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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+3) RESIDENTIAL BUILDING AT T.S.NO.57/15 & 57/3 BLOCK NO.07, OF PULIYUR VILLAGE, SOUTH SIVAN KOIL STREET, KODAMBAKKAM , CHENNAI -600 024.

CLIENT : Mrs .P.Swarnalatha Reddy.,

REPORT NO	DATE	REVISION-0
VCE/24/GIR–378	21.02.2024	Submission for Design of Foundation

21.02.2024

To

Client : Mrs.P.Swarnalatha Reddy.,

SUB: GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF (STILT+3) RESIDENTIAL BUILDING AT T.S.NO.57/15 & 57/3 BLOCK NO.07, OF PULIYUR VILLAGE, SOUTH SIVAN KOIL STREET, KODAMBAKKAM , CHENNAI -600 024.

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.S.Jeyanthi, M.Tech.,

General Manager.

VELTECH CONSULTING ENGINEERS CHENNAI 600 073

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Appendix - A

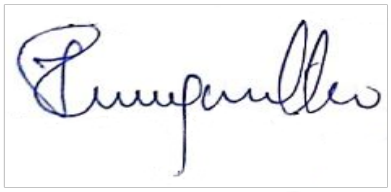
- Borelog Sheets

Appendix - B

- Laboratory Test Results

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- Pile Calculation & Photos





INTRODUCTION

This report presents the geotechnical investigations results carried out by **Veltech Consulting Engineers,** for the proposed Construction of (Stilt+3) Residential Building At T.S.No.57/15 & 57/3 Block No.07, Of Puliyur Village, South Sivan Koil Street, Kodambakkam , Chennai -600 024.

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This work was authorized by the **Client : Mrs.P.Swarnalatha Reddy.,**

Standard Penetration Testing boreholes were drilled at the site up to a maximum depth of 24.0mbelow 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+3) Residential Building At T.S.No.57/15 & 57/3 Block No.07, Of Puliyur Village, South Sivan Koil Street, Kodambakkam , Chennai -600 024.

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+3) Residential Building At T.S.No.57/15 & 57/3 Block No.07, Of Puliyur Village, South Sivan Koil Street, Kodambakkam , Chennai -600 024. 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 24.0m.

BH -1 was started on 13.02.2024and completed on 14.02.2024.
BH -2 was started on 15.02.2024and completed on 16.02.2024.

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 (Stilt+3) Residential Building is given below:

BH-1

Depth (m)		Soil Description
From	To	
0.0	1.0	Filling soil
1.0	4.5	Brownish medium to fine sand
4.5	7.0	Brownish fine silty sand
7.0	21.0	Blackish high plastic and high swelling clay
21.0	22.0	Blackish medium plastic and medium swelling clay

BH-2

Depth (m)		Soil Description
From	To	
0.0	1.0	Filling soil

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1.0	4.0	Brownish medium to fine sand
4.0	7.0	Brownish medium to fine sand
7.0	9.0	Blackish medium plastic and medium swelling clay
9.0	21.0	Blackish high plastic and high swelling clay
21.0	23.0	Greyish white fine silty sand
23.0	24.0	Greyish brown medium plastic and high swelling clay

GROUND WATER

Ground water table was found at the depth of 2.0mbelow the 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.

ALTERNATE 1: SHALLOW FOUNDATION

- Isolated /Strip foundation shall be adopted for the proposed structure.
- Excavate upto the depth of 3.0m and backfill by gravels for 100cm thickness with proper compaction.
- Foundation shall be placed at **2.0m** depth below the existing ground level on a gravel fill of 100cm thickness. The width of footing shall be limited to 3.0m
- An allowable bearing pressure of **150kN/m^2** at the depth of **2.0m upon fill** shall be taken for design.
- Grade beams shall be adopted in order to minimize differential settlements.
- Dewatering may be required at the time of foundation concrete.
- The type of foundation shall be decided by the structural engineer based upon foundation loads and the structural design conditions.

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- The probable maximum and differential settlement of the soil under any part of the foundation must be limited to safe and tolerable limits.

ALTERNATE 2: BORED PILE FOUNDATION

A Pile length of 22.0m 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.

PILE CAPACITIES

Bedrock was not encountered up to a maximum explored depth. Hence, the Piles utilizing friction shall be adopted for the proposed structures. The Pile capacities of the bored piles are worked out considering a depth of 22.0m 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)
22.0	450	350	28	230
22.0	500	410	32	260
22.0	600	530	42	330

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.

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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.

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 15cm thickness is recommended below the foundation/pile cap. 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.

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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.

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.S.Jeyanthi, M.Tech.,
General Manager.

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CHENNAI
600 073

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building

APPENDIX A

BOREHOLE LOG

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BOREHOLE LOG

Client	: Mrs.P.Swarnalatha Reddy.,	**Water Table**	:2.0m
Type of building	: (Stilt+3) Residential Building	**Ele . Of G.L**	Nil
Location	: Kodambakkam, Chennai.	**Type Of Boring**	: Rotary
B.H. No	: 1	**Dia of Boring**	: 150mm
Final Depth	: 22.0m	**Started on**	: 13.02.2024
		Ended on	: 14.02.2024

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0 – 1.0			Filling soil					
1.0 – 2.0	▼		Brownish medium to fine sand	4	5	7	12	Medium dense
2.0 – 3.0			Ditto	4	6	8	14	Medium dense
3.0 – 4.5			Brownish fine silty sand	5	7	10	17	Medium dense
4.5 – 6.0			Ditto	6	8	10	18	Medium dense
6.0 – 7.5			Blackish high plastic and high swelling clay	3	4	6	10	Stiff
7.5 – 9.0			Ditto	3	4	4	8	Firm
9.0 – 10.5			Ditto	4	4	4	8	Firm

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BOREHOLE LOG

		Water Table	: 2.0m
Client	: Mrs.P.Swarnalatha Reddy.,	Ele . Of G.L	Nil
Type of building	: (Stilt+3) Residential Building	Type Of Boring	: Rotary
Location	: Kodambakkam, Chennai.	Dia of Boring	: 150mm
B.H. No	: 1	Started on	: 13.02.2024
Final Depth	: 22.0m	Ended on	: 14.02.2024

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			Blackish high plastic and high swelling clay	2	1	1	2	Very soft
12.0 – 14.0			Ditto	2	2	2	4	Soft
14.0 – 16.0			Blackish high plastic and high swelling clay	1	1	1	2	Very soft
16.0 – 18.0			Ditto	2	2	2	4	Soft
18.0 – 20.0			Ditto	2	3	3	6	Firm
20.0 – 20.5								

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BOREHOLE LOG

		Water Table	: 2.0m
Client	: Mrs.P.Swarnalatha Reddy.,	Ele . Of G.L	: Nil
Type of building	: (Stilt+3) Residential Building	Type Of Boring	: Rotary
Location	: Kodambakkam, Chennai.	Dia of Boring	: 150mm
B.H. No	: 1	Started on	: 13.02.2024
Final Depth	: 22.0m	Ended on	: 14.02.2024

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	SPT COUNT 15 -30 cm	SPT COUNT 30 -45 cm	SPT COUNT N- Value	Relative Density /Consistency
21.0 – 22.0			Blackish medium plastic and medium swelling clay	35	50/15cm penetration			Hard
22.0 – 31.0			Borehole 1 terminated at the depth of 22.0m					

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BOREHOLE LOG

		Water Table	: 2.0m
Client	: Mrs.P.Swarnalatha Reddy.,	Ele . Of G.L	Nil
Type of building	: (Stilt+3) Residential Building	Type Of Boring	: Rotary
Location	: Kodambakkam, Chennai.	Dia of Boring	: 150mm
B.H. No	: 2	Started on	: 15.02.2024
Final Depth	: 24.0m	Ended on	: 16.02.2024

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
0.0 – 1.0			Filling soil					
1.0 – 2.0			Brownish medium to fine sand	5	7	8	15	Medium dense
2.0 – 3.0			Ditto	6	9	9	18	Medium dense
3.0 – 4.5			Brownish medium to fine sand	7	10	11	21	Medium dense
4.5 – 6.0			Ditto	8	10	12	22	Medium dense
6.0 – 7.5			Blackish medium plastic and medium swelling clay	3	4	6	10	Stiff
7.5 – 9.0			Blackish high plastic and high swelling clay	3	4	4	8	Firm
9.0 – 10.5			Ditto	3	3	4	7	Firm

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BOREHOLE LOG

Client	: Mrs.P.Swarnalatha Reddy.,	Water Table	: 2.0m
Type of building	: (Stilt+3) Residential Building	Ele . Of G.L	Nil
Location	: Kodambakkam, Chennai.	Type Of Boring	: Rotary
B.H. No	: 2	Dia of Boring	: 150mm
Final Depth	: 24.0m	Started on	: 15.02.2024
		Ended on	: 16.02.2024

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			Blackish high plastic and high swelling clay	4	2	2	4	Soft
12.0 – 14.0			Ditto	1	1	1	2	Very Soft
14.0 – 16.0			Blackish high plastic and high swelling clay	1	1	2	3	Soft
16.0 – 18.0			Ditto	2	2	3	5	Firm
18.0 – 20.0			Ditto	2	3	3	6	Firm

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BOREHOLE LOG

		Water Table	**: 2.0m**
Client	**: Mrs.P.Swarnalatha Reddy.,**	**Ele . Of G.L**	**: Nil**
Type of building	**: (Stilt+3) Residential Building**	**Type Of Boring**	**: Rotary**
Location	**: Kodambakkam, Chennai.**	**Dia of Boring**	**: 150mm**
B.H. No	**: 2**	**Started on**	**: 15.02.2024**
Final Depth	**: 24.0m**	**Ended on**	**: 16.02.2024**

Depth (m)	GWL	SYMBOL	DESCRIPTION	SPT COUNT 0 -15 cm	15 -30 cm	30 -45 cm	N- Value	Relative Density /Consistency
21.0 – 22.5			Greyish white fine silty sand	20	35	40	75	Very dense
23.0 – 24.0			Greyish brown medium plastic and high swelling clay	40	50/15cm penetration			Hard
24.5 – 31.0			Borehole 2 terminated at the depth of 24.0m					

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VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building

APPENDIX B

LABORATORY TEST RESULTS





GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) 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	Filling soil					
2.0	16.46	Non Plastic				SM
3.0	12.31	Non Plastic				SP
4.5	15.62	Non Plastic				SM
6.0	14.48	Non Plastic				SM
7.5	36.24	59	30	29	60	CH
9.0	30.87	63	33	30	66	CH
10.5	29.21	66	35	31	63	CH
12.0	48.56	57	29	28	60	CH
14.0	35.71	62	30	32	65	CH
16.0	41.83	60	29	32	60	CH
18.0	37.04	65	31	34	63	CH
20.0	33.06	67	34	33	65	CH
22.0	19.93	41	18	23	43	CI

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GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building

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

DEPTH M	GRAVEL SAND %	COARSE SAND %	MEDIUM SAND %	FINE SAND %	SILT + CLAY%
2.0	-	-	43	41	16
3.0	-	-	47	43	10
4.5	-	-	18	45	37
6.0	-	-	12	56	32
7.5	-	-	2	5	93
9.0	-	-	1	1	98
10.5	-	-	-	1	99
12.0	-	-	4	9	87
14.0	-	1	1	2	96
16.0	2	-	3	5	90
18.0	-	-	2	4	94
20.0	-	-	1	1	98
22.0	3	2	15	27	53

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GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) 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	Filling soil					
2.0	14.18	Non Plastic				SM
3.0	14.25	Non Plastic				SP
4.5	12.69	Non Plastic				SM
6.0	10.58	Non Plastic				SP
7.5	30.27	48	24	24	45	CI
9.0	32.79	63	31	32	65	CH
10.5	33.36	67	33	34	68	CH
12.0	31.55	64	31	33	65	CH
14.0	35.22	61	30	31	62	CH
16.0	34.76	64	32	32	60	CH
18.0	28.53	62	30	32	60	CH
20.0	27.85	65	33	32	63	CH
22.0	18.75	Non Plastic				SM
24.0	22.19	47	23	24	55	CI

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GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building

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

DEPTH M	GRAVEL SAND %	COARSE SAND %	MEDIUM SAND %	FINE SAND %	SILT + CLAY%
2.0	-	-	39	47	14
3.0	-	-	36	53	11
4.5	-	-	41	46	13
6.0	-	-	43	52	5
7.5	-	-	8	21	71
9.0	-	-	-	1	99
10.5	-	-	-	1	99
12.0	-	-	-	1	99
14.0	-	-	2	3	95
16.0	-	-	1	3	96
18.0	-	-	3	5	92
20.0	-		1	2	97
22.0	5	3	17	33	42
24.0	-	-	10	27	63

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GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) 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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VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building

APPENDIX C

PILE CALCULATION &PHOTOS



Client : **Mrs.P.Swarnalatha Reddy.,**
Project : **(Stilt+3) Residential Building**
Location : **Kodambakkam, Chennai.**

DESIGN OF PILE FOUNDATION (Ref BH-1)

1.0 Type of Installation of Pile **Bored pile**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	450.00 mm
Length of Pile	:	22.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

1.2.2

Layer-I

Type of Strata	:	sand
Average SPT of the strata,N	:	15
Bulk Density of the strata, γ	:	18.14 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	30.00 Deg
tan phi		0.58
Top of Strata	:	0.00 m
Bottom of Strata	:	7.00 m
Average Thickness of Strata,I_c	:	7.00 m
Effective overburden pressure at the middle of the strata,σ_m	:	28.49 kN/m^2
Coef. Earth Pressure at Rest		1.00
Skin Resistance of the pile,q_s	:	162.59 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

Layer-II

Type of Strata	:	Clay
Length of strata,lc		15.00 m
Average SPT of the strata,N	:	10
Bulk Density of the strata, γ	:	17.61 kN/m^3
Undrained Shear Strength (Cu)	:	25.00 kN/m^2
Adhesion, σ	:	0.70
Skin Resistance of the pile,q_s	:	370.91 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 Computation of End Bearing Resistance:

Type of Bearing Strata	:	Clay
Cross-Sectional Area of pile,Ap	:	0.1589625 m^2
R.L of bottom of pile	:	22.00 m
Minimum SPT-value of the Bearing Strat	:	50
Unconfined compression strength (c)	:	250.00 Kn/m2
Bearing Capacity Factor(Nc)	:	9.00
Ultimate End Bearing Resistance (Qp)	:	**357.67** kN
(Qp=Ap*c*Nc)		

1.3.0

Ultimate Load Carrying Capacity (Qs+Qp)	:	**891.17** kN
Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**356.5** kN
say		**350 kN**
Lateral Load Bearing Capacity		**28 kN**
Ultimate uplift resistance		**533.51 kN**
Safe Uplift resistance		**177.84 kN**
Self wt. of pile	:	**52.46**
Say		**230.29 kN**

VELTECH CONSULTING ENGINEERS CHENNAI 600 073

Client : **Mrs.P.Swarnalatha Reddy.,**
Project : **(Stilt+3) Residential Building**
Location : **Kodambakkam, Chennai.**

DESIGN OF PILE FOUNDATION (Ref BH-1)

1.0 Type of Installation of Pile **Bored pile**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	500.00 mm
Length of Pile	:	22.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

1.2.2

Layer-I

Type of Strata	:	sand
Average SPT of the strata,N	:	15
Bulk Density of the strata, γ	:	18.14 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	30.00 Deg
tan phi		0.58
Top of Strata	:	0.00 m
Bottom of Strata	:	7.00 m
Average Thickness of Strata,I_c	:	7.00 m
Effective overburden pressure at the middle of the strata,σ_m	:	28.49 kN/m^2
Coef. Earth Pressure at Rest		1.00
Skin Resistance of the pile,q_s	:	180.66 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

Layer-II

Type of Strata	:	Clay
Length of strata,lc		15.00 m
Average SPT of the strata,N	:	10
Bulk Density of the strata, γ	:	17.61 kN/m^3
Undrained Shear Strength (Cu)	:	25.00 kN/m^2
Adhesion, σ	:	0.70
Skin Resistance of the pile,q_s	:	412.13 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 Computation of End Bearing Resistance:

Type of Bearing Strata	:	Clay
Cross-Sectional Area of pile,Ap	:	0.19625 m^2
R.L of bottom of pile	:	22.00 m
Minimum SPT-value of the Bearing Strat	:	50
Unconfined compression strength (c)	:	250.00 Kn/m2
Bearing Capacity Factor(Nc)	:	9.00
Ultimate End Bearing Resistance (Qp)	:	**441.56 kN**
(Qp=Ap*c*Nc)		

1.3.0

Ultimate Load Carrying Capacity (Qs+Qp)	:	**1034.35 kN**
Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**413.7 kN**
say		**410 kN**
Lateral Load Bearing Capacity		**32.8 kN**
Ultimate uplift resistance		**592.79 kN**
Safe Uplift resistance		**197.60 kN**
Self wt. of pile	:	**64.76**
Say		**262.36 kN**

VELTECH CONSULTING ENGINEERS CHENNAI 600 073

Client : **Mrs.P.Swarnalatha Reddy.,**
Project : **(Stilt+3) Residential Building**
Location : **Kodambakkam, Chennai.**

DESIGN OF PILE FOUNDATION (Ref BH-1)

1.0 Type of Installation of Pile — **Bored pile**

1.1 Geometrical Data

Assumed Diameter of pile(D)	:	600.00 mm
Length of Pile	:	22.00 m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

1.2.2

Layer-I

Type of Strata	:	sand
Average SPT of the strata,N	:	15
Bulk Density of the strata, γ	:	18.14 kN/m^3
Angle of Shearing Resistance - Limited to a Maximum of	:	30.00 Deg
tan phi		0.58
Top of Strata	:	0.00 m
Bottom of Strata	:	7.00 m
Average Thickness of Strata,I_c	:	7.00 m
Effective overburden pressure at the middle of the strata,σ_m	:	28.49 kN/m^2
Coef. Earth Pressure at Rest		1.00
Skin Resistance of the pile,q_s	:	216.79 kN
(q_s: σ *k*tanϕ *pi()*d*Ic)		

Layer-II

Type of Strata	:	Clay
Length of strata,lc		15.00 m
Average SPT of the strata,N	:	10
Bulk Density of the strata, γ	:	17.61 kN/m^3
Undrained Shear Strength (Cu)	:	25.00 kN/m^2
Adhesion, σ	:	0.70
Skin Resistance of the pile,q_s	:	494.55 kN
(q :σ*Cu*pi*d*Ic)		

1.2.2 Computation of End Bearing Resistance:

Type of Bearing Strata	:	Clay
Cross-Sectional Area of pile,Ap	:	0.2826 m^2
R.L of bottom of pile	:	22.00 m
Minimum SPT-value of the Bearing Strat	:	50
Unconfined compression strength (c)	:	250.00 Kn/m2
Bearing Capacity Factor(Nc)	:	9.00
Ultimate End Bearing Resistance (Qp)	:	635.85 kN
(Qp=Ap*c*Nc)		
Ultimate Load Carrying Capacity (Qs+Qp)	:	**1347.19 kN**
Safe Load Carrying Capacity (Qsafe =Qu/2.5)	:	**538.9 kN**
say		**530 kN**
Lateral Load Bearing Capacity		**42.4 kN**
Ultimate uplift resistance		**711.34 kN**
Safe Uplift resistance		**237.11 kN**
Self wt. of pile	:	**93.26**
Say		**330.37 kN**

1.3.0

VELTECH CONSULTING ENGINEERS CHENNAI 600 073

GEOTECHNICAL INVESTIGATION REPORT

VELTECH CONSULTING ENGINEERS

CLIENT: Mrs.P.Swarnalatha Reddy.,

Project : (Stilt+3) Residential Building



VELTECH CONSULTING ENGINEERS CHENNAI 600 073



our services doesn't just end there

Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.

Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.

Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.

NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management

Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



empowering your real estate decisions with smart tools

Property Valuation & Cost Estimation

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

Ownership, Compliance & Legal Verification

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

Zoning & Land Use Analysis

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

Property Documentation & Workflow Tools

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Vastu & Property Management Tools

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