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SOIL EXPLORATION REPORT

OF

PROJECT: SOIL INVESTIGATION WORK FOR OCEAN BREEZE AT THORAIPAKKAM.

PN: 7887

F.S.ENGINEERS PVT LTD

Foundation & Structural Engineers

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SOIL EXPLORATION REPORT

PROJECT NO : 7887

PROJECT NAME : Proposed Construction of Individual Villas (G+02) & (Stilt + 03) apartments " Ocean Breeze" project at Thoraipakkam

1. INTRODUCTION

M/s. Ocean Lifespaces India Pvt Ltd -Chennai proposing to construct a project "Ocean Breeze" construction of Individual villas (G+02) & (Stilt + 03) apartments comprised in Survey Nos. 224/1B, 224/2A, 224/2B2, 232/1B, 232/2B, 232/3B, 232/5, 232/6, 232/7, 232/9 at Okkiyam Thoraipakkam Village, Sholinganallur Taluk, Division - 194, Zone – 15, Chennai district – 600097. at the location shown in Fig-1. Soil exploration work was referred to this firm with a view to determining the soil properties of the area and to arrive at the most suitable foundation system for the proposed structure. For this purpose, two boreholes were bored upto the depth of 14 to 17M below ground level. The boreholes were terminated, after drilling the required depth in the medium rock layer. The borehole locations are given in Fig-1. The work comprised of conducting Standard Penetration Tests in the field and collecting samples for testing in the laboratory. The report presents the details of the work, analysis of test results and foundation recommendations made based on the analysis.

2. EXPLORATION TECHNIQUE

Rotary Drilling technique was adopted for boring in this area. Casing pipes and bentonite slurry were used to protect the sides of the boreholes. Standard Penetration Tests were conducted at change of layers and at specified intervals disturbed samples were collected in plastic bags from all the layers for visual observation and classification tests. Undisturbed samples could not be collected since the cohesive soil layers are expansive. Core sample were collected in the medium rock layers

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Director

3. SOIL PROFILE

The profile of the area as observed in the boreholes is given in Figs. 2 to 3. The top soil of 0.5M is non-uniform. The underlying layer is expansive sandy clay upto 4 to 6M. At the location of BH-1 the layers followed by expansive sandy clay are clayey sand, cemented sand and disintegrated rock upto 12.3M followed by medium rock. At the location of BH-2 the layers followed by sandy clay is disintegrated rock upto 13.5M followed by medium rock. No water table was met with at the boreholes at the time of exploration. The water table could however rise upto GL during heavy rain.

4. ANALYSIS OF TEST RESULTS

1. Standard Penetration Test
2. Grain Size Analysis
3. Determination of Specific Gravity
4. Differential free swell
4. Crushing Strength of Rock

An analysis of the results of these tests was presented in this section of the report.

4.1 Standard Penetration Test

These tests were conducted at change of layers and at specified intervals, commencing the test at 1.5 M below ground level. The results are presented graphically in Figs. 2 to 3. The relative density of the cohesionless layers obtained from the N values is given in the borelogs.

4.2 Grain Size Analysis

Combined sieve and hydrometer analyses were conducted on the various samples collected. The results are given in Table-1. Based on the proportion of the different soil constituents, the soil is classified using the Triangular Chart.

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4.3 Determination of Specific Gravity

The specific gravities of the soil grains were determined from the various samples collected. The results are given in Table-1. No abnormal value is noted in the test results.

4.4 Differential Free Swell Test

This test was conducted by keeping equal volumes of dry powdered soil in water and in kerosene. The differential swell is given by,

$$Dfs = \frac{\text{Volume of soil in water} - \text{Volume of soil in kerosene}}{\text{Volume of soil in kerosene}}$$

The test was conducted on the samples collected from the sandy clay layers. The results are given in Table-1. The sandy clay layers are seen to be expansive with differential swell of over 45%. These layers would have swell pressure of about 1kg/cm^2

4.5 Crushing Strength of Rock

Core samples collected from medium rock layers were tested for determining crushing strength of rock. The results are given in Table -2.

5. FOUNDATION ANALYSIS

For the proposed structure shallow foundations are not possible for regular structures since the sandy clay layers upto 4 to 6M is expansive. A pile foundation is recommended.

The piles could be seated for 25cm in the medium rock. The length of pile could be varies from 12.55 to 13.75M. The piles could be designed as end bearing pile. The end bearing capacity of the pile could be computed using the formula,

Qe = 4 X N X As Tonnes, where,

N = Standard Penetration Test value

As = Area of cross-section of pile expressed in sq.ft

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When the piles are seated in the medium rock layer with rebound N value the structural capacity of the pile would determine the allowable load. This is limited to 50kg/cm^2. of C.S of pile for cast-in-situ concrete. The lateral load capacity for a minimum of reinforcement of 0.4% of C.S of pile is 10% of vertical capacity. The pull out capacity which is given by skin friction computed using the formula N/3 + 1 T/M^2 of surface area of pile gives more than 50% of vertical capacity. Accordingly the pile capacities are given below

Pile dia (D)cm	Vertical Capacity T	Lateral Capacity T	Pull out Capacity T
45	79	8	Pull out capacity is 50% of vertical capacity
50	98	10	
60	141	14	
70	192	19	
90	318	32	

Care should be taken to see that all cut medium rock pieces are flushed from pile bore with good quality of bentonite slurry and high horse power pump. After flushing SPT should be conducted in one pile bore in a group. The SPT value should be more than 50.

Concrete blocks and debris were present upto 1 to 1.5M at some areas. This aspect should be considered in the pile boring.

6. LIGHTLY LOADED STRUCTURES

For unimportant structure like compound walls etc under reamed piles of 4.2M length with bulb formed at 4M could be given with the following capacities

The bearing capacities of the under-reamed pile as per IS-2911 Part-III are as follows

Pile Dia (cms)	Vertical Load (T)	Lateral Load (T)
20	8	0.8
25	12	1.2
30	16	1.6
37.5	24	2.4
40	28	2.8

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An initial pile load test has to be conducted at site to verify the load bearing capacity, proper bulb formation and quality of construction of the pile.

7. PLINTH FILLING

The excavated sandy clay should not be used for floor filling. Prior to floor filling a 25cm thickness of sand lime layer (1 lime and 4 sand) to be given. Further filling should be done by hill earth compacted in layers of 25cm. The moisture content should be about 10%. The minimum dry density obtained should be 1.8gm/cc.

If plinth filling in this manner is not possible floor slab will have to designed as s structural member connect to pile.

8. CONCLUSION

1. The area explored has got top soil of 0.5M is non-uniform. The underlying layer is expansive expansive sandy clay upto 4 to 6M. At the location of BH-1 the layers followed by expansive sandy clay are clayey sand, cemented sand and disintegrated rock upto 12.3M followed by medium rock. At the location of BH-2 the layers followed by sandy clay is disintegrated rock upto 13.5M followed by medium rock. No water table was met with at the boreholes at the time of exploration. The water table could however rise upto GL during heavy rain.

2. For the proposed structure shallow foundations are not feasible. Regular pile foundation is recommended

3. The piles could be seated for 25cm in the medium rock layer. The length of pile could be varies from 12.55 to 13.75M

4. For lightly loaded structures under-reamed piles could be of length 4.2 M with bulb formed at 4 M resting the bulb on the sandy clay / clayey sand layer.

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5. Suggested precautions and piling method should be adopted while undertaking the construction.

6. Floor filling should be done as per the specifications given

For F.S. ENGINEERS (P) LTD.

(Dr. A. Verghese Chummar) Director

F.S. Engineers Pvt. Ltd

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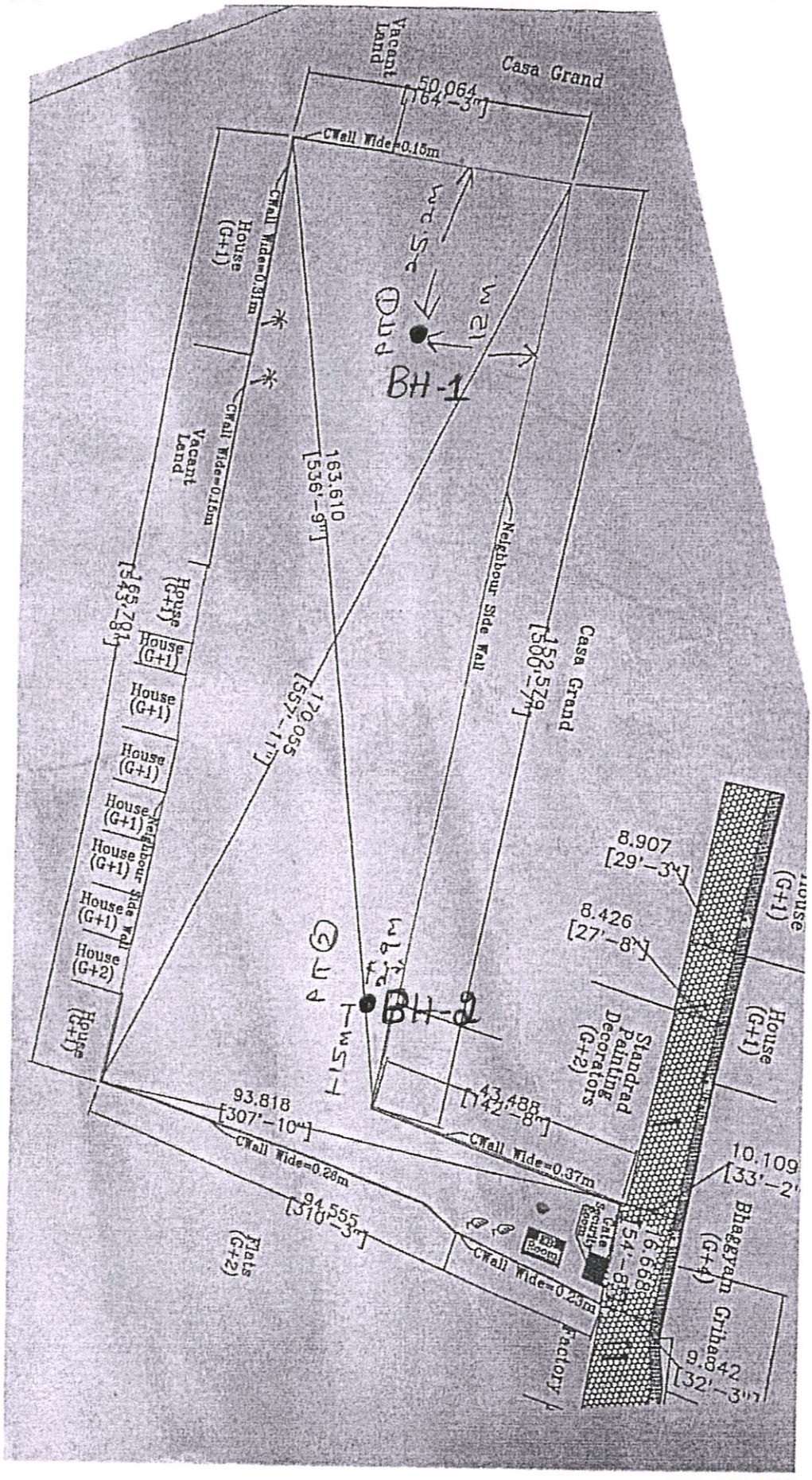
Venkatapuram, Chennai-15

Director

Dated: March 4th, 2025

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Fig : 1 **Site plan** **PN : 7887**

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F.S.ENGINEERS PRIVATE LIMITED

SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

FIELD BORE LOG

PROJECT : SOIL INVESTIGATION WORK FOR OCEAN BREEZE AT THORAIPAKKAM

BORE HOLE NO : 1

TYPE OF BORING : ROTARY DRILLING

DATE OF COMMENCEMENT : 24.02.2025

DATE OF COMPLETION : 25.02.2025

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN "CMS"	RELATIVE DENSITY CONSISTANCYD	10 20 30 40 >50
		TOP SOIL	0.50	0.50						
1		SANDY CLAY SC1 (Brownish Grey)	3.50			1.50	3	30	SOFT	
2										
3						3.00	6	30	MEDIUM	
4				4.00						
5		CLAYEY SAND CS1 (Greyish Brown)	4.50			4.50	12	30	MEDIUM	
6						6.00	14	30	MEDIUM	
7										
8						7.50	19	30	MEDIUM	
9		CEMENTED SAND CMS1 (Greyish Brown)	1.50	8.50		9.00	29	30	MEDIUM	
10				10.00						
11		DISINTEGRATED ROCK DR1 (Greyish Brown)	2.30			10.50	36	30	DENSE	
12						12.00	>50	0	V.DENSE	
				12.30		12.30			REBOUND	
13		MEDIUM ROCK MR1 (DR Verity) (Grey)	1.70							
14.00 →				14.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ **END OF BORING**

Fig : 2

P N : 7887

For F.S. ENGINEERS (P) LTD.

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F.S.ENGINEERS PRIVATE LIMITED

SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

FIELD BORE LOG

PROJECT : SOIL INVESTIGATION WORK FOR OCEAN BREEZE AT THORAIPAKKAM

BORE HOLE NO : 2

TYPE OF BORING : ROTARY DRILLING

DATE OF COMMENCEMENT : 26.02.2025

DATE OF COMPLETION : 26.02.2025

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCYD	10 20 30 40 >50
		TOP SOIL	0.50	0.50						
1 2 3 4 5 6		SANDY CLAY SC1 (Brownish Grey)	5.50			1.50	5	30	MEDIUM	
						3.00	10	30	STIFF	
						4.50	13	30	STIFF	
				6.00		6.00	16	30	MEDIUM	
7 8 9 10 11 12 13		DISINTEGRATED ROCK DR1 (Greyish Brown)	7.50			7.50	22	30	MEDIUM	
						9.00	24	30	MEDIUM	
						10.50	29	30	MEDIUM	
						12.00	33	30	DENSE	
				13.50		13.50			REBOUND	
14 15 16 17.00		MEDIUM ROCK MR2 (Grey)	3.50							
				17.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY ↓

Fig : 3

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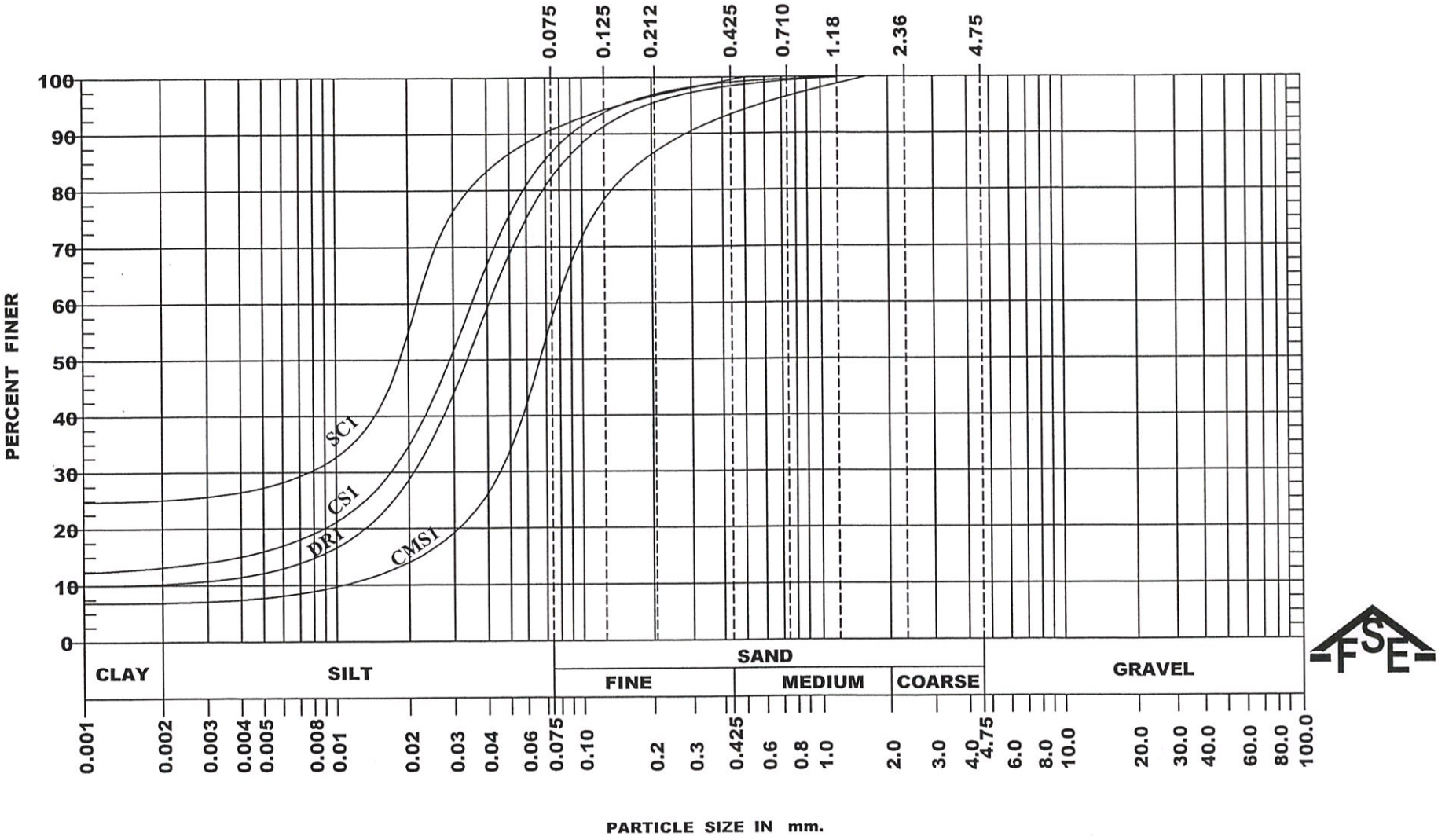


FIG. 4 GRAIN SIZE DISTRIBUTION CURVE

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Sl.No	Depth	Layer	W_L	Wp	Wn	swell	Grain Size Distribution				Sp. Gr.
							Clay	Silt	Sand	Gravel	G
	M		%	%	%	%	%	%	%	%	
1	2	3	4	5	6	7	8	9	10	11	12
BH.1											
	0.00-0.50	TOP SOIL	-	-	-	-	-	-	-	-	-
	0.50-4.00	SC1	-	-	-	34	25	10	65	-	2.63
	4.00-8.50	CS1	-	-	-	-	15	12	73	-	2.64
	8.50-10.00	CMS1	-	-	-	-	7	21	72	-	2.65
	10.00-12.30	DR1	-	-	-	-	10 (not clay)	13	77	-	2.64
	12.30-14.00	MR1	-	-	-	-	-	-	-	-	2.65
BH.2											
	0.00-0.50	TOP SOIL	-	-	-	-	-	-	-	-	-
	0.50-6.00	SC1	-	-	-	37	23	14	73	-	2.63
	6.00-13.50	DR1	-	-	-	-	9 (not clay)	10	81	-	2.64
	13.50-17.00	MR2	-	-	-	-	-	-	-	-	2.65

Lab table : 1 **lab test result** **PN : 7887**

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PROJECT: SOIL INVESTIGATION WORK FOR OCEAN BREEZE AT THORAIPAKKAM.

Crushing Strength of Rock

BH No	Depth	Layer	Crushing Strength Of Rock In kg / cm^2
BH.2	13.50-17.00	MR2	53

Table: 2

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THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

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- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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