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PROJECT NAME

PROPOSED CONSTRUCTION OF RESIDENTIAL GROUP DEVELOPMENT COMPRISING 4 BLOCKS AND COMBINED BASEMENT; BLOCK 1: BASEMENT FLOOR + GROUND FLOOR + 5 FLOORS (18.15M HEIGHT) RESIDENTIAL BUILDING WITH 95 DWELLING UNITS, BLOCK 2: BASEMENT FLOOR + GROUND FLOOR + 4 FLOORS + 5TH FLOOR PART (18.15M HEIGHT) RESIDENTIAL BUILDING WITH 54 DWELLING UNITS AND SWIMMING POOL, INDOOR GAMES ROOM, ASSOCIATION ROOM, VIDEO GAMES ROOM & KIDS PLAY ROOM; BLOCK 3: BASEMENT FLOOR + GROUND FLOOR + 5 FLOORS (18.15M HEIGHT) RESIDENTIAL BUILDING WITH 36 DWELLING UNITS; BLOCK 4: BASEMENT FLOOR + GROUND FLOOR + 5 FLOORS (18.15M HEIGHT) RESIDENTIAL BUILDING WITH 24 DWELLING UNITS; TOTALLY 209 DWELLING UNITS AVAILING PREMIUM FSI IN S.NOS. 10/1, 10/5, 10/6, 10/7, 10/8, 10/11A, 11/7A, 11/8A1A, 11/8B, 11/8C1A, 11/8C1B, 11/8C2, 11/8C3, 11/8C4, 11/9A, 11/10B1B, 11/10B2, 12/1A, AND 12/1B OF NEELANKARAI VILLAGE AND S.NO.23/24 OF SEEVARAM VILLAGE WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION.

CLIENT NAME

CASAGRANDBUILDER PVT. LTD.,
NPL DEVI COMPLEX, NO.111, OLD NO. 59,
LB ROAD, THIRUVANMIYUR,
CHENNAI 600 041.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

PROJECT NO: GEC-JC-GT-4037/2022-2023

DATE: 10/08/2022


GEO ENGINEERING CONSULTANTS
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REPORT TEXT

INTRODUCTION

1.0 Project Information Matrix

Nature of project : Proposed construction of Residential Building (Stilt+5 Upper Floors)
 Project Owner : **Casagrand Builder (P) Limited,**
 Project Location : Neelankarai Village, Sholinganallur Taluk, Chennai.
 Job Code : GEC-JC-GT-4037

1.1 Scope of Work

1.1.1 Field Work

- ❖ Conducting eight soil investigation bore holes of 150 mm & NX diameter up to 23.0m depth or up to the refusal strata with SPT>100
- ❖ Conducting Standard Penetration Test (SPT) within the borehole at every 1.0m depth interval up to 5.0m and thereafter at every 1.5m depth interval up to termination depth.
- ❖ Collection of Soil Samples and undisturbed samples from the clayey strata with SPT-value less than 15.
- ❖ Collection of water samples if groundwater table met within the investigation depth

1.2 Laboratory Work

- ❖ Natural Moisture Content
- ❖ Atterberg's limits
- ❖ Grain Size Analysis
- ❖ Chemical Analysis test on soil and water samples to give pH, Chlorides and Sulphates

1.2 Structure of the Report

- ❖ Contents
- ❖ Introduction
- ❖ Investigation Methodology & Test Results
- ❖ Geology & Sub-Surface Stratification
- ❖ Foundation System
- ❖ Recommendation
- ❖ Annexure

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 Preamble:

Eight soil investigation boreholes were put as per the planning of the engineer in-charge and these locations are shown in Fig.2.0. The equipment used and the methodology adopted to carry out the fieldwork is described below.

2.1 Methodology of Field Work:

2.1.1 Equipment Used and Method of Drilling:

All the boreholes were sunk by conventional rotary drilling rigs. For borehole Methodology followed for boring conformed to IS: 1892 -2000. Boring was progressed by the cutting action of rotating bit with water circulation and stabilizing the side of the boreholes by using casing pipes/bentonite slurry up to required depth to prevent collapse of sidewall. Boring was continued by normal boring process using MS soil cutter in soil. However, Tungsten Carbide (TC) bit drilling was resorted to drill in highly weathered rock stratum where the normal boring process became slow. Diamond Core (DC) bit drilling was adopted in moderately weathered rock formations where penetration using TC bit was became slow.

2.1.2 Standard Penetration Tests:

This is a field test to determine "Penetration Resistance of Stratum at the Test Depth". This has been conducted in the boreholes generally up to refusal depth using procedures described in IS: 2131- 2002. In this test, split spoon sampler (50.8 mm OD and 35 mm ID) has replaced driving bit. Sampler is then driven by dropping 63.5 kg hammer on top of driving collar with free fall of 75 cm. The length of sampler is 60 cm.

The tests were conducted at the depth intervals indicated in Chapter-1 (Sec.1.1.1).

2.1.3 Collection of Soil Samples:

2.1.3.1 Disturbed Samples:

The SPT-samples collected were used as disturbed soil samples. These samples were used for visual and physical identification and for conducting laboratory classification tests as per I.S.1498-1970.

2.1.4 Collection of Ground Water Samples:

One representative water sample from each borehole was collected after 24 hours of completing the borehole if water table met within the investigated depth.

Note on Groundwater Table Record:

- ❖ Groundwater table observation in geotechnical report is predominantly to arrive at foundation design criteria and shall not be construed as design guidelines for the design of dewatering systems
- ❖ The groundwater level indicated in the bore logs is specific to the duration of investigation and intensity of the monsoon rains during the time of investigation.



Hence, the level shall be taken as guidelines only to plan the investigation for the dewatering system

- ❖ No foundation excavation or basement excavations if anticipated within the groundwater table zone shall be carried out without implementing groundwater lowering schemes

2.2 Laboratory testing:

2.2.1 On Coarse Grained Soil

On the representative samples, sieve analysis tests were conducted to arrive at grain size distribution. These tests were conducted as per I.S.2720 (part 4)-1985 and the results are presented in Tables-2.1 to 2.8. The graphical representation of grain size distribution curve for the representative samples in each bore is presented in Fig. 2.9 to 2.16.

2.2.2 On Fine Grained Soil

On the SPT sample index property tests were conducted to estimate consistency. These test results are presented in Tables-2.1 to 2.8. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig.2.17 to 2.21.

2.2.3 Chemical Analysis Tests

On representative soil and water samples chemical analysis tests were conducted to estimate pH, Chloride and Sulphates and these results are presented in Table - 2.9.

2.3 Summary:

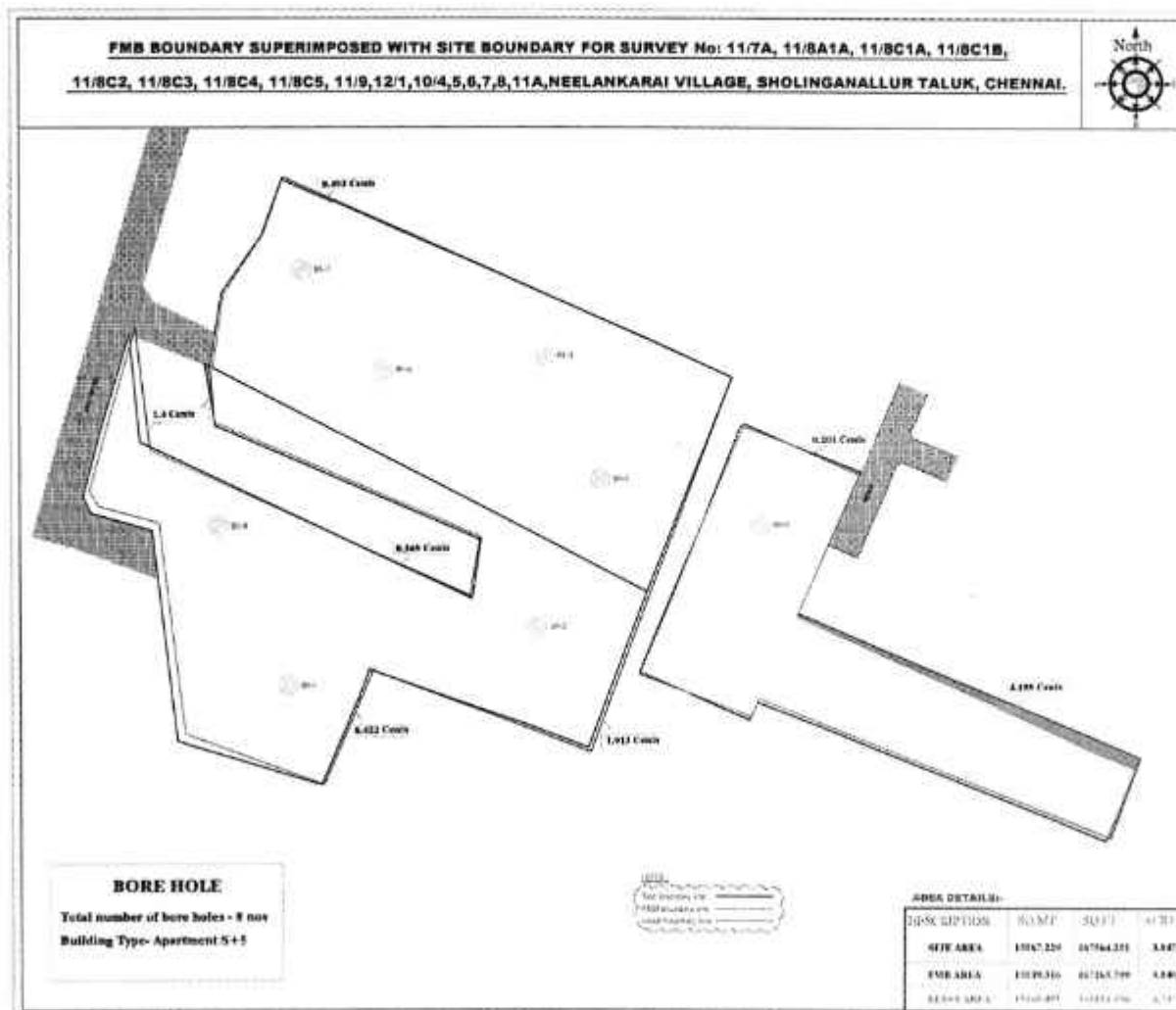
The four locations of the field investigation boreholes are shown in site plan given in Fig.2.0. The average sub soil profiles encountered at each location along with their classification and engineering properties are presented in Figs.2.1 to 2.8.

SITE PLAN



PERUNGUDI 3.8ACRS BORE HOLE LOCATION

Borehole Location- dwg



SOIL PROFILE

G E S		SITE INVESTIGATION RECORD										BORE HOLE No: BH-01					
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (5TILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET 1 OF 1					
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		DIA OF BORE HOLE 150mm NK					
STRUCTURE		Still+5 Upper Floors		DRILLING METHOD		Rotary		CD-ORDINATES		N -		BORE START DATE 24/07/2022					
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		BORE END DATE 25/07/2022					
TOTAL DRILL DAYS		2															
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data				
	Date	Time		Total Core Recovery %	R.Q.D %	Blows/cm			Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description	
						0-15	15-30	30-45									SPT 'N' Value
1																	
2	16	05	SC	-	-												Filled up Soil Brownish, Silty Sand with Brick & Building waste Material
3	16	06	SC	-	-	0	0	1	1	3.00	1	SS	-3.0				Greyish Black, Moist, Very Loose, Clayey Silty SAND(SC) Sand-Clay mixtures
4	16	18	SC	-	-					3.45							
5	16	19	SC	-	-	0	0	1	1	4.00	2	SS	-4.0				
6	16	29	SC	-	-					4.45							Greyish Black, Moist, Very Loose, Poorly Graded, Silty SAND(SP-SM/SM) Sand- Silt mixtures
7	16	30	SC	-	-	0	0	1	1	5.00	3	SS	-5.0				
8	16	44	SC	-	-					5.45							
9	16	45	SC	-	-	1	1	1	2	6.50	4	SS	-6.5				
10	17	04	SC	-	-					6.95							
11	17	05	SC	-	-	1	1	1	2	8.00	5	SS	-8.0				
12	17	37	SC	-	-					8.45							
13	17	39	SC	-	-	1	1	2	3	9.50	6	SS	-9.5				
14										9.95							

CS - Core Sample		DS - Disturbed Sample		LOGGED		VINOD PRADAP		PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample		SC - Soil Cutter		DATE		24/07/2022		GROUND LEVEL (m)		0.00	
UDS - Undisturbed Sample		TCB - Tungsten Carbide Bit		CHECKED		JALEEL YASIN		WATER TABLE (m)		1.50	
WS - Wash Sample		DB - Diamond Bit		DATE		10/08/2022		CASING DEPTH (m)		3.00	

SITE INVESTIGATION RECORD															BORE HOLE No.		BH-01	
PROJECT NAME															SHEET		2 OF 2	
PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK															DIA OF BORE HOLE		150mm 5X	
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		24/07/2022				
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		25/07/2022				
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		CO-ORDINATES		E -		TOTAL DRILL DAYS		2				
Depth below E.G.L. (m)	Drilling progress per metre			Core Details Type of Drill Bit (SC / TCB / DB)	Total Core Recovery %	R.O.D %	SPT Details			Sample Details				Layer Data				
	Time		Blows/cm.				Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description				
	Date	Hr.	Min.												0-15	15-30	30-45	SPT 'N' Value
11	07	30	To	SC	-	-	1	1	2	3	11.00	7	SS	-11.0				Greyish Black, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures
12	07	50	To	SC	-	-					11.45							
13	12	30	To	DB	5	0					12.50	8	WS	-12.5	+	+	+	Brownish Grey, V.Dense, Completely Weathered Rock, Descent from Granite Rock
14	12	40	To	DB	4	0					14.00	9	CS	-14.0	+	+	+	
15	14	50	To	DB	10	0					15.50	10	CS	-15.5	+	+	+	Brownish Grey, Highly Weathered Rock, Descent from Granite Rock
16	15	35	To	DB	15	0					16.50	11	CS	-16.5	+	+	+	
17	15	50	To	DB	45	26					18.00	12	CS	-18.0	+	+	+	Greyish Black,, Moderately Weathered Rock, Descent from Granite Rock
18	17	35	To	DB							19.00	13	CS	-19.0	+	+	+	
19	18	10	To															
20																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	25/07/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.50	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

Borehole terminated at 19 m depth below E.G.L.

FIG.2.1 Sub Soil Profile at BH-01 Location

		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-02								
								SHEET		1	OF	3						
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						DIA OF BORE HOLE		150mm	☒							
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-								
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N	-							
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E		-								
										BORE START DATE	26/07/2022							
										BORE END DATE	26/07/2022							
										TOTAL DRILL DAYS	1							
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time		Total Core Recovery %	R.O.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description	
		Hr.				Min.	0-15	15-30										30-45
1																		
2																		
3	26/07/2022	09	20	SC	-	-												Filled up Soil Brownish, Silty Sand with Brick & Building waste Material
4		To	21															
5		09	30	SC	-	-	0	0	1	1	3.00	1	SS	-3.0				
6		To	31								3.45							
7		09	43	SC	-	-	0	0	1	1	4.00	2	SS	-4.0				Brownish Grey, Moist, Very Soft Silty CLAY(CH/C) Silty Clays of high / Medium plasticity
8		To	44								4.45							
9		09	53	SC	-	-	0	1	1	2	5.00	3	SS	-5.0				
10		To	54								5.45							
11		10	05	SC	-	-	0	0	1	1	6.50	4	SS	-6.5				
12		To	06								6.95							
13		10	15	SC	-	-	0	0	1	1	8.00	5	SS	-8.0				Grey, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand- Silt mixtures
14		To	16								8.45							
15							1	1	1	2	9.50	6	SS	-9.5				
16											9.95							

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/07/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

GEC		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-02									
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						SHEET		2 OF 3									
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-									
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -									
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		BORE START DATE									
										26/07/2022									
										BORE END DATE									
										26/07/2022									
										TOTAL DRILL DAYS									
										1									
Depth below E.G.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time			Total Core Recovery %	R.Q.D %	Blows/cm			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description	
		Hr.	Min.				0-15	15-30	30-45										
10	To	10	25	SC	-	-	2	2	3	5	11.00	7	SS	-11.0		L3	12.0	Grey, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures	
11	To	10	26	SC	-	-					11.45								
12	To	10	40	SC	-	-												Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
13	To	10	50	SC	-	-													
14	To	11	10	SC	-	-												Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
15	To	11	17	SC	-	-													
16	To	11	40	SC	-	-												Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
17	To	11	49	SC	-	-													
18	To	12	20	SC	-	-												Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
19	To	12	28	SC	-	-													
20	To	13	00	SC	-	-												Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
21	To	13	09	SC	-	-													
22	To	14	20	DB	35	0												Brownish Grey, Moderately Weathered Rock, Descent from Granite Rock	
23	To	14	53	DB	35	0													
24	To																		
25	To																		
26	To																		
27	To																		
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99	To																		
100	To																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/07/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-02							
								SHEET		2	OF	3					
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						DIA OF BORE HOLE		150mm	✓						
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-							
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		BORE START DATE		26/07/2022							
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		BORE END DATE		26/07/2022							
								CD-ORDINATES		N	-						
										E	-						
								TOTAL DRILL DAYS		1							
Depth below E.G.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data			
	Time		Total Core Recovery %		R.Q.D. %	Blows/cm			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description
	Date					0-15	15-30	30-45									
	Hr.	Min.															
21	15	30	To	DB	45	20											Greyish Black, Moderately Weathered Rock, Descent from Granite Rock
	16	20															
	17	00	To	DB	62	40											Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
	18	04															
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/07/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	1.00	

Borehole terminated at 22 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

 SITE INVESTIGATION RECORD															BORE HOLE No: BH-03							
															SHEET: 1 OF 3							
PROJECT NAME: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK															DIA OF BORE HOLE: 150mm ☒							
LOCATION: Neelankarai Village, Sholinganallur Taluk															MACHINE No:		CR-01		CHAINAGE (m): -		BORE START DATE: 27/07/2022	
STRUCTURE: Stilt+5 Upper Floors															DRILLING METHOD: Rotary		CO-ORDINATES: N -		BORE END DATE: 27/07/2022			
JOB CODE: GEC-JC-GT-4037															FLUSHING MEDIUM: Bentonite		E -		TOTAL DRILL DAYS: 1			
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data									
	Time			Total Core Recovery %	R.O.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description					
	Hr.	Min.				0-15	15-30	30-45														
1																						
2	08	30																				
	To		SC	-	-																	
3	08	31																				
	To		SC	-	-																	
4	08	40																				
	To		SC	-	-																	
5	08	41																				
	To		SC	-	-																	
6	08	50																				
	To		SC	-	-																	
7	08	51																				
	To		SC	-	-																	
8	09	01																				
	To		SC	-	-																	
9	09	02																				
	To		SC	-	-																	
10	09	30																				
	To		SC	-	-																	
11	09	31																				
	To		SC	-	-																	
12	09	43																				
	To		SC	-	-																	
13	09	44																				
	To		SC	-	-																	
14																						
	To		SC	-	-																	
15																						
	To		SC	-	-																	
16																						
	To		SC	-	-																	
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	To		SC	-	-																	
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	To		SC	-	-																	
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	To		SC	-	-																	
55																						
	To		SC	-	-	</																

	SITE INVESTIGATION RECORD						BORE HOLE No.		BH-03									
							SHEET		2	OF	3							
	PROJECT NAME						PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK											
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-								
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N - E -								
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		BORE START DATE		27/07/2022								
BORE END DATE		27/07/2022		TOTAL DRILL DAYS		1												
Depth below E.O.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details			Layer Data					
	Date	Time			Total Core Recovery %	R.Q.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description
		Hr.	Min.				0-15	15-30	30-45									
11	09	59	To	SC	-	-	13cm Penet. For 50 Blows	>100	11.00 11.13	7	SS	-11.0	+	+	+	Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock		
12	10	04	To	SC	-	-	11cm Penet. For 50 Blows	>100	12.50 12.61	8	SS	-12.5	+	+	+			
13	10	20	To	SC	-	-	11cm Penet. For 50 Blows	>100	14.00 14.11	9	SS	-14.0	+	+	+			
14	10	23	To	SC	-	-	13cm Penet. For 50 Blows	>100	15.50 15.63	10	SS	-15.5	+	+	+			
15	10	45	To	SC	-	-	SPT Hammer Rebounded	>100	17.00	11	WS	-17.0	+	+	+			
16	10	49	To	SC	-	-	SPT Hammer Rebounded	>100	18.50	12	WS	-18.5	+	+	+			
17	11	20	To	SC	-	-	SPT Hammer Rebounded	>100	19.50	13	WS	-19.5	+	+	+			
18	11	27	To	SC	-	-												
19	12	00	To	SC	-	-												
20	12	09	To	SC	-	-												
21	12	41	To	SC	-	-												
22	12	47	To	SC	-	-												
23	13	50	To	SC	-	-												
24	13	59	To	SC	-	-												
25	13	59	To	SC	-	-												
26	13	59	To	SC	-	-												
27	13	59	To	SC	-	-												
28	13	59	To	SC	-	-												
29	13	59	To	SC	-	-												
30	13	59	To	SC	-	-												
31	13	59	To	SC	-	-												
32	13	59	To	SC	-	-												
33	13	59	To	SC	-	-												
34	13	59	To	SC	-	-												
35	13	59	To	SC	-	-												
36	13	59	To	SC	-	-												
37	13	59	To	SC	-	-												
38	13	59	To	SC	-	-												
39	13	59	To	SC	-	-												

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-03					
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET		2 OF 3					
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		27/07/2022					
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		27/07/2022					
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		TOTAL DRILL DAYS		1					
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data						
	Date	Time		Total Core Recovery %	R.Q.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description		
						0-15	15-30	30-45											
14	To	40	DB	15	0	-	-	-	-	20.50	14	CS	-20.5	+	+	+	Greyish Black, Moderately Weathered Rock, Descent from Granite Rock		
15	To	30	DB	27	10	-	-	-	-	22.00	15	CS	-22.0	+	+	+		L4	22.0
16	To	40	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+		L5	23.0
17	To	07	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
18	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
19	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
20	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
21	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
22	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
23	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
24	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
25	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
26	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
27	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
28	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
29	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
30	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	
31	To	09	DB	52	30	-	-	-	-	23.00	16	CS	-23.0	+	+	+	L5	23.0	

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	27/07/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

Borehole terminated at 23 m depth below E.G.L.

FIG.2.3 Sub Soil Profile at BH-03 Location

GEC		SITE INVESTIGATION RECORD						BORE HOLE No. BH-04										
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						SHEET 1 OF 1										
LOCATION		MACHINE No.		CR-01		CHAINAGE (m)		DIA OF BORE HOLE 150mm										
STRUCTURE		DRILLING METHOD		Rotary		CO-ORDINATES		BORE START DATE 28/07/2022										
JOB CODE		FLUSHING MEDIUM		Bentonite				BORE END DATE 28/07/2022										
								TOTAL DRILL DAYS 1										
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time		Total Core Recovery %	R.Q.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description	
						0-15	15-30	30-45										
1																		
2	08	40	SC	-	-													Filled up Soil Brownish, Silty Sand with Brick & Building waste Material
3	08	41	SC	-	-	0	0	1	1	3.00	1	SS	-3.0					Brownish, Moist, Very Soft Silty CLAY(CH) Silty Clays of high plasticity
4	08	49	SC	-	-					3.45								
5	08	50	SC	-	-	1	1	1	2	4.00	2	SS	-4.0					
6	09	00	SC	-	-					4.45								Grey, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures
7	09	01	SC	-	-	1	1	1	2	5.00	3	SS	-5.0					
8	09	11	SC	-	-					5.45								
9	09	12	SC	-	-	1	1	1	2	6.50	4	SS	-6.5					
10	09	21	SC	-	-					6.95								
11	09	22	SC	-	-	1	1	1	2	8.00	5	SS	-8.0					
12	9	33	SC	-	-					8.45								
13	09	34	SC	-	-	1	1	1	2	9.50	6	SS	-9.5					
14										9.95								
15																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	28/07/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

GEC		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-04								
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						SHEET		2 OF 2								
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-								
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N - E -								
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		BORE START DATE		28/07/2022								
								BORE END DATE		28/07/2022								
								TOTAL DRILL DAYS		1								
Depth below E.G.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data				
	Date	Time			Total Core Recovery %	R.Q.D. %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description
		Hr.	Min.				0-15	15-30	30-45									
11	09	45	To	SC	-	-	2	5	7	12	11.00	7	SS	-11.0				Greyish Black, Moist, Medium Dense, Poorly Graded, Silty SAND ((SP- SM/SM)) Sand-Silt mixtures
12	09	46	To	SC	-	-					11.45							
13	10	03	To	SC	-	-					12.50	8	SS	-12.5	+			Brownish Grey, V.Dense, Completely Weathered Rock, Descent from Granite Rock
14	10	20	To	SC	-	-					12.52				+			
15	10	26	To	SC	-	-					14.00	9	WS	-14.0	+			
16	12	07	To	DB	22	0									+			
17	13	10	To	DB	45	0					15.50	10	CS	-15.5	+			Brownish Grey, Moderately Weathered Rock, Descent from Granite Rock
18	14	30	To	DB	62	21					17.00	11	CS	-17.0	+			
19	15	40	To	DB							18.50	12	CS	-18.5	+			Greyish Black,, Slightly Weathered Rock, Descent from Granite Rock
20	16	05	To	DB											+			
21	17	40	To	DB											+			

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	28/07/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

Borehole terminated at 18.5 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-04 Location

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-05			
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET		1 OF 3			
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		29/07/2022			
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		29/07/2022			
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		TOTAL DRILL DAYS		1			
Depth below E.G.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data			
	Time		Total Core Recovery %		R.Q.D %	Blows/cm			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description
	Date	Hr.				Min.	0-15	15-30									
1																	
2	08	10		SC	-	-											Filled up Soil Brownish, Silty Sand with Brick & Building waste Material
3	08	11															
4	08	17		SC	-	-											
5	08	18															
6	08	27		SC	-	-											
7	08	28															
8	08	10		SC	-	-											
9	09	11															
10	09	22		SC	-	-											
11	09	23															
12	09	55		SC	-	-											
13	09	56															
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CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/07/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	0.70	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	2.00	

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-05				
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET		2 OF 3				
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		29/07/2022				
STRUCTURE		Still+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		29/07/2022				
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		TOTAL DRILL DAYS		1				
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time		Total Core Recovery %	R.Q.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description	
						0-15	15-30	30-45										
10	10	10	SC	-	-	1	1	1	2	11.00	7	SS	-11.0				Gray, Moist, Very Loose, Poorly Graded, Silty SAND(SM) Sand-Silt mixtures	
11	10	11								11.45								
10	22	10	SC	-	-	11cm Penet. For 50 Blows			>100	12.50	8	SS	-12.5				Brown, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
12	10	25								12.61								
10	47	10	SC	-	-	9cm Penet. For 50 Blows			>100	14.00	9	SS	-14.0					
14	10	51								14.09								
11	20	11	SC	-	-	3cm Penet. For 50 Blows			>100	15.50	10	WS	-15.5					
15	11	29								15.53								
12	10	12	SC	-	-	SPT Hammer Rebounded			>100	17.00	11	WS	-17.0					
17	12	27																
14	03	14	DB	16	0	-	-	-	-	18.50	12	CS	-18.5					Brownish Grey,, Moderately Weathered Rock, Descent from Granite Rock
18	14	47																
15	15	16	DB	40	0	-	-	-	-	20.00	13	CS	-20.0					
20	16	10																

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/07/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.00	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	2.00	

18

		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-06								
								SHEET		2	OF	2						
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						DIA OF BORE HOLE		150mm	✓							
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-	BORE START DATE	30/07/2022						
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N	-	BORE END DATE	30/07/2022					
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		CO-ORDINATES		E	-	TOTAL DRILL DAYS	1					
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details			Layer Data						
	Date	Time		Total Core Recovery %	R.Q.D. %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description	
		Hr.				Min.	0-15	15-30										30-45
11	30/07/2022	10 01 To 10 02	SC	-	-	1	2	4	6	11.00	7	SS	-11.0				Greyish Black, Moist, Loose, Poorly Graded, Silty SAND ((SP-SM/SM)) Sand-Silt mixtures	
12		10 13 To 10 16	SC	-	-					11.45					L5	12.0		
13		10 30 To 11 00	SC	-	-	12cm Penet. for 50 Blows			>100	12.50	8	SS	-12.5	+	+		Brownish Grey, V.Dense, Completely Weathered Rock, Descent from Granite Rock	
14						SPT Hammer Rebounded			>100	12.62				+	+			
15		12 07 To 13 04	DB	26	0					14.00	9	WS	-14.0	+	+	L6	14.0	
16		14 20 To 15 17	DB	49	0									+	+			
17		15 50 To 17 02	DB	62	29					15.50	10	CS	-15.5	+	+			Brownish Grey, Moderately Weathered Rock, Descent from Granite Rock
18										17.00	11	CS	-17.0	+	+	L7	17.0	
19														+	+			
20										18.00	12	CS	-18.0	+	+	L8	18.0	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
CS - Core Sample		DS - Disturbed Sample		LOGGED		VINOD PRADAP		PROJECT SITE DETAILS		REMARKS								
SS - Split Spoon Sample		SC - Soil Cutter		DATE		30/07/2022		GROUND LEVEL (m)		0.00								
UDS - Undisturbed Sample		TCB - Tungsten Carbide Bit		CHECKED		JALEEL YASIN		WATER TABLE (m)		1.20								
WS - Wash Sample		DB - Diamond Bit		DATE		10/08/2022		CASING DEPTH (m)		3.00								
Borehole terminated at 18 m depth below E.G.L																		
FIG.2.6 Sub Soil Profile at BH-06 Location																		

GEC		SITE INVESTIGATION RECORD						BORE HOLE No. BH-07										
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK						SHEET 1 OF 1										
LOCATION	Neelankarai Village, Sholinganallur Taluk	MACHINE No.	CR-01	CHAINAGE (m)	-	DIA OF BORE HOLE		150mm	✓									
STRUCTURE	Stilt+5 Upper Floors	DRILLING METHOD	Rotary	CD-ORDINATES	N	-	BORE START DATE		31/07/2022									
JOB CODE	GEC-JC-GT-4037	FLUSHING MEDIUM	Bentonite		E	-	BORE END DATE		31/07/2022									
						TOTAL DRILL DAYS		1										
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time		Total Core Recovery %	R.O.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description	
						0-15	15-30	30-45										
1																		
2	09:40	To	SC	-	-													Filled up Soil Brownish, Silty Sand with Brick & Building waste Material
3	09:41	To	SC	-	-	0	0	1	1	3.00	1	SS	-3.0					Brownish, Moist, Very Soft Sandy Silty CLAY(CH) Silty Clays of high plasticity
4	09:50	To	SC	-	-					3.45								
5	09:51	To	SC	-	-	1	1	1	2	4.00	2	SS	-4.0					
6	09:59	To	SC	-	-					4.45								
7	10:00	To	SC	-	-	1	1	1	2	5.00	3	SS	-5.0					Brownish Grey, Moist, Very Loose, Clayey Silty SAND(SC) Sand-Clay mixtures
8	10:10	To	SC	-	-					5.45								
9	10:11	To	SC	-	-	1	1	1	2	6.50	4	SS	-6.5					
10	10:20	To	SC	-	-					6.95								
11	10:21	To	SC	-	-	0	1	1	2	8.00	5	SS	-8.0					
12	10:30	To	SC	-	-					8.45								
13	10:31	To	SC	-	-	0	1	1	2	9.50	6	SS	-9.5					Grey, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures
14										9.95								

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	31/07/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.40	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-07			
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET		2 OF 2			
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		31/07/2022			
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		31/07/2022			
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		TOTAL DRILL DAYS		1			
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data				
	Date	Time		Total Core Recovery %	R.O.D %	Blows/cm.	SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description		
	Hr.	Min.		0-15	15-30	30-45											
10	10	43	SC	-	-	1	1	1	2	11.00	7	SS	-11.0				Greyish Black, Moist, Very Loose, Poorly Graded, Silty SAND(SM) Sand-Silt mixtures
11	11	00	SC	-	-					11.45							
12	11	09	SC	-	-									L4	12.0		
13	11	30	SC	-	-					12.50	8	SS	-12.5	+	+	+	Brownish Grey, V.Dense, Completely Weathered Rock, Descent from Granite Rock
14	11	41	SC	-	-					12.62				+	+	+	
15	12	30	DB	28	0					13.50	9	WS	-13.5	+	+	+	
16	13	39	DB	39	7									+	+	+	
17	14	57	DB	58	20					15.00	10	CS	-15.0	+	+	+	Brownish Grey, Moderately Weathered Rock, Descent from Granite Rock
18	15	03	DB	58	20					16.50	11	CS	-16.5	+	+	+	
19	16	03	DB	58	20					18.00	12	CS	-18.0	+	+	+	Greyish Black, Slightly Weathered Rock, Descent from Granite Rock
20	18	20	DB	58	20									+	+	+	
CS - Core Sample		DS - Disturbed Sample		LOGGED		VINOD PRADAP		PROJECT SITE DETAILS				REMARKS					
SS - Split Spoon Sample		SC - Soil Cutter		DATE		31/07/2022		GROUND LEVEL (m)				0.00					
UDS - Undisturbed Sample		TCB - Tungsten Carbide Bit		CHECKED		JALEEL YASIN		WATER TABLE (m)				1.40					
WS - Wash Sample		DB - Diamond Bit		DATE		10/08/2022		CASING DEPTH (m)				3.00					
Borehole terminated at 18 m depth below E.G.L																	
FIG.2.7 Sub Soil Profile at BH-07 Location																	

 SITE INVESTIGATION RECORD															BORE HOLE No.		BH-08											
PROJECT NAME															SHEET		1 OF 1											
PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK															DIA OF BORE HOLE		150mm											
LOCATION															Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		01/08/2022	
STRUCTURE															Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		01/08/2022	
JOB CODE															GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		TOTAL DRILL DAYS		1			
Depth below E.G.L. (m)	Drilling progress per metre			Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data														
	Date	Time			Total Core Recovery %	R.Q.D %	Blows/cm.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description										
		Hr.	Min.				0-15	15-30	30-45																			
1	01/08/2022	08	49	SC	-	-	0	0	1	1	3.00	1	SS	-3.0	L1	2.5	Filled up Soil Brownish,Silty Sand with Brick & Building waste Material											
2		To	08															50										
3		09	00	SC	-	-	0	1	1	2	4.00	2	SS	-4.0	L2	4.0	Brownish,Moist,Very Soft Sandy Silty CLAY(CH) Silty Clays of high plasticity											
4		To	09															01										
5		09	10	SC	-	-	0	1	1	2	5.00	3	SS	-5.0	L3	6.5	Brownish Grey,Molst, Very Loose, Clayey Silty SAND(SC) Sand-Clay mixtures											
6		To	09															11										
7		09	20	SC	-	-	0	0	1	1	6.50	4	SS	-6.5	L3	6.5	Gray, Moist, Very Loose,Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures											
8		To	09															21										
9		09	29	SC	-	-	1	1	1	2	8.00	5	SS	-8.0														
10		To	09																30									
		09	41	SC	-	-	1	2	2	4	9.50	6	SS	-9.5														
		To	09																42									

CS - Core Sample	DS - Disturbed Sample	LOGGED	VINOD PRADAP	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	01/08/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	JALEEL YASIN	WATER TABLE (m)	1.40	
WS - Wash Sample	DB - Diamond Bit	DATE	10/08/2022	CASING DEPTH (m)	3.00	

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-08				
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+5 UPPER FLOORS) AT NEELANKARAI VILLAGE, SHOLINGANALLUR TALUK										SHEET		2 OF 2				
LOCATION		Neelankarai Village, Sholinganallur Taluk		MACHINE No.		CR-01		CHAINAGE (m)		-		BORE START DATE		01/08/2022				
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE END DATE		01/08/2022				
JOB CODE		GEC-JC-GT-4037		FLUSHING MEDIUM		Bentonite		E -		-		TOTAL DRILL DAYS		1				
Depth below E.G.L. (m)	Drilling progress per metre		Type of Drill Bit (SC / TCB / DB)	Core Details		SPT Details			Sample Details				Layer Data					
	Date	Time		Total Core Recovery %	R.Q.D %	Blows/cm.			Depth	No.	Type	RL (m)	Legend	No.	Depth	Geotechnical Description		
						0-15	15-30	30-45									SPT 'N' Value	
11	10	00	To	SC	-	-	1	1	2	3	11.00	7	SS	-11.0				Greyish Black, Moist, Very Loose, Poorly Graded, Silty SAND((SP-SM/SM)) Sand-Silt mixtures
12	10	15	To	SC	-	-					11.45							
13	10	40	To	SC	-	-					12.50	8	SS	-12.5				Brownish Grey, V.Dense, Completely Weathered Rock, Descent from Granite Rock
14	10	49	To	SC	-	-					12.53							
15	11	13	To	SC	-	-					13.50	9	WS	-13.5				
16	11	50	To	SC	-	-					15.00	10	WS	-15.0				
17	12	40	To	DB	15	0					16.00	11	WS	-16.0				
18	12	40	To	DB	15	0												Greyish Black,, Moderately Weathered Rock, Descent from Granite Rock
19	14	17	To	DB	21	0					17.50	12	CS	-17.5				
20	14	52	To	DB	21	0					19.00	13	CS	-19.0				Greyish Black,, Slightly Weathered Rock, Descent from Granite Rock
	16	01	To	DB	54	19					20.00	14	CS	-20.0				
CS - Core Sample		DS - Disturbed Sample		LOGGED		VINOD PRADAP		PROJECT SITE DETAILS				REMARKS						
SS - Split Spoon Sample		SC - Soil Cutter		DATE		01/08/2022		GROUND LEVEL (m)				0.00						
UDS- Undisturbed Sample		TCB - Tungsten Carbide Bit		CHECKED		JALEEL YASIN		WATER TABLE (m)				1.40						
WS - Wash Sample		DB - Diamond Bit		DATE		10/08/2022		CASING DEPTH (m)				3.00						
Borehole terminated at 20 m depth below E.G.L																		
FIG.2.8 Sub Soil Profile at BH-08 Location																		

Grain Size Distribution Curves

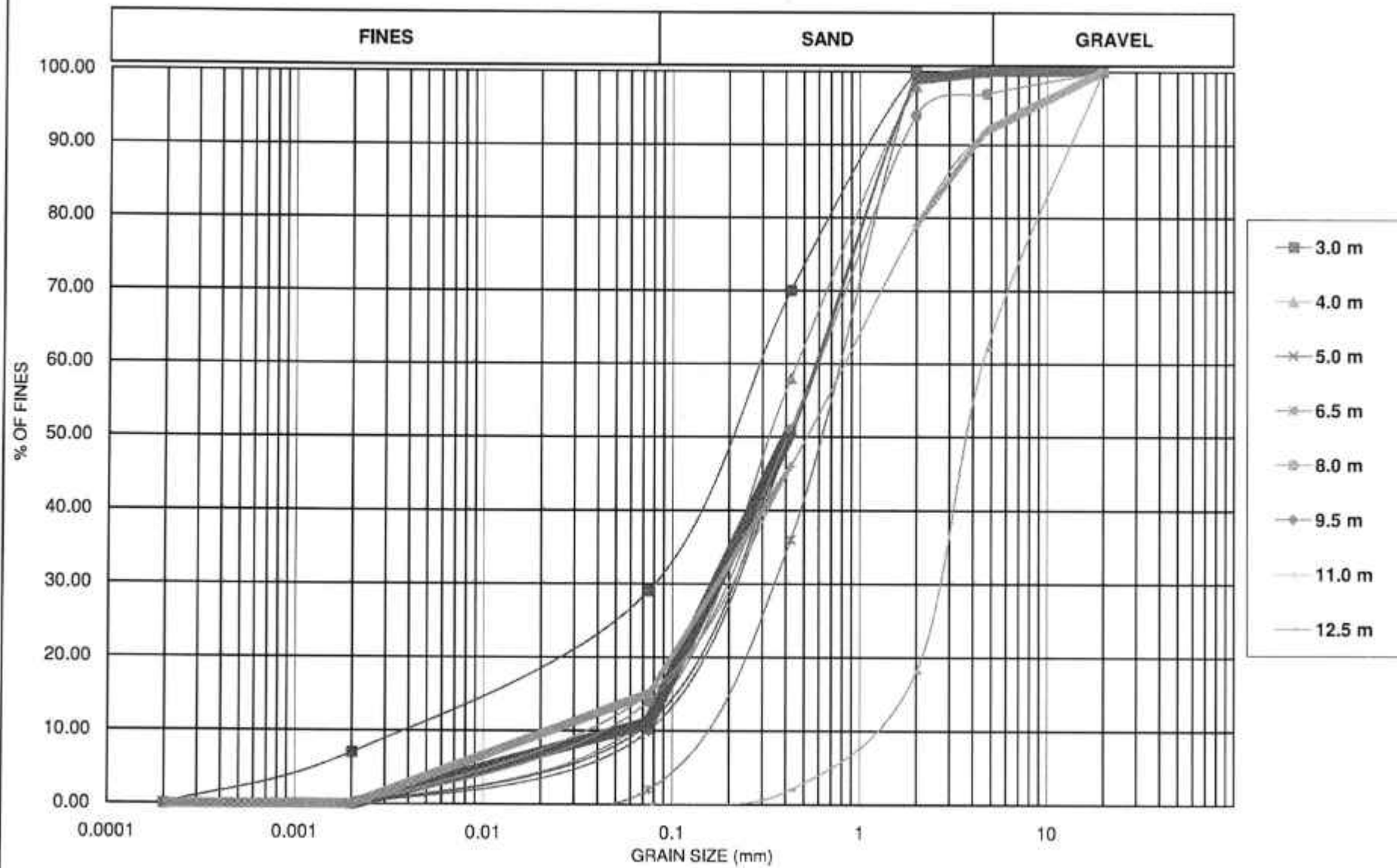


Fig. 2.9 GRAIN SIZE DISTRIBUTION CURVE - BH-01

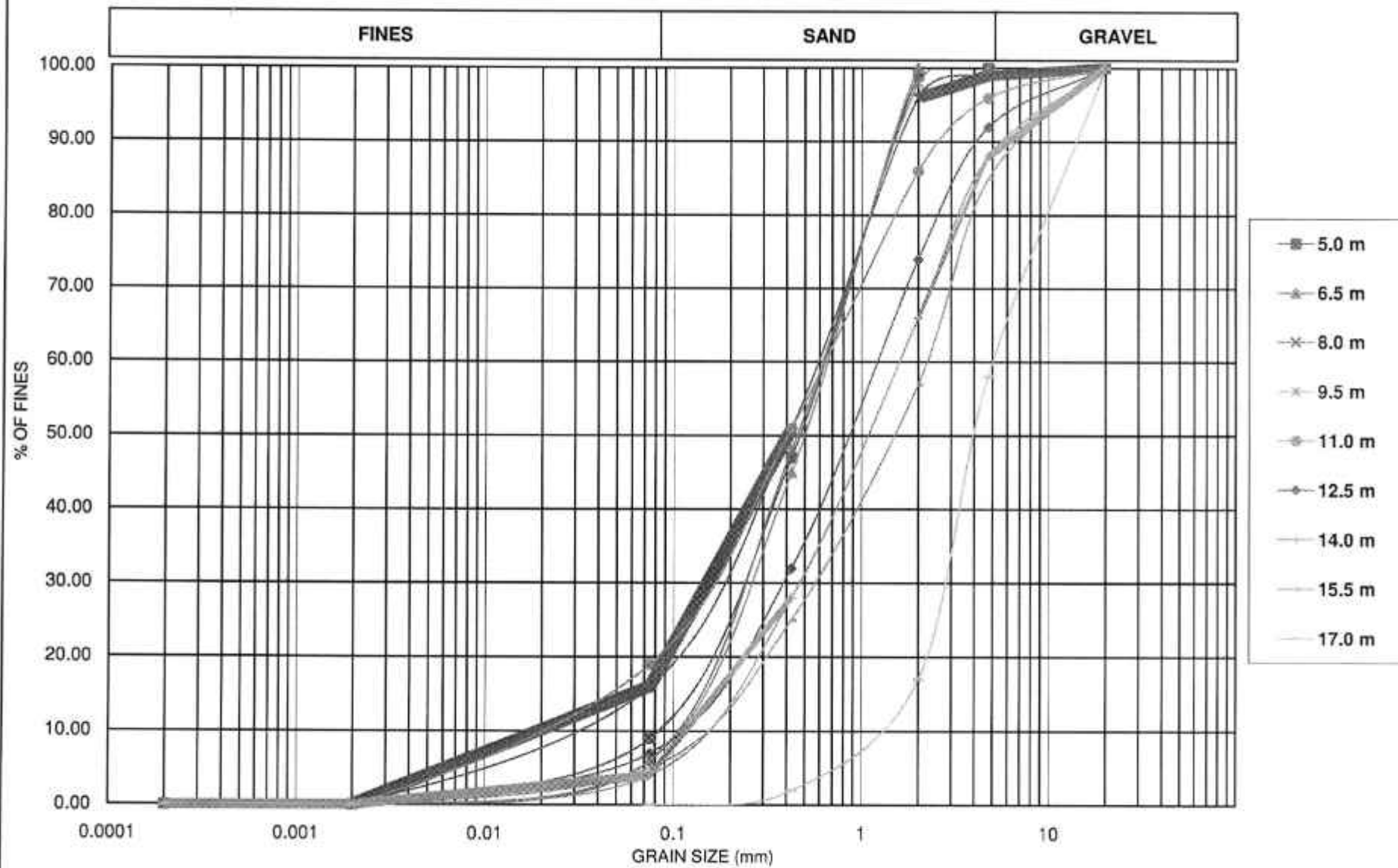


Fig. 2.10 GRAIN SIZE DISTRIBUTION CURVE - BH-02

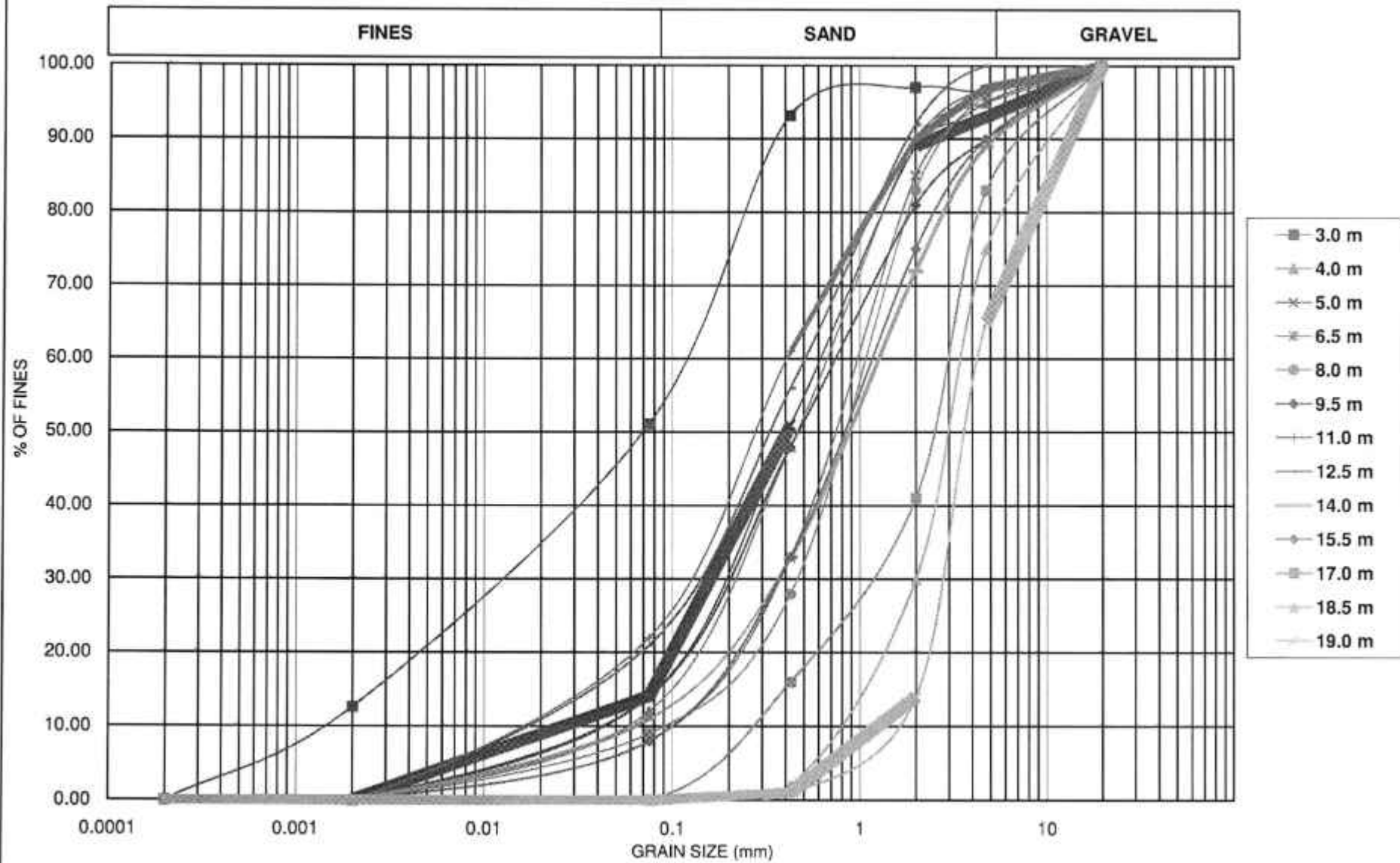


Fig. 2.11 GRAIN SIZE DISTRIBUTION CURVE - BH-03

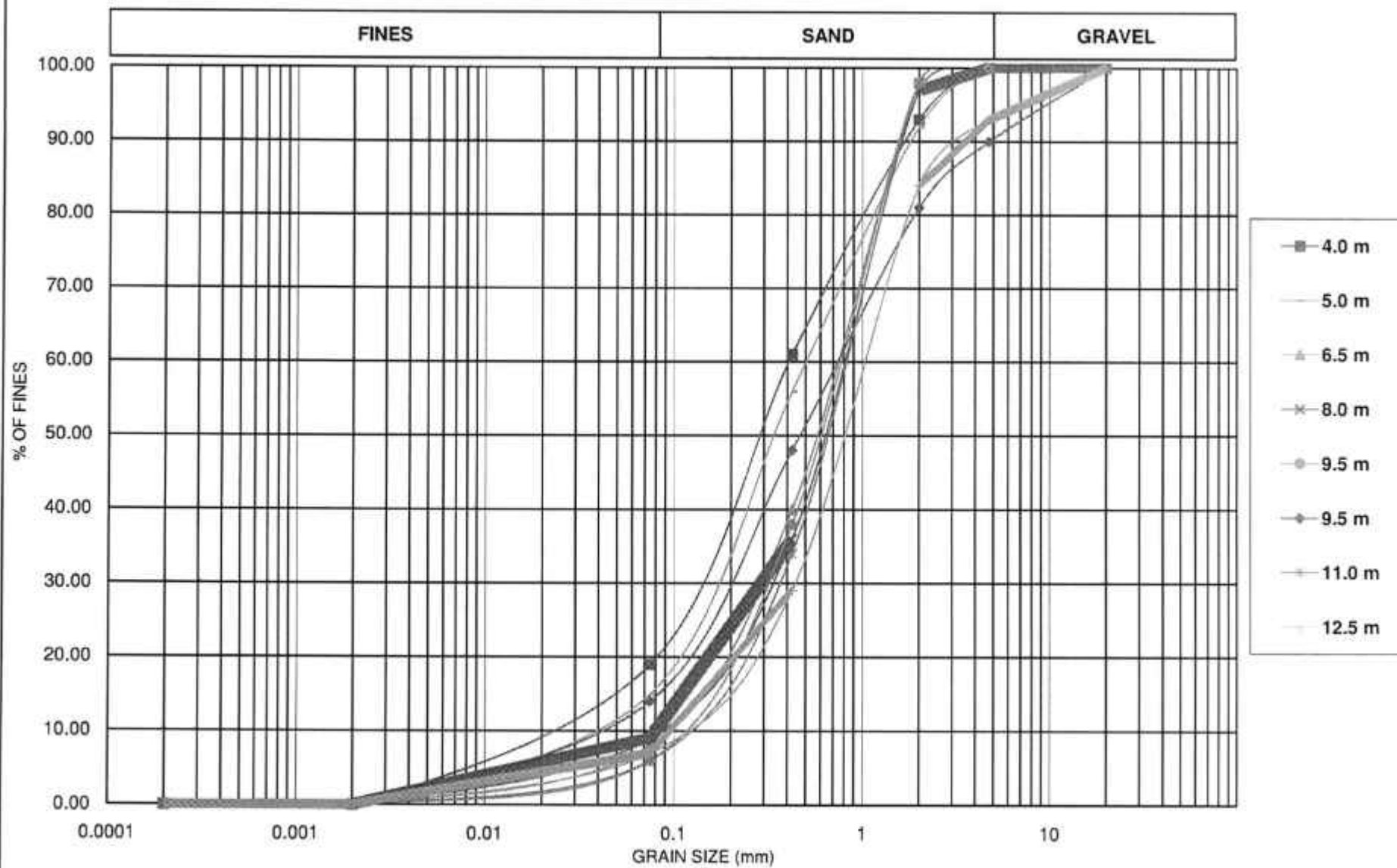


Fig. 2.12 GRAIN SIZE DISTRIBUTION CURVE - BH-04

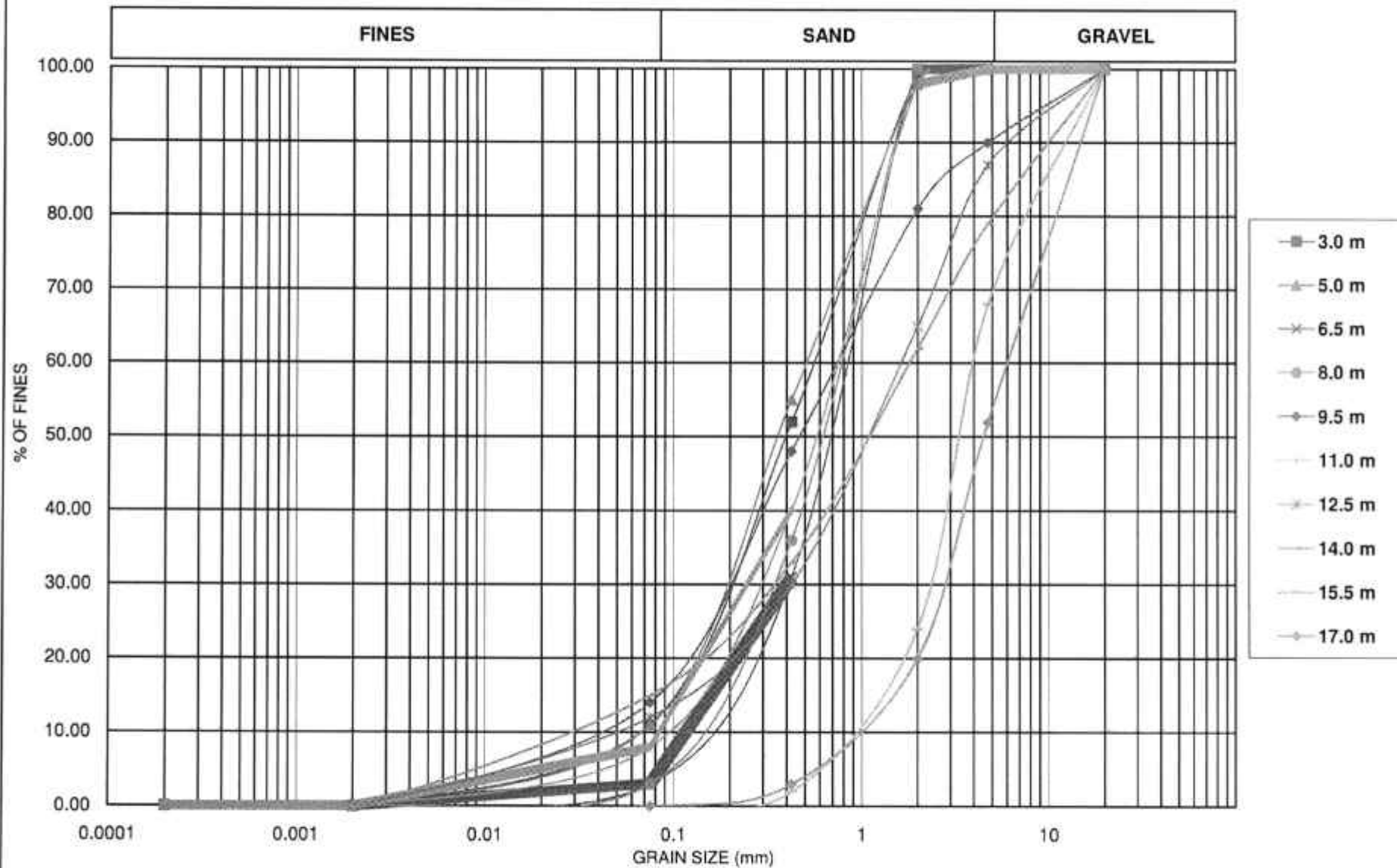


Fig. 2.13 GRAIN SIZE DISTRIBUTION CURVE - BH-05

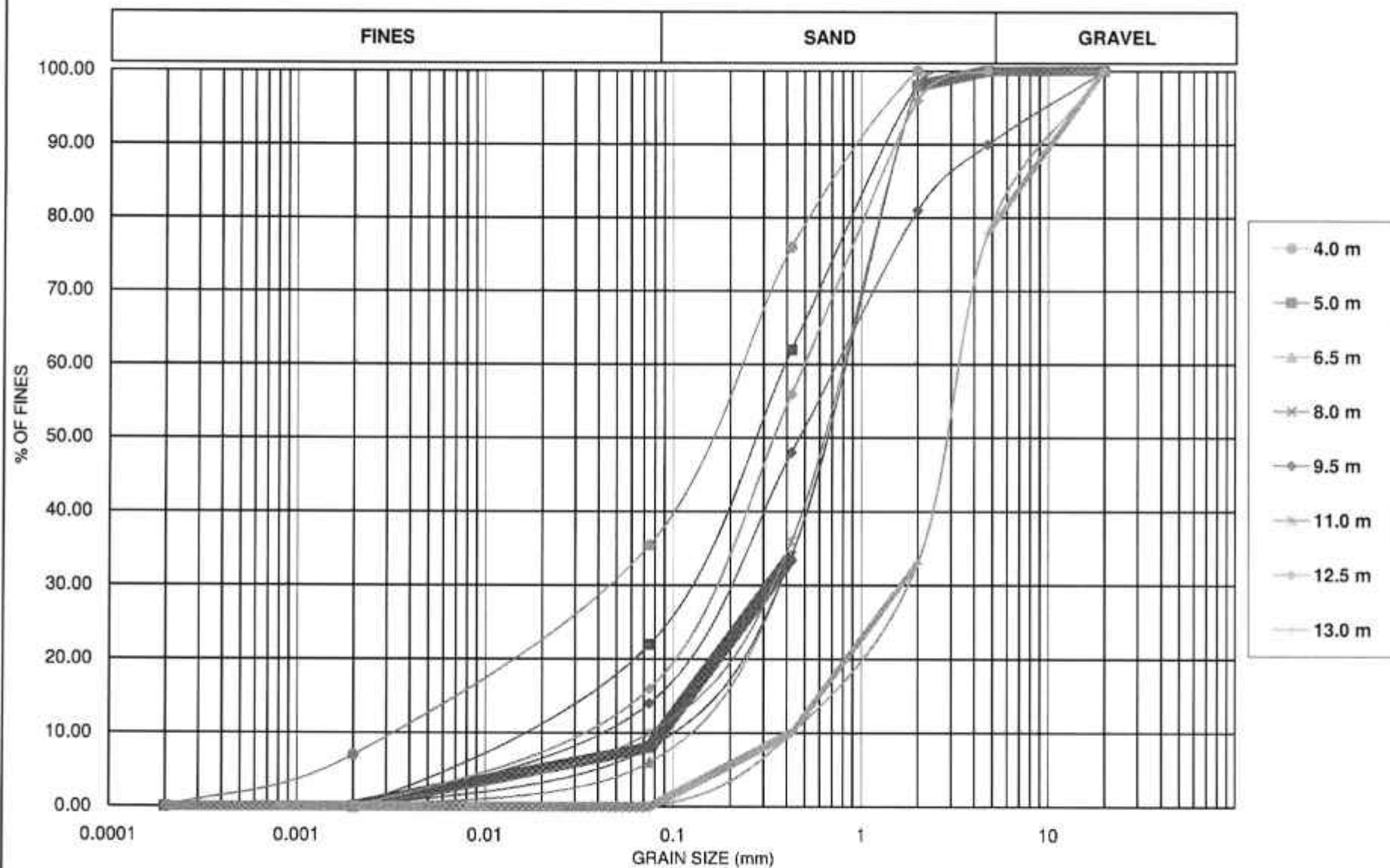
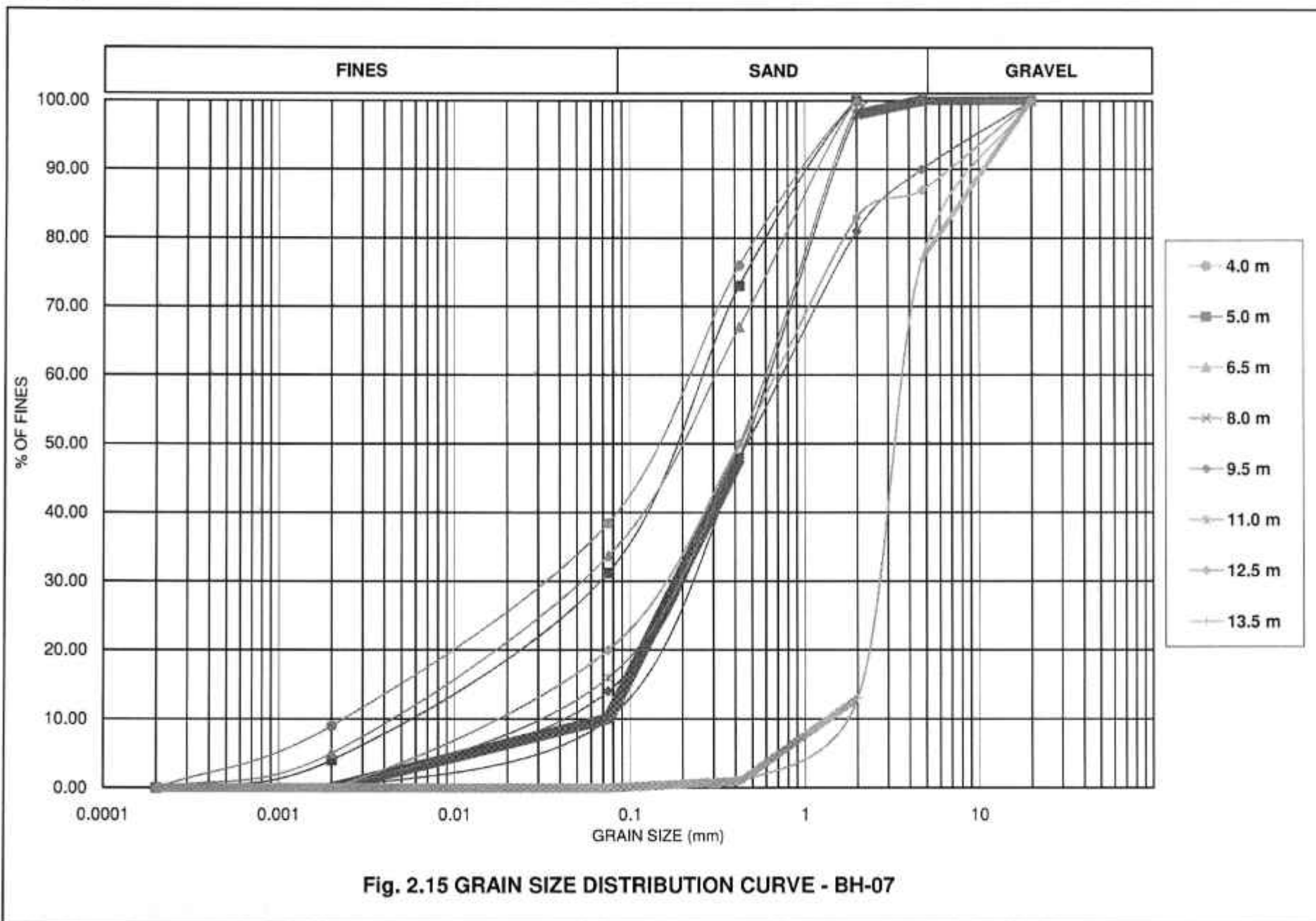


Fig. 2.14 GRAIN SIZE DISTRIBUTION CURVE - BH-06



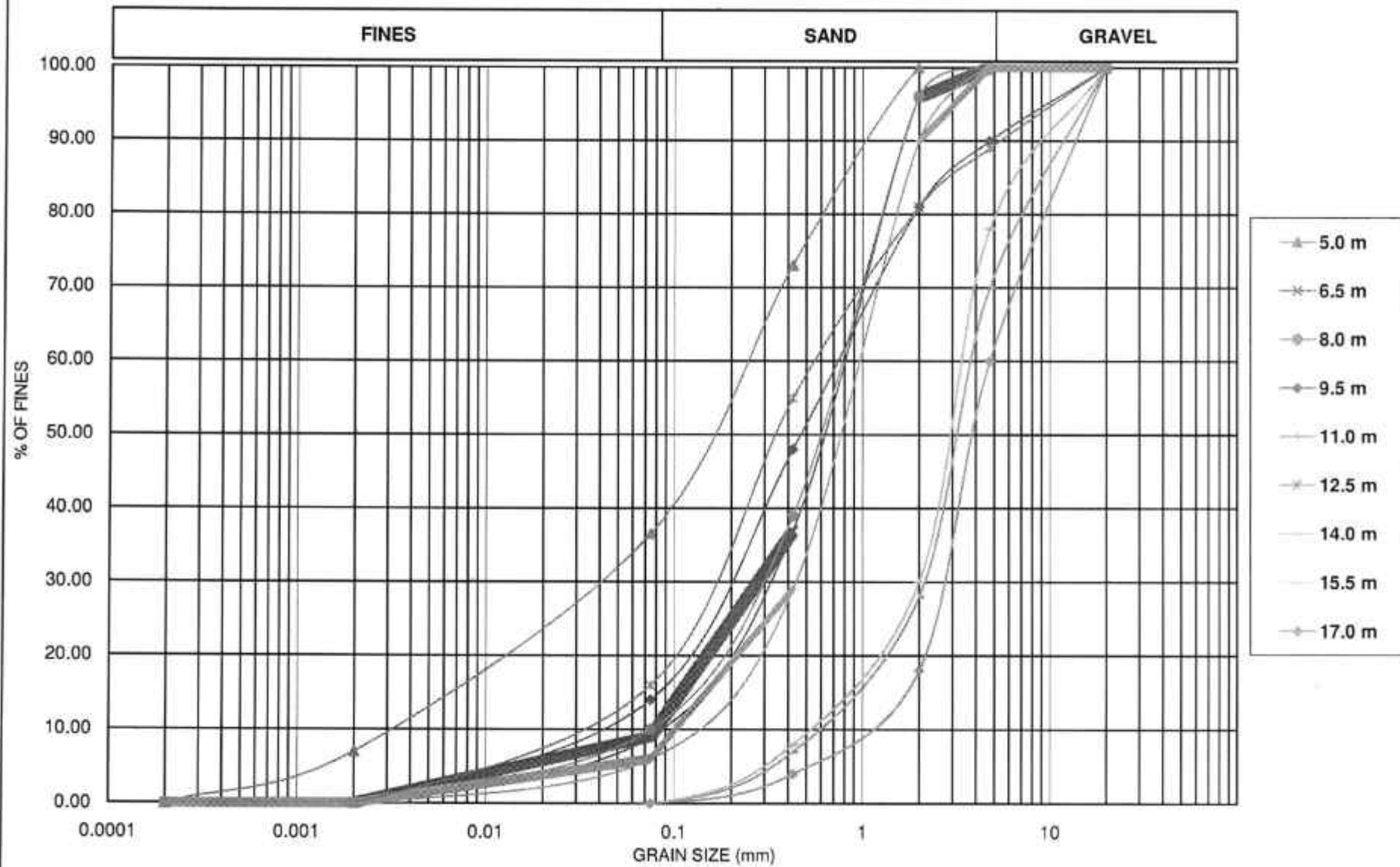


Fig. 2.16 GRAIN SIZE DISTRIBUTION CURVE - BH-08

HYDROMETER ANALYSIS CURVE

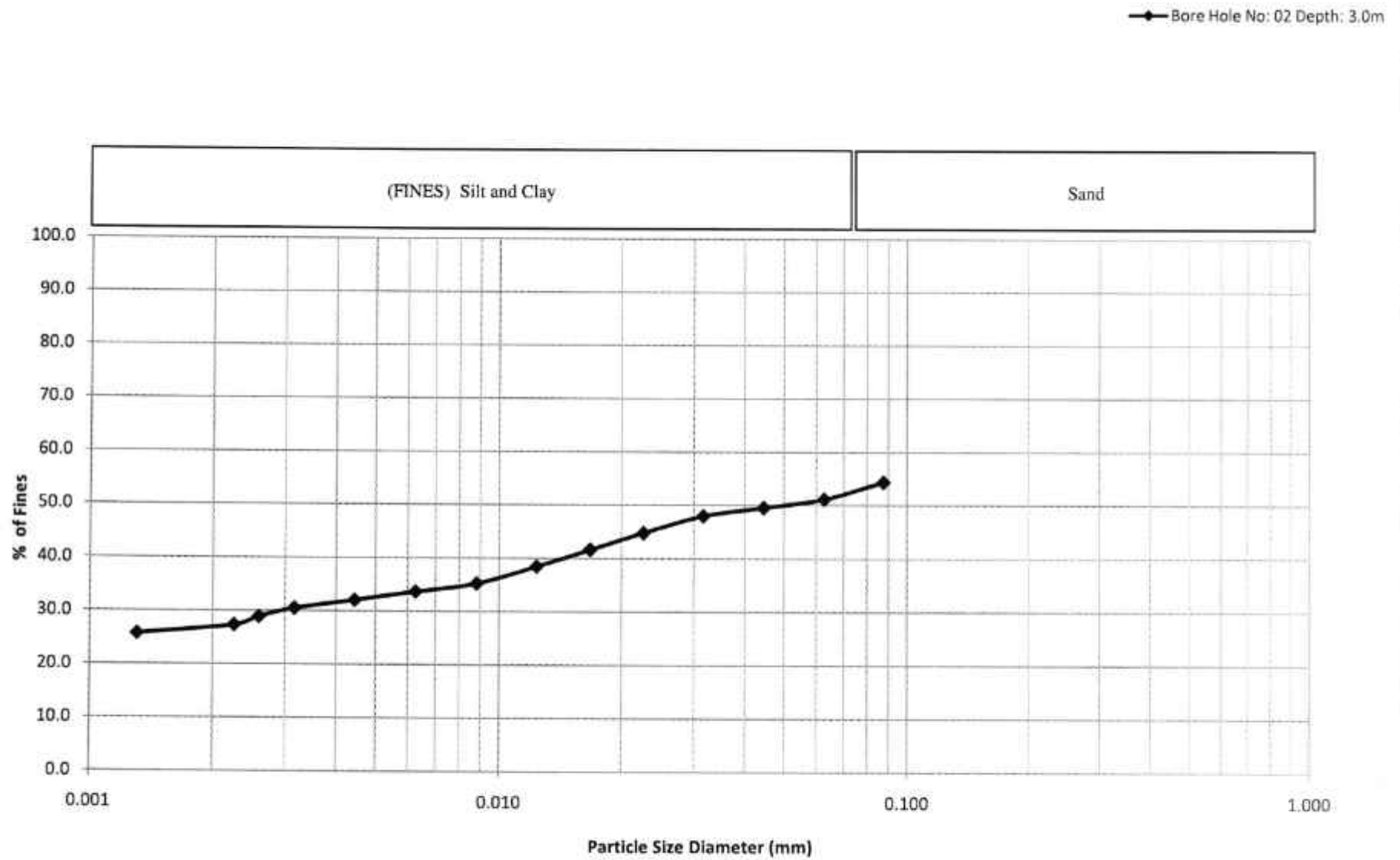


Fig 2.17 Hydrometer Analysis Master Curve

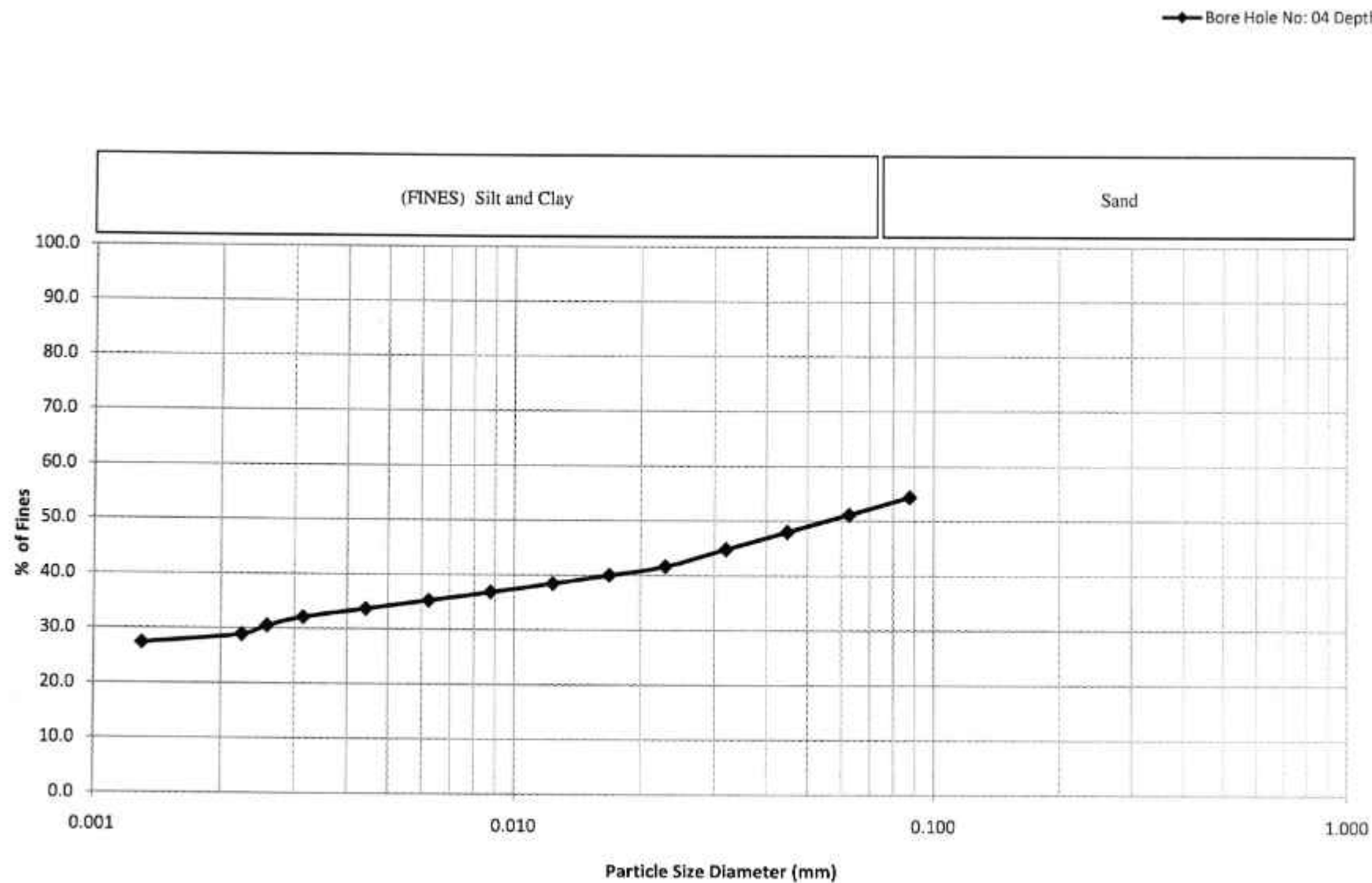


Fig 2.18 Hydrometer Analysis Master Curve

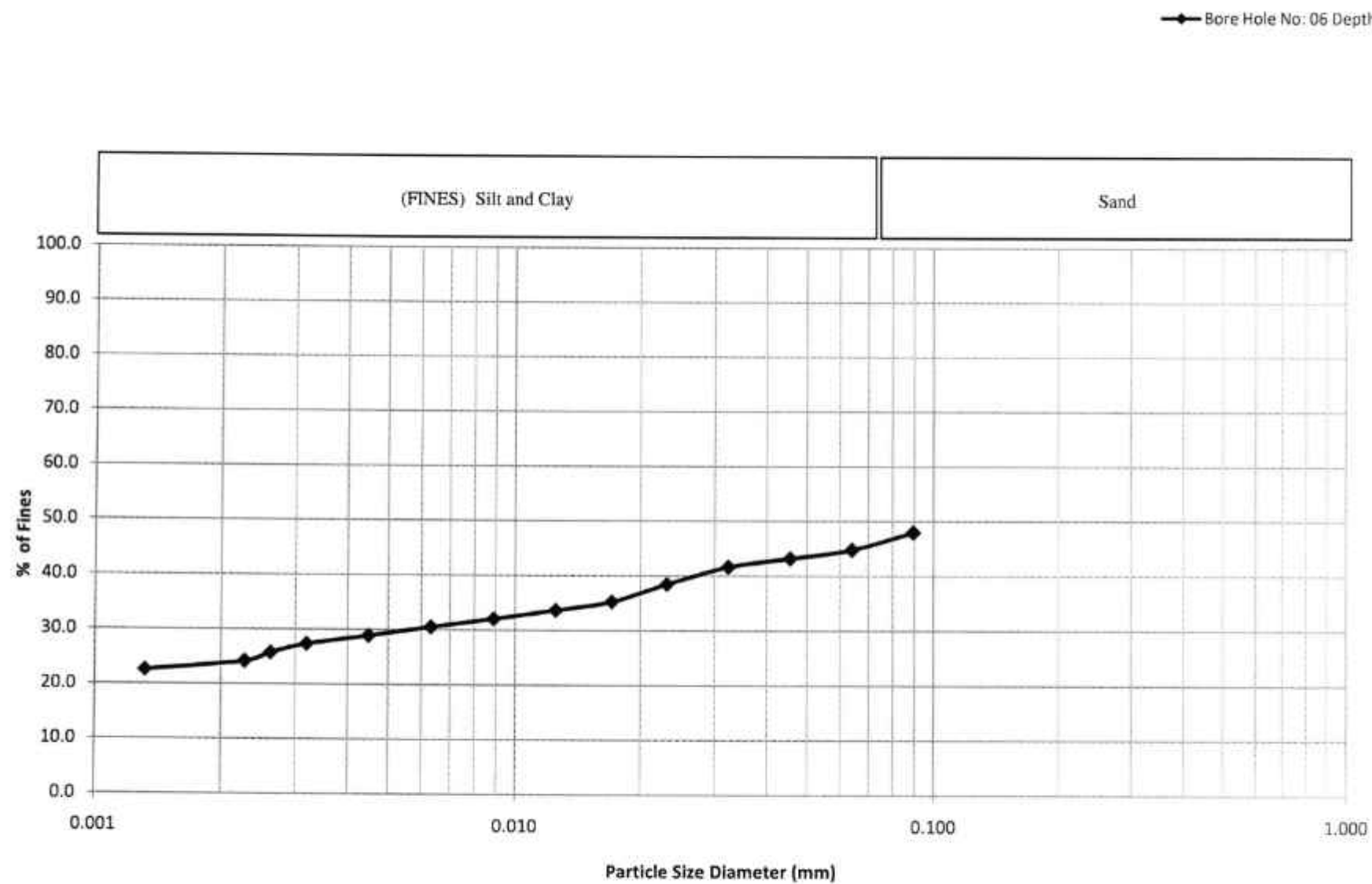


Fig 2.29 Hydrometer Analysis Master Curve

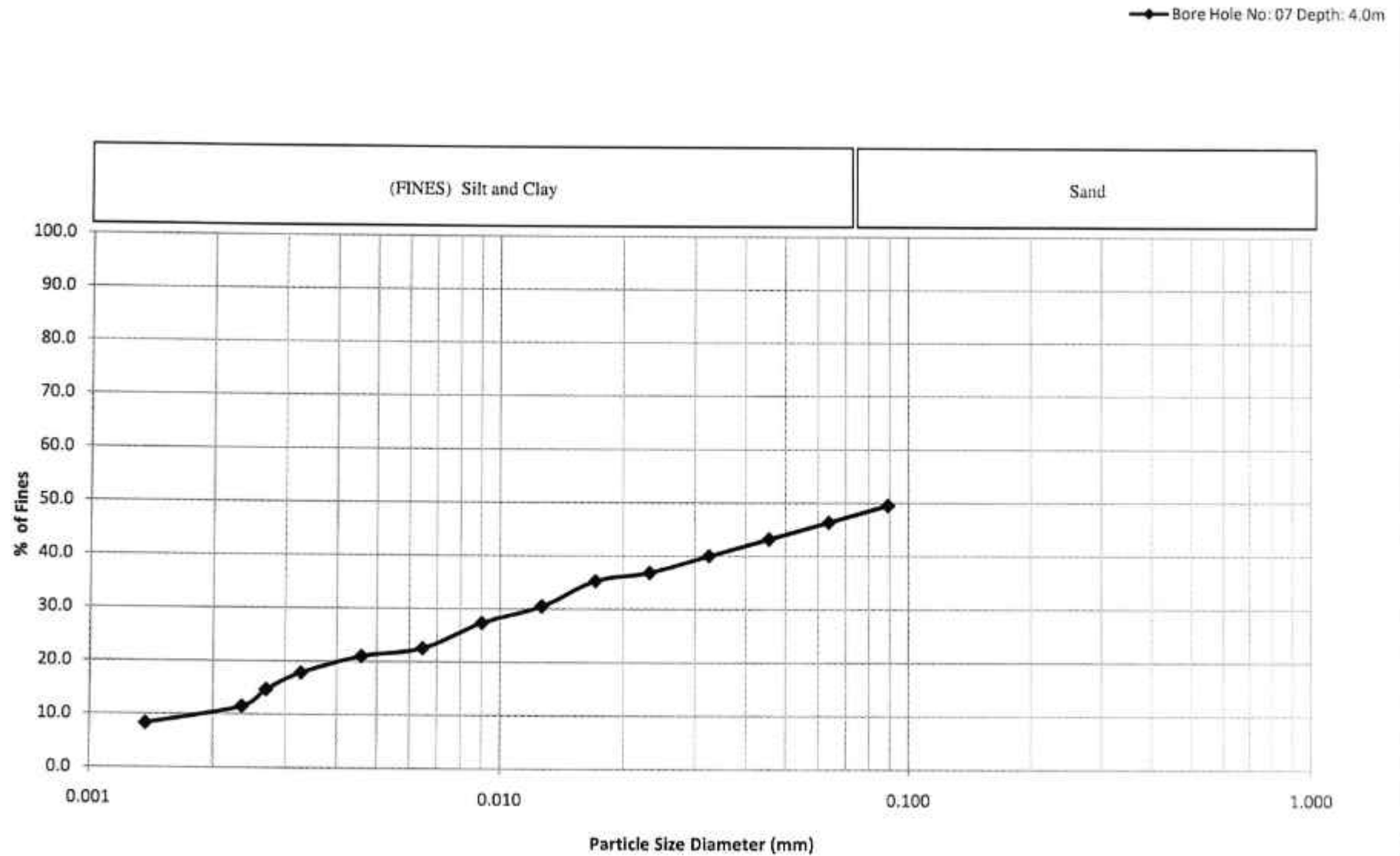


Fig 2.20 Hydrometer Analysis Master Curve

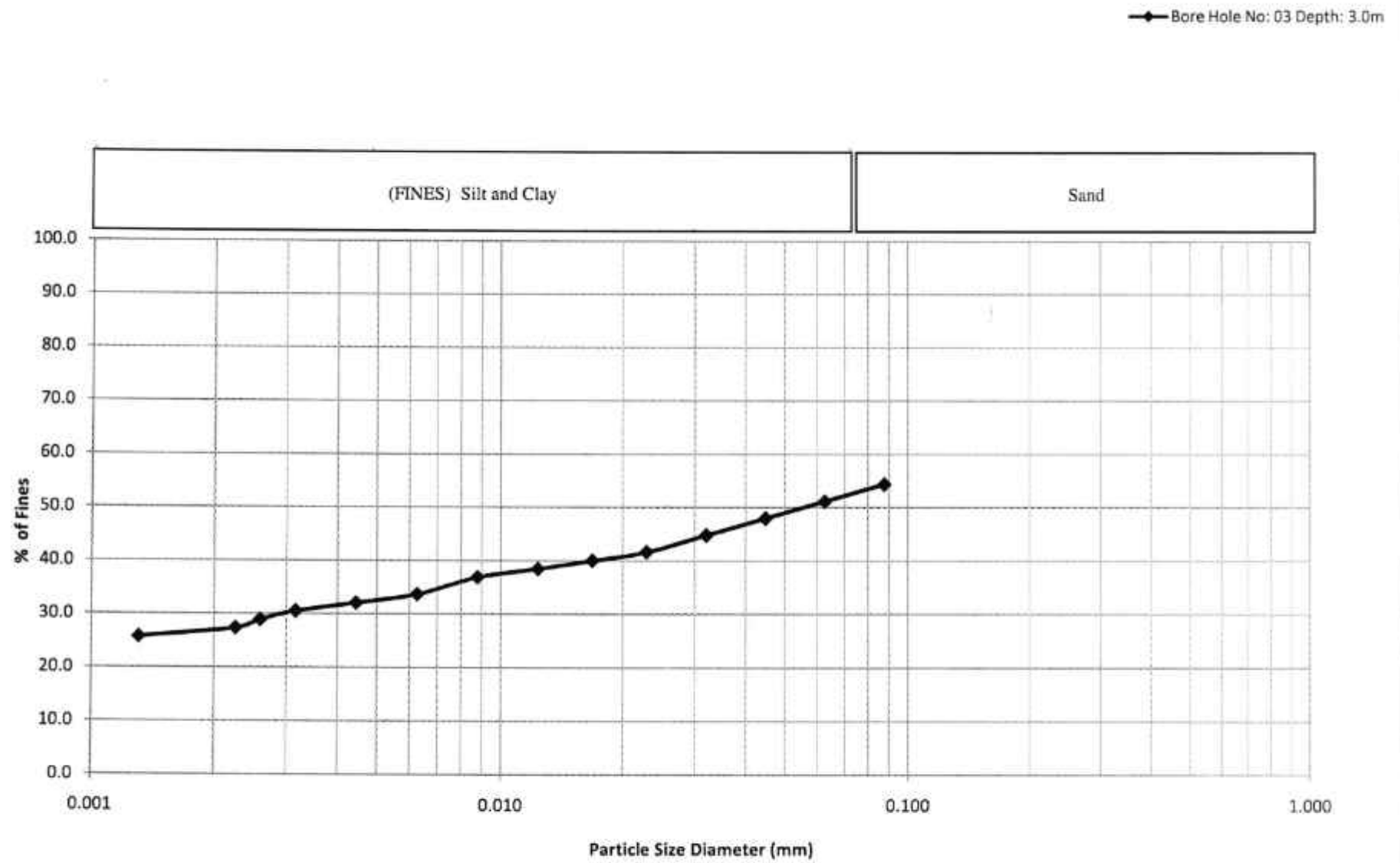


Fig 2.21 Hydrometer Analysis Master Curve

LABORATORY TEST RESULTS



Table-2.1 Laboratory Classification of Soil Samples from BH-01

Table-2.1 Laboratory Classification of Soil Samples from BH-01																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	I _p	I _c	SL (%)	FS (%)	Consistency	Position With Respect to A-Alline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _U =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ x D ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
3.0	1	SS	18	32	15	17	0.82	18	41	CG>50%	Above	-	0	0	30	36	27	7	-	-	-	-	-	V.Loose	<50%	SC
4.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	40	46	12	0	-	-	-	-	-	V.Loose	<50%	SP-SM
5.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	48	40	11	0	-	-	-	-	-	V.Loose	<50%	SP-SM
6.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	0	64	34	2	0	-	-	-	-	-	V.Loose	<50%	SP
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	3	3	43	37	14	0	-	-	-	-	-	V.Loose	<50%	SM
9.5	3	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	49	40	10	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	3	SS	-	-	-	-	-	-	-	CG>50%	-	-	8	13	33	31	15	0	-	-	-	-	-	V.Loose	<50%	SM
12.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	38	44	16	2	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained CG = Coarse Grained NMC= Nature Moisture Content LL = Liquid Limit			PL = Plastic Limit I _p = Plasticity Index I _c = (LL-NMC)/I _p SL = Shrinkage Limit			FS = Differential Free Well Index C _U = Uniformity Coefficient C _C = Coefficient of Curvature					LAB IN-CHARGE		PRAVEEN													
											REVIEWED BY		JALEEL YASIN													



Table-2.2 Laboratory Classification of Soil Samples from BH-02

Table-2.2 Laboratory Classification of Soil Samples from BH-02																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	Ip	Ic	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _u =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ xD ₆₀)	Relative Density	IS-Notation	
																										Gravel
3.0	1	SS	48	55	21	34	0.21	12	62	Very Soft	Above	CH	0	0	5	18	52	25	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	1	SS	35	39	18	21	0.19	14	45	Very Soft	Above	CI	0	0	8	32	42	18	-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	52	38	9	0	-	-	-	-	-	V.Loose	<50%	SP-SM
6.5	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	0	55	39	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM
8.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	1	3	45	35	16	0	-	-	-	-	-	V.Loose	<50%	SM
9.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	50	42	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	5	SS	-	-	-	-	-	-	-	CG>50%	-	-	4	10	35	32	19	0	-	-	-	-	-	Loose	<50%	SM
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	8	18	42	25	7	0	-	-	-	-	-	V.Dense	<50%	SP-SM
14.0	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	12	22	38	24	4	0	-	-	-	-	-	V.Dense	<50%	SP
15.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	15	28	32	20	5	0	-	-	-	-	-	V.Dense	<50%	SP-SM
17.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	42	41	15	2	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained CG = Coarse Grained NMC= Nature Moisture Content LL = Liquid Limit			PL = Plastic Limit Ip = Plasticity Index Ic = (LL-NMC)/Ip SL = Shrinkage Limit			FS = Differential Free Well Index C _u = Uniformity Coefficient C _c = Coefficient of Curvature						LAB IN-CHARGE			PRAVEEN											
												REVIEWED BY			JALEEL YASIN											



Table-2.3 Laboratory Classification of Soil Samples from BH-03

Table-2.3 Laboratory Classification of Soil Samples from BH-03																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	I _p	I _c	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _U =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ xD ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
3.0	1	SS	-	-	-	-	-	-	CG>50%	-	-	0	4	37	46	13	0	-	-	-	-	-	V.Loose	<50%	SM	
4.0	1	SS	-	-	-	-	-	-	CG>50%	-	-	5	5	42	36	12	0	-	-	-	-	-	V.Loose	<50%	SP-SM	
5.0	1	SS	-	-	-	-	-	-	CG>50%	-	-	7	4	38	37	14	0	-	-	-	-	-	V.Loose	<50%	SM	
6.5	1	SS	-	-	-	-	-	-	CG>50%	-	-	5	10	52	25	8	0	-	-	-	-	-	V.Loose	<50%	SP-SM	
8.0	2	SS	-	-	-	-	-	-	CG>50%	-	-	4	13	55	19	9	0	-	-	-	-	-	V.Loose	<50%	SP-SM	
9.5	2	SS	-	-	-	-	-	-	CG>50%	-	-	10	9	33	34	14	0	-	-	-	-	-	V.Loose	<50%	SM	
11.0	>100	SS	-	-	-	-	-	-	CG>50%	-	-	3	7	29	39	22	0	-	-	-	-	-	V.Dense	<50%	SM	
12.5	>100	SS	-	-	-	-	-	-	CG>50%	-	-	0	8	36	35	21	0	-	-	-	-	-	V.Dense	<50%	SM	
14.0	>100	SS	-	-	-	-	-	-	CG>50%	-	-	11	17	39	22	11	0	-	-	-	-	-	V.Dense	<50%	SP-SM	
15.5	>100	SS	-	-	-	-	-	-	CG>50%	-	-	10	15	42	25	8	0	-	-	-	-	-	V.Dense	<50%	SP-SM	
17.0	>100	WS	-	-	-	-	-	-	CG>50%	-	-	17	42	25	16	0	0	-	-	-	-	-	V.Dense	<50%	SP	
18.5	>100	WS	-	-	-	-	-	-	CG>50%	-	-	25	45	28	2	0	0	-	-	-	-	-	V.Dense	<50%	SP	
19.5	>100	WS	-	-	-	-	-	-	CG>50%	-	-	35	51	13	1	0	0	-	-	-	-	-	V.Dense	<50%	SP	
FG = Fine Grained			PL = Plastic Limit			FS = Differential Free Well Index						LAB IN-CHARGE						PRAVEEN								
CG = Coarse Grained			I _p = Plasticity Index			C _u = Uniformity Coefficient						REVIEWED BY						JALEEL YASIN								
NMC= Nature Moisture Content			I _c = (LL-NMC)/I _p			C _c = Coefficient of Curvature																				
LL = Liquid Limit			SL = Shrinkage Limit																							

Table-2.4 Laboratory Classification of Soil Samples from BH-04																																	
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																														
			Fine Grained (FG)										Coarse Grained (CG)																				
			NMC(%)	LL (%)	PL (%)	I_p	I_c	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	$C_u=D_{60}/D_{10}$	$C_c=D_{30}^2/(D_{10} \times D_{60})$	Relative Density	IS-Notation								
																										Gravel	Sand						
3.0	1	SS	52	59	23	36	0.19	12	75	Very Soft	Above	CH	0	0	3	15	55	27	-	-	-	-	-	FG>50%	FG>50%	FG>50%							
4.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	7	32	42	19	0	-	-	-	-	-	V.Loose	<50%	SM							
5.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	8	36	41	15	0	-	-	-	-	-	V.Loose	<50%	SM							
6.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	58	32	8	0	-	-	-	-	-	V.Loose	<50%	SP-SM							
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	3	61	27	9	0	-	-	-	-	-	V.Loose	<50%	SP-SM							
9.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	60	32	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM							
11.0	12	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	64	28	6	0	-	-	-	-	-	M.Dense	<50%	SP-SM							
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	7	9	55	22	7	0	-	-	-	-	-	V.Dense	<50%	SP-SM							
14.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	42	28	17	13	0	0	-	-	-	-	-	V.Dense	<50%	SP							
FG = Fine Grained CG = Coarse Grained NMC= Nature Moisture Content LL = Liquid Limit										PL = Plastic Limit I_p = Plasticity Index I_c = (LL-NMC)/ I_p SL = Shrinkage Limit										FS = Differential Free Well Index C_u = Uniformity Coefficient C_c = Coefficient of Curvature										LAB IN-CHARGE		PRAVEEN	
																														REVIEWED BY		JALEEL YASIN	



Table-2.5 Laboratory Classification of Soil Samples from BH-05

Table-2.5 Laboratory Classification of Soil Samples from BH-05																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	I _p	I _c	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₅ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _u =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ xD ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
3.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	49	37	12	0	-	-	-	-	-	V.Loose	<50%	SP-SM
4.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	47	41	11	0	-	-	-	-	-	V.Loose	<50%	SP-SM
5.0	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	43	44	11	0	-	-	-	-	-	V.Loose	<50%	SP-SM
6.5	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	0	69	28	3	0	-	-	-	-	-	V.Loose	<50%	SP
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	0	64	33	3	0	-	-	-	-	-	V.Loose	<50%	SP
9.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	64	25	10	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	58	32	8	0	-	-	-	-	-	V.Loose	<50%	SP-SM
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	13	22	35	18	12	0	-	-	-	-	-	V.Dense	<50%	SP-SM
14.0	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	21	17	29	18	15	0	-	-	-	-	-	V.Dense	<50%	SM
15.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	32	44	22	2	0	0	-	-	-	-	-	V.Dense	<50%	SP
17.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	48	32	17	3	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained CG = Coarse Grained NMC= Nature Moisture Content LL = Liquid Limit										PL = Plastic Limit I _p = Plasticity Index I _c = (LL-NMC)/I _p SL = Shrinkage Limit					FS = Differential Free Well Index C _u = Uniformity Coefficient C _c = Coefficient of Curvature					LAB IN-CHARGE		PRAVEEN				
																				REVIEWED BY		JALEEL YASIN				



Table-2.6 Laboratory Classification of Soil Samples from BH-06

Table-2.6 Laboratory Classification of Soil Samples from BH-06																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	I _p	I _c	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _u =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ xD ₆₀)	Relative Density	IS-Notation	
																										Gravel
3.0	2	SS	51	57	22	35	0.17	11	89	Very Soft	Above	CH	0	0	9	21	48	22	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	2	SS	31	32	14	18	0.06	18	45	CG>50%	Above	-	0	0	24	36	33	7	-	-	-	-	-	V.Loose	<50%	SC
5.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	36	40	22	0	-	-	-	-	-	V.Loose	<50%	SM
6.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	64	28	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	64	26	8	0	-	-	-	-	-	V.Loose	<50%	SP-SM
9.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	66	27	5	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	6	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	62	26	10	0	-	-	-	-	-	Loose	<50%	SP-SM
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	4	40	40	16	0	-	-	-	-	-	V.Dense	<50%	SM
13.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	22	45	23	10	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained			PL = Plastic Limit			FS = Differential Free Well Index						LAB IN-CHARGE			PRAVEEN											
CG = Coarse Grained			I _p = Plasticity Index			C _u = Uniformity Coefficient						REVIEWED BY			JALEEL YASIN											
NMC= Nature Moisture Content			I _c = (LL-NMC)/I _p			C _c = Coefficient of Curvature																				
LL = Liquid Limit			SL = Shrinkage Limit																							



Table-2.7 Laboratory Classification of Soil Samples from BH-07

Table-2.7 Laboratory Classification of Soil Samples from BH-07																										
Depth of Sample below E.G.L (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	I_p	I_c	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	$C_u = D_{60}/D_{10}$	$C_c = D_{30}^2/(D_{10} \times D_{60})$	Relative Density	IS-Notation	
																										Gravel
3.0	1	SS	45	51	21	30	0.20	12	79	Very Soft	Above	CH	0	0	12	21	45	22	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	2	SS	30	34	15	19	0.21	15	65	CG>50%	Above	-	0	0	24	32	35	9	-	-	-	-	-	V.Loose	<50%	SC
5.0	2	SS	28	32	16	16	0.25	15	52	CG>50%	Above	-	0	0	27	39	30	4	-	-	-	-	-	V.Loose	<50%	SC
6.5	2	SS	28	30	14	16	0.13	17	38	CG>50%	Above	-	0	0	33	30	32	5	-	-	-	-	-	V.Loose	<50%	SC
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	2	50	38	10	0	-	-	-	-	-	V.Loose	<50%	SP-SM
9.5	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	54	34	11	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	1	49	34	16	0	-	-	-	-	-	V.Loose	<50%	SM
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	13	4	33	30	20	0	-	-	-	-	-	V.Dense	<50%	SM
13.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	23	64	12	1	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained			PL = Plastic Limit			FS = Differential Free Well Index						LAB IN-CHARGE						PRAVEEN								
CG = Coarse Grained			Ip = Plasticity Index			Cu = Uniformity Coefficient																				
NMC= Nature Moisture Content			Ic = (LL-NMC)/Ip			Cc = Coefficient of Curvature						REVIEWED BY						JALEEL YASIN								
LL = Liquid Limit			SL = Shrinkage Limit																							



Table-2.8 Laboratory Classification of Soil Samples from BH-08

Table-2.8 Laboratory Classification of Soil Samples from BH-08																										
Depth of Sample below E.G.L. (m)	SPT-Value	Type of Sample	Sub Soil Classification																							
			Fine Grained (FG)										Coarse Grained (CG)													
			NMC(%)	LL (%)	PL (%)	Ip	Ic	SL (%)	FS (%)	Consistency	Position With Respect to A-Aline	IS-Notation	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D ₁₀ (mm)	D ₃₀ (mm)	D ₆₀ (mm)	C _u =D ₆₀ /D ₁₀	C _c =D ₃₀ ² /(D ₁₀ xD ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
3.0	1	SS	52	58	22	36	0.17	11	85	Very Soft	Above	CH	0	3	9	10	52	26	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	2	SS	31	36	16	20	0.25	15	55	CG>50%	Above	-	0	0	24	33	35	8	-	-	-	-	-	V.Loose	<50%	SC
5.0	2	SS	31	35	15	20	0.20	17	62	CG>50%	Above	-	0	0	27	32	34	7	-	-	-	-	-	V.Loose	<50%	SC
6.5	1	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	4	59	28	9	0	-	-	-	-	-	V.Loose	<50%	SP-SM
8.0	2	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	4	57	29	10	0	-	-	-	-	-	V.Loose	<50%	SP-SM
9.5	4	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	13	58	23	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM
11.0	3	SS	-	-	-	-	-	-	-	CG>50%	-	-	0	10	61	23	6	0	-	-	-	-	-	V.Loose	<50%	SP-SM
12.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	11	8	26	39	16	0	-	-	-	-	-	V.Dense	<50%	SM
13.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	30	42	21	7	0	0	-	-	-	-	-	V.Dense	<50%	SP
15.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	22	48	22	8	0	0	-	-	-	-	-	V.Dense	<50%	SP
16.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	40	42	14	4	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained CG = Coarse Grained NMC= Nature Moisture Content LL = Liquid Limit			PL = Plastic Limit Ip = Plasticity Index Ic = (LL-NMC)/Ip SL = Shrinkage Limit			FS = Differential Free Well Index C _u = Uniformity Coefficient C _c = Coefficient of Curvature						LAB IN-CHARGE			PRAVEEN											
												REVIEWED BY			JALEEL YASIN											



Table-2.9 Results of Chemical Analysis

SL No.	Bore HoleNo.	Water				Soil (2:1)			
		Depth of Sample (m)	pH	Chlorides (ppm)	Sulphates (ppm)	Depth of Sample (m)	pH	Chlorides (ppm)	Sulphates (ppm)
1	BH-01	1.50	7.40	1972	789	3.0	7.42	1854	698
2	BH-03	1.00	7.40	1967	833	4.0	7.42	1836	703
3	BH-05	0.70	7.40	1911	810	3.0	7.42	1854	715
4	BH-07	1.40	7.40	1935	817	4.0	7.42	1841	708

GEOLOGY & SUB-SURFACE STRATIFICATION

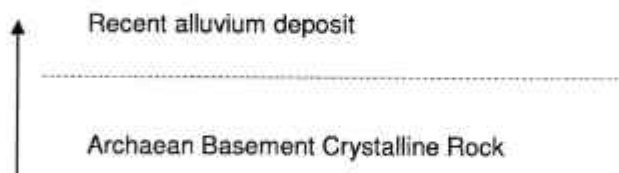
3.0 Preamble:

Geotechnical investigation carried out at a specific site provides location specific sub surface characteristics based on which the design of sub structures/foundations is generally carried out. However, the macro-level understanding of the sub surface is also needed for a comprehensive understanding of the sub structure/foundation response to naturally super imposed loads like earthquake forces etc., The macro level understanding of the sub surface is better provided through the knowledge of the Geology of the region. Since, it is beyond the scope of the present study to carry out geological investigation to establish the geology of the study region; published data are presented below along with the sub surface stratification observed through the direct borehole investigation carried out at the specified locations.

3.1 Geology of the Region (based on the published data)

3.1.1 Formation Characteristics:

The present location falls under Chennai district, which can be geologically classified as hard rock formation (Charnockite of Meta igneous origin) of Archaean Rock Group, overlain by recent alluvium deposits. The entire area is mostly covered by recent alluvium on the site. The rocks present in this site are of Archaean age undergone weathering to variable extent. The thickness of alluvium deposit is around 12m meter underlain by varying degree of weathering. The present site is Neelankarai village, Sholinganallur Taluk, geologically it is classified as recent alluvium deposits consisting of Sandy Silty Clay/Clayey Silty Sand, which is underlying by varying degree of weathering and basement rock.



3.2 DESIGN SUB SOIL PROFILE: (from Foundation Engineering Application)

The sub soil characteristics obtained at the test location are further processed to arrive at the design soil parameters required for the design of sub structure using the following shear strength correlations with respect to the Standard Penetration Test Values of different layers.

- For Coarse Grained Material, Ref. IS: 6403 to estimate Angle of Shearing Resistance (Reproduced and shown in Fig.A1).
- For Fine Grained Material, Ref. Terzaghi & Peck, 1948, to estimate Unconfined Compressive Strength (Reproduced and shown in Fig.A2).

Based on the above, the average design soil characteristics are given below:

REFERENCE BORE HOLE-BH:					01	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.50	2.50	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.50	4.00	1.50	Clayey Silty Sand	Greyish Black	1	Very Loose	-	12	-	19.76
3	4.00	12.00	8.00	Silty Sand	Greyish Black	2	Very Loose	-	13	-	19.91
4	12.00	13.00	1.00	Completely Weathered Rock	Brownish Grey	>100	Very Dense	-	21	-	42.5
5	13.00	16.50	3.50	Highly Weathered Rock	Brownish Grey	CRR-5%,4% & 10% RQD-0%					
6	16.50	19.00	2.50	Moderately Weathered Rock	Greyish Black	CRR-15% to 45%, RQD-26%					

REFERENCE BORE HOLE-BH:					02	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.20	2.20	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.20	5.00	2.80	Silty Caly	Brownish Grey	1	Very Loose	-	12	-	19.76
3	5.00	12.00	7.00	Silty Sand	Grey	2	Very Loose	-	13	-	19.91
4	12.00	18.00	6.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
5	18.00	21.00	3.00	Moderately Weathered Rock	Brownish Grey	CRR-35% & 45% RQD-20%					
6	21.00	22.00	1.00	Slightly Weathered Rock	Greyish Black	CRR-62%, RQD-40%					

REFERENCE BORE HOLE-BH:					03	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.20	2.20	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.20	10.00	7.80	Silty Sand	Grey	1	Very Loose	-	12	-	19.76
3	10.00	19.50	9.50	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
4	19.50	22.00	2.50	Moderately Weathered Rock	Greyish Black	CRR-15% & 27% RQD-10%					
5	22.00	23.00	1.00	Slightly Weathered Rock	Greyish Black	CRR-52%, RQD-30%					

REFERENCE BORE HOLE-BH:					04	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.20	2.20	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.20	4.00	1.80	Sandy Silty Caly	Brownish Grey	1	Very Loose	-	12	-	19.76
3	4.00	10.00	6.00	Silty Sand	Grey	2	Very Loose	-	13	-	19.91
4	10.00	12.00	2.00	Silty Sand	Greyish Black	12	Medium Dense	-	16	-	30.6
5	12.00	14.00	2.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
6	14.00	17.00	3.00	Moderately Weathered Rock	Brownish Grey	CRR-22% & 45% RQD-0%					
7	17.00	18.50	1.50	Slightly Weathered Rock	Greyish Black	CRR-62%, RQD-21%					



REFERENCE BORE HOLE-BH:					05	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.20	2.20	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.20	12.00	9.80	Silty Sand	Grey	1	Very Loose	-	12	-	19.76
3	12.00	17.00	5.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
4	17.00	20.00	3.00	Moderately Weathered Rock	Briwish Grey	CRR-16% & 40% RQD-0%					
5	20.00	21.00	1.00	Slightly Weathered Rock	Greyish Black	CRR-65%, RQD-24%					

REFERENCE BORE HOLE-BH:					06	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.00	2.00	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.00	4.00	2.00	Sandy Silty Caly	Brownish	2	Very Loose	-	13	-	19.91
3	4.00	5.00	1.00	Calyey Silty Sand	Brownish Grey	2	Very Loose	-	13	-	19.91
4	5.00	10.00	5.00	Silty Sand	Grey	2	Very Loose	-	13	-	19.91
5	10.00	12.00	2.00	Silty Sand	Grey	6	Loose	-	14.5	-	29.2
6	12.00	14.00	2.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
7	14.00	17.00	3.00	Moderately Weathered Rock	Brownish Grey	CRR-26% & 49%, RQD-0%					
8	17.00	18.00	1.00	Slightly Weathered Rock	Greyish Black	CRR-62%, RQD-29%					

REFERENCE BORE HOLE-BH:					07	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.00	2.00	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.00	4.00	2.00	Sandy Silty Caly	Brownish	1	Very Loose	-	12	-	19.76
3	4.00	7.00	3.00	Clayey Silty Sand	Brownish Grey	2	Very Loose	-	13	-	19.91
4	7.00	12.00	5.00	Silty Sand	Grey	2	Very Loose	-	13	-	19.91
5	12.00	14.00	2.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
6	14.00	16.50	2.50	Moderately Weathered Rock	Brownish Grey	CRR-28% & 39% RQD-7%					
7	16.50	18.50	2.00	Slightly Weathered Rock	Greyish Black	CRR-58%, RQD-20%					

REFERENCE BORE HOLE-BH:					08	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m ³	Shear Parameters	
	Top. R.L.	Bot. R.L.	Thickness							(C _u) kPa	(φ) Deg.
1	0.00	2.50	2.50	Filled Up Soil	Brownish	-	-	-	-	-	-
2	2.50	4.00	1.50	Sandy Silty Caly	Brownish	1	Very Loose	-	12	-	19.76
3	4.00	6.50	2.50	Clayey Silty Sand	Brownish Grey	2	Very Loose	-	13	-	19.91
4	6.50	12.00	5.50	Silty Sand	Grey	2	Very Loose	-	13	-	19.91
5	12.00	16.00	4.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	42.5
6	16.00	19.00	3.00	Moderately Weathered Rock	Brownish Grey	CRR-15% & 21% RQD-0%					
7	19.00	20.00	1.00	Slightly Weathered Rock	Greyish Black	CRR-54%, RQD-19%					

FOUNDATION SYSTEM

FOUNDATION SYSTEM

4.0 Preamble:

In the design of foundation system, the stress-strain compatibility of the super structure, sub structure and the bearing strata should be satisfied both individually and as a combined system. In view of this, the following data are needed for the design of foundation system, defined in terms of the type of sub structure and the bearing strata characteristics.

- The super structure characteristics along with the loading pattern on the sub structure
- The sub soil characteristics that define the required substructure configuration for a safe transfer of super-structural loads to the bearing strata

Considering the above aspects of the foundation design, the suitable type of foundation system is presented below.

4.1 Proposed Structures

An understanding of the proposed construction and the order of loads on the foundations is needed for choosing the appropriate foundation system. In the present case, the proposed structure is configured with stilt plus 5 upper floors, and is meant for residential building occupancy. For this kind of structure, the column loads could vary between 1500 kN to 2500 kN. The above-mentioned loads have no bearing on the design of either sub or super structures and are mentioned just to provide an insight to choose an appropriate foundation system with respect to subsoil conditions.

4.2 Foundation System

For the kind of proposed structure and the sub soil conditions, it is not possible to adopt any kind of open foundation system from both shear and settlement considerations. Hence, it is advisable to adopt deep pile foundation system.

The piles can be installed by drilling with direct mud circulation technique (**Bored Cast In-situ Piles**) and the recommended safe load carrying capacity of bored cast in-situ piles in compression, tension and lateral for different depth and diameters is worked out as per IS 2911-Part-I-Section-2 and are presented in Table 4.1.

Typical computations are presented in Annexure



Table:-4.1 Recommended Safe Load Carrying Capacities of Bored Cast-in Situ Piles with Rock Socketing

Sl.No	Reference Bore hole No.	Length of Pile below E.G.L	Assumed Length of Cut-Off Below E.G.L	Dia.of Pile in (mm)	Rock Socket	Depth of Rock Socketing (m)	Total Length of Pile (m)	Length of Pile Below Cutoff (m)	SAFE LOAD CARRYING CAPACITY (kN)		
									Vertical Load Carrying Capacity	Pull Out Capacity	Lateral Load Carrying Capacity
1	BH-04, BH-06 & BH-07	14.0	1.0	500	1D	0.5	14.5	13.5	1000	250	10
2				550		0.6	14.6	13.6	1100	300	14
3				600		0.6	14.6	13.6	1400	350	15
4				650		0.7	14.7	13.7	1600	450	18
5				750		0.8	14.8	13.8	2100	550	20
6				800		0.8	14.8	13.8	2300	600	25
7				900		0.9	14.9	13.9	2700	800	30
1	BH-01 to BH-03, BH-05 & BH-08	16.0	1.0	500	1D	0.5	16.5	15.5	1000	325	12
2				550		0.6	16.6	15.6	1200	350	14
3				600		0.6	16.6	15.6	1450	450	16
4				650		0.7	16.7	15.7	1700	500	18
5				750		0.8	16.8	15.8	2200	650	23
6				800		0.8	16.8	15.8	2500	700	25
7				900		0.9	16.9	15.9	2800	850	31

D=Diameter of the Pile

Note:

1.0 As per IS:14593 Table-1.0 Suggested Minimum Length of Socket (Clause 6.5.1) Sound relatively homogeneous rock igneous rock including including granite, gneiss 1D to 2D. In the present project site is igneous rock formation we recommended socket length 1D.

2.0 The above load carrying capacities are valid only recommended socket length should be achieved.

3.0 The theoretical load carrying estimates of piles shall be confirmed by conducting pile loads tests as per the guide lines laid down in IS: 2911-Part-IV.

RECOMMENDATIONS

RECOMMENDATIONS

6.0 Recommendation for Deep pile foundation system:

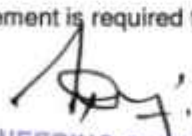
- ❖ If deep pile foundation system adopt, Bored Cast in situ piles are recommended as the suitable foundation system.
- ❖ The allowable safe load carrying capacities as per IS 2911-Part-I-Section-2 (2010) for different diameters of piles with two different approaches are given in Table-4.1 can be adopted as provisional design loads.
- ❖ As the load carrying capacity of piles not only depends upon the sub soil properties, but also depends on the care and experience of installation piles.
- ❖ The theoretical load carrying estimates of piles shall be confirmed by conducting pile loads tests as per the guide lines laid down in IS: 2911-Part-IV.
- ❖ The boring shall be carried out using direct mud circulation prepared out of sodium bentonite.
- ❖ After reaching the borehole termination depth, the borehole shall be cleaned using mud circulation for a minimum period of 30min or till the return mud is relatively clear of soil particles.
- ❖ After ensuring the borehole is clean, the tremie pipe shall be lowered and concrete can be done.

6.1 Construction method statement of pile foundation:

- ❖ For the bored cast in situ piles, a guide casing of 6.0m to 8.0m length can be adopted
- ❖ The mud used shall be made out of sodium bentonite with minimum free swell index of more than 300% and liquid limit more than 100%. The silt content in bentonite shall not more than 5%.
- ❖ The mud was prepared using sodium bentonite with a density of 1.10 to 1.15 g/cc.

6.2 General Recommendation:

- ❖ Since, chlorides and sulphates are well within the permissible limits, no special steel or cement is required for the construction of footings


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6.3 Special Recommendations

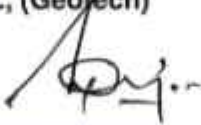
- ❖ Since, the sub soil strata are very soft silty clay and very loose silty sand/clayey sand layer between 2.0 to 12.0m depth below ground level. The loose layer will affect when the pile boring of sub soil is necking and bulging factor upon the installation of pile, due to Lateral soil expansion. Hence, in order to assure quality of the pile, it is ideal to carryout pile integrity test on all piles.

For Geo Engineering Consultants, Chennai



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ANNEXURE



ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES														As Per IS:2911-(P-I,S-2)-2010				
Type of Pile				Bored		Diameter of Pile				Length of Pile below E.G.L.(m)			14		Excluding rock socket depth			
Reference Bore Hole				BH-6						600			mm		Surcharge Pressure		0	
Layer No.	Layer Thk. (m)			Type of Strata	Ave. SPT	(γ) kN/m ³		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q _f) kN			
	Top. R.L.	Bot. R.L.	Thickness			of Layer	Ave. upto Layer	(C _u) kPa	(φ) Deg.	At top of Layer	At Bot. of Layer	At Mid. of Layer						
1	0	1	1	Cut-Off Level for single basement floor														
2	1	2	1.0	Sand	1	12.0	12.0	-	19.8	0.0	2.0	1.0	-	1.0	q _f	2	-0.7	
3	2	4	2.0	Clay	1	13.5	12.8	7	-	2.0	9.0	5.5	1.0	-	q _f	3	26.4	
4	4	12	8.0	Sand	2	13.0	13.3	-	19.9	9.0	33.0	21.0	-	1.0	q _f	4	114.7	
5	12	14	2.0	Weathered Rock	60	20.5	16.8	-	42.5	33.0	54.0	43.5	-	1.5	q _f	5	225.6	
Summation of Positive Skin Resistance (kN) Q _f = 366.75																		
Summation of Negative Skin Resistance (kN) -Q _f = -0.68																		



Computation of End Bearing Resistance and Socketing Capacity (Cole and Stroud Method)			
Type of Strata: Highly Weathered Rock	Allowable Safe Pull out Capacity	$Q_{A-pull}: Qf/3$ (kN)	122.25
Diameter of the Pile (D):	0.60 m		
Shear Strenght of Rock at Pile Tip (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010) (C_{u1}):	1200 kN/m ²		
Bearing Capacity Factor (N_c), Ref B-8, Page No.13, IS 2911/1/2-2010:	9.0		
Cross Sectional Area of Pile Toe (A_p):	0.3 m ²		
Factor of Safety (F_s):	3.0		
Safe End Bearing Capacity ($Q_{End}=C_{u1}N_cA_p/F_s$):	1017.88 kN		
Computation of Rock Socket Capacity			
Type of Strata: Highly Weathered Rock			
Diameter of the Pile (D):	0.60 m		
Shear Strenght of Rock in the Socketed Length (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010)(C_{u2}):	800 kN/m ²		
α :	0.90		
Socket Length into the rock 1D (L):	0.6 m		
Factor of Safety (F_s):	3.0		
Safe Socketing Capacity ($Q_{Soc}= \alpha C_{u2}\pi DL/F_s$):	271.43 kN		
Safe Load Capacity ($Q_s=Q_{end}+Q_{soc}+Q_{fric}$)	1412.00 kN		
Safe Load Capacity of Pull out:	393.68 kN		
Skin Resistance in Clay Layer is $\pi^*d^*T_l^*C_u^*\alpha$ Skin Resistance in Sand Layer is $\pi^*d^*T_l^*q_l^*K^*\tan(\phi)$ End Bearing Resistance in Clay Layer is $\pi^*d^2/4^*C_u^*N_c$ End Bearing Resistance in Sand Layer is $\pi^*d^2/4^*Q^*N_q$ K=Coef. Earth Pressure at Rest q_l =Effective Overburden Pressure at middle of Layer N_q =Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above		Where C_u =Undrained Shear Strength of Clay ϕ =Angle of Shearing Resistance N_c =Bearing Capacity Factor = 9 Q (l.e) Effective Overburden Pressure at pile tip=Effective height of overburden X (γ 10) d =Dia. Of Pile α =Adhesion Factor T_l =Thickness of Layer	



ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES														As Per IS:2911-(P-I,S-2)-2010			
Type of Pile				Bored		Diameter of Pile			Length of Pile below E.G.L.(m)			16		Excluding rock socket depth			
Reference Bore Hole				BH-3					500	mm	Surcharge Pressure		0	kPa			
Layer No.	Layer Thk. (m)			Type of Strata	Ave. SPT	(γ) kN/m ³		Shear Parameters		Effective Overburden Pressure (kPa)			Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q _f) kN		
	Top. R.L.	Bot. R.L.	Thickness			of Layer	Ave. upto Layer	(C _u) kPa	(φ) Deg.	At top of Layer	At Bot. of Layer	At Mid. of Layer					
1	0	1	1	Cut-Off Level for single basement floor													
2	1	2.2	1.2	Sand	1	12.0	12.0	-	19.8	0.0	2.4	1.2	-	1.0	qf	2	-0.8
3	2.2	10	7.8	Sand	1	12.0	12.0	-	19.8	2.4	18.0	10.2	-	1.0	qf	3	44.9
4	10	12	2.0	Sand	2	13.0	12.5	-	19.9	18.0	24.0	21.0	-	1.0	qf	4	23.9
5	12	16	4.0	Weathered Rock	60	20.5	16.8	-	42.5	24.0	66.0	45.0	-	1.5	qf	5	389.0
Summation of Positive Skin Resistance (kN) Q _f = 457.84																	
Summation of Negative Skin Resistance (kN) -Q _f = -0.81																	



Computation of End Bearing Resistance and Socketing Capacity (Cole and Stroud Method)			
Type of Strata: Highly Weathered Rock	Allowable Safe Pull out Capacity	$Q_{A-pull}: Qf/3$ (kN)	152.61
Diameter of the Pile (D):	0.50 m		
Shear Strenght of Rock at Pile Tip (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010) (Cu_1):	1200 kN/m ²		
Bearing Capacity Factor (N_c), Ref B-8, Page No.13, IS 2911/1/2-2010:	9.0		
Cross Sectional Area of Pile Toe (A_p):	0.2 m ²		
Factor of Safety (F_s):	3.0		
Safe End Bearing Capacity ($Q_{End}=C_{u1}N_cA_p/F_s$):	706.86 kN		
Computation of Rock Socket Capacity			
Type of Strata: Highly Weathered Rock			
Diameter of the Pile (D):	0.50 m		
Shear Strenght of Rock in the Socketed Length (Grade-D, Ref Figure-3, Page No. 13, IS 2911/1/2-2010)(Cu_2):	800 kN/m ²		
α :	0.90		
Socket Length into the rock 1D (L):	0.5 m		
Factor of Safety (F_s):	3.0		
Safe Socketing Capacity ($Q_{Soc}=\alpha C_{u2}\pi DL/F_s$):	188.50 kN		
Safe Load Capacity ($Q_s=Q_{end}+Q_{soc}+Q_{fric}$)	1048.00 kN		
Safe Load Capacity of Pull out:	341.11 kN		
Skin Resistance in Clay Layer is $\pi \cdot d \cdot T_1 \cdot C_u \cdot \alpha$ Skin Resistance in Sand Layer is $\pi \cdot d \cdot T_1 \cdot q_1 \cdot K \cdot \tan(\phi)$ End Bearing Resistance in Clay Layer is $\pi \cdot d^2/4 \cdot C_u \cdot N_c$ End Bearing Resistance in Sand Layer is $\pi \cdot d^2/4 \cdot Q \cdot N_q$ K =Coef. Earth Pressure at Rest q_1 =Effectiv Overburden Pressure at middle of Layer N_q =Bearing Capacity Factor, Ref. Fig.1 of IS: Code Refered above		Where C_u =Undrained Shear Strength of Clay ϕ =Angle of Shearing Resistance N_c =Bearing Capacity Factor = 9 Q (I.e) Effective Overburden Pressure at pile tip=Effective height of overburden X ($\gamma \cdot 10$) d =Dia. Of Pile α =Adhesion Factor T_1 =Thickness of Layer	



LATERAL LOAD CARRYING CAPACITY OF BORED CAST- SITU PILES

Reference Bore Hole : BH-03

1 Geometrical Data

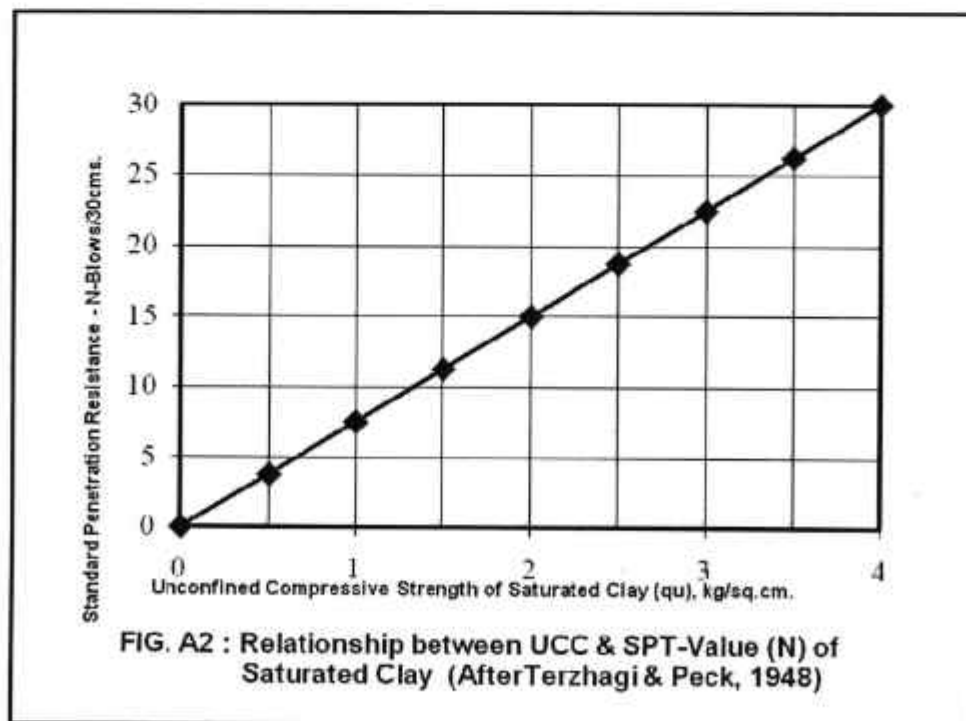
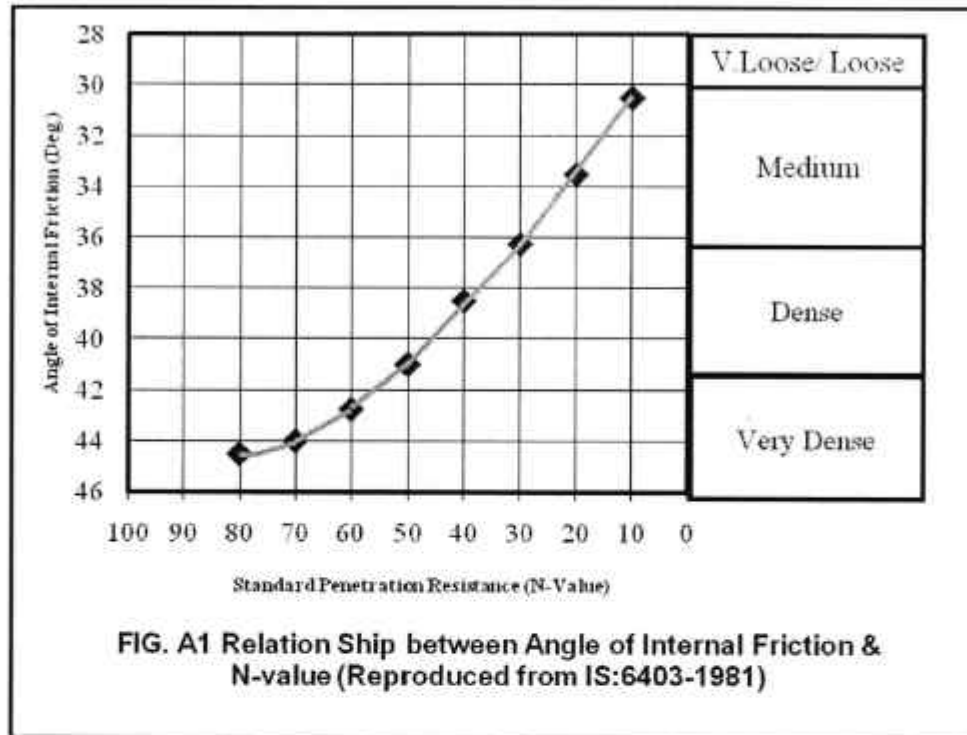
Type of Pile Head Considered	Fixed	
Diameter of Pile (d)	0.60	m
Free standing Length of Pile (e)	0	m
Length of Pile below E.G.L (Le)	16.0	m
Cut-Off Level From E.G.L	1.0	
Length of Pile below Cut-Off Level (Le)	15.0	m
Grade of Concrete (M)	25	MN/m ²
Young's Modulus of Concrete (E)	25000000	kN/m ²
Moment of Inertia (I)	0.006362	m ⁴

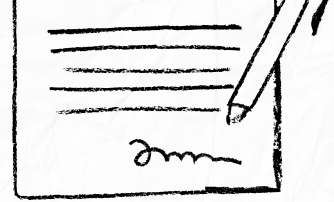
2 Determination of Depth of Fixity

Type of Soil Strata	Sand	
Ground Water Condition	Submerged	
Average Design SPT "N" Value	1	
$T = (EI/nh)^{1/5}$		
(n can be read as η in the above and below equation in case of Sand)		
nh=	200	kN/m ³
In Case of Sand	-	kN/m ²
T=	3.80	
L1/T	0.00	
L1/T	2.20	
Depth of Fixity below Cut off (z _f)	8.37	m

3 Determination of Lateral Load and Moment Carrying Capacity for 0.005 m Lateral Deflection:

Allowable Lateral Deflection (Y)	0.005	m
Lateral Load Carrying Capacity (H) = $Y \cdot 12EI / (e + z_f)^3$	16.30	kN
Recommended Design Lateral Load carrying Capacity	16	kN
Fixed End Moment, $M_F = H(e + z_f)/2$	68	
Reduction Factor (L ₁ /T)	0.83	m
Actual Moment (Fixed End Moment/Reduction Factor), M_F	57	kN-m





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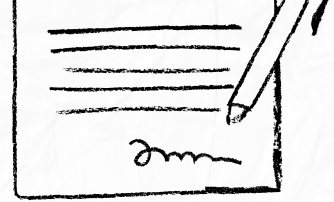
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Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter



Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer



Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator



Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary



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