

**PRE-INVESTMENT SURVEY
OF FISHING HARBOURS**

INDIA

MALLIPATNAM

ENGINEERING

**SURVEY
SOIL INVESTIGATIONS
DESIGN**

**REPORT PREPARED FOR
THE FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ACTING AS EXECUTING AGENCY FOR THE UNITED NATIONS DEVELOPMENT PROGRAMME
BY
SCANDIACONSULT**

**SCANDIACONSULT INTERNATIONAL AB
GOTHENBURG SWEDEN
1972**

PREFACE

The Pre-Investment Survey of Fishing Harbours is being conducted by the Food and Agriculture Organization of the United Nations in cooperation with the Government of India. The Food and Agriculture Organization of the United Nations, on this Project, is acting as the Executing and Participating Agency for the United Nations Development Programme. The Agency has sub-contracted certain professional and other services to Scandiaconsult International AB, Sweden.

The Project has its Headquarters at Bangalore, India. This Technical Report constitutes one of a number of reports which will be issued during the life of the Project. The contents of this Report are based on the work of Scandiaconsult personnel and of other professional and technical staff provided by the Government of India and the Food and Agriculture Organization of the United Nations.

The conclusions and recommendations given in the Report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the Project.

The designations employed and the presentation of the material in this document (and maps) do not imply the expression of any opinion whatsoever on the part of the United Nations or the Food and Agriculture Organization of the United Nations concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

FAO. Mallipatnam - Engineering - Survey, Soil Investigations, Design prepared by the Pre-Investment Survey of Fishing Harbours Project, India 23 p. 10. Drawings.
FI:SF/IND 55 Technical Report 23.

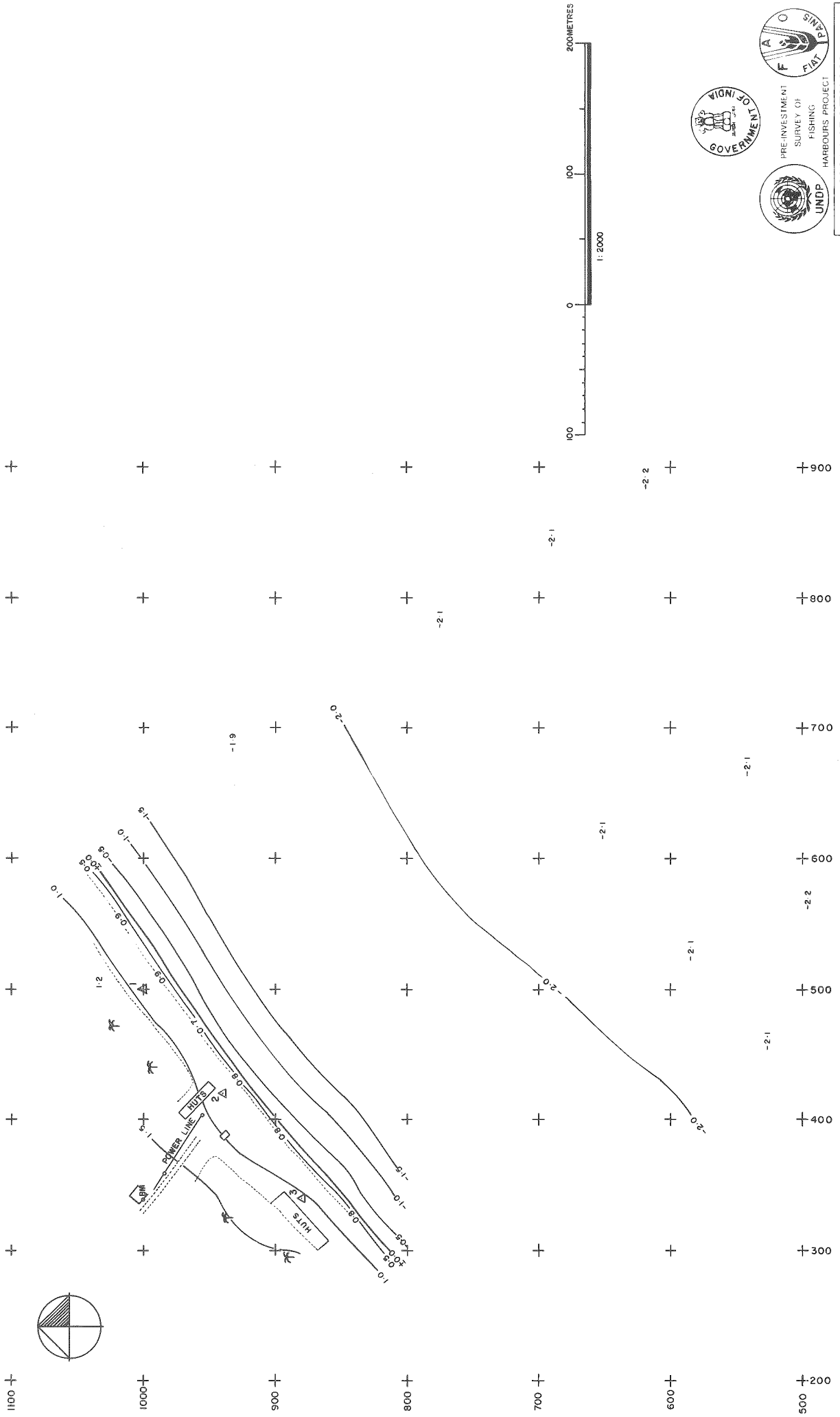
A B - S T R A C T

This report describes engineering studies involving survey, soil investigations and design for a site at Mallipatnam in the State of Tamil Nadu on the east coast of India.

Survey work included topographic and hydrographic survey.

Soil Investigations included sounding and sampling using Swedish systems and equipment. Soil conditions in the area consist of, on land a layer of sand overlying clay while under water the clay is overlain by a layer of silty sand and clay for a depth of about 1 m. Conditions are suitable for the use of piles for structures. Reclamation of areas outside existing low water line would require removal of upper layer of loose silt and clay prior to reclamation.

Design study outlines the design of a T-shaped jetty to provide fair-weather landing and berthing facilities. The jetty will cater for vessels with maximum draft of 1.5 m. At the root of the jetty an area is provided for shore facilities. The estimated cost of the works is Rs. 1,120,000 (US \$ 154,000 approx.).



PRE-INVESTMENT
SURVEY OF
FISHING
HARBOURS PROJECT

MALLIPATNAM

SURVEY OCTOBER 1971

SCALE: 1:2000

DATE: 3-4-72

57

7

-2.2

-2.1

-2.1

-2.1

-2.2

-2.1

-1.9

-2.1

-2.2

-2.1

-2.0

-2.0

-2.0

500

300

700

300

800

300

900

300

1000

300

1100

300

900

800

700

600

500

400

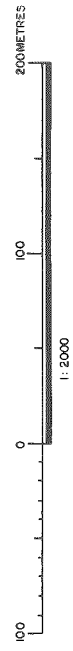


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SURVEY

Chapter 1

SURVEY REPORT1.1 LOCATION OF SITE

The site investigated is located (Lat. $10^{\circ}17'$, Long. $79^{\circ}19'$) on the western shore of Palk Strait approx. 60 kms. west of Point Calimere.

1.2 SURVEY PERIOD

The survey work was carried out during the period 19th to 27th October, 1971.

1.3 BASELINE

A baseline was established along the shore and was marked by three steel-pipes cast in concrete pillars set in the ground. The distances between the stations were measured by steel-tape and the azimuth corrected for deviations was determined by prismatic compass.

1.4 GRID

A local survey grid was established and rectangular co-ordinates were calculated for the three main stations.

1.5 DATUM

A survey datum was established and a benchmark was marked on the foundation of Fisheries Co-operative house located approx. 115 m from the shore along the road. Datum is 2.80 m below the benchmark.

1.6 TOPOGRAPHIC SURVEY

Topographic features were surveyed by tacheometry.

1.7 HYDROGRAPHIC SURVEY

Hydrographic survey was carried out using Kelvin Hughes Echo-sounder MS-36 with an outboard rig mounted on a local fishing boat. The positions were determined by theodolite observations from two stations on land.

1.8 MAPS

The result of topographic and hydrographic survey plotted to a scale 1:1000 are shown on Drawing No. 57-07.

1.9 LIST OF CO-ORDINATES

<u>Station</u>	<u>North</u>	<u>East</u>	<u>Height</u>
1	1000.00	500.00	+1.114
2	940.072	419.799	+1.128
3	880.201	339.671	+0.929

1.10 TIDE

The survey period was not long enough to allow recordings in sufficient detail for tidal analysis. Tidal values for the secondary port of Kottai-patnam (approx. 35 kms. south-west of Mallipatnam) were obtained. (Admiralty Tide Tables II, 1971).

By comparing recorded levels for Mallipatnam with predicted levels for Kottaipatnam and assuming similar tidal conditions the following tidal values relative to Survey Datum at Mallipatnam have been obtained:-

MHWS	+0.53
MHWN	+0.41
MLWN	+0.16
MLWS	+0.04
L.A.T.	-0.11

1.11 DRAWINGS

<u>Drawing No.</u>	<u>Title</u>
57-04	Coastline of India with location of proposed harbour, Scale 1:10,000,000
57-02	Map showing location of site; Scale 1:63,360
57-05	Northern coastline of Palk Strait, Scale 1:300,000
57-07	Survey - October, 1971, Scale 1:2000

SOIL INVESTIGATIONS

Chapter 2

SOIL INVESTIGATIONS REPORT

2.1 ASSIGNMENT

The investigations of the site which were carried out during the period 18th to 27th October, 1971, were undertaken to obtain information for the general planning and design of a fishing harbour.

2.2 METHODS OF WORK

A. Penetration Test Borings

Hammersounding

B. Sampling

Post Hole Auger
Swedish Standard Piston
Sampling (St.II)

C. Recording of Borings and Test Results

A - Penetration Test Borings

Hammersounding

This method of drilling is also classed as one of the penetration tests. The equipment consists of 3 m long, 32 mm. diam. flush-jointed steel rods, with a square drill bit 40 x 40 mm, the tip of which is turned to a conical point. The rod and bit are put into the ground, cylindrical wedges are locked on to the rod about 1.50 m above the ground. A 65 kg. weight is lifted 60 cm. above the locked wedges and allowed to fall freely onto them, driving the bit and rod into the ground. The number of blows required to drive the bit for each step of 20 cm. is noted. The locked wedges are released and lifted up along the rods and re-locked for further driving, additional 1 m or 3 m long rods being added as required.

General

The above method of sounding was carried out without casing. No allowance is made for the increased weight of drilling rods or the increased friction on the surface of the rods at increasing depths. This method of sounding provides information for drawing resistance-to-penetration diagrams and indicates the general nature of the soil penetrated.

Samples are taken at points determined from the results of the soundings. These samples are examined and tested to establish the characteristics of the soil which information is read in conjunction with the sounding diagrams.

B - Sampling

Post Hole Auger

This is used above the water table in cohesionless soils and in all but the hardest cohesive soils, to obtain disturbed samples.

Swedish Standard Piston Sampler (Designation St.II)

This sampler is used for taking 50 mm diam. undisturbed samples. The sampler containing 3 Nos. 170 mm long and 50 mm diam. reinforced plastic sample tubes is forced into the ground without using any casing. A piston pushes the soil to the side so that it does not enter the sampler. When the desired depth is reached the rods are rotated in an anti-clockwise direction thereby forcing out past the piston a thin-walled metal tube with a hard metal cutting shoe containing the sample tubes. The sampler is withdrawn and after removal of the cutting shoe, a clockwise rotation of the sampling rods extrudes the samples in the tubes, each end of which is then covered with a plastic disc and an air-tight rubber cap. The numbers permanently marked on the sides of the tubes are recorded together with the depths from which the samples were taken.

C - Recording of Borings and Test Results

The symbols indicated on the enclosed pages: Soil Mechanics Symbols Sheets Nos. 1 and 2 are used on all plans, sections, and diagrams describing the borings.

2.3 BORINGS EXECUTED

The total number of borings was

6 Hammersoundings.

Samples were collected in 2 holes

The locations of the borings are shown in the Borehole Plan Drawing No. 57-8.

The results of the soundings are drawn in diagram form on Drawing No. 57-9.

2.4 POSITIONING AND LEVELLING

The positions and levels of boreholes were fixed with reference to the Project local grid and Datum respectively.

2.5 LABORATORY TESTS

Tests have been carried out on some of the samples by the Department of Civil Engineering, Indian Institute of Technology, Madras.

2.6 DESCRIPTION OF SOIL LAYERS

The borings on land have indicated that the soil consists of sand down to a level about -3 m where firm white clay with lime-stone begins. The borings out in the sea have shown a loose layer of silty sand and clay down to about 1 m below bedlevel where firm white clay begins. Borings were executed in this material down to maximum -15.4 m. No rock was met in any of the boreholes.

2.7 CONCLUSIONS

The investigations indicate that soil conditions are suitable for construction of a quay on piles. To avoid settlements if reclamation is required out in the sea it would be advisable to remove the top loose layer, i.e., the first 1.0 to 1.5 m below bedlevel. In the sand on the shore only small negligible settlements are expected if a reclamation is made there and proposed buildings can be founded directly on the sand. Permissible work load for foundations of at least 1 m² area resting on firm sand is 20 t/m².

The results from the investigations are recorded on the following documents annexed hereto:

Borehole Schedule	1 Page
Soil Sample Schedule	2 Pages
Particle Size Distribution Analysis	10 "
Soil Mechanics Symbols Sheets	2 "

2.8 BOREHOLE SCHEDULE

Borehole Number	Easting	Northing	Bed or Ground Level	Depth	Stop Level	Remarks
1	509	989	+0.8	16.2	-15.4	H/S
2	569	909	-1.9	6.1	- 8.0	H/S S
3	429	930	+0.8	13.2	-12.4	H/S
4	506	850	-1.9	11.6	-13.5	H/S
5	350	866	+0.8	13.2	-12.4	H/S S
6	410	788	-1.9	7.8	- 9.8	H/S

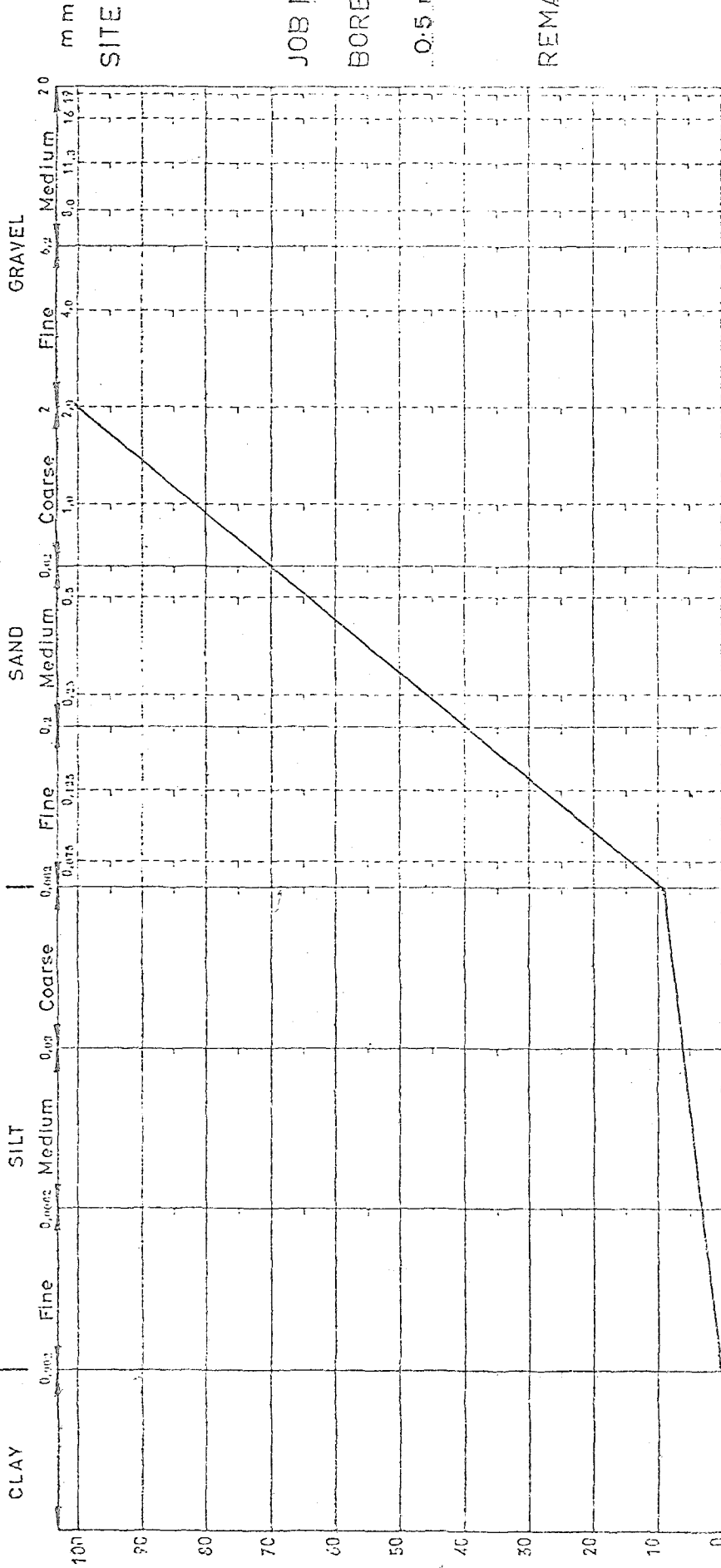
2.9 SOIL SAMPLE SCHEDULE

Borehole Depth below G.L. (m)	Sample Description	M/C %	Bulk Density g/cm ³	LL %	PL %	PI %	C kg/cm ²	ϕ°	Sulphate content	Remarks, Tested by
<u>BOREHOLE 2</u> G.L. -1.9 m 1.0	White silty CLAY	10.8	-						Nil	IIT, Madras
<u>BOREHOLE 5</u> G.L. +0.8 m 0.5	Yellow medium to fine SAND	16.1	-						Nil	IIT, Madras
2.0	Grey silty SAND with sea shells	18.8	1.85						Nil	IIT, Madras
2.15	Grey silty fine SAND with sea shells and odour of organic soil	13.3	2.20						Nil	IIT, Madras
3.0	Grey medium to fine SAND with sea shells and pebbles and odour of organic soil	16.0	2.07						Nil	IIT, Madras
3.15	Grey medium to fine SAND with sea shells and odour of organic soil	15.2	2.09						Nil	
4.0	Yellowish white sandy CLAY with lime stone and pebbles	27.5	2.13	51.50	33.1	18.4	0.12	20	Nil	IIT, Madras

Borehole Depth below G.L. (m)	Sample Description	M/C %	Bulk Density g/cm ³	LL %	PL %	PI %	C kg/cm ²	ϕ°	Sulphate content	Remarks, Tested by
4.15	Yellowish white sandy CLAY with lime stone and pebbles	17.0	2.23	39.8	18.5	21.3	0.07	25	Nil	IIT, Madras
5.0	Yellowish white sandy CLAY with lime stone and pebbles	14.3	1.57	42.9	17.9	25.0	0.15	23	Nil	IIT, Madras
5.1	Yellowish white sandy CLAY with lime stone and pebbles	17.1	2.30	40.0	17.0	23.0	0.15	24	Nil	IIT, Madras
5.25	Yellowish brown sandy CLAY with lime stone and pebbles	17.9	1.36	35.3	18.4	16.9	0.10	22	Nil	IIT, Madras

BOREHOLE 5
(Contd.)

2-10 PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No.

BOREHOLE 5

0.5 m below G.L.

REMARKS GL = + 0.8 m.

MATERIAL Yellow medium to fine Sand.

TESTED BY.
DEPT. OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS.

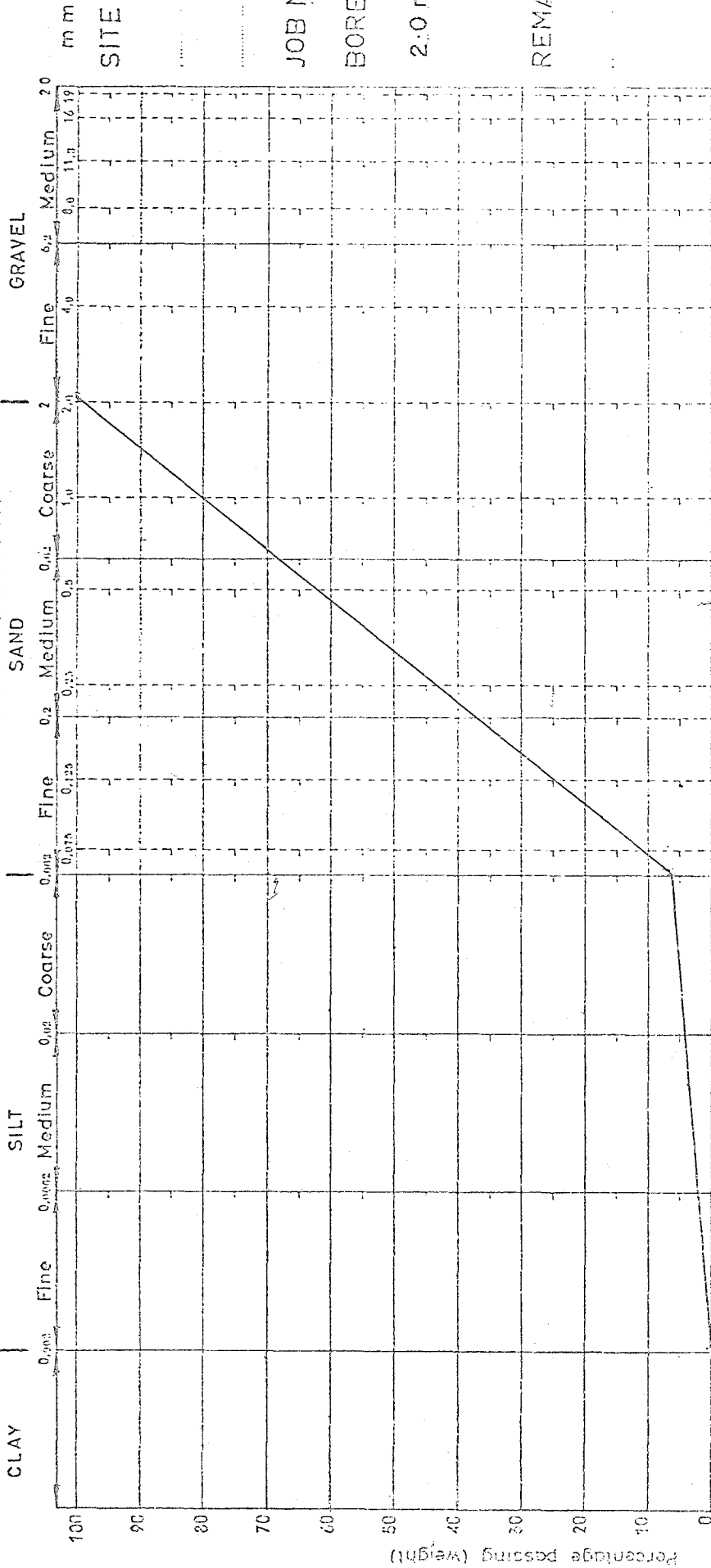
Sieve m.m.	Retained gram	Percent passing %
2	0	100
0.5		
0.2		
0.06	91	9
<0.06		
0.002	9	0
<0.002	0	0
Σ	100	

US Stand. series

Organic content
 Removed with H₂O₂ found
 Iron precipitation not found
 Removal of iron with oxalate solution
 Weighed quantity < 2 mm gram
 Material < 2 mm from sieve analysis %
 Temp. Spec. gravity
 Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before g
 Weight after g
 Weight loss. g

Cyl. no.	Sed. Reading g/l	% of mat < 2 mm	% of mat < 16 mm
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

PARTICLE SIZE DISTRIBUTION



Cyl no.	Sed. Reading g/l	% of mat < 2	% of mat < 16
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

Organic content
 Removed with H₂O₂ found
 Iron precipitation not found
 Removal of iron with oxalate solution
 Weighed quantity < 2 mm from sieve analysis %
 Material < 2 mm from sieve analysis %
 Temp. Spec. gravity

Other tests
 Capillarity m
 Hygroscopic

Washing
 Weight before g
 Weight after g
 Weight loss g

Sieve m.m.	Retained gram	Percent passing %
2	0	100
0.5		
0.2		
0.06	93	7
< 0.06		
0.002	7	0
< 0.002	0	0
Σ	100	

MATERIAL Grey silty Sand with sea shells.

TESTED BY.
 DEPT. OF CIVIL ENGINEERING
 INDIAN INSTITUTE OF TECHNOLOGY
 MADRAS.

SITE MALLIPATNAM

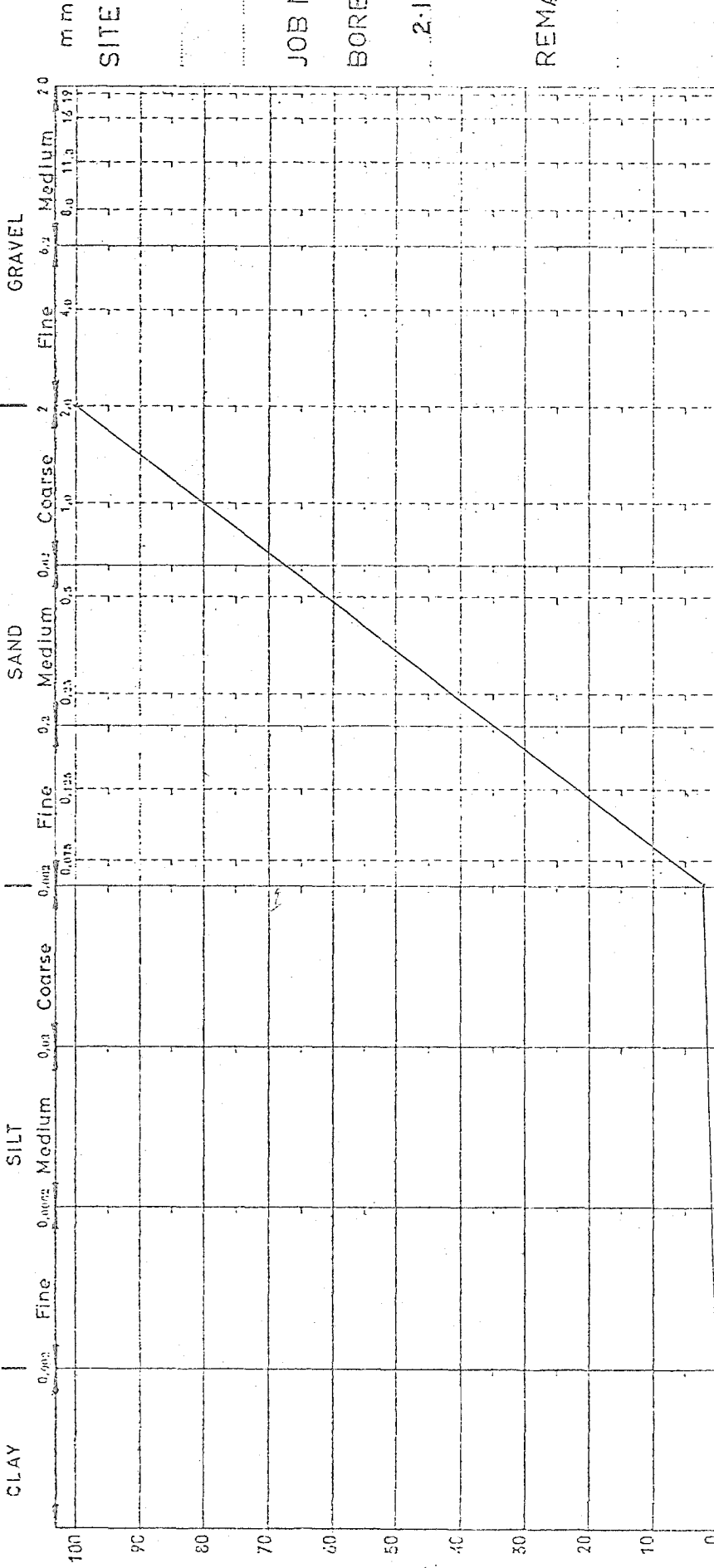
JOB No

BOREHOLE 5

2.0 m below G.L.

REMARKS G.L.F. ± 0.8 m.

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No.

BOREHOLE 5

2.15 m below GL

REMARKS GL = +0.8 m

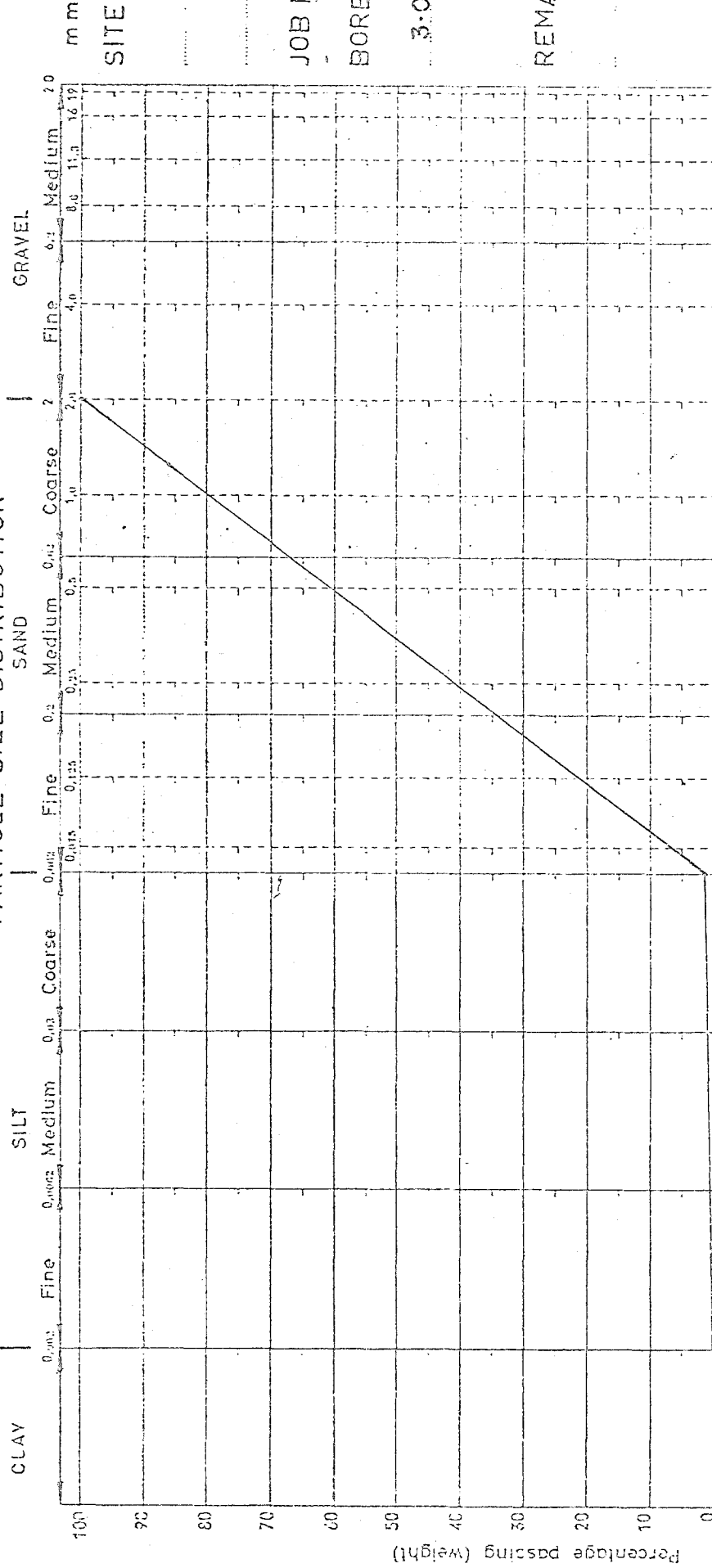
Cyl no.	Organic content		US Stand. series	Sieve m.m.	Retained gram	Percent passing %
	Sed. Reading min.	% of mat < 2 mm				
0						
1						
2						
4						
10				2	0	100
20				0.6		
50				0.2		
100				0.06		
200				< 0.06		
400				0.002		
				< 0.002		
				M	100	

MATERIAL Grey silty fine sand with sea shells and odour of organic soil.

TESTED BY:
DEPT. OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS.

Organic content: Removed with H₂O₂ not found
 Iron precipitation found
 Removal of iron with oxalate solution
 Weighed quantity < 2 mm gram
 Material < 2 mm from sieve analysis %
 Temp. Spec. gravity
 Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before g
 Weight after g
 Weight loss g

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No

BOREHOLE 5

3.0m below G.L.

REMARKS G.L. = +0.8m

Sieve m.m.	Retained gram	Percent passing
2	0	100
0.5		
0.2		
0.06	99	1
<0.06		
0.002	1	0
<0.002	0	0
Σ	100	

US Stand. series

Organic content removed with H_2O_2 found not found

Iron precipitation found not found

Removal of iron with oxalate solution gram

Weighted quantity <2 mm from sieve analysis %

Temp. Spec. gravity

Other tests

Capillarity m

Hygroscopic

Washing

Weight before g

Weight after g

Weight loss. g

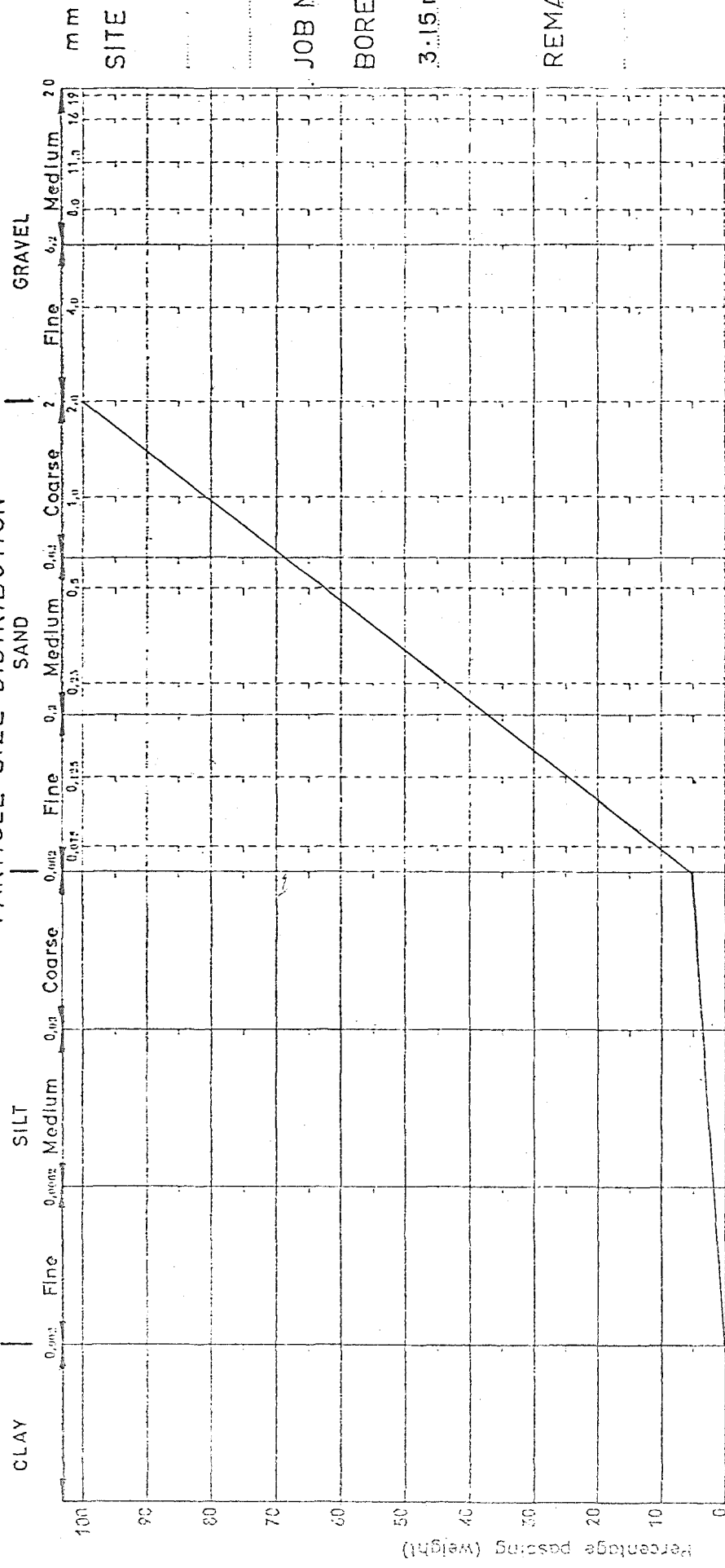
Cyl. no.	Sed. Reading min. g/l	% of mat <2	% of mat <16
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

MATERIAL Grey medium to fine Sand with sec shells and pebbles and odour of organic soil.

TESTED BY.
DEPT. OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS.

E

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No

BOREHOLE 5

3.15 m below G.L.

REMARKS G.L. = +0.8 m.

MATERIAL Grey medium to fine Sand with sea shells and odour of organic soil.

TESTED BY.
DEPT. OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS.

Sieve m.m.	Retained gram	Percent passing %
2	0	100
0.6		
0.2		
0.06	95	5
<0.06		
0.002	5	0
<0.002	0	0
Σ	100	

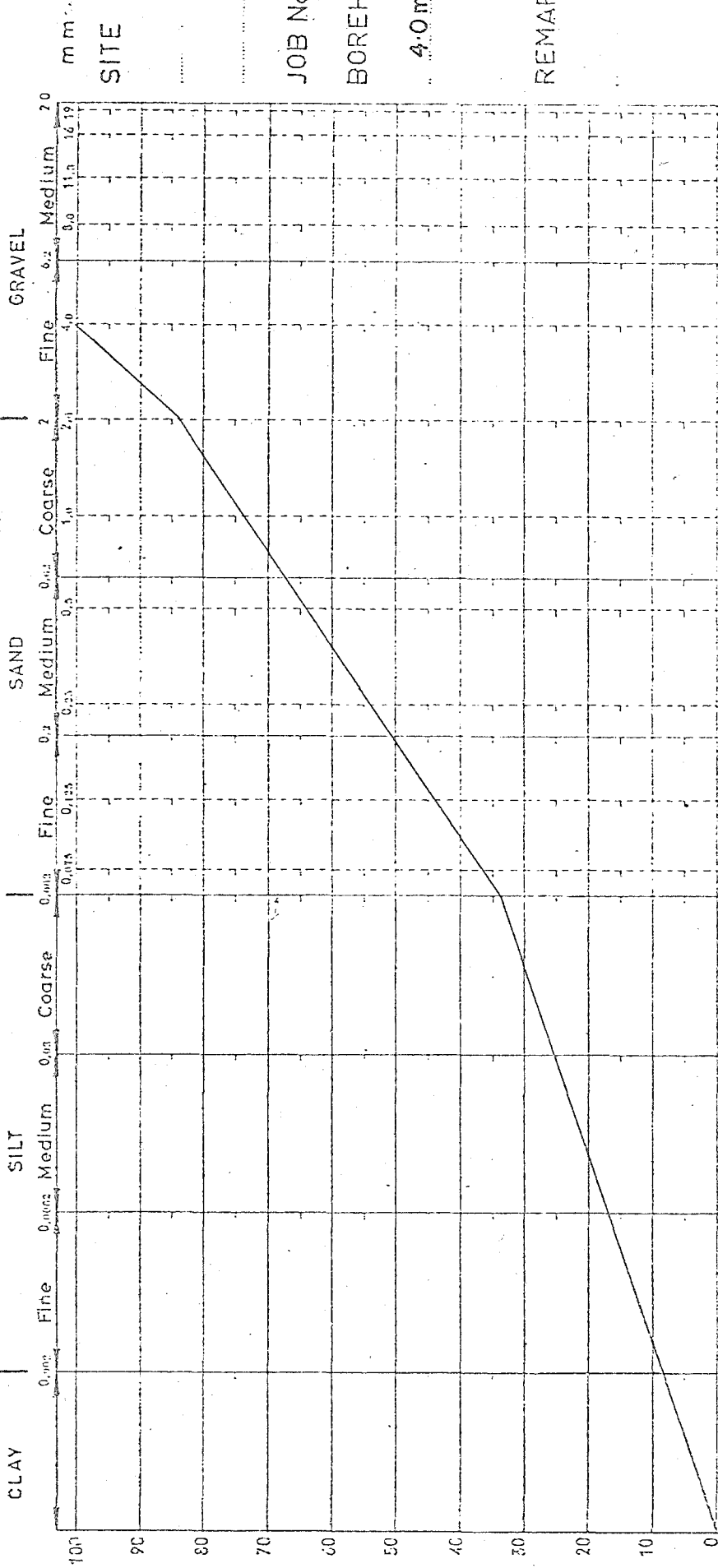
US Stand. series

Organic content
 Removed with H₂O₂ not found
 Iron precipitation found
 Removal of iron with oxalate solution
 Weighed quantity <2 mm gram
 Material <2 mm from sieve analysis %
 Temp. Spec. gravity

Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before g
 Weight after g
 Weight loss g

Cyl no.	Sed. Reading min. g/l	% of mat <2	% of mat <16
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

PARTICLE SIZE DISTRIBUTION



Cyl no.	Secd. Reading g/l	% of mat < 2	% of mat < 76
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

Organic content: removed with H₂O₂ found, not found

Iron precipitation: found, not found

Removal of iron with oxalate solution:

Weighed quantity < 2 mm: _____ gram

Material < 2 mm from sieve analysis: _____ %

Temp.: _____ Spec. gravity: _____

Other tests: _____

Capillarity: _____ m

Hygroscopic: _____

Washing: _____

Weight before: _____ g

Weight after: _____ g

Weight loss: _____ g

Sieve m.m.	Retained gram	Percent passing %
2	18	82
0.5		
0.2		
0.06	49	33
< 0.06		
0.002	24.5	8.5
< 0.002	8.5	0
Σ	100	

MATERIAL: Yellowish white sandy Clay with lime stone and pebbles.

TESTED BY:
DEPT. OF CIVIL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS.

SITE: MALLIPATNAM

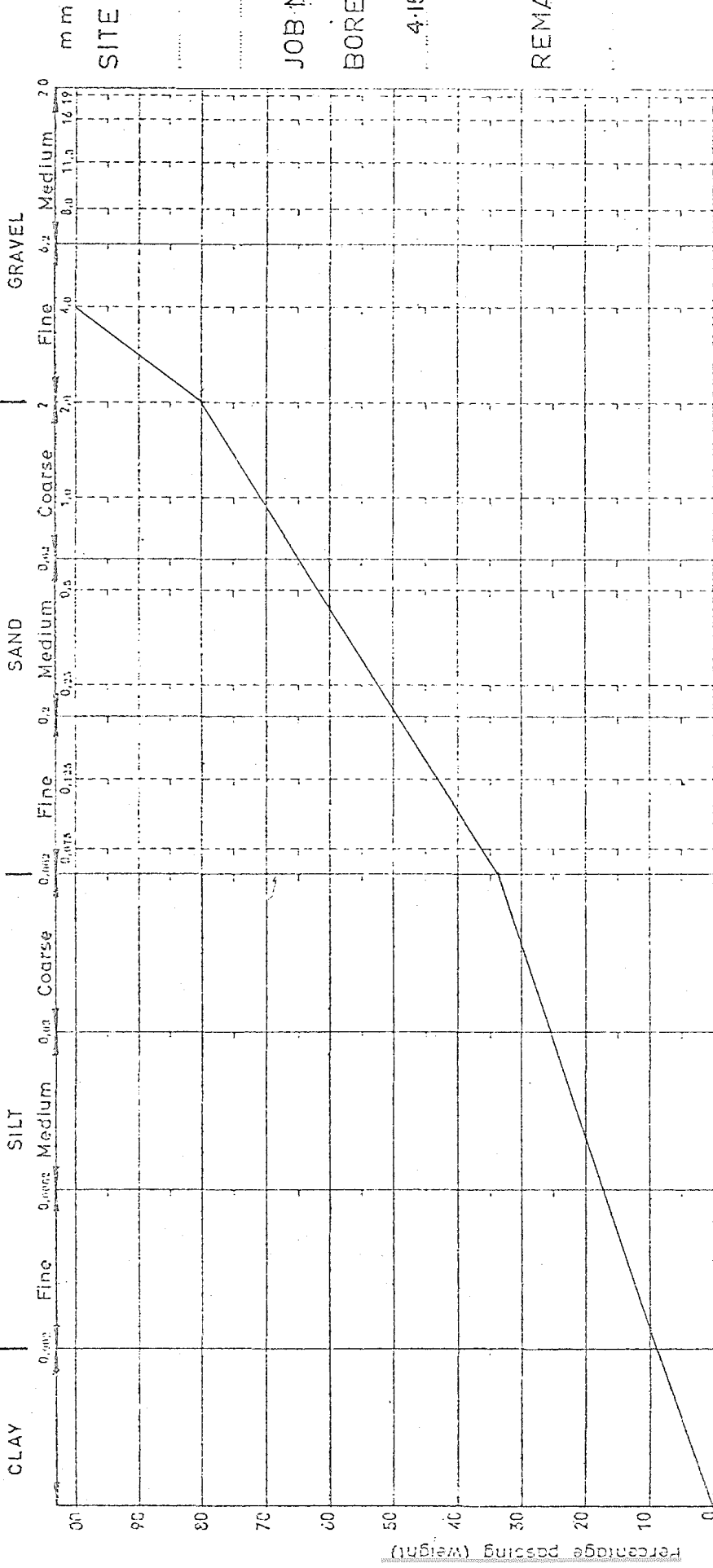
JOB No: _____

BOREHOLE: 5

4.0 m below G.L.

REMARKS: G.L. = +0.8 m

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No

BOREHOLE 5

4.15 m below G.L.

REMARKS G.L. = 10.8 m.

Sieve m.m.	Retained gram	Percent passing $\sum \frac{w_i}{W}$
2		80
0.5		
0.2		
0.06		33
<0.06		
0.002		9
<0.002		0
Σ	100	

US Stand. series

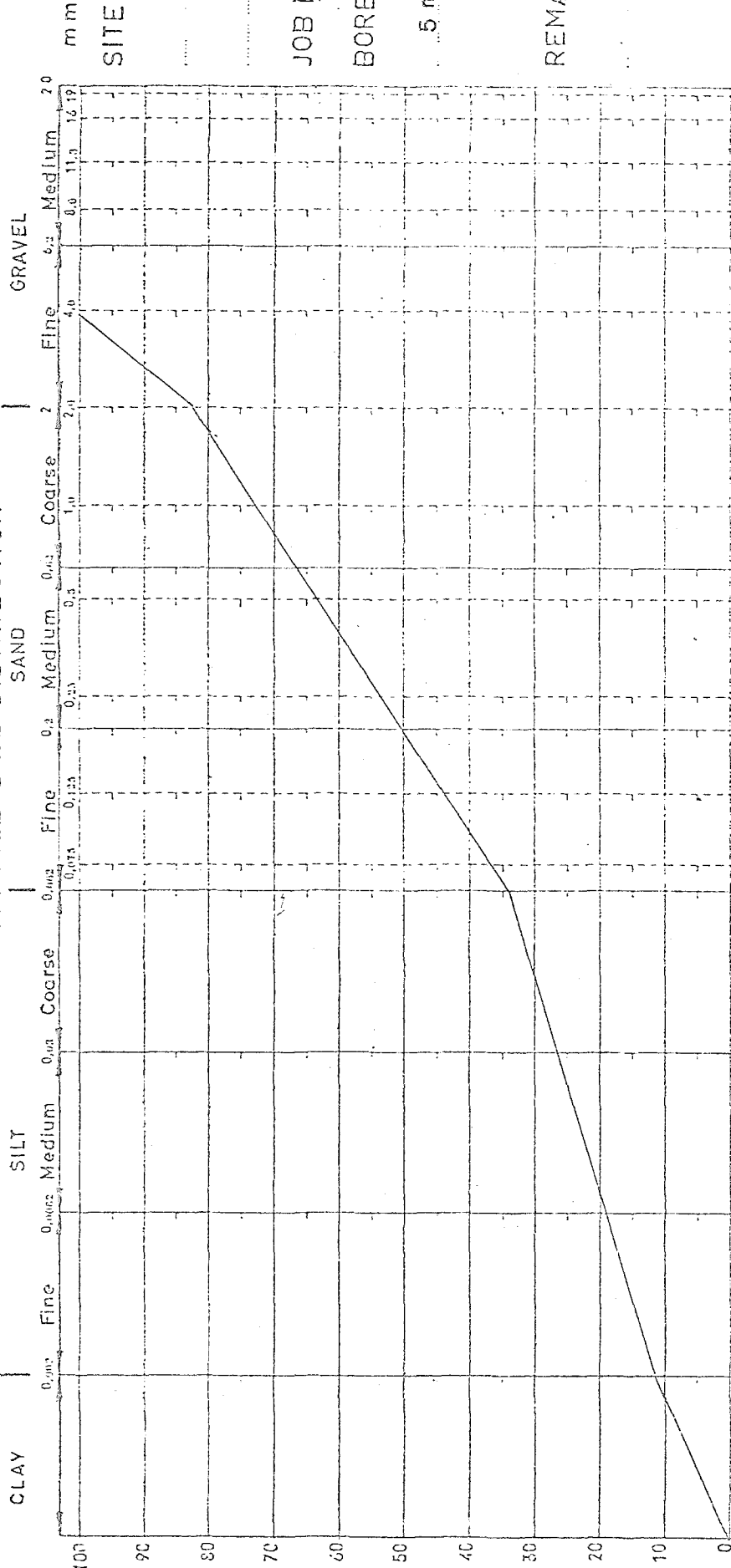
Organic content
 Removed with H₂O₂ found not found
 Iron precipitation found not found
 Removal of iron with oxalate solution
 Weighed quantity <2 mm gram
 Material <2 mm from sieve analysis %
 Temp. Spec. gravity
 Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before g
 Weight after g
 Weight loss. g

Cyl no.	Sed. Reading g/l	% of mat <2	% of mat <16
9			
1			
2			
4			
10			
20			
50			
100			
200			
400			

MATERIAL Yellowish white sandy Clay with lime stone and pebbles.

TESTED BY.
 DEPT. OF CIVIL ENGINEERING
 INDIAN INSTITUTE OF TECHNOLOGY
 MADRAS.

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No

BOREHOLE 5

5 m below GL

REMARKS GL. = +0.8m

Sieve m.m.	Retained gram	Retained %	Percent passing
2		18	82
0.5			
0.2			
0.06		48	34
<0.06			
0.002		23	11
<0.002		11	0
M		100	

US Stand. series

Organic content
 Removed with H₂O₂ found not found
 Iron precipitation
 Removal of iron with oxalate solution
 Weighed quantity <2 mm gram
 Material <2 mm from sieve analysis %
 Temp. Spec. gravity
 Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before 9
 Weight after 9
 Weight loss. g

Cyl no.	Sed. Reading min.	g/l	% of mat <2	% of mat <16
0				
1				
2				
4				
10				
20				
50				
100				
200				
400				

MATERIAL Yellowish white sandy Clay with lime stone and pebbles.

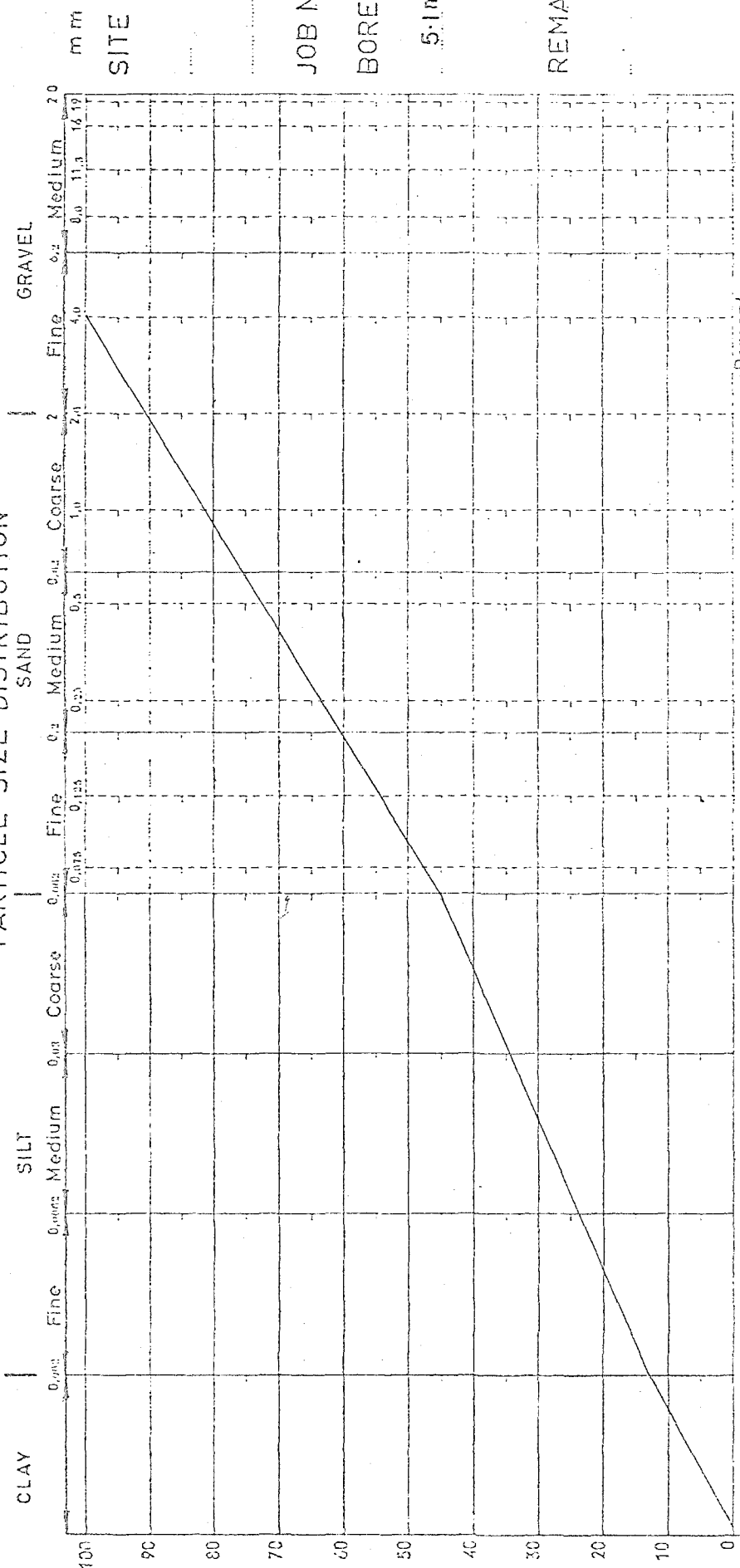
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 INDIAN INSTITUTE OF TECHNOLOGY
 MADRAS.

PARTICLE SIZE DISTRIBUTION

SILT
 0.075 0.15 0.3 0.6 1.18 2.0 4.75 7.5 15
 Fine Coarse

SAND
 0.075 0.15 0.3 0.6 1.18 2.0 4.75 7.5 15 30 60 100
 Fine Medium Coarse

GRAVEL
 2.0 4.75 7.5 15 30 60 100 200 475 750 1500 3000 6000 12500 25000
 Fine Medium Coarse



SITE MALLIPATNAM

JOB No.

BOREHOLE 5

5.1m below G.L.

REMARKS G.L. = + 0.8m.

MATERIAL Yellowish white sandy Clay with lime stone and pebbles

TESTED BY.
 DEPT. OF CIVIL ENGINEERING
 INDIAN INSTITUTE OF TECHNOLOGY
 MADRAS.

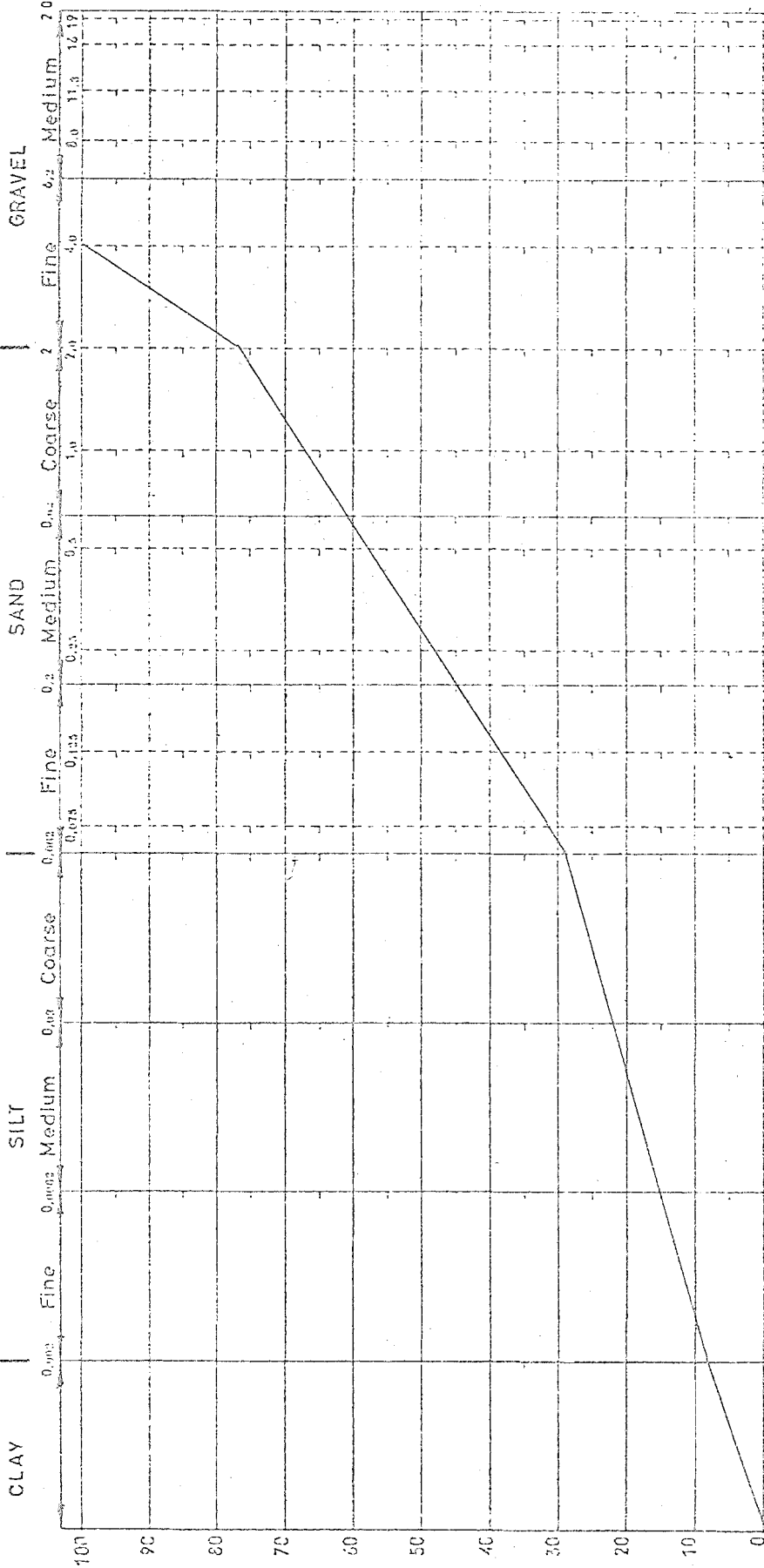
Sieve m.m.	Retained gram	%	percent passing
2		10	90
0.5			
0.2		45	45
0.06			
<0.06			
0.002		31.5	13.5
<0.002		13.5	0
Σ		100	

Cyl. no.	Sed. Reading min. g/l	% of mat < 2	% of mat < 16
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

US Stand. series

Organic content
 Removed with H₂O₂
 Iron precipitation found not found
 Removal of iron with oxalate solution
 Weighed quantity < 2 mm gram
 Material < 2 mm from sieve analysis %
 Temp. Spec. gravity
 Other tests
 Capillarity m
 Hygroscopic
 Washing
 Weight before g
 Weight after g
 Weight loss g

PARTICLE SIZE DISTRIBUTION



SITE MALLIPATNAM

JOB No

BOREHOLE 5

5.25 m below G.L.

REMARKS G.L. = +0.8 m

Sieve m.m.	Retained gram	Percent passing %
2	24	76
0.5	47	29
0.2	20.5	8.5
0.06	8.5	0
<0.06	100	
0.002		
<0.002		
Σ		

US Stand. series

Organic content

Removed with H₂O₂

Iron precipitation found

Removal of iron with oxalate solution

Weighted quantity <2 mm gram

Material <2 mm from sieve analysis %

Temp. Spec. gravity

Other tests

Capillarity m

Hygroscopic

Washing

Weight before g

Weight after g

Weight loss. g

Cyl. no.	Sed. Reading min. g/l	% of mat <2	% of mat <16
0			
1			
2			
4			
10			
20			
50			
100			
200			
400			

MATERIAL Yellowish brown sandy Clay with lime stone and pebbles.

TESTED BY. DEPT. OF CIVIL ENGINEERING INDIAN INSTITUTE OF TECHNOLOGY MADRAS.

57-23

- SOUNDING
- Sticksounding
 - ⊖ Weightsounding, Press-sounding
Motorsounding
 - ⊙ Hammersounding

Detailed Plan
Symbol
81

+4.10	20.09.69	
+3.15	22.09.69	
A		
+6.86		Cl +5.20
		Sa +3.60
		Si +3.10
		Sa +1.60
		Cl -2.10
		Gr -4.45

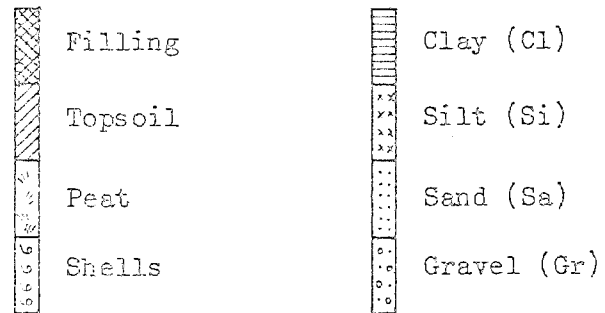
Simple Plan
Symbol
81

A Indicates Chemical or Special analysis carried out



















- SAMPLING
- ⊖ Disturbed Sample
 - ⊙ Undisturbed Sample

SECTIONS

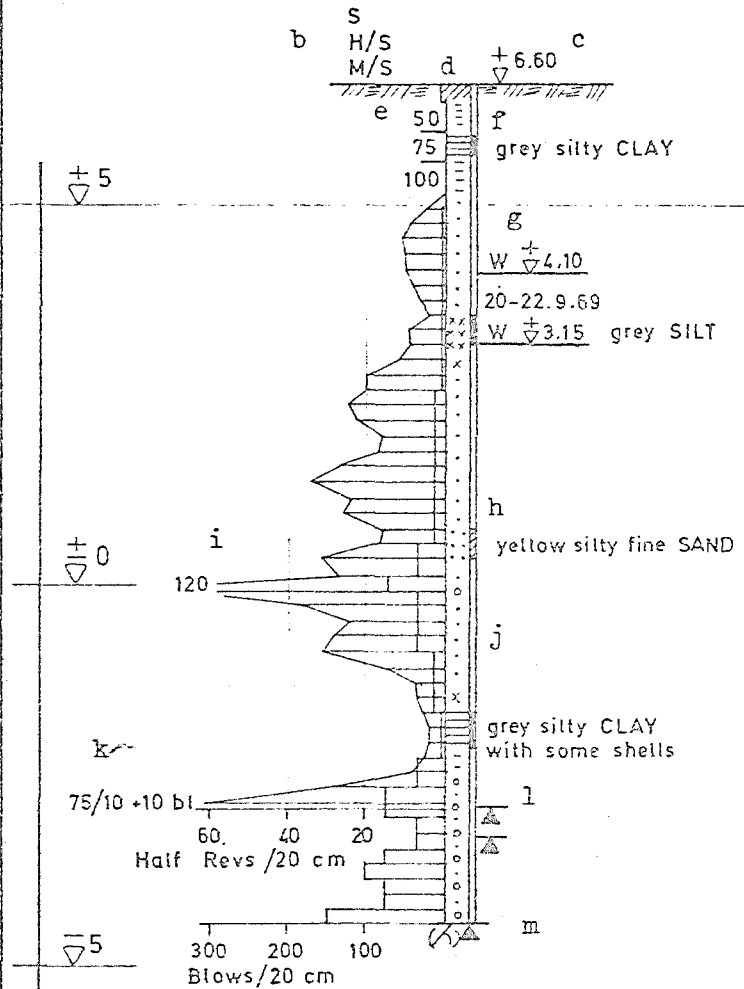
- IN-SITU TESTS
- ⊗ Vane Test
 - Sounding to hard stop
 - Sounding to presumed Rock
 - Rock boring at least 3 m.
under presumed Rock surface
 - - Ditto - with examination
of the dust
 - Rock coring at least 3 m.



BOREHOLE STOPS

- | | Section | Plan | |
|--|---|---|---|
| |  |  | Probably Rock |
| HYDROLOGICAL MEASUREMENTS |  |  | Probably Stone or Rock |
| ○ Ground Water Level measured |  |  | Stone, Block or Rock |
| ○ Ground Water Level recorded
over long period |  |  | Non-Rock, Stone or
Block stop |
| ○ - Ditto - short period |  |  | Boring discontinued, can
be driven deeper without
hammering |
| ○ Pump or Infiltration Test |  |  | - Ditto - but only with
hammering |
| ○ Pore Pressure Measurement |  |  | |
| ○ Deformation Measurement |  |  | |
| □ Trial Pit or other test point
e.g. Test Loading |  |  | |

81 a



a Borehole number 81

b S Sampling carried out
H/S Hammersounding carried out
M/S Motorsounding carried out

c Ground level in metres above or below Datum

d Hole made in ground with auger or crow-bar. 20 cm deep

e 50, 75, 100, pressures in kg. applied for Motorsounding. The rods were not turned.

f Fully shaded area indicates undisturbed sampling. The adjectives describing the sample are in small letters. Nouns are in capital letters. Borehole legend across the whole section indicates that the material has been sampled and seen. Legend in the centre of the section only indicates the material present, in the opinion of the engineer.

g

W ±4.10	Highest water level measured over the period shown.
20-22.9.69	
W ±3.15	Lowest water level measured over same period.

h Position of disturbed sample shown cross-hatched.

i Motorsounding, half revs./20 cm., recorded i when the figure is very high.

j Hammersounding, number of hammer-blows/20 cm.

k 75/10+10 bl 75 half turns. Motorsounding penetrated only 10 cm. 10 blows of a sledge hammer were applied.

l Previous boring attempt discontinued at a hard stop.

m Boring stopped on Stone, Block or Rock.

Hammersounding results are represented as follows:

- Free sinking is drawn as 0 blows/20 cm.
- 1 - 10 blows as 5 blows/20 cm.
- 11- 20 blows as 15 blows/20 cm.
- 21- 50 blows as 35 blows/20 cm.
- 51-100 blows as 75 blows/20 cm.

2.12 DRAWINGS

<u>Drawing No.</u>	<u>Title</u>
57-8	Borehole Plan
57-9	Borehole Section Nos. 1, 2, 3, 4, 5 and 6.

DESIGN

Chapter 3

DESIGN OF THE HARBOUR

3.1 INTRODUCTION

The village of Mallipatnam is situated in Thanjavur District in the State of Tamil Nadu about 160 kms. south of Madras and 60 kms. west of Point Calimere on the east coast of India.

Mallipatnam is connected by a 10 km. all-weather road with the town Adirampatnam north-east of the village. Adirampatnam has railway connections.

The fishermen operating in the Palk Straits are said to move from place to place for fishing depending on the season. At present, there are no facilities for fish landing or berthing of boats at Mallipatnam. Any fish landing in the area takes places on the open beach.

3.2 LOCATION OF THE HARBOUR

The village of Mallipatnam is situated just on the shore and the selected site is close to the village. The coast is open but the site is well-protected against the NE-monsoon. Sheltered to some extent by Ceylon and the south main land of India the height of waves reaching the jetty from SE to S could be expected to be 1.3 m.

3.3 SIZE, LAYOUT AND DETAILS OF THE HARBOUR

3.3.1 General

Due to the present undeveloped state of the fishing industry in the area and the difficulties arising from littoral drift and limited water depth, fairweather landing facilities only are being provided. A T-shaped jetty at the same time serving both for landing and berthing has been provided. Areas for marketing, ice plant, office buildings, etc., are included.

3.3.2 Depth

With relation to MLWS a depth of 1.5 m is available approx. 50 m from H.W. line, while a depth of 2.0 m is available at a distance of approx. 200 m with little increase in depth beyond this distance.

3.3.3 Landing Jetty

A landing jetty, 12 m wide and 60 m long, is proposed. Landing is assumed to take place on both sides of the jetty. The depth of water available along side is 1.8 m below MLWS. The maximum draft of vessels catered for in this design will be 1.5 m.

3.3.4 Approach Jetty

The approach jetty is 108 m long. The first 54 m length of the approach jetty is 4.5 m wide to provide access from the shore and the next 54 m is 6 m wide and designed to serve as berthing jetty.

3.3.5 Design conditions

The following design conditions are assumed:-

- (i) Top level of the jetty + 2.00 m
- (ii) Live load on the landing jetty 1.0 t/m^2 .
- (iii) Live load on the approach jetty:

Width 4.5 m	0.5 t/m^2
Width 6.0 m	1.0 t/m^2
- (iv) Mooring forces: perpendicular to the jetty 300 kg/m
parallel to the jetty 100 kg/m
- (v) Wave: 1.3 m high

3.3.6 Soil conditions

The sub-soil conditions are good for using friction piles for the foundation of the jetty. Piles 30 x 30 cm. square with a bearing capacity of 30 tons have to be driven to depths varying 10-12 m below the bed-level.

3.3.7 Water Supply

Fresh water is to some extent already available within the area. In the Cost Estimate funds have been allocated for drilling a well to obtain drinking water.

3.3.8 Fuel

Fuel to the vessels will be supplied at the landing jetty through a pipeline from a tank ashore.

3.3.9 Power

The required quantity of power is assumed to be made available from the same source, presently supplying to Mallipatnam. Electricity will be provided to Auction Hall, Ice Plant, Office, Buildings, etc. Distribution also will be made to the landing jetty and roads.

3.3.10 Drainage

The drainage of the land area will be by two separate systems. The drainage from the marketing area which may be polluted with organic debris, fish offal, etc. will be conducted to a settling tank. Other surface drainage will be discharged direct to the sea.

3.3.11 Fencing

The harbour area will be enclosed by a fence.

3.4 DRAWINGS

<u>Drawing No.</u>	<u>Title</u>
57-13	Proposed Fishing Harbour Perspective
57-10	General Layout, 1:1000
57-11	Approach Jetty, Sections 1:50
57-12	Landing Jetty, Section 1:50

3.5 COST ESTIMATE

Description	Unit	Quantity	Cost per Unit Rs.		Estimated Cost Rs.
1. Earth work in reclamation	m ³	5 700	5		28 500
2. Landing jetty 12 m wide	m	60	4 700		282 000
3. (a) Approach jetty 6 m wide, berthing portion	m	54	2 500	135 000	
(b) Approach jetty 4.5 m wide (remaining)	m	54	1 250	<u>67 500</u>	202 500
4. (a) Access road	m ²	500	20	10 000	
(b) Trafficked areas	m ²	1 200	20	24 000	
(c) Other surfaced areas	m ²	4 400	15	<u>66 000</u>	100 000
5. Stone pitching	m ³	200	20		4 000
6. Water supply	L.S.				70 000
7. Drainage and Sewerage	L.S.				40 000
8. Port Offices	L.S.				30 000
9. Market Hall	L.S.				50 000
10. Electricity and Power	L.S.				30 000
11. Fuel Supply	L.S.				50 000
12. Fence around the harbour	m	260	80		20 800
					<u>907 800</u>
					90 780
					<u>998 580</u>
					121 420
					<u>1 120 000</u>
					GRAND TOTAL: 1 120 000

LIST OF DRAWINGS

It should be observed that some of the drawings have been reduced in scale. Graduated figures giving the main scales have been added to each drawing in order to facilitate reading.

SURVEY

<u>Drawing No.</u>	<u>Title</u>
57-04	Coastline of India with location of proposed harbour, 1:10,000,000
57-02	Map showing location of site, 1:63,360
57-05	Northern coastline of Palk Straits, 1:300,000
57-07	Survey - October, 1971; 1:2,000

SOIL INVESTIGATIONS

<u>Drawing No.</u>	<u>Title</u>
57-8	Borehole Plan
57-9	Borehole Section Nos. 1, 2, 3, 4, 5 and 6.

DESIGN

<u>Drawing No.</u>	<u>Title</u>
57-13	Proposed Fishing Harbour - Perspective
57-10	General Layout, 1:1000
57-11	Approach Jetty - Sections, 1:50
57-12	Landing Jetty - Section, 1:50