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CLIENT	**M/s. MAYUR PROMOTERS PRIVATE LIMITED, CHENNAI**
PROJECT	**ROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT +5FLOOR) AT DOOR 48/46, TAYLORS ROAD, KILPAUK, CHENNAI 600 010, COMPRISED IN T. S. No. 140/7, BLOCK- 10 OF EGMORE VILLAGE, GREATER CHENNAI CORPORATION DIVISION-103, ZONE -8.**
TITLE	**GEOTECHNICAL INVESTIGATION REPORT**

0	**01-11-2022**	**CTRL/ M/s. MAYUR PROMOTERS PRIVATE LIMITED /M-130/2022-23**	
REV.	**DATE**	**REPORT NUMBER**	**PREP. BY**

For CON-TECH RESEARCH LAB

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CHAPTER-1

INTRODUCTION

1.0 Preamble

M/s. Mayur Promoters Private Limited, Chennai proposed to construct a **Residential Building (Stilt +5floor) At Door 48/46, Taylors Road, Kilpauk, Chennai 600 010, Comprised In T. S. No. 140/7, Block- 10 Of Egmore Village, Greater Chennai Corporation Division-103, Zone -8.**

For the purpose of designing the foundations, the responsibility of carrying out suitable soil investigations was entrusted to **M/s. Con-Tech Research Lab, Chennai.**

This report contains the field and laboratory test results along with Design computations and recommendations for suitable foundation systems.

1.1 Scope of Work

- Sinking Two Standard Soil investigation bore holes of 150mm diameter up to a depth of 15.50m below existing ground level as directed by the engineer-in-charge.
- Conducting Standard Penetration Test (SPT) at regular depth intervals.
- Collection of Split Spoon Samples or Disturbed Soil Samples
- Collection of water samples from each bore hole.
- Conducting relevant laboratory test results.

1.2 Structure of the Report

- Contents
- Introduction
- Investigation Methodology & Test Results
- Figures & Tables
- Sub-Surface Stratification
- Foundation Systems
- Recommendations
- Annexure (Design Computations)

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 Field Testing:

2.1 Preamble:

Two standard soil investigation boreholes were put. The equipment used and the methodology adopted to carry out the fieldwork is described below.

2.2 Equipment Used and Method of Drilling:

2.2.1 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.

2.2.2 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.

2.3 In-Situ Strength Tests:

2.3.1 Standard Penetration Test:

Standard penetration tests were conducted at the borehole location, 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.

2.4. Collection of Samples:

2.4.1 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.

2.4.2 Ground Water

For conducting suitable chemical tests, the ground water sample was collected from the respective boreholes.

2.5 Summary of Field Work

The locations of the boreholes are shown in site plan given in Fig.2.0. The soil profiles obtained at each location is shown in Figs.2.1 and 2.2.

2.6 Laboratory Testing:

2.6.1 Coarse Grained Samples:

2.6.1.1 Grain size Analysis Tests:

On the coarse grained samples, grain size distribution tests were conducted as per I.S.2720 (Part 4)-1985, to know the gradation characteristics and to classify them. These results are presented in Tables 2.1 and 2.2.

2.6.2 Fine Grained Samples:

2.6.2.1 Index Property – Free Swell Tests:

Atterberg Limits were carried out on fine grained soil samples to evaluate the limits of different consistency states. Generally Liquid limits, Plastic limits and Shrinkage Limits tests were conducted as per I.S.2720 (Part-5)-1985 and I.S.2720 (Part 6)-1972. On such type of soil strata encountered at the investigation locations, such tests were conducted and the test results are presented in Tables 2.1 and 2.2.

2.6.3 Chemical Analysis Tests:

2.6.3.1 Water Samples:

On representative water samples, chemical analysis tests were conducted to estimate pH, Chlorides and Sulphates. These results are presented in Table-2.3.

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Location: BH-01

Started On : 29/10/2022; Ended On : 29/10/2022 G.W.T: 2.50m below existing ground level

R.L of Layer (m)	G.W.T. (m)	Soil Profile	Engineering Description of Soil	SPT - Details: Depth of SPT below E.G.L (m)	0-15 cm	15-30 cm	30-45 cm	N-Value	Graphical Representation of SPT (0 10 20 30 40 50 60 70 80 90)	Relative Density/Consistency	Type of Sample
1.50			Brownish Medium Stiff Silty Clay	1.00	3	3	4	7		M Stiff	SS
2.50	↓		Brownish Stiff Silty Clay	2.00	4	5	5	10		Stiff	SS
4.00			Brownish Very Stiff Silty Clay	3.00	5	7	9	16		V.Stiff	SS
5.50			Brownish Medium Dense Silty Clayey Fine Sand	4.50	7	10	13	23		M.Dense	SS
8.00			Brownish Dense Silty Fine Sand	6.00	13	18	21	39		Dense	SS
				7.50	15	23	27	50		Dense	SS
10.00			Blackish Very Stiff Silty Clay	9.00	8	9	11	20		V.Stiff	SS
				10.50	4	5	7	12		Stiff	SS
13.00			Blackish Stiff Silty Clay	12.00	3	5	5	10		Stiff	SS
15.50			Yellowish Hard Silty Clay	13.50	18	26	13cms Penetration for 50 Blows			Hard	SS
				15.50	30	10cms Penetration for 50 Blows				Hard	SS

Bore Hole Terminated at a depth of 15.50m below the existing ground level

Fig. 2.1 Soil Profile at BH-01 Location

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Location: BH-02

Started On : 30/10/2022; Ended On : 30/10/2022 G.W.T: 2.50m below existing ground level

R.L of Layer (m)	G.W.T. (m)	Soil Profile	Engineering Description of Soil	Depth of SPT below E.G.L (m)	SPT - Details 0-15 cm	15-30 cm	30-45 cm	N-Value	Graphical Representation of SPT 0 10 20 30 40 50 60 70 80 90	Relative Density/Consistency	Type of Sample
			Filled Up Soil	1.00	SPT neglected for the fill					-	DS
2.00				2.00	4	3	3	6		M.Stiff	SS
G.W.T	↓		Brownish Medium Stiff Silty Clay								
3.00				3.00	8	10	10	20		M.Dense	SS
			Brownish Medium Dense Silty Fine Sand								
4.50				4.50	12	15	17	32		Dense	SS
			Brownish Dense Silty Fine Sand								
6.00				6.00	9	8	8	16		M.Dense	SS
			Brownish Medium Dense Silty Fine Sand	7.50	10	12	13	25		M.Dense	SS
8.00											
			Brownish Dense Silty Fine Sand	9.00	18	20	21	41		Dense	SS
10.00											
			Brownish Very Stiff Silty Clay	10.50	8	10	12	22		V.Stiff	SS
11.50											
			Brownish Very Dense Silty Fine Sand	12.00	20	25	34	59		V.Dense	SS
				13.50	18	26	31	57		V.Dense	SS
15.50				15.50	26	29	32	61		V.Dense	SS

Bore Hole Terminated at a depth of 15.50m below the existing ground level

Fig. 2.2 Soil Profile at BH-02 Location

Table 2.1: Laboratory Test Result on the Soil Sample Collected from BH-01

Depth of Sample below E.G.L. (m)	SPT of Sample	Type of Sample	Engineering Description of Soil	NMC(%)	Natural Density (g/cc)	Clay					Relative Density/ Consistency	Sieve Analysis						IS-Classification
						LL (%)	PL (%)	PI	I_c	FS		Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	
0.00 to 1.50	7	SS	Silty Clay	38	1.6	78	22	56	0.71	60	M.Stiff	0	0	0	0	18	82	CH
1.50 to 2.50	10	SS	Silty Clay	30	1.7	62	21	41	0.78	-	Stiff	0	0	0	0	19	81	CH
2.50 to 4.00	16	SS	Silty Clay	27	1.8	66	24	42	0.93	-	V.Stiff	0	0	0	0	21	79	CI
4.00 to 5.50	23	SS	Silty Clayey Fine Sand	-	1.7	-	-	-	-	-	M.Dense	0	0	0	78	10	12	SM
5.50 to 8.00	44	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	Dense	0	0	0	84	16	0	SM
8.00 to 10.00	20	SS	Silty Clay	25	1.8	69	25	44	1.00	-	V.Stiff	0	0	0	0	22	78	CI
10.00 to 13.00	11	SS	Silty Clay	29	1.7	64	23	41	0.85	-	Stiff	0	0	0	0	20	80	CH
13.00 to 15.50	>100	SS	Silty Clay	15	2.0	42	32	10	2.70	-	Hard	0	0	0	0	25	75	CI

Table 2.2: Laboratory Test Result on the Soil Sample Collected from BH-02

Depth of Sample below E.G.L. (m)	SPT of Sample	Type of Sample	Engineering Description of Soil	NMC(%)	Natural Density (g/cc)	Clay					Relative Density/ Consistency	Sieve Analysis						IS-Classification
						LL (%)	PL (%)	PI	I_c	FS		Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	
0.00 to 2.00	-	DS	Filled Up Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.00 to 3.00	6	SS	Silty Clay	44	1.5	80	19	61	0.59	70	M.Stiff	0	0	0	0	17	83	CH
3.00 to 4.50	20	SS	Silty Fine Sand	-	1.6	-	-	-	-	-	M.Dense	0	0	0	77	23	0	SM
4.50 to 6.00	32	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	Dense	0	0	0	82	18	0	SM
6.00 to 8.00	20	SS	Silty Fine Sand	-	1.6	-	-	-	-	-	M.Dense	0	0	0	78	22	0	SM
8.00 to 10.00	41	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	Dense	0	0	0	83	17	0	SM
10.00 to 11.50	22	SS	Silty Clay	25	1.9	66	24	42	0.98	-	V.Stiff	0	0	0	0	21	79	CI
11.50 to 15.50	58	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	85	15	0	SM

Table 2.3: Chemical Analysis Results conducted on Water Samples collected from BH-01 & BH-02

Location	Depth of Sample below E.G.L. (m)	pH	Chlorides (ppm)	Sulphates (ppm)
BH-01	2.50	6.11	335.69	377.65
BH-02	2.50	6.12	341.55	384.24

CHAPTER-3

SUB-SURFACE STRATIFICATION

3.0 Preamble

The sub surface stratification at borehole location, with respect to foundation/geotechnical engineering application are derived based on the visual identification, laboratory classification tests and field in-situ strength tests. Further, the strength parameters are estimated based on the in-situ strength test results as per the following correlation.

* **For Coarse Grained Samples, Ref. Fig.1, IS: 6403 to estimate Angle of Shearing Resistance.**
* **For Fine Grained Samples, Ref. Terzaghi & Peck, 1948, to estimate Unconfined Compressive Strength.**

3.1 Sub Surface Stratification:

3.1.1 Soil Profile at BH-01 Location

(At BH-01 Location, as presented in Site plan)

* **Layer-1 (from E.G.L to 1.50m depth)**

Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	1.50m
SPT of the layer	07
Consistency	Medium Stiff
Un-drained Cohesion, Cu	46.66kPa

* **Layer-2 (from 1.50m to 2.50m depth)**

Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	1.00m
SPT of the layer	10
Consistency	Stiff
Un-drained Cohesion, Cu	66.66kPa

* **Layer-3 (from 2.50m to 4.00m depth)**

Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	1.50m
SPT of the layer	16
Consistency	Very Stiff
Un-drained Cohesion, Cu	106.66kPa

* **Layer-4 (from 4.00m to 5.50m depth)**

Type of Strata	Silty Clayey Fine Sand
Colour	Brownish

Thickness of Layer	1.50m
SPT of the layer	23
Relative Density	Medium Dense
Angle of Shearing Resistance, ϕ	33.90^0
* **Layer-5 (from 5.50m to 8.00m depth)**	
Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.50m
SPT of the layer	44
Relative Density	Dense
Angle of Shearing Resistance, ϕ	39.65^0
* **Layer-6 (from 8.00m to 10.00m depth)**	
Type of Strata	Silty Clay
Colour	Blackish
Thickness of Layer	2.00m
SPT of the layer	20
Consistency	Very Stiff
Un-drained Cohesion, Cu	133.33kPa
* **Layer-7 (from 10.00m to 13.00m depth)**	
Type of Strata	Silty Clay
Colour	Blackish
Thickness of Layer	3.00m
SPT of the layer	11
Consistency	Stiff
Un-drained Cohesion, Cu	73.33kPa
* **Layer-8 (from 13.00m to 15.50m depth)**	
Type of Strata	Silty Clay
Colour	Yellowish
Thickness of Layer	2.50m
SPT of the layer	>100
Consistency	Hard
Un-drained Cohesion, Cu	666.66kPa

Ground Water

Ground water table was encountered at a depth of 2.50m below the existing ground level during the last week of October 2022.

3.1.2 Soil Profile at BH-02 Location
(At BH-02 Location, as presented in Site plan)

* **Layer-1 (from E.G.L to 2.00m depth)**	
Type of Strata	Filled Up Soil
Colour	-
Thickness of Layer	2.00m
* **Layer-2 (from 2.00m to 3.00m depth)**	
Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	1.00m
SPT of the layer	06
Consistency	Medium Stiff

	Un-drained Cohesion, Cu	40.00kPa
*	**Layer-3 (from 3.00m to 4.50m depth)**	
	Type of Strata	Silty Fine Sand
	Colour	Brownish
	Thickness of Layer	1.50m
	SPT of the layer	20
	Relative Density	Medium Dense
	Angle of Shearing Resistance, ϕ	33.00^0
*	**Layer-4 (from 4.50m to 6.00m depth)**	
	Type of Strata	Silty Fine Sand
	Colour	Brownish
	Thickness of Layer	1.50m
	SPT of the layer	32
	Relative Density	Dense
	Angle of Shearing Resistance, ϕ	36.55^0
*	**Layer-5 (from 6.00m to 8.00m depth)**	
	Type of Strata	Silty Fine Sand
	Colour	Brownish
	Thickness of Layer	2.00m
	SPT of the layer	20
	Relative Density	Medium Dense
	Angle of Shearing Resistance, ϕ	33.00^0
*	**Layer-6 (from 8.00m to 10.00m depth)**	
	Type of Strata	Silty Fine Sand
	Colour	Brownish
	Thickness of Layer	2.00m
	SPT of the layer	41
	Relative Density	Dense
	Angle of Shearing Resistance, ϕ	38.975^0
*	**Layer-7 (from 10.00m to 11.50m depth)**	
	Type of Strata	Silty Clay
	Colour	Brownish
	Thickness of Layer	1.50m
	SPT of the layer	22
	Consistency	Very Stiff
	Un-drained Cohesion, Cu	146.66kPa
*	**Layer-8 (from 11.50m to 15.50m depth)**	
	Type of Strata	Silty Fine Sand
	Colour	Brownish
	Thickness of Layer	4.00m
	SPT of the layer	58
	Relative Density	Very Dense
	Angle of Shearing Resistance, ϕ	42.20^0

Ground Water

Ground water table was encountered at a depth of 2.50m below the existing ground level during the last week of October 2022.

CHAPTER-4

FOUNDATION SYSTEM

4.0 Preamble

The foundation system design is an interface between super structure and the sub soil bearing strata characteristics. A sound foundation system should be safe against bearing strata shear response under the super structure load intensity. Similarly, the stability of the foundation system is governed by the bearing strata deformation response under the super structure load intensity. In addition, as a combined system of super structure and foundation, the overall stability is also governed by the super structure arrangement.

Considering the above aspects of foundation design, the suitable type of foundation system with respect to the sub soil conditions encountered at the borehole locations is presented in the subsequent sections.

4.1 Bearing Strata Characteristics

From field investigations, it can be observed that the sub-soil strata encountered at shallow depths are weak from both shear strength characteristics and deformation considerations and hence cannot be considered as bearing strata for proposed impending loads from structure.

Further, the sub-soil strata encountered up to the depth of investigations can also offer a good frictional resistance against a suitable designed structural member if being cast or driven in such soils.

Considering the above, suitable foundation system is presented below.

4.2 Foundation System

4.2.1 Deep Foundation System-15.50m Long Bored Cast-in-Situ Friction Piles

Considering the weak shear strength characteristics of sub-soil strata encountered at shallow depths, deep foundation system consisting of 15.50m long bored cast-in-situ Friction Piles can be adopted.

Piles shall be drilled through DMC (direct mud circulation) technique.

For four different diameters, the safe load carrying capacities of 15.50m long bored cast-in-situ Friction Piles are computed and presented below which can be adopted for foundation design purposes.

S. No	Type of Installation of Pile	Type of Pile	Length of Pile below Existing Ground Level (m)	Diameter of Pile (mm)	Safe Load Carrying Capacity (MT)	Safe Pull Out Capacity (MT)
1	Bored Cast-in-Situ	Fixed Head Pile	15.50	400	61	61
2				450	69	69
3				500	76	76
4				550	84	84

The computations of safe load carrying capacity for 400mm diameter and 15.50m long bored cast-in-situ Friction pile are annexed to this report.

CHAPTER-5

CONCLUSIONS & RECOMMENDATIONS

1. Deep foundation system presented in Clause 4.2.1, Chapter-IV can be adopted for foundation design purposes.
2. Suitable pile load tests (as per I.S: 2911, part-IV) shall be performed to confirm the presented **theoretical** safe load carrying capacities and arrive at the design safe load capacity of piles. (**Mandatory**).
3. Pile cap can be located over 0.30m thick well compacted ground replaced CNS (Cohesive Non-Swelling) soil surface.
4. **CNS can be non-plastic clean river sand or quarry dust or fly-ash or sand-gravels mix.**
5. Piles shall be grouped according to the column design load requirements.
6. Safe load carrying capacities of piles shall be limited to their structural capacities.

General

7. As the chlorides and sulphates present in the collected water samples are within the permissible limits, no special steel or cement is recommended to be used for foundation construction purposes.

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DESIGN OF PILE FOUNDATION (Ref. BH-02)

Refer, IS:2911(Part I/Sec 2)-1979, Reaffirmed 1997

1.0 Type of Installation of Pile

1.1 Geometrical Data

Bored Cast in Situ

Assumed Diameter of pile(D):	**400.0**	mm
Assumed R.L of E.G.L:	0.000	m
Length of pile below E.G.L.(l) :	**15.500**	m
R.L. of Bot. of Pile	-15.50	m

1.2 Design of Pile for Vertical Compression

1.2.1 Computation of Skin Resistance:

1.2.1.1

Layer-II

Type of Strata:	Silty Clay	
Average SPT of the strata,N:	6	
Bulk Density of the strata,g:	15	kN/m3
Undrained Cohesion, Cu:	40.00	kPa
R.L of top of Strata:	-2.00	m
R.L of bottom of Strata:	-3.00	m
Average Thickness of Strata,Ic:	1.00	m
Effective overburden pressure over the top of strata,stop:	0.00	kN/m2
Effective overburden pressure over the bottom of strata,sbottom:	5.00	kN/m2
Effective overburden pressure at the middle of the strata,smiddle:	2.50	kN/m2
Adhesion Factor, a:	0.70	
Skin Resistance of the pile,qs:	35.19	kN

(qs:a*Cu*pi()*d*Ic)

1.2.1.2

Layer-III

Type of Strata:	Silty Fine Sand	
Average SPT of the strata,N:	20	
Bulk Density of the strata,γ:	16	kN/m^3
Angle of Shearing Resistance,ϕ:	33	Deg.
R.L of top of Strata:	-3.00	m
R.L of bottom of Strata:	-4.50	m
Average Thickness of Strata,I_c:	1.50	m
Effective overburden pressure over the top of strata,σ_{top}:	5.00	kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}:	14.00	kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}:	9.50	kN/m^2
Coeff. Of Earth Pressure, k:	1.50	
Skin Resistance of the pile,q_s:	17.44	kN

(q_s:σ*k*tanϕ*pi()*d*Ic)

1.2.1.3

Layer-IV

Type of Strata:	Silty Fine Sand	
Average SPT of the strata,N:	32	
Bulk Density of the strata,γ:	19	kN/m^3
Angle of Shearing Resistance,ϕ:	36.55	Deg.
R.L of top of Strata:	-4.50	m

R.L of bottom of Strata: -6.00 m
Average Thickness of Strata,I_c: 1.50 m
Effective overburden pressure over the top of strata,σ_{top}: 14.00 kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}: 27.50 kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}: 20.75 kN/m^2
Coeff. Of Earth Pressure, k: 2.00
Skin Resistance of the pile,q_s: 57.99 kN
(q_s:σ*k*tanϕ*pi()*d*Ic)

1.2.1.4 **Layer-V**

Type of Strata: Silty Fine Sand
Average SPT of the strata,N: 20
Bulk Density of the strata,γ: 16 kN/m^3
Angle of Shearing Resistance,ϕ: 33 Deg.
R.L of top of Strata: -6.00 m
R.L of bottom of Strata: -8.00 m
Average Thickness of Strata,I_c: 2.00 m
Effective overburden pressure over the top of strata,σ_{top}: 27.50 kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}: 39.50 kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}: 33.50 kN/m^2
Coeff. Of Earth Pressure, k: 1.50
Skin Resistance of the pile,q_s: 82.01 kN
(q_s:σ*k*tanϕ*pi()*d*Ic)

1.2.1.5 **Layer-VI**

Type of Strata: Silty Fine Sand
Average SPT of the strata,N: 41
Bulk Density of the strata,γ: 19 kN/m^3
Angle of Shearing Resistance,ϕ: 38.975 Deg.
R.L of top of Strata: -8.00 m
R.L of bottom of Strata: -10.00 m
Average Thickness of Strata,I_c: 2.00 m
Effective overburden pressure over the top of strata,σ_{top}: 39.50 kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}: 57.50 kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}: 48.50 kN/m^2
Coeff. Of Earth Pressure, k: 2.00
Skin Resistance of the pile,q_s: 197.24 kN
(q_s:σ*k*tanϕ*pi()*d*Ic)

1.2.1.6 **Layer-VII**

Type of Strata: Silty Clay
Average SPT of the strata,N: 22
Bulk Density of the strata,g: 19 kN/m3
Undrained Cohesion, Cu: 146.67 kPa
R.L of top of Strata: -10.00 m
R.L of bottom of Strata: -11.50 m
Average Thickness of Strata,Ic: 1.50 m

Effective overburden pressure over the top of strata,stop:	57.50	kN/m2
Effective overburden pressure over the bottom of strata,sbottom:	71.00	kN/m2
Effective overburden pressure at the middle of the strata,smiddle:	64.25	kN/m2
Adhesion Factor, a:	0.40	
Skin Resistance of the pile,qs:	110.58	kN
(qs:a*Cu*pi()*d*Ic)		

1.2.1.7 **Layer-VIII**

Type of Strata:	Silty Fine Sand	
Average SPT of the strata,N:	58	
Bulk Density of the strata,γ:	20	kN/m^3
Angle of Shearing Resistance,ϕ:	42.2	Deg.
R.L of top of Strata:	-11.50	m
R.L of bottom of Strata:	-15.50	m
Average Thickness of Strata,I_c:	4.00	m
Effective overburden pressure over the top of strata,σ_{top}:	71.00	kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}:	111.00	kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}:	91.00	kN/m^2
Coeff. Of Earth Pressure, k:	2.50	
Skin Resistance of the pile,q_s:	1036.90	kN
(q_s:σ*k*tanϕ*pi()*d*Ic)		

Ultimate Skin Resistance,q_s: 1537.36 kN

1.2.2 **Computation of End Bearing Resistance:**

Ultimate End Bearing Resistance (Qp) Neglected for Friction Pile

1.3.0

Ultimate Load Carrying Capacity (Qu=Qs+Q_p)	**1537.4**	**kN**
Safe Load Carrying Capacity (Qsafe =Qu/2.50)	**614.9**	**kN**
However, limit Q_{safe} to the structural capacity of pile:	**610.0**	**kN**



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