BOOSHNAM ASSOCIATES

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CLIENT	**M/s. RAINBOW DEVELOPERS, CHENNAI.**
PROJECT	**PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT+03) AT S.NO :212/2, MADHA NAGAR MAIN ROAD, MADHANANDHAPURAM VILLAGE, SRIPERUMBUDUR TALUK, KANCHEEPURAM DISTRICT, GREATER CHENNAI CORPORATION, DIVISION :156, ZONE:12.**
TITLE	**GEOTECHNICAL INVESTIGATION REPORT**

REV.	DATE	REPORT NUMBER	REMARK
0	21.05.2021	BAG/ M/s. RAINBOW DEVELOPERS /M-1794/21-22	

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CHAPTER-1

INTRODUCTION

1.0 Preamble

M/s. Rainbow Developers, Chennai proposed to construct a **Residential Building (Stilt+03) at S. No:212/2, Madha Nagar Main Road, Madhanandhapuram Village, Sriperumbudur Taluk, Kancheepuram District, Greater Chennai Corporation, Division :156, Zone:12.**

For the purpose of designing the foundations, the responsibility of carrying out suitable soil investigations was entrusted to **M/s. Booshnam Associates, 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 Four Standard Soil investigation bore holes of 150mm diameter up to a depth of 10.50m 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:

Four 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 Manual 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 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 to 2.4.

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 to 2.4.

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 to 2.4.

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-2.5.

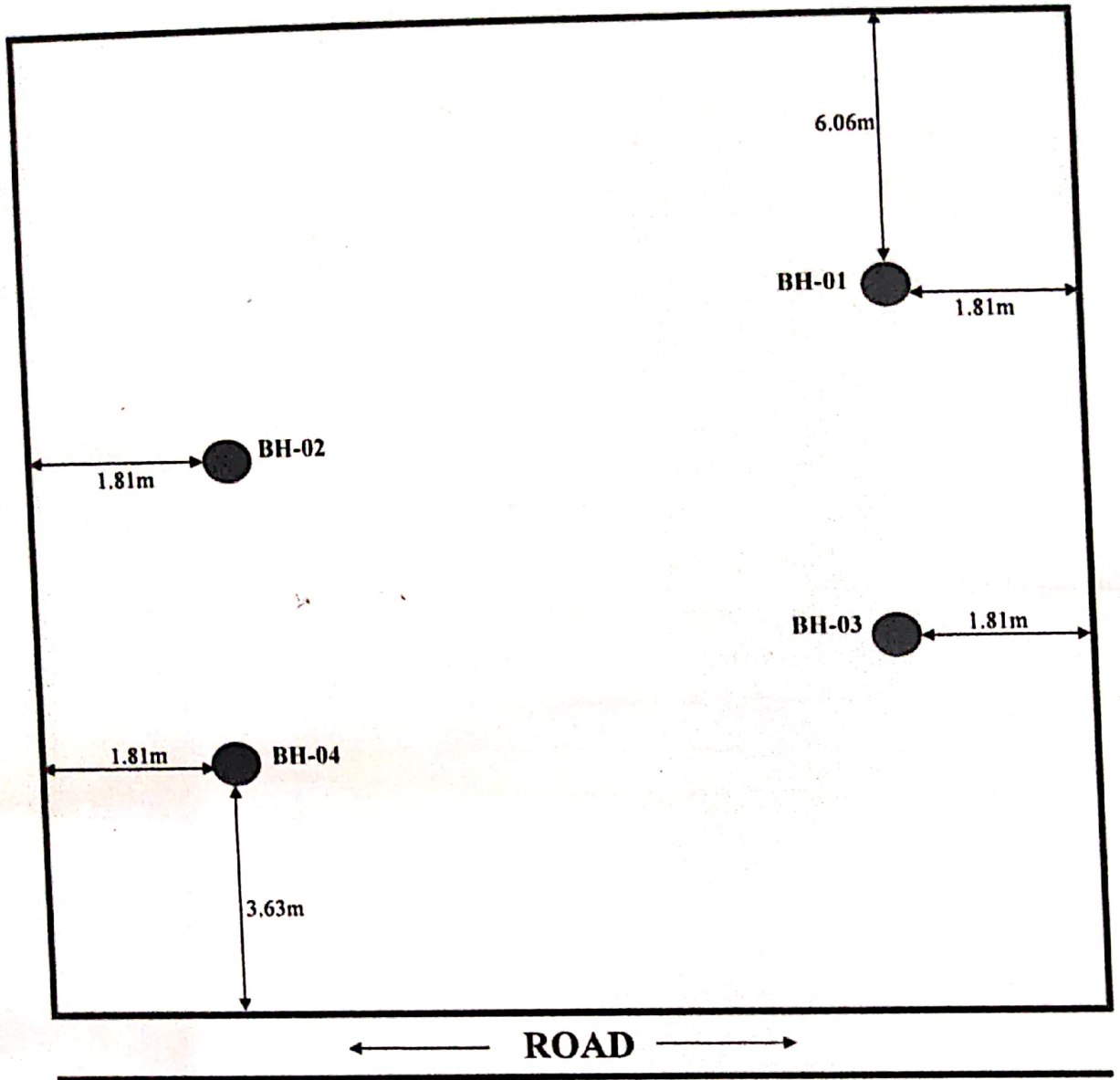

Fig. 2.0: Site Plan Representing the locations of Field Investigation Points

Project : Proposed Construction of Residential Building (Stilt+03) at S. No:212/2, Madha Nagar Main Road, Madhanandhapuram Village, Sriperumbudur Taluk, Kancheepuram District, Greater Chennai Corporation, Division :156, Zone:12.

Location: BH-01

Started On : 18/05/2021; Ended On : 18/05/2021 G.W.T: 3.00m 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
2.00			Brownish Very Stiff Silty Clay	1.50	5	7	14	21		V.Stiff	SS
G.W.T 4.00			Blackish Hard Silty Clay	3.00	10	14	17	31		Hard	SS
				4.50	7	10	16	26		V.Stiff	SS
6.50			Blackish Very Stiff Silty Clay	6.00	9	12	15	27		V.Stiff	SS
8.00			Greyish Very Dense Silty Fine Sand	7.50	15	23	34	57		V.Dense	SS
			Greyish Medium Dense Silty Fine Sand	9.00	6	9	13	22		M.Dense	SS
10.50				10.50	5	8	12	20		M.Dense	SS

Bore Hole Terminated at a depth of 10.50m below the existing ground level

Fig. 2.1 Soil Profile at BH-01 Location

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Location: BH-02

Started On : 18/05/2021; Ended On : 18/05/2021 G.W.T: 3.00m 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/Consisteney	Type of Sample
2.00			Brownish Medium Dense Silty Fine Sand	1.50	9	13	15	28		M.Dense	SS
G.W.T 5.00	↓		Brownish Very Dense Silty Fine Sand	3.00	15	22	35	57		V.Dense	SS
				4.50	17	25	37	62		V.Dense	SS
7.00			Blackish Very Stiff Silty Clay	6.00	7	11	13	24		V.Stiff	SS
8.00			Greyish Very Dense Silty Fine Sand	7.50	13	21	31	52		V.Dense	SS
			Greyish Medium Dense Silty Fine Sand	9.00	7	10	13	23		M.Dense	SS
10.50				10.50	4	7	13	20		M.Dense	SS

Bore Hole Terminated at a depth of 10.50m below the existing ground level

Fig. 2.2 Soil Profile at BH-02 Location

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Location: BH-03

Started On : 19/05/2021; Ended On : 19/05/2021 G.W.T: 2.00m 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
2.00	↓		Brownish Dense Silty Fine Sand	1.50	8	17	21	38		Dense	SS
			Brownish Very Dense Silty Fine Sand	3.00	14	26	33	59		V.Dense	SS
4.50				4.50	18	28	36	64		V.Dense	SS

Bore Hole Terminated at a depth of 4.50m below the existing ground level

Fig. 2.3 Soil Profile at BH-03 Location

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Location: BH-04

Started On : 19/05/2021; Ended On : 19/05/2021 G.W.T: 2.00m below existing ground level

R.L of Layer (m)	G.W.T. (m)	Soil Profile	Engineering Description of Soil	SPT - Details					Graphical Representation of SPT	Relative Density/Consistency	Type of Sample
				Depth of SPT below E.G.L (m)	0-15 cm	15-30 cm	30-45 cm	N-Value	0 10 20 30 40 50 60 70 80 90		
2.00	↓		Brownish Dense Silty Fine Sand	1.50	9	15	22	37		Dense	SS
			Brownish Very Dense Silty Fine Sand	3.00	16	24	32	56		V Dense	SS
4.50				4.50	17	31	37	68		V Dense	SS

Bore Hole Terminated at a depth of 4.50m below the existing ground level

Fig. 2.4 Soil Profile at BH-04 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 2.00	21	SS	Silty Clay	22	1.9	66	24	42	1.0	60	V.Stiff	0	0	0	0	19	81	CI
2.00 to 4.00	31	SS	Silty Clay	19	2.0	58	29	29	1.3	-	Hard	0	0	0	0	20	80	CI
4.00 to 6.50	26	SS	Silty Clay	20	1.9	60	21	39	1.0	-	V.Stiff	0	0	0	0	18	82	CI
6.50 to 8.00	57	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	84	16	0	SM
8.00 to 10.50	22	SS	Silty Fine Sand	-	1.7	-	-	-	-	-	M.Dense	0	0	0	79	21	0	SM

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	28	SS	Silty Fine Sand	-	1.8	-	-	-	-	-	M.Dense	0	0	0	79	21	0	SM
2.00 to 5.00	59	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	85	15	0	SM
5.00 to 7.00	24	SS	Silty Clay	20	1.9	60	26	34	1.2	-	V.Stiff	0	0	0	0	20	80	CI
7.00 to 8.00	52	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	84	16	0	SM
8.00 to 10.50	23	SS	Silty Fine Sand	-	1.7	-	-	-	-	-	M.Dense	0	0	0	78	22	0	SM

Table 2.3: Laboratory Test Result on the Soil Sample Collected from BH-03

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	38	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	Dense	0	0	0	80	20	0	SM
2.00 to 4.50	59	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	84	16	0	SM

Table 2.4: Laboratory Test Result on the Soil Sample Collected from BH-04

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	37	SS	Silty Fine Sand	-	1.9	-	-	-	-	-	Dense	0	0	0	81	19	0	SM
2.00 to 4.50	56	SS	Silty Fine Sand	-	2.0	-	-	-	-	-	V.Dense	0	0	0	86	14	0	SM

Table 2.5: Chemical Analysis Results conducted on Water Samples collected from BH-01 to BH-04

Location	Depth of Sample below E.G.L. (m)	pH	Chlorides (ppm)	Sulphates (ppm)
BH-01	3.00	7.70	319.11	358.99
BH-02	3.00	7.71	315.09	354.47
BH-03	2.00	7.72	322.35	362.64
BH-04	2.00	7.70	328.24	369.27

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 2.00m depth)**

Type of Strata	Silty Clay
Colour	Brownish
Thickness of Layer	2.00m
SPT of the layer	21
Consistency	Very Stiff
Un-drained Cohesion, Cu	140.00kPa

* **Layer-2 (from 2.00m to 4.00m depth)**

Type of Strata	Silty Clay
Colour	Blackish
Thickness of Layer	2.00m
SPT of the layer	31
Consistency	Hard
Un-drained Cohesion, Cu	206.66kPa

* **Layer-3 (from 4.00m to 6.50m depth)**

Type of Strata	Silty Clay
Colour	Blackish
Thickness of Layer	2.50m
SPT of the layer	26
Consistency	Very Stiff
Un-drained Cohesion, Cu	173.33kPa

* **Layer-4 (from 6.50m to 8.00m depth)**

Type of Strata	Silty Fine Sand
Colour	Greyish
Thickness of Layer	1.50m

SPT of the layer	57
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.05⁰
* **Layer-5 (from 8.00m to 10.50m depth)**	
Type of Strata	Silty Fine Sand
Colour	Greyish
Thickness of Layer	2.50m
SPT of the layer	22
Relative Density	Medium Dense
Angle of Shearing Resistance, ϕ	33.60⁰

Ground Water

Ground water table was encountered at a depth of 3.00m below the existing ground level during the fourth week of May 2021.

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	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.00m
SPT of the layer	28
Relative Density	Medium Dense
Angle of Shearing Resistance, ϕ	35.40⁰
* **Layer-2 (from 2.00m to 5.00m depth)**	
Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	3.00m
SPT of the layer	59
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.35⁰
* **Layer-3 (from 5.00m to 7.00m depth)**	
Type of Strata	Silty Clay
Colour	Blackish
Thickness of Layer	2.00m
SPT of the layer	24
Consistency	Very Stiff
Un-drained Cohesion, Cu	160.00kPa
* **Layer-4 (from 7.00m to 8.00m depth)**	
Type of Strata	Silty Fine Sand
Colour	Greyish
Thickness of Layer	1.00m
SPT of the layer	52
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	41.30⁰
* **Layer-5 (from 8.00m to 10.50m depth)**	
Type of Strata	Silty Fine Sand
Colour	Greyish
Thickness of Layer	2.50m

SPT of the layer	23
Relative Density	Medium Dense
Angle of Shearing Resistance, ϕ	33.90^0

Ground Water

Ground water table was encountered at a depth of 3.00m below the existing ground level during the fourth week of May 2021.

3.1.3 Soil Profile at BH-03 Location
(At BH-03 Location, as presented in Site plan)

* **Layer-1 (from E.G.L to 2.00m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.00m
SPT of the layer	38
Relative Density	Dense
Angle of Shearing Resistance, ϕ	38.20^0

* **Layer-2 (from 2.00m to 4.50m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.50m
SPT of the layer	59
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	42.35^0

Ground Water

Ground water table was encountered at a depth of 2.00m below the existing ground level during the fourth week of May 2021.

3.1.4 Soil Profile at BH-04 Location
(At BH-04 Location, as presented in Site plan)

* **Layer-1 (from E.G.L to 2.00m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.00m
SPT of the layer	37
Relative Density	Dense
Angle of Shearing Resistance, ϕ	37.925^0

* **Layer-2 (from 2.00m to 4.50m depth)**

Type of Strata	Silty Fine Sand
Colour	Brownish
Thickness of Layer	2.50m
SPT of the layer	56
Relative Density	Very Dense
Angle of Shearing Resistance, ϕ	41.90^0

Ground Water

Ground water table was encountered at a depth of 2.00m below the existing ground level during the fourth week of May 2021.

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 from type but possess non-uniform shear strength characteristics, BH-01 being relatively weak from deformation considerations and hence shall be considered as design borehole to determine the bearing strata and its safe bearing capacity.

Considering BH-01 as design borehole, it can be further envisaged that the highly plastic fine-grained soil strata encountered at shallow depths will hold good to act as bearing strata from shear strength characteristics and deformation considerations for nominal column loads in the range of 650kN to 750kN respectively.

If fine-grained strata encountered at shallow depths are considered as bearing strata, the safe bearing capacity of open foundation system will be a function of un-drained cohesive strength of the bearing strata.

Care shall be taken in locating the foundation system on such type of highly plastic fine-grained strata so that ordinate pressures resulting from its volumetric change phenomenon during variations in seasonal moisture content variations do not impact the structural system of foundation.

Further, care shall also be taken so that the dispersed foundation stresses on the underlying relatively weak soil strata encountered at 5.00m depths below

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Further, care shall also be taken so that the dispersed foundation stresses on the underlying relatively weak soil strata encountered at 5.00m depths below

existing ground level (SPT @ 6.00m is 24, Ref. BH-02) are within its safe bearing capacity limits.

Considering the above, suitable foundation system is presented below.

4.2. Foundation System

4.2.1 Open Foundation System (BH-01)

Considering the highly plasticity of fine-grained soil strata encountered at shallow depths, their shear strength characteristics and presence of underlying relatively weak soil strata encountered at 5.00m below existing ground level, open foundation system of ***Isolated Column Footing/ Strip Raft*** *located at a design depth of 1.60m below present existing ground level over 0.30m thick well compacted CNS (cohesive non-swelling) soil can be adopted.*

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

Type of Open Foundation System	Total Depth of Excavations below existing ground level (m)	Backfill with well compacted CNS (m)	Depth of **Isolated Column Footing** below Existing Ground Level (m)	Safe Bearing Capacity (t/m^2)	Elastic Settlements (mm)
Isolated Column Footing	**1.90**	**0.30**	**1.60**	**20**	**40**

The computations for above are annexed to this report.

Notes

Safe Bearing Capacity of open foundation system is restricted considering the presence of underlying relatively weak soil strata encountered at 5.00m depths below existing ground level (SPT @ 6.00m is 24, Ref. BH-02) i.e. 3.10m distant apart from the bottom level of footing.

CHAPTER-5

CONCLUSIONS & RECOMMENDATIONS

1. Open Foundation system presented in Clause 4.2.1, Chapter-IV can be adopted for foundation design purposes.
2. **Above presented foundation system specifications shall be strictly adhered to. (IMP)**

Open Foundation System.

3. In case, ground water table is encountered within recommended depth of foundation system, provision shall be made to continuously bail the water out of the foundation pits to keep the surfaces of pit consolidated dry.
4. Safe Bearing Capacity of open foundation system is restricted considering the presence of underlying relatively weak soil strata encountered at 5.00m depths below existing ground level (SPT @ 6.00m is 24, Ref. BH-02) i.e. 3.10m distant apart from the bottom level of footing.

Open Foundation Depths

5. Depth of open excavations below present existing ground level shall be 1.90m.
6. Recommended Thickness of CNS Back-Fill @ Site is 0.30m.
7. Depth of Isolated Column Footing below existing ground level will be 1.60m.

Usage of Excavated Earth

8. **Excavated highly plastic fine-grained soil encountered at shallow depths shall be in no case used for back filling purposes.**
9. **No structural units can be in direct contact of highly plastic fine-grained soil strata encountered at shallow depths. A 0.30m thick well compacted CNS is recommended to be sand-witched in between.**

Type of CNS to Use

10. **CNS can be well graded coarse-grained M-Sand or quarry dust or clean river sand or sand: gravels mix (1:2) or fly-ash.**
11. As the chlorides and sulphates present in 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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For BOOSHNAM ASSOCIATES
Er.A.NIVEDHITHA M.Tech
Geotechnical Engineer

DESIGN OF OPEN FOUNDATION SYSTEM (Ref. BH-01)

1 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

1.1 Geometrical Data :

Type of Foundation System:	Isolated Column Footing	
R.L of the top of Borehole (m):	0.00	m
Depth of Foundation excavations below existing ground level (D_f):	1.90	m
Recommended Thickness of CNS Back-Fill below Footing:	0.30	m
Effective Depth of Foundation below existing ground level (D_f):	1.60	m
Design Width of Foundation (B):	1.00	m
Thickness of Foundation (T) :	0.25	m

1.2 Soil Data :

Type of Bearing Strata :	Silty Clay	
Design SPT-value of the Bearing Strata : (considered based upon the density of the strata)	21	
Type of Shear Failure:	General	
Undrained Cohesion, Cu:	140.00	kPa

1.3 Design Parameters:

Bulk Density of Soil above the foundation detph (γ_{bulk})	19.00	kN/m^3
Effective Overburden pressure at foundation level (q)	14.40	kPa
Water Table Correction Factor (w')	0.50	

Bearing Capacity Factors:

N_c = 5.14

N_q = N/A

N_γ = N/A

Shape Factors:

S_c = 1.30

S_q = N/A

S_γ = N/A

Depth Factors :

D_c = 1.00

D_q = N/A

D_γ = N/A

Inclination Factor:

I_c = 1.00

I_q = N/A

I_γ = N/A

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 = 935.48 kPa

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) : 2.50

Qsafe : 374.19 kPa

Recommended Safe Bearing Capacity: 200.00 kPa

Restricted considering the presence of underlying relatively weak soil layer encountered at 5.00m depths from existing ground level i.e. 3.10m distant apart from the bottom level of footing.

1.6 Settlements

Since, the bearing strata are very stiff fine-grained type, the settlements under the allowable safe bearing pressure 200kPa will be of immediate elastic nature. The elastic settlements corresponding to a safe bearing pressure of 200kPa and average SPT of 21 considering extent of pressure bulb below bottom level of footing are computed to be in the order of 40mm which is within the permissible limits of 50mm for isolated column footings as per I.S:1904.