PROPOSED CONSTRUCTION OF STILT+5 FLOORS RESIDENTIAL APARTMENT AT THIRUVANMIYUR, CHENNAI

Report on Geotechnical Investigation

Client:

Mr. J. Jayakrishnan & Mrs. J. Kamatchi

Chennai.

REPORT ISSUE STATUS			
<1>	19.09.2023	Revision 1	Proposed Structure has been revised from Stilt + 3 Floors to Stilt + 5 floors
<0>	26.07.2023	Final Report	-
Issue	**Date**	**Description**	**Updation**

MARS SYNERGY GEOTECH Pvt Ltd

An ISO 9001: 2015 Certified Company

NABL Accredited Laboratory

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NABL : ULR-TC867823100000207F

Project No: MSGTPL/SI-5904-R1/23-24

July-2023

M S GEOTECH
Geotechnical, Geophysical & Engineering Survey in Offshore & Onshore

To

19th Sep 2023

Mr. J. Jayakrishnan & Mrs. J. Kamatchi,
Chennai.

Dear Sir / Madam,

Reg: Preparation of geotechnical investigation report for the proposed construction of Stilt + 5 Floors Residential Apartment at Door No.19/2, Canal Road, Kamarajar Nagar West, Thiruvanmiyur, Chennai – 600 041, Tamil Nadu, INDIA.

The **Mars Synergy Geotech Pvt Ltd**, Chennai has completed the geotechnical engineering services for the above referred project.

This geotechnical engineering report presents the results of the subsurface exploration and the recommendations for your proposed structures foundation are presented here in final form together with a summary of field and laboratory data.

We appreciate the opportunity to be of service to you on this project. If you have any comments concerning this report, or if we may be of further services, please contact us/mail.

Note:

1. The test results enclosed are only related to the sample tested by us.
2. The Report shall not be reproduced in full or part without written permission from Mars Synergy Geotech Laboratory.
3. All the lab related tested values are as per the standard conditions followed by the lab.
4. Samples are retained for 30 days from sample received date at lab.

Sincerely,

Mars Synergy Geotech Pvt Ltd.

VASANTHI PADMANABAN, M.Tech.,
Registered Geotechnical Engineer
Reg. No: GTE/19/04/016

ULR-TC867823100000207F

Report No: **MSGTPL/SI-5904-R1/23-24**

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REPORT ON GEOTECHNICAL INVESTIGATION AND RECOMMENDATION FOR THE PROPOSED CONSTRUCTION OF STILT+5 FLOORS RESIDENTIAL APARTMENT AT THIRUVANMIYUR, CHENNAI.

1.0 INTRODUCTION

Mr. J. Jayakrishnan & Mrs. J. Kamatchi are planning to construct a Stilt+5 Floors Residential Apartment at Door No.19/2, Canal Road, Kamarajar Nagar West, Thiruvanmiyur, Chennai – 600 041, Tamil Nadu, INDIA. **M/s. Mars Synergy Geotech Pvt Ltd**, Chennai has carried out this investigation and completed on 14th July 2023 as per the client instructions.

The scope of work includes the following

- Making two numbers of Standard Soil Investigation bore-holes
- Collecting soil samples at regular depth intervals
- Conducting SPTs at every 1.0m/1.50m depth intervals
- Conducting laboratory tests on samples collected
- Submitting report with laboratory test results and recommendation for foundations.

1.1 DESCRIPTION OF STRUCTURE

The proposed structure is a Stilt+5 floors Residential Apartment. The exact details of columns are not available at the time of preparation of this report. Assuming an approximate column spacing of 4.5 to 5.5 m c/c considering this the central column load works about 170 to 180 tones for proposed apartment. These loads are assumed for the purpose of foundation only and for the structural design, exact loads are to be estimated based on a suitable structural analysis.

1.2 SOIL INVESTIGATION

The field investigation works were carried out using 1 set of Rotary mechanical drilling Rig. The following activities, carried out in chronological sequence, comprised the field work for the project

- Mobilization of rotary drilling rig, water pump, testing tools and accessories.
- Collection of disturbed samples of non-cohesive soils.
- Sampling and logging of the boreholes. Packing, labeling and dispatching the samples to laboratory.
- Field investigation, tests and laboratory tests conducted as per IS-1892 and IS -2720

1.3 FIELD SAMPLING

Two numbers of standard soil investigation boreholes of 100mm diameter was made at the locations shown in the drawing, **MSGTPL/SI-5904-R1** enclosed. Investigations were conducted up to a depth of 13.0m and 15.0m from existing ground level. SPTs were conducted at every 1.0m/1.5m depth intervals and samples were collected for identification and testing.

1.4 LABORATORY TESTS

The laboratory-testing scheme is so designed to obtain the design parameters for the foundations. The following parameters are evaluated:

- Type of soil and it's gradation properties
- Atterberg Limits
- Specific Gravity
- Natural Moisture Content (NMC)
- Sieve analysis on the coarse-grained soil fraction

All the test results are presented in the tabular forms. Comprehensive field information along with SPT values is presented on separate sheet.

1.5 SOIL PROFILE

Based on visual identification of soil samples and test results (of both field and laboratory tests), the soil profile arrived. Subsoil is made-up of three/six distinctive layers there are

BH-1

(i) Soft CLAY up to -3.50m with **SPT's N=2-4**
(ii) Loose SAND -3.50m to -8.50m with **SPT's N=4-5**
(iii) Very Dense SAND -8.50m to -13.0m with **SPT's N=>50**

BH-2

(i) Filled up soil up to -1.50m
(ii) Medium stiff CLAY -1.50m to -2.50m with **SPT's N=6**
(iii) Very Loose SAND -2.50m to -4.50m with **SPT's N=2-3**
(iv) Loose SAND -4.50m to -10.50m with **SPT's N=-5-10**
(v) Very Dense SAND -10.50m to -13.0m with **SPT's N=>50**
(vi) Weathered disintegrated Rock -13.0m to -15.0m with **SPT's N=>100**

The soil profile details are presented in the bore-chart.

1.6 GROUND WATER TABLE

At the time of Soil Investigation (12/07/2023 to 15/07/2023) at site, ground water table was encountered at **(-)0.0m** depth from Existing Ground Level.

1.7 DISCUSSION ON FOUNDATION

At this site two boreholes were investigated up to 13.0m and 15.0 depth, the proposed structure is a six-storied apartment, the column loads are high it is about 100 to 120Tones.

Based on the soil ideal to adopt bored cast in –situ pile foundation for the proposed residential apartment.

Soil Design Parameters									
From (m)	To (m)	Thickness (m)	Soil Type	Avg SPT 'N'	γ' (kN/m³)	C (T/sq.m)	α	Φ (deg)	K
0	1.5	1.5	Filled up soil		7.0	-	-	18	1.0
1.5	2.5	1.0	Medium stiff CLAY	6	7.5	3.0	1.0	-	-
2.5	4.5	2.0	Very loose SAND	2	6.0	-	-	18	1.0
4.5	10.5	6.0	Loose SAND	7	7.5	-	-	25	1.0
10.5	13.0	2.5	Very Dense Moorum	>50	10.0	-	-	35	1.1
13.0	15.0	2.0	Weathered Rock	>100	12.0	50	0.3	-	-

1.8 RECOMMENDATIONS

- ✓ Considering that this structure is a six storied Residential Apartment, pile foundation is recommended up to **15.0m depth** from existing Ground level.
- ✓ The pile bore may be terminated at a depth of minimum three times diameter of the pile in to hard strata (where three consecutive SPT 'N' values of more than 50 are obtained in each test at depth intervals of one pile diameter).
- ✓ To satisfy the above criterion the pile length shall be about **15.0m** from the existing ground level.
- ✓ The pile capacities for varying diameters are provided below for the proposed structure.

Bored Cast In-situ Pile Capacities as per IS-2911 Part-1 Sec-2 :2010					
Pile Termination Level Below EGL (m)	Pile Dia (mm)	Safe Vertical Capacity (Tones)	Safe Uplift Capacity (Tones)	Safe Lateral Capacity wrt 5mm Deflection	
				Free Head (Tones)	Fixed Head* (Tones)
15.0	450	55	29	0.18	0.68
	500	65	32	0.24	0.85
	600	90	40	0.40	1.46
*Note: Apply 0.75 for Group efficiency for lateral capacities					

- Recommended Pile length is including socketing in to hard strata (2D to 3D)
- The proposed project site is situated in Thiruvanmiyur, Chennai which falls under Seismic Zone III as per IS 1893 (Part 1) - 2002. Structure should be design against Earth quake resistance.
- Pile Cut of level is considered 1.0m below EGL.
- Use minimum M25 Grade of concrete
- Centre to centre spacing of piles shall not be less than 3 times of the diameter of the pile shaft.
- **The above safe loads suggested are only tentative and these have to be confirmed by conducting through pile load tests conducted as per I.S-2911part –IV:2013**

VASANTH PADMANABAN, M.Tech.,
Registered Geotechnical Engineer
Reg. No: GTE / 19 / 04 / 016

LIQUEFACTION ANALYSIS

Earth quake mangnitute	=	6.5
As per IS1893(part1),2002	=	
Zone factor (Z)	=	0.16
Importance factor	=	1
$a_{max}/g=Z$	=	0.16
GWT	=	0
Design GWT	=	0 m
Magnitude Scaling Factor	=	1.4

BH-2

Liquefaction Calculation

DEPTH	FINES CONTENT %	SPT VALUES (N)	UNIT WEIGHT(KN/m^3)	P_a(Kpa)	P_0'(Kpa)	P_0(Kpa)	$C_N=(Pa/P_0')^{0.5}$	C_{HT}	C_{HW}	C_{BD}	C_{RL}	C_{SS}	$(N_1)_{60}$	r_d	a_{max}/g	CSR	α	β	$(N_1)_{60cs}$	$CRR_{7.5}$	CRR/CSR	Remarks
2.0	63	6	16	100	12	32	1.70	0.75	0.98	1.05	0.75	1.1	6.49	0.985	0.16	0.273	0.50	1.20	8.29	0.098	0.52	Liquefiable
3.0	22	3	16	100	18	48	1.70	0.75	0.98	1.05	0.8	1.1	3.46	0.977	0.16	0.271	3.93	1.09	7.71	0.094	0.50	Liquefiable
4.0	30	2	16	100	24	64	1.70	0.75	0.98	1.05	0.80	1.1	2.31	0.969	0.16	0.269	4.71	1.15	7.37	0.091	0.49	Liquefiable
5.0	31	5	16	100	30	80	1.70	0.75	0.98	1.05	0.80	2.1	11.02	0.962	0.16	0.267	4.77	1.16	17.58	0.187	1.01	Non Liquefiable
6.5	6	10	17	100	45.5	111	1.48	0.75	0.98	1.05	0.95	3.1	33.69	0.95	0.16	0.240	0.03	1.00	33.88	8.736	52.48	Non Liquefiable
8.0	7	6	16	100	48	128	1.44	0.75	0.98	1.05	0.95	4.1	26.03	0.939	0.16	0.260	0.12	1.01	26.37	0.322	1.78	Non Liquefiable
10.0	13	9	16	100	60	160	1.29	0.75	0.98	1.05	0.95	5.1	43.44	0.907	0.16	0.252	1.89	1.04	46.94	0.266	1.52	Non Liquefiable

ESTIMATION OF VERTICAL CAPACITY OF PILE

Project:	5904-R1, Stilt+5 Floors Residential Apartment
Location:	Thiruvanmiyur
Reference BH's	BH-1 to BH-2

$$Q_u = A_p(\tfrac{1}{2}D\gamma N_\gamma + P_D N_q) + \sum_{i=1}^{n} K_i P_{Di} \tan\delta_i A_{si}$$

$$Q_u = A_p N_c c_p + \sum_{i=1}^{n} \alpha_i c_i A_{si}$$

Dia of Pile	600	mm
Elevation	0	m
Pile Cut off Level	1.0	m
Pile termination level below G.L	15	m
Total Length of Pile	14.0	m
Factor of safety	**2.5**	
Pdi=15*Dia*γ'	63	kN/m^2

Soil Design Parameters

Sl.No	From (m)	To (m)	Thickness (m)	Soil Type	Avg 'N'	γ' (kN/m^3)	C (kPa)	α	ϕ	K	Pdi (kN/m^2)
1	0	1.5	1.5	Filled up soil		7	-	-	18	1	1.75
2	1.5	2.5	1	Medium stiff CLAY	6	7.5	30	1	-	-	7.25
3	2.5	4.5	2	Very Loose SAND	2	6	-	-	18	1	17
4	4.5	10.5	6	Loose SAND	7	7.5	-	-	25	1	45.5
5	10.5	13	2.5	Very Dense Moorum	>50	10	-	-	35	1.1	80.5
6	13	15	2	Weathred Rock	>100	12	500	0.3	-	-	105

Pile Calculations As per IS-2911 part-1/Sec-2-2010

Sl.No	From (m)	To (m)	Thickness (m)	Avg 'N'	γ' (kN/m^3)	C (kPa)	α	ϕ	K	Asi	Sf (kN)	Sfi (kN)
1	1.0	1.5	0.5	0	7	-	-	18	1	0.94	-0.54	-0.54
2	1.5	2.5	1	6	7.5	30	1	-	-	1.88	-56.55	-57.08
3	2.5	4.5	2	2	6	-	-	18	1	3.77	-20.82	-77.91
4	4.5	10.5	6	7	7.5	-	-	25	1	11.31	239.96	162.05
5	10.5	13	2.5	>50	10	-	-	35	1.1	4.71	292.18	454.23
6	13	15	2	>100	12	500	0.3	-	-	3.77	565.49	**1019.72**

Due to loose SAND soil is liquefying up to 4.50m hence Positive skin friction Ignored

End Bearing

Bearing Strata	Dia (m)	Ap (m^2)	γ' (kN/m^3)	Cu(kPA)	Nq	Ng	Nc	Qp (kN)	Qult (kN)	Qallow (kN)
Weathred Rock	0.6	0.283	10	500	-	-	9	1272.3	2292.1	**916.83**

Safe vertical Capacity of Single Pile	**92**	**Tones**

Lateral Pile Capacity Calculation

Project Title : 5904-R1, Stilt+5 Floors Residential Apartment
Site : Thiruvanmiyur
BH: BH-1 to BH-2

As Per IS-2911(Part-1/Sec-2):2010

$Deflection, y = \frac{H(e+Z_f)^3}{3EI} X10^3$ ... for free head pile		$Deflection, y = \frac{H(e+Z_f)^3}{12EI} X10^3$ ... for fixed head pile

Input

Soil		Loose sand (Submerged)	
Diameter of Pile	=	600	mm
Length of Pile Below FGL, (L)	=	15	m
Length of Pile Above FGL, (L1=e)	=	4	m
Grade of Concrete	=	25	
Allowable Deflection, (y)	=	**5**	mm
Young's modulus of pile material, (E)	=	25000.00	MN/m^2
Moment Inertia of the Pile Cross section (I)	=	0.0064	m^4

For CLAY			Stiffness factor R, in m = $\sqrt[4]{\frac{EI}{KB}}$	
k_1=		MN/m^2	L1/R=	#DIV/0!
K=	0	MN/m^3	Lf/R (Free Head)=	1.9
R=	#DIV/0!	m	Lf/R (Fixed Head)=	2.2
For SAND				
η_h=	2	MN/m^3	Stiffness factor T, in m = $\sqrt[5]{\frac{EI}{\eta_h}}$	
T=	2.40	m	L_f/T(Free Head)=	1.88
L_1/T=	1.66711		L_f/T(Fixed Head)=	1.95

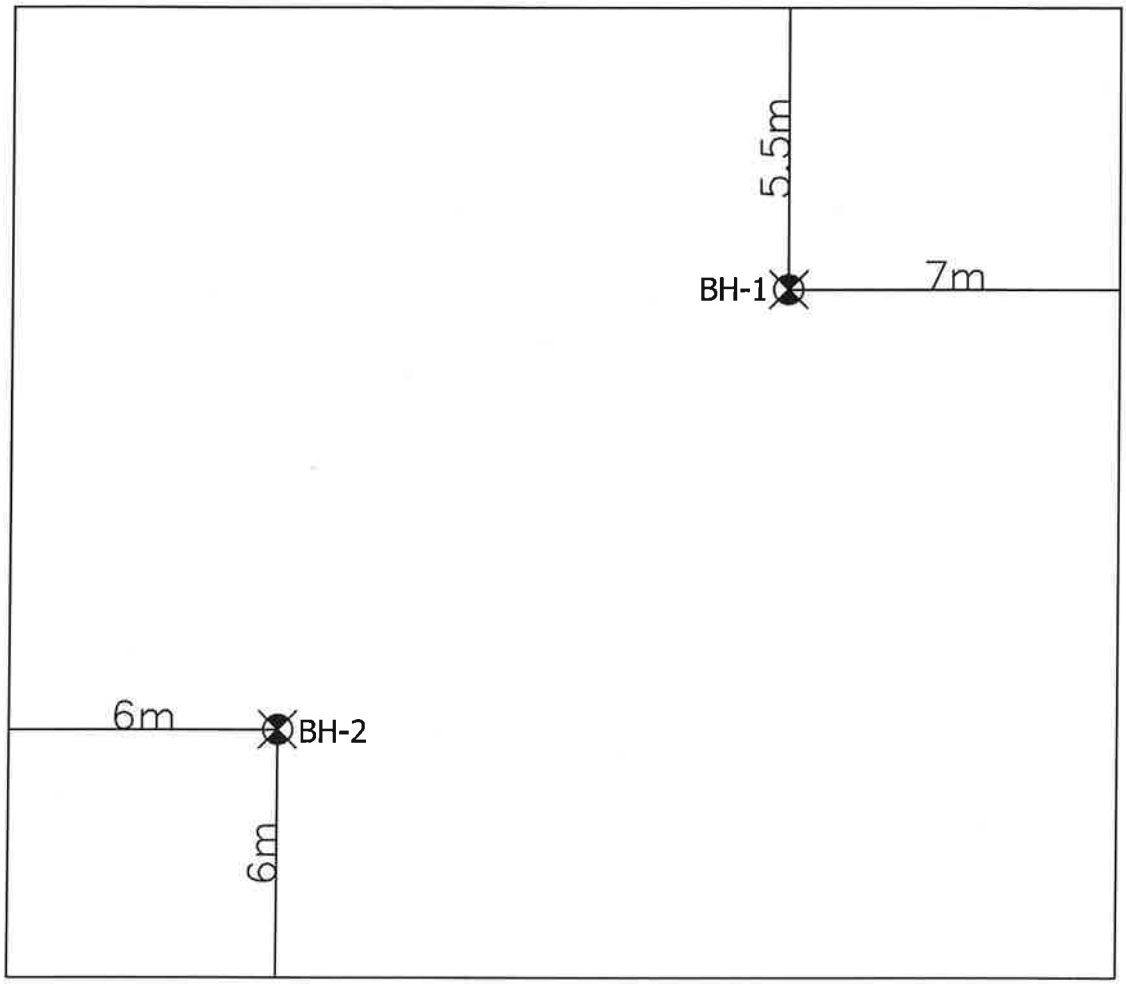
Output for SANDY Soil

Z_F (Free Head) / Depth of Fixity =	4.51	m
Z_f (Fixed Head) / Depth of Fixity =	4.68	m

Result

Lateral Load Free Head =	**0.39**	**Tones**
Lateral Load Fixed Head =	**1.46**	**Tones**

CANAL ROAD, KAMARAJAR NAGAR WEST



TITLE: DRAWING SHOWING THE SOIL INVESTIGATION BORE HOLE LOCATIONS

PROJECT: PROPOSED CONSTRUCTION OF STILT+5 FLOORS RESIDENTIAL APARTMENT AT THIRUVANMIYUR

LEGEND:

BH: BORE HOLE -SOIL TEST LOCATION

ACTIVITY	EXECUTED BY	SCALE: N T S
FOREMEN	RAJESH	
DRAFTING	JB	

MARS SYNERGY GEOTECH Pvt Ltd
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DRAWING NO: MSGTPL/SI-5904 R1/23-24

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BOREHOLE LOG

Project No: MSGTPL/SI-5904-R1/23-24

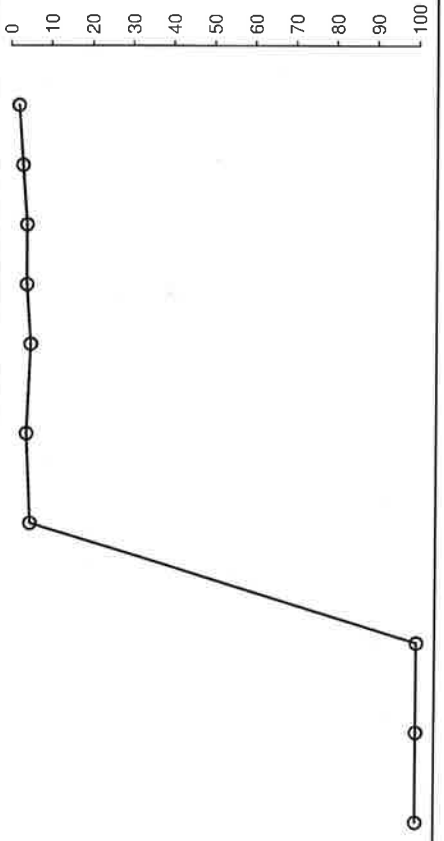
Project: Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

Location	Thiruvanmiyur
Ground R.L	Nil
Drilling	Rotary

Borehole No	BH-1	
G.W.T (m)	Top Level	
Date of Start	12-Jul-2023	
Date of Complete	12-Jul-2023	
Dia of Bore (mm)	100	Sheet
Termination Depth (m)	13.00	1 of 1

Depth below EGL (m)	Layer Thickness	Soil Layers Description	Soil Symbol	IS-Classification	Type Field Test	Test Depth (m)	SPT Values Record 0 to 45cm			SPT- N- Value
0.0	2.0	Soft Brownish & Greyish CLAY		CH						
0.5										
1.0					SPT	1.0	1	1	1	2
1.5										
2.0					SPT	2.0	1	1	2	3
2.5	1.0	Soft Greyish Sandy CLAY		CI						
3.0					SPT	3.0	1	2	2	4
3.5	5.0	Loose Greyish Fine to Medium SAND		SW-SM						
4.0					SPT	4.0	2	2	2	4
4.5										
5.0					SPT	5.0	1	2	3	5
5.5										
6.0										
6.5					SPT	6.5	2	2	2	4
7.0										
7.5										
8.0					SPT	8.0	2	2	3	5
8.5	3.5	Very Dense Brownish & Light Greyish Clayey SAND		SC						
9.0										
9.5										
10.0					SPT	10.0	14	34	50 Blows for 13Cm	
10.5										
11.0										
11.5					SPT	11.5	50 Blows for 11Cm			
12.0	1.5	Very Dense Brownish Medium SAND		SW-SM						
12.5										
13.0					SPT	13.0	50 Blows for 0Cm			
13.5										
14.0										
14.5										
15.0										

Graphical Representation of SPT



Borehole Termination Depth (m) 13.0

EGL- Existing Ground Level
R.L- Reduced Level
GWT- Ground Water Table
SPT- Standard Penetration Test
UDS- Undisturbed Sample
VST- Vane Shear Test
DS- Disturbed Sample
CR- Core Recovery
RQD- Rock Quality Designation

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BOREHOLE LOG

Project No: MSGTPL/SI-5904-R1/23-24

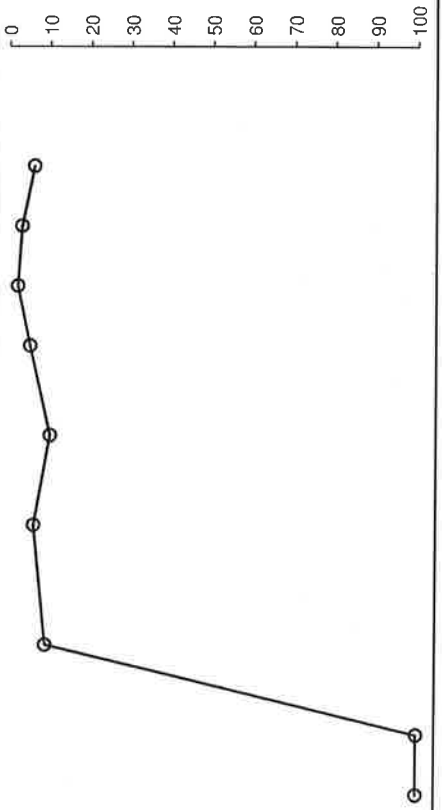
Project: Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

Location	Thiruvanmiyur
Ground R.L	Nil
Drilling	Rotary

Borehole No	**BH-2**	
G.W.T (m)	Top Level	
Date of Start	14-Jul-2023	
Date of Complete	15-Jul-2023	
Dia of Bore (mm)	100	Sheet
Termination Depth (m)	15.00	1 of1

Depth below EGL (m)	Layer Thickness	Soil Layers Description	Soil Symbol	IS-Classification	Type Field Test	Test Depth (m)	SPT Values Record 0 to 45cm			SPT- N- Value
0.0	1.0	Filled up soil								
0.5										
1.0						1.0	-	-	-	-
1.5	1.0	Medium Stiff Brownish CLAY		CI						
2.0					SPT	2.0	2	3	3	**6**
2.5	3.0	Very Loose to Loose Greyish Clayey SAND		SC						
3.0					SPT	3.0	1	1	2	**3**
3.5										
4.0					SPT	4.0	1	1	1	**2**
4.5										
5.0					SPT	5.0	1	2	3	**5**
5.5	5.0	Loose Light Greyish Fine to Medium SAND		SW-SM						
6.0										
6.5					SPT	6.5	3	4	6	**10**
7.0										
7.5										
8.0					SPT	8.0	3	3	3	**6**
8.5										
9.0										
9.5										
10.0					SPT	10.0	3	4	5	**9**
10.5	2.5	Very Dense Brownish Moorum		SC-GP						
11.0										
11.5					SPT	11.5	25	35	50 Blows for 7Cm	
12.0										
12.5					SPT	12.5	50 Blows for 5Cm			
13.0	2.5	Weathered Disintegrated Rock		GP						
13.5					DC	13.5	Rebound			
14.0										
14.5										
15.0					DC	15.0	Rebound			

Graphical Representation of SPT



Borehole Termination Depth (m) 15.0

EGL- Existing Ground Level
R.L- Reduced Level
GWT- Ground Water Table
SPT- Standard Penetration Test
UDS- Undisturbed Sample
VST- Vane Shear Test
DS- Disturbed Sample
CR- Core Recovery
RQD- Rock Quality Designation

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Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

BH No 1 | **Ground Water Level: Top Level** | **Termination Depth:13.0m**

SUMMARY OF TEST RESULTS

N Value	Layer Thickness	Depth (m)	Soil Description	IS Classification	Index Properties (%)						Specific Gravity	Grain Size Analysis (%)				
					NMC	W_L	W_P	I_P	Ic	FreeSwell		Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay
		0.00														
2	2.0	1.00	Soft Brownish & Greyish CLAY	CH	37	60	18	42								
3		2.00			30	55	18	37								
	1.0		Soft Greyish Sandy CLAY	CI												
4		3.00			33	36	15	22								
4		4.00			21							0	1	45	41	13
5	5.0	5.00	Loose Greyish Fine to Medium SAND	SW-SM	16							0	2	52	38	8
4		6.50			19							0	2	42	50	6
5		8.00			16							0	2	46	42	10
>100	3.5	10.00	Very Dense Brownish & Light Greyish Clayey SAND	SC	14							7	7	31	22	33
>100		11.50			10							1	12	37	26	24
	1.5		Very Dense Brownish Medium SAND	SW-SM												
>100		13.00														

MS GEOTECH
Geotechnical, Geophysical & Engineering Survey in Offshore & Onshore

Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

BH No 2 | **Ground Water Level: Top Level** | **Termination Depth:15.0m**

SUMMARY OF TEST RESULTS

N Value	Layer Thickness	Depth (m)	Soil Description	IS Classification	Index Properties (%)						Specific Gravity	Grain Size Analysis (%)				
					NMC	W_L	W_P	I_P	Ic	FreeSwell		Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay
	1.0	0.00	Filled up soil													
		1.00														
	1.0		Medium Stiff Brownish CLAY	CI												
6		2.00			21							2	2	13	20	63
	3.0		Very Loose to Loose Greyish Clayey SAND	SC												
3		3.00			24							1	0	30	47	22
2		4.00			27							0	1	32	37	30
5		5.00			26							5	4	29	31	31
	5.0		Loose Light Greyish Fine to Medium SAND	SW-SM												
10		6.50			17							0	0	60	34	6
6		8.00			17							1	3	48	41	7
9		10.00			16							1	3	39	44	13
	2.5		Very Dense Brownish Moorum	SC-GP												
>100		11.50			11							34	14	22	15	15
>100		12.50			10							43	11	20	15	11
	2.5		Weathered Disintegrated Rock	GP												
>100		13.00														
>100		15.00														

NABL
TC-8678

ULR-TC867823100000207F

MS GEOTECH
Geotechnical, Geophysical & Engineering Survey in Offshore & Onshore

Project No: MSGTPL/SI-5904-R1/23-24
Project :Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

Method: IS-2720 P-2

Natural Moisture Content Data Sheet

BH.No/ Pit no	1		1		1		1		1		1	
Depth (m)	1.0		2.0		3.0		4.0		5.0		6.5	
Tare No	111	138	66	113	112	24	250	226	63	230	296	171
Wt of Tare (gr)	30.93	29.12	28.38	29.49	27.87	29.92	29.16	29.65	29.97	28.39	29.05	29.54
Tare + Soil (gr)	49.00	51.52	52.05	47.91	42.59	46.17	50.41	57.50	54.57	55.92	52.87	51.51
Tare+Dry soil (gr)	44.09	45.45	46.54	43.60	38.90	42.13	46.79	52.68	51.12	52.02	49.06	48.00
Wt of Water (gr)	4.91	6.07	5.51	4.31	3.69	4.04	3.62	4.82	3.45	3.90	3.81	3.51
Wt Dry soil (gr)	13.16	16.33	18.16	14.11	11.03	12.21	17.63	23.03	21.15	23.63	20.01	18.46
Water Content (%)	37.31	37.17	30.34	30.55	33.45	33.09	20.53	20.93	16.31	16.50	19.04	19.01
Average Water Content (%)	37		30		33		21		16		19	

NABL
TC-8678

MS GEOTECH
Geotechnical, Geophysical & Engineering Survey in Offshore & Onshore

ULR-TC867823100000207F

Project No: MSGTPL/SI-5904-R1/23-24

Project :Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

Method: IS-2720 P-2

Natural Moisture Content Data Sheet

BH.No/ Pit no	1		1		1		2		2		2	
Depth (m)	8.0		10.0		11.5		2.0		3.0		4.0	
Tare No	114	143	68	292	289	208	270	57	248	243	69	70
Wt of Tare (gr)	29.40	29.52	28.27	30.78	29.93	29.02	32.63	29.25	28.76	30.28	29.42	27.74
Tare + Soil (gr)	55.13	55.53	52.43	59.58	50.73	47.44	51.67	50.96	47.18	54.72	51.79	50.54
Tare+Dry soil (gr)	51.65	51.97	49.45	55.97	48.80	45.72	48.39	47.19	43.61	49.95	47.00	45.65
Wt of Water (gr)	3.48	3.56	2.98	3.61	1.93	1.72	3.28	3.77	3.57	4.77	4.79	4.89
Wt Dry soil (gr)	22.25	22.45	21.18	25.19	18.87	16.70	15.76	17.94	14.85	19.67	17.58	17.91
Water Content (%)	15.64	15.86	14.07	14.33	10.23	10.30	20.81	21.01	24.04	24.25	27.25	27.30
Average Water Content (%)	16		14		10		21		24		27	

NABL
TC-8678

ULR-TC867823100000207F

MS GEOTECH
Geotechnical, Geophysical & Engineering Survey in Offshore & Onshore

Project No: MSGTPL/SI-5904-R1/23-24
Project :Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

Method: IS-2720 P-2

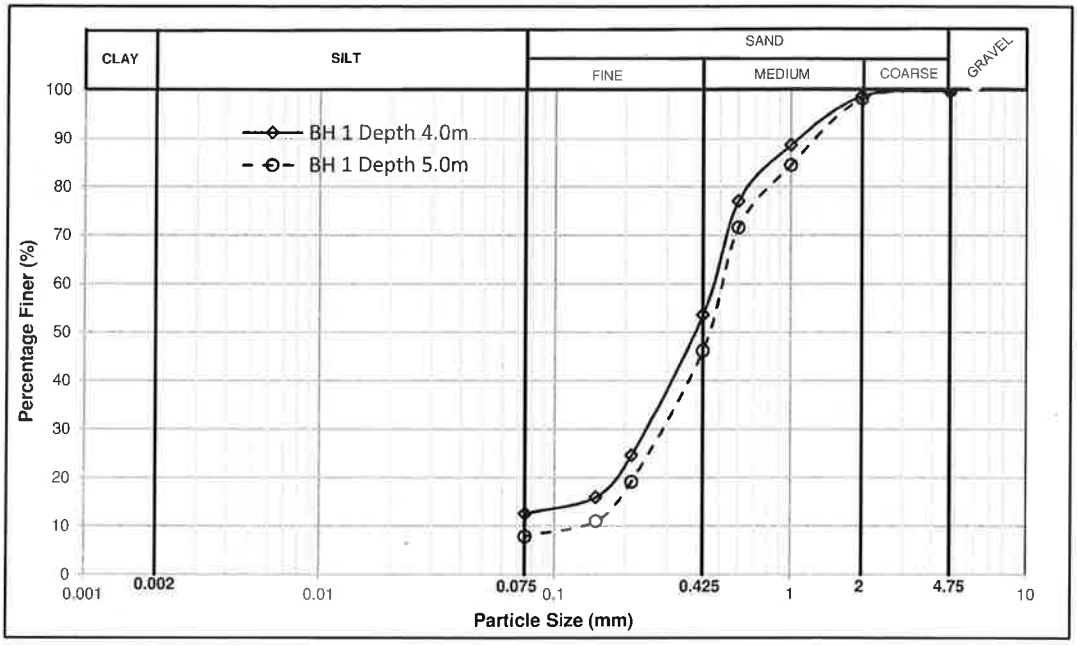
Natural Moisture Content Data Sheet

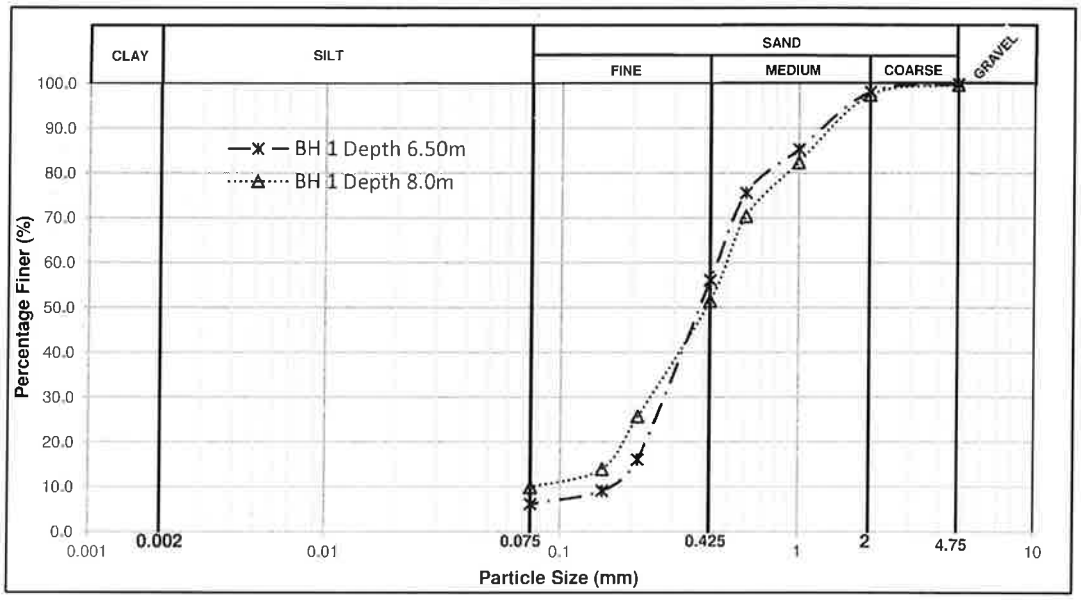
BH.No/ Pit no	2		2		2		2		2		2	
Depth (m)	5.0		6.5		8.0		10.0		11.5		12.5	
Tare No	56	196	100	9	46	78	127	205	142	184	170	236
Wt of Tare (gr)	30.13	28.71	29.66	29.16	29.74	28.61	29.63	29.49	29.38	28.76	30.47	30.55
Tare + Soil (gr)	57.46	46.53	46.67	48.55	52.21	51.79	53.68	56.82	51.24	48.13	44.60	48.61
Tare+Dry soil (gr)	51.75	42.82	44.20	45.80	48.90	48.42	50.30	52.97	49.00	46.19	43.29	46.94
Wt of Water (gr)	5.71	3.71	2.47	2.75	3.31	3.37	3.38	3.85	2.24	1.94	1.31	1.67
Wt Dry soil (gr)	21.62	14.11	14.54	16.64	19.16	19.81	20.67	23.48	19.62	17.43	12.82	16.39
Water Content (%)	26.41	26.29	16.99	16.53	17.28	17.01	16.35	16.40	11.42	11.13	10.22	10.19
Average Water Content (%)	26		17		17		16		11		10	

Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

GRAIN SIZE ANALYSIS



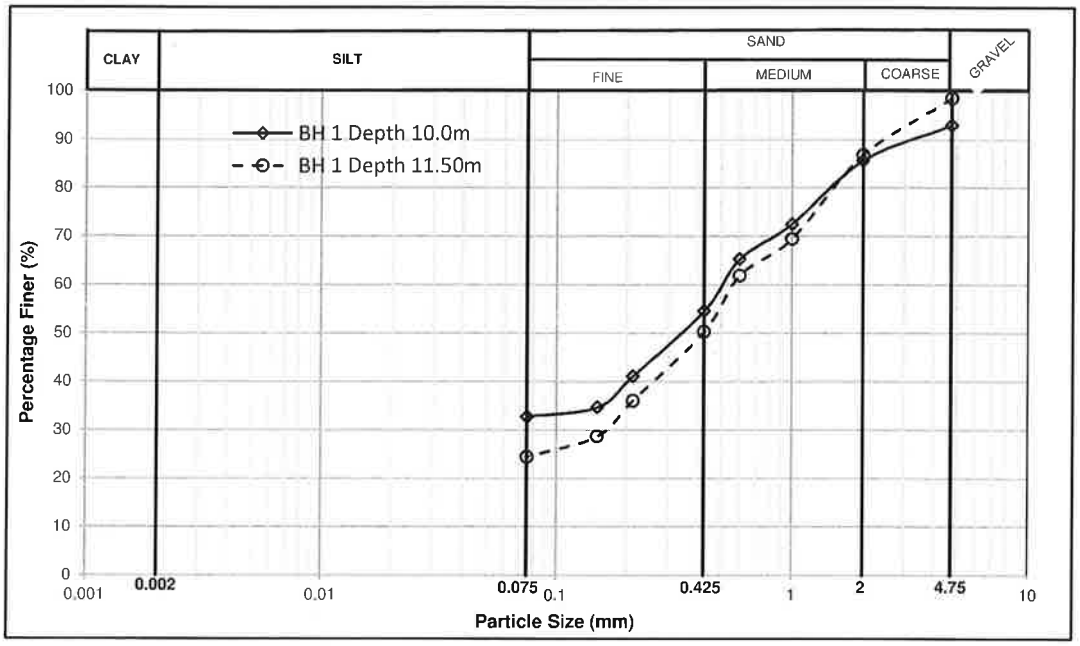


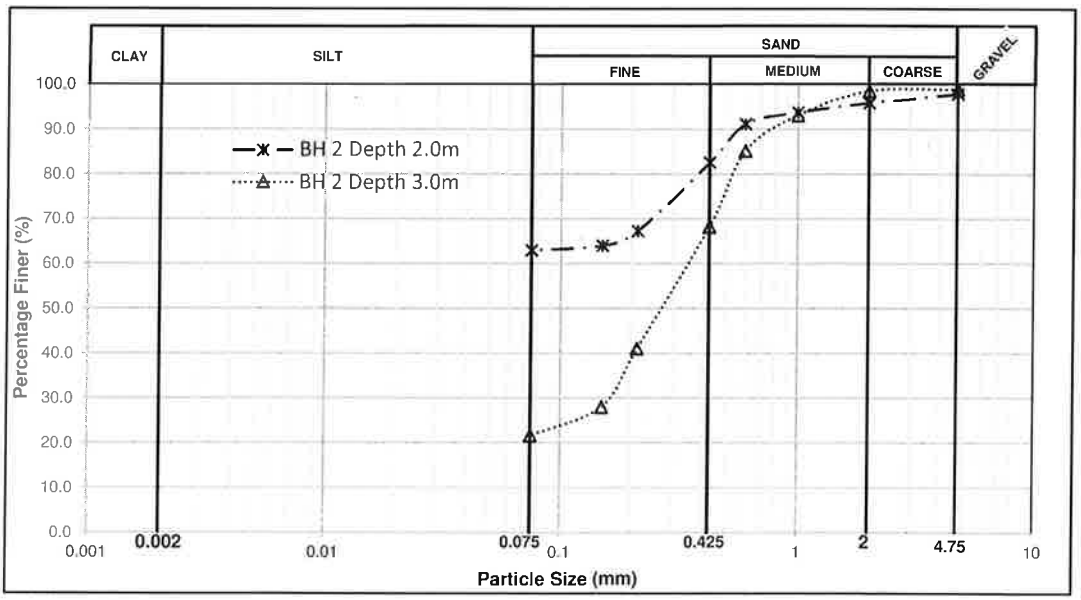
BH-No	Depth	Gravel	SAND (%)			SILT& CLAY	D_{10}	D_{30}	D_{60}	Cu	Cc
	(m)	(%)	Coarse	Medium	Fine	(%)	(mm)	(mm)	(mm)		
1	4.0m	0	1	45	41	13		0.252	0.473	#####	#####
1	5.0m	0	2	52	38	8	0.124	0.297	0.520	4.18	1.37
1	6.50m	0	2	42	50	6	0.181	0.352	0.243	1.34	2.83
1	8.0m	0	2	46	42	10	0.077	0.248	0.504	6.53	1.58

Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

GRAIN SIZE ANALYSIS



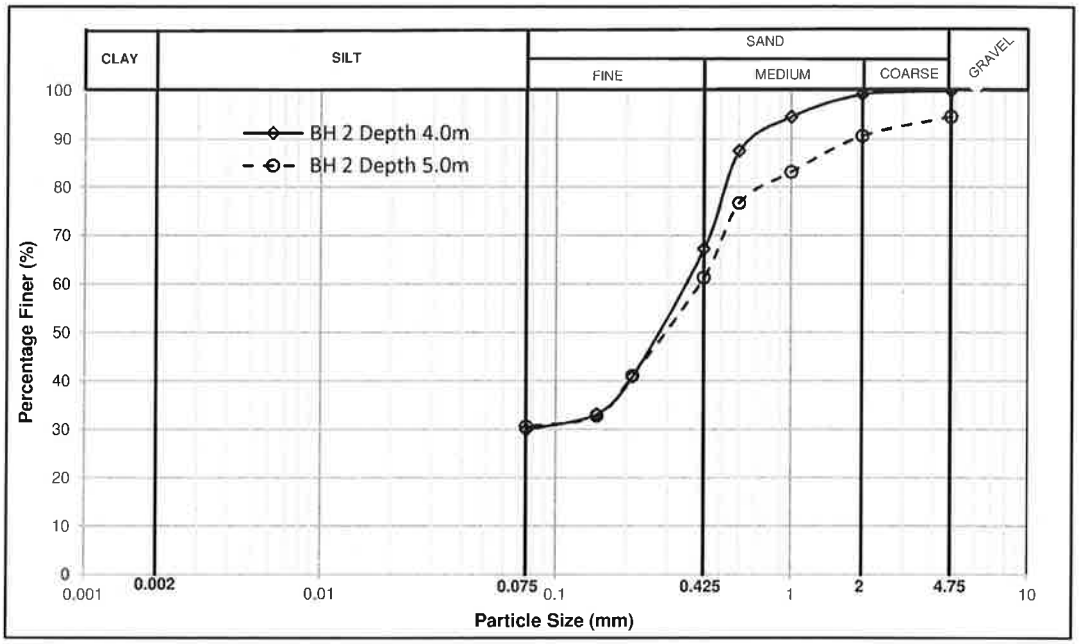


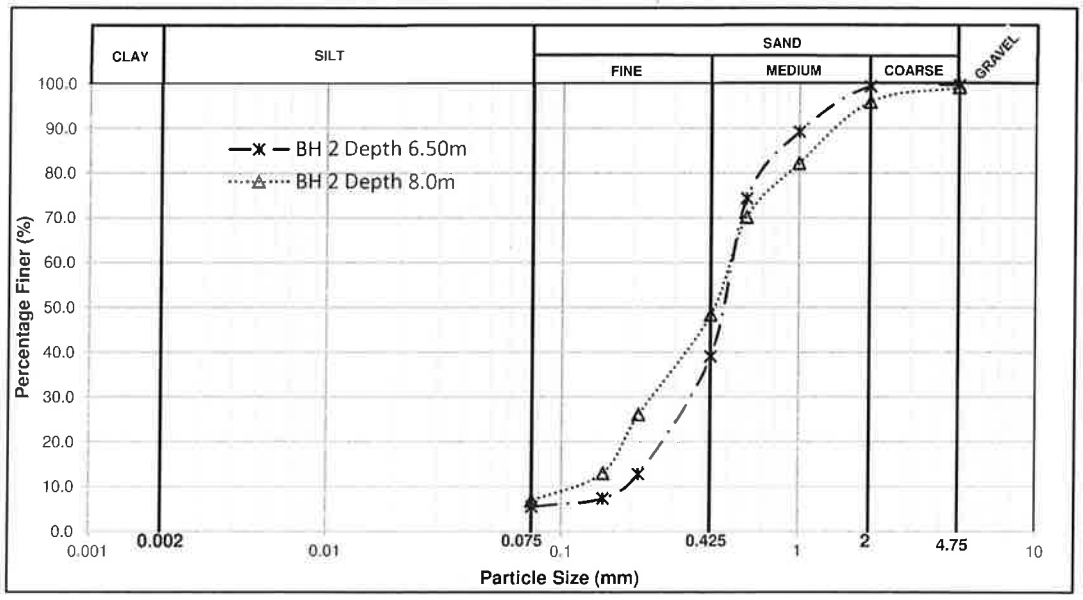
BH-No	Depth	Gravel	SAND (%)			SILT& CLAY	D_{10}	D_{30}	D_{60}	Cu	Cc
	(m)	(%)	Coarse	Medium	Fine	(%)	(mm)	(mm)	(mm)		
1	10.0m	7	7	31	22	33			0.514	#####	#####
1	11.50m	1	12	37	26	24		0.161	0.571	#####	#####
2	2.0m	2	2	13	20	63				#####	#####
2	3.0m	1	0	30	47	22		0.160	0.361	#####	#####

Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

GRAIN SIZE ANALYSIS



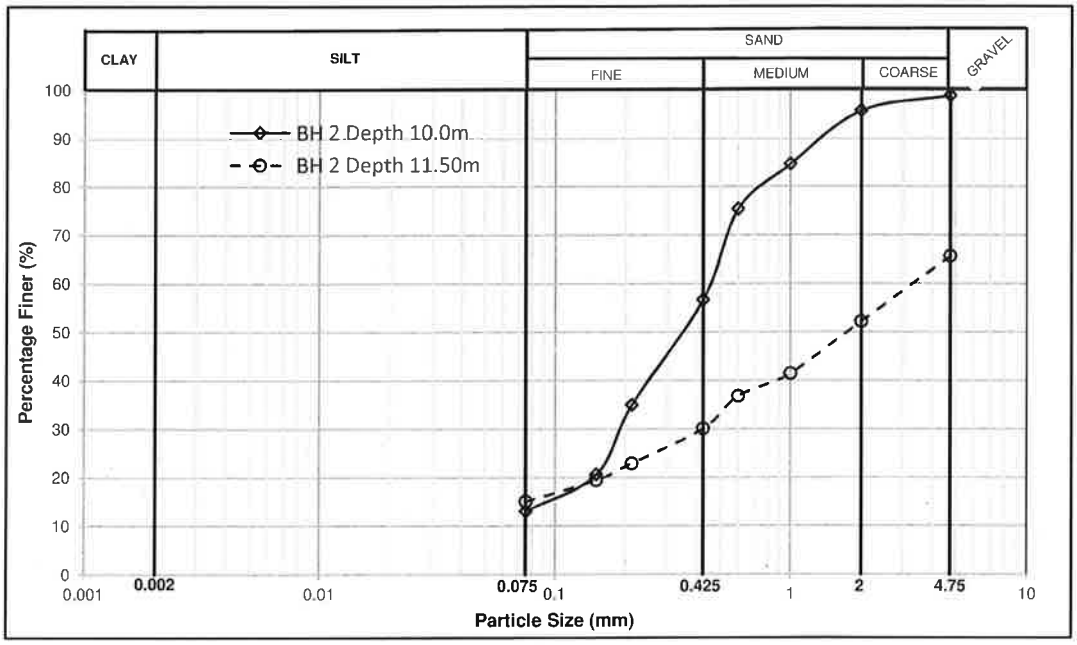


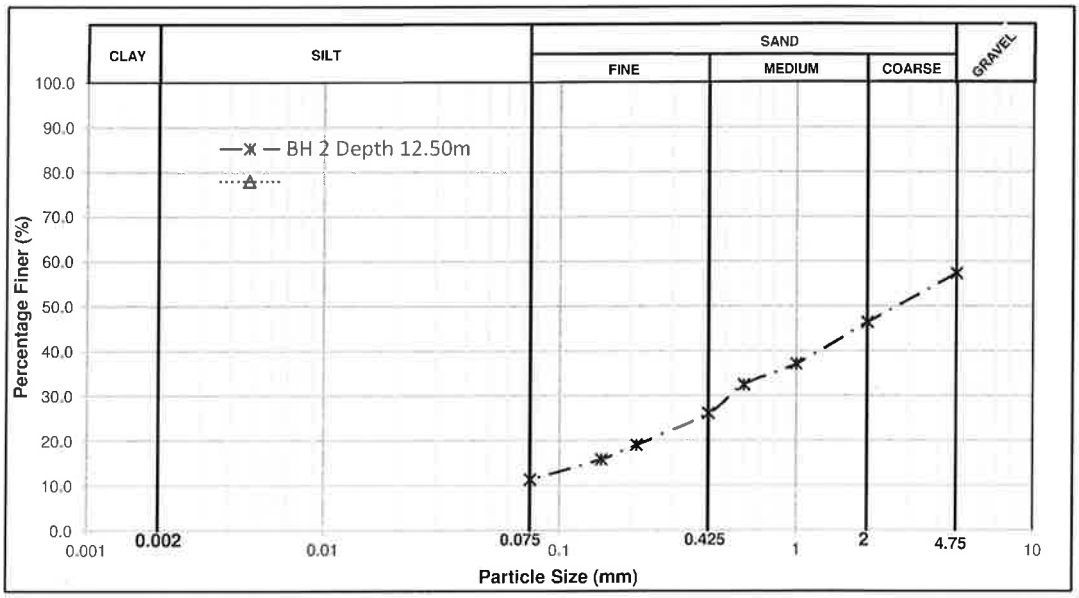
BH-No	Depth	Gravel	SAND (%)			SILT& CLAY	D_{10}	D_{30}	D_{60}	Cu	Cc
	(m)	(%)	Coarse	Medium	Fine	(%)	(mm)	(mm)	(mm)		
2	4.0m	0	1	32	37	30		0.078	0.367	#####	#####
2	5.0m	5	4	29	31	31	0.078	0.367	0.000	0.00	#####
2	6.50m	0	0	60	34	6	0.196	0.362	0.701	3.58	0.95
2	8.0m	1	3	48	41	7	0.114	0.250	0.519	4.57	1.06

Project No: MSGTPL/SI-5904-R1/23-24

Project : Proposed Construction of Stilt+5 Floors Residential Apartment at Thiruvanmiyur

GRAIN SIZE ANALYSIS





BH-No	Depth	Gravel	SAND (%)			SILT& CLAY	D_{10}	D_{30}	D_{60}	Cu	Cc
	(m)	(%)	Coarse	Medium	Fine	(%)	(mm)	(mm)	(mm)		
2	10.0m	1	3	39	44	13		0.191	0.456	#####	#####
2	11.50m	34	14	22	15	15	0.191	0.456	0.000	0.00	#####
2	12.50m	43	11	20	15	11		0.451	4.970	#####	#####

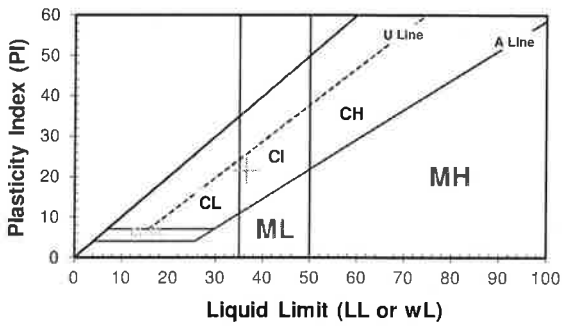
ATTERBERG LIMITS DATA SHEET

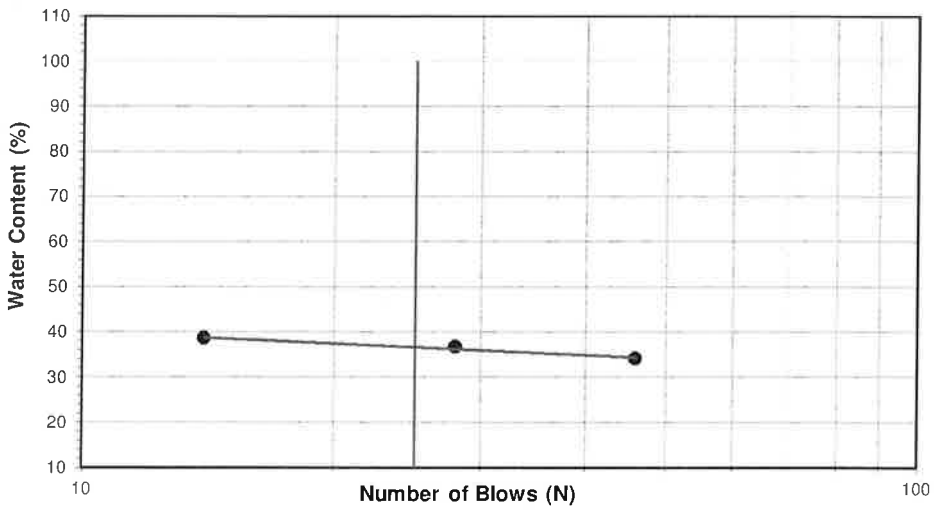
IS-2720-Part-5

Project :	Stilt+5 Floors Residential Apartment
Location:	Thiruvanmiyur
Boring No:	1
Sample Depth:	3.0m
Project No:	**MSGTPL/SI-5904-R1/23-24**

TEST			LIQUID LIMIT				PLASTIC LIMIT			
Variable	NO		1	2	3		1	2		
	Var.	Units								
Number of Blows	N	blows	14	28	46					
Tare Number	---	---	69	61	42		22			
Weight of Empty Tare	M_C	(g)	29.42	29.68	30.29		29.87			
Wt of Tare + Soil (Wet)	M_{CMS}	(g)	59.18	46.89	62.62		49.61			
Wt of Tare + Soil (Dry)	M_{CDS}	(g)	50.90	42.28	54.40		47.06			
Weight of Soil	M_S	(g)	21.48	12.60	24.11		17.19			
Weight of Water	M_W	(g)	8.28	4.61	8.22		2.55			
Water Content	*w*	(%)	**38.5**	**36.6**	**34.1**		**14.8**			

Liquid Limit (LL or w_L) (%)	36
Plastic Limit (PL or w_P) (%)	15
Plasticity Index (PI) (%)	**22**
Soil Classification	**CI**





.....END OF THE REPORT.....

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