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VELTECH CONSULTING ENGINEERS

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An ISO 9001:2015 Certified

GEOTECHNICAL INVESTIGATION REPORT

PROJECT: **GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF (STILT+5) RESIDENTIAL BUILDING AT NO. 15, ZAKARIA COLONY, 1ST STREET, VARADARAJANPET, CHOOLAIMEDU, CHENNAI - 600094. COMPRISED IN OLD T.S. NO:62, AS PER PATTA NEW T.S.NO. 62/2, BLOCK NO. 29 OF PULIYUR VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION**

CLIENT : M/s. TUYA HOMES.,

REPORT NO	DATE	REVISION-0
VCE/23/GIR–211	04.10.2023	Submission for Design of Foundation

Veltech Consulting Engineers

Geotechnical investigation

An ISO 9001:2015 Certified

04.10.2023

To

Client : M/s. TUYA HOMES.,

SUB: GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF (STILT+5) RESIDENTIAL BUILDING AT NO.15, ZAKARIA COLONY, 1ST STREET, VARADARAJANPET, CHOOLAIMEDU, CHENNAI - 600094. COMPRISED IN OLD T.S. NO:62, AS PER PATTA NEW T.S.NO. 62/2, BLOCK NO. 29 OF PULIYUR VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION

Dear Sir,

We are glad to submit two copy of our final Geotechnical Investigation Report for the above captioned project.

We look forward to hearing from you at your earliest convenience regarding this report.

We are pleased to work for you in this project. We assure our continual services to our best.

Yours Truly,

FOR VELTECH CONSULTING ENGINEERS

Er.R.VENKATA KRISHNAIAH.M.E.,

Geotechnical Consultant

VELTECH CONSULTING ENGINEERS CHENNAI 600073

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INTRODUCTION

This report presents the geotechnical investigations results carried out by Veltech Consulting Engineers, for the proposed construction of (Stilt+5) Residential Building At No.15, Zakaria Colony, 1st Street, Varadarajanpet, Choolaimedu, Chennai - 600094. comprised in Old T.S. No:62, As per Patta New T.S.No. 62/2, Block No. 29 of Puliyur village within the limits of Greater Chennai Corporation

This work was authorized by the **Client :M/s.TUYA HOMES.,**

Standard Penetration Testing for boreholes weredrilled at the site up to a maximum depth of 20.0mbelow existing ground level.

The investigation consists of drilling two boreholes, soil sampling, field and laboratory testing and preparation of a Geotechnical Report for the Proposed Construction of (Stilt+5) Residential Building At No.15, Zakaria Colony, 1st Street, Varadarajanpet, Choolaimedu, Chennai - 600094.

SCOPE OF WORK

The scope of this investigation is to:

- Conducting Standard Penetration Test (SPT) at regular depth intervals.
- Collecting split spoon samples or disturbed soil samples
- Conducting relevant laboratory tests
- Recommend a suitable foundation system and safe bearing pressure at foundation level.

SITE DESCRIPTION

The site for the proposed construction of (Stilt+5) Residential Building At No.15,.Zakaria Colony, 1st Street, Varadarajanpet, Choolaimedu, Chennai - 600094.

The elevation of site is same from the nearby road level.

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EXPLORATION TECHNIQUES

After the visual inspection of the site, the subsurface investigation was carried out as mentioned below:

Two (2) exploration boreholes were drilled to a maximum depth of 20.0m

BH-1was started on 27.09.2023 and completed on 28.09.2023.

BH-2was started on 28.09.2023 and completed on 29.09.2023.

Equipment Used

The equipment used for performing the drilling operations is a Calyx Rotary Drill Rig with direct mud circulation technique. The drill mud used was made out of Sodium Bentonite.

Methodology of drilling

In the soil strata, the drilling operations have been carried out using special drill bits and cutters coupled with direct mud circulation.

In-Situ Strength Tests:
Standard Penetration Test:

Standard penetration tests were conducted at the borehole locations, in accordance with IS: 2131. The tests were conducted at every change of strata up to the depth of termination of the borehole as directed by the engineer-in-charge.

Collection of Samples:
Disturbed Soil 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.

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LABORATORY TESTING

All the extracted soil samples were brought to our Laboratory for further examination in accordance with IS: 1498-1970. Selected samples were subjected to the following physical tests.

1. **Moisture Content**
2. **Sieve Analysis (IS: 2720 Part IV — 1985)**
3. **Liquid limit (IS: 2720 Part V — 1985)**
4. **Plastic Limit and Plasticity Index (IS: 2720 Part VI — 1972)**
5. **Differential Free Swell Test**

The laboratory test results are given in Appendix "C".

SUBSURFACE SOIL DESCRIPTION

Based on boreholes information, sub surface soil profile for the proposed construction Of Residential Building is given below:

BH-1

Depth (m)		Soil Description
From	To	
0.0	2.5	Brownish high plastic and swelling clay
2.5	5.5	Brownish fine sand
5.5	6.5	Brownish greyish medium to fine sand
6.5	11.5	Greyish medium to fine sand
11.5	14.5	Greyish white clayey fine silty sand with gravel
14.5	17.5	Greyish white medium plastic and high swelling clay with lime
17.5	18.0	Brownish shale
18.0	20.0	Brownish yellow slate rock

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BH-2

Depth (m)		Soil Description
From	To	
0.0	1.5	Brownish medium plastic and swelling clay
1.5	2.5	Brownish clayey fine silty sand
2.5	4.0	Brownish medium fine sand
4.0	12.5	Greyish brown medium to fine sand
12.5	14.5	Greyish white clayey fine silty sand with gravel
14.5	17.5	Greyish brown medium plastic and high swelling clay
17.5	18.0	Brownish shale
18.0	20.0	Brownish yellow slate rock

GROUND WATER

Ground water table was found at the depth of 2.0mbelow the existing ground level at the time of field investigation. However it will fluctuate due to seasonal variations.

FOUNDATION RECOMMENDATIONS

Based on the borehole information and laboratory test results in addition to the nature of structure, the recommendations for the proposed structure are given below.

BORED PILE FOUNDATION:

A Pile length of 20.0m has been analyzed below and the corresponding Pile capacities are given. Selection of Pile length was estimated according to soil profile and soil stiffness as obtained from SPT values. In case of bored pile the pile cap shall be placed 1.0m below ground level.

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PILE CAPACITIES

Bedrock was not encountered up to a maximum explored depth. Hence, the Piles utilizing friction and end bearing capacities shall be adopted for the proposed structures. The Pile capacities of the bored piles are worked out considering a depth of20.0m below ground level as the top of pile level. Estimation of Pile capacities are given below with reference to the boreholes drilled at site

PILE CAPACITY CALCULATIONS				
Pile Length (m)	**Pile Diameter (mm)**	**Factor of Safety = 2.5 Allowable Pile Load Capacity (kN)**	**Lateral load bearing capacity(kN)**	**Uplift Resistance(kN)**
20.0	450	840	67	355
20.0	500	990	79	400
20.0	600	1330	106	495

PILE GROUPING

The group efficiency shall be worked out based on number of Piles in a group. Piles shall have a minimum spacing of 2.5 times diameter centre to centre or minimum 1.5 times diameter as clear spacing in order to mobilise frictional resistance, which is a key factor in achieving better Pile capacities. Larger spacing is always preferable, in case of bored piles.

PILE GROUP EFFICENCY

Pile group efficiency will depend on the pattern of arrangement of piles and number of piles in a group. An efficiency of about 60 to 70% shall be considered for the on site soil condition, in general. However, it shall be decided based on pile load tests. Sequence of casting of Piles shall be such that the adjacent Piles do not get affected during Pile drilling. Tremmie concrete shall be carried out in order to minimise segregation. Water-cement ratio shall also be controlled in order not to be affected by water, existing inside the Pile boring. Gradual pull out of Pile casing is necessary, to avoid necking of Piles.

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UPLIFT CAPACITY

Uplift capacity of piles shall be considered as 50% of the ultimate frictional capacity of Piles.

PILE TESTING

The group efficiency shall be worked out based on number of Piles in a group. However, Pile load tests are recommended to observe the performance of the Piles and to re-confirm the theoretical Pile capacities. Load tests to be carried out after a minimum period of 1 week after driving of Pile.

Pile load tests should be conducted by loading up to 1.5 times the service load on working Pile, while minimum two (2) times the service load on Pilot Piles. A minimum of (two) 2 pile load test can be conducted for this project.

FOUNDATION CONSIDERATIONS

A PCC (Plain Cement Concrete) layer of 20-30cm thickness is recommended below the Pile cap/ foundation. Any over excavation in the foundation trenches should be re-filled by plain concrete and any disturbed and loose materials found in the foundation trenches should be removed before placement of P.C.C.

Excavated material except clay can be used as general backfill material. As per general practice the backfill material should not contain more than 15 % fines passing 0.075 mm sieve, retain 40% on 4.75mm size sieve while the maximum size of gravel allowed is 50mm.

Backfilling materials shall be placed in horizontal layers not exceeding 25 cm thickness and each layer shall be compacted to at least 95% of the maximum dry density.

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GENERAL CONSIDERATIONS

The recommendations for foundation design and construction are based on the information obtained from the boreholes drilled at site. When foundation construction is underway, the recommendations of this report should be checked through field inspection, to validate the information for use during the construction stage. Any variation in underground conditions revealed by the borehole should be brought to our attention for alternate recommendations, if required.

Yours Truly,

FOR VELTECH CONSULTING ENGINEERS

Er.R.VENKATA KRISHNAIAH.M.E.,
Geotechnical Consultant

VELTECH CONSULTING ENGINEERS * CHENNAI 600073

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

APPENDIX A

BOREHOLE LOG

BOREHOLE LOG

		Water Table	: 2.0m
Client	: M/s.TUYA HOMES.,	Ele . Of G.L	: 0.0m
Type of building	: (Stilt+5) Residential Building	Type Of Boring	: Rotary
Location	: Choolaimedu, Chennai.	Dia of Boring	: 150mm
B.H. No	: 1	Started on	: 27.09.2023
Final Depth	: 20.0m	Ended on	: 28.09.2023

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0			Brownish high plastic and swelling clay					
1.0			Ditto	2	3	3	6	Firm
2.0	▼		Ditto	5	6	6	12	Stiff
3.0			Brownish fine sand	6	7	8	15	Medium dense
4.5			Ditto	7	8	10	18	Medium dense
6.0			Brownish greyish medium to fine sand	9	12	15	27	Medium dense
7.0			Greyish medium to fine sand	8	14	16	30	Medium dense
8.5			Ditto	9	12	16	28	Medium dense
10.0			Ditto	12	15	15	30	Medium dense
10.5								

BOREHOLE LOG

		Water Table	2.0m
Client	: M/s.TUYA HOMES.,	Ele . Of G.L	: 0.0m
Type of building	: (Stilt+5) Residential Building	Type Of Boring	: Rotary
Location	: Choolaimedu, Chennai.	Dia of Boring	: 150mm
B.H. No	: 1	Started on	: 27.09.2023
Final Depth	: 20.0m	Ended on	: 28.09.2023

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
11.0 – 14.0			Greyish medium to fine sand with silt mixtures	14	18	18	36	Dense
			Greyish white clayey fine silty sand with gravel	18	100/27cm			Very Dense
14.5 – 17.0			Greyish white medium plastic and high swelling clay with lime	20	50/15cm			Hard
17.5			Brownish shale	50/3cm				Very Dense
18.0 – 19.5			Brownish yellow slate rock Ditto	6cm -1nos, 4cm-1nos, 7.5cm-1nos, 7-1nos,8-1nos, 2-1nos, 3-1nos				TCR=19.0% RQD= Nil
20.0 – 21.0			Borehole 1 terminated at the depth of 20.0m					

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BOREHOLE LOG

		Water Table	: 2.0m
Client	: M/s.TUYA HOMES.,	Ele . Of G.L	: 0.0m
Type of building	: (Stilt+5) Residential Building	Type Of Boring	: Rotary
Location	: Choolaimedu, Chennai.	Dia of Boring	: 150mm
B.H. No	: 2	Started on	: 28.09.2023
Final Depth	: 20.0m	Ended on	: 29.09.2023

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0			Brownish medium plastic and swelling clay					
1.0			Ditto	3	3	5	8	Stiff
1.5								
2.0	▼		Brownish clayey fine silty sand	3	4	7	11	Medium dense
3.0			Brownish medium fine sand	5	7	7	14	Medium dense
4.5			Greyish brown medium to fine sand	7	8	9	17	Medium dense
6.0			Ditto	10	11	13	24	Medium dense
7.0			Ditto	12	14	15	29	Medium dense
8.5			Greyish brown medium to fine sand	10	11	12	23	Medium dense
10.0			Ditto	11	14	16	30	Medium dense
10.5								

BOREHOLE LOG

Client	: M/s.TUYA HOMES.,	Water Table	2.0m
Type of building	: (Stilt+5) Residential Building	Ele . Of G.L	: 0.0m
Location	: Choolaimedu, Chennai.	Type Of Boring	: Rotary
B.H. No	: 2	Dia of Boring	: 150mm
Final Depth	: 20.0m	Started on	: 28.09.2023
		Ended on	: 29.09.2023

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
11.0 – 12.0			Greyish brown medium to fine sand	14	16	18	34	Dense
12.5 – 14.0			Greyish white clayey fine silty sand with gravel	18	35	65	100	Very Dense
14.5 – 17.0			Greyish brown medium plastic and high swelling clay	19	100/26cm			Hard
17.5			Brownish shale	50/3cm				Very Dense
18.0 – 19.5			Brownish yellow slate rock Ditto	9cm -1nos, 9cm-1nos, 7cm-1nos, 6-1nos,5-1nos, 4-1nos, 4-1nos				TCR=22.0% RQD= Nil
20.0 – 21.0			Borehole 2 terminated at the depth of 20.0m					

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

APPENDIX B

LABORATORY TEST RESULTS

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

1- a) PHYSICAL ANALYSIS OF SOIL BH-1

Test results of Moisture content , Atterberg limits

DEPTH M	Moisture Content%	Atterberg limits				IS Classification
		W_L%	W_P%	I_P%	FSI%	
1.0	26.50	51	25	26	45	CH
2.0	24.76	46	23	23	40	CI
3.0	18.02	Non plastic				SM
4.5	16.54	Non plastic				SM
6.0	14.93	Non plastic				SM
7.5	12.86	Non plastic				SP
9.0	11.75	Non plastic				SP
10.5	15.60	Non plastic				SM
12.0	17.59	Non plastic				SM
14.0	21.84	Non plastic				SM
16.0	24.91	45	22	23	55	CI

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

1-b) GRAIN SIZE ANALYSIS OF SOIL – BH-1

DEPTH M	GRAVEL SAND %	COARSE SAND %	MEDIUM SAND %	FINE SAND %	SILT + CLAY%
1.0	-	2	2	4	92
2.0	-	-	5	24	71
3.0	2	-	12	63	23
4.5	-	-	18	67	15
6.0	-	-	23	58	19
7.5	-	2	36	50	12
9.0	-	1	44	47	8
10.5	-	-	6	60	34
12.0	-	2	27	41	30
14.0	18	9	12	26	35
16.0	5	3	9	11	72

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

2- a) PHYSICAL ANALYSIS OF SOIL BH-2

Test results of Moisture content , Atterberg limits

DEPTH M	Moisture Content%	Atterberg limits				IS Classification
		W_L%	W_P%	I_P%	FSI%	
1.0	23.6	49	23	26	40	CI
2.0	18.15	Non plastic				SC
3.0	16.26	Non plastic				SM
4.5	16.58	Non plastic				SM
6.0	17.13	Non plastic				SM
7.5	15.91	Non plastic				SM
9.0	14.03	Non plastic				SM
10.5	14.29	Non plastic				SP
12.0	16.84	Non plastic				SM
14.0	21.08	Non plastic				SM
16.0	26.02	46	24	22	60	CI

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

2-b) GRAIN SIZE ANALYSIS OF SOIL – BH-2

DEPTH M	GRAVEL SAND %	COARSE SAND %	MEDIUM SAND %	FINE SAND %	SILT + CLAY%
1.0	-	-	3	14	83
2.0	-	-	5	53	42
3.0	-	2	42	38	18
4.5	-	-	34	40	26
6.0	-	1	28	42	29
7.5	-	-	39	36	25
9.0	-	1	57	29	13
10.5	3	2	54	32	9
12.0	-	-	32	46	22
14.0	21	13	19	9	38
16.0	5	2	3	11	79

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

ABBREVIATION

Note

- W_N = Natural Moisture content (%)
- W_L = Liquid limit (%)
- W_P = Plasticity Limit (%)
- I_P = Plasticity Index (%)
- F.S.I = Free Swell Index (%)
- IS = Indian Standard Classification
- CL = Low compressibility Clay of $W_L < 35\%$
- CI = Inorganic Clay of $35\% < W_L < 50\%$
- CH = High Compressibility Clay of $W_L > 50\%$
- SP = Poorly graded sand
- GP = Poorly graded gravel
- SW = Well graded sand
- SM = Silty sand

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CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building

APPENDIX C

PHOTOS

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT : M/s.Tuya Homes.,

Project : (Stilt+5) Residential Building



Client : **M/s.TUYA HOMES.,**
Type of building : **(Stilt+5) Residential Building**
Location : **Choolaimedu, Chennai.**

DESIGN OF PILE FOUNDATION (NBH-5)

1.0 Type of Installation of Pile **Bored Cast in Situ**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	450.00 mm
Length of Pile	:	20.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

Layer-I

Type of Strata	:	Clay
Length of strata,lc		5.50 m
Average SPT of the strata,N	:	23
Bulk Density of the strata, γ	:	16.86 kN/m^3
Undrained Shear Strength (Cu)	:	30.00 kN/m^2
Adhesion, σ	:	0.50
Skin Resistance of the pile,q_s	:	116.57 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 **Layer-II**

Type of Strata	:	sand
Average SPT of the strata,N	:	36
Bulk Density of the strata, γ	:	18.05 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.00 Deg
tan phi		0.62
Top of Strata	:	2.50 m
Bottom of Strata	:	14.50 m
Average Thickness of Strata,I_c	:	12.00 m
Effective overburden pressure at the middle of the strata,σ_{midc}	:	86.03 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	592.11 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.2 **Layer-III**

Type of Strata	:	weathered rock
Average SPT of the strata,N	:	100
Bulk Density of the strata, γ	:	20.00 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.50 Deg
tan phi		0.64
Top of Strata	:	17.50 m
Bottom of Strata	:	20.00 m
Average Thickness of Strata,I_c	:	2.50 m
Effective overburden pressure at the middle of the strata,σ_{midc}	:	146.83 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	214.65 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.5 Computation of End Bearing Resistance:

	Type of Bearing Strata	:	weathered rock
	Dia of pile	:	0.45 m
	Cross-Sectional Area of pile,Ap	:	0.1589625 m^2
	R.L of bottom of pile	:	20.00 m
	Minimum SPT-value of the Bearing Strata	:	100
	Angle of internal friction	:	36.00
	Bearing Capacity Factor(Nq)	:	65.00
	Effecitve Over Burden Pressure at the bottom of pile (qu	:	114.00 kN/m^2
	Ultimate End Bearing Resistance (Qp)	:	**1177.91** kN
	(Qp=Ap*Nq*qu)		
1.3.0	**Ultimate Load Carrying Capacity (Qs+Qp)**	:	**2101.24** kN
	Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**840.5** kN
	say		**84 T**
	Lateral Load Bearing Capacity		**7 T**
	Ultimate uplift resistance		**923.33 kN**
	Safe Uplift resistance		**307.78 kN**
	Self wt. of pile	:	**47.69 kN**
	Say		**355 kN**
			36 T

Client	:	**M/s.TUYA HOMES.,**
Type of building	:	**(Stilt+5) Residential Building**
Location	:	**Choolaimedu, Chennai.**

DESIGN OF PILE FOUNDATION (NBH-5)

1.0 Type of Installation of Pile — **Bored Cast in Situ**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	500.00 mm
Length of Pile	:	20.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

Layer-I

Type of Strata	:	Clay
Length of strata,lc		5.50 m
Average SPT of the strata,N	:	23
Bulk Density of the strata, γ	:	16.86 kN/m^3
Undrained Shear Strength (Cu)	:	30.00 kN/m^2
Adhesion, σ	:	0.50
Skin Resistance of the pile,q_s	:	129.53 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 Layer-II

Type of Strata	:	sand
Average SPT of the strata,N	:	36
Bulk Density of the strata, γ	:	18.05 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.00 Deg
tan phi		0.62
Top of Strata	:	2.50 m
Bottom of Strata	:	14.50 m
Average Thickness of Strata,I_c	:	12.00 m
Effective overburden pressure at the middle of the strata,σ_{mid}	:	86.03 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	657.90 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.2 Layer-III

Type of Strata	:	weathered rock
Average SPT of the strata,N	:	100
Bulk Density of the strata, γ	:	20.00 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.50 Deg
tan phi		0.64
Top of Strata	:	17.50 m
Bottom of Strata	:	20.00 m
Average Thickness of Strata,I_c	:	2.50 m
Effective overburden pressure at the middle of the strata,σ_{mid}	:	146.83 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	238.50 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.5 Computation of End Bearing Resistance:

Type of Bearing Strata	:	weathered rock	
Dia of pile	:	0.50	m
Cross-Sectional Area of pile,Ap	:	0.19625	m^2
R.L of bottom of pile	:	20.00	m
Minimum SPT-value of the Bearing Strata	:	100	
Angle of internal friction	:	36.00	
Bearing Capacity Factor(Nq)	:	65.00	
Effecitve Over Burden Pressure at the bottom of pile (qu	:	114.00	kN/m^2
Ultimate End Bearing Resistance (Qp)	:	**1454.21**	kN
(Qp=Ap*Nq*qu)			

1.3.0	**Ultimate Load Carrying Capacity (Qs+Qp)**	:	**2480.13**	kN
	Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**992.1**	kN
	say		**99**	**T**
	Lateral Load Bearing Capacity		**8**	**T**
	Ultimate uplift resistance		**1025.92**	**kN**
	Safe Uplift resistance		**341.97**	**kN**
	Self wt. of pile	:	**58.88**	**kN**
	Say		**401**	**kN**
			40	**T**

Client	:	**M/s.TUYA HOMES.,**
Type of building	:	**(Stilt+5) Residential Building**
Location	:	**Choolaimedu, Chennai.**

DESIGN OF PILE FOUNDATION (NBH-5)

1.0 Type of Installation of Pile — **Bored Cast in Situ**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	600.00 mm
Length of Pile	:	20.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

Layer-I

Type of Strata	:	Clay
Length of strata,lc		5.50 m
Average SPT of the strata,N	:	23
Bulk Density of the strata, γ	:	16.86 kN/m^3
Undrained Shear Strength (Cu)	:	30.00 kN/m^2
Adhesion, σ	:	0.50
Skin Resistance of the pile,q_s	:	155.43 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 **Layer-II**

Type of Strata	:	sand
Average SPT of the strata,N	:	36
Bulk Density of the strata, γ	:	18.05 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.00 Deg
tan phi		0.62
Top of Strata	:	2.50 m
Bottom of Strata	:	14.50 m
Average Thickness of Strata,I_c	:	12.00 m
Effective overburden pressure at the middle of the strata,σ_{mid}	:	86.03 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	789.48 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.2 **Layer-III**

Type of Strata	:	weathered rock
Average SPT of the strata,N	:	100
Bulk Density of the strata, γ	:	20.00 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	32.50 Deg
tan phi		0.64
Top of Strata	:	17.50 m
Bottom of Strata	:	20.00 m
Average Thickness of Strata,I_c	:	2.50 m
Effective overburden pressure at the middle of the strata,σ_{mid}	:	146.83 kN/m^2
Coef. Earth Pressure at Rest		0.65
Skin Resistance of the pile,q_s	:	286.19 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

1.2.5 Computation of End Bearing Resistance:

Type of Bearing Strata	:	weathered rock
Dia of pile	:	0.60 m
Cross-Sectional Area of pile,Ap	:	0.2826 m^2
R.L of bottom of pile	:	20.00 m
Minimum SPT-value of the Bearing Strata	:	100
Angle of internal friction	:	36.00
Bearing Capacity Factor(Nq)	:	65.00
Effecitve Over Burden Pressure at the bottom of pile (qu	:	114.00 kN/m^2
Ultimate End Bearing Resistance (Qp)	:	**2094.07** kN
(Qp=Ap*Nq*qu)		

1.3.0

Ultimate Load Carrying Capacity (Qs+Qp)	:	**3325.17** kN
Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**1330.1** kN
say		**133 T**
Lateral Load Bearing Capacity		**11 T**
Ultimate uplift resistance		**1231.10 kN**
Safe Uplift resistance		**410.37 kN**
Self wt. of pile	:	**84.78 kN**
Say		**495 kN**
		50 T

CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru R.VENKATA KRISHNAIAH** has enrolled as **Registered Geo-Technical Engineer (RGTE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.E.,(Civil) - Geo Technical Engg.** and experience in the relevant field for **10 years**.

He has been given the Registration No.**GTE/19/07/032** on **05.07.2019.** He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto **04.07.2024**.



05/07/2019

(R.SHIVAKUMAR)
ASSISTANT PLANNER
CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
CHENNAI - 600 008

R.VENKATA KRISHNAIAH
GEOTECHNICAL CONSULTANT
VELTECH CONSULTING ENGINEERS
NO.10, ELUMALAI NAICKEN STREET,
SELAIYUR, CHENNAI - 600073.
REG. NO. GTE/19/07/032



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empowering your real estate decisions with smart tools

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