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CLIENT	**HANSA ESTATES PVT. LTD., CHENNAI**
PROJECT	**PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (G+05) 'HANSA THIRU VELLORE' AT PLOT-D, THIRUMALAI STREET, RAJAJIPURAM II, THIRUVALLUR**
TITLE	**GEOTECHNICAL INVESTIGATION REPORT**

		For Geo Mines Engineers Pvt Ltd	
		Director	
0	10-04-2023	GMEPL/HANSA ESTATES PVT. LTD./016/2023-24	
REV.	**DATE**	**REPORT NUMBER**	**PREP. BY**

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DISCLAIMER

We've been asked to look into the ground and identify and quantify everything that mother nature has put thereand predict how those materials will react to construction and long-term performance of a facility - and we may fall short of this lofty goal.

We have made reasonable and prudent conclusions but a cloud of uncertainty inherently looms over the project as per the pre and post facilities laid and their elemental behaviour on the mother soil.

Also, the variable nature of soil strata and it's varying characteristics may make the recommended foundation system disqualify and hence it's recommended that special care shall be taken by the owner during and after the construction is complete and during the run period of the building.

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CHAPTER-1

INTRODUCTION

1.0 Preamble

Hansa Estates Pvt. Ltd., Chennai proposed construction a **Residential Building (G+05) 'Hansa Thiru Vellore' at Plot-D, Thirumalai Street, Rajajipuram II, Thiruvallur.**

For the purpose of designing the foundations, the responsibility of carrying out suitable soil investigation was entrusted to **M/s. Geo Mines ENGINEERS Pvt. Ltd., 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 below existing ground level where SPT>100 or 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)

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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 was a Manual Rotary Drill Rig. The soil from the sides of boreholes were contained against lateral collapse by installing casing pipes with the progress of drill.

2.2.2 Methodology of drilling

In the soil strata, the drilling operations have been carried out using special bucket shaped, helical and spiral augers.

2.3 In-Situ Strength Tests:

2.3.1 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.

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.

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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 soil 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:

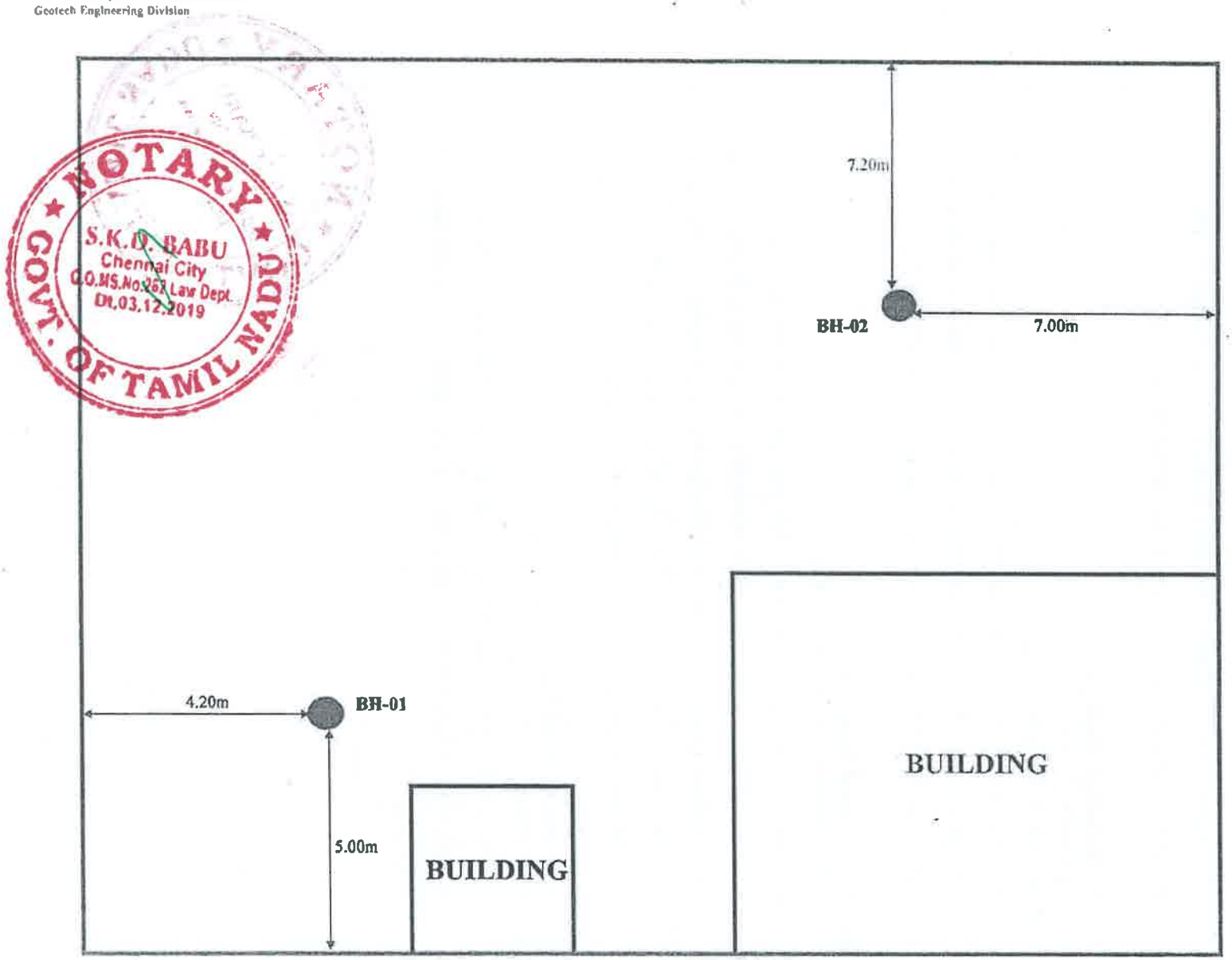
Atterberg Limits were carried out on fine grained soil samples to evaluate the limits of different consistency states. Generally Liquid limits, Plastic limits and Shrinkage Limits tests were conducted as per I.S.2720 (Part-5)-1985 and I.S.2720 (Part 6)-1972. As no such type of soil strata encountered at the investigation locations, no such tests could be conducted.

2.6.3 Chemical Analysis Tests:

2.6.3.1 Soil Samples:

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





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Fig. 2.0: Site Plan Representing the locations of Field Investigation Points

Project : Proposed Construction of Residential Building (G+05) 'Hansa Thiru Vellore' at Plot-D, Thirumalai Street, Rajajipuram II, Thiruvallur

Location: BH-01

Started On : 08/04/2023; Ended On : 08/04/2023 G.W.T: Not met within investigation depths

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	ical Representation (0 1 2 3 4 5 6 7 8 9)	Relative Density/Consistency	Type of Sample
			Brownish Loose							Loose	DS
1.00			Silty Clayey Fine Sand								
			Brownish to Greenish	1.50	6	15	23	38		Dense	SS
			Dense								
			Cemented Sand	3.00	5	17	25	42		Dense	SS
4.50											
			Brownish	4.50	9	28	37	65		V Dense	SS
			Very Dense								
5.50			Cemented Sand								
			Weathered	6.00	08cms Penetration for 50 Blows					V Dense	SS
6.20			Rock								

Bore Hole Terminated at a depth of 6.20m below the existing grou

Fig. 2.1 Soil Profile at BH-01 Location



Project : Proposed Construction of Residential Building (G+05) 'Hansa Thiru Vellore' at Plot-D, Thirumalai Street, Rajajipuram II, Thiruvallur

Location: BH-02

Started On : 08/04/2023; Ended On : 08/04/2023 G.W.T: Not met within investigation depths

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	ical Representation (0 1 2 3 4 5 6 7 8 9)	Relative Density/Consistency	Type of Sample
			Brownish Loose							Loose	DS
1.00			Silty Clayey Fine Sand	1.50	7	16	23	39		Dense	SS
			Brownish to Greenish Dense Cemented Sand	3.00	6	18	21	39		Dense	SS
4.00											
			Brownish Very Dense Cemented Sand	4.50	11	29	38	67		V.Dense	SS
5.50											
			Weathered Rock	6.00	09cms Penetration for 50 Blows					V.Dense	SS
6.20											

Bore Hole Terminated at a depth of 6.20m below the existing grou

Fig. 2.2 Soil Profile at BH-02 Location



Table 2.1: Laboratory Test Results on the Soil Samples 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 1.00	-	DS	Silty Clayey Fine Sand	-	1.5	-	-	-	-	-	Loose	0	0	0	79	9	12	SM
1.00 to 4.00	40	SS	Cemented Sand	-	1.9	-	-	-	-	-	Dense	0	13	17	43	14	13	SM
4.00 to 5.50	65	SS	Cemented Sand	-	2.0	-	-	-	-	-	V.Dense	0	21	14	38	12	15	SM
5.50 to 6.20	>100	SS	Weathered Rock	-	2.0	-	-	-	-	-	V.Dense	38	19	22	13	8	0	SDR

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Table 2.2: Laboratory Test Results on the Soil Samples 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 1.00	-	DS	Silty Clayey Fine Sand	-	1.5	-	-	-	-	-	Loose	0	0	0	66	14	20	SM
1.00 to 4.00	39	SS	Cemented Sand	-	1.9	-	-	-	-	-	Dense	0	20	19	38	11	12	SM
4.00 to 5.50	67	SS	Cemented Sand	-	2.0	-	-	-	-	-	V.Dense	0	27	21	31	11	10	SM
5.50 to 6.20	>100	SS	Weathered Rock	-	2.0	-	-	-	-	-	V.Dense	35	14	22	21	8	0	SDR

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

Location	Depth of Sample below E.G.L. (m)	pH	Chlorides (ppm)	Sulphates (ppm)
BH-01	3.00	6.76	299.81	337.28
BH-02	3.00	6.75	300.04	337.54

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CHAPTER-3

SUB-SURFACE STRATIFICATION

3.0 Preamble

The sub surface stratification at borehole locations, 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 0.00m to 1.00m depth)**

Type of Strata	Silty Clayey Fine Sand
Colour	Brownish
Thickness of Layer	1.00m
SPT of the layer	-
Relative Density	Loose
Angle of Shearing Resistance, ϕ	-

* **Layer-2 (from 1.00m to 4.00m depth)**

Type of Strata	Cemented Sand
Colour	Brownish to Greenish
Thickness of Layer	3.00m
SPT of the layer	40
Relative Density	Dense
Angle of Shearing Resistance, ϕ	38.75^0

* **Layer-3 (from 4.00m to 5.50m depth)**

Type of Strata	Cemented Sand
Colour	Brownish
Thickness of Layer	1.50m
SPT of the layer	65
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.50^0

* **Layer-4 (from 5.50m to 6.20m depth)**

Type of Strata	Weathered Rock

Colour	-
Thickness of Layer	0.70m
SPT of the layer	>100
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.50^0

Ground Water

No ground water table was encountered within the explored depth of investigation in the first week of April 2023.

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

* **Layer-1 (from 0.00m to 1.00m depth)**

Type of Strata	Silty Clayey Fine Sand
Colour	Brownish
Thickness of Layer	1.00m
SPT of the layer	-
Relative Density	Loose
Angle of Shearing Resistance, ϕ	-

* **Layer-2 (from 1.00m to 4.00m depth)**

Type of Strata	Cemented Sand
Colour	Brownish to Greenish
Thickness of Layer	3.00m
SPT of the layer	39
Relative Density	Dense
Angle of Shearing Resistance, ϕ	38.475^0

* **Layer-3 (from 4.00m to 5.50m depth)**

Type of Strata	Cemented Sand
Colour	Brownish
Thickness of Layer	1.50m
SPT of the layer	67
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.50^0

* **Layer-4 (from 5.50m to 6.20m depth)**

Type of Strata	Weathered Rock
Colour	-
Thickness of Layer	0.70m
SPT of the layer	>100
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.50^0

Ground Water

No ground water table was encountered within the explored depth of investigation in the first week of April 2023.

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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 uniformly stratified coarse-grained type but possess varying shear strength characteristics, BH-01 being relatively weak from deformation considerations than that of other investigation location and hence shall be considered as design borehole to determine the bearing strata and foundation design parameters.

Considering BH-01 as design borehole, it can further be envisaged that if coarse-grained soil strata encountered at shallow depths are considered as bearing strata, the safe bearing capacity of open foundation system will be a function of least width of footing and effective over burden pressure on the bearing strata.

Further, the refusal soil strata (SPT>60) encountered below 5.50m depths from existing ground level can also be considered as good end bearing strata for proposed impending loads from structure.

Considering the above, suitable foundation systems are presented below.

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4.2 Foundation System

4.2.1 Open Foundation System (BH-01)

Considering the bearing strata characteristics of sub-soil strata encountered at shallow depths, open foundation system of Isolated Column Footing type located at a least depth of 2.20m below present existing ground level (E.G.L) can be adopted.

The safe bearing capacity of such type of open foundation is computed and presented below which can be adopted for foundation design purposes.

S. No.	Type of Open Foundation System	Depth of Footing below Existing Ground Level (m)	Observed Thickness of Fill (m)	Depth of Footing below Natural Ground Level (m)	Type of Bearing Strata	Safe Bearing Capacity (MT/m^2)	Elastic Settlements <50mm (mm)
1	Isolated Column Footing	2.20	0.00	2.20	Cemented Sand	22	25

The computations for above are annexed to this report.

4.2.2 Deep Foundation System-8.00m Long Bored Cast-in-Situ Friction cum End Bearing Piles

In case, the foundation pressure impending from columns is more than the computed safe bearing pressure as presented in Clause 4.2.1, Chapter-IV, deep foundation system consisting of 8.00m long bored cast-in-situ Friction cum End Bearing Piles can also be adopted.

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

For four different diameters, the safe load carrying capacities of 8.00m long bored cast-in-situ Friction cum End Bearing Piles are computed and presented below which can be adopted for foundation design purposes.



S. No	Type of Installation of Pile	Length of Pile below Existing Ground Level (m)	Type of Bearing Strata	Diameter of Pile (mm)	Safe Load Carrying Capacity (MT)	Safe Pull Out Capacity (MT)
1	Bored Cast-in-Situ	8.00	Weathered Rock	400	50	24
2				450	60	28
3				500	70	31
4				550	80	35

The computations of safe load carrying capacity for 400mm diameter and 8.00m long bored cast-in-situ Friction cum End Bearing pile are annexed to this report.

CHAPTER5

CONCLUSIONS & RECOMMENDATIONS

1. Foundation systems presented in Clause 4.2.1 & 4.2.2, Chapter-IV can be adopted for foundation design purposes.

Open Foundation System

2. Safe bearing capacity presented in Clause 4.2.1, Chapter-IV can be adopted for open foundation design purposes.
3. **In no case, least depth of footing shall be less than 2.20m below existing ground level.**
4. Care shall be taken so that the ultimate bearing strata are none other than coarse-grained **Dense Cemented Sand** type.
5. Excavated coarse-grained soil encountered at shallow depths can be used for back filling purposes.
6. Safe bearing capacity presented in Clause 4.2.1, Chapter-IV is computed considering any rise in the ground water table at or above the level of footing.
7. **It is recommended to connect the grade beams so that the structure can act as a single unit against any differential settlements in between the individual footings.**
8. Special provisions to contain any lateral collapse of soil from the walls excavated foundation pits are required up to the recommended foundation bottom slab levels.
9. In case, the ground water table is encountered within the recommended depths of foundation system, the same shall be bailed out continuously to keep the sub-grade well consolidated.

Deep Foundation System

10. *Care shall be taken so that the ultimate end bearing soil strata are none other than recommended "Weathered Rock" type. The same shall be reaffirmed by*

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our Geotechnical Engineer during foundation laying works are under progress.

11. Suitable pile load tests (as per I.S: 2911, part-IV) shall be performed to confirm the presented theoretical safe load carrying capacities and shall be used as allowable/design load carrying capacities of pile under considerations. **(Mandatory).**
12. Pile cap can be located over 0.30m thick well compacted existing ground surface.
13. Piles shall be grouped according to the column design load requirements.
14. Safe load carrying capacities of piles shall be limited to their structural capacities.

General

15. 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.

For Geo Mines Engineers Pvt Ltd

Director

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DESIGN OF OPEN FOUNDATION SYSTEM (BH-01)

1 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

1.1 Geometrical Data :

Type of Foundation System:	Isolated Col. Footing	
R.L of the top of Borehole (m):	0.00	m
Depth of Foundation below existing ground level (D_f):	2.20	m
Observed Thickness of fill at site:	0.00	m
Effective Depth of Foundation below natural ground level (D_f):	2.20	m
Design Width of Foundation (B):	1.00	m
Thickness of Foundation (T) :	0.25	m

1.2 Soil Data :

Type of Bearing Strata :	Cemented Sand	
Design SPT-value of the Bearing Strata :	38	
(considered based upon the density of the strata)		
Type of Shear Failure:	General	
Angle of Shearing Resistance - Limited to a Maximum of:	38.20	Deg.

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk})	19.00	kN/m^3
Effective Overburden pressure at foundation level (q)	19.80	kPa
Water Table Correction Factor (w')	0.50	

Bearing Capacity Factors:

N_c = N/A

N_q = 53.08

N_γ = 87.31

Shape Factors:

S_c = N/A

S_q = 1.79

S_γ = 0.60

Depth Factors :

D_c = N/A

D_q = 1.00



$D_\gamma = 1.00$

Inclination Factor:

$I_c = N/A$

$I_q = 1.00$

$I_\gamma = 1.00$

1.4 Ultimate Bearing Capacity (Qu) :

$Qu = Cu*Nc*Sc*D_C*I_C+q*(Nq-1)*Sq*Dq*Iq + 0.5*B*\gamma*N\gamma*S\gamma*D\gamma*Ig*w'$

$Q_u =$ 2126.73 kPa

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50
Qsafe :	850.69 kPa
Recommended Safe Bearing Capacity:	220.00 kPa

1.6 Settlements

Since, the bearing strata are coarse-grained type, the settlements under the allowable safe bearing pressure 220kPa will be of immediate elastic nature. The elastic settlements corresponding to a safe bearing pressure of 220kPa and average SPT of 38 considering extent of pressure bulb below bottom level of footing are computed to be in the order of 25mm which is within the permissible limits of 50mm for Isolated Column Footings as per I.S:1904.



DESIGN OF PILE FOUNDATION (Ref: BH-01)

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

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

1.1 Geometrical Data

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) :	**8.000**	m
R.L. of Bot. of Pile	-8.00	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:	Cemented Sand	
Average SPT of the strata,N:	40	
Bulk Density of the strata,γ:	19	kN/m^3
Angle of Shearing Resistance,ϕ:	38.75	Deg.
R.L of top of Strata:	-1.00	m
R.L of bottom of Strata:	-4.00	m
Average Thickness of Strata,I_c:	3.00	m
Effective overburden pressure over the top of strata,σ_{top}:	0.00	kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}:	27.00	kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}:	13.50	kN/m^2
Coeff. Of Earth Pressure, k:	2.00	
Skin Resistance of the pile,q_s:	81.69	kN
(q_s:σ*k*tanϕ*pi()*d*Ic)		

1.2.1.2 **Layer-III**

Type of Strata:	Cemented Sand	
Average SPT of the strata,N:	60	
Bulk Density of the strata,γ:	20	kN/m^3
Angle of Shearing Resistance,ϕ:	42.5	Deg.
R.L of top of Strata:	-4.00	m
R.L of bottom of Strata:	-5.50	m
Average Thickness of Strata,I_c:	1.50	m
Effective overburden pressure over the top of strata,σ_{top}:	27.00	kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}:	42.00	kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}:	34.50	kN/m^2
Coeff. Of Earth Pressure, k:	2.50	
Skin Resistance of the pile,q_s:	148.97	kN
(q_s:σ*k*tanϕ*pi()*d*Ic)		

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1.2.1.3 **Layer-IV**

Type of Strata:	Weathered Rock	
Average SPT of the strata,N:	60	
Bulk Density of the strata,γ:	20	kN/m^3
Angle of Shearing Resistance,ϕ:	42.5	Deg.
R.L of top of Strata:	-5.50	m
R.L of bottom of Strata:	-8.00	m
Average Thickness of Strata,I_c:	2.50	m
Effective overburden pressure over the top of strata,σ_{top}:	42.00	kN/m^2
Effective overburden pressure over the bottom of strata,σ_{bottom}:	67.00	kN/m^2
Effective overburden pressure at the middle of the strata,σ_{middle}:	54.50	kN/m^2
Coeff. Of Earth Pressure, k:	2.50	
Skin Resistance of the pile,q_s:	392.23	kN
(q_s:σ*k*tanϕ*pi()*d*Ic)		
Ultimate Skin Resistance,q_s:	**622.90**	**kN**

1.2.2 Computation of End Bearing Resistance:

Type of Bearing Strata	Weathered Rock	
Cross-Sectional Area of pile,Ap:	0.126	m^2
R.L of bottom of pile:	-8.00	
Minimum SPT-value of the Bearing Strata	60	
Angle of Shear Resistance, ϕ:	42.50	Deg.
Effective Overburden Pressure, q:	30.00	kPa
Bearing Capacity Factor(Nq)	220.00	
Ultimate End Bearing Resistance (Qp)	**829.4**	**kN**
(Qp=Ap*q*Nq)		

1.3.0 **Ultimate Load Carrying Capacity (Qu=Qs+Q_p)**	**1452.3**	**kN**
Safe Load Carrying Capacity (Qsafe =Qu/2.5)	**580.9**	**kN**
However, limit Q_{safe} to the structural capacity of pile:	**500.0**	**kN**



Depth of fixity of Pile

Length of Pile

L_1 = 0 cm
[since the pile cast at ground level with fixed head]

Characteristic strength of Concrete

f_{ck} = 30 N/mm^2

Diameter of Pile

D = 40 cm

Modulas of Elasticity of Concrete (E)

$5000 \times \sqrt{f_{ck}} = 5000 \times \sqrt{30}$ N/mm^2
[As per IS 456 :2000 pg. no : 16]

= 273861.28 Kg/cm^2

Moment of Inertia of Pile (I)

$\frac{\pi \times D^4}{64} = \frac{3.14 \times 40^4}{64}$ cm^4

= 125600.0 cm^4

K1 (constant) = 0.525 Kg/cm^2
[As per IS : 2911 (Part 1 / Sec 1) - appendix-B]

T (constant) = $\sqrt[5]{\frac{(E \times I)}{K1}}$
[As per IS : 2911 (Part 1 / Sec 1) - appendix-B, Cl.5.5.2]

= 145.64 cm

Hence L_1 / T

= $\frac{L_1}{T}$
[As per IS : 2911 (Part 1 / Sec 1) - appendix-B, Cl.5.5.2]

= 0.0E+00



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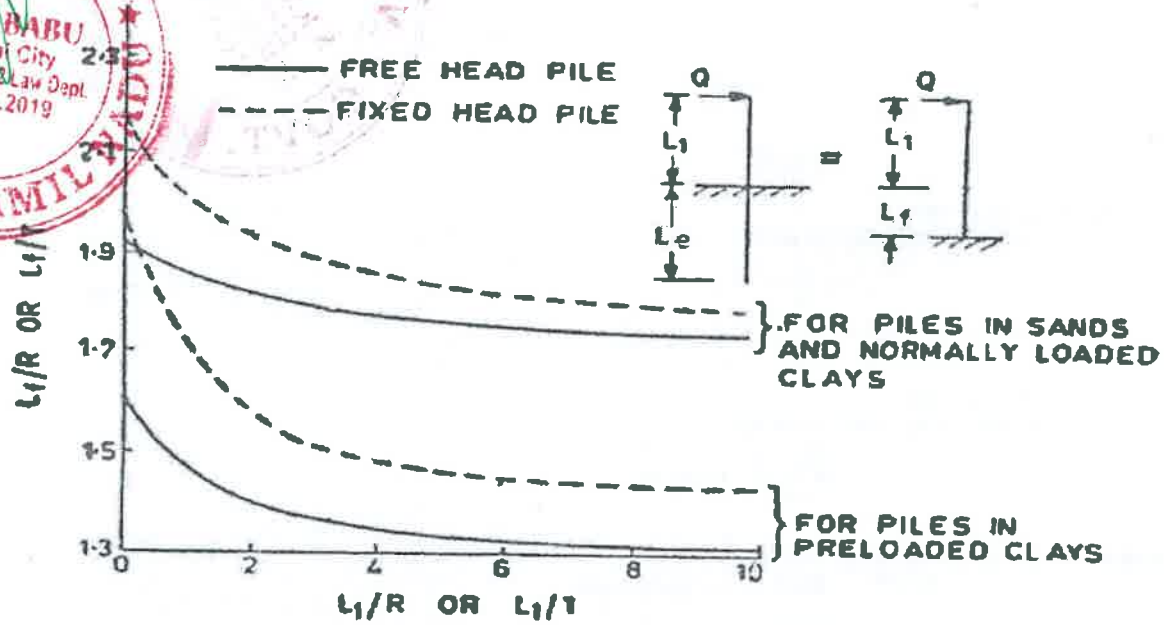


FIG. 2 DETERMINATION OF DEPTH FIXITY

For fixed head pile

$$\frac{L_1}{T} = 2.2$$

[As per IS : 2911 (Part 1 / Sec 1) - appendix-B, Cl.5.5.2 fig 2]

Length of fixity

L_f = 320.40 cm [As per IS : 2911 (Part 1 / Sec 1) -
= 3.20 m appendix-B, Cl.5.5.2]

Embedded Length

Le > 4 x R [As per IS : 2911 (Part 1 / Sec 1) -
> 5.8 m appendix-B, Cl.5.5.2]

Calculation of Lateral capacity of pile

(From IS:2911, Part 1 / Sec. 1, Cl.5.5.2 - Appendix A)

$$\text{Lateral capacity, } Q = \frac{12\,E\,I\,Y}{(L_1 + L_f)^3}$$ for Fixed Head Pile

Where ,

Y = Lateral deflection pf pile = 5 mm (As per IS2911, part1 / sec.1)

Modulas of Elasticity of Concrete (E) = 273861.28 Kg/cm2

Moment of Inertia of Pile (I) = 125600.0 cm4

L1 + Lf = 0 + 320.40
= 320.4 cm
= 3.20 m

Safe Lateral Load Carrying Capacity

$$Q = \frac{12 \times 273861.28 \times 125600 \times 0.10}{3.20 \times 3.20 \times 320.4 \times 2.5}$$

= 2.5 MT

= 25 kN

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S.K.D. BABU
Advocate & Notary
No.60/33, 4th Main Road
CIT Nagar,
Chennai - 600 035

S.No	Diameter of Pile (mm)	Depth of Fixity of Pile below Ground Level (m)	Safe Lateral Load Carrying Capacity (KN)
1	400	3.20	25.00
2	450	3.52	30.00
3	500	3.83	36.00
4	550	4.13	42.00

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