Verified RealEstate™

Your trusted partner for buying, selling, and managing property, ensuring hassle-free service with 100% transparency.

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified RealEstate™



GEOTECHNICAL INVESTIGATION REPORT

FOR

PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING

JOB NO: YPI/SIR/2022-23/053

SITE NAME:PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING

SITE ADDRESS: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, COIMBATORE

LAT-LONG: 10.990159, 77.034044

SITE INVESTIGATION DATE: 17.11.2022

REPORT SUBMITING DATE: 22.11.2022

CLIENT

KOVAI LIFESTYLE,
COIMBATORE

YUBE
Prime Infra.
" Expert in Geo-technical Services "

No 48, 1st Floor, Palaniappa Nagar, Suramangalam Post, Salem, Tamilnadu – 636 005
Care: +91 958 555 6789 / yubeprimeinfra@gmail.com / www.yubeprimeinfra.com

Job No: YPI/SIR/2022-23/053
Date: 22.11.2022

To

KOVAI LIFE STYLE,
COIMBATORE

Name of Work : GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, COIMBATORE

Sub **:** Submission of Soil Investigation Report - Reg

Dear Sir,

We are pleased to hereby transmit Two (02) original Hard Copies and Soft Copies sent to your concern address, our final Geotechnical Investigation Report for the above mentioned project. If you have any questions, please contact this office.

It has been a pleasure being of service to you on this project. Assuring you of our continued co-operation, we remain.

YUBE PRIME INFRA SALEM - 636 005

For Yube Prime Infra.,

(Authorized Signatory)

INDEX

SR NO.	PARTICULARS	PAGE NO
01.	INTRODUCTION	04
02.	PROCEDURE OF INVESTIGATION	04
03.	RELEVANT IS CODES	08
04.	FOUNDATION ANALYSIS	09
05.	FIELD INVESTIGATION REPORT	12
06.	LABORATORY INVESTIGATION REPORT	14
07.	SIEVE ANALYSIS	15
08.	RECOMMENDATIONS	16
09.	CERTIFICATION	17
12.	PHOTOGRAPHS	18
11.	SITE PLAN	19

YUBE PRIME INFRA SALEM - 636 005

1 INTRODUCTION

Sub surface investigation and laboratory tests for Proposed Construction of Residential building at Vellalore road, Singanallur, Coimbatore the objective of the exploration work was to determine the probable sub surface conditions such as stratification, denseness or hardness of the strata, position of ground water table etc. and to evaluate probable range of safe bearing capacity for the structure. To fulfill the objective, the work carried out is comprises of:

- Drilling two boreholes up to the depth of 6.00m below existing ground level in order to know the sub surface stratification, conducting necessary field tests and to collect disturbs and undisturbed soil samples for laboratory testing.

- Testing soil samples in the laboratory to determine its physical and engineering properties of the soil samples, and

- Analyzing all field and laboratory data to evaluate safe bearing capacity of the soil for given foundation sizes and necessary recommendations for foundation design and construction.

2 PROCEDURE OF INVESTIGATION

The actual site investigation work was started on 17.11.2022 and was completed on 17.11.2022.

2.1 Drilling

Two boreholes of 150mm diameter is drill up to the depth of 6.00m. Where caving of the borehole occurred, casing was used to keep the borehole stable. The work was in general accordance with IS: 4892 – 1979. Client's representatives choose and selected the location of borehole.

2.1.1 Disturbed Samples: Disturbed representative samples were collected, logged, labelled and placed in polythene bags.

2.1.2 Undisturbed Samples: Undisturbed soil samples are collected in 120 mm diameter thin walled sampler (Shelby tube) from the borehole. The sampler used for the sampling had smooth surface and appropriate area ratio and cutting edge angle thereby minimizing disturbance of soil

YUBE PRIME INFRA SALEM - 636 005

during sampling. Samples are logged and labelled properly and transfer to the laboratory for further testing.

2.1.3 Water Table: Water table was not met during the sub soil exploration work carried out in the month of **NOVEMBER-2022**.

2.1.4 Seismic Zone: The proposed project is situated at **COIMBATORE**. It falls under the **Seismic Zone-III**, according to the Indian Standard Seismic Zoning Map. Zone - III: This is said to **Moderate Seismic Zone** as per Tamil Nadu State Seismic Range Risk Zone.

2.1.5 Method of Sampling: Sampler is coupled together with a sampler head to form a sampling assembly. The sampler head provide a non-flexible connection between the sampling tube and the drill rods. Vent holes are provided in the sampler head to allow escape of water from the top of sampler tube during penetration. The sampling tubes are made free from dust and rust. Coating of oil is applied on both sides to obtain the undisturbed samples in best possible manner.

The sampler is then lowered inside the bore hole on a string of rods and driven to a predetermined level. On completion of driving the sampler is first rotated within the borehole to shear the soil sample at bottom and then pulled out. Upon removal of the sampling tubes, the length of sample in the tube is recorded. The disturbed material in the upper end of the tube, if any, is completely removed before sealing.

The soil at the lower end of the tube is trimmed to a distance of about 12 to 20 mm. After cleaning and inserting an impervious disc at each end, both ends are sealed. The empty space in the sampler, if any, is filled with the moist soil, and the ends covered with tight wrapper. The identification mark is then made on each sample.

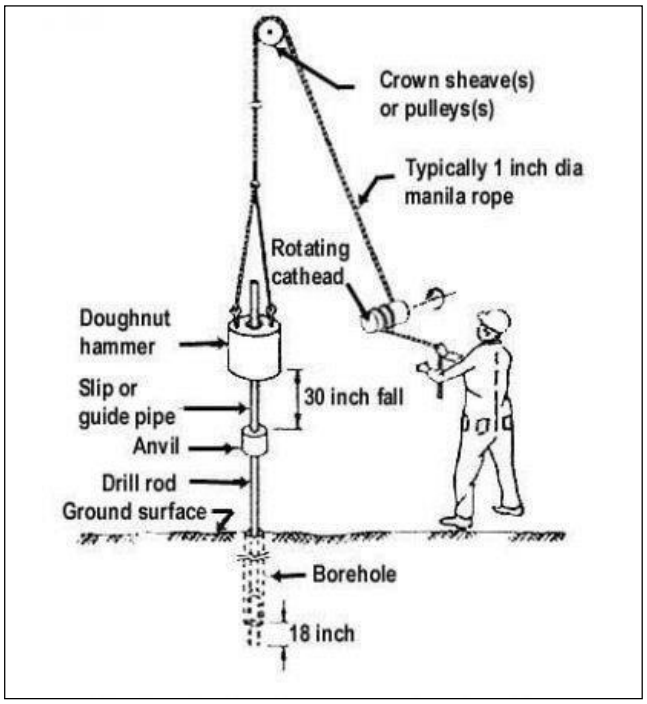
YUBE PRIME INFRA SALEM - 636 005

2.2 Standard Penetration Test (SPT)

Standard penetration tests were conducted at 1.0/1.5 m intervals or at change of stratum as per Indian standard ARE 2133-1981 and split spoon sampler used confirmed to the Indian standard, IS 9640-1980.

The standard penetration test is conducted in a borehole using a Standard split spoon sampler. When the borehole has been drilled to the desired depth, the drilling tools are removed and the sampler is lowered to the bottom of the hole. The sampler is driven into the soil by a drop hammer of 63.5 kg mass falling through a height of 75 cm at the rate of 30 blows per minute as per IS 2133-1963. The number of hammer blows required to drive 15 cm of the sample is counted. The sample is further driven by 15 cm and the number of blows recorded. Likewise, the sample is once again further driven by 15 cm and the number of blows recorded. The number of blows recorded for the first 15 cm is disregarded. The number of blows recorded for the last two 15 cm intervals are added to give the standard penetration number (N). If the number of blows for 30 cm drive exceeds 50, it is taken as refusal and the test is discontinued.

Sufficient disturbed soil samples were collected from the split spoon sampler while performing the standard penetration tests in each hole.



YUBE PRIME INFRA SALEM - 636 005

2.3 Laboratory Tests

The operations to be performed in the laboratory depend upon the type of the nature of data required for the problem at hand. In case of cohesionless material, like sand, the laboratory tests are usually minimum and the design parameters are worked out from field test data such as form SPT- N value, Core resistance and plate load test data.

In the case of cohesive soils, the programme of laboratory testing can vary from carrying out simple tests such as unconfined tests to comprehensive study of soil behaviour using triaxial shear tests and consolidation tests. Following laboratory tests are conducted.

COHESIVE SOIL	COHESIVE LESS SOIL
Specific gravity	Specific gravity
Natural moisture content	Natural moisture content
Sieve Analysis	Sieve analysis
Unconfined compression test	Direct shear test
Wet / Dry Density	Wet / Dry Density
Atterberg's limits	
Consolidation test	
Triaxial test	

YUBE PRIME INFRA SALEM - 636 005

3 RELEVANT IS – CODES

All the test are carried out as per IS codes. Some of the prominent test and there relevant IS Codes are given in the table.

S No.	Type of Testing	As per IS Code
01	Excavation of bore holes (Field Test)	IS 1892 - 1979 (Reaffirmed 2002)
02	Standard Penetration Test (Field Test)	IS 2131 - 1981 (Reaffirmed 2002)
03	Atterberg' s Limit (Laboratory Test)	IS 2720 Part 5 - 1970 (Reaffirmed 2006)
04	Grain Size Analysis (Laboratory Test)	IS 2720 Part 4 - 1975 (Reaffirmed 2006)
05	Specific Gravity Test (Laboratory Test)	IS 2720 Part 3 – 1981 (Reaffirmed 2002)
06	Density Test (Laboratory Test)	IS 2720 Part 8 -1983 (Reaffirmed 2006)
07	Direct Shear Test (Laboratory Test)	IS 2720 Part 13-1986 (Reaffirmed 2002)
08	Tri-axial Compression Test (Laboratory Test)	IS 2720 Part 10-1973 (Reaffirmed 2002) IS 2720 Part 11-1971 (Reaffirmed 2002) IS 2720 Part 12-1981 (Reaffirmed 2002)
09	Soil Classification (Laboratory Test)	IS 1498-1970 (Reaffirmed 2007)
10	Soil Bearing Capacity as per settlement criteria	IS 8009 -1976 (Reaffirmed 2006)
11	Soil Bearing Capacity as per shear criteria	IS 6403 – 1981 (Reaffirmed 2004)

YUBE PRIME INFRA SALEM - 636 005

4 FOUNDATION ANALYSIS

4.1 Soil Profile

The profile of the area as observed in the bore hole is given in the chart. The Borehole is terminated at maximum depth of 6.00m.

Borehole No: 01

Depth of Soil (m)	Soil Description	IS Classification
0.00 – 1.60	Inorganic clay	CL - Inorganic clay
1.60 – 2.80	Clayey Sand	SC – Clayey Sand
2.80 – 3.50	Soft Disintegrated Rock	SDR – Soft Disintegrated Rock
3.50 – 6.00	Weather Rock	WR– Weather Rock

Borehole No: 02

Depth of Soil (m)	Soil Description	IS Classification
0.00 – 1.90	Inorganic clay	CL - Inorganic clay
1.90 – 2.80	Clayey Sand	SC – Clayey Sand
2.80 – 5.00	Soft Disintegrated Rock	SDR – Soft Disintegrated Rock
5.00 – 6.00	Weather Rock	WR– Weather Rock

YUBE PRIME INFRA SALEM - 636 005

4.2 Safe Bearing Capacity

Maximum intensity of loading that the foundation will safely carry without the risk of shear failure of soil irrespective of any settlement that may occur.

Safe Bearing Capacity (SBC) = $q = 0.314\ N^2\ B.Rw_2 + 0.943\ (120 + N^2)\ D_f.\ Rw_1$

Where,

N	:	Standard Penetration Value
B	:	Width of Footing (or least lateral dimensions)
D_f	:	Depth of Foundation
Rw_1 & Rw_2	:	Water Reduction Factor

4.3 Allowable Bearing Pressure

The net intensity of loading which the foundation will carry without undergoing settlement in excess of the permissible value for the structure under consideration but not exceeding net safe bearing capacity. The safe bearing pressure, qs corresponding to a settlement of 25mm is given by,

$$q = 1.36\ (N - 3)\ ((B+0.3)/2B)^2\ Rw_2\ .\ Rd$$

Where,

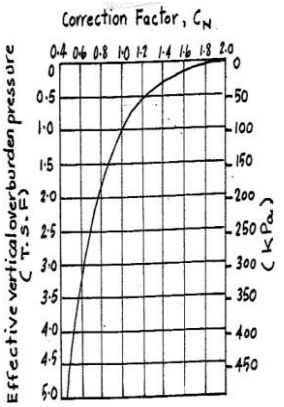
B	:	Maximum Size of the Footing
R	:	Water table correction factor (For the worst case, Taken as 0.5)

YUBE PRIME INFRA SALEM - 636 005

SBC CALCULATION

Allowable bearing capacity calculation

Width of the footing, B	=	2 m	
Depth of foundation, Df	=	3 m	
Unit weight of soil	=	18 kN/m^3	
Submergible unt wt	=	8 kN/m^3	
Avg. observed N value	=	50	
Eff. overburden pressure at foundation level	=	24 kN/m^3	
Overburden correction factor	=	1.2	
N value after overburden corretion, N'	=	60	
Depth of GWT	=	0 m	
Dialtancy corretion, N"	=	37.5	
Factor of Safety	=	3	
Rw1	=	0.5	
Rw2	=	0.5	
Ultimate Bearing capacity based on shear	=	$0.314xN"^2xBxRw1+0.943x(100+N"^2)xDfxRw2$	
	=	2572.15 KN/m^2	
Safe bearing capacity based on shear	=	857.384 KN/m^2	
Safe bearing capacity based on settlement	=	$1.36x(N"-3)x((B+0.3)/2B)^2xSxRdxRw)$	
Settlement for Sand	=	25 mm	
Depth factor, Rd	=	1+Df/B <2	
Rd	=	1.2 Say	
Water table factor, Rw	=	0.5+0.5(Dw/B)	0.5<Rw<1
Rw	=	0.5 Since GWT is below 0m from EGL	
Qs	=	465.388 KN/m^2	For 50mm controlled Settlement
Qs	=	372.31 KN/m^2	For 40mm controlled Settlement
Qs	=	232.694 kN/m^2	For 25mm controlled Settlement
Allowable Bearing Pressure at Df depth is	=	**232** kN/m^2	**For CONTROLLED SETTLEMENT OF 25M**



YUBE PRIME INFRA SALEM - 636 005

5 FIELD INVESTIGATION REPORT

BORE LOG DETAILS

BOREHOLE NO: 01

Job No: YPI/SIR/2022-23/053

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, COIMBATORE

Soil Investigation done by:	Yube Prime Infra, Salem - 05	**Method:** Rotary drilling	Ground Water Table	-
			Commencement Date	08.11.2022
			Completion Date	08.11.2022

Depth below G.L.(R.L)	Soil Profile	IS Classification of Soil	Thickness of layer (m)	Depth at which test is conducted	Standard Penetration Test Data				Relative density / Consistency	Graphical representation of penetration resistance				
					N1	N2	N3	N = N2+N3		**20**	**40**	**60**	**80**	**120**
1.60		Inorganic clay	1.60	1.00	4	6	8	14	Stiff					
2.80		Clayey Sand	1.20	2.00	7	10	11	21	V Stiff					
				3.00	30	38	50/6	>50	V Dense					
3.50		Soft Disintegrated Rock	0.70	4.50	R				DO					
6.00		Weathered Rock	2.50	6.00	CR	2cm +2cm+3 small pieces Core Recovery								

***R-Refusal,CR-Core Recovery**

BOREHOLE NO: 02

Job No: YPI/SIR/2022-23/048

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, COIMBATORE

Soil Investigation done by:	Yube Prime Infra, Salem - 05	**Method:** Rotary drilling	Ground Water Table	-
			Commencement Date	08.11.2022
			Completion Date	08.11.2022

Depth below G.L.(R.L)	Soil Profile	IS Classification of Soil	Thickness of layer (m)	Depth at which test is conducted	Standard Penetration Test Data				Relative density / Consistency	Graphical representation of penetration resistance				
					N1	N2	N3	N = N2+N3		**20**	**40**	**60**	**80**	**120**
1.90		Inorganic clay	1.90	1.00	4	5	7	12	Stiff					
				2.00	8	10	12	22	V Stiff					
2.80		Clayey Sand	1.40	3.00	50/4	-	-	>50	V Dense					
5.00		Soft Disintegrated Rock	1.70	4.50	R				DO					
6.00		Weathered Rock	1.00	6.00	CR	3cm+2cm +4 Small Pieces								

***R-Refusal,CR-Core Recovery**

YUBE PRIME INFRA * SALEM - 636 005 *

6 LABORATORY INVESTIGATION REPORT

MECHANICAL PROPERTIES OF SOIL

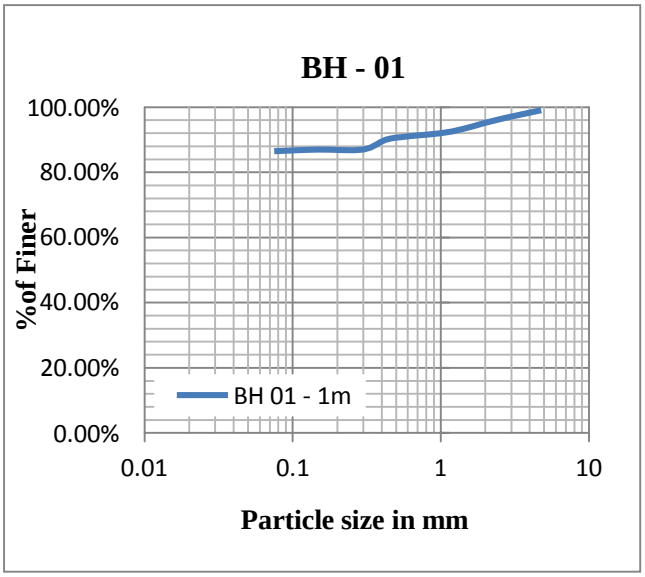
BH No	Depth (m) from EGL	Method of Sample	Number of sample collected	Grain Size Analysis			Consistency limits			IS Classification	Specific Gravity	Density g/cc	Observed N Value	Corrected N Value
				Gravel %	Sand %	Fines %	Liquid Limit %	Plastic Limit %	Plasticity Index %					
01	1.00	SPT	1	1.0	12.5	86.5	32	17	15	CL	2.70	1.72	14	14.0
	2.00	SPT	1	31.3	53.0	15.7	22	12	10	SC	2.67	1.81	21	25.0
	3.00	SPT	1	7.0	65.0	28.0	20	12	08	SC	2.67	1.90	>50	50.0
	4.50	DS	1	-	-	-	-	-	-	SDR	-	-	>50	50.0
	6.00	CR	1	-	-	-	-	-	-	WR	-	-	>50	50.0
02	1.00	SPT	1	1.0	9.0	90.0	30	18	12	CL	2.7	1.71	12	12.0
	2.00	SPT	1	23.2	49.7	27.1	23	16	07	SC	2.67	1.83	22	26.0
	3.00	DS	1	-	-	-	-	-	-	SDR	-	-	>50	50.0
	4.50	DS	1	-	-	-	-	-	-	SDR	-	-	>50	50.0
	6.00	CR	1	-	-	-	-	-	-	WR	-	-	>50	50.0

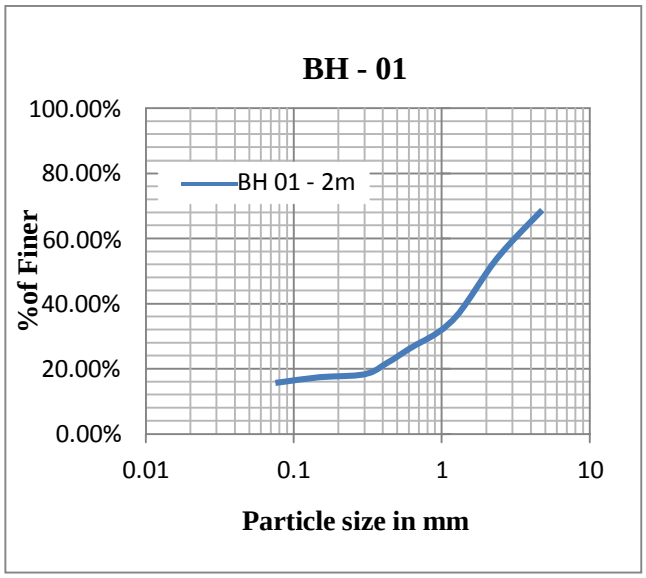
***SPT – Standard Penetration Test, DS – Disturbed Sample , CR-Core Recovery**

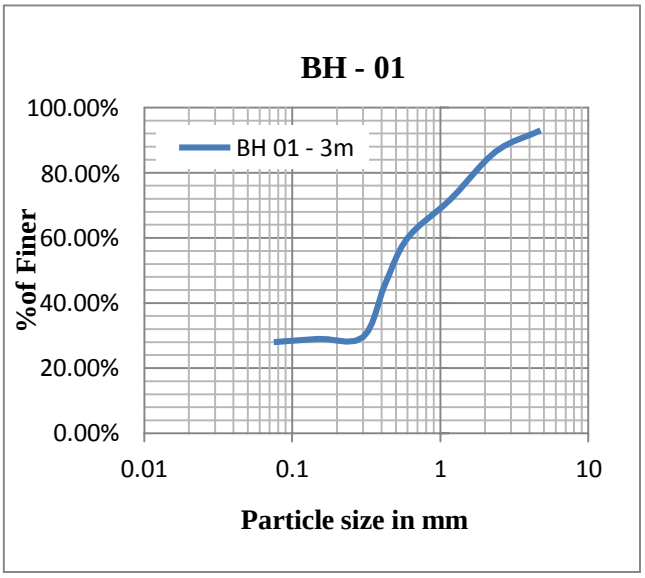
BH No	Depth (m) from EGL	Moisture Content (%)	Cohesion value C KN/m^2	Angle of shearing resistance (Ø)	Remarks
01	1.00	22.17	77	-	-
	2.00	15.95	-	36	
	3.00	20.55	-	36	
02	1.00	21.02	66	-	-
	2.00	16.94	-	36	-

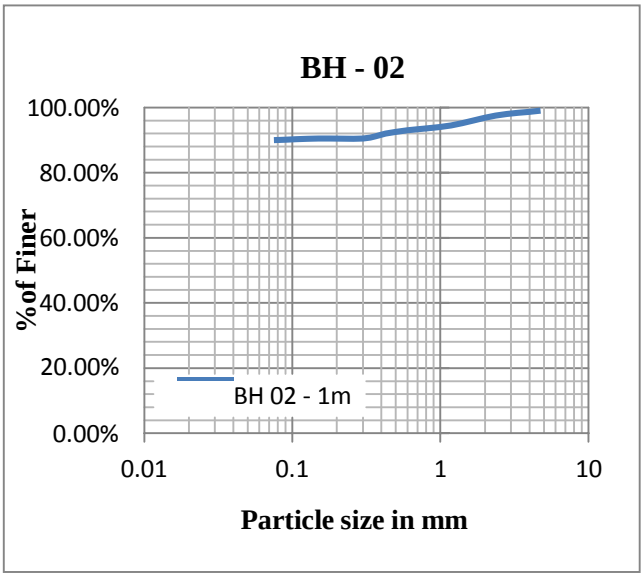
YUBE PRIME INFRA SALEM - 636 005

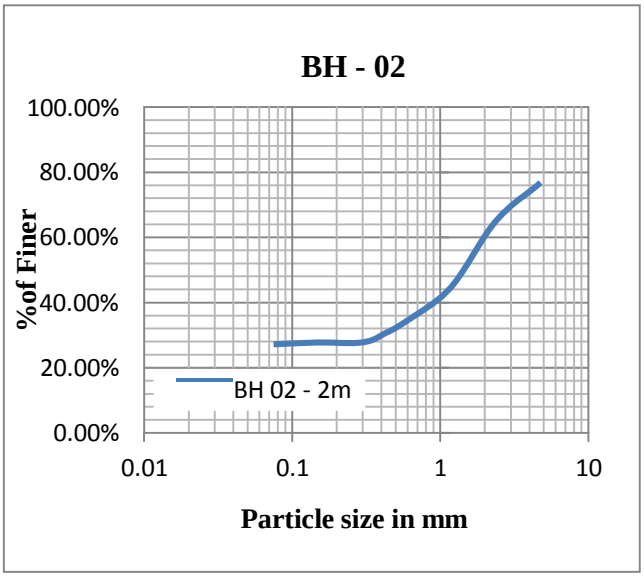
7 SIEVE ANALYSIS











YUBE PRIME INFRA SALEM - 636 005

8 RECOMMENDATIONS

Type of Foundation

After critical review of the results, OPEN FOUNDATION in the form of ISOLATED FOOTING may be designed for this project.

Depth of foundation & Safe Bearing Capacity

The depth of foundation and Safe Bearing Capacity shall be given in the table.

SI NO	DEPTH (m)	ALLOWABLE SETTLEMENT	WATER TABLE	SBC t/m^2	SIZE OF FOOTING (m)
01	3.00	25mm	Not met	23.00	2.00 x 2.00

Depth of Foundation & Safe Pile Capacity

The safe Pile capacities (Qp) and depth of Pile are given in the below table may be used for design purpose.

Safe Pile Capacity

The safe Pile capacities (Q) and depth of pile are shown in the table may be used for design.

Diameter Ø ,mm / Depth, m	Safe pile capacity in kN		
	300 Ø	450 Ø	500 Ø
4.00	111	212	252

Permissible Settlement

The safe bearing capacity is recommended for a permissible settlement of 25mm.

Safety Measures

The top layer soil should be used for back filling.

YUBE PRIME INFRA * SALEM - 636 005 *

9 CERTIFICATION

FOR KOVAI LIFESTYLE, COIMBATORE WE (YUBE PRIME INFRA) HAVE A PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, COIMBATORE. GEOTECHNICAL INVESTIGATION WORK WAS CONDUCTED AT THE SITE ON 17-NOVEMBER-2022. AFTER ANALYSIS OF THE TEST REPORTS, IT IS RECOMMENDED THAT ISOLATED FOUNDATION TO BE ADOPTED FOR DESIGN PURPOSE WITH SAFE BEARING CAPACITY AND DEPTH OF FOUNDATION ARE GIVEN IN THE TABLE.

SOIL DATA AS PER COMPUTATION

SI NO	DEPTH (m)	ALLOWABLE SETTLEMENT	WATER TABLE	SBC t/m^2	SIZE OF FOOTING (m)
01	3.00	25mm	Not met	23.00	2.00 x 2.00

Diameter Ø ,mm / Depth, m	Safe pile capacity in kN		
	300 Ø	450 Ø	500 Ø
4.00	111	212	252

YUBE PRIME INFRA SALEM-636 005

FOR YUBE PRIME INFRA

Er. M.YUVARAJ, ME (GEOTECH), MIGS
(GEOTECHNICAL & STRUCTURAL CONSULTANT)

Er. M.YUVARAJ, M.E.,MIGS
Geotechnical Engineer
Reg. No: CGLRGN/RGTE/2019/06/004
yuvaraj.gct@gmail.com,Ph:97893 19626

10 SITE PHOTOS



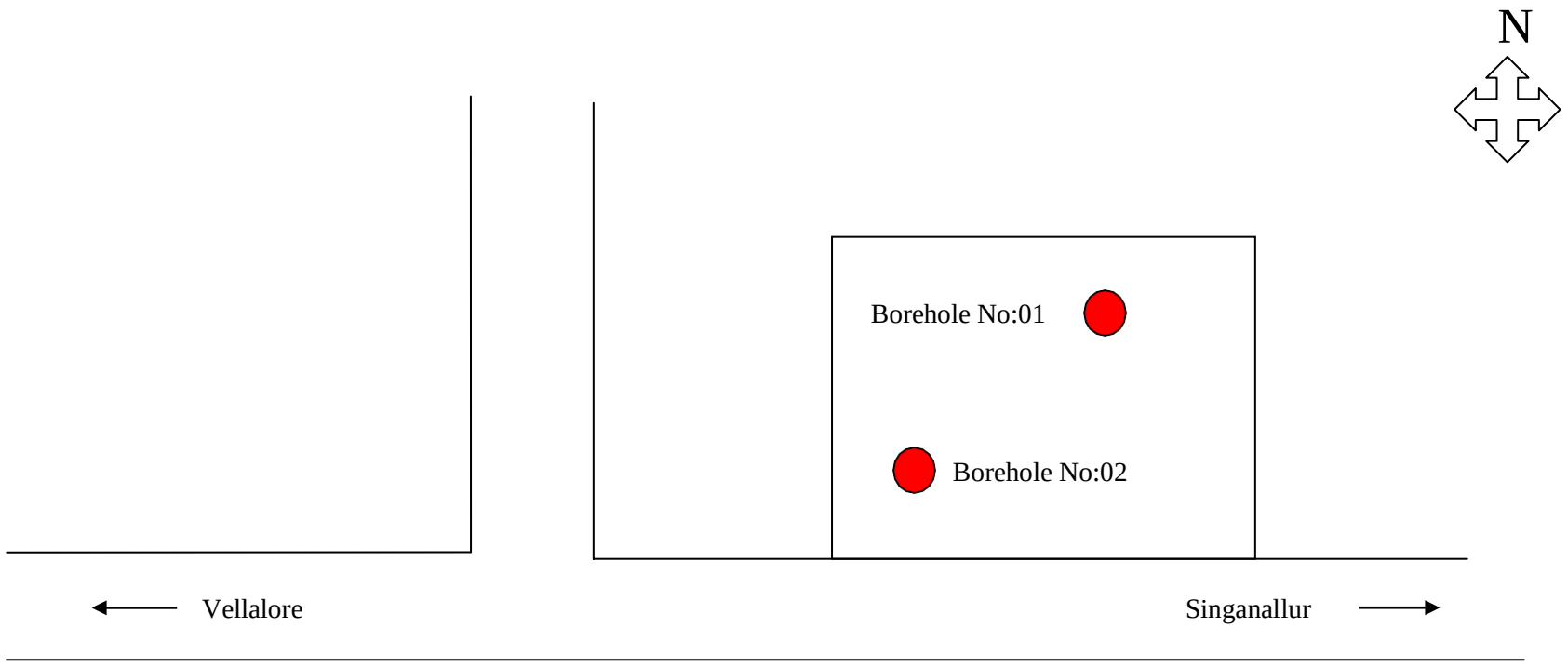






11 SITE LAYOUT

PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT VELLALORE ROAD, SINGANALLUR, AND COIMBATORE.



YUBE PRIME INFRA SALEM - 636 005

Pile Capacity Calculation

Project :	**PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT COIMBATORE**
Client :	**KOVAI LIFESTYLE**
Title:	**BCIS Pile Capacity (Compression)**

Pile Details:

Existing Bed level	=	0.0	m
Design Water Level	=	0.0	m
Pile Diameter, D	=	0.30	m
Pile Cut-off level from EGL	=	1.0	m
Pile Cut-off Level	=	1.0	m
Pile Founding level	=	4.0	m
Total Length of Pile from EGL	=	4.0	m
Pile Embedment length	=	3.0	m
Pile Density	=	25.0	kN/m^3
Factor of Safety	=	3	
Critical Pile Length	=	4.5	

Safe Vertical Capacity of pile = **111 kN**

Design Soil Profile and Parameters:

Sl.No.	Soil type	Reduced Level, m		Layer th. m	SPT N	Design Soil Parameters				Co-efficients	
		From	To			c	ϕ	γ	γ'	α	K
						kN/m^2	deg.	kN/m^3	kN/m^3		
1	CL	0.0	1.8	1.8	13	78.0	0.0	17.0	7.0	0.57	0.00
2	SC	1.8	3.3	1.5	21	126.0	0.0	17.5	7.5	0.35	0.00
3	SDR	3.3	5.0	1.7	50	300.0	0.0	18.0	8.0	0.28	0.00
4	WR	5.0	6.0	1.0	60	0.0	39.0	19.5	9.5	0.00	1.45

Calculation of Vertical Capacity:

Ultimate Capacity of Pile , $Q_{ult} = Q_b + Q_s - W_p$

Where,	Q_b	=	Ultimate End Bearing
	Q_s	=	Ultimate Skin Resistance
	W_p	=	Self weight of Pile

Qsafe = Q_{ult} / FoS

Skin friction resistance, Q_f = $KP\tan\delta\ A_s + \alpha C A_s$

K	=	Coefficient of earth pressure
P	=	Effective overburden pressure
δ	=	Angle of wall friction between pile and soil
A_s	=	Surface area of pile shaft
α	=	Adhesion factor
C	=	Average cohesion throughout the length of the pile

End bearing resistance in granular soils, Q_e = $A_p \times P_d \times N_q$

A_p	=	Cross sectional area of the pile toe
D	=	Pile Diameter
Y	=	Effective unit weight of soil at pile toe
P_d	=	Effective overburden pressue at pile toe

N_Y and N_q are the bearing capacity factors depending upon the angle of internal friction φ at toe.

End bearing resistance in Cohesive soil, Qe = $A_p \times C_P \times N_C$

A_p	=	Cross sectional area of the pile toe
C_P	=	Avg. Cohesion at the pile tip
N_C	=	Bearing capacity factor usuall

YUBE PRIME INFRA SALEM - 636 005

Calculation of Skin Resistances:											
Layer-1:	Layer thickness, L_1						=	1.8	m		
Pile embedment in the layer,h_1							=	0.8	m		
Ultimate Skin Resistance, Q_{s1} =		$(K_1*P_1*\tan\delta1+\alpha_1*c_1)$ x A_{s1}									
	Earth pressure co-efficient K_1						=	0.0			
	Overburden pressure P_1						=	2.8	kN/m^2		
	Reduction factor, α						=	0.57			
	Cohesion, c_1						=	78	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 1, $A_{s1} = \pi * D * h_1$						=	0.75	m^2		
Ultimate Skin Resistance, Q_{s1} =							=	34	kN		
Layer-2:	Layer thickness, L_2						=	1.5	m		
Pile embedment in the layer,h_2							=	1.5	m		
Ultimate Skin Resistance, Q_{s2} =		$(K_2*P_2*\tan\delta_2+\alpha_2*c_2)$ x A_{s2}									
	Earth pressure co-efficient K_2						=	0.0			
	Overburden pressure P_2						=	11.2	kN/m^2		
	Reduction factor, α						=	0.3			
	Cohesion, c_2						=	126	kN/m^2		
	Friction Angle, δ_2						=	0	Deg		
	Surface area of Pile in layer 2, $A_{s2} = \pi * D * h_2$						=	1.4	m^2		
Ultimate Skin Resistance, Q_{s2} =							=	62	kN		
Layer-3:	Layer thickness, L_3						=	1.7	m		
Pile embedment in the layer,h_3							=	0.7	m		
Ultimate Skin Resistance, Q_{s3} =		$(K_3*P_3*\tan\delta_3+\alpha*c_3)$ x A_{s3}									
	Earth pressure co-efficient K_3						=	0.0			
	Overburden pressure P_3						=	19.7	kN/m^2		
	Reduction factor, α						=	0.28			
	Cohesion, c_3						=	300	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 3, $A_{s3} = \pi * D * h_3$						=	0.7	m^2		
Ultimate Skin Resistance, Q_{s3} =							=	55	kN		
Layer-4:	Layer thickness, L_4						=	1.0	m		
Pile embedment in the layer,h_4							=	0.0	m		
Ultimate Skin Resistance, Q_{s4} =		$(K_4*P_4*\tan\delta_4+\alpha*c_4)$ x A_{s4}									
	Earth pressure co-efficient K_4						=	1.5			
	Overbuden pressure P_4						=	22.5	kN/m^2		
	Reduction factor, α						=	0.00			
	Cohesion, c_4						=	0	kN/m^2		
	Friction Angle, δ_4						=	39	Deg		
	Surface area of Pile in layer 4, $A_{s4} = \pi * D * h_4$						=	0.0	m^2		
Ultimate Skin Resistance, Q_{s4} =							=	0	kN		

YUBE PRIME INFRA SALEM - 636 005

Calculation of Ultimate End Bearing Resistance:										
Ultimate End bearing Resistance, $Q_b = ((C_p*N_c)+(P_d*N_q)) * A_p$										
Where,	Cohesion at Pile Toe, c					=	300	kN/m^2		
	Bearing Capacity Factor, N_c					=	9			
	Eff. Overburden pressure at pile toe, P_d					=	22.5	kN/m^2		
	Bearing Capacity Factor, N_q					=	0.00			
	Area of Pile at toe, A_p					=	0.07	m^2		
Ultimate End bearing Resistance, $Q_b = ((C_p*N_c)+(P_d*N_q)) * A_p$						=	191	kN		
Self Weight of the Pile, Wp										
Self weight of the Pile , $W_p = A_p * (L_{bw} * \gamma'_p)$										
Where, Area of pile, A_p						=	0.07	m^2		
	Total Length of Pile , L					=	3	m		
	Unit Weight of Pile material below water, γ'_p					=	15	kN/m^3		
Self weight of the Pile , W_p						=	3	kN		
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s - W_p$										
	Ultimate End Bearing, Q_b					=	191	kN		
	Ultimate Skin Resistance, Q_s					=	151	kN		
	Self weight of the Pile, W_p					=	3	kN		
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s$						=	342	kN		
Safe Capacity of Pile, $Q_{safe} = ((\Sigma Q_{sf}/FOS_{sf})+(Q_b / FoS_b)-W_p$										
	Factor of Safety against skin friction					=	3.0			
	Factor of Safety against end bearing					=	3.0			
Safe Capacity of Pile, $Q_{safe} = Q_{ult}$ / FoS (without -ve skin friction)						=	**111**	**kN**		
Uplift Capacity of the Pile										
The uplift capacity contributed by top clay layer of 4m thickness is neglected in the analysis.										
Ultimate Uplift Capacity of Pile , $Q_u = Q_s + W_p$										
Safe uplift capacity of the pile, $Q_{usafe} = Q_u$ / FOS										
Ultimate skin resistance for layer 1, Q_{s1}					=	34	kN			
Ultimate skin resistance for layer 2, Q_{s2}					=	62	kN			
Ultimate skin resistance for layer 3, Q_{s3}					=	55	kN			
Total ultimate skin resistance, Q_s					=	151	kN			
Self weight of pile, W_p					=	3	kN			
Ultimate uplift capacity of the pile, Q_u					=	2/3 * Q_s + W_p				
					=	104	kN			
FOS					=	3.0				
Safe uplift capacity of the pile					=	**35**	**kN**			

YUBE PRIME INFRA * SALEM - 636 005 *

Project :	**PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT COIMBATORE**
Client :	**KOVAI LIFESTYLE**
Title:	**BCIS Pile Capacity (Compression)**

Pile Details:

Existing Bed level	=	0.0	m
Design Water Level	=	0.0	m
Pile Diameter, D	=	0.45	m
Pile Cut-off level from EGL	=	1.0	m
Pile Cut-off Level	=	1.0	m
Pile Founding level	=	4.0	m
Total Length of Pile from EGL	=	4.0	m
Pile Embedment length	=	3.0	m
Pile Density	=	25.0	kN/m^3
Factor of Safety	=	3	
Critical Pile Length	=	6.75	

Safe Vertical Capacity of pile	=	212	kN

Design Soil Profile and Parameters:

Sl.No.	Soil type	Reduced Level, m		Layer th. m	SPT N	Design Soil Parameters				Co-efficients	
		From	To			c	ϕ	γ	γ'	α	K
						kN/m^2	deg.	kN/m^3	kN/m^3		
1	CL	0.0	1.8	1.8	13	78.0	0.0	17.0	7.0	0.57	0.00
2	SC	1.8	3.3	1.5	21	126.0	0.0	17.5	7.5	0.35	0.00
3	SDR	3.3	5.0	1.7	50	300.0	0.0	18.0	8.0	0.28	0.00
4	WR	5.0	6.0	1.0	60	0.0	39.0	19.5	9.5	0.00	1.45

Calculation of Vertical Capacity:

Ultimate Capacity of Pile , $Q_{ult} = Q_b + Q_s - W_p$

Where,	Q_b	=	Ultimate End Bearing
	Q_s	=	Ultimate Skin Resistance
	W_p	=	Self weight of Pile

Qsafe = Q_{ult} / FoS

Skin friction resistance, Q_f		=	$KP\tan\delta\ A_s + \alpha C A_s$
	K	=	Coefficient of earth pressure
	P	=	Effective overburden pressure
	δ	=	Angle of wall friction between pile and soil
	A_s	=	Surface area of pile shaft
	α	=	Adhesion factor
	C	=	Average cohesion throughout the length of the pile

End bearing resistance in granular soils, Q_e		=	$A_p \times P_d \times N_q$
	A_p	=	Cross sectional area of the pile toe
	D	=	Pile Diameter
	Y'	=	Effective unit weight of soil at pile toe
	P_d	=	Effective overburden pressue at pile toe

N_Y and N_q are the bearing capacity factors depending upon the angle of internal friction φ at toe.

End bearing resistance in Cohesive soil, Qe		=	$A_p \times C_P \times N_C$
	A_p	=	Cross sectional area of the pil
	C_P	=	Avg. Cohesion at the pile tip
	N_C	=	Bearing capacity factor usually taken as 9

YUBE PRIME INFRA SALEM - 636 005

Calculation of Skin Resistances:											
Layer-1:	Layer thickness, L_1						=	1.8	m		
Pile embedment in the layer,h_1							=	0.8	m		
Ultimate Skin Resistance, Q_{s1} =		$(K_1*P_1*\tan\delta1+\alpha_1*c_1)$ x A_{s1}									
	Earth pressure co-efficient K_1						=	0.0			
	Overburden pressure P_1						=	2.8	kN/m^2		
	Reduction factor, α						=	0.57			
	Cohesion, c_1						=	78	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 1, $A_{s1} = \pi * D * h_1$						=	1.13	m^2		
Ultimate Skin Resistance, Q_{s1} =							=	50	kN		
Layer-2:	Layer thickness, L_2						=	1.5	m		
Pile embedment in the layer,h_2							=	1.5	m		
Ultimate Skin Resistance, Q_{s2} =		$(K_2*P_2*\tan\delta_2+\alpha_2*c_2)$ x A_{s2}									
	Earth pressure co-efficient K_2						=	0.0			
	Overburden pressure P_2						=	11.2	kN/m^2		
	Reduction factor, α						=	0.3			
	Cohesion, c_2						=	126	kN/m^2		
	Friction Angle, δ_2						=	0	Deg		
	Surface area of Pile in layer 2, $A_{s2} = \pi * D * h_2$						=	2.1	m^2		
Ultimate Skin Resistance, Q_{s2} =							=	93	kN		
Layer-3:	Layer thickness, L_3						=	1.7	m		
Pile embedment in the layer,h_3							=	0.7	m		
Ultimate Skin Resistance, Q_{s3} =		$(K_3*P_3*\tan\delta_3+\alpha*c_3)$ x A_{s3}									
	Earth pressure co-efficient K_3						=	0.0			
	Overburden pressure P_3						=	19.7	kN/m^2		
	Reduction factor, α						=	0.28			
	Cohesion, c_3						=	300	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 3, $A_{s3} = \pi * D * h_3$						=	1.0	m^2		
Ultimate Skin Resistance, Q_{s3} =							=	83	kN		
Layer-4:	Layer thickness, L_4						=	1.0	m		
Pile embedment in the layer,h_4							=	0.0	m		
Ultimate Skin Resistance, Q_{s4} =		$(K_4*P_4*\tan\delta_4+\alpha*c_4)$ x A_{s4}									
	Earth pressure co-efficient K_4						=	1.5			
	Overbuden pressure P_4						=	22.5	kN/m^2		
	Reduction factor, α						=	0.00			
	Cohesion, c_4						=	0	kN/m^2		
	Friction Angle, δ_4						=	39	Deg		
	Surface area of Pile in layer 4, $A_{s4} = \pi * D * h_4$						=	0.0	m^2		
Ultimate Skin Resistance, Q_{s4} =							=	0	kN		

YUBE PRIME INFRA SALEM - 636 005

Calculation of Ultimate End Bearing Resistance:										
Ultimate End bearing Resistance, $Q_b = ((C_P * N_C)+(P_d * N_q)) * A_p$										
Where,	Cohesion at Pile Toe, c					=	300	kN/m^2		
	Bearing Capacity Factor, N_c					=	9			
	Eff. Overburden pressure at pile toe, P_d					=	22.5	kN/m^2		
	Bearing Capacity Factor, N_q					=	0.00			
	Area of Pile at toe, A_p					=	0.16	m^2		
Ultimate End bearing Resistance, $Q_b = ((C_P * N_C)+(P_d * N_q)) * A_p$						=	429	kN		
Self Weight of the Pile, Wp										
Self weight of the Pile , $W_p = A_p * (L_{bw} * \gamma'_p)$										
Where, Area of pile, A_p						=	0.16	m^2		
	Total Length of Pile , L					=	3	m		
	Unit Weight of Pile material below water, γ'_p					=	15	kN/m^3		
Self weight of the Pile , W_p						=	7	kN		
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s - W_p$										
	Ultimate End Bearing, Q_b					=	429	kN		
	Ultimate Skin Resistance, Q_s					=	227	kN		
	Self weight of the Pile, W_p					=	7	kN		
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s$						=	656	kN		
Safe Capacity of Pile, $Q_{safe} = ((\Sigma Q_{sf}/FOS_{sf})+(Q_b / FoS_b)-W_p$										
	Factor of Safety against skin friction					=	3.0			
	Factor of Safety against end bearing					=	3.0			
Safe Capacity of Pile, $Q_{safe} = Q_{ult}$ / FoS (without -ve skin friction)						=	**212**	**kN**		
Uplift Capacity of the Pile										
The uplift capacity contributed by top clay layer of 4m thickness is neglected in the analysis.										
Ultimate Uplift Capacity of Pile , $Q_u = Q_s + W_p$										
Safe uplift capacity of the pile, $Q_{usafe} = Q_u$ / FOS										
Ultimate skin resistance for layer 1, Q_{s1}					=	50	kN			
Ultimate skin resistance for layer 2, Q_{s2}					=	93	kN			
Ultimate skin resistance for layer 3, Q_{s3}					=	83	kN			
Total ultimate skin resistance, Q_s					=	227	kN			
Self weight of pile, W_p					=	7	kN			
Ultimate uplift capacity of the pile, Q_u					=	2/3 * Q_s + W_p				
					=	158	kN			
FOS					=	3.0				
Safe uplift capacity of the pile					=	**53**	**kN**			



Project :	**PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING AT COIMBATORE**
Client :	**KOVAI LIFESTYLE**
Title:	**BCIS Pile Capacity (Compression)**

Pile Details:

Existing Bed level	=	0.0	m
Design Water Level	=	0.0	m
Pile Diameter, D	=	0.50	m
Pile Cut-off level from EGL	=	1.0	m
Pile Cut-off Level	=	1.0	m
Pile Founding level	=	4.0	m
Total Length of Pile from EGL	=	4.0	m
Pile Embedment length	=	3.0	m
Pile Density	=	25.0	kN/m^3
Factor of Safety	=	3	
Critical Pile Length	=	7.5	

Safe Vertical Capacity of pile	=	252	kN

Design Soil Profile and Parameters:

Sl.No.	Soil type	Reduced Level, m		Layer th. m	SPT N	Design Soil Parameters				Co-efficients	
		From	To			c	ϕ	γ	γ'	α	K
						kN/m^2	deg.	kN/m^3	kN/m^3		
1	CL	0.0	1.8	1.8	13	78.0	0.0	17.0	7.0	0.57	0.00
2	SC	1.8	3.3	1.5	21	126.0	0.0	17.5	7.5	0.35	0.00
3	SDR	3.3	5.0	1.7	50	300.0	0.0	18.0	8.0	0.28	0.00
4	WR	5.0	6.0	1.0	60	0.0	39.0	19.5	9.5	0.00	1.45

Calculation of Vertical Capacity:

Ultimate Capacity of Pile , $Q_{ult} = Q_b + Q_s - W_p$

Where,	Q_b	=	Ultimate End Bearing
	Q_s	=	Ultimate Skin Resistance
	W_p	=	Self weight of Pile

Qsafe = Q_{ult} / FoS

Skin friction resistance, Q_f		=	$KP\tan\delta\ A_s + \alpha C A_s$
	K	=	Coefficient of earth pressure
	P	=	Effective overburden pressure
	δ	=	Angle of wall friction between pile and soil
	A_s	=	Surface area of pile shaft
	α	=	Adhesion factor
	C	=	Average cohesion throughout the length of the pile

End bearing resistance in granular soils, Q_e		=	$A_p \times P_d \times N_q$
	A_p	=	Cross sectional area of the pile toe
	D	=	Pile Diameter
	Y'	=	Effective unit weight of soil at pile toe
	P_d	=	Effective overburden pressue at pile toe

N_Y and N_q are the bearing capacity factors depending upon the angle of internal friction φ at toe.

End bearing resistance in Cohesive soil, Qe		=	$A_p \times C_P \times N_C$
	A_p	=	Cross sectional area of the pile to
	C_P	=	Avg. Cohesion at the pile tip
	N_C	=	Bearing capacity factor usually taken as 9

YUBE PRIME INFRA SALEM - 636 005

Calculation of Skin Resistances:											
Layer-1:	Layer thickness, L_1						=	1.8	m		
Pile embedment in the layer,h_1							=	0.8	m		
Ultimate Skin Resistance, Q_{s1} =		$(K_1*P_1*\tan\delta1+\alpha_1*c_1)$ x A_{s1}									
	Earth pressure co-efficient K_1						=	0.0			
	Overburden pressure P_1						=	2.8	kN/m^2		
	Reduction factor, α						=	0.57			
	Cohesion, c_1						=	78	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 1, $A_{s1} = \pi * D * h_1$						=	1.26	m^2		
Ultimate Skin Resistance, Q_{s1} =							=	56	kN		
Layer-2:	Layer thickness, L_2						=	1.5	m		
Pile embedment in the layer,h_2							=	1.5	m		
Ultimate Skin Resistance, Q_{s2} =		$(K_2*P_2*\tan\delta_2+\alpha_2*c_2)$ x A_{s2}									
	Earth pressure co-efficient K_2						=	0.0			
	Overburden pressure P_2						=	11.2	kN/m^2		
	Reduction factor, α						=	0.3			
	Cohesion, c_2						=	126	kN/m^2		
	Friction Angle, δ_2						=	0	Deg		
	Surface area of Pile in layer 2, $A_{s2} = \pi * D * h_2$						=	2.4	m^2		
Ultimate Skin Resistance, Q_{s2} =							=	104	kN		
Layer-3:	Layer thickness, L_3						=	1.7	m		
Pile embedment in the layer,h_3							=	0.7	m		
Ultimate Skin Resistance, Q_{s3} =		$(K_3*P_3*\tan\delta_3+\alpha*c_3)$ x A_{s3}									
	Earth pressure co-efficient K_3						=	0.0			
	Overburden pressure P_3						=	19.7	kN/m^2		
	Reduction factor, α						=	0.28			
	Cohesion, c_3						=	300	kN/m^2		
	Friction Angle, δ1						=	0	Deg		
	Surface area of Pile in layer 3, $A_{s3} = \pi * D * h_3$						=	1.1	m^2		
Ultimate Skin Resistance, Q_{s3} =							=	92	kN		
Layer-4:	Layer thickness, L_4						=	1.0	m		
Pile embedment in the layer,h_4							=	0.0	m		
Ultimate Skin Resistance, Q_{s4} =		$(K_4*P_4*\tan\delta_4+\alpha*c_4)$ x A_{s4}									
	Earth pressure co-efficient K_4						=	1.5			
	Overbuden pressure P_4						=	22.5	kN/m^2		
	Reduction factor, α						=	0.00			
	Cohesion, c_4						=	0	kN/m^2		
	Friction Angle, δ_4						=	39	Deg		
	Surface area of Pile in layer 4, $A_{s4} = \pi * D * h_4$						=	0.0	m^2		
Ultimate Skin Resistance, Q_{s4} =							=	0	kN		

YUBE PRIME INFRA SALEM - 636 005

Calculation of Ultimate End Bearing Resistance:							
Ultimate End bearing Resistance, $Q_b = ((C_P*N_C)+(P_d*N_q)) * A_p$							
Where,	Cohesion at Pile Toe, c	=	300	kN/m^2			
	Bearing Capacity Factor, N_c	=	9				
	Eff. Overburden pressure at pile toe, P_d	=	22.5	kN/m^2			
	Bearing Capacity Factor, N_q	=	0.00				
	Area of Pile at toe, A_p	=	0.20	m^2			
Ultimate End bearing Resistance, $Q_b = ((C_P*N_C)+(P_d*N_q)) * A_p$		=	530	kN			
Self Weight of the Pile, Wp							
Self weight of the Pile , $W_p = A_p * (L_{bw} * \gamma'_p)$							
Where, Area of pile, A_p		=	0.20	m^2			
	Total Length of Pile , L	=	3	m			
	Unit Weight of Pile material below water, γ'_p	=	15	kN/m^3			
Self weight of the Pile , W_p		=	9	kN			
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s - W_p$							
	Ultimate End Bearing, Q_b	=	530	kN			
	Ultimate Skin Resistance, Q_s	=	252	kN			
	Self weight of the Pile, W_p	=	9	kN			
Ultimate Capacity of the Pile , $Q_{ult} = Q_b + Q_s$		=	782	kN			
Safe Capacity of Pile, $Q_{safe} = ((\Sigma Q_{sf}/FOS_{sf})+(Q_b / FoS_b)-W_p$							
	Factor of Safety against skin friction	=	3.0				
	Factor of Safety against end bearing	=	3.0				
Safe Capacity of Pile, $Q_{safe} = Q_{ult}$ / FoS (without -ve skin friction)		=	**252**	**kN**			
Uplift Capacity of the Pile							
The uplift capacity contributed by top clay layer of 4m thickness is neglected in the analysis.							
Ultimate Uplift Capacity of Pile , $Q_u = Q_s + W_p$							
Safe uplift capacity of the pile, $Q_{usafe} = Q_u$ / FOS							
Ultimate skin resistance for layer 1, Q_{s1}		=	56	kN			
Ultimate skin resistance for layer 2, Q_{s2}		=	104	kN			
Ultimate skin resistance for layer 3, Q_{s3}		=	92	kN			
Total ultimate skin resistance, Q_s		=	252	kN			
Self weight of pile, W_p		=	9	kN			
Ultimate uplift capacity of the pile, Q_u		=	2/3 * Q_s + W_p				
		=	177	kN			
FOS		=	3.0				
Safe uplift capacity of the pile		=	**59**	**kN**			

YUBE PRIME INFRA SALEM - 636 005



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

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

Verified RealEstate™

We're honored to be part of your real estate journey

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
+91 9996 12 9996
www.verified.realestate