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GEOTECHNICAL REPORT FOR

RESIDENTIAL BUILDING AT NARAYANASAMY 1ST STREET, WEST SAIDAPET, CHENNAI

Client :

M/s. Legendary Real Estates Pvt. Ltd.,
Chennai

Architect :

Consultant :

Structural Consultant :

Job No. G(C)9809 Date : 21.04.2023

NAGADI CONSULTANTS PRIVATE LIMITED

Branch :

Chennai

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Project :

RESIDENTIAL BUILDING AT NARAYANASAMY 1ST STREET, WEST SAIDAPET, CHENNAI

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GEOTECHNICAL INVESTIGATION REPORT

for Residential Building at Kothvalchavadi Street, Saidapet (West), Chennai - 600015

EXECUTIVE SUMMARY

M/s. Legendary Real Estates Pvt. Ltd., Chennai are proposing to construct a Residential Building at Kothvalchavadi Street, Saidapet (West), Chennai - 600015.

The site for the proposed Residential building is situated at New No. 129/73, Old No. 62 & 63on the southern side of Kothvalchavadi Street, Saidapet (West), Chennai - 600015. The site measures approximately 40m x 48.5m. The site is having boundary wall on all the sides and is fairly level in topography. Vegetation in the form of grass and trees was observed within the site during the period of field investigations. As per the information provided by the client, the existing double storeyed building and existing shed within the site will be demolished prior to the construction of the new building.

The proposed Residential Building consists of an open stilt floor at ground level and five upper floors.

Geotechnical investigations have been undertaken at the site as per the scope of investigations, stipulated by the client, which consisted of conducting 4 boreholes down to refusal/rock strata (where N-value is >100) and further drilling in refusal/rock strata by minimum 3m was to be carried out.

The results of borehole investigations indicate the presence of filled-up strata (soil with brickbats and building materials) down to 2.5-2.8m depth below which virgin soil was encountered. The virgin soil encountered is Brown silty sand/Brown clayey silty sand down to 4-4.3m depth, underlain by refusal strata (where N-value is >100) in the form of reddish brown clayey silty sand with gravel down to 5.5/6m depth at which weathered rock was encountered extending down to the maximum investigated depth of 7/7.5m below existing ground level.

The soil strata is in a medium dense state down to the depths of refusal strata encountered

Ground water table was encountered at 3m depth in the boreholes during the period of field investigations.

In view of the observed subsoil conditions, the proposed Residential building can be supported on *Shallow Foundations - Isolated /Strip Footings laid at a minimum depth of 3m below the existing ground level. Net allowable bearing pressures for different widths of foundations are given below:*

Width of Foundations (m)	**1.5**	**≥3**
Net Allowable Bearing Pressure (t/m²)	**15**	**17**

The excavated soil can be used for backfilling purposes.

The foundation surface should be watered for at least 24 hours. The top slush should then be removed and the surface compacted heavily. If any loose pockets are observed, the same shall be filled with brickbats/ gravel and compacted well. Foundations can subsequently be placed over such a prepared surface.

Stiff Tie-beams connecting the columns in both directions may be provided which will render additional rigidity to the structure

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REPORT ON GEOTECHNICAL INVESTIGATION FOR RESIDENTIAL BUILDING AT KOTHVALCHAVADI STREET, SAIDAPET (WEST), CHENNAI - 600015

1.0 INTRODUCTION

1.1 Overview

1.1.1 M/s. Legendary Real Estates Pvt. Ltd., Chennai are proposing to construct a Residential Building at Kothvalchavadi Street, Saidapet (West), Chennai - 600015.

1.1.2 The geotechnical investigations have been carried out to ascertain the soil conditions for the design of foundations of the proposed Residential building.

1.2 Authority

A detailed geotechnical investigations programme has been conducted as per the authorisation by M/s. Legendary Real Estates Pvt. Ltd., Chennai vide our oral Work Order No.NCC/OWO/LREPL/009/C/2023.

2.0 PROJECT DETAILS

2.1 Site Location

The site for the proposed Residential building is situated at New No. 129/73, Old No. 62 & 63on the southern side of Kothvalchavadi Street, Saidapet (West), Chennai - 600015.

2.2 Site Layout and Topography

2.2.1 The site measures approximately 40m x 48.5m. The site is having boundary wall on all the sides and is fairly level in topography. Vegetation in the form of grass and trees was observed within the site during the period of field investigations. As per the information provided by the client, the existing double storeyed building and existing shed within the site will be demolished prior to the construction of the new building.

2.2.2 The colour of the exposed soil surface is Brown.

2.3 The Structure

As per information provided by the client, the proposed structure is a Residential Building consisting of an open stilt floor at ground level and five upper floors.

2.4 Seismic Zone

Site for the proposed Residential Building is situated in West Saidapet, Chennai which falls under Seismic Zone III as per IS 1893 (Part 1) - 2016.

2.5 Geographical Information

2.5.1 Site for the proposed Residential Building is located at:

a) Latitude : 13°01'

b) Longitude : 80°12'

3.0 OBJECT OF INVESTIGATIONS

3.1 For designing the foundation system of the proposed residential building, the following data are required:

a) Type of foundation system.

b) Depth below the ground level at which the foundation system is to be laid.

c) Allowable bearing pressure on the foundations levels.

3.2 To determine above factors, the following information would be required:

a) The subsoil profile indicating thicknesses of the various soil strata, to a depth down to the influence zone below the foundations.

b) Engineering properties of the soil strata at various levels.

c) Physical characteristics of the soil strata.

d) Variation of the strength of the strata with depth.

3.3 For evaluating the above parameters, field investigations and laboratory investigations on the soil samples collected during the field investigations, have been carried out.

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3.4 The results from these investigations have been analysed to provide the recommendations for the design of foundations.

4.0 SCOPE OF INVESTIGATIONS

4.1 Scope of investigations as given in the work order consisted of:

a) Conducting 4 boreholes down to refusal strata (where N-value is >100); and further drilling in refusal/rock strata by a minimum of 3m, as required by the client.

b) Conducting standard penetration tests at 1.5m depth intervals.

c) Recovering undisturbed soil samples from various levels of the subsoil strata.

d) Recording ground water table levels, if met with.

e) Conducting relevant laboratory tests on soil samples recovered.

f) Preparation and submission of a technical report containing the details of the tests carried out, their analysis and recommendations regarding the foundation system to be adopted. Two copies of the report are to be submitted.

5.0 FIELD INVESTIGATIONS

5.1 General Details

5.1.1 The locations of the boreholes were shown at site by the client's representative. A Schematic site plan showing the boreholes locations marked by the client is given in fig. 1.

5.1.2 Weather was clear during the period of field investigations which were carried out in the first week of April 2023.

5.2 Boreholes

5.2.1 The boreholes were progressed by mechanically operated rotary core drill method.

5.2.2 Refusal strata was encountered at 4-4.3m depth below existing ground level. The

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drilling in refusal/rock strata was conducted using NX size core barrel fitted with diamond bits.

5.2.3 The boreholes were terminated after drilling a minimum of 3m in refusal/rock strata (where N-value is >100) as per the stipulated scope of work.

5.2.4 The depths at which ground water table was encountered, depths at which refusal strata was encountered and termination depths of the boreholes are given below:.

Borehole No.	Depth of Ground Water Table Below EGL (m)	Depth of Refusal Strata Below EGL (m)	Termination Depth Below EGL (m)
1	3	4.3	7.5
2	3	4.3	7.5
3	3	4.1	7
4	3	4	7

5.2.5 The refusal strata encountered (i.e. N-value > 100) is in the form of reddish brown clayey silty sand with gravel underlain by brownish grey completely weathered rock at 5.5/6m depth below existing ground level which extends down to the termination depths of the boreholes.

5.2.6 Ground water table was encountered at 3m depth in the boreholes during the period of field investigations.

5.2.7 Standard Penetration Tests were conducted in soil strata at 1/1.5m depth intervals.

5.2.8 Disturbed soil samples recovered from split spoon sampler were packed in polythene bags, labelled and retained for identification purposes.

5.2.9 Undisturbed soil samples were recovered by thin walled tubes conforming to IS 2132. These tubes had an area ratio of less than 10%. The diameter of soil samples were 50mm and length 45cm.

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6.0 LABORATORY INVESTIGATIONS

6.1 The soil samples brought to the laboratory were subjected to various tests to determine the following properties

a) Type of soil and its gradation

b) Consistency limits

c) Natural density

d) Natural water content

e) Shear strength properties

6.2 In order to determine the above properties listed in 6.1, the following tests were conducted.

a) Sieve analysis on the coarse grained soil fraction

b) Hydrometer analysis on the fine grained soil fraction

c) Liquid and plastic limits

d) Natural Density and Water Content tests

e) Triaxial tests

f) Free Swell Index tests

7.0 RESULTS AND ANALYSIS

7.1 Presentation of Results

7.1.1 The results of borehole investigations and of the laboratory investigations conducted on the soil samples collected from the boreholes have been presented in the form of soil and rock profile tables in Table Nos.1 to 4.

7.1.2 The soil profile tables indicate the following:

a) Standard Penetration Test Values (i.e. N- values observed) at various depths

b) Soil description identifying the type of soil

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c) Grain size analysis indicating composition of subsoil

d) Consistency limits

e) In-situ bulk density and Water content

f) Triaxial test results

7.2 Analysis of Soil / Rock Profile

7.2.1 A perusal of the data presented in the soil/rock profile tables indicate the presence of the following substrata.

a) Stratum - I : Filled up (soil with brickbats and building materials)

b) Stratum - II : Brown silty sand

c) Stratum - III : Brown clayey silty sand

d) Stratum - IV : Reddish brown clayey silty sand with gravel

e) Stratum - V : Brownish grey weathered rock strata (Charnockite Based)

7.2.2 The thicknesses in each borehole of each strata described in 7.2.1 is given in the table below:

BH No.	Depth (m) : from - to				
	Stratum - I	Stratum - II	Stratum - III	Stratum - IV	Stratum - V
1	0.0 - 2.7	2.7 - 4.3	-	4.3 - 6	6 - 7.5
2	0.0 - 2.5	2.5 - 4.3	-	4.3 - 6	6 - 7.5
3	0.0 - 2.7	2.7 - 4.1	-	4.1 - 5.5	5.5 - 7
4	0.0 - 2.8	-	2.8 - 4	4 - 5.5	5.5 - 7

7.2.3 The above results show that :

a) Stratum - I consisting of Filled up (soil with brickbats and building materials) has been encountered down to the depths of 2.5/2.7/2.8m below existing ground level.

b) Stratum - II consisting of Brown silty sand having significant percentages of

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sand and varying percentages of silt, has been encountered form 2.5/2.7m depths down to 4.1/4.3m depths below existing ground level except at the location of borehole BH4.

c) Stratum - III consisting of Brown clayey silty sand having significant percentages of sand and varying percentages of clay and silt, has been encountered form 2.8m depth down to 4m depth below existing ground level only at the location of borehole BH4.

d) Stratum - IV consisting of Reddish brown clayey silty sand with gravel having significant percentages of sand and varying percentages of clay, silt and gravel, has been encountered form 4/4.1/4.3m depths down to 5.5/6m depths below existing ground level.

e) Stratum - V consisting of Brownish grey weathered rock strata (Charnockite Based) has been encountered from about 5.5/6m depth down to the termination depths of boreholes of 7/7.5m below existing ground level.

7.3 Soil Composition

7.3.1 The grain size distribution of the soil samples at various depths, as determined in the laboratory have been presented in the form of grain size analysis curves in figs. 3.

7.3.2 The variations in the grain size distribution - strata wise across the boreholes are as follows:

a) Stratum - II : Brown silty sand

BH No.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
1	0	86	14	0
2	0	88	12	0
3	0	92	8	0

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This stratum was not encountered at the location of borehole BH4.

b) Stratum - III : Brown clayey silty sand

BH No.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
4	0	46	33	21

This stratum was encountered only at the location of borehole BH4.

c) Stratum - IV : Reddish brown clayey silty sand with gravel

BH No.	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
1	18	55	18	9
2	21	55	16	8
3	24	54	15	7
4	19	54	17	10

7.3.3 The above results indicate that :

a) Stratum - II consists of about 8 - 14% of silt and 86 - 92% of sand.

b) Stratum - III consists of about 21% of clay, 33% of silt and 46% of sand.

c) Stratum - IV consists of about 7 - 10% of clay, 15 - 18% of silt, 54 - 54% of sand and 18 - 24% of gravel.

7.4 In-situ Bulk Density, Water Content and Dry density

7.4.1 The in-situ bulk density, water content and dry density obtained from undisturbed soil sample are tabulated below.

BH No.	Depth (m)	In-situ Bulk Density (g/cm^3)	Water Content (%)	Dry Density (g/cm^3)
3	3.5	1.89	14.3	1.65

7.4.2 The dry density indicates that the soil strata is in a medium dense state down to the depths of refusal strata encountered at 4/4.3m depths below existing ground level.

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7.5 Consistency Limits

7.5.1 The Consistency Limits determined for the soil in Stratum - II (Brown silty sand) indicate that the soil in this strata is non plastic in nature.

7.5.2 The Consistency Limits determined for the soil in Stratum - III (Brown clayey silty sand) indicates that the liquid limit is 23%, plastic limit is 15% and plasticity index is 8%.

7.5.3 The Consistency Limits determined for the soil in Stratum - IV (Reddish brown clayey silty sand with gravel) indicates that the liquid limit is 19%, plastic limit is 13% and plasticity index is 6%.

7.5.4 The Consistency Limits indicate that the soil in :

a) Stratum - II (Brown silty sand) is non plastic in nature

b) Stratum - III (Brown clayey silty sand) is low plastic in nature.

c) Stratum - IV (Reddish brown clayey silty sand with gravel) is low plastic in nature.

7.6 Standard Penetration Tests

7.6.1 Standard Penetration Test values (N-values observed) are presented in the soil profile table nos.1 to 4.

7.6.2 The N-values indicate that virgin soil strata is in a medium dense state down to the depths of refusal strata encountered at 4/4.3m depth below existing ground level with N-values ranging between 13 and 17.

7.7 Triaxial Test Results

The cohesion 'c' obtained from consolidated drained triaxial compression test is 0.13kg/cm² and the angle of shearing resistance 'ϕ' of the soil is 26°.

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7.8 Free Swell Index

7.8.1 The free swell index of the soil samples collected at various depths are given below:

BH No.	Free Swell Index (%) at depths (m)	
	3	4/4.2/4.3/4.5
1	5.2	5.6
2	5.3	5.2
3	4.6	5.7
4	17.2	8.3

7.8.2 The above results indicate that the soil strata is low medium swelling in nature. Hence, the excavated soil can be used for backfilling purposes.

7.9 Compiled Soil Profile

7.9.1 An overview of the results and their analysis has been presented in the form of a compiled soil (fig. 2).

7.9.2 The above figure shows the various strata encountered and their thicknesses in each of the boreholes and also gives the soil composition and the observed N-values at various depths along with the depth at which undisturbed soil samples were collected.

8.0 DESIGN CRITERIA

8.1 Design Parameters

8.1.1 The parameters required for the design of foundation system for the proposed residential building are:

a) Type of foundation to be adopted

b) Depth at which the foundations have to be laid

c) Allowable bearing pressure on the soil at the foundation level

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8.1.2 On the basis of the analysis of the results of investigations, the required design parameters have been arrived at and are given in the following sections.

8.2 Type of Foundations

8.2.1 The type of foundation depends on the following:

a) Subsoil conditions

b) Type of structure

c) Configuration at loading points

d) Loading intensity on each sub-structure/structural element.

8.2.2 As per information provided by the client, the proposed structure is a Residential Building consisting of an open stilt floor at ground level and five upper floors.

8.2.3 The results of the investigations have shown that soil strata is in a medium dense state down to the depths of refusal strata encountered at 4/4.3m depth below existing ground level.

8.2.4 In view of the above, *Shallow Foundations - Isolated/Strip Footings* can be adopted for the proposed residential building.

8.3 Depth of Foundations

8.3.1 The depth at which foundations should be laid will be governed by the following criteria.

a) Top filled up strata/loose soil, if any

b) There should be sufficient thickness of soil above the footing/foundations so that the bearing capacity of the soil can be fully mobilised.

c) Soil below the level of footings/foundations should have the requisite strength to support the anticipated bearing pressures on the foundations without allowing the settlement of footings/foundations to exceed the acceptable limits.

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d) Requirements of the type of structure (Residential Building consisting of an open stilt floor at ground level and five upper floors).

8.3.2 The results of the investigations have shown the presence of filled-up strata down to about 2.5-2.8m depth below existing ground level.

8.3.3 Giving due consideration to the above factors, foundations of the proposed residential building can be made to rest at a minimum depth of *3m below the existing ground level*. The soil available at the founding level will be Brown silty sand/Brown clayey silty sand.

8.4 Allowable Bearing Pressure

8.4.1 Allowable bearing pressure has been evaluated by:

a) Shear failure criteria based on the average soil data

b) Settlement criteria based on the SPT values (N-values)

c) Settlement criteria based on deformation modulus

8.4.2 A water table correction factor of 0.5 has been considered.

8.4.3 An allowable settlement of 40mm has been considered to evaluate the allowable bearing pressure for Isolated/Strip footings.

8.4.4 On the basis of the above analysis, net allowable bearing pressures for different widths of foundations are given below:

Width of Foundations (m)	**1.5**	**≥3**
Net Allowable Bearing Pressure (t/m^2)	**15**	**17**

9.0 RECOMMENDATIONS

9.1 Type of Foundations

Shallow Foundations - Isolated/Strip Footings

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9.2 Depth of Foundations

Minimum 3m below the existing ground level

9.3 Allowable Bearing Pressure

Net allowable bearing pressures for different widths of foundations for 40mm settlement are given below:

Width of Foundations (m)	*1.5*	*≥3*
Net Allowable Bearing Pressure (t/m²)	*15*	*17*

9.4 Construction Advisories

9.4.1 The soil of each strata has been described with name, colour etc. During excavation, any variations observed in the nature and condition of the soil from those given in this Report should be noted and appropriate action should be taken.

9.4.2 The excavated soil can be used for backfilling purposes.

9.4.3 The foundation surface should be watered for at least 24 hours. The top slush should then be removed and the surface compacted heavily. If any loose pockets are observed, the same shall be filled with brickbats/ gravel and compacted well. Foundations can subsequently be placed over such a prepared surface.

9.4.4 Stiff Tie-beams connecting the columns in both directions may be provided which will render additional rigidity to the structure.

9.5 Appendices

9.5.1 The calculations for the allowable bearing pressure have been provided in Appendix-A of this report.

9.5.2 The List of IS codes referred for providing the recommendations and that which might be required to implement the same have been given in Appendix-B of this report.

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9.6 **Notes**

9.6.1 The recommendations given in this report have been arrived at on the basis of design parameters which have been judiciously adopted by giving due consideration to the results of field and laboratory investigations as well as NAGADI's experience of over four decades in working in various types of soil and rock conditions all over India.

9.6.2 The entire report should be studied before adopting the recommendations given in the report.

10.0 LIMITATIONS

This Geotechnical investigation has been carried out at locations in the site chosen by the client as representing the entire site. The recommendations provided in this Report are hence valid only for those test locations. However, if there is any change in the subsoil conditions and properties at places between or beyond the chosen test locations, Nagadi may be contacted for further actions. Fresh investigations will have to be carried out at such locations.

Dr. N. Santosh Rao
Technical Director
For NAGADI CONSULTANTS PVT. LTD.

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ANALYSIS FOR ALLOWABLE BEARING PRESSURE

Data

(i) Soil Properties :

c (kg/cm^2) = 0.13 ϕ = 26 ° γ (g/cm^3) = 1.89

(ii) Depth of Foundation, D (m) = 3

(iii) Allowable Settlement, s (mm) = 40

Shear Failure Criterion (Ref. IS : 6403)

N_c = 17.68 N_q = 8.55 N_γ = 8.30 R_w = 0.50 R_w' = 0.50

$$q_s = \frac{1}{3}\left(c \cdot N_c + \gamma\, D \cdot N_q \cdot R_w + 0.5 \cdot \gamma \cdot B \cdot N_\gamma \cdot R'_w\right) - \gamma\, D.R_w$$

B (m)	1.5	≥3
q_s (t/m^2)	14.9	16.8

Settlement Criterion (Ref. IS : 8009)

(i) From N Values

B (m)	1.5	≥3
H (m)	1.5	1.5
N_{av}	38	44
q_a (t/m^2)	34.9	34.4

(ii) From Triaxial Compression Tests : $q_a = \dfrac{s \cdot E}{0.7 \cdot H}$

B (m)	1.5	≥3.0
H (m)	1.5	1.5
E (kg/cm^2)	95	125
q_a (t/m^2)	34.3	47.6

ADOPT	B (m)	1.5	≥3
	q (t/m^2)	15	17

Note : q_s and q_a are NET VALUES, Weight of backfill etc. need not be added to the loading except in case of filling above original G.L.

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LIST OF IS CODES

Field Investigation

1. IS : 1498 - 1970 : Classification and identification of soils for general engineering purposes (First Revision) (Amendment 2)
2. IS : 1892 - 1979 : Code of practice for sub surface investigations for foundations (First revision)
3. IS : 2131 - 1981 : Method of Standard Penetration Tests for soils (First revision)
4. IS : 2132 - 1986 : Code of practice for thin walled tube sampling of soils (Second revision)

Laboratory Tests

1. IS : 2720 - 1983 (Part 1) : Methods of test for soils: Preparation of dry soil samples for various tests (Second revision)
2. IS : 2720 - 1980 (Part 2) : Method of test for soils: Determination of water content (Second revision) Amendment 1
3. IS : 2720 - 1980 (Part 3/Sec 1) : Method of test for soils : Determination of Specific Gravity : Fine grained soils. (First revision)
4. IS : 2720 - 1980 (Part 3/Sec 2) : Method of test for soils : Determination of Specific Gravity : Fine, Medium & Coarse grained soils. (First revision).
5. IS : 2720 - 1985 (Part 4) : Method of test for soils : Grain size analysis (Second revision)
6. IS : 2720 - 1985 (Part 5) : Method of test for soils : Determination of liquid and plastic limit (Second revision)
7. IS : 2720 - 1977 (Part 40) : Methods of tests for soils: Determination of free swell index of soils.

Foundation Construction

1. IS : 1080 - 1986 : Code of practice for design and construction of shallow foundations on soils (other than raft, ring and shell) (Second revision)
2. IS : 1904 - 1986 : Code of practice for design and construction of foundation in soils: General requirements (Third revision)
3. IS 6403 - 1981 : Code of practice for determination of bearing capacity of shallow foundations : First revision (Amendment 1)
4. IS 8009 - 1976 (Part 1) : Code of practice for calculation of settlements of foundations : Shallow foundations subject to symmetrical static vertical loads (Amendment 2)

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TABLES

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SOIL PROFILE

Project: Residential Building at Narayanasamy 1st Street, West Saidapet, Chennai.

B. H. Location: | Water Table: 3.0m | Term. Depth : 7.5m | B.H. No. : 1

N- Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm³)	Water Cont (%)	Type	c (kg/cm²)	ϕ (°)
	0.0	Ground level											
	2.6	Filled up (Soil with brickbats & building materials)											
	2.7	Change of strata											
15	3.0	Brown silty sand	0	86	14	0	-	NP					
	3.5	Brown silty sand									Sample slipped		
	4.3	Change of strata											
100 (15/30cm)		Reddish brown clayey silty sand with gravel	18	55	18	9	19	13					
	6.0	Change of strata											
100 (50/5cm)		Brownish grey weathered rock											
> 100 (35/nil)	7.5	Brownish grey weathered rock											

*-Natural Bulk Density # -N Values (Observed)

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Job No.: G(C)1809

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SOIL PROFILE

Project: Residential Building at Narayanasamy 1st Street, West Saidapet, Chennai.

B. H. Location: | Water Table: 3.0m | Term. Depth : 7.5m | B.H. No. : 2

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm³)	Water Cont (%)	Type	c (kg/cm²)	Φ (°)
	0.0	Ground level											
	2.4	Filled up (Soil with brickbats & building materials)											
	2.5	Change of strata											
17	3.0	Brown silty sand	0	88	12	0	-	NP					
	3.5	Brown silty sand									Sample slipped		
	4.3	Change of strata											
100 (30/32cm)	4.5	Reddish brown clayey silty sand with gravel	21	55	16	8	-	NP					
	6.0	Change of strata											
100 (50/7cm)		Brownish grey weathered rock											
>100 (35/nil)	7.5	Brownish grey weathered rock											

*-Natural Bulk Density # -N Values (Observed)

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SOIL PROFILE

Project: Residential Building at Narayanasamy 1st Street, West Saidapet, Chennai.

B. H. Location: | Water Table: 3.0m | Term. Depth : 7.0m | B.H. No. : 3

N Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm³)	Water Cont (%)	Type	c (kg/cm²)	Φ (°)
	0.0	Ground level											
	2.6	Filled up (Soil with brickbats & building materials)											
	2.7	Change of strata											
17	3.0	Brown silty sand	0	92	8	0	-	NP					
	3.5	Brown silty sand									Sample slipped		
	4.1	Change of strata											
100 (7.6cm)	4.2	Reddish brown clayey silty sand with gravel	24	54	15	7	-	NP					
	5.5	Change of strata											
100 (50.8cm)		Brownish grey weathered rock											
> 100 (35mil)	7.0	Brownish grey weathered rock											

*-Natural Bulk Density # -N Values (Observed)

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Job No. : G(C)1809

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SOIL PROFILE

Project: Residential Building at Narayanasamy 1st Street, West Saidapet, Chennai.

B. H. Location: | Water Table: 3.0m | Term. Depth : 7.0m | B.H. No. : 4

N - Value#	Depth (m)	Soil Description	Grain Size Analysis				Atterberg Limits		In-situ properties		Triaxial Test		
			Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid (%)	Plastic (%)	Density* (g/cm³)	Water Cont (%)	Type	c (kg/cm²)	ϕ (°)
	0.0	Ground level											
	2.7	Filled up (Soil with brickbats & building materials)											
	2.8	Change of strata											
13	3.0	Brown clayey silty sand	0	46	33	21	23	15					
	3.5	Brown clayey silty sand							1.89	14.3	CD	0.13	26
	4.0	Change of strata											
100 (12cm)		Reddish brown clayey silty sand with gravel	19	54	17	10	19	13					
	5.5	Change of strata											
100 (30cm)		Brownish grey weathered rock											
> 100 (33nil)	7.0	Brownish grey weathered rock											
		*-Natural Bulk Density # -N Values (Observed)											

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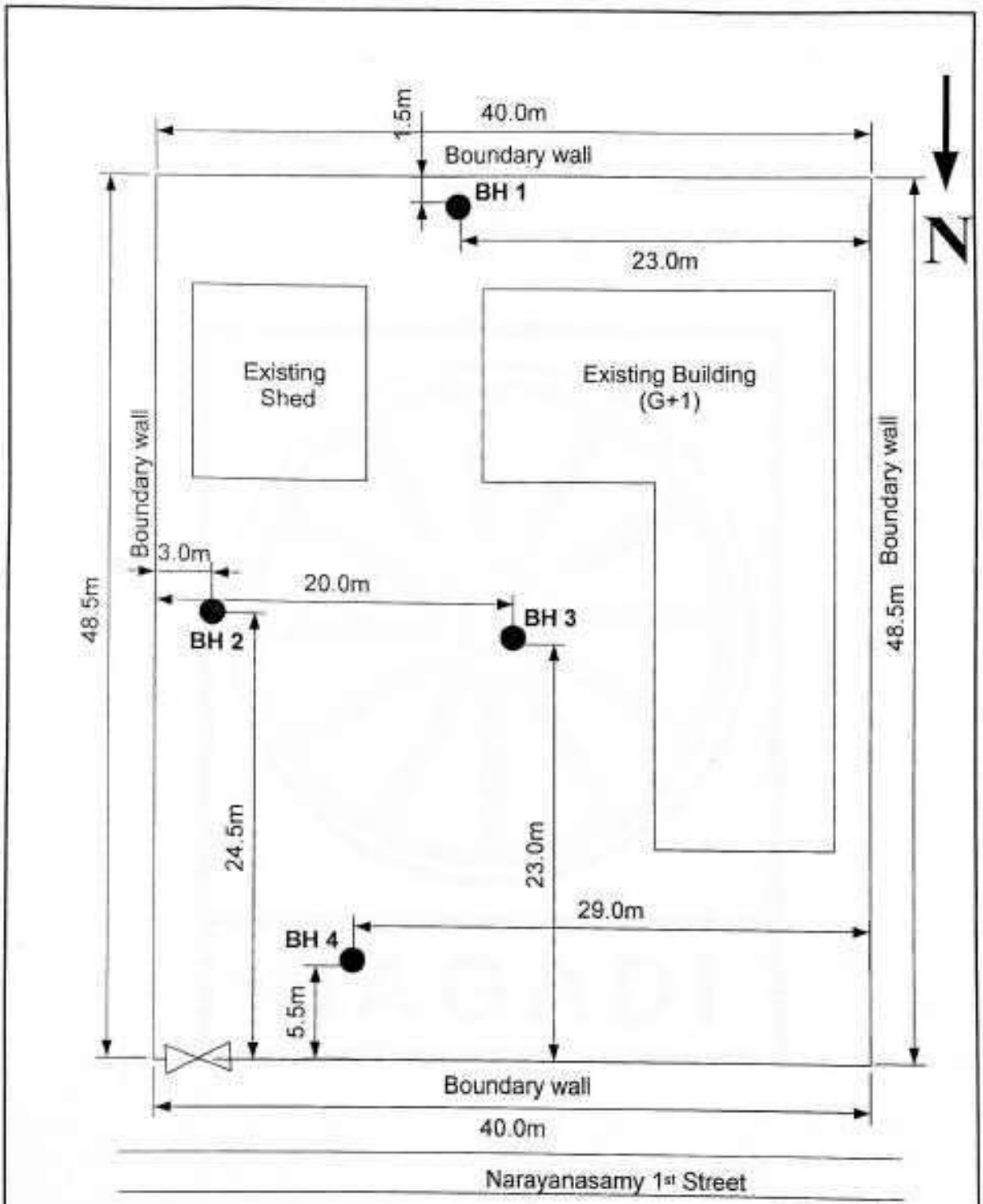
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FIGURES



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SCHEMATIC SITE PLAN
(Not to Scale)

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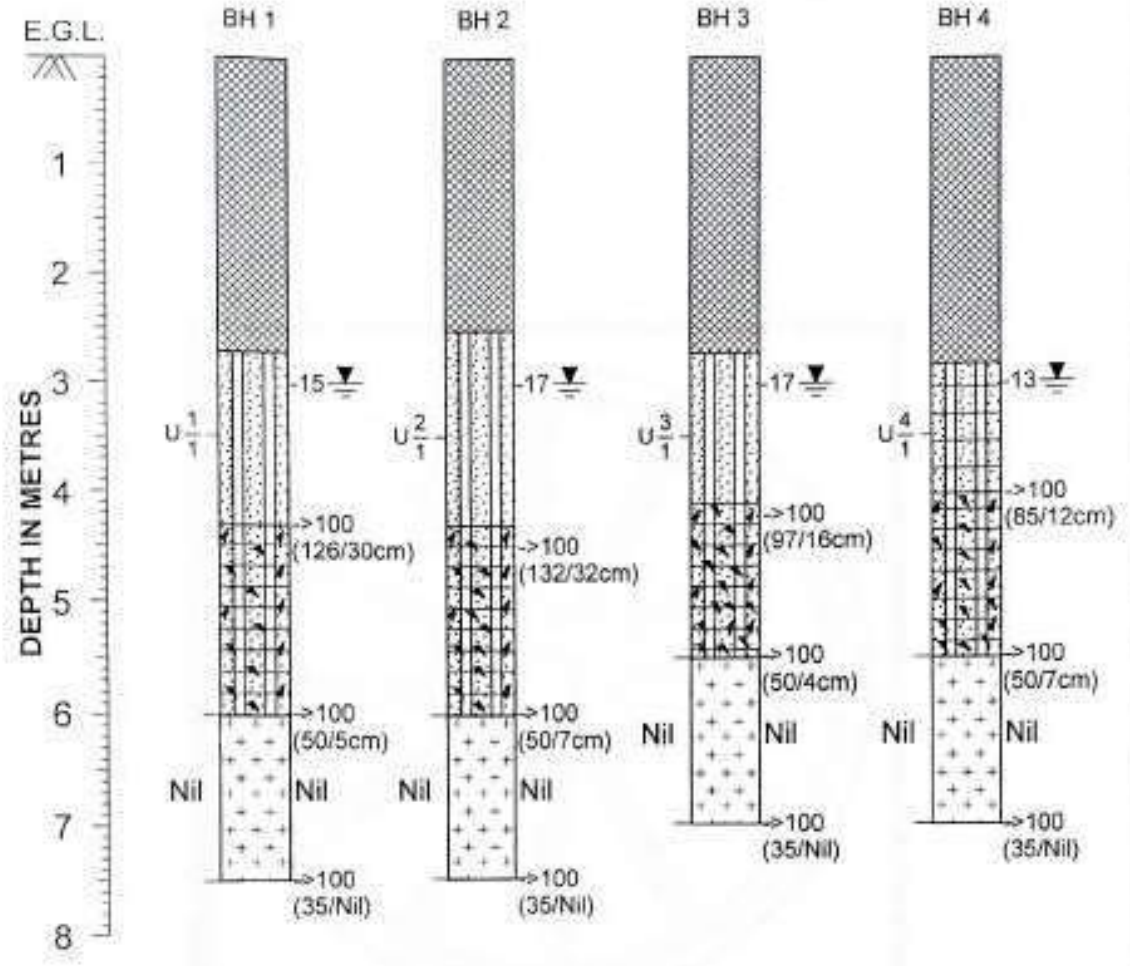
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LEGEND

- Filled-up Strata Soil with brickbats & building materials
- Brown Silty (8-14%) Sand (86-92%)
- Brown Clayey (21%) Silty (33%) Sand (46%)
- Brown Clayey (7-10%) Silty (15-18%) Sand (54-55%)with Gravels (18-24%)
- Brownish grey Weathered rock
- Nil — Core recovery – Nil
- Nil — RQD- Nil
- 15 'N' Value (Observed)
- Water table encountered
- E.G.L : Existing Ground level
- $U\frac{2}{1}$ – 1st undisturbed soil sample at borehole no.2

COMPILED SOIL PROFILE

PROJECT : RESIDENTIAL BUILDING AT NARAYANASAMY 1ST STREET, WEST SAIDAPET, CHENNAI.

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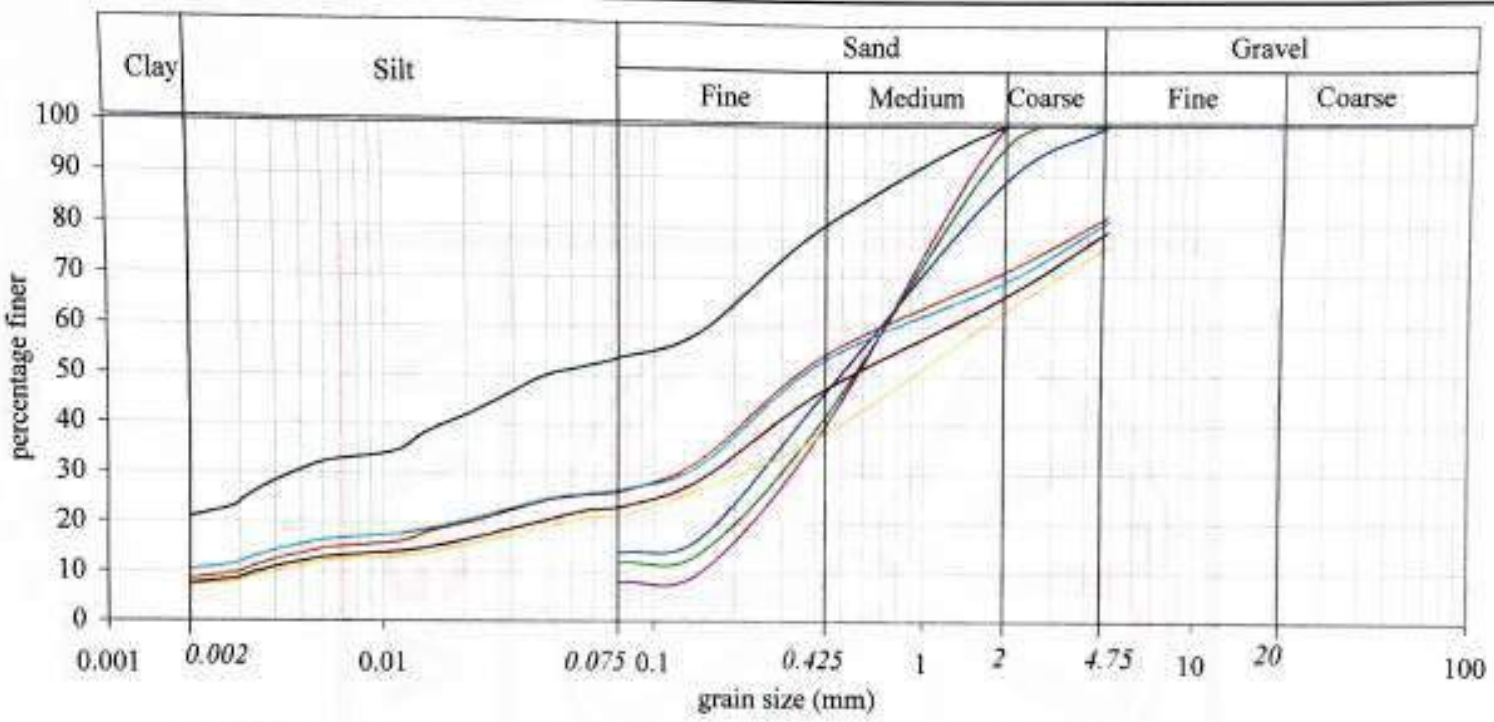
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Line Style	Bore hole	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	d_{60}	d_{10}	U
	1	3.0	Silty sand	0	86	14	0	0.625	-	-
	1	4.3	Clayey silty sand with gravel	18	55	18	9	0.700	0.003	233.3
	2	3.0	Silty sand	0	88	12	0	0.700	-	-
	2	4.5	Clayey silty sand with gravel	21	55	16	8	1.300	0.004	325.0
	3	3.0	Silty sand	0	92	8	0	0.710	0.160	4.4
	3	4.2	Clayey silty sand with gravel	24	54	15	7	1.700	0.004	425.0
	4	3.0	Clayey silty sand	0	46	33	21	0.160	-	-
	4	4.0	Clayey silty sand with gravel	19	54	17	10	0.800	-	-

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