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PROJECT NAME

PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + 5 UPPER FLOORS)
COMPRISED IN SF NOS: 398/2A2, 444/3A & 444/6 AT KEERANATHAM,
ANNUR TALUK, COIMBATORE, TAMILNADU.

CLIENT NAME

CASA GRANDE COIMBATORE LLP,
COIMBATORE.

PROJECT ADDRESS

CASAGRAND KEERANATHAM,
SF NOS: 398/2A2, 444/3A & 444/6 ANNUR TALUK,
COIMBATORE.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

PROJECT NO: GEC-JC-GT-4084/2022-2023

DATE: 16/11/2022



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REPORT TEXT

INTRODUCTION

1.0 Project Information Matrix

Nature of project : Proposed Residential Building (Stilt+5 Upper Floors)
 Project Owner : **Casa Grande Coimbatore LLP,**
 Project Location : Keeranatham, Coimbatore, Tamil Nadu.
 Job Code : GEC-JC-GT-4084

1.1 Scope of Work

1.1.1 Field Work

- ❖ Conducting seven soil investigation bore holes of 150 mm & NX diameter up to 6.0m 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:

Seven 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 2.7. The graphical representation of grain size distribution curve for the representative samples in each bore is presented in Fig. 2.8 to 2.14.

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 2.7. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig.2.15 to 2.20.

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 - 2.8.

2.3 Summary:

The seven 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 2.7.

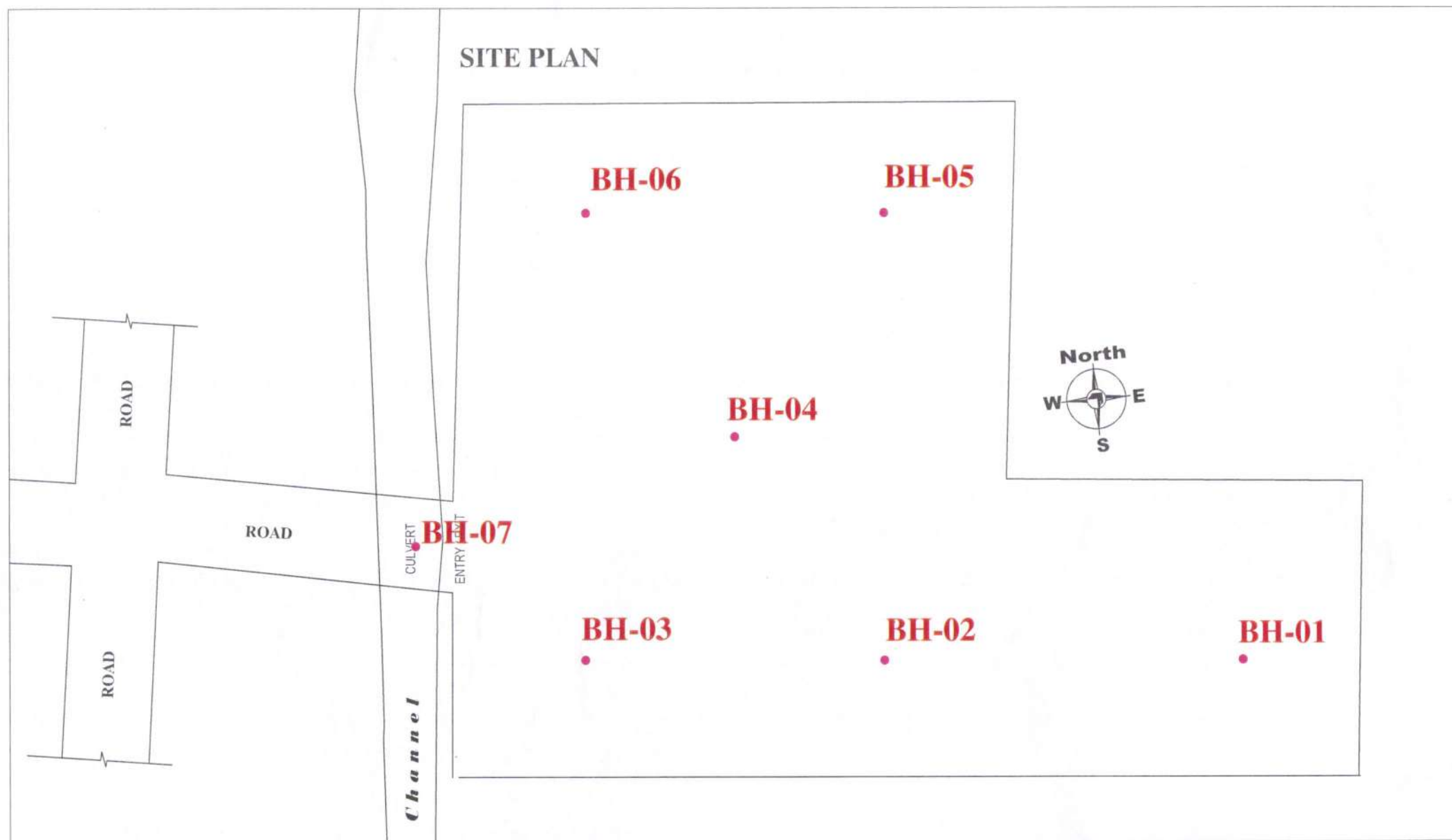


FIG.1: THE SITE PLAN SHOWING THE BOREHOLE LOCATIONS

SOIL PROFILE

GEC		SITE INVESTIGATION RECORD										BORE HOLE No. BH-01							
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT AT COIMBATORE										SHEET 1 OF 1							
LOCATION		Keeranatham, Coimbatore		MACHINE No.		CR-01		CHAINAGE (m)		-		DIA OF BORE HOLE 150mm NX							
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE START DATE 28/10/2022							
JOB CODE		JC-GT-4080		FLUSHING MEDIUM		Bentonite		E -		BORE END DATE 29/10/2022		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.			SPT 'N' Value	Depth	No.	Type	RL (m)	Legend	No	Depth	Geotechnical Description		
						0-15	15-30	30-45											
1 2 3 4 5 6 7 8 9 10	28/10/2022	14 57 To	SC	-	-	07	13	16	29	1.00	1	SS	-1.0		L1	0.5	Brown, Moist, Clayey Sand(SC) Sand-Clay mixtures		
		14 58 To	SC	-	-	19	26	31	57	1.45	2	SS	-2.0		L2	2.0	Greyish Brown, Moist, Very Stiff, Sandy Silty CLAY (CH) with Lime Particles Sandy Clay of High Plasticity		
		15 18 To	SC	-	-	SPT Hammer Rebound			>100	2.00	2	SS	-2.0		L3	3.0	Greyish Brown, Moist, Very Dense, Poorly Graded, Clayey SAND(SC) with Lime Particles Sand-Clay mixtures		
		15 19 To	SC	-	-	-	-	-	-	2.45	3	WS	-3.0		L4	3.5	Whitish, Moist, Very Dense, Poorly Graded, Silty SAND(SM) with Lime Particle Sand-Silt mixtures		
		16 00 To	DB	18	0	-	-	-	-	4.00	4	CS	-4.0			L5	6.0	White/Light Brown, Fine Grains, Massive, Highly Weathered Limestone Rock	
	16 40 To	DB	22	0	-	-	-	-	5.00	5	CS	-5.0							
	17 30 To	DB	27	0	-	-	-	-	6.00	6	CS	-6.0							
	06 30 To																		
	07 06 To																		
	29/10/2022	07 20 To																	
08 01 To																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Vinod Pradap	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Jaleel Yasin	WATER TABLE (m)	Nil	
WS - Wash Sample	DB - Diamond Bit	DATE	15/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 6 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01 Location

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-02				
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT AT COIMBATORE										SHEET		1 OF 1				
LOCATION		Keeranatham, Coimbatore		MACHINE No.		CR-01		CHAINAGE (m)		-		DIA OF BORE HOLE		150mm				
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE START DATE		29/10/2022				
JOB CODE		JC-GT-4080		FLUSHING MEDIUM		Bentonite		E -		-		BORE END DATE		29/10/2022				
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										
	29/10/2022	09:30 To 09:31	SC	-	-	7	12	19	31	1.00	1	SS	-1.0		L1	0.5	Brown, Moist, Clayey Sand(SC) Sand-Clay mixtures	
		09:39 To 09:40	SC	-	-	13	29	40	69	1.45	2	SS	-2.0		L2	2.0	Greyish Brown, Moist, Very Stiff, Sandy Silty CLAY (CH) with Lime Particles Sandy Clay of High Plasticity	
		10:10 To 10:15	SC	-	-	SPT Hammer Rebound			>100	2.45	3	WS	-2.5		L3	2.5	Greyish Brown, Moist, Very Dense, Poorly Graded, Clayey SAND(SC) with Lime Particles Sand-Clay mixtures	
		10:30 To 11:10	DB	11	0	-	-	-	-	4.00	4	CS	-4.0				White/Light Brown, Fine Grains, Massive, Highly Weathered Limestone Rock	
		11:25 To 12:20	DB	17	0	-	-	-	-	5.00	5	CS	-5.0					
		12:40 To 13:30	DB	26	0	-	-	-	-	6.00	6	CS	-6.0		L4	6.0		

CS - Core Sample	DS - Disturbed Sample	LOGGED	Vinod Pradap	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/10/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Jaleel Yasin	WATER TABLE (m)	NII	
WS - Wash Sample	DB - Diamond Bit	DATE	15/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 6 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

GEC		SITE INVESTIGATION RECORD										BORE HOLE No.		BH-03					
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT AT COIMBATORE										SHEET		1 OF 1					
LOCATION		Keeranatham, Coimbatore		MACHINE No.		CR-01		CHAINAGE (m)		-		DIA OF BORE HOLE		150mm					
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -		BORE START DATE		29/10/2022					
JOB CODE		JC-GT-4080		FLUSHING MEDIUM		Bentonite		CO-ORDINATES		E -		BORE END DATE		29/10/2022					
												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										
	29/10/2022	14	30	SC	-	-	5	7	13	20	1.00	1	SS	-1.0		L1	0.5	Brown, Moist, Clayey Sand(SC) Sand-Clay mixtures	
		14	32																
		14	40	SC	-	-	18	20	35	55	1.45	2	SS	-2.0		L2	2.0	Greyish, Moist, Very Stiff, Sandy Silty CLAY (CH) with Lime Particles Sandy Clay of High Plasticity	
		14	44																
		14	59	SC	-	-	SPT Hammer Rebound			>100	2.45	3	WS	-2.5		L3	2.5	Greyish, Moist, Very Dense, Poorly Graded, Clayey GRAVEL (GC) with Lime Particles Sand-Clay mixtures	
		15	07																
		15	20	DB	14	0	-	-	-	-	4.00	4	CS	-4.0					White, Fine Grains, Massive, Highly Weathered Limestone Rock
		16	01																
		16	16	DB	27	0	-	-	-	-	5.00	5	CS	-5.0					
		17	10																
17	25	DB	33	0	-	-	-	-	6.00	6	CS	-6.0							
18	15																		
6																			
7																			
8																			
9																			
10																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	Vinod Pradap	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/10/2022	GROUND LEVEL (m)	0.00	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Jaleel Yasin	WATER TABLE (m)	NII	
WS - Wash Sample	DB - Diamond Bit	DATE	15/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 6 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

GEC		SITE INVESTIGATION RECORD						BORE HOLE No.		BH-05								
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT AT COIMBATORE						SHEET		1 OF 1								
LOCATION		Keeranatham, Coimbatore		MACHINE No.		CR-01		CHAINAGE (m)		-								
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES		N -								
JOB CODE		JC-GT-4080		FLUSHING MEDIUM		Bentonite		E -		TOTAL DRILL DAYS								
BORE START DATE		30/10/2022		BORE END DATE		31/10/2022		DIA OF BORE HOLE		150mm								
NX																		
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	16	29	To	SC	-	-	7	10	11	21	1.00	1	SS	-1.0		L1	0.5	Brown, Moist, Clayey Sand(SC) Sand-Clay mixtures
2	16	30	To	SC	-	-	19	23	24	47	1.45	2	SS	-2.0		L2	2.0	Brownish, Moist, Very Stiff, Sandy Silty CLAY (CH) with Lime Particles Sandy Clay of High Plasticity
3	16	39	To	SC	-	-	SPT Hammer Rebound			>100	2.00	2	SS	-2.0		L3	2.8	Greyish, Moist, Dense, Poorly Graded, Clayey GRAVEL (GC) with Lime Particles Sand-Clay mixtures
4	16	41	To	SC	-	-	SPT Hammer Rebound			>100	2.45	3	WS	-2.8		L3	2.8	Greyish, Moist, Dense, Poorly Graded, Clayey GRAVEL (GC) with Lime Particles Sand-Clay mixtures
5	17	00	To	SC	-	-	SPT Hammer Rebound			>100	2.75	3	WS	-2.8		L3	2.8	Greyish, Moist, Dense, Poorly Graded, Clayey GRAVEL (GC) with Lime Particles Sand-Clay mixtures
6	17	10	To	DB	13	0	SPT Hammer Rebound			>100	4.00	4	CS	-4.0		L4	6.0	White/Light Brown, Fine Grains, Massive, Highly Weathered Limestone Rock
7	17	54	To	DB	17	0	SPT Hammer Rebound			>100	5.00	5	CS	-5.0		L4	6.0	White/Light Brown, Fine Grains, Massive, Highly Weathered Limestone Rock
8	06	55	To	DB	17	0	SPT Hammer Rebound			>100	6.00	6	CS	-6.0		L4	6.0	White/Light Brown, Fine Grains, Massive, Highly Weathered Limestone Rock
9	07	47	To	DB	24	0	SPT Hammer Rebound			>100								
10	08	00	To	DB	24	0	SPT Hammer Rebound			>100								
11	08	51	To	DB	24	0	SPT Hammer Rebound			>100								

CS - Core Sample	DS - Disturbed Sample	LOGGED	Vinod Pradap	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	31/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Jaleel Yasin	WATER TABLE (m)	Nil	
WS - Wash Sample	DB - Diamond Bit	DATE	15/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 6 m depth below E.G.L

FIG.2.5 Sub Soil Profile at BH-05 Location

GEC		SITE INVESTIGATION RECORD						BORE HOLE No. BH-06									
PROJECT NAME		PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT AT COIMBATORE						SHEET 1 OF 1									
LOCATION		Keeranatham, Coimbatore		MACHINE No.		CR-01		CHAINAGE (m)									
STRUCTURE		Stilt+5 Upper Floors		DRILLING METHOD		Rotary		CO-ORDINATES									
JOB CODE		JC-GT-4080		FLUSHING MEDIUM		Bentonite		TOTAL DRILL DAYS									
BORE START DATE		30/10/2022		BORE END DATE		30/10/2022		DIA OF BORE HOLE									
150mm		✓		NX													
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									
	12/00	To	SC	-	-	6	13	17	30	1.00	1	SS	-1.0		L1	0.5	Brown, Moist, Clayey Sand(SC) Sand-Clay mixtures
	12/02	To	SC	-	-	18	43	50	93	1.45	2	SS	-2.0		L2	2.0	Brownish, Moist, Very Stiff, Sandy Silty CLAY (CH) with Lime Particles Sandy Clay of High Plasticity
	12/11	To	SC	-	-	SPT Hammer Rebound			>100	2.45	3	WS	-3.0		L3	3.0	Brownish, Moist, Very Dense, Poorly Graded, Clayey GRAVEL (GC) with Lime Particles Sand-Clay mixtures
	12/39	To	DB	19	0	-	-	-	-	4.50	4	CS	-4.5		L4	6.0	White, Fine Grains, Massive, Highly Weathered Limestone Rock
	13/01	To	DB	28	0	-	-	-	-	6.00	5	CS	-6.0				
	13/56	To	DB														
	14/15	To															
	15/13	To															

CS - Core Sample	DS - Disturbed Sample	LOGGED	Vinod Pradap	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	30/10/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Jaleel Yasin	WATER TABLE (m)	Nil	
WS - Wash Sample	DB - Diamond Bit	DATE	15/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 6 m depth below E.G.L

FIG.2.6 Sub Soil Profile at BH-06 Location

Grain Size Distribution Curves

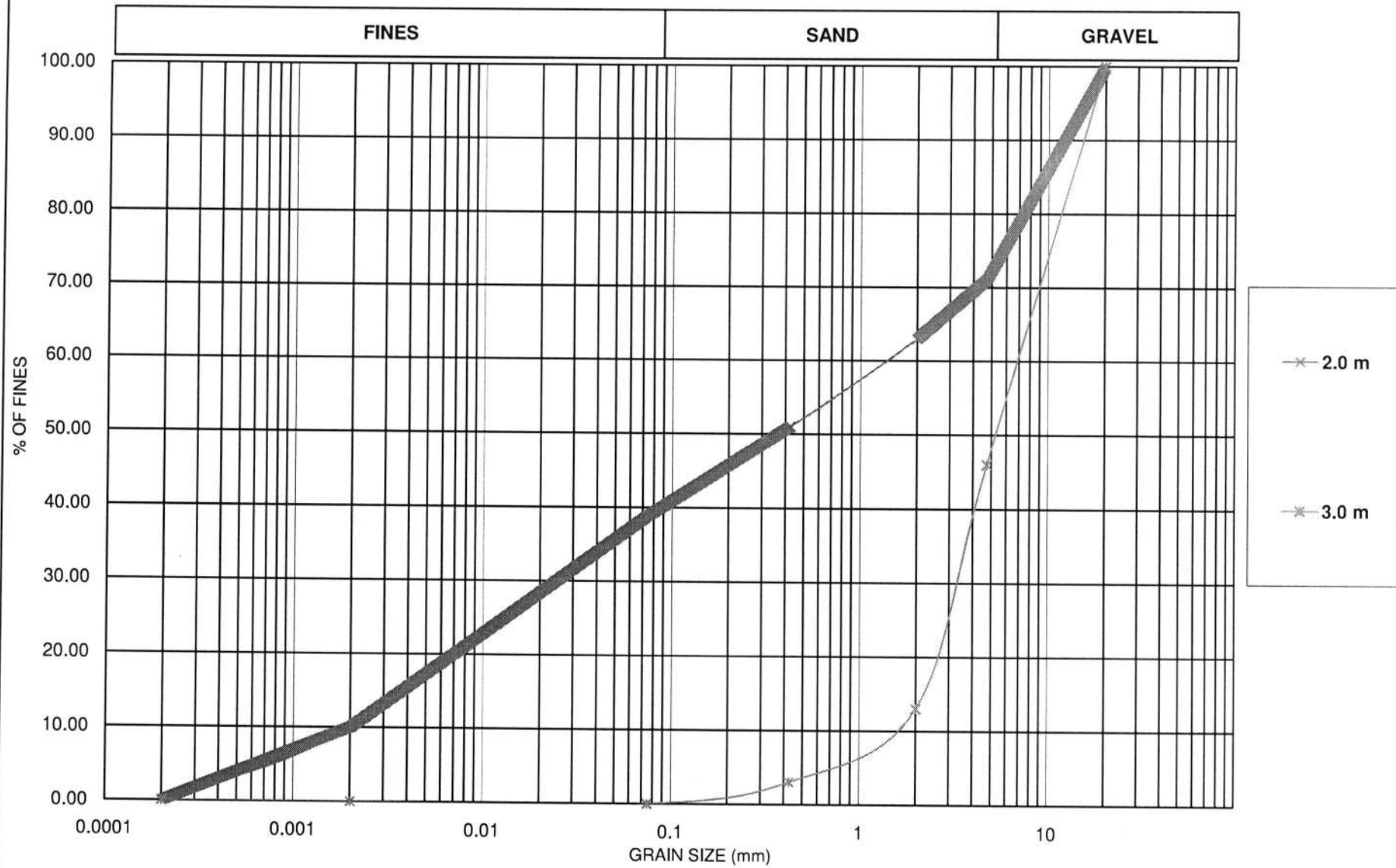


Fig. 2.8 GRAIN SIZE DISTRIBUTION CURVE - BH-01

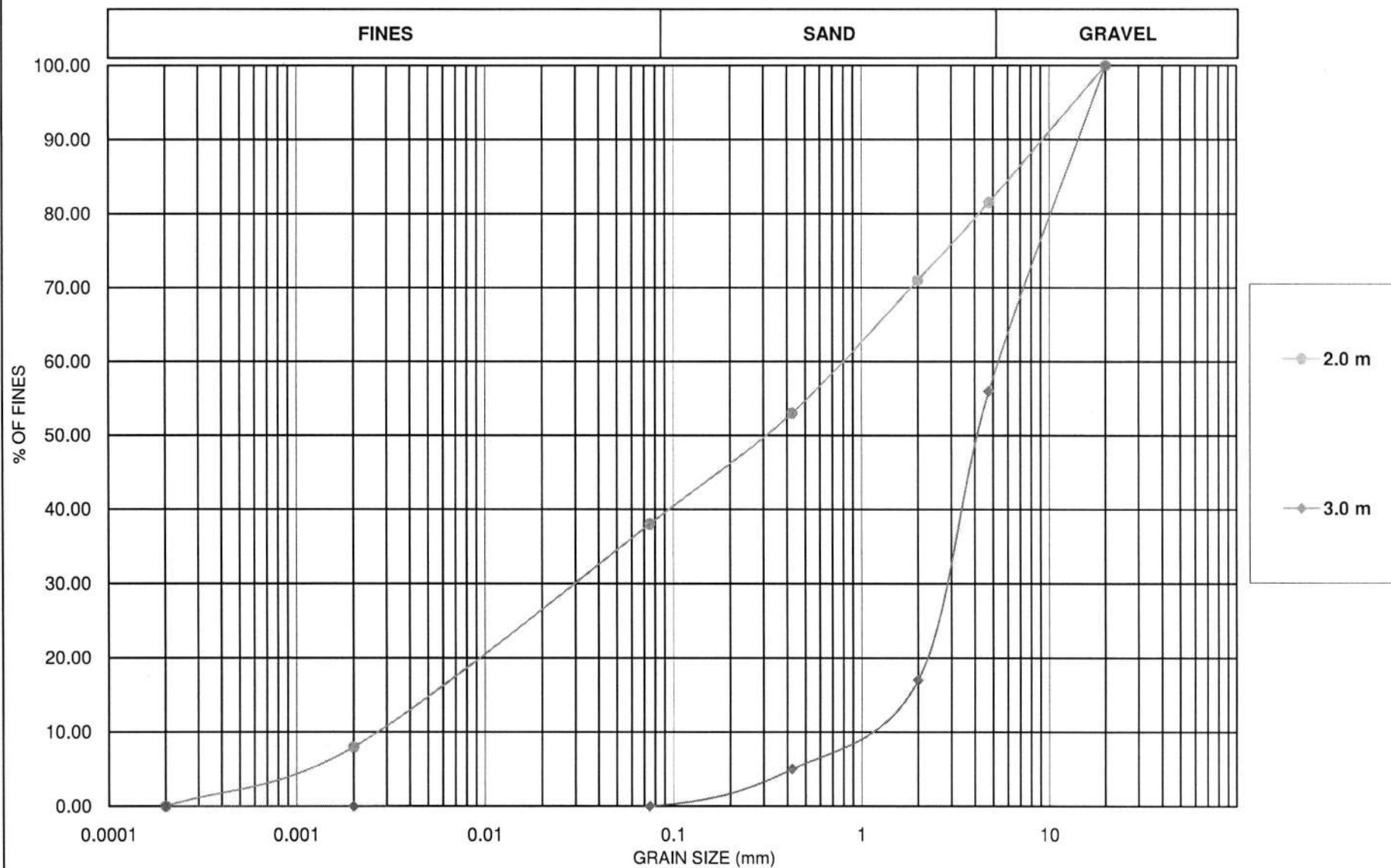


Fig. 2.9 GRAIN SIZE DISTRIBUTION CURVE - BH-02

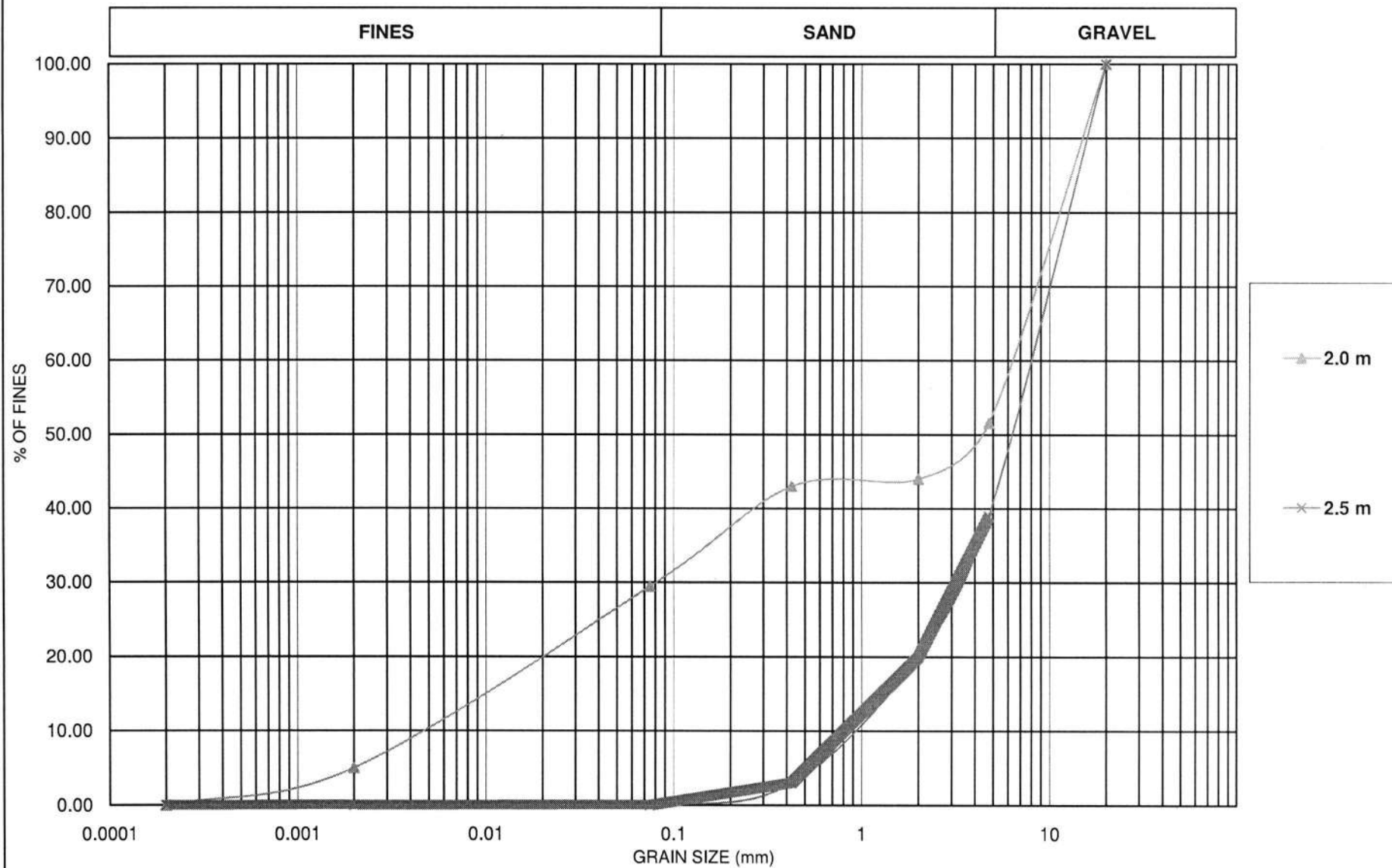


Fig. 2.10 GRAIN SIZE DISTRIBUTION CURVE - BH-03

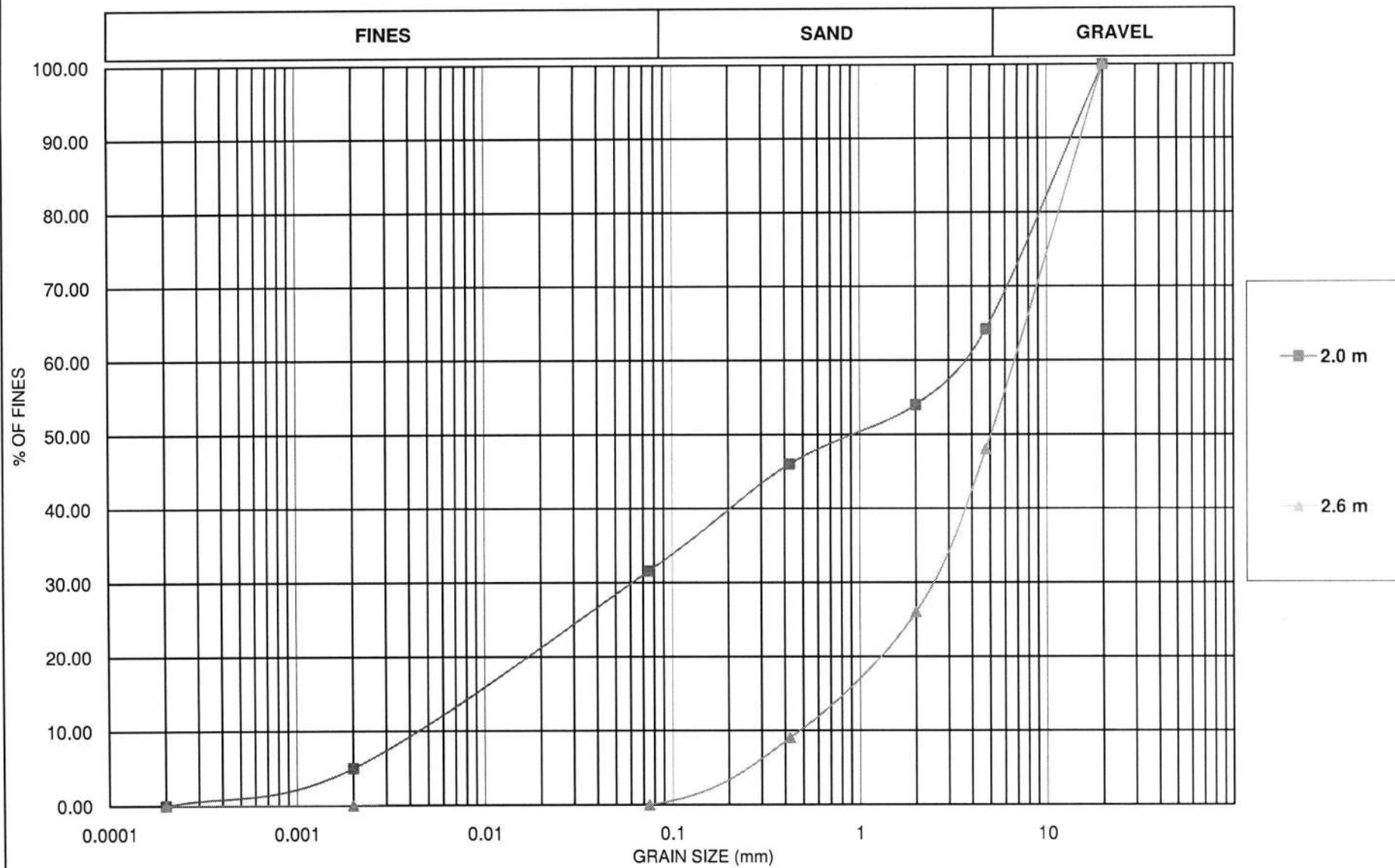


Fig. 2.11 GRAIN SIZE DISTRIBUTION CURVE - BH-04

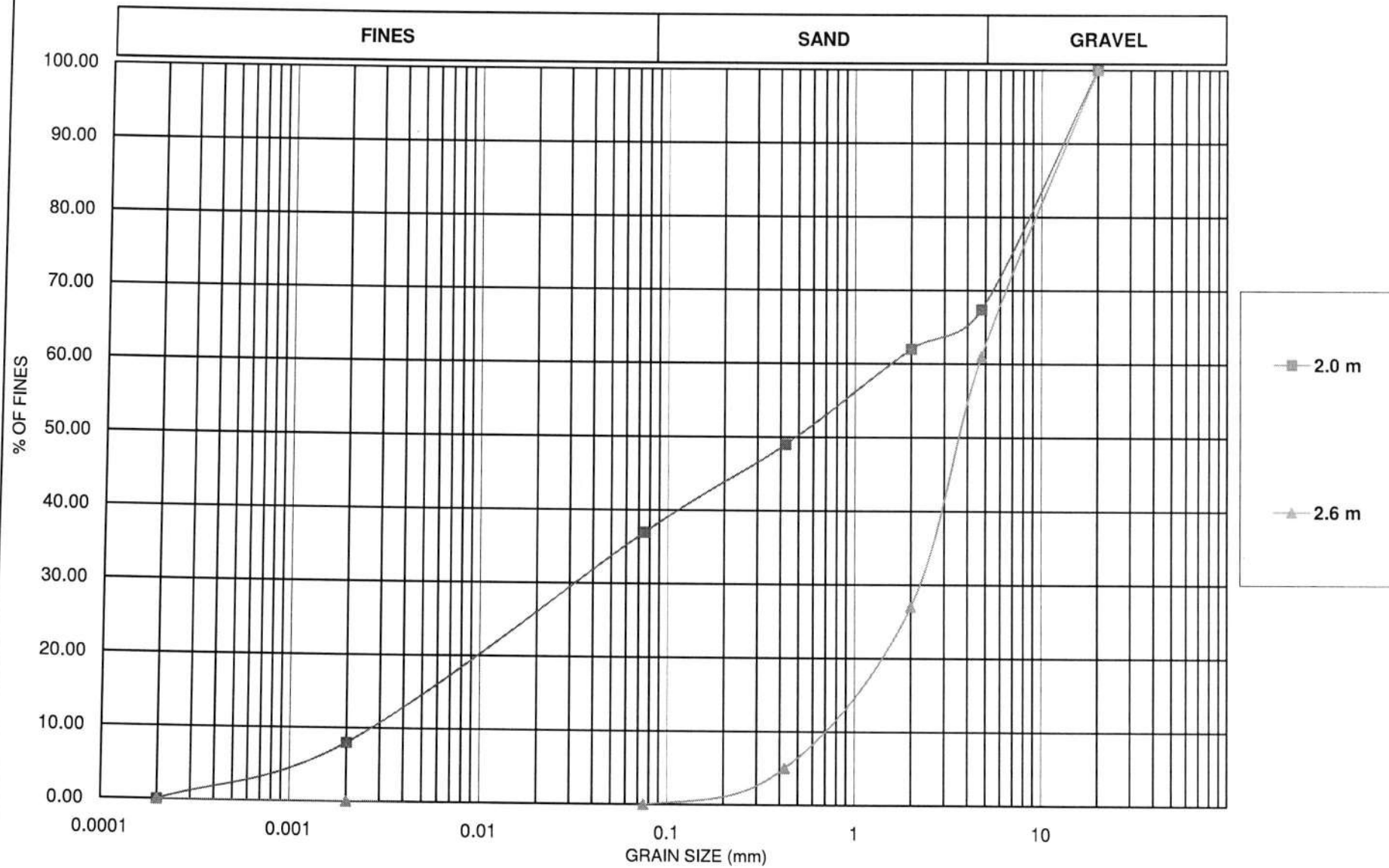


Fig. 2.12 GRAIN SIZE DISTRIBUTION CURVE - BH-05

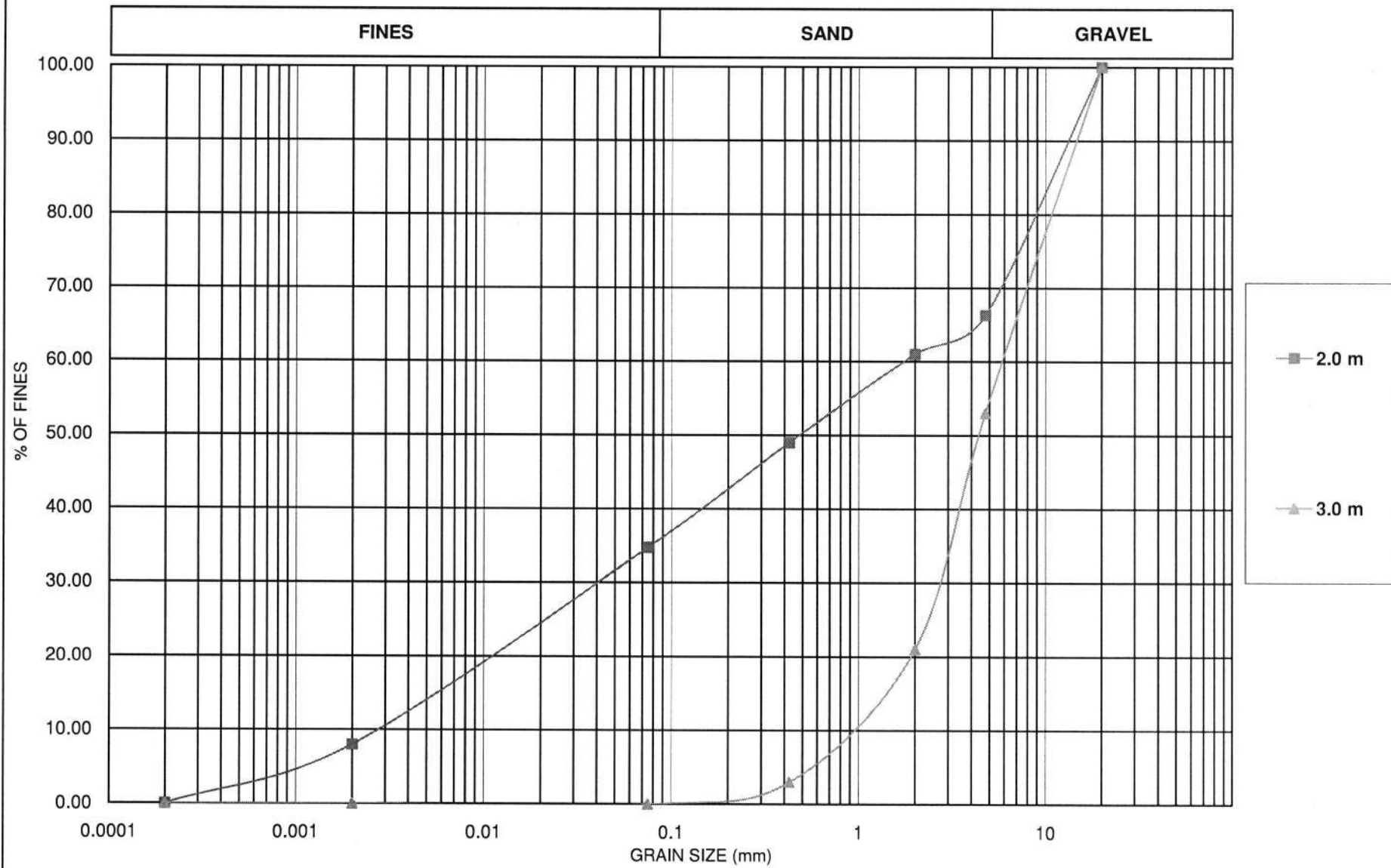
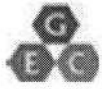


Fig. 2.13 GRAIN SIZE DISTRIBUTION CURVE - BH-06

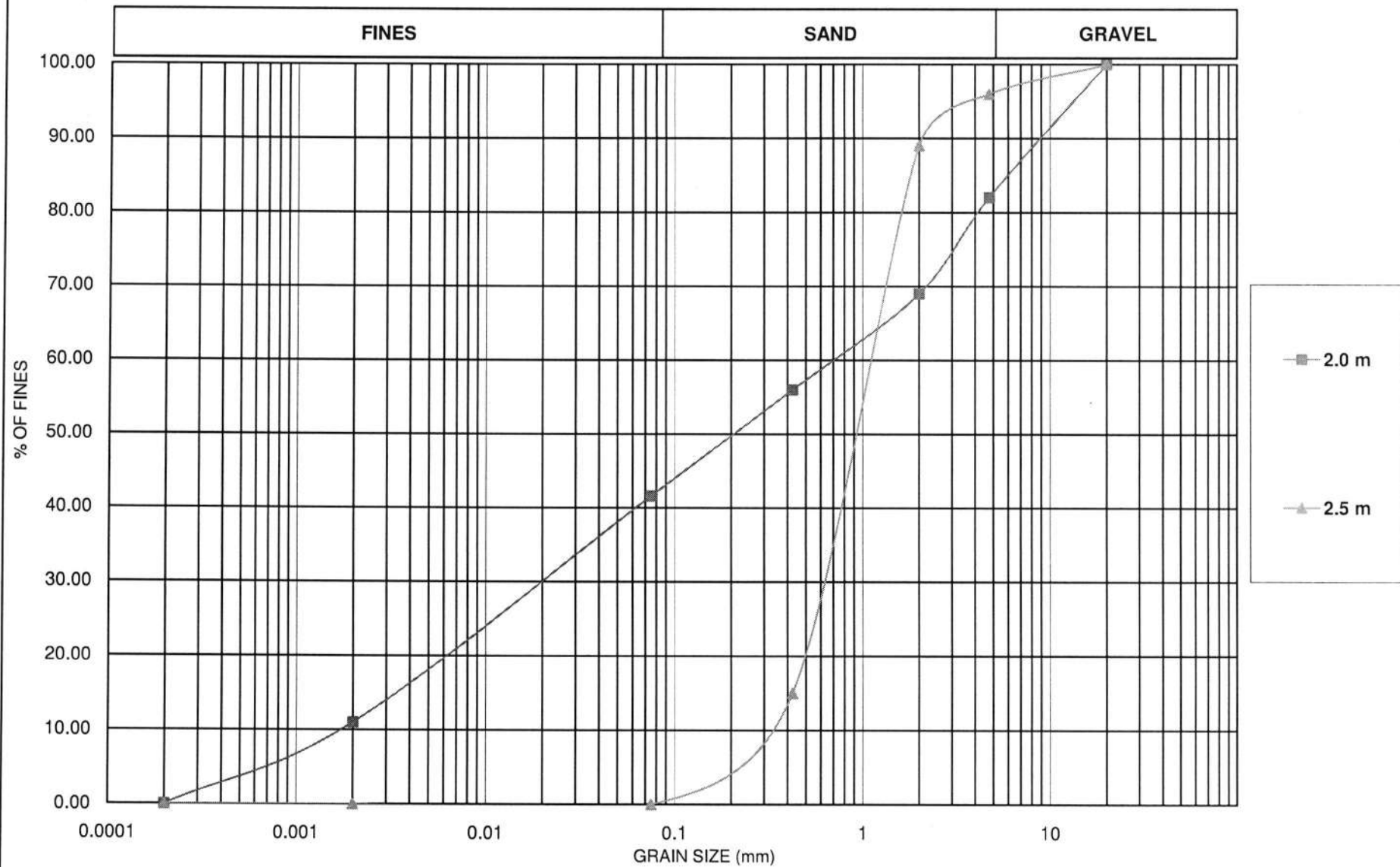


Fig. 2.14 GRAIN SIZE DISTRIBUTION CURVE - BH-07

HYDROMETER ANALYSIS CURVE

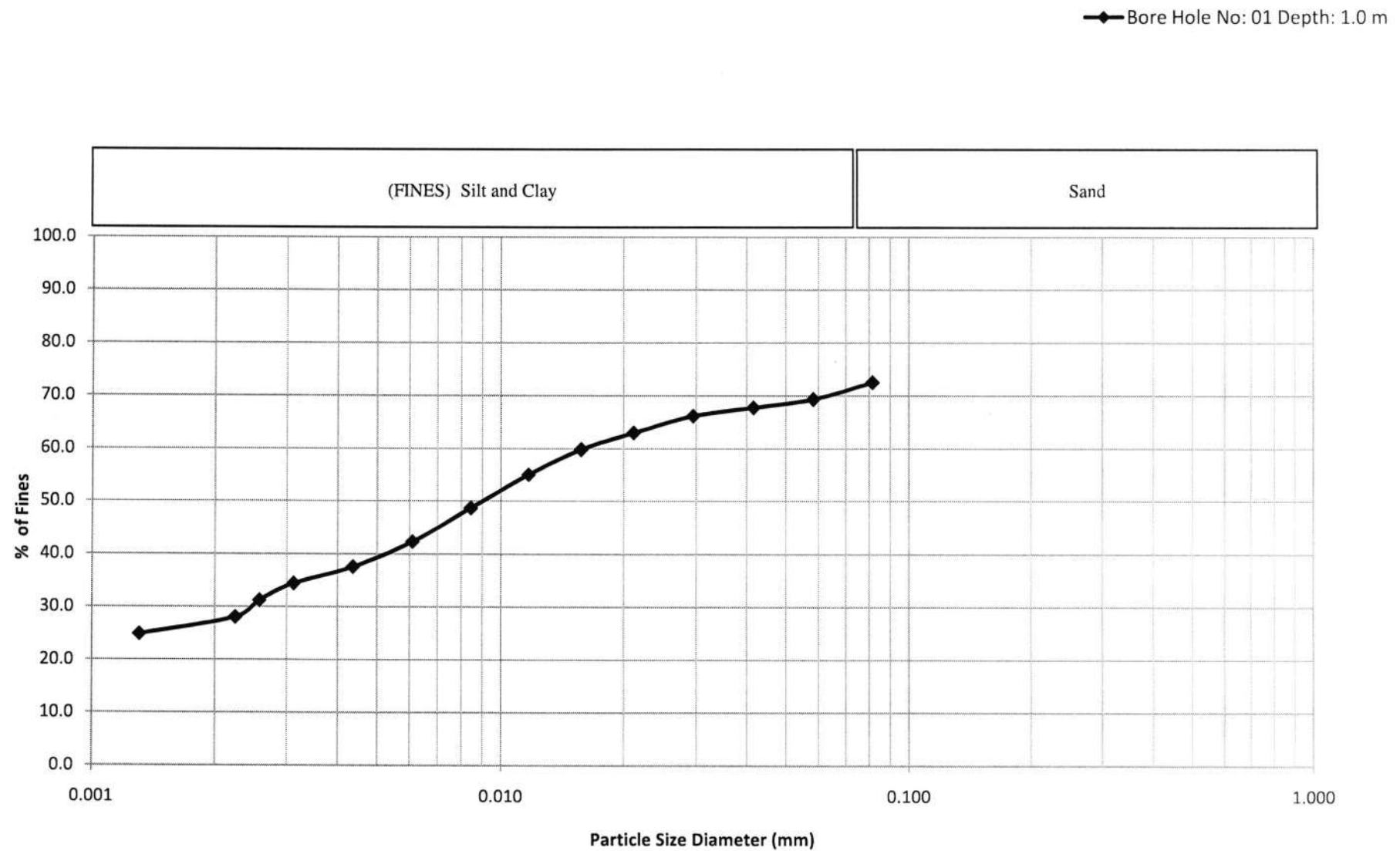


Fig 2.15 Hydrometer Analysis Master Curve

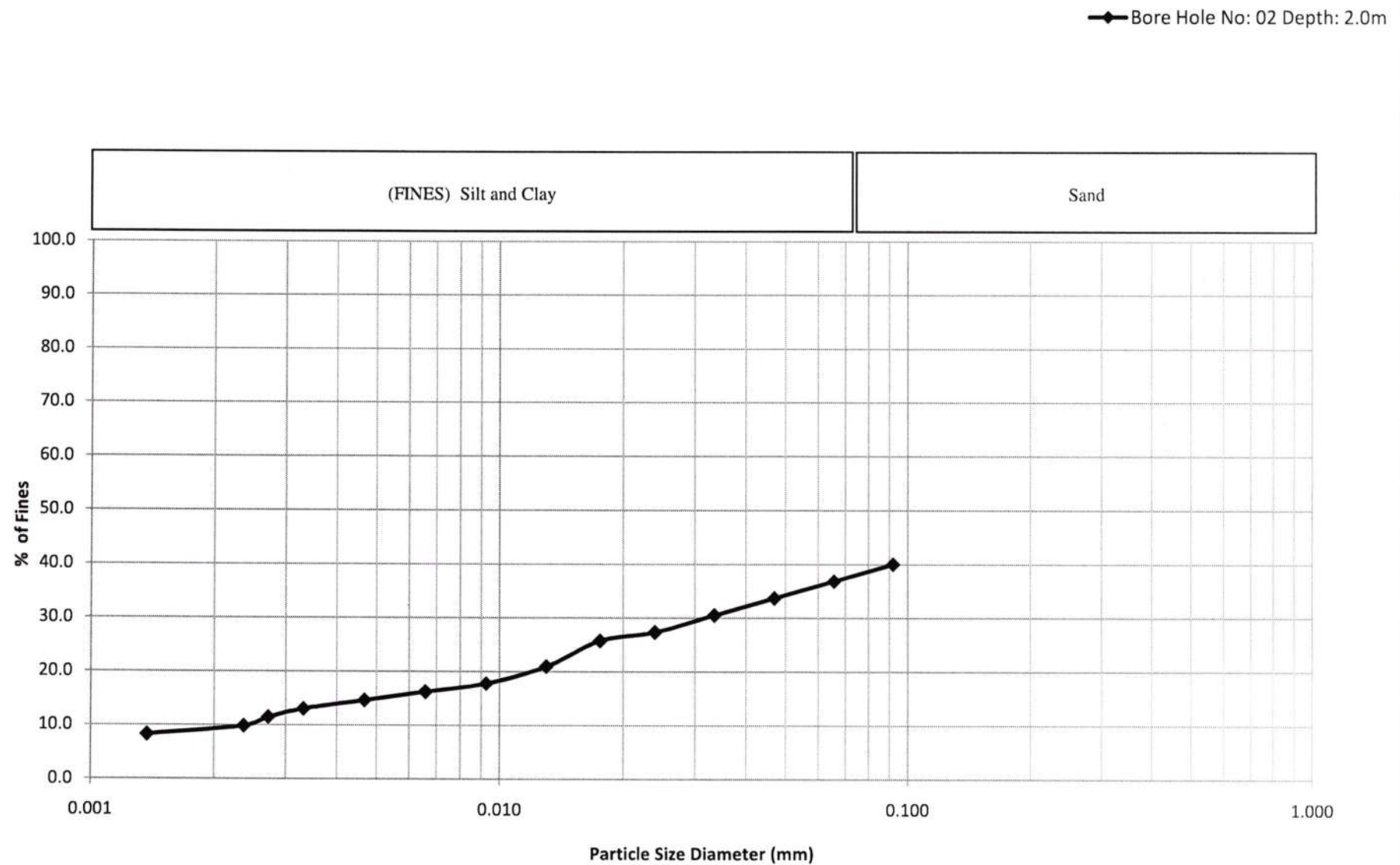


Fig 2.16 Hydrometer Analysis Master Curve

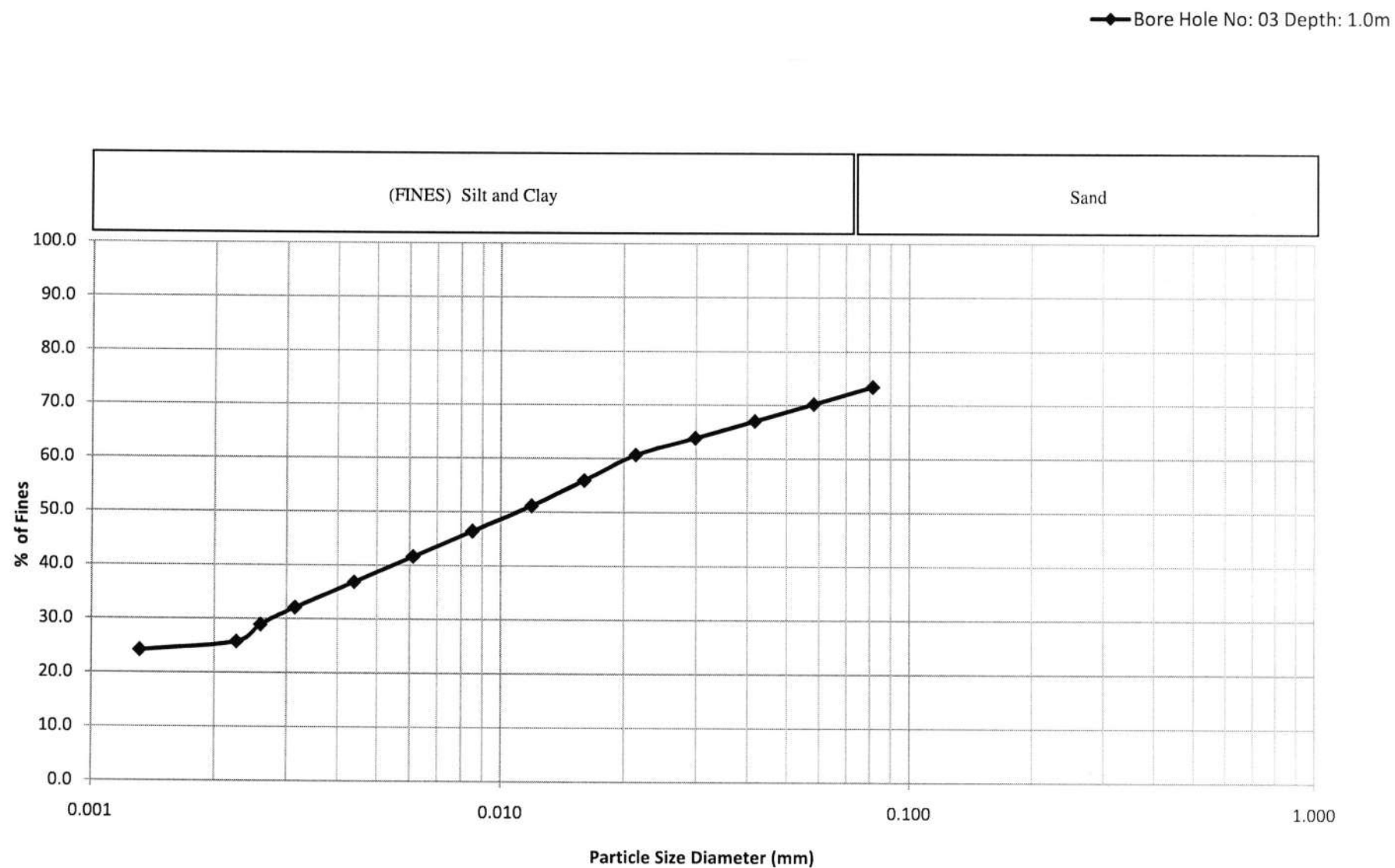


Fig 2.17 Hydrometer Analysis Master Curve

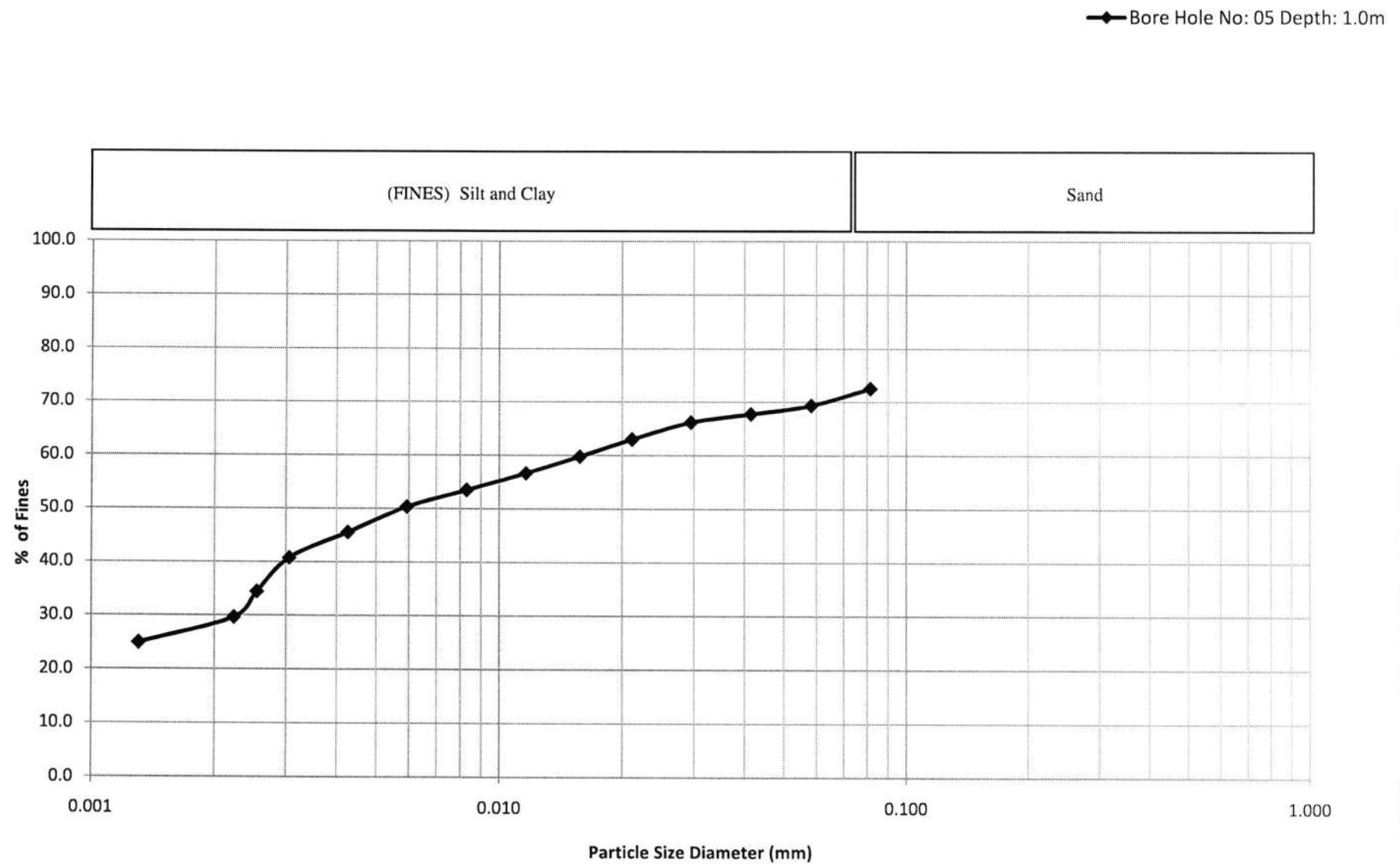


Fig 2.18 Hydrometer Analysis Master Curve

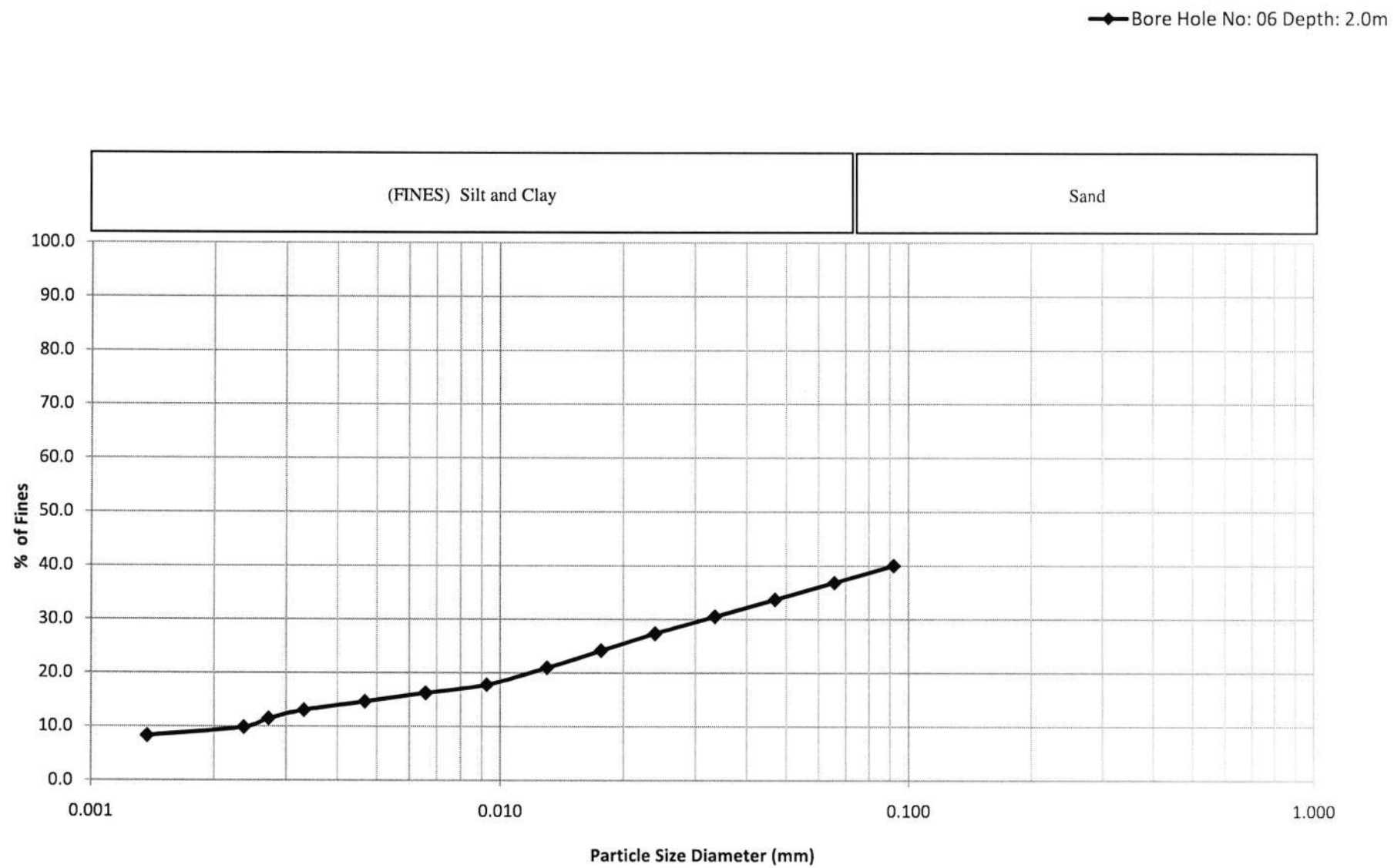


Fig 2.19 Hydrometer Analysis Master Curve



—◆— Bore Hole No: 07 Depth: 1.0m

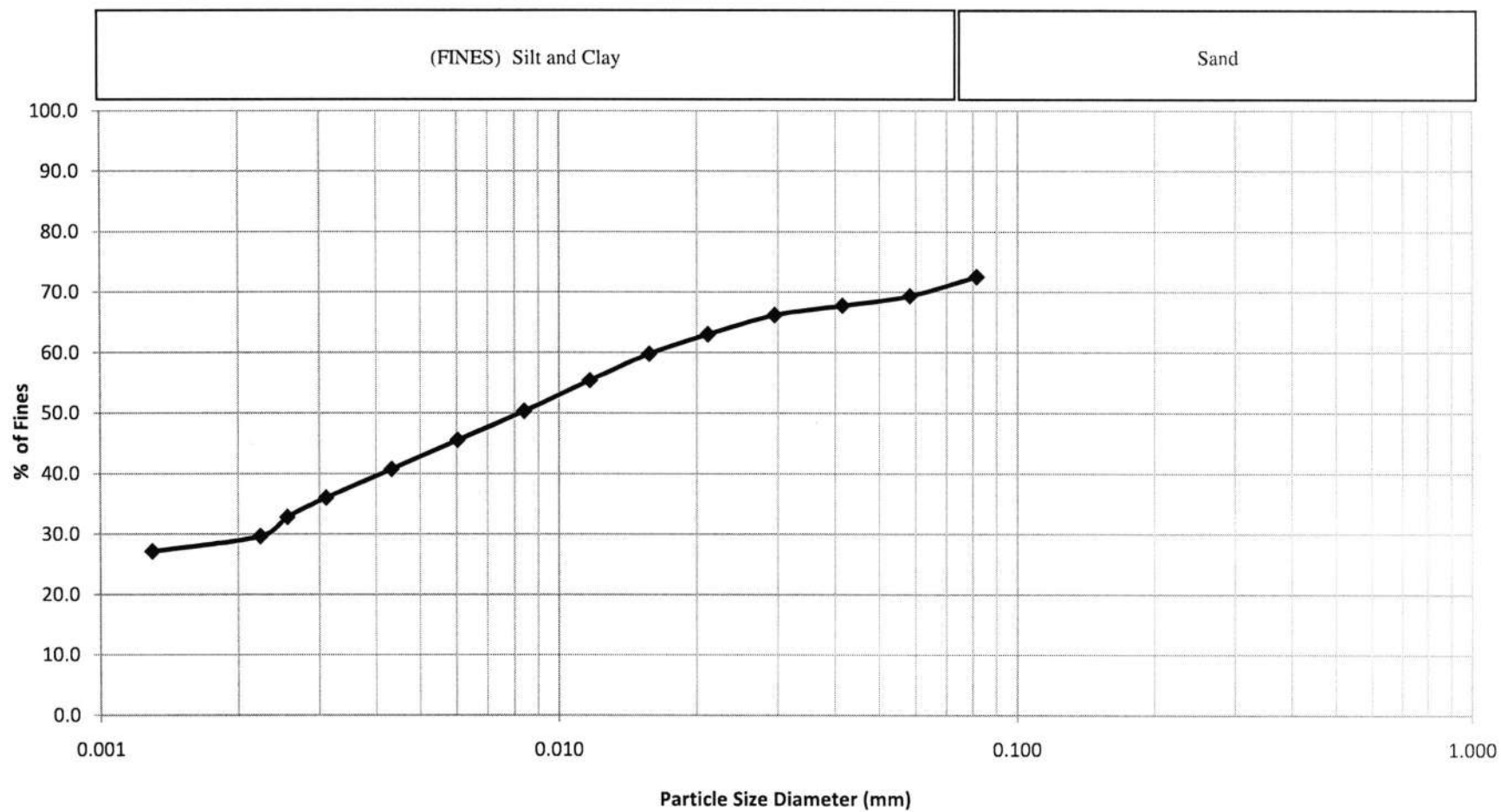


Fig 2.20 Hydrometer Analysis Master Curve

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-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 x D ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
1.0	29	SS	27	68	30	38	1.08	11	122	V.Stiff	Above	CH	3	5	11	11	45	25	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	57	SS	24	64	28	36	1.11	13	55	CG>50%	Above	-	26	11	12	6	35	10	-	-	-	-	-	V.Dense	<50%	SC
3.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	54	33	10	3	0	0	-	-	-	-	-	V.Dense	GP	<50%
FG = Fine Grained						PL = Plastic Limit						FS = Differential Free Well Index						LAB IN-CHARGE				M.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						IP=LL-PL														



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 (%)	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 x D ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
1.0	31	SS	30	63	31	32	1.03	11	109	Hard	Above	CH	2	6	15	12	42	23	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	69	SS	22	52	26	26	1.15	14	49	CG>50%	Above	-	17	12	18	10	35	8	-	-	-	-	-	V.Dense	<50%	SC
3.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	44	39	12	5	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained						PL = Plastic Limit				FS = Differential Free Well Index						LAB IN-CHARGE			M.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				IP=LL-PL																



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 x D ₆₀)	Relative Density	IS-Notation	
																										Gravel
1.0	20	SS	28	64	30	34	1.06	11	118	V.Stiff	Above	CH	7	7	8	7	47	24	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	55	SS	10	41	21	20	1.55	14	50	CG>50%	Above	-	46	10	1	10	28	5	-	-	-	-	-	V.Dense	GC	<50%
2.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	61	19	17	3	0	0	-	-	-	-	-	V.Dense	GP	<50%
FG = Fine Grained			PL = Plastic Limit					FS = Differential Free Well Index										LAB IN-CHARGE				M.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					IP=LL-PL																		



Table-2.4 Laboratory Classification of Soil Samples from BH-04

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 ×D ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
1.0	37	SS	25	58	29	29	1.14	12	108	Hard	Above	CH	10	6	7	11	42	24	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	82	SS	8	42	20	22	1.55	15	46	CG>50%	Above	-	34	12	8	11	30	5	-	-	-	-	-	V.Dense	GC	<50%
2.6	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	52	22	17	9	0	0	-	-	-	-	-	V.Dense	GP	<50%
FG = Fine Grained			PL = Plastic Limit					FS = Differential Free Well Index										LAB IN-CHARGE			M.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					IP=LL-PL																		

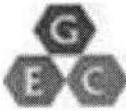


Table-2.5 Laboratory Classification of Soil Samples from BH-05

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 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
1.0	21	SS	25	68	31	37	1.16	10	100	V.Stiff	Above	CH	7	7	17	8	39	22	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	47	SS	24	57	28	29	1.14	12	70	CG>50%	Above	-	30	8	13	7	34	8	-	-	-	-	-	Dense	GC	<50%
2.6	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	39	34	22	5	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained			PL = Plastic Limit				FS = Differential Free Well Index										LAB IN-CHARGE				M.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				IP=LL-PL																			

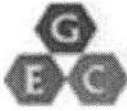


Table-2.6 Laboratory Classification of Soil Samples from BH-06

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 x D ₆₀)	Relative Density	IS-Notation	
																									Gravel	Sand
1.0	30	SS	24	58	29	29	1.17	11	98	V.Stiff	Above	CH	11	10	16	10	35	18	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	93	SS	22	53	27	26	1.19	14	57	CG>50%	Above	-	31	8	12	9	32	8	-	-	-	-	-	V.Dense	GC	<50%
3.0	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	47	32	18	3	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained						PL = Plastic Limit						FS = Differential Free Well Index						LAB IN-CHARGE			M.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						IP=LL-PL														



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-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
1.0	31	SS	32	78	33	45	1.02	9	100	Hard	Above	CH	2	7	9	6	49	27	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	63	SS	21	58	26	32	1.16	12	60	CG>50%	Above	-	16	15	13	8	37	11	-	-	-	-	-	V.Dense	<50%	SC
2.5	>100	WS	-	-	-	-	-	-	-	CG>50%	-	-	4	7	74	15	0	0	-	-	-	-	-	V.Dense	<50%	SP
FG = Fine Grained			PL = Plastic Limit			FS = Differential Frees Well Index										LAB IN-CHARGE			M.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			IP=LL-PL																				



Table-2.8 Results of Chemical Analysis					
SL No.	Bore HoleNo.	Soil (2:1)			
		Depth of Sample (m)	pH	Chlorides (mg/l)	Sulphates (mg/l)
1	BH-01	2.0	7.34	221	309
2	BH-03	2.0	7.34	228	315
3	BH-05	2.0	7.34	225	306
4	BH-07	2.0	7.34	231	318



CHAPTER-3

GEOLOGY & SUB-SURFACE STRATIFICATION

3.0 Preamble:

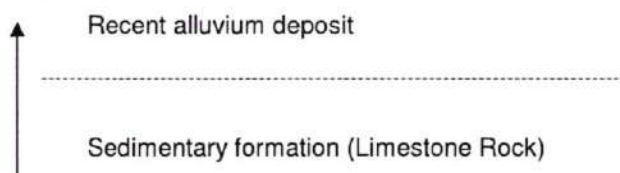
Geotechnical investigation carried out at a specific site provides location specific sub surface characteristics based on which the design of sub structures/foundations is generally carried out. However, the macro-level understanding of the sub surface is also needed for a comprehensive understanding 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 coimbatore district, which can be geologically classified as Sedimentary rock formation and hard rock formation (Charnockite of Meta igneous origin) of Archaean Rock Group, overlain by recent deposits. The entire area is mostly covered by recent alluvium on the site. The rocks present in this site are of sedimentary formation Limestone undergone weathering to variable extent. The thickness of alluvium deposit is around 2 to 3 meter underlain by varying degree of weathering.

The present location falls under coimbatore District, geologically it is classified as recent alluvium deposits consisting of Sandy Silty Clay and silty sand/Clayey Silty Sand, which is underlying by 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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Greyish Brown	29	-	Very Stiff	20.5	193	-
3	2.00	3.00	1.00	Clayey Silty Sand	Greyish Brown	57	Very Dense	-	20.5	-	42.05
4	3.00	3.50	0.50	Silty Sand with Lime Particles	White	>100	Very Dense	-	21	-	42.5
5	3.50	6.00	2.50	Highly Weathered Limestone	White/Brown	CRR-18 %,22% & 28%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Greyish Brown	31	-	Hard	21	207	-
3	2.00	2.50	0.50	Clayey Silty Sand	Greyish Brown	69	Very Dense	-	21	-	42.5
4	2.50	6.00	3.50	Highly Weathered Limestone	White/Brown	CRR-11 %,17% & 26%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Greyish	20	-	Very Stiff	20	133	-
3	2.00	2.50	0.50	Clayey Gravel	Greyish	55	Very Dense	-	20.5	-	41.75
4	2.50	6.00	3.50	Highly Weathered Limestone	White/Brown	CRR-14 %,27% & 33%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Brownish Grey	37	-	Hard	21	247	-
3	2.00	2.60	0.60	Clayey Gravel	Brownish Grey	82	Very Dense	-	21	-	42.5
4	2.60	6.00	3.40	Highly Weathered Limestone	White/Brown	CRR-18 %,20% & 24%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Brownish Grey	21	-	Very Stiff	20.5	140	-
3	2.00	2.60	0.60	Clayey Gravel	Brownish	47	Dense	-	20	-	40.33
4	2.60	6.00	3.40	Highly Weathered Limestone	White/Brown	CRR-13 %,17% & 24%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Brownish	30	-	Very Stiff	20.5	200	-
3	2.00	3.00	1.00	Clayey Gravel	Brownish	93	Very Dense	-	21	-	42.5
4	3.00	6.00	3.00	Highly Weathered Limestone	White	CRR-19 % & 28%, RQD-0%					

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	0.50	0.50	Clayey Silty Sand	-	-	-	-	-	-	-
2	0.50	2.00	1.50	Sandy Silty Clay	Greyish Brown	31	-	Hard	21	207	-
3	2.00	2.50	0.50	Clayey Silty Sand	Greyish Brown	63	Very Dense	-	21	-	42.5
4	2.50	6.00	3.50	Highly Weathered Limestone	White	CRR-16 %,27% & 34%, RQD-0%					

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

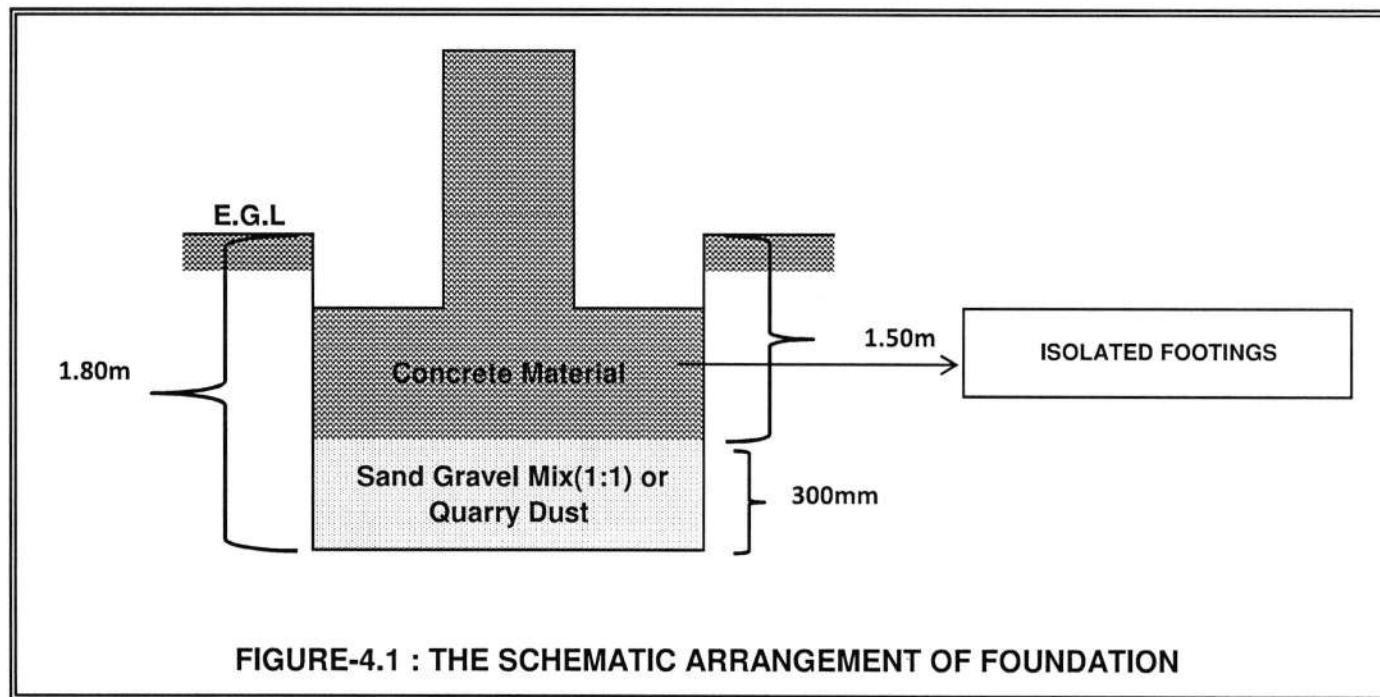
An understanding of the proposed construction and the order of loads on the foundations is needed for choosing the appropriate foundation system. In the present case, the proposed structure is configured with stilt plus five upper floors, and is meant for residential use. For this kind of structure, 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

4.2 Foundation System

For the kind of proposed structure and sub soil conditions, shallow foundation system coupled with soil replacement within the foundation trench can be adopted. The Isolated column footings can be located at a depth of 1.5m over a well compacted sand-gravel (1:1) mix or quarry dust of 300mm thickness laid in non-compacted layers of 150mm at optimum moisture content and compacted using a plate compactor or hand ramming technique.

Thus, the overall depth of foundation excavation will be 1.80m below the existing ground level. The schematic arrangement of foundation system is presented in Fig. 4.1.

The footings can be designed for an allowable safe bearing pressure of 300kPa.



RECOMMENDATIONS



CHAPTER-5

RECOMMENDATIONS

5.0 Recommendation for shallow foundation

- ❖ For the kind of sub soil conditions shallow foundation system coupled with soil replacement type of ground improvement technique within the foundation pit can be adopted
- ❖ The depth of foundation excavation will be 1.80m below the existing ground level and shall be back filled with either sand-gravel (1:1) mix or quarry dust of 300mm thickness laid in non-compacted layers of thickness not more than 150mm and compacted at optimum moisture content using a plate vibrator or hand rammer
- ❖ The **Isolated column footings** can be located at a depth of 1.50m over the prepared bed and can be designed for an allowable safe bearing pressure of 300kPa.
- ❖ The back filling of foundation trenches shall be carried out using either sand/gravel or quarry dust.
- ❖ All columns shall be connected with grade beams in both the directions irrespective of wall layout
- ❖ The ground floor shall be minimum 1.0m above the natural ground and the plinth shall be filled with sand/gravel/quarry dust. This height is recommended to contain the influence of soil volume change on the flooring. In case, floor is not raised, the ground floor shall be constructed as a suspended R.C.C. slab.

5.1 General Recommendation:

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

FOR GEO ENGINEERING CONSULTANTS, CHENNAI

AUTHORIZED SIGNATORY

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ANNEXURE



TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATIONS

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

Ref.BH-05

1.1 Geometrical Data :

Shape of the Foundation Square
 Depth of Foundation Below E.G.L."Df" (m) 1.50
 Soil Replacement Thickness of CNS Layer (m) 0.30
 Total Depth of Foundation (m) 1.80
 Breadth of Footing "B" (m) 1.00
 Length of Footing "L" (m) 1.00
 B/L 1.00
 Inclination of Vertical Load with the Vertical (a) 0.00

1.2 Soil Data :

Type of Effective Bearing Strata : Sand
 Average Design SPT-value of the Bearing Strata 30.00
 Type of Shear Failure: General
 Angle of Shearing Resistance 36.00

phi

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk}) 18.50 kN/m³
 Water Table Correction Factor (w') 0.50
 Effective Overburden pressure at foundation level (q) 12.75 kPa
 Bearing Capacity Factors:
 $N_c = N/A$
 $N_q = 39.48$
 $N_g = 60.31$

Shape Factors:

$S_c = -$
 $S_q = 1.20$
 $S_g = 0.80$

Depth Factors :

$D_c = -$
 $D_q = 1.02$
 $D_g = 1.02$

Inclination Factor:

$I_c = 1.00$
 $I_q = 1.00$
 $I_g = 1.00$

1.4 Ultimate Bearing Capacity (Q_u) :

$Q_u = q \cdot (N_q - 1) \cdot S_q \cdot D_q \cdot I_q + 0.5 \cdot B \cdot g \cdot N_g \cdot S_g \cdot D_g \cdot I_g \cdot w'$ 831.16 kPa
 (g should be read as gamma)

1.5 Safe Bearing Capacity (Q_{safe}) :

Factor of Safety (F.S.) : 2.50
 $Q_{safe} : 332.47$ kPa
Say Q_{safe} 300 kPa

2 Computation of Settlement for Maximum Pressure and Size of Footing: (as per IS:8009-Part-I-Ref. Eq.11) (Elastic Analysis)

The immediate elastic settlement (S_i)= $qB(1-\mu^2)/E_s$

q= bearing pressure 300.00 kPa
 Poission's Ratio (μ) 0.30

Modulus of Elasticity (E_s)(Ref. Joseph E Bowels,1996,page316,Table5.6, Japanese design standards)

Modulus of Elasticity (E_s) 78000.00 kPa
 Size of footing considered for maximum settlement(m) 1.00
 Influence factor 1.00
 Rigidity Factor 1.00
 Elastic Settlement (DH_i) 3.50 mm
<50 mm

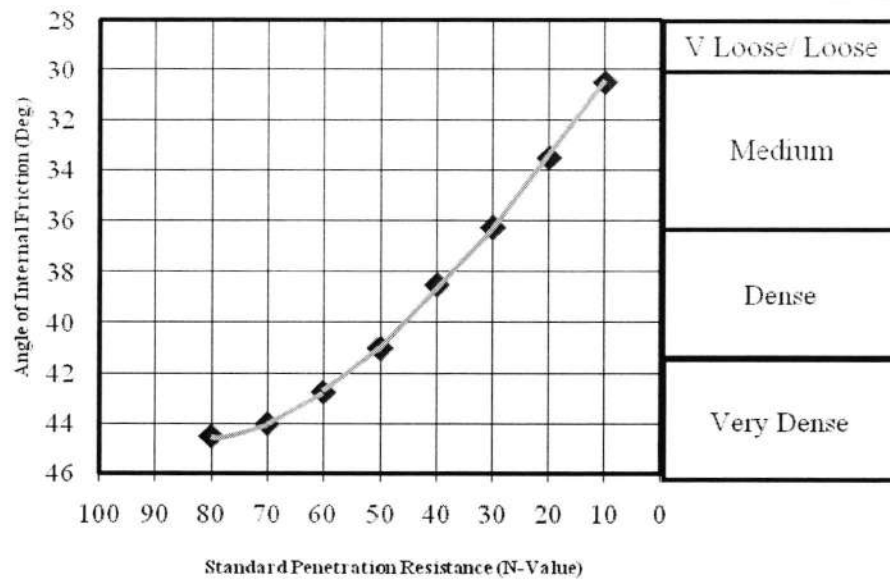


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

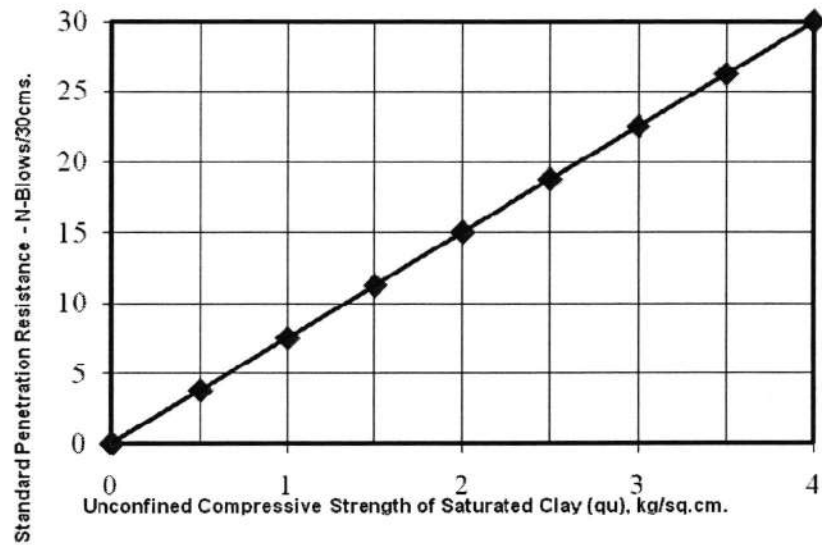
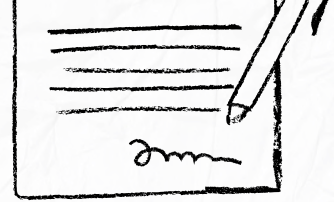


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (After Terzaghi & Peck, 1948)



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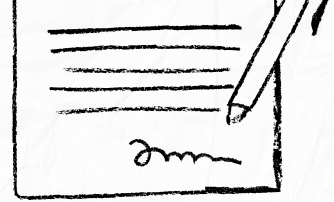
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