.300	1.800	0.150	0.900	0.311	0.279	0.270	0.240	0.789	2.535	
8		11.00	2.00	17	2.00	1.00	0.013	100	○	0.400	2.200	0.200	1.100	0.301	0.271		0.240	0.511	1.700	
9		12.00	1.00	18	2.00	1.00	0.013	100	○	0.200	2.400	0.100	1.200	0.295	0.271		0.240	0.511	1.733	○
10		13.50	1.50	19	2.00	1.00	0.012	100	○	0.300	2.700	0.150	1.350	0.287	0.269		0.240	0.509	1.771	
11		15.00	1.50	17	2.00	1.00	0.110	11	×	0.300	3.000	0.150	1.500	0.279	0.245	0.113	0.000	0.358	1.284	
12		16.50	1.50	18	2.00	1.00	0.110	11	×	0.300	3.300	0.150	1.650	0.271	0.244	0.113	0.000	0.357	1.319	
13		18.00	1.50	27	2.00	1.00	0.040	68	×	0.300	3.600	0.150	1.800	0.263	0.290	0.190	0.112	0.592	2.252	
14		19.50	1.50	28	2.00	1.00	0.040	68	×	0.300	3.900	0.150	1.950	0.255	0.287	0.190	0.112	0.589	2.311	
15		21.00	1.50	17	2.00	1.00	0.250	4	×	0.300	4.200	0.150	2.100	0.247	0.217	0.033	0.000	0.250	1.015	
16		22.50	1.50	25	2.00	1.00	0.250	4	×	0.300	4.500	0.150	2.250	0.239	0.257	0.033	0.000	0.290	1.214	
17		24.00	1.50	25	2.00	1.00	0.250	4	×	0.300	4.800	0.150	2.400	0.230	0.250	0.033	0.000	0.283	1.230	○
18		25.00	1.00	26	2.00	1.00	0.250	4	×	0.200	5.000	0.100	2.500	0.225	0.251	0.033	0.000	0.284	1.263	

BH.NO: 2 Water level in underground : -1.8m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0		0																		
1		1.50	1.50	17	2.00	2.00	0.610	4	×	0.300	0.300	0.300	0.300	0.176	0.364	-0.05	0.000	0.314	1.783	○
2		3.00	1.50	9	2.00	1.20	0.610	4	×	0.300	0.600	0.180	0.480	0.215	0.244	-0.05	0.000	0.189	0.881	×
3		4.50	1.50	16	2.00	1.00	0.110	32	×	0.300	0.900	0.150	0.630	0.240	0.306	0.113	0.000	0.419	1.747	
4		5.00	0.50	19	2.00	1.00	0.270	6	×	0.100	1.000	0.050	0.680	0.245	0.327	0.025	0.000	0.353	1.440	
5		7.50	2.50	15	2.00	1.00	0.270	6	×	0.500	1.500	0.250	0.930	0.258	0.268	0.025	0.000	0.293	1.137	
6		9.00	1.50	20	2.00	1.00	0.140	8	×	0.300	1.800	0.150	1.080	0.260	0.296	0.090	0.000	0.385	1.484	
7		10.50	1.50	12	2.00	1.00	0.120	9	×	0.300	2.100	0.150	1.230	0.259	0.220	0.105	0.000	0.325	1.253	
8		12.00	1.50	37	2.00	1.00	0.120	5	×	0.300	2.400	0.150	1.380	0.257	0.372	0.105	0.000	0.477	1.857	○
9		13.50	1.50	32	2.00	1.00	0.150	28	×	0.300	2.700	0.150	1.530	0.253	0.334	0.083	0.000	0.417	1.646	
10		15.00	1.50	46	2.00	1.00	0.210	21	×	0.300	3.000	0.150	1.680	0.249	0.388	0.050	0.000	0.438	1.757	
11		16.50	1.50	50	2.00	1.00	0.210	21	×	0.300	3.300	0.150	1.830	0.244	0.392	0.050	0.000	0.442	1.810	
12		18.50	2.00	21	2.00	1.00	0.020	86	×	0.400	3.700	0.200	2.030	0.237	0.245	0.280	0.184	0.708	2.988	
13		19.50	1.00	16	2.00	1.00	0.100	38	×	0.200	3.900	0.100	2.130	0.233	0.210	0.190	0.000	0.400	1.714	
14		21.00	1.50	8	2.00	1.00	0.017	90	○	0.300	4.200	0.150	2.280	0.227	0.145		0.000	0.145	0.636	
15		22.50	1.50	8	2.00	1.00	0.030	87	×	0.300	4.500	0.150	2.430	0.221	0.141	0.190	0.188	0.519	2.350	
16		24.00	1.50	23	2.00	1.00	0.015	96	○	0.300	4.800	0.150	2.580	0.214	0.234	0.308	0.000	0.541	2.526	○
17		25.50	1.50	30	2.00	1.00	0.015	92	○	0.300	5.100	0.150	2.730	0.208	0.261	0.308	0.000	0.569	2.739	

Standard by MOC(Ministry of Construction)
to Bridges and Roads

* Water level in underground : less 10 m
* Depth of hard layer : less 20 m
* Average diameter of particles : 0.02 mm < D50 mm < 2.0 mm
* Compressive strength : less 0.2 kg/sq.cm
* Soil index : 0

BH.NO: 3 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0.00	0.00	6	2.00	1.00	0.250	7	×	0.000	0.000	0.000	0.000	?0DIV	0.258	0.033	0.000	0.291	?0DIV	
2		1.50	1.50	10	2.00	1.00	0.250	7	×	0.300	0.300	0.150	0.150	0.352	0.303	0.033	0.000	0.335	0.953	
3		3.00	1.50	2	2.00	1.00	0.250	7	×	0.300	0.600	0.150	0.300	0.344	0.125	0.033	0.000	0.158	0.458	×
4		4.50	1.50	2	2.00	1.00	0.250	7	×	0.300	0.900	0.150	0.450	0.336	0.116	0.033	0.000	0.149	0.444	
5		6.00	1.50	18	2.00	1.00	0.250	7	×	0.300	1.200	0.150	0.600	0.328	0.328	0.033	0.000	0.361	1.102	
6		7.50	1.50	19	2.00	1.00	0.250	7	×	0.300	1.500	0.150	0.750	0.320	0.319	0.033	0.000	0.352	1.102	
7		9.00	1.50	29	2.00	1.00	0.250	7	×	0.300	1.800	0.150	0.900	0.311	0.375	0.033	0.000	0.408	1.311	
8		10.50	1.50	34	2.00	1.00	0.250	7	×	0.300	2.100	0.150	1.050	0.303	0.389	0.033	0.000	0.422	1.390	○
9		12.00	1.50	23	2.00	1.00	0.250	7	×	0.300	2.400	0.150	1.200	0.295	0.307	0.033	0.000	0.340	1.151	
10		13.50	1.50	30	2.00	1.00	0.250	7	×	0.300	2.700	0.150	1.350	0.287	0.337	0.033	0.000	0.370	1.290	
11		15.00	1.50	29	2.00	1.00	0.250	4	×	0.300	3.000	0.150	1.500	0.279	0.320	0.033	0.000	0.353	1.266	
12		16.50	1.50	12	2.00	1.00	0.250	4	×	0.300	3.300	0.150	1.650	0.271	0.199	0.033	0.000	0.232	0.857	×
13		18.00	1.50	19	2.00	1.00	0.250	1	×	0.300	3.600	0.150	1.800	0.263	0.243	0.033	0.000	0.276	1.050	
14		19.50	1.50	17	2.00	1.00	0.250	1	×	0.300	3.900	0.150	1.950	0.255	0.223	0.033	0.000	0.256	1.006	○
15		21.00	1.50	21	2.00	1.00	0.250	4	×	0.300	4.200	0.150	2.100	0.247	0.242	0.033	0.000	0.274	1.113	
16		22.50	1.50	33	2.00	1.00	0.230	0	×	0.300	4.500	0.150	2.250	0.239	0.295	0.041	0.000	0.336	1.409	
17		24.00	1.50	30	2.00	1.00	0.230	0	×	0.300	4.800	0.150	2.400	0.230	0.274	0.041	0.000	0.315	1.369	○
18		25.50	1.50	50	2.00	1.00	0.180	17	×	0.300	5.100	0.150	2.550	0.222	0.346	0.065	0.000	0.411	1.849	

BH.NO: 4 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0	0.00	5	2.00	1.00	0.160	17	×	0.000	0.000	0.000	0.000	?0DIV	0.236	0.076	0.000	0.312	?0DIV	
2		1.50	1.50	8	2.00	1.00	0.160	17	×	0.300	0.300	0.150	0.150	0.352	0.271	0.076	0.000	0.347	0.986	×
3		3.00	1.50	8	2.00	1.00	0.160	17	×	0.300	0.600	0.150	0.300	0.344	0.249	0.076	0.000	0.326	0.948	
4		4.50	1.50	29	2.00	1.00	0.160	17	×	0.300	0.900	0.150	0.450	0.336	0.443	0.076	0.000	0.519	1.547	
5		6.00	1.50	11	2.00	1.00	0.160	17	×	0.300	1.200	0.150	0.600	0.328	0.257	0.076	0.000	0.333	1.017	
6		7.50	1.50	14	2.00	1.00	0.150	13	×	0.300	1.500	0.150	0.750	0.320	0.274	0.083	0.000	0.357	1.117	○
7		9.00	1.50	21	2.00	1.00	0.150	13	×	0.300	1.800	0.150	0.900	0.311	0.320	0.083	0.000	0.402	1.292	
8		10.50	1.50	24	2.00	1.00	0.120	21	×	0.300	2.100	0.150	1.050	0.303	0.327	0.105	0.000	0.431	1.422	
9		12.00	1.50	6	2.00	1.00	0.120	21	×	0.300	2.400	0.150	1.200	0.295	0.157	0.105	0.000	0.261	0.885	×
10		13.50	1.50	12	2.00	1.00	0.150	24	×	0.300	2.700	0.150	1.350	0.287	0.213	0.083	0.000	0.296	1.032	
11		15.00	1.50	20	2.00	1.00	0.150	24	×	0.300	3.000	0.150	1.500	0.279	0.266	0.083	0.000	0.349	1.250	○
12		16.50	1.50	10	2.00	1.00	0.150	24	×	0.300	3.300	0.150	1.650	0.271	0.182	0.083	0.000	0.265	0.977	×
13		18.00	1.50	17	2.00	1.00	0.150	24	×	0.300	3.600	0.150	1.800	0.263	0.230	0.083	0.000	0.313	1.190	
14		19.50	1.50	11	2.00	1.00	0.150	24	×	0.300	3.900	0.150	1.950	0.255	0.180	0.083	0.000	0.262	1.031	○
15		21.00	1.50	19	2.00	1.00	0.150	24	×	0.300	4.200	0.150	2.100	0.247	0.230	0.083	0.000	0.313	1.267	
16		22.50	1.50	21	2.00	1.00	0.150	15	×	0.300	4.500	0.150	2.250	0.239	0.235	0.083	0.000	0.318	1.334	
17		24.00	1.50	27	2.00	1.00	0.180	14	×	0.300	4.800	0.150	2.400	0.230	0.260	0.065	0.000	0.325	1.412	○
18		25.50	1.50	50	2.00	1.00	0.180	17	×	0.300	5.100	0.150	2.550	0.222	0.346	0.065	0.000	0.411	1.849	

Standard by MOC(Ministry of Construction)
to Bridges and Roads

* Water level in underground : less 10 m
* Depth of hard layer : less 20 m
* Average diameter of particles : 0.02 mm < D50 mm < 2.0 mm
* Commpressive strength : less 0.2 kg/sq.cm
* Soil index : 0

BH.NO: 5 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0.00	0.00	5	2.00	1.00	0.210	16	×	0.000	0.000	0.000	0.000	?0DIV	0.236	0.050	0.000	0.286	?0DIV	
2		1.50	1.50	18	2.00	1.00	0.210	16	×	0.300	0.300	0.150	0.150	0.352	0.406	0.050	0.000	0.456	1.295	
3		3.00	1.50	29	2.00	1.00	0.210	16	×	0.300	0.600	0.150	0.300	0.344	0.475	0.050	0.000	0.525	1.527	
4		4.50	1.50	25	2.00	1.00	0.210	16	×	0.300	0.900	0.150	0.450	0.336	0.411	0.050	0.000	0.461	1.374	
5		6.00	1.50	22	2.00	1.00	0.210	16	×	0.300	1.200	0.150	0.600	0.328	0.363	0.050	0.000	0.413	1.260	
6		7.50	1.50	26	2.00	1.00	0.140	13	×	0.300	1.500	0.150	0.750	0.320	0.373	0.090	0.000	0.463	1.449	
7		9.00	1.50	18	2.00	1.00	0.140	13	×	0.300	1.800	0.150	0.900	0.311	0.296	0.090	0.000	0.385	1.238	○
8		10.50	1.50	15	2.00	1.00	0.140	13	×	0.300	2.100	0.150	1.050	0.303	0.258	0.090	0.000	0.348	1.147	
9		13.50	3.00	15	2.00	1.00	0.020	90	×	0.600	2.700	0.300	1.350	0.287	0.239	0.190	0.200	0.629	2.189	
10		15.00	1.50	15	2.00	1.00	0.020	90	×	0.300	3.000	0.150	1.500	0.279	0.230	0.190	0.200	0.620	2.223	
11		18.50	3.50	15	2.00	1.00	0.019	86	○	0.700	3.700	0.350	1.850	0.260	0.214	0.190	0.184	0.588	2.260	
12		20.00	1.50	10	2.00	1.00	0.019	86	○	0.300	4.000	0.150	2.000	0.252	0.170	0.190	0.184	0.544	2.158	
13		21.50	1.50	25	2.00	1.00	0.230	10	×	0.300	4.300	0.150	2.150	0.244	0.261	0.041	0.000	0.302	1.239	
14		23.00	1.50	27	2.00	1.00	0.230	10	×	0.300	4.600	0.150	2.300	0.236	0.265	0.041	0.000	0.306	1.296	
15		25.00	2.00	29	2.00	1.00	0.230	10	×	0.400	5.000	0.200	2.500	0.225	0.266	0.041	0.000	0.307	1.362	○
16		26.50	1.50	23	2.00	1.00	0.230	11	×	0.300	5.300	0.150	2.650	0.217	0.231	0.041	0.000	0.272	1.255	
17		27.50	1.00	45	2.00	1.00	0.230	11	×	0.200	5.500	0.100	2.750	0.212	0.319	0.041	0.000	0.360	1.700	

BH.NO: 6 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0.00	0.00	15	2.00	1.00	0.160	45	×	0.000	0.000	0.000	0.000	?0DIV	0.408	0.076	0.020	0.505	?0DIV	
2		1.50	1.50	19	2.00	1.00	0.160	45	×	0.300	0.300	0.150	0.150	0.352	0.417	0.076	0.020	0.513	1.459	
3		3.00	1.50	22	2.00	1.00	0.160	45	×	0.300	0.600	0.150	0.300	0.344	0.414	0.076	0.020	0.510	1.484	
4		4.50	1.50	22	2.00	1.00	0.160	45	×	0.300	0.900	0.150	0.450	0.336	0.386	0.076	0.020	0.482	1.437	
5		6.00	1.50	24	2.00	1.00	0.160	45	×	0.300	1.200	0.150	0.600	0.328	0.379	0.076	0.020	0.475	1.451	
6		7.50	1.50	22	2.00	1.00	0.160	45	×	0.300	1.500	0.150	0.750	0.320	0.344	0.076	0.020	0.440	1.377	
7		9.00	1.50	24	2.00	1.00	0.270	23	×	0.300	1.800	0.150	0.900	0.311	0.342	0.025	0.000	0.367	1.178	
8		10.50	1.50	24	2.00	1.00	0.270	23	×	0.300	2.100	0.150	1.050	0.303	0.327	0.025	0.000	0.352	1.161	○
9		12.00	1.50	10	2.00	1.00	0.080	47	×	0.300	2.400	0.150	1.200	0.295	0.202	0.144	0.028	0.375	1.269	
10		13.50	1.50	10	2.00	1.00	0.010	97	○	0.300	2.700	0.150	1.350	0.287	0.195	0.190	0.228	0.613	2.134	
11		15.00	1.50	25	2.00	1.00	0.052	60	×	0.300	3.000	0.150	1.500	0.279	0.297	0.186	0.080	0.564	2.020	
12		16.50	1.50	19	2.00	1.00	0.052	60	×	0.300	3.300	0.150	1.650	0.271	0.251	0.186	0.080	0.517	1.909	
13		18.00	1.50	17	2.00	1.00	0.050	73	×	0.300	3.600	0.150	1.800	0.263	0.230	0.190	0.132	0.552	2.101	
14		19.50	1.50	15	2.00	1.00	0.050	73	×	0.300	3.900	0.150	1.950	0.255	0.210	0.190	0.132	0.532	2.089	
15		21.00	1.50	28	2.00	1.00	0.210	21	×	0.300	4.200	0.150	2.100	0.247	0.279	0.050	0.000	0.329	1.333	
16		22.50	1.50	18	2.00	1.00	0.200	22	×	0.300	4.500	0.150	2.250	0.239	0.218	0.055	0.000	0.273	1.143	
17		24.00	1.50	30	2.00	1.00	0.057	57	×	0.300	4.800	0.150	2.400	0.230	0.274	0.177	0.068	0.520	2.256	○
18		25.50	1.50	30	2.00	1.00	0.057	57	×	0.300	5.100	0.150	2.550	0.222	0.268	0.177	0.068	0.513	2.309	

Standard by MOC(Ministry of Construction)
to Bridges and Roads

* Water level in underground : less 10 m
* Depth of hard layer : less 20 m
* Average diameter of particles : 0.02 mm < D50 mm < 2.0 mm
* Commpressive strength : less 0.2 kg/sq.cm
* Soil index : 0

BH.NO: 7 Water level in underground : 0m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0																				
1		0.00	0.00	8	2.00	1.00	0.190	6	×	0.000	0.000	0.000	0.000	?0DIV	0.298	0.060	0.000	0.358	?0DIV	
2		1.50	1.50	17	2.00	1.00	0.190	6	×	0.300	0.300	0.150	0.150	0.352	0.394	0.060	0.000	0.454	1.291	
3		3.00	1.50	21	2.00	1.00	0.190	6	×	0.300	0.600	0.150	0.300	0.344	0.404	0.060	0.000	0.464	1.349	○
4		4.50	1.50	22	2.00	1.00	0.180	5	×	0.300	0.900	0.150	0.450	0.336	0.386	0.065	0.000	0.451	1.343	
5		6.00	1.50	22	2.00	1.00	0.180	5	×	0.300	1.200	0.150	0.600	0.328	0.363	0.065	0.000	0.428	1.306	
6		7.50	1.50	9	2.00	1.00	0.140	7	×	0.300	1.500	0.150	0.750	0.320	0.220	0.090	0.000	0.309	0.968	×
7		9.00	1.50	13	2.00	1.00	0.150	10	×	0.300	1.800	0.150	0.900	0.311	0.251	0.083	0.000	0.334	1.073	
8		10.50	1.50	14	2.00	1.00	0.150	10	×	0.300	2.100	0.150	1.050	0.303	0.249	0.083	0.000	0.332	1.095	
9		13.50	3.00	15	2.00	1.00	0.008	100	○	0.600	2.700	0.300	1.350	0.287	0.239	0.190	0.240	0.669	2.329	
10		15.00	1.50	12	2.00	1.00	0.038	75	×	0.300	3.000	0.150	1.500	0.279	0.206	0.190	0.140	0.536	1.921	○
11		16.80	1.80	19	2.00	1.00	0.034	89	×	0.360	3.360	0.180	1.680	0.269	0.249	0.190	0.196	0.635	2.359	
12		18.00	1.20	23	2.00	1.00	0.030	91	×	0.240	3.600	0.120	1.800	0.263	0.268	0.190	0.204	0.662	2.517	
13		19.50	1.50	36	2.00	1.00	0.270	7	×	0.300	3.900	0.150	1.950	0.255	0.325	0.025	0.000	0.350	1.376	
14		21.00	1.50	19	2.00	1.00	0.270	7	×	0.300	4.200	0.150	2.100	0.247	0.230	0.025	0.000	0.255	1.035	
15		22.50	1.50	44	2.00	1.00	0.250	9	×	0.300	4.500	0.150	2.250	0.239	0.341	0.033	0.000	0.374	1.566	
16		24.00	1.50	38	2.00	1.00	0.250	9	×	0.300	4.800	0.150	2.400	0.230	0.309	0.033	0.000	0.342	1.483	○
17		25.50	1.50	28	2.00	1.00	0.210	9	×	0.300	5.100	0.150	2.550	0.222	0.259	0.050	0.000	0.309	1.389	
18		27.00	1.50	30	2.00	1.00	0.210	9	×	0.300	5.400	0.150	2.700	0.214	0.262	0.050	0.000	0.312	1.456	

BH.NO: 8 Water level in underground : -0.8m

Basic data									Judgement on Liquefaction											
No	A	B	C	D	E	F	G	H			L		M	L	R1	R2	R3	R	R/L	T
0																				
0		0.00																		
1		1.50	1.50	14	2.00	1.53	0.300	3	×	0.300	0.300	0.230	0.230	0.230	0.342	0.015	0.000	0.357	1.554	
2		3.00	1.50	10	2.00	1.00	0.300	3	×	0.300	0.600	0.150	0.380	0.272	0.268	0.015	0.000	0.284	1.043	
3		4.50	1.50	24	2.00	1.00	0.800	0	×	0.300	0.900	0.150	0.530	0.285	0.390	-0.050	0.000	0.340	1.191	
4		6.00	1.50	22	2.00	1.00	0.750	0	×	0.300	1.200	0.150	0.680	0.289	0.352	-0.050	0.000	0.302	1.045	
5		7.50	1.50	16	2.00	1.00	0.110	7	×	0.300	1.500	0.150	0.830	0.289	0.285	0.113	0.000	0.398	1.379	○
6		9.00	1.50	13	2.00	1.00	0.110	11	×	0.300	1.800	0.150	0.980	0.286	0.245	0.113	0.000	0.358	1.253	
7		10.50	1.50	50	2.00	1.00	0.120	6	×	0.300	2.100	0.150	1.130	0.282	0.461	0.105	0.000	0.566	2.006	
8		12.00	1.50	41	2.00	1.00	0.100	22	×	0.300	2.400	0.150	1.280	0.277	0.401	0.122	0.000	0.524	1.892	
9		13.50	1.50	39	2.00	1.00	0.220	17	×	0.300	2.700	0.150	1.430	0.271	0.377	0.045	0.000	0.423	1.559	
10		15.00	1.50	22	2.00	1.00	0.450	29	×	0.300	3.000	0.150	1.580	0.265	0.274	-0.025	0.000	0.249	0.941	
11		16.50	1.50	22	2.00	1.00	0.450	29	×	0.300	3.300	0.150	1.730	0.258	0.265	-0.025	0.000	0.241	0.932	×
12		18.00	1.50	29	2.00	1.00	0.018	89	○	0.300	3.600	0.150	1.880	0.252	0.296	0.190	0.196	0.682	2.709	
13		19.50	1.50	31	2.00	1.00	0.250	35	×	0.300	3.900	0.150	2.030	0.245	0.297	0.033	0.000	0.330	1.349	○
14		21.00	1.50	30	2.00	1.00	0.037	81	×	0.300	4.200	0.150	2.180	0.238	0.285	0.220	0.164	0.668	2.812	
15		22.50	1.50	44	2.00	1.00	0.100	36	×	0.300	4.500	0.150	2.330	0.230	0.336	0.122	0.000	0.459	1.991	
16		24.00	1.50	30	2.00	1.00	0.008	89	○	0.300	4.800	0.150	2.480	0.223	0.271	0.190	0.196	0.657	2.946	○
17		25.50	1.50	13	2.00	1.00	0.008	89	○	0.300	5.100	0.150	2.630	0.216	0.174	0.190	0.196	0.560	2.599	

Standard by Building Association

* Depth of hard layer	: less 20 m
* Clay content in soil	: less 10 %, except 20 % more
* Fine particle content	: less 35 %
* Plastic index	: less 15 %
* ⊿N	: 1.2 FC -6 (5 % < FC < 10 %) 0.2 FC +4 (10 % < FC < 20 %) 0.1 FC +6 (20 % < FC)

BH.NO: 1 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd / σz'	N1	⊿N	Na	τl / σz'	Fl	T
0																						
0																						
1		0.00	0.00	1	2.00	1.00	0.110	11	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	6.2	6.2	0.099	?0DIV	
2		1.50	1.50	4	2.00	1.00	0.110	11	0		×	3.00	3.00	1.50	1.50	0.279	10.3	6.2	16.5	0.185	0.662	×
3		3.00	1.50	5	2.00	1.00	0.110	11	0		×	3.00	6.00	1.50	3.00	0.273	9.1	6.2	15.3	0.173	0.634	
4		4.50	1.50	10	2.00	1.00	0.110	11	0		×	3.00	9.00	1.50	4.50	0.266	14.9	6.2	21.1	0.268	1.006	
5		6.00	1.50	16	2.00	1.00	0.110	11	0		×	3.00	12.00	1.50	6.00	0.260	20.7	6.2	26.9	0.500	1.923	
6		7.50	1.50	17	2.00	1.00	0.110	11	0		×	3.00	15.00	1.50	7.50	0.254	19.6	6.2	25.8	0.490	1.932	
7		9.00	1.50	16	2.00	1.00	0.022	100	19	23	○	3.00	18.00	1.50	9.00	0.247	16.9	16.0	32.9	0.500	2.023	
8		11.00	2.00	17	2.00	1.00	0.013	100	36	34	○	4.00	22.00	2.00	11.00	0.239	16.2	16.0	32.2	0.500	2.096	
9		12.00	1.00	18	2.00	1.00	0.013	100			○	2.00	24.00	1.00	12.00	0.234	16.4	16.0	32.4	0.500	2.134	
10		13.50	1.50	19	2.00	1.00	0.012	100	38	30	○	3.00	27.00	1.50	13.50	0.228	16.4	16.0	32.4	0.500	2.194	○
11		15.00	1.50	17	2.00	1.00	0.110	11	0		×	3.00	30.00	1.50	15.00	0.221	13.9	6.2	20.1	0.243	1.097	
12		16.50	1.50	18	2.00	1.00	0.110	11	0		×	3.00	33.00	1.50	16.50	0.215	14.0	6.2	20.2	0.246	1.144	
13		18.00	1.50	27	2.00	1.00	0.040	68	13		○	3.00	36.00	1.50	18.00	0.209	20.1	12.8	32.9	0.500	2.397	
14		19.50	1.50	28	2.00	1.00	0.040	68			○	3.00	39.00	1.50	19.50	0.202	20.1	12.8	32.9	0.500	2.473	
15		21.00	1.50	17	2.00	1.00	0.250	4	0		×	3.00	42.00	1.50	21.00	0.196	11.7	0.0	11.8	0.143	0.731	
16		22.50	1.50	25	2.00	1.00	0.250	4	0		×	3.00	45.00	1.50	22.50	0.189	16.7	0.0	16.7	0.187	0.988	×
17		24.00	1.50	25	2.00	1.00	0.250	4	0		×	3.00	48.00	1.50	24.00	0.183	16.1	0.0	16.2	0.182	0.995	
18		25.00	1.00	26	2.00	1.00	0.250	4	0		×	2.00	50.00	1.00	25.00	0.179	16.4	0.0	16.5	0.185	1.036	○

BH.NO: 2 Water level in underground : -1.8m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd / σz'	N1	⊿N	Na	τl / σz'	Fl	T
0																						
0		0																				
1		1.50	1.50	17	2.00	2.00	0.610	4	0		×	3.00	3.00	3.00	3.00	0.140	31.0	0.0	31.0	0.500	3.581	○
2		3.00	1.50	9	2.00	1.20	0.610	4	0		×	3.00	6.00	1.80	4.80	0.171	13.0	0.0	13.0	0.153	0.897	×
3		4.50	1.50	16	2.00	1.00	0.110	32	2		×	3.00	9.00	1.50	6.30	0.190	20.2	9.2	29.4	0.500	2.627	
4		5.00	0.50	19	2.00	1.00	0.270	6	0		×	1.00	10.00	0.50	6.80	0.194	23.0	1.2	24.2	0.394	2.028	○
5		7.50	2.50	15	2.00	1.00	0.270	6	0		×	5.00	15.00	2.50	9.30	0.204	15.6	1.2	16.8	0.189	0.924	×
6		9.00	1.50	20	2.00	1.00	0.140	8	0		×	3.00	18.00	1.50	10.80	0.206	19.2	3.6	22.8	0.320	1.554	○
7		10.50	1.50	12	2.00	1.00	0.120	9	0		×	3.00	21.00	1.50	12.30	0.205	10.8	4.8	15.6	0.176	0.856	×
8		12.00	1.50	37	2.00	1.00	0.120	5	0		×	3.00	24.00	1.50	13.80	0.204	31.5	0.0	31.5	0.500	2.454	
9		13.50	1.50	32	2.00	1.00	0.150	28	0		×	3.00	27.00	1.50	15.30	0.201	25.9	8.8	34.7	0.500	2.487	
10		15.00	1.50	46	2.00	1.00	0.210	21	0		×	3.00	30.00	1.50	16.80	0.198	35.5	8.1	43.6	0.500	2.529	
11		16.50	1.50	50	2.00	1.00	0.210	21	0		×	3.00	33.00	1.50	18.30	0.194	37.0	8.1	45.1	0.500	2.579	○
12		18.50	2.00	21	2.00	1.00	0.020	86	34	27	○	4.00	37.00	2.00	20.30	0.188	14.7	14.6	29.3	0.500	2.658	
13		19.50	1.00	16	2.00	1.00	0.100	38	0		×	2.00	39.00	1.00	21.30	0.185	11.0	9.8	20.8	0.260	1.405	
14		21.00	1.50	8	2.00	1.00	0.017	90	19	15	○	3.00	42.00	1.50	22.80	0.180	5.3	15.0	20.3	0.250	1.387	
15		22.50	1.50	8	2.00	1.00	0.030	87	19	17	○	3.00	45.00	1.50	24.30	0.175	5.1	14.7	19.8	0.238	1.358	
16		24.00	1.50	23	2.00	1.00	0.015	96	29	17	○	3.00	48.00	1.50	25.80	0.170	14.3	15.6	29.9	0.500	2.939	○
17		25.50	1.50	30	2.00	1.00	0.015	92	32	16	○	3.00	51.00	1.50	27.30	0.165	18.2	15.2	33.4	0.500	3.034	

Standard by Building Association

* Depth of hard layer : less 20 m
* Clay content in soil : less 10 %, except 20 % more
* Fine particle content : less 35 %
* Plastic index : less 15 %
* ⊿N : 1.2 FC -6 (5 % < FC < 10 %)
  0.2 FC +4 (10 % < FC < 20 %)
  0.1 FC +6 (20 % < FC)

BH.NO: 3 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd/σz'	N1	⊿N	Na	τl/σz'	Fl	T
0																						
0																						
1		0.00	0.00	6	2.00	1.00	0.250	7	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	2.4	2.4	0.000	?0DIV	×
2		1.50	1.50	10	2.00	1.00	0.250	7	0		×	3.00	3.00	1.50	1.50	0.279	25.8	2.4	28.2	0.500	1.790	○
3		3.00	1.50	2	2.00	1.00	0.250	7	0		×	3.00	6.00	1.50	3.00	0.273	3.7	2.4	6.1	0.098	0.359	
4		4.50	1.50	2	2.00	1.00	0.250	7	0		×	3.00	9.00	1.50	4.50	0.266	3.0	2.4	5.4	0.093	0.349	×
5		6.00	1.50	18	2.00	1.00	0.250	7	0		×	3.00	12.00	1.50	6.00	0.260	23.2	2.4	25.6	0.475	1.827	
6		7.50	1.50	19	2.00	1.00	0.250	7	0		×	3.00	15.00	1.50	7.50	0.254	21.9	2.4	24.3	0.415	1.637	
7		9.00	1.50	29	2.00	1.00	0.250	7	0		×	3.00	18.00	1.50	9.00	0.247	30.6	2.4	33.0	0.500	2.023	
8		10.50	1.50	34	2.00	1.00	0.250	7	0		×	3.00	21.00	1.50	10.50	0.241	33.2	2.4	35.6	0.500	2.077	○
9		12.00	1.50	23	2.00	1.00	0.250	7	0		×	3.00	24.00	1.50	12.00	0.234	21.0	2.4	23.4	0.350	1.494	
10		13.50	1.50	30	2.00	1.00	0.250	7	0		×	3.00	27.00	1.50	13.50	0.228	25.8	2.4	28.2	0.500	2.194	
11		15.00	1.50	29	2.00	1.00	0.250	4	0		×	3.00	30.00	1.50	15.00	0.221	23.7	0.0	23.7	0.365	1.648	
12		16.50	1.50	12	2.00	1.00	0.250	4	0		×	3.00	33.00	1.50	16.50	0.215	9.3	0.0	9.3	0.123	0.572	
13		18.00	1.50	19	2.00	1.00	0.250	1	0		×	3.00	36.00	1.50	18.00	0.209	14.2	0.0	14.2	0.163	0.782	×
14		19.50	1.50	17	2.00	1.00	0.250	1	0		×	3.00	39.00	1.50	19.50	0.202	12.2	0.0	12.2	0.147	0.727	
15		21.00	1.50	21	2.00	1.00	0.250	4	0		×	3.00	42.00	1.50	21.00	0.196	14.5	0.0	14.5	0.166	0.848	×
16		22.50	1.50	33	2.00	1.00	0.230	0	0		×	3.00	45.00	1.50	22.50	0.189	22.0	0.0	22.0	0.292	1.543	
17		24.00	1.50	30	2.00	1.00	0.230	0	0		×	3.00	48.00	1.50	24.00	0.183	19.4	0.0	19.4	0.230	1.258	○
18		25.50	1.50	50	2.00	1.00	0.180	17	0		×	3.00	51.00	1.50	25.50	0.176	31.3	7.4	38.7	0.500	2.834	

BH.NO: 4 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd/σz'	N1	⊿N	Na	τl/σz'	Fl	T
0																						
0																						
1		0.00	0.00	5	2.00	2.00	0.160	17	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	7.4	7.4	0.108	?0DIV	
2		1.50	1.50	8	2.00	1.20	0.160	17	0		×	3.00	3.00	1.80	1.80	0.233	18.9	7.4	26.3	0.500	2.148	
3		3.00	1.50	8	2.00	1.00	0.160	17	0		×	3.00	6.00	1.50	3.30	0.248	13.9	7.4	21.3	0.274	1.105	
4		4.50	1.50	29	2.00	1.00	0.160	17	0		×	3.00	9.00	1.50	4.80	0.250	41.9	7.4	49.3	0.500	2.002	
5		6.00	1.50	11	2.00	1.00	0.160	17	0		×	3.00	12.00	1.50	6.30	0.248	13.9	7.4	21.3	0.270	1.090	○
6		7.50	1.50	14	2.00	1.00	0.150	13	0		×	3.00	15.00	1.50	7.80	0.244	15.9	6.6	22.5	0.309	1.267	
7		9.00	1.50	21	2.00	1.00	0.150	13	0		×	3.00	18.00	1.50	9.30	0.239	21.8	6.6	28.4	0.500	2.091	
8		10.50	1.50	24	2.00	1.00	0.120	21	0		×	3.00	21.00	1.50	10.80	0.234	23.1	8.1	31.2	0.500	2.136	
9		12.00	1.50	6	2.00	1.00	0.120	21	0		×	3.00	24.00	1.50	12.30	0.229	5.4	8.1	13.5	0.157	0.687	
10		13.50	1.50	12	2.00	1.00	0.150	24	0		×	3.00	27.00	1.50	13.80	0.223	10.2	8.4	18.6	0.215	0.965	×
11		15.00	1.50	20	2.00	1.00	0.150	24	0		×	3.00	30.00	1.50	15.30	0.217	16.2	8.4	24.6	0.420	1.935	○
12		16.50	1.50	10	2.00	1.00	0.150	24	0		×	3.00	33.00	1.50	16.80	0.211	7.7	8.4	16.1	0.171	0.810	×
13		18.00	1.50	17	2.00	1.00	0.150	24	0		×	3.00	36.00	1.50	18.30	0.205	12.6	8.4	21.0	0.265	1.292	○
14		19.50	1.50	11	2.00	1.00	0.150	24	0		×	3.00	39.00	1.50	19.80	0.199	7.8	8.4	16.2	0.182	0.914	×
15		21.00	1.50	19	2.00	1.00	0.150	24	0		×	3.00	42.00	1.50	21.30	0.193	13.0	8.4	21.4	0.278	1.441	
16		22.50	1.50	21	2.00	1.00	0.150	15	0		×	3.00	45.00	1.50	22.80	0.187	13.9	7.5	21.4	0.278	1.488	○
17		24.00	1.50	27	2.00	1.00	0.180	14	0		×	3.00	48.00	1.50	24.30	0.181	17.3	7.4	24.7	0.430	2.381	

Standard by Building Association

* Depth of hard layer : less 20 m
* Clay content in soil : less 10 %, except 20 % more
* Fine particle content : less 35 %
* Plastic index : less 15 %
* ΔN : 1.2 FC -6 (5 % < FC < 10 %)
  0.2 FC +4 (10 % < FC < 20 %)
  0.1 FC +6 (20 % < FC)

BH.NO: 5 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd σz'	N1	ΔN	Na	τl σz'	Fl	T
0																						
0																						
1		0.00	0.00	5	2.00	1.00	0.210	16	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	7.2	7.2	0.106	?0DIV	
2		1.50	1.50	18	2.00	1.00	0.210	16	0		×	3.00	3.00	1.50	1.50	0.279	46.5	7.2	53.7	0.500	1.790	
3		3.00	1.50	29	2.00	1.00	0.210	16	0		×	3.00	6.00	1.50	3.00	0.273	52.9	7.2	60.1	0.500	1.832	
4		4.50	1.50	25	2.00	1.00	0.210	16	0		×	3.00	9.00	1.50	4.50	0.266	37.3	7.2	44.5	0.500	1.877	
5		6.00	1.50	22	2.00	1.00	0.210	16	0		×	3.00	12.00	1.50	6.00	0.260	28.4	7.2	35.6	0.500	1.923	
6		7.50	1.50	26	2.00	1.00	0.140	13	0		×	3.00	15.00	1.50	7.50	0.254	30.0	6.6	36.6	0.500	1.972	
7		9.00	1.50	18	2.00	1.00	0.140	13	0		×	3.00	18.00	1.50	9.00	0.247	19.0	6.6	25.6	0.500	2.023	
8		10.50	1.50	15	2.00	1.00	0.140	13	0		×	3.00	21.00	1.50	10.50	0.241	14.6	6.6	21.2	0.270	1.122	○
9		13.50	3.00	15	2.00	1.00	0.020	90	32	38	○	6.00	27.00	3.00	13.50	0.228	12.9	15.0	27.9	0.500	2.194	
10		15.00	1.50	15	2.00	1.00	0.020	90	32	38	○	3.00	30.00	1.50	15.00	0.221	12.2	15.0	27.2	0.500	2.258	
11		18.50	3.50	15	2.00	1.00	0.019	86	31		○	7.00	37.00	3.50	18.50	0.206	11.0	14.6	25.6	0.480	2.325	
12		20.00	1.50	10	2.00	1.00	0.019	86	31		○	3.00	40.00	1.50	20.00	0.200	7.1	14.6	21.7	0.280	1.400	
13		21.50	1.50	25	2.00	1.00	0.230	10	0		×	3.00	43.00	1.50	21.50	0.194	17.0	6.0	23.0	0.327	1.689	
14		23.00	1.50	27	2.00	1.00	0.230	10	0		×	3.00	46.00	1.50	23.00	0.187	17.8	6.0	23.8	0.370	1.977	
15		25.00	2.00	29	2.00	1.00	0.230	10	0		×	4.00	50.00	2.00	25.00	0.179	18.3	6.0	24.3	0.400	2.240	
16		26.50	1.50	23	2.00	1.00	0.230	11	0		×	3.00	53.00	1.50	26.50	0.172	14.1	6.2	20.3	0.250	1.452	
17		27.50	1.00	45	2.00	1.00	0.230	11	0		×	2.00	55.00	1.00	27.50	0.168	27.1	6.2	33.3	0.342	2.037	
18																						

BH.NO: 6 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd σz'	N1	ΔN	Na	τl σz'	Fl	T
0																						
0																						
1		0.00	0.00	5	2.00	2.00	0.160	45	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	10.5	10.5	0.133	?0DIV	
2		1.50	1.50	8	2.00	1.20	0.160	45	0		×	3.00	3.00	1.80	1.80	0.233	18.9	10.5	29.4	0.500	2.148	
3		3.00	1.50	8	2.00	1.00	0.160	45	0		×	3.00	6.00	1.50	3.30	0.248	13.9	10.5	24.4	0.408	1.645	
4		4.50	1.50	29	2.00	1.00	0.160	45	0		×	3.00	9.00	1.50	4.80	0.250	41.9	10.5	52.4	0.500	2.002	
5		6.00	1.50	11	2.00	1.00	0.160	45	0		×	3.00	12.00	1.50	6.30	0.248	13.9	10.5	24.4	0.408	1.648	○
6		7.50	1.50	14	2.00	1.00	0.160	45	0		×	3.00	15.00	1.50	7.80	0.244	15.9	10.5	26.4	0.500	2.051	
7		9.00	1.50	21	2.00	1.00	0.270	23	0		×	3.00	18.00	1.50	9.30	0.239	21.8	8.3	30.1	0.500	2.091	
8		10.50	1.50	24	2.00	1.00	0.270	23	0		×	3.00	21.00	1.50	10.80	0.234	23.1	8.3	31.4	0.500	2.136	
9		12.00	1.50	6	2.00	1.00	0.080	47	0		×	3.00	24.00	1.50	12.30	0.229	5.4	10.7	16.1	0.181	0.792	×
10		13.50	1.50	12	2.00	1.00	0.010	97	33	16	○	3.00	27.00	1.50	13.80	0.223	10.2	15.7	25.9	0.490	2.198	
11		15.00	1.50	20	2.00	1.00	0.052	60	0		×	3.00	30.00	1.50	15.30	0.217	16.2	12.0	28.2	0.500	2.303	
12		16.50	1.50	10	2.00	1.00	0.052	60	0		×	3.00	33.00	1.50	16.80	0.211	7.7	12.0	19.7	0.236	1.118	○
13		18.00	1.50	17	2.00	1.00	0.050	73	0		×	3.00	36.00	1.50	18.30	0.205	12.6	13.3	25.9	0.500	2.437	
14		19.50	1.50	11	2.00	1.00	0.050	73	0		×	3.00	39.00	1.50	19.80	0.199	7.8	13.3	21.1	0.267	1.341	
15		21.00	1.50	19	2.00	1.00	0.210	21	0		×	3.00	42.00	1.50	21.30	0.193	13.0	8.1	21.1	0.267	1.384	
16		22.50	1.50	21	2.00	1.00	0.200	22	0		×	3.00	45.00	1.50	22.80	0.187	13.9	8.2	22.1	0.295	1.579	○
17		24.00	1.50	27	2.00	1.00	0.057	57	0		×	3.00	48.00	1.50	24.30	0.181	17.3	11.7	29.0	0.500	2.769	
18		25.50	1.50	27	2.00	1.00	0.057	57	0		×	3.00	51.00	1.50	25.80	0.174	16.8	11.7	28.5	0.500	2.867	

Standard by Building Association

* Depth of hard layer	:	less 20 m
* Clay content in soil	:	less 10 %, except 20 % more
* Fine particle content	:	less 35 %
* Plastic index	:	less 15 %
* ΔN	:	1.2 FC -6 (5 % < FC < 10 %)
		0.2 FC +4 (10 % < FC < 20 %)
		0.1 FC +6 (20 % < FC)

BH.NO: 7 Water level in underground : 0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd σz'	N1	ΔN	Na	τl σz'	Fl	T
0																						
0																						
1		0.00	0.00	5	2.00	1.00	0.190	6	0		×	0.00	0.00	0.00	0.00	?0DIV	?0DI	1.2	1.2	0.000	?0DIV	
2		1.50	1.50	18	2.00	1.00	0.190	6	0		×	3.00	3.00	1.50	1.50	0.279	46.5	1.2	47.7	0.500	1.790	
3		3.00	1.50	29	2.00	1.00	0.190	6	0		×	3.00	6.00	1.50	3.00	0.273	52.9	1.2	54.1	0.500	1.832	
4		4.50	1.50	25	2.00	1.00	0.180	5	0		×	3.00	9.00	1.50	4.50	0.266	37.3	0.0	37.3	0.500	1.877	
5		6.00	1.50	22	2.00	1.00	0.180	5	0		×	3.00	12.00	1.50	6.00	0.260	28.4	0.0	28.4	0.500	1.923	
6		7.50	1.50	26	2.00	1.00	0.140	7	0		×	3.00	15.00	1.50	7.50	0.254	30.0	2.4	32.4	0.500	1.972	
7		9.00	1.50	18	2.00	1.00	0.150	10	0		×	3.00	18.00	1.50	9.00	0.247	19.0	6.0	25.0	0.450	1.821	
8		10.50	1.50	15	2.00	1.00	0.150	10	0		×	3.00	21.00	1.50	10.50	0.241	14.6	6.0	20.6	0.251	1.043	○
9		13.50	3.00	15	2.00	1.00	0.008	100	66	38	○	6.00	27.00	3.00	13.50	0.228	12.9	16.0	28.9	0.500	2.194	
10		15.00	1.50	15	2.00	1.00	0.038	75	12	38	○	3.00	30.00	1.50	15.00	0.221	12.2	13.5	25.7	0.435	1.965	
11		16.80	1.80	15	2.00	1.00	,.034	89	11		○	3.60	33.60	1.80	16.80	0.214	11.6	14.9	26.5	0.500	2.340	
12		18.00	1.20	10	2.00	1.00	0.030	91	15		○	2.40	36.00	1.20	18.00	0.209	7.5	15.1	22.6	0.310	1.486	
13		19.50	1.50	25	2.00	1.00	0.270	7	0		×	3.00	39.00	1.50	19.50	0.202	17.9	2.4	20.3	0.247	1.222	
14		21.00	1.50	27	2.00	1.00	0.270	7	0		×	3.00	42.00	1.50	21.00	0.196	18.6	2.4	21.0	0.265	1.354	
15		22.50	1.50	29	2.00	1.00	0.250	9	0		×	3.00	45.00	1.50	22.50	0.189	19.3	4.8	24.1	0.387	2.045	
16		24.00	1.50	23	2.00	1.00	0.250	9	0		×	3.00	48.00	1.50	24.00	0.183	14.8	4.8	19.6	0.233	1.274	○
17		25.50	1.50	45	2.00	1.00	0.210	9	0		×	3.00	51.00	1.50	25.50	0.176	28.2	4.8	33.0	0.500	2.834	
18		27.00	1.50	45	2.00	1.00	0.210	9	0		×	3.00	54.00	1.50	27.00	0.170	27.4	4.8	32.2	0.500	2.941	

BH.NO: 8 Water level in underground : -0.8m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd σz'	N1	ΔN	Na	τl σz'	Fl	T
0																						
0		0.00																				
1		1.50	1.50	14	2.00	1.53	0.300	3	0		×	3.00	3.00	2.30	2.30	0.183	29.2	0.0	29.2	0.500	2.739	○
2		3.00	1.50	10	2.00	1.00	0.300	3	0		×	3.00	6.00	1.50	3.80	0.216	16.2	0.0	16.2	0.182	0.844	×
3		4.50	1.50	24	2.00	1.00	0.800	0	0		×	3.00	9.00	1.50	5.30	0.226	33.0	0.0	33.0	0.500	2.208	
4		6.00	1.50	22	2.00	1.00	0.750	0	0		×	3.00	12.00	1.50	6.80	0.230	26.7	0.0	26.7	0.500	2.178	
5		7.50	1.50	16	2.00	1.00	0.110	7	0		×	3.00	15.00	1.50	8.30	0.229	17.6	2.4	20.0	0.242	1.056	
6		9.00	1.50	13	2.00	1.00	0.110	11	0		×	3.00	18.00	1.50	9.80	0.227	13.1	6.2	19.3	0.228	1.004	
7		10.50	1.50	50	2.00	1.00	0.120	6	0		×	3.00	21.00	1.50	11.30	0.224	47.0	1.2	48.2	0.500	2.234	
8		12.00	1.50	41	2.00	1.00	0.100	22	0		○	3.00	24.00	1.50	12.80	0.220	36.2	8.2	44.4	0.500	2.276	○
9		13.50	1.50	39	2.00	1.00	0.220	17	0		×	3.00	27.00	1.50	14.30	0.215	32.6	7.4	40.0	0.500	2.324	
10		15.00	1.50	22	2.00	1.00	0.450	29	6		○	3.00	30.00	1.50	15.80	0.210	17.5	8.9	26.4	0.500	2.378	
11		16.50	1.50	22	2.00	1.00	0.450	29	6		○	3.00	33.00	1.50	17.30	0.205	16.7	8.9	25.6	0.480	2.340	
12		18.00	1.50	29	2.00	1.00	0.018	89	23	11	○	3.00	36.00	1.50	18.80	0.200	21.2	14.9	36.1	0.500	2.503	
13		19.50	1.50	31	2.00	1.00	0.250	35	6		×	3.00	39.00	1.50	20.30	0.194	21.8	9.5	31.3	0.500	2.574	
14		21.00	1.50	30	2.00	1.00	0.037	81	20	10	○	3.00	42.00	1.50	21.80	0.189	20.3	14.1	34.4	0.500	2.651	
15		22.50	1.50	44	2.00	1.00	0.100	36	4	9	×	3.00	45.00	1.50	23.30	0.183	28.8	9.6	38.4	0.500	2.735	
16		24.00	1.50	30	2.00	1.00	0.008	89	42	31	○	3.00	48.00	1.50	24.80	0.177	19.1	14.9	34.0	0.500	2.825	○
17		25.50	1.50	13	2.00	1.00	0.008	89	42	31	○	3.00	51.00	1.50	26.30	0.171	8.0	14.9	22.9	0.324	1.894	
18																						

Standard by Building Association

* Depth of hard layer : less 20 m
* Clay content in soil : less 10 %, except 20 % more
* Fine particle content : less 35 %
* Plastic index : less 15 %
* Δ N : 1.2 FC -6 (5 % < FC < 10 %)
  0.2 FC +4 (10 % < FC < 20 %)
  0.1 FC +6 (20 % < FC)

BH.NO: 9 Water level in underground : -2.0m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd / σz'	N1	ΔN	Na	τl / σz'	Fl	T
0																						
0		0.00																				
1		1.50	1.50	5	2.00	2.00	0.120	2	0		×	3.00	3.00	3.00	3.00	0.140	9.1	0.0	9.1	0.122	0.874	×
2		3.00	1.50	18	2.00	1.33	0.120	4	0		×	3.00	6.00	2.00	5.00	0.164	25.5	0.0	25.5	0.475	2.898	
3		4.50	1.50	29	2.00	1.00	0.140	3	0		×	3.00	9.00	1.50	6.50	0.185	36.0	0.0	36.0	0.500	2.709	
4		6.00	1.50	25	2.00	1.00	0.140	3	0		×	3.00	12.00	1.50	8.00	0.195	28.0	0.0	28.0	0.500	2.563	○
5		7.50	1.50	22	2.00	1.00	0.140	3	0		×	3.00	15.00	1.50	9.50	0.200	22.6	0.0	22.6	0.311	1.553	
6		9.00	1.50	26	2.00	1.00	0.140	2	0		×	3.00	18.00	1.50	11.00	0.202	24.8	0.0	24.8	0.436	2.155	
7		10.50	1.50	18	2.00	1.00	0.140	2	0		×	3.00	21.00	1.50	12.50	0.202	16.1	0.0	16.1	0.181	0.895	×
		12.00	1.50	15	2.00	1.00	0.110	25	0		×	3.00	24.00	1.50	14.00	0.201	12.7	8.5	21.2	0.271	1.349	
9		13.50	1.50	15	2.00	1.00	0.150	22	0		×	3.00	27.00	1.50	15.50	0.199	12.1	8.2	20.3	0.247	1.244	○
10		15.00	1.50	15	2.00	1.00	0.140	22	0		×	3.00	30.00	1.50	17.00	0.195	11.5	8.2	19.7	0.236	1.208	
11		16.50	1.50	15	2.00	1.00	0.210	9	0		×	3.00	33.00	1.50	18.50	0.192	11.0	4.8	15.8	0.178	0.928	×
12		18.00	1.50	10	2.00	1.00	0.032	91	22		○	3.00	36.00	1.50	20.00	0.188	7.1	15.1	22.2	0.296	1.576	
13		19.50	1.50	25	2.00	1.00	0.032	91	22	15	○	3.00	39.00	1.50	21.50	0.183	17.1	15.1	32.2	0.500	2.727	○
14		21.00	1.50	27	2.00	1.00	0.040	88	17	14	×	3.00	42.00	1.50	23.00	0.179	17.8	14.8	32.6	0.500	2.797	
15		22.50	1.50	29	2.00	1.00	0.026	92	29	31	○	3.00	45.00	1.50	24.50	0.174	18.5	15.2	33.7	0.500	2.876	
16		24.00	1.50	23	2.00	1.00	0.036	67	18	12	×	3.00	48.00	1.50	26.00	0.169	14.3	12.7	27.0	0.500	2.962	○
17		25.00	1.00	45	2.00	1.00	0.040	62	20	13	○	2.00	50.00	1.00	27.00	0.165	27.4	12.2	39.6	0.500	3.023	
18																						

BH.NO: 10 Water level in underground : -2.8m

Basic data											Judgement on Liquefaction											
NO	A	B	C	D	E	F	G	H					L		M	τd / σz'	N1	ΔN	Na	τl / σz'	Fl	T
0																						
0		0.00																				
1		1.50	1.50	14	2.00	2.00	0.100	11	0		×	3.00	3.00	3.00	3.00	0.140	25.6	6.2	31.8	0.500	3.581	
2		3.00	1.50	10	2.00	1.85	0.100	6	0		×	3.00	6.00	2.78	5.78	0.142	13.2	1.2	14.4	0.164	1.157	
3		4.50	1.50	24	2.00	1.00	0.100	8	0		×	3.00	9.00	1.50	7.28	0.165	28.1	3.6	31.7	0.500	3.034	○
4		6.00	1.50	22	2.00	1.00	0.110	9	0		×	3.00	12.00	1.50	8.78	0.178	23.5	4.8	28.3	0.500	2.813	
5		7.50	1.50	16	2.00	1.00	0.015	92	37	29	○	3.00	15.00	1.50	10.28	0.185	15.8	15.2	31.0	0.500	2.701	
6		9.00	1.50	13	2.00	1.00	0.100	8	0		×	3.00	18.00	1.50	11.78	0.189	12.0	3.6	15.6	0.176	0.932	×
7		10.50	1.50	50	2.00	1.00	0.110	9	0		×	3.00	21.00	1.50	13.28	0.190	43.4	4.8	48.2	0.500	2.626	
8		12.00	1.50	41	2.00	1.00	0.110	7	0		×	3.00	24.00	1.50	14.78	0.190	33.7	2.4	36.1	0.500	2.628	
9		13.50	1.50	39	2.00	1.00	0.100	10	0		×	3.00	27.00	1.50	16.28	0.189	30.6	6.0	36.6	0.500	2.645	
10		15.50	2.00	22	2.00	1.00	0.090	41	11	10	×	4.00	31.00	2.00	18.28	0.186	16.3	10.1	26.4	0.500	2.688	○
11		18.20	2.70	22	2.00	1.00	0.110	6	0		×	5.40	36.40	2.70	20.98	0.180	15.2	1.2	16.4	0.184	1.021	
12		19.20	1.00	29	2.00	1.00	0.090	35	0		×	2.00	38.40	1.00	21.98	0.178	19.6	9.5	29.1	0.500	2.813	
13		20.20	1.00	31	2.00	1.00	0.022	93	24	12	○	2.00	40.40	1.00	22.98	0.175	20.5	15.3	35.8	0.500	2.856	
14		21.00	0.80	30	2.00	1.00	0.022	93	24		○	1.60	42.00	0.80	23.78	0.173	19.5	15.3	34.8	0.500	2.892	
15		23.00	2.00	44	2.00	1.00	0.022	88	20	11	○	4.00	46.00	2.00	25.78	0.167	27.4	14.8	42.2	0.500	2.994	○
16		24.00	1.00	30	2.00	1.00	0.250	7	0		×	2.00	48.00	1.00	26.78	0.164	18.3	2.4	20.7	0.258	1.574	
17		25.00	1.00	13	2.00	1.00	0.120	11	0		×	2.00	50.00	1.00	27.78	0.161	7.8	7.1	14.9	0.324	2.016	
18																						

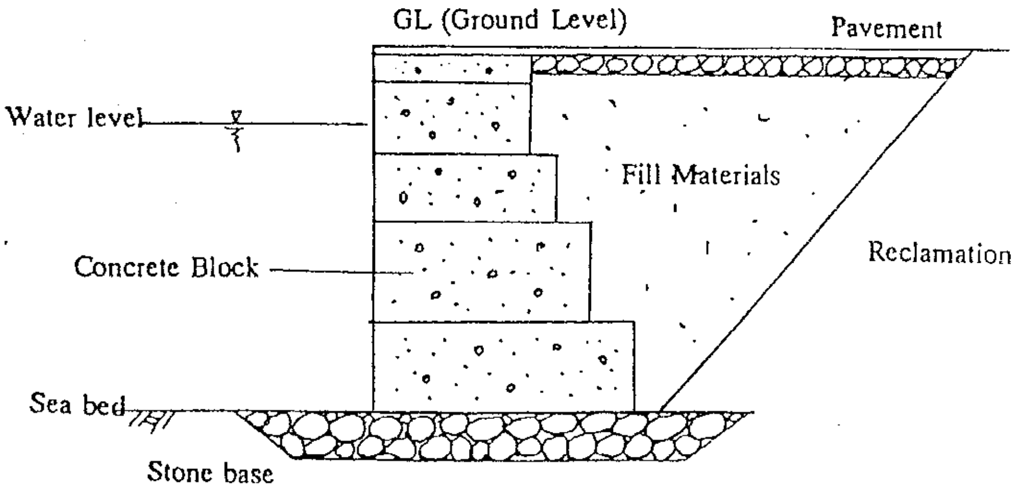
Appendix (IV)-5 Types of Marine Facilities

Types of Mooring Facilities

(1) Concrete block

This is one of the economical types on the stable sub–soil, and in the calm water condition. It is applicable for the facilities in the shallow water such as −3.0m, −4.5m, −6.0m, and −7.5m quaywalls in general, but there are some cases of −9.0m quaywall.

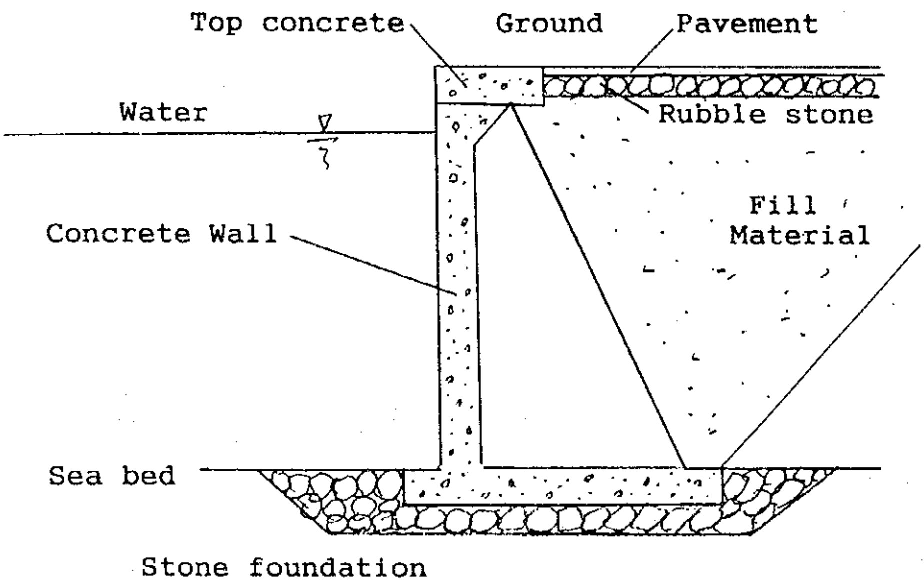
The typical cross–section is shown as below.



(2) L–shaped Retaining Wall

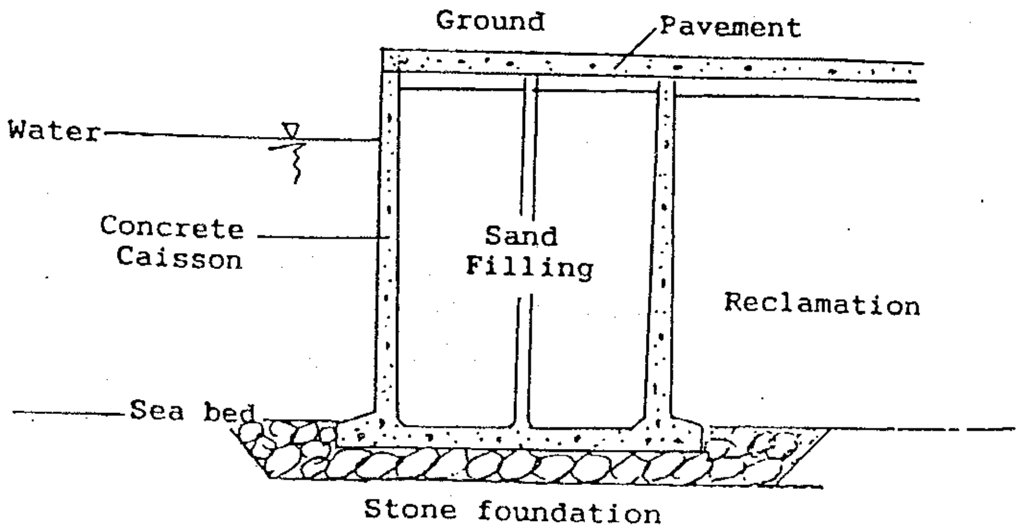
This is one of the alternative types of item (1). It is applicable not only to the marine structures but also to the structures on land, and to the walls of water depth of less than –5.0m in general.

The typical cross–section is shown as follow.



c) Concrete Caisson

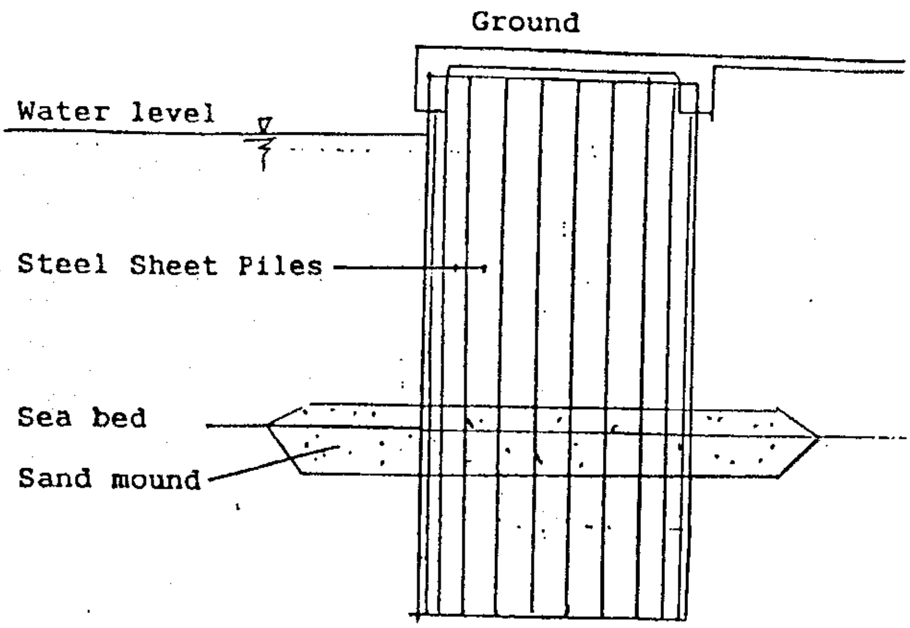
This type is used in deeper water area and has high stability on the good sub-soil conditiontb quite expensive.



(4) Cellar Bulkhead Quaywall

This type is made of the steel sheet piles in circular shape. It is applicable to the soft sub-soil ground such as silty/clayey layers and in the deep water area.

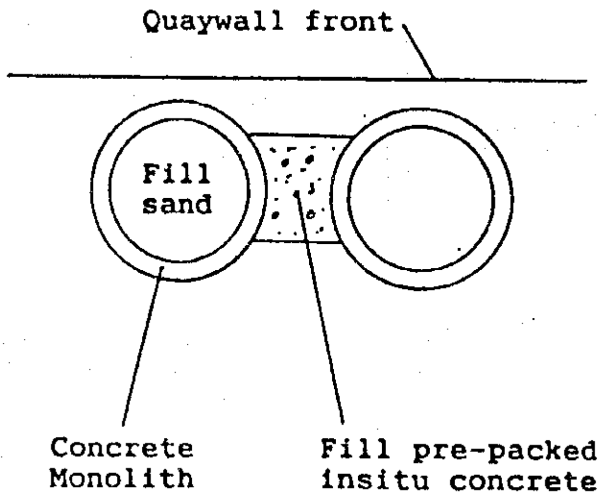
The typical cross-section is shown as follow.



(5) Concrete Monolith (Well)

This is one of the alternatives of the item (40. It is made of the concrete instead of the steel and applicable to the stiff sub-soil ground. There are some difficulties for the construction.

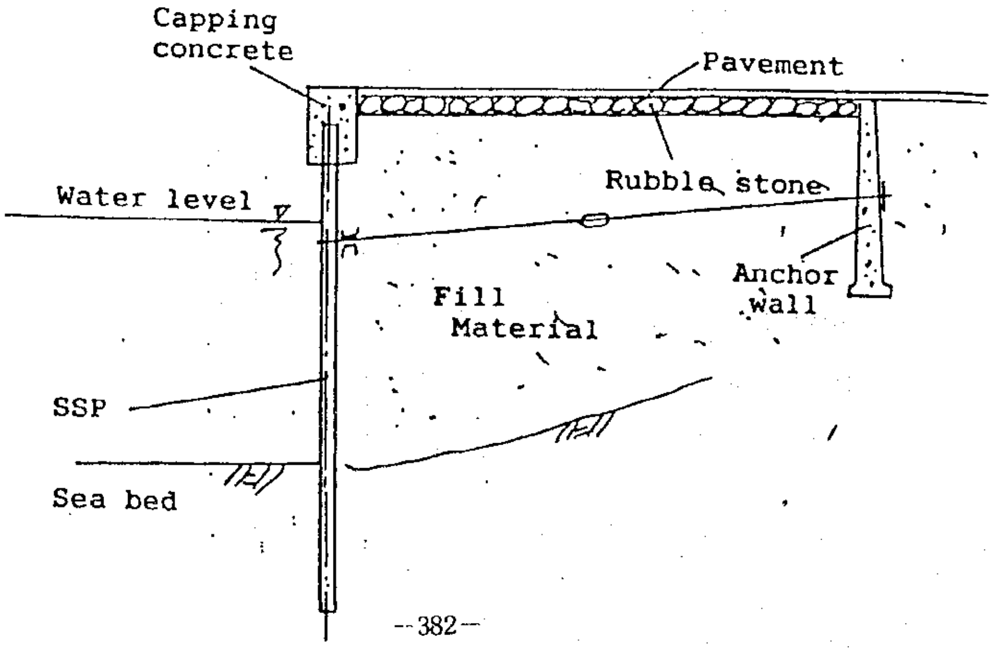
The plan view is shown as follow.



(6) Steel Sheet Pile (SSP) Quaywall

This is one of the standard types of the quaywall. The construction works will be carried out in the short time. Rare cases of incline due to the pressure of the soil have been seen on this type.

The typical cross-section is shown as follow.

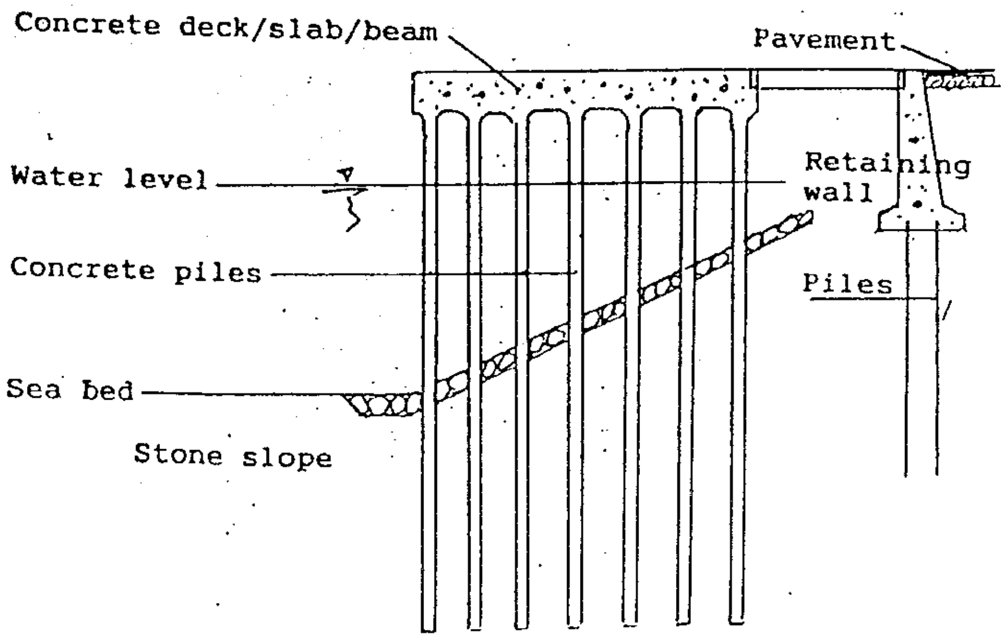


(7) Concrete Pile Pier (square or round piles)

This is also one of the standard types as same as the ones mentioned above.
The water can pass through the structures below.
Therefore, it is applicable to the structures in the strong water currents such as the pier structures alongside of the river.

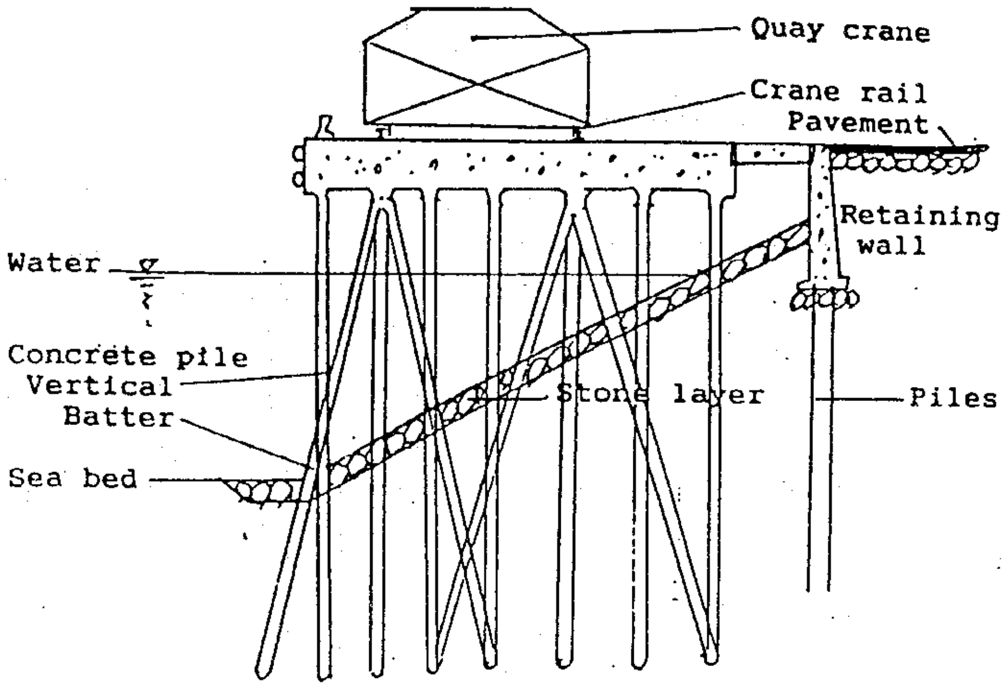
The typical cross-section is shown as follow.

Concrete Pile Pier (square or round pile)



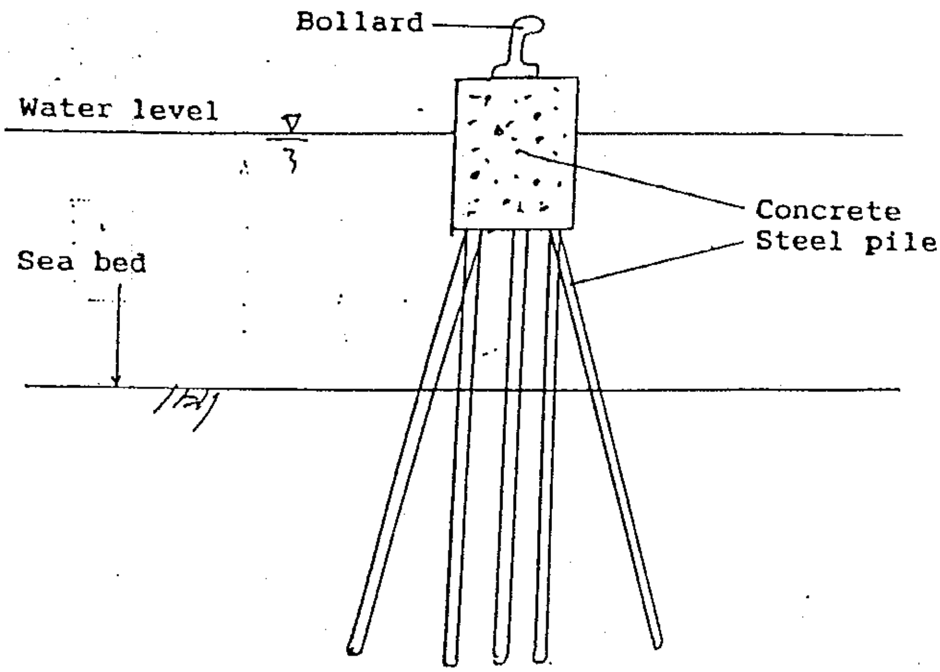
(8) Concrete Pile Pier with Batter Piles

This type is almost as same as the above item. Its deference is using not only the vertical piles but also the batter piles.



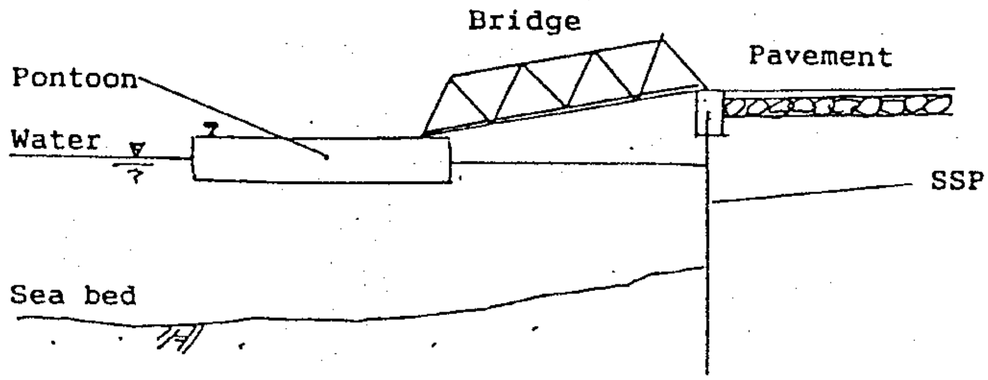
(9) Dolphin

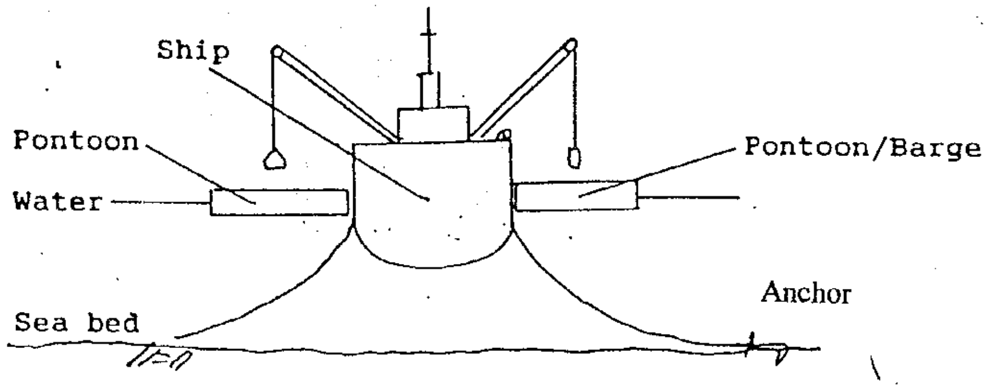
This is a more economical mooring system for ships. The ship can be moored to two (2) or four (4) dolphins without the quaywall. The loading/unloading facilities and the access bridges can also be connected to these dolphins, if necessary.



(10) Floating Pontoon

These two (2) types as shown in the sketches below are useful in the water level varying (rise and down) area such as the river, the wide tidal range areas and the off-shore.

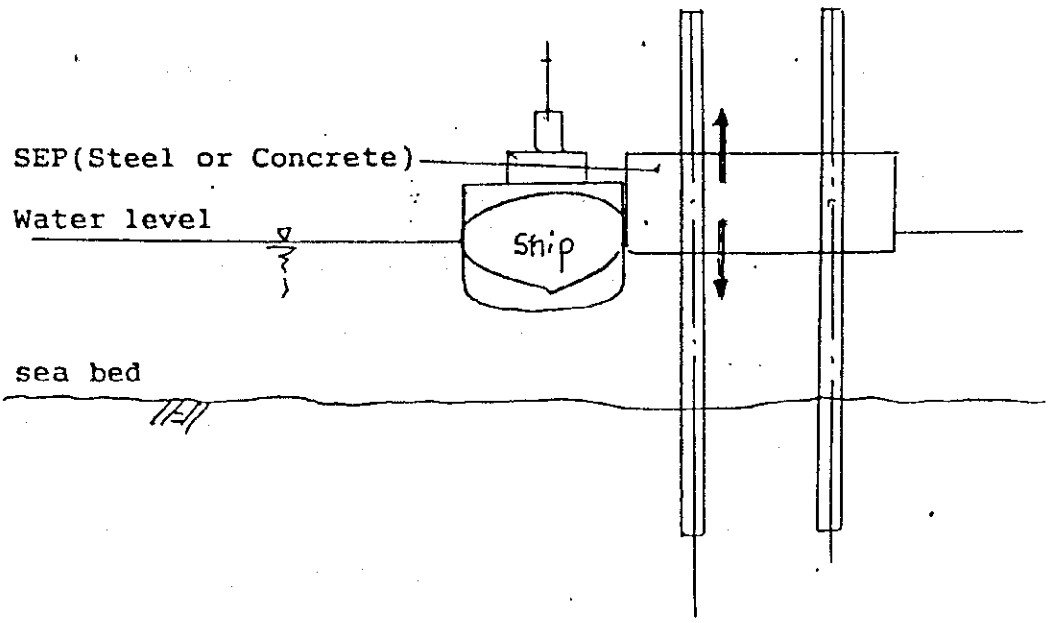




(11) SEP (Self-Elevating Platform)

This type is the most stable mooring system for the ships and applicable to the rough sea condition such as the oil exploit station. It is very expensive.

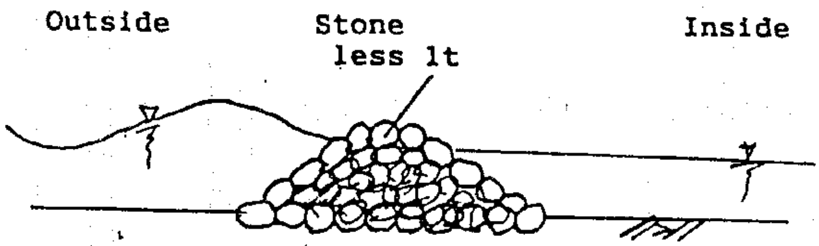
SEP (Self-elevating Platform)



Types of Breakwater

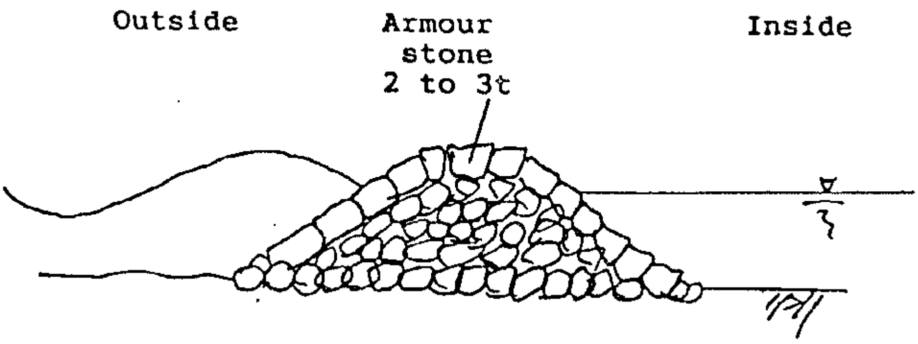
(1) Stone dike

This is a simple and the most economical type as shown below.



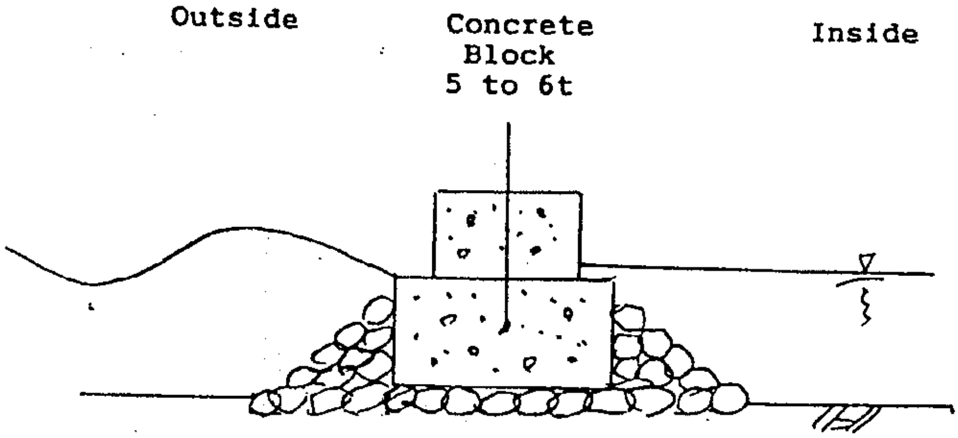
(2) Stone dike with Armor stone

This type is more reinforced and covered with armor stones of 2 to 3 tons each.



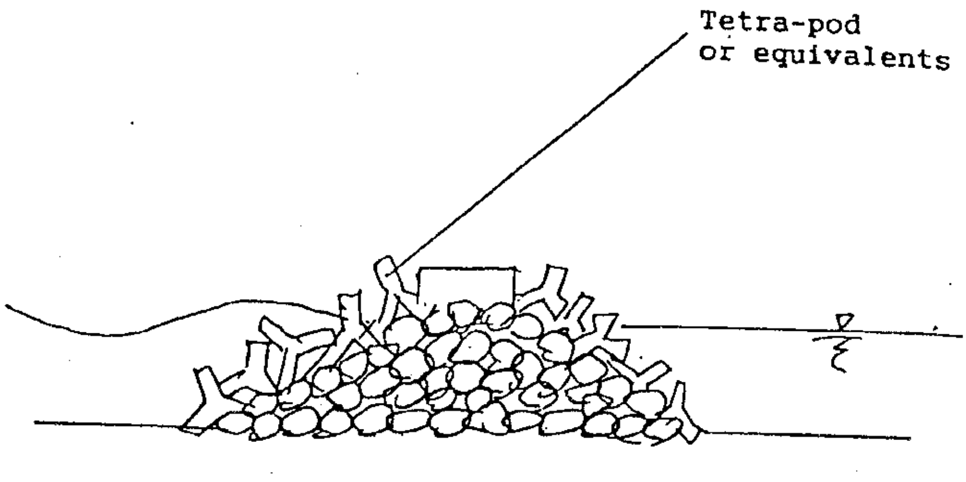
(3) Concrete Block-1

This one is stronger than item (2) and use the concrete blocks as shown below.



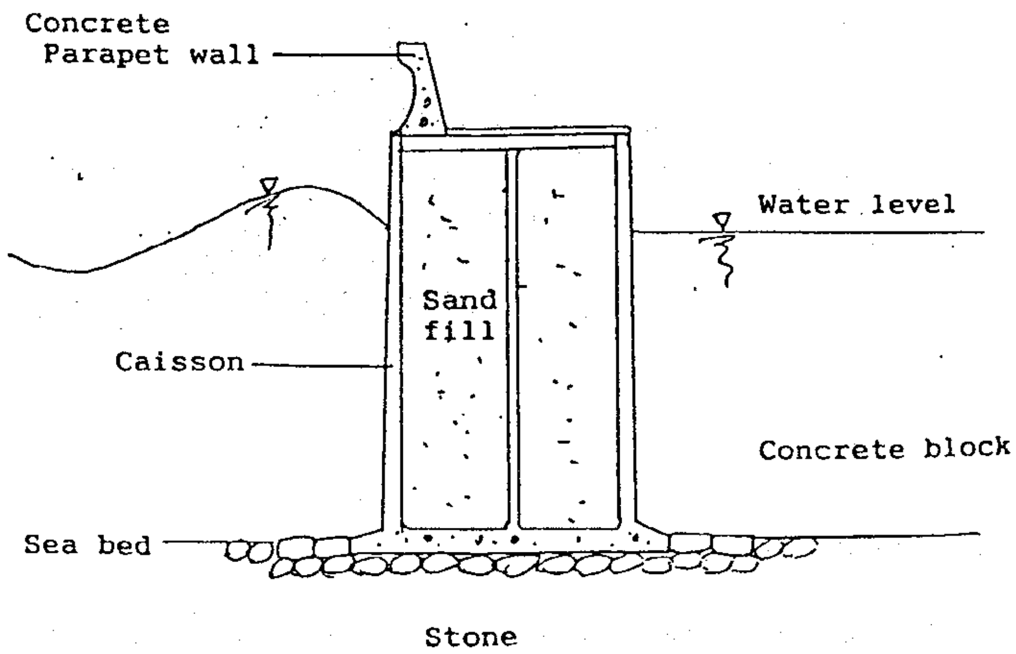
(4) Concrete Block-2

This type is an alternative form of item (3) and exists in Anzali port.



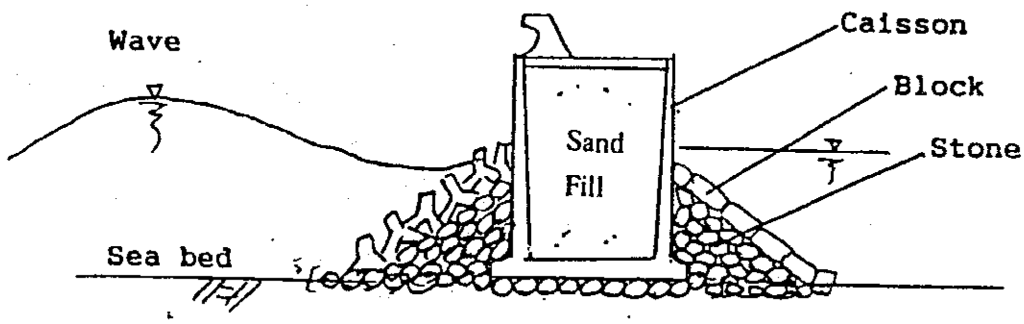
(5) Concrete Caisson

This is one of the stable types and is used in deep sea area. There are some difficulties in the construction of this type such as the foundation and the installation. It is costly.



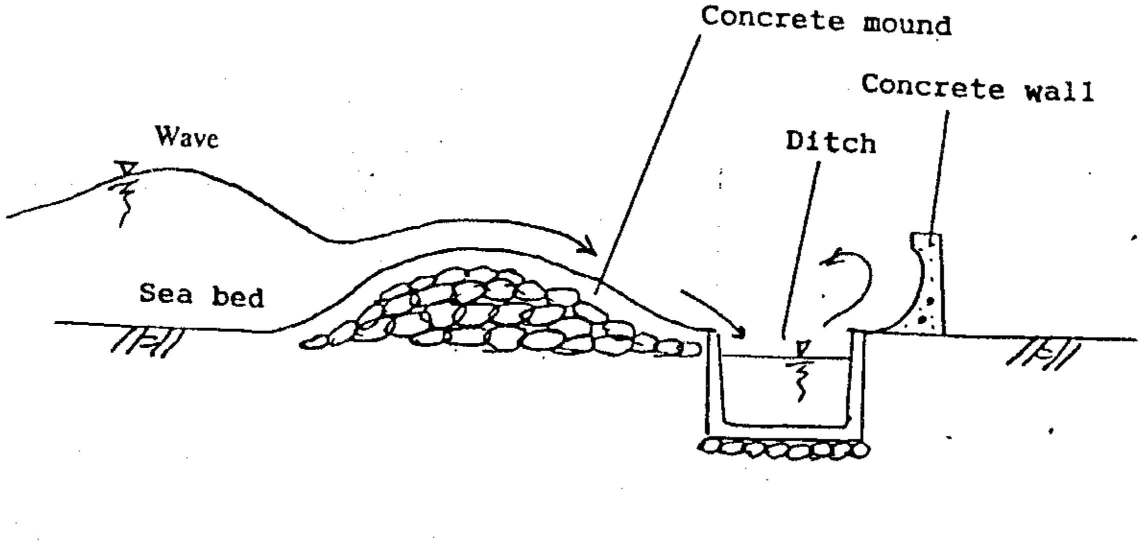
(6) Combined type (caisson + block)

This is a combined type of the item (4) and (5) as shown below.



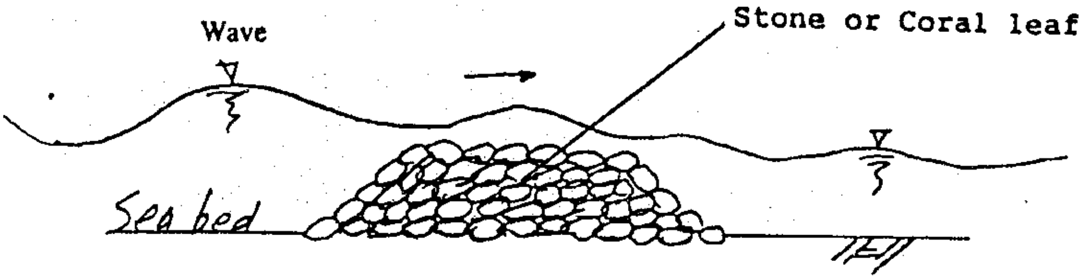
(7) Over Flow type

The energy will be decreased by the over–flowing on the stone mound as shown in the sketch below. This is a unique type which does not break the wave forces directly.



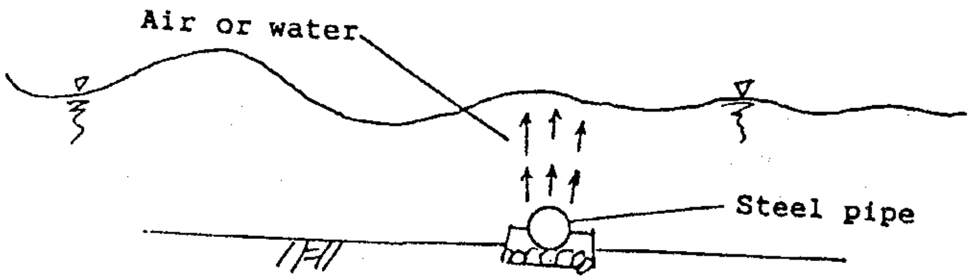
(8) Sub-marine type

The purpose of this type is also as same as the ones above, like the coral reef in the ocean. It is not applicable to the area with the wide tidal range.



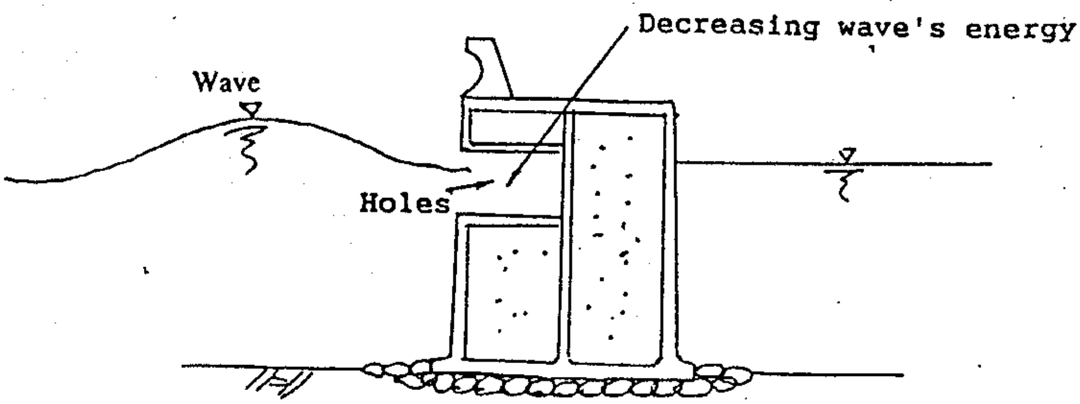
(9) Air/Water Jet type

The energy of the wave will be reduced by the powers of the air jet or water jet as shown in the following sketch. Its effect is not expected to be so strong, but will be applicable to the areas with no high wave.

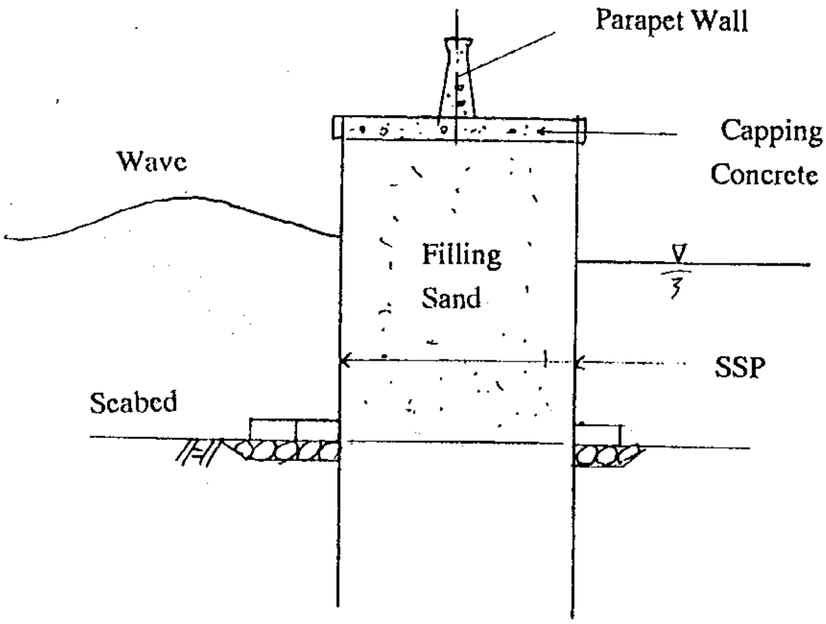


(10) Caisson with holes

This is a modified type of the item (5). The purpose of holes is to absorb the wave's energy.



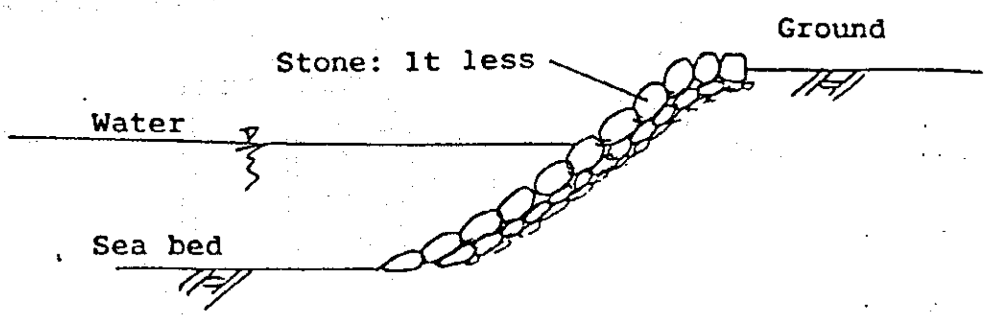
(11) Steel Sheet Piles (SSP) Double Wall



A3-6.3 Seawall (Revetment)

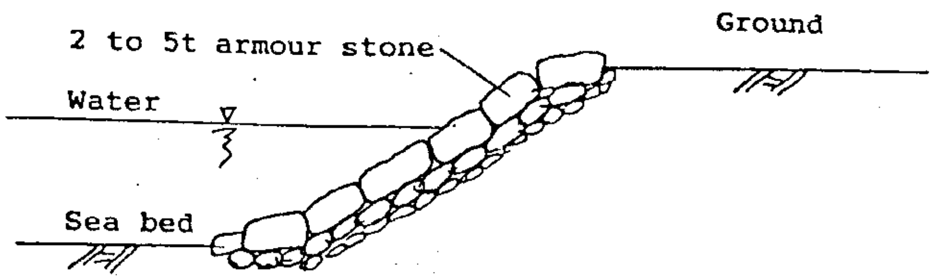
(1) Stone

This is the most simple and economical type as shown below.



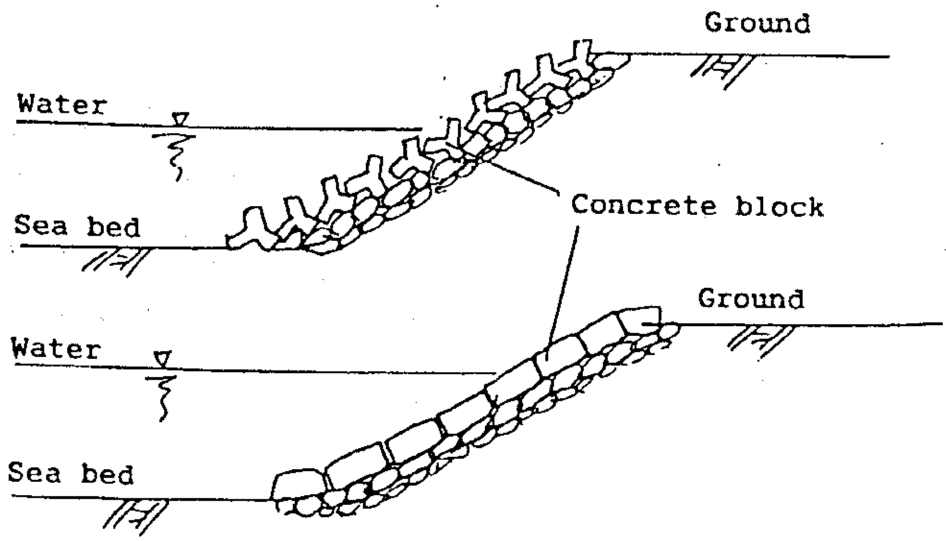
(2) Armor stone

This type is stronger than the item (1) covered with armor stones on the stone slope surface as shown below.



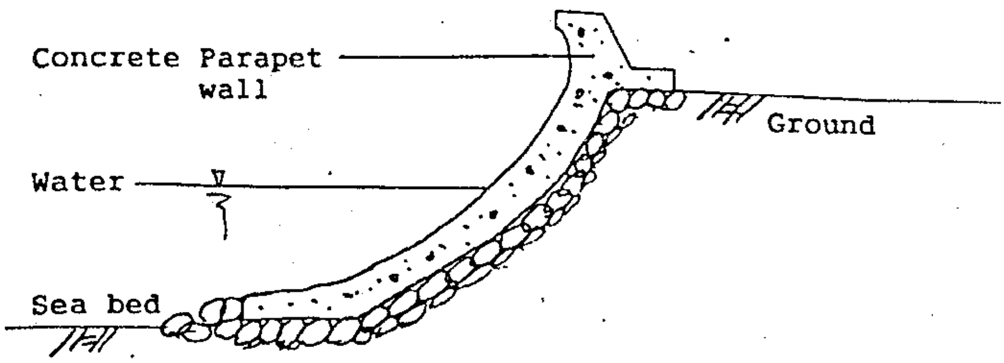
(3) Concrete Block

This type is reinforced by the various types of the concrete blocks as shown below.



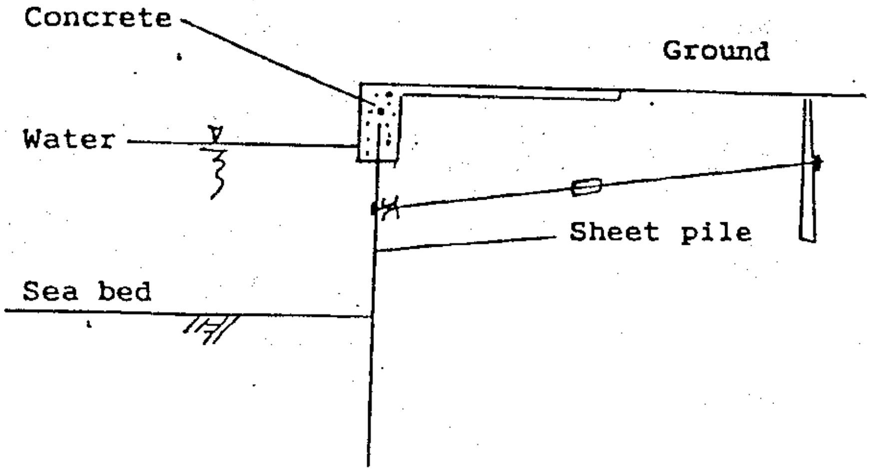
(4) Concrete

This type is protected by the insitu concrete for the wave action as shown below.



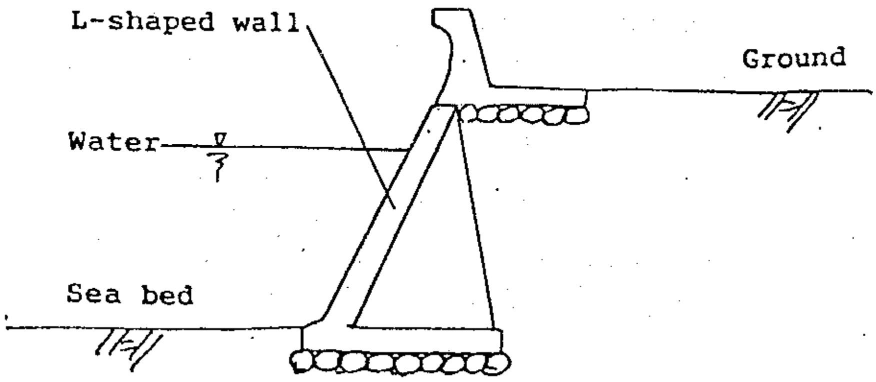
(5) Steel Sheet Pile (SSP)

This is applicable to the deep water area as shown below, but it is costly.



(6) Concrete wall (L-shaped)

This is applicable to the stiff sub-soil layers as shown below.



Appendix (IV)-6 Financial Analysis

Appendix IV-5.1 Operating Income of Anzali Port

Anzali Port Income

	2001~	2003~	2005~
Container Cargo Income			
Income from Shipping Company(1,000 US$)/1,000 GRT =	1.46	1.46	1.46
Unloading Income(1,000 US$)/1,000 tons =	7.52	8.29	9.20
Loading Income(1,000 US$)/1,000 tons =	7.46	8.23	9.14
Other Cargo Income(1,000 US$)/1,000 tons =	3.34	3.34	3.34

C. cargo handling tariff/TEU revise	
1993/94	22,000RLs
1995~	120,000RLs
1997~	133,000RLs
1999~	147,000RLs
2001~	163,000RLs
2003~	180,000RLs
2005~	200,000RLs

Current c. volume (1,000tons)	Import	Export
Container	43	3
Other cargo	993	39
Total	1,036	42

Cargo Volume — Unit: 1,000 tons

Year	Import Container (1)	Import Transit (2)	Import Container Total (1)+(2)=(3)	Import Other Cargo Total(4)	Import Grand Total (3)+(4)	Export Container (5)	Export Transit (6)	Export Container Total (5)+(6)=(7)	Export Other Cargo Total(8)	Export Grand Total (7)+(8)	Number of calling Container Vessels	Av. GRT of Container Vessels (1,000GRT)	Income Increase (Import & Export) Container Cargo (1,000US$)	Income Increase Other Cargo (1,000US$)	Income Increase Total (1,000US$)
1995	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
2001	109	170	279	1444	1723	3	129	132	113	245	85	4	3,233	1,754	4,987
2002	141	186	327	1536	1863	4	141	145	132	277	102	4	3,791	2,124	5,915
2003	183	204	387	1628	2015	5	155	160	152	312	124	4	4,868	2,498	7,366
2004	237	223	460	1693	2153	7	170	177	206	383	150	4	5,765	2,896	8,661
2005	307	244	551	1806	2357	9	186	195	203	398	181	4	7,486	3,263	10,749
2006	397	268	665	1999	2664	12	204	216	246	462	219	4	8,948	4,051	13,000
2007	515	293	808	2193	3001	16	224	240	296	536	265	4	10,752	4,866	15,618
2008	667	321	988	2386	3374	22	245	267	355	622	320	4	12,976	5,708	18,684
2009	864	352	1216	2570	3786	29	269	298	426	724	387	4	15,748	6,560	22,308
2010	1120	385	1505	2736	4241	39	295	334	507	841	468	4	19,209	7,385	26,594
2011	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2012	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2013	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2014	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2015	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2016	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2017	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2018	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2019	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2020	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2021	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2022	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2023	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2024	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2025	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2026	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2027	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2028	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2029	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277
2030	1120	385	1505	2736	4241	39	295	334	507	841	468	5	19,892	7,385	27,277

Appendix IV-5.2 Project Cost of Anzali Port

Project Cost of Anzali Port

Unit:1,000$

	Cost	Local P	Foreign P	Intial Investment Costs by Facilities: Direct Cost	Mobilization	Engineering	P.Contigency	Total	Maintenance Cost	Depriciation Period	Depriciation Per Year
Construction Cost	58,650	36,737	21,913	53,650	5,000	5,865	5,865	70,380	616		1,420
Mobilization	5,000	1,250	3,750	0	5,000	500	500	6,000	0		0
Dredging & Reclamation	4,200	1,680	2,520	4,200	0	420	420	5,040	0		0
Quaywall	32,430	19,458	12,972	32,430	0	3,243	3,243	38,916	389	50	778
Breakwater	7,000	6,300	700	7,000	0	700	700	8,400	84	50	168
Seawall	110	110	0	110	0	11	11	132	1	50	3
Pavement	5,520	4,968	552	5,520	0	552	552	6,624	66	30	221
CFS	600	360	240	600	0	60	60	720	7	40	18
Gate, Others	2,790	2,011	779	2,790	0	279	279	3,348	33	30	112
Survey, Others	1,000	600	400	1,000	0	100	100	1,200	0		
Rehabilitation	23,330	14,531	8,799	22,330	1,000	2,333	2,333	27,996	0		0
Mobilization	1,000	250	750	0	1,000	100	100	1,200	0		
Dredging & Reclamation	750	300	450	750	0	75	75	900	0		
Quaywall	16,950	10,170	6,780	16,950	0	1,695	1,695	20,340	0		
Pavement	3,000	2,700	300	3,000	0	300	300	3,600	0		
Slip way	1,000	700	300	1,000	0	100	100	1,200	0		
Utility	330	231	99	330	0	33	33	396	0		
Survey, Others	300	180	120	300	0	30	30	360			
Equipment	11,000	2,200	8,800	11,000	0	1,100	1,100	13,200	660		960
Unloader	0	0	0	0	0	0	0	0	0	15	0
Transfer Crane	7,200	1,440	5,760	7,200	0	720	720	8,640	432	15	576
Mobile Crane	3,300	660	2,640	3,300	0	330	330	3,960	198	15	264
Forklift, Others	500	100	400	500	0	50	50	600	30	5	120
Engineering and Sup.	9,298	1,860	7,438	0	0	0	0	0	0		
Physical Contigency	9,298	5,300	3,998	0	0	0	0	0	0		
Total	111,576	60,628	50,949	86,980	6,000	9,298	9,298	111,576	1,276		2,380

	1995	1996	1997	1998	1999	2000	2001
Project Cost Total	4,088	8,008	44,950	38,500	16,030	0	0
Construction, Equipment	4,088	8,008	43,117	18,300	11,000	0	0
Rehabilitation	0	0	1,833	20,200	5,030	0	0
Maintenance	0	0	0	389	430	1,276	1,276
Depriciation	0	0	0	778	911	2,380	2,380

Appendix IV-5.3 Calculation of FIRR (Anzali Port)

Result of Caluculation

Original Case	7.0%	
Sensitivity Analysis A	5.5%	Revenue 10%Down
Sensitivity Analysis B	5.7%	Cost 10%Up
Sensitivity Analysis C	4.1%	Revenue 10%Down, Cost 10%Up

Unit: 1,000US$

Year	Revenues			Cost			Revenue-Cost	Net Present Value		
	Operating Revenues	Subsidy (G. Fund)	Total	Investment	Expense	Total		Revenues	Cost	Difference
1995	0		0	4,088	0	4,088	-4,088	0	4,088	-4,088
1996	0		0	8,008	0	8,008	-8,008	0	7,481	-7,481
1997	0		0	43,117	0	43,117	-43,117	0	37,626	-37,626
1998	0		0	18,300	389	18,689	-18,689	0	15,235	-15,235
1999	0		0	11,000	430	11,430	-11,430	0	8,704	-8,704
2000	0		0	0	1,276	1,276	-1,276	0	908	-908
2001	4,987		4,987		3,670	3,670	1,317	3,314	2,439	875
2002	5,915		5,915		4,115	4,115	1,800	3,672	2,555	1,117
2003	7,366		7,366		4,812	4,812	2,554	4,272	2,790	1,481
2004	8,661		8,661		5,433	5,433	3,228	4,692	2,943	1,749
2005	10,749		10,749		6,436	6,436	4,313	5,439	3,257	2,183
2006	13,000		13,000		7,516	7,516	5,484	6,145	3,553	2,592
2007	15,618		15,618		8,773	8,773	6,845	6,897	3,874	3,023
2008	18,684		18,684		10,244	10,244	8,440	7,708	4,226	3,482
2009	22,308		22,308		11,984	11,984	10,324	8,597	4,618	3,979
2010	26,594		26,594		14,041	14,041	12,553	9,573	5,055	4,519
2011	27,277		27,277		14,369	14,369	12,908	9,173	4,832	4,341
2012	27,277		27,277		14,369	14,369	12,908	8,569	4,514	4,055
2013	27,277		27,277		14,369	14,369	12,908	8,005	4,217	3,788
2014	27,277		27,277		14,369	14,369	12,908	7,478	3,939	3,539
2015	27,277		27,277		14,369	14,369	12,908	6,985	3,680	3,306
2016	27,277		27,277		14,369	14,369	12,908	6,525	3,437	3,088
2017	27,277		27,277		14,369	14,369	12,908	6,096	3,211	2,885
2018	27,277		27,277		14,369	14,369	12,908	5,694	3,000	2,695
2019	27,277		27,277		14,369	14,369	12,908	5,319	2,802	2,517
2020	27,277		27,277		14,369	14,369	12,908	4,969	2,618	2,351
2021	27,277		27,277		14,369	14,369	12,908	4,642	2,445	2,197
2022	27,277		27,277		14,369	14,369	12,908	4,336	2,284	2,052
2023	27,277		27,277		14,369	14,369	12,908	4,051	2,134	1,917
2024	27,277		27,277		14,369	14,369	12,908	3,784	1,993	1,791
2025	27,277		27,277		14,369	14,369	12,908	3,535	1,862	1,673
2026	27,277		27,277		14,369	14,369	12,908	3,302	1,739	1,563
2027	27,277		27,277		14,369	14,369	12,908	3,085	1,625	1,460
2028	27,277		27,277		14,369	14,369	12,908	2,882	1,518	1,364
2029	27,277		27,277		14,369	14,369	12,908	2,692	1,418	1,274
2030	27,277		27,277		14,369	14,369	12,908	2,515	1,325	1,190
Total	679,422	0	679,422	84,513	366,498	451,011	228,411	163,943	163,943	-0

Appendix IV-5.4 Financial Statements for Short-term Project (Anzali Port)

Unit: 1,000US$

PROFIT AND LOSS STATEMENT (UNIT: 1,000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Operating Revenue	0	0	0	0	0	0	4,987	5,915	7,366	8,661	10,749	13,900
Operating Expenses	0	0	0	1,167	1,341	3,656	6,050	6,495	7,192	7,813	8,816	9,896
Personnel	0	0	0	0	0	0	1,975	2,342	2,917	3,430	4,257	5,148
Maintenance and repair	0	0	0	389	430	1,276	1,276	1,276	1,276	1,276	1,276	1,276
Other expenditure	0	0	0	0	0	0	419	497	619	728	903	1,092
Depreciation costs	0	0	0	778	911	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Net Operating Income	0	0	0	-1,167	-1,341	-3,656	-1,063	-580	174	848	1,933	3,104
Non-operating Revenues	0	0	0	0	0	0	0	0	0	0	0	0
Interest on deposit	0	0	0	0	0	0	0	0	0	0	0	0
Non-operating Expenses	0	0	0	0	143	421	1,924	2,524	2,854	2,789	2,721	2,652
Interest on long-term loans	0	0	0	0	143	421	1,924	2,524	2,854	2,789	2,721	2,652
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Income Before Tax	0	0	0	-1,167	-1,484	-4,077	-2,987	-3,104	-2,680	-1,941	-788	452
Income Tax	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax	0	0	0	-1,167	-1,484	-4,077	-2,987	-3,104	-2,680	-1,941	-788	452
(Contribution To the Government)	0	0	0	0	0	0	0	0	0	0	0	226
Net Income After Contribution	0	0	0	-1,167	-1,484	-4,077	-2,987	-3,104	-2,680	-1,941	-788	226
Retained Earnings	0	0	0	-1,167	-2,651	-6,728	-9,715	-12,819	-15,499	-17,440	-18,227	-18,001

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Operating Revenue	15,618	18,684	22,308	26,594	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277
Operating Expenses	11,153	12,624	14,364	16,421	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749
Personnel	6,185	7,399	8,834	10,531	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802
Maintenance and repair	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276
Other expenditure	1,312	1,569	1,874	2,234	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291
Depreciation costs	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Net Operating Income	4,465	6,060	7,944	10,173	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528
Non-operating Revenues	0	0	0	0	0	0	0	0	0	0	0	0
Interest on deposit	0	0	0	0	0	0	0	0	0	0	0	0
Non-operating Expenses	2,580	2,506	2,430	2,352	2,271	2,188	2,103	2,015	1,924	1,830	1,734	1,635
Interest on long-term loans	2,580	2,506	2,430	2,352	2,271	2,188	2,103	2,015	1,924	1,830	1,734	1,635
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Income Before Tax	1,885	3,554	5,514	7,821	8,257	8,340	8,425	8,513	8,604	8,698	8,794	8,893
Income Tax	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax	1,885	3,554	5,514	7,821	8,257	8,340	8,425	8,513	8,604	8,698	8,794	8,893
(Contribution To the Government)	943	1,777	2,757	3,910	4,129	4,170	4,213	4,257	4,302	4,349	4,397	4,447
Net Income After Contribution	943	1,777	2,757	3,910	4,129	4,170	4,213	4,257	4,302	4,349	4,397	4,447
Retained Earnings	-17,059	-15,282	-12,525	-8,614	-4,486	-316	3,897	8,153	12,455	16,804	21,201	25,648

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Revenue	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277	27,277
Operating Expenses	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749	16,749
Personnel	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802	10,802
Maintenance and repair	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276	1,276
Other expenditure	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291	2,291
Depreciation costs	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Net Operating Income	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528
Non-operating Revenues	0	0	0	0	0	0	0	0	0	0	0	0
Interest on deposit	0	0	0	0	0	0	0	0	0	0	0	0
Non-operating Expenses	1,533	1,428	1,319	1,208	1,093	975	853	706	543	212	73	0
Interest on long-term loans	1,533	1,428	1,319	1,208	1,093	975	853	706	543	212	73	0
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Net Income Before Tax	8,995	9,100	9,209	9,320	9,435	9,553	9,675	9,822	9,985	10,316	10,455	10,528
Income Tax	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax	8,995	9,100	9,209	9,320	9,435	9,553	9,675	9,822	9,985	10,316	10,455	10,528
(Contribution To the Government)	4,498	4,550	4,605	4,660	4,718	4,777	4,838	4,911	4,993	5,158	5,228	5,264
Net Income After Contribution	4,498	4,550	4,605	4,660	4,718	4,777	4,838	4,911	4,993	5,158	5,228	5,264
Retained Earnings	30,145	34,695	39,300	43,960	48,677	53,454	58,291	63,202	68,195	73,353	78,580	83,845

CASH FLOW STATEMENT (Unit: 1,000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Cash Beginning	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow	4,088	8,008	43,117	18,300	11,282	831	3,613	4,933	5,903	6,238	6,539	6,987
Net operating income	0	0	0	-1,167	-1,341	-3,656	-1,063	-580	174	848	1,933	3,104
Depreciation costs	0	0	0	778	911	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Long-term loans	4,088	8,008	43,117	18,300	11,000	0	0	0	0	0	0	0
Short-term loans	0	0	0	389	712	2,107	2,296	3,134	3,348	3,010	2,225	1,503
Government Funds	0	0	0	0	0	0	0	0	0	0	0	0
Cash Outflow (excluding G. Funds)	4,088	8,008	43,117	18,300	11,282	831	3,613	4,933	5,903	6,238	6,539	6,987
Investment	4,088	8,008	43,117	18,300	11,000	0	0	0	0	0	0	0
Repayment for long-term loans	0	0	0	0	100	300	1,368	1,859	2,185	2,250	2,318	2,387
Interest on long-term loans	0	0	0	0	143	421	1,924	2,524	2,854	2,789	2,721	2,652
Repayment for short-term loans	0	0	0	0	39	110	321	550	864	1,199	1,500	1,722
(Contribution to the Government)	0	0	0	0	0	0	0	0	0	0	0	226
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Cash Outflow	0	0	0	0	0	0	0	0	0	0	0	0
Cash Ending	0	0	0	0	0	0	0	0	0	0	0	0
Cash excess	0	0	0	0	0	0	0	0	0	0	0	0
Cash shortage	0	0	0	0	0	0	0	0	0	0	0	0

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cash Beginning	0	0	0	559	2,264	4,317	6,559	9,071	11,874	14,932	18,167	21,503
Cash Inflow	7,854	8,789	10,324	12,553	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908
Net operating income	4,465	6,060	7,944	10,173	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528
Depreciation costs	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Long-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Short-term loans	1,009	349	0	0	0	0	0	0	0	0	0	0
Government Funds	0	0	0	0	0	0	0	0	0	0	0	0
Cash Outflow (excluding G. Funds)	7,854	8,789	9,765	10,847	10,855	10,667	10,396	10,105	9,850	9,673	9,572	9,520
Investment	0	0	0	0	0	0	0	0	0	0	0	0
Repayment for long-term loans	2,459	2,533	2,609	2,687	2,768	2,851	2,936	3,024	3,115	3,208	3,305	3,404
Interest on long-term loans	2,580	2,506	2,430	2,352	2,271	2,188	2,103	2,015	1,924	1,830	1,734	1,635
Repayment for short-term loans	1,872	1,973	1,969	1,898	1,687	1,458	1,144	810	509	286	136	35
(Contribution to the Government)	943	1,777	2,757	3,910	4,129	4,170	4,213	4,257	4,302	4,349	4,397	4,447
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Cash Outflow	0	0	559	1,705	2,053	2,241	2,512	2,803	3,058	3,235	3,336	3,388
Cash Ending	0	0	559	2,264	4,317	6,559	9,071	11,874	14,932	18,167	21,503	24,891
Cash excess	0	0	559	2,264	4,317	6,559	9,071	11,874	14,932	18,167	21,503	24,891
Cash shortage	0	0	0	0	0	0	0	0	0	0	0	0

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cash Beginning	24,891	28,262	31,581	34,846	38,055	41,206	44,299	47,330	50,532	54,130	60,133	67,156
Cash Inflow	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908	12,908
Net operating income	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528	10,528
Depreciation costs	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380	2,380
Long-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Government Funds	0	0	0	0	0	0	0	0	0	0	0	0
Cash Outflow (excluding G. Funds)	9,537	9,589	9,644	9,699	9,757	9,816	9,877	9,706	9,311	6,905	5,885	5,264
Investment	0	0	0	0	0	0	0	0	0	0	0	0
Repayment for long-term loans	3,506	3,611	3,720	3,831	3,946	4,064	4,186	4,089	3,775	1,535	584	0
Interest on long-term loans	1,533	1,428	1,319	1,208	1,093	975	853	706	543	212	73	0
Repayment for short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
(Contribution to the Government)	4,498	4,550	4,605	4,660	4,718	4,777	4,838	4,911	4,993	5,158	5,228	5,264
Interest on short-term loans	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow - Cash Outflow	3,372	3,319	3,265	3,209	3,152	3,093	3,032	3,202	3,598	6,003	7,024	7,644
Cash Ending	28,262	31,581	34,846	38,055	41,206	44,299	47,330	50,532	54,130	60,133	67,156	74,800
Cash excess	28,262	31,581	34,846	38,055	41,206	44,299	47,330	50,532	54,130	60,133	67,156	74,800
Cash shortage	0	0	0	0	0	0	0	0	0	0	0	0

BALANCE SHEET (UNIT: 1,000 US$)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
(Assets)												
Current Assets	0	0	0	0	0	0	0	0	0	0	0	0
Cash & Deposit	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Assets	4,088	12,096	55,213	72,735	82,824	80,444	78,064	75,684	73,304	70,924	68,544	66,164
Construction costs	4,088	12,096	55,213	73,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513
Accumulated depreciation	0	0	0	778	1,689	4,069	6,449	8,829	11,209	13,589	15,969	18,349
Net fixed assets	4,088	12,096	55,213	72,735	82,824	80,444	78,064	75,684	73,304	70,924	68,544	66,164
Total Assets	4,088	12,096	55,213	72,735	82,824	80,444	78,064	75,684	73,304	70,924	68,544	66,164
(Liabilities and capital)												
Liabilities	4,088	12,096	55,213	73,902	85,475	87,172	87,779	88,503	88,803	88,364	86,771	84,165
Current Liabilities (Short-term loan)	0	0	0	389	1,062	3,059	5,034	7,617	10,102	11,913	12,638	12,419
Fixed Liabilities (Long-term loan)	4,088	12,096	55,213	73,513	84,413	84,113	82,745	80,886	78,701	76,451	74,133	71,746
Capital	0	0	0	-1,167	-2,651	-6,728	-9,715	-12,819	-15,499	-17,440	-18,227	-18,001
Investment In Kind By Gov. Funds	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax and Cont.	0	0	0	-1,167	-1,484	-4,077	-2,987	-3,104	-2,680	-1,941	-788	226
Retained Earnings	0	0	0	-1,167	-2,651	-6,728	-9,715	-12,819	-15,499	-17,440	-18,227	-18,001
Total Liabilities and capital	4,088	12,096	55,213	72,735	82,824	80,444	78,064	75,684	73,304	70,924	68,544	66,164

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
(Assets)												
Current Assets	0	0	559	2,264	4,317	6,559	9,071	11,874	14,932	18,167	21,503	24,891
Cash & Deposit	0	0	559	2,264	4,317	6,559	9,071	11,874	14,932	18,167	21,503	24,891
Fixed Assets	63,784	61,404	59,024	56,644	54,264	51,884	49,504	47,124	44,744	42,364	39,984	37,604
Construction costs	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513
Accumulated depreciation	20,729	23,109	25,489	27,869	30,249	32,629	35,009	37,389	39,769	42,149	44,529	46,909
Net fixed assets	63,784	61,404	59,024	56,644	54,264	51,884	49,504	47,124	44,744	42,364	39,984	37,604
Total Assets	63,784	61,404	59,583	58,908	58,581	58,443	58,575	58,998	59,676	60,531	61,487	62,495
(Liabilities and capital)												
Liabilities	80,843	76,686	72,108	67,523	63,057	58,758	54,678	50,844	47,221	43,727	40,286	36,847
Current Liabilities (Short-term loan)	11,556	9,932	7,963	6,065	4,377	2,919	1,775	965	457	171	35	-0
Fixed Liabilities (Long-term loan)	69,287	66,754	64,145	61,458	58,690	55,839	52,903	49,879	46,764	43,556	40,251	36,847
Capital	-17,059	-15,282	-12,525	-8,614	-4,486	-316	3,897	8,153	12,455	16,804	21,201	25,648
Investment In Kind By Gov. Funds	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax and Cont.	943	1,777	2,757	3,910	4,129	4,170	4,213	4,257	4,302	4,349	4,397	4,447
Retained Earnings	-17,059	-15,282	-12,525	-8,614	-4,486	-316	3,897	8,153	12,455	16,804	21,201	25,648
Total Liabilities and capital	63,784	61,404	59,583	58,908	58,581	58,443	58,575	58,998	59,676	60,531	61,487	62,495

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
(Assets)												
Current Assets	28,262	31,581	34,846	38,055	41,206	44,299	47,330	50,532	54,130	60,133	67,156	74,800
Cash & Deposit	28,262	31,581	34,846	38,055	41,206	44,299	47,330	50,532	54,130	60,133	67,156	74,800
Fixed Assets	35,224	32,844	30,464	28,084	25,704	23,324	20,944	18,564	16,184	13,804	11,424	9,044
Construction costs	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513	84,513
Accumulated depreciation	49,289	51,669	54,049	56,429	58,809	61,189	63,569	65,949	68,329	70,709	73,089	75,469
Net fixed assets	35,224	32,844	30,464	28,084	25,704	23,324	20,944	18,564	16,184	13,804	11,424	9,044
Total Assets	63,486	64,425	65,310	66,139	66,910	67,623	68,274	69,096	70,314	73,937	78,580	83,844
(Liabilities and capital)												
Liabilities	33,341	29,730	26,010	22,179	18,233	14,169	9,983	5,894	2,119	584	-0	-0
Current Liabilities (Short-term loan)	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0
Fixed Liabilities (Long-term loan)	33,341	29,730	26,010	22,179	18,233	14,169	9,983	5,894	2,119	584	0	0
Capital	30,145	34,695	39,300	43,960	48,677	53,454	58,291	63,202	68,195	73,353	78,580	83,845
Investment In Kind By Gov. Funds	0	0	0	0	0	0	0	0	0	0	0	0
Net Income After Tax and Cont.	4,498	4,550	4,605	4,660	4,718	4,777	4,838	4,911	4,993	5,158	5,228	5,264
Retained Earnings	30,145	34,695	39,300	43,960	48,677	53,454	58,291	63,202	68,195	73,353	78,580	83,845
Total Liabilities and capital	63,486	64,425	65,310	66,139	66,910	67,623	68,274	69,096	70,314	73,937	78,580	83,845

FINANCIAL INDICATORS

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Working Ratio (%)							73.6%	69.6%	65.3%	62.7%	59.9%	57.8%
Operating Ratio (%)							121.3%	109.8%	97.6%	90.2%	82.0%	76.1%
Rate of Return on Net Fixed Assets	0.0%	0.0%	0.0%	-1.6%	-1.6%	-4.5%	-1.4%	-0.8%	0.2%	1.2%	2.8%	4.7%
Debt Service Coverage Ratio					-177.0%	-177.0%	40.0%	41.1%	50.7%	64.1%	85.6%	108.8%

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Working Ratio (%)	55.2%	54.8%	53.7%	52.8%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%
Operating Ratio (%)	71.4%	67.6%	64.4%	61.7%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%
Rate of Return on Net Fixed Assets	7.0%	9.9%	13.5%	18.0%	19.4%	20.3%	21.3%	22.3%	23.5%	24.9%	26.3%	28.0%
Debt Service Coverage Ratio	135.8%	167.5%	204.9%	240.1%	256.2%	256.2%	256.2%	256.2%	256.2%	256.2%	256.2%	256.2%

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Working Ratio (%)	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%	52.7%
Operating Ratio (%)	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%	61.4%
Rate of Return on Net Fixed Assets	29.9%	32.1%	34.6%	37.5%	41.0%	45.1%	50.3%	56.7%	65.1%	76.3%	92.2%	116.4%
Debt Service Coverage Ratio	256.2%	256.2%	256.2%	256.2%	256.2%	256.2%	256.2%	269.2%	298.9%	738.9%	1984.7%	

List of Separete-Volume Appendixes (Field Reports)

1. Field Report No.1 Topographic Survey at Anzali Port
   (English Version, Persian Version, Original Maps of Survey Results)

2. Field Report No.2 Soil Investigation at Anzali Port
   (English Version, Persian Version)

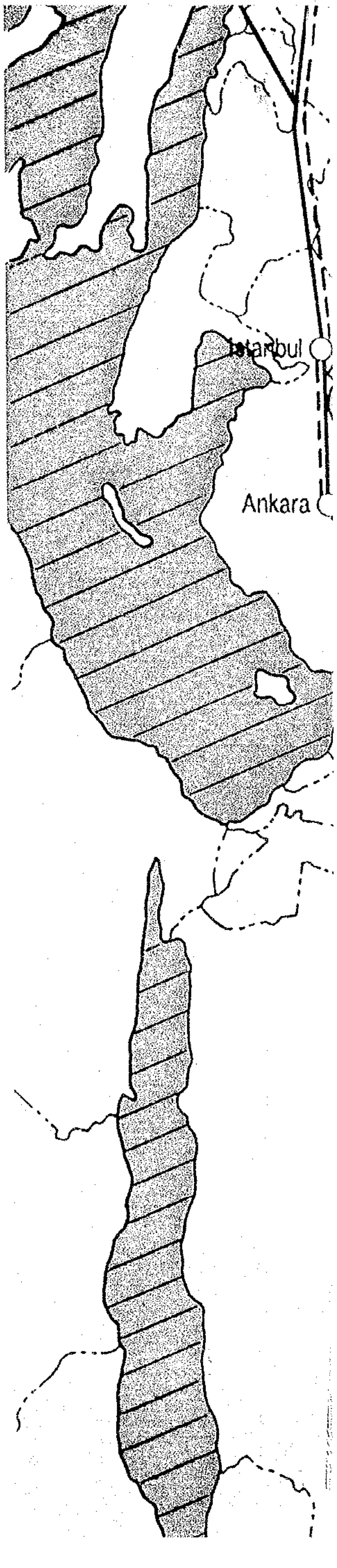
3. Filed Report No.3 Seawater Quality and Seabed Material Survey at Imam Khomeini Port
   (English Version, Persian Version)

4. Field Report No.4 Visual Inspection of General Cargo Wharf Structures at Imam Khomeini Port
   (English Version, Persian Version)

5. Field Report No.5 Structural Survey at Imam Khomeini Port
   (English Version, Persian Version, Photos, Drawings)

6. Field Report No.6 Environmental Study of Port of Bandar Anzali
   (English Version, Persian Version)

7. Field Report No.7 Hydrographic Survey, Imam Khomeini Port
   (English Version, Persian Version, Original Maps of Survey Results)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