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PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru R.VENKATA KRISHNAIAH** has enrolled as **Registered Geo-Technical Engineer (RGTE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.E.,(Civil) - Geo Technical Engg.** and experience in the relevant field for **10 years**.

He has been given the Registration No.**GTE/19/07/032** on **05.07.2019.** He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto **04.07.2024**.



(R.SHIVAKUMAR)
ASSISTANT PLANNER

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For NAAGHAPPA SHELTERS
PARTNER

303

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GSTIN : 33ACTPV7888E1ZO

SOIL INVESTIGATION REPORT

PROJECT : Geotechnical Investigation for the Proposed Construction of Six Storied (S+5) Residential Apartment Building at No. A-53, Hindu Colony, Nanganallur, Chennai - 600 061.

CLIENT : M/s. Naaghappa Shelters,
No. 9, 46th Street,
Nanganallur,
Chennai-600 061.

PROJECT NO. : ALMS_GTI_956

DATE : 20.9.2023

For NAAGHAPPA SHELTERS

J. Jayalakshmi

PARTNER

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i)SCOPE OF WORK

ii)FIELD INVESTIGATION

iii)LABORATORY TESTS

iv)CONCLUSION AND RECOMMENDATIONS

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4. BORE LOG

For NAAGHAPPA SHELTERS

PARTNER

1 INTRODUCTION

1.1 This geotechnical investigation work has been undertaken as per the verbal authorisation given by the representative of M/s. Naaghappa Shelters, No. 9, 46th Street, Nanganallur, Chennai - 600 061, for the Proposed Construction of Six Storied (S+5) Residential Apartment Building at No. A-53, Hindu Colony, Nanganallur, Chennai – 61.

1.2 This report presents the test results and recommendations for the allowable safe bearing capacities & types of foundations.

2 SCOPE OF WORK

2.1 In order to estimate the safe bearing capacity / pile carrying capacity and to decide suitable foundation systems for the proposed structure, it was decided by the client / client's representative conduct the tests at two (2) locations by drilling the bore holes, conducting SPTs, collecting samples, conducting necessary laboratory tests & furnishing the report.

3. DETAILS OF WORK

3.1 In order to fulfil the above scope, the field and laboratory tests were conducted as detailed below;

3.2 Field Investigation:

3.2.1 Two (2) numbers of 150 mm diameter bore holes (BH1 & BH2) were made at the locations, marked in fig. 1, by semi mechanised rotary wash boring method.

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3.2.2 Standard Penetration Tests were conducted as per I.S : 2131 at regular intervals and the observed N values are given in the borelogs (figs. 2 & 3).

3.2.3 The dense strata having N value more than 100 was met from 4m depth to 5.6m depth in the bore hole 1 and the bore hole 1 was terminated at 5.6m depth from the existing ground level present at the location of the bore hole 1, since, drilling beyond 5.6m depth with normal drilling bit was difficult, due to the presence of dense highly weathered rock layer, after informing the client's representative.

3.2.4 The dense strata having N value more than 100 was met from 3m depth to 5.8m depth in the bore hole 2 and the bore hole 2 was terminated at 5.8m depth from the existing ground level present at the location of the bore hole 2, since, drilling beyond 5.8m depth with normal drilling bit was difficult, due to the presence of dense highly weathered rock layer, after informing the client's representative.

3.2.5 Disturbed soil samples were collected and soil recovered from the split spoon sampler were retained for identification purpose and conducting laboratory tests. The wash samples were collected from completely weathered rock layer.

3.2.6 The observation was made for ground water levels, during the field investigation.

3.3 Laboratory Tests:

3.3.1 Tests were conducted as per the procedures laid down in the relevant Indian Standards Specifications.

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3.3.2 Tests viz., Grain Size Analysis, Atterberg's Limits & Differential Free Swell Index were conducted.

4 RESULTS

4.1 .The sub soil layers present at these two (2) locations of the tests, consists of medium dense to dense silty sand / completely weathered rock / highly weathered rock layers, up to the termination depths, as shown in the borelogs (figs. 2 & 3).

4.2 The ground water levels were noted at 1.2m depths in both the bore holes, from the corresponding ground levels present at the time of field investigation, after completing the field work. Since, bentonite slurry was sticking to the walls & prevented the seepage of water, actual ground water levels can vary. Hence, before commencement of the work, a trial pit shall be made up to the foundation depth & the presence of ground water shall be physically / visually verified and the execution of the foundations shall be planned accordingly.

4.3 The results of grain size analysis are given in table 1.

4.4 Atterberg's Limits & Differential Free Swell Indices are given in table 2.

5 CONCLUSION AND RECOMMENDATIONS

5.1 Based on visual soil examination, laboratory & field test results, the subsoil layers are classified according to IS : 1498 and presented in the borelogs (figs. 2 & 3).

5.2 The safe bearing capacities & settlement calculations were made according to the provisions laid down in IS : 6403, IS : 8009 (Part I) & IS : 2950.

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5.3 The subsoil layers present at these two locations of the tests are varying much in properties, strengths, stratifications & compositions from location to location of the bore holes and consisting more silts with some clay & fine sands in shallow depths, within the pressure influence of the shallow footings, which can lead to high differential as well as total settlements.

5.4 Based on the properties, strengths, stratifications & compositions of the subsoil layers present at these two locations of the tests only, the recommendations are made as follows in two (2) options & any one can be adopted.

5.5 Option – 1 :

5.5.1 For the proposed building, RCC Isolated Footings can be provided at 2.0m depth or below from the existing ground levels present at the time of investigation, in such a way that the footings are placed on medium dense silty sand with clay & traces of gravel (SM2) layer at the location of BH1 and on medium dense silty sand with gravel (SM2) layer at the location of BH2. The recommended allowable **safe bearing capacity is 11 t/sqm**. The expected total settlement will be less than 50mm, which is permissible as per IS : 1904.

5.5.2 If the RCC Isolated Footings are not adequate, RCC Strip Raft Footings / Combined Footings can be provided at 2.0m depth or below from the existing ground levels present at the time of investigation, in such a way that the footings are placed on medium dense silty sand with clay & traces of gravel (SM2) layer at the location of BH1 and on medium dense silty sand with gravel (SM2) layer at the location of BH2. The

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recommended allowable **safe bearing capacity is 13 t/sqm**. The expected total settlement will be less than 75mm, which is permissible as per IS : 1904.

5.5.3 In both the cases of 5.5.1 & 5.5.2, the minimum width of the footings shall be 1.8m, even in case of smaller loads on the footings, to have required depth of pressure influence.

5.5.4 During execution, the presence of above specified medium dense silty sand with clay & traces of gravel / with gravel (SM2) layer at the foundation depth of 2.0m or below, shall be confirmed at all the locations of the foundations, on comparing the test results given in the report, to have the expected bearing capacities. If any variation is found, the same shall be informed to us & additional investigation can be done at those locations and the recommendations can be modified based on the additional investigation & adopted accordingly.

5.5.5 The subsoil layers present below the foundations consisting more silts with some clay & fine sand i.e. 41% to 65%, which can become further loose when mixing with water and lead to very high settlements. Hence, sufficient care shall be taken to prevent the seepage of water to the subsoil layers present below the foundations & up to the pressure influence of the foundations from surface / sumps / septic tanks / toilets / soak pits / rain water harvesting pits etc., to avoid differential settlements & to safe guard the stability of the foundations as well as the structure in whole.

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5.6 Option – 2 :

5.6.1 Alternatively, for the proposed building, RCC Isolated Footings can be provided at 3.0m depth or below from the existing ground levels present at the time of investigation, in such a way that the footings are placed on dense silty sand with traces of gravel (SM3) layer at the location of BH1 & on dense silty sand with gravel (SM3) layer at the location of BH2. The recommended allowable **safe bearing capacity is 21 t/sqm**. The expected total settlement will be less than 50mm, which is permissible as per IS : 1904.

5.6.2 If the RCC Isolated Footings are not adequate, RCC Strip Raft Footings / Combined Footings can be provided at 3.0m depth or below from the existing ground levels present at the time of investigation, in such a way that the footings are placed on dense silty sand with traces of gravel (SM3) layer at the location of BH1 & on dense silty sand with gravel (SM3) layer at the location of BH2. The recommended allowable **safe bearing capacity is 23 t/sqm**. The expected total settlement will be less than 75mm, which is permissible as per IS : 1904.

5.6.3 In both the cases of 5.6.1 & 5.6.2, the minimum width of the footings shall be 1.5m, even in case of smaller loads on the footings, to have required depth of pressure influence.

5.6.4 During execution, the presence of above specified dense silty sand with traces of gravel / dense silty sand with gravel (SM3) layers at the foundation depth of 3.0m or below, shall be confirmed at all the locations of the foundations, on comparing the test

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results given in the report, to have the expected bearing capacities. If any variation is found, the same shall be informed to us & additional investigation can be done at those locations and the recommendations can be modified based on the additional investigation & adopted accordingly.

5.6.4 The subsoil layers present below the foundations consisting more silts & fine sand i.e. 41% to 44%, which can become further loose when mixing with water and lead to very high settlements. Hence, sufficient care shall be taken to prevent the seepage of water to the subsoil layers present below the foundations & up to the pressure influence of the foundations from surface / sumps / septic tanks / toilets / soak pits / rain water harvesting pits etc., to avoid differential settlements & to safe guard the stability of the foundations as well as the structure in whole.

5.7 Before commencement of the work, the depths of presence of the foundations of the structures in the adjoining plots shall be determined and the execution of the foundations of the proposed building in this plot shall be planned accordingly, in such a way that the stability of the foundations & the structures in the adjoining plots are not disturbed.

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5.8 The silty sand with clay (SM1) and silty sand with clay & traces of gravel (SM2) layers present at the location of BH1 will be low expansive in nature and hence, the same can be used for refilling purposes around footings, but not in under floors. The silty sand with traces of clay (SM1) & silty sand with gravel (SM2) layers present at the location of BH2, silty sand with gravel (SM3) layer present at both the locations of bore holes (BH1 & BH2) will be very low expansive to low expansive in nature and hence, the same can be used for refilling purposes around footings.

For Abide Landmark Surveyors

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TABLE 1

Grain Size Analysis

Bore Hole No.	Depth (m)	Gravel (%)	Sand (%)			Silt & Clay (%)
			Coarse	Medium	Fine	
1	1.0	0	3	23	26	48
	2.0	7	9	19	15	50
	3.0	7	19	33	15	26
	*4.0	14	51	32	1	2
	*5.6	25	57	17	1	0
2	1.0	2	3	29	28	38
	2.0	10	15	23	15	37
	3.0	16	15	25	15	29
	*4.0	8	15	51	10	16

Note : * Washing Sample

TABLE 2

Atterberg's Limits & Differential Free Swell Index

Bore Hole No.	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Free Swell Index (%)
1	1.0	28.42	23.74	25
	2.0	29.57	24.36	26
	3.0	-	N.P.	8
2	1.0	24.65	22.10	18
	2.0	20.24	N.P.	18
	3.0	-	N.P.	12
	*4.0	-	N.P.	-

Note : * Washing Sample

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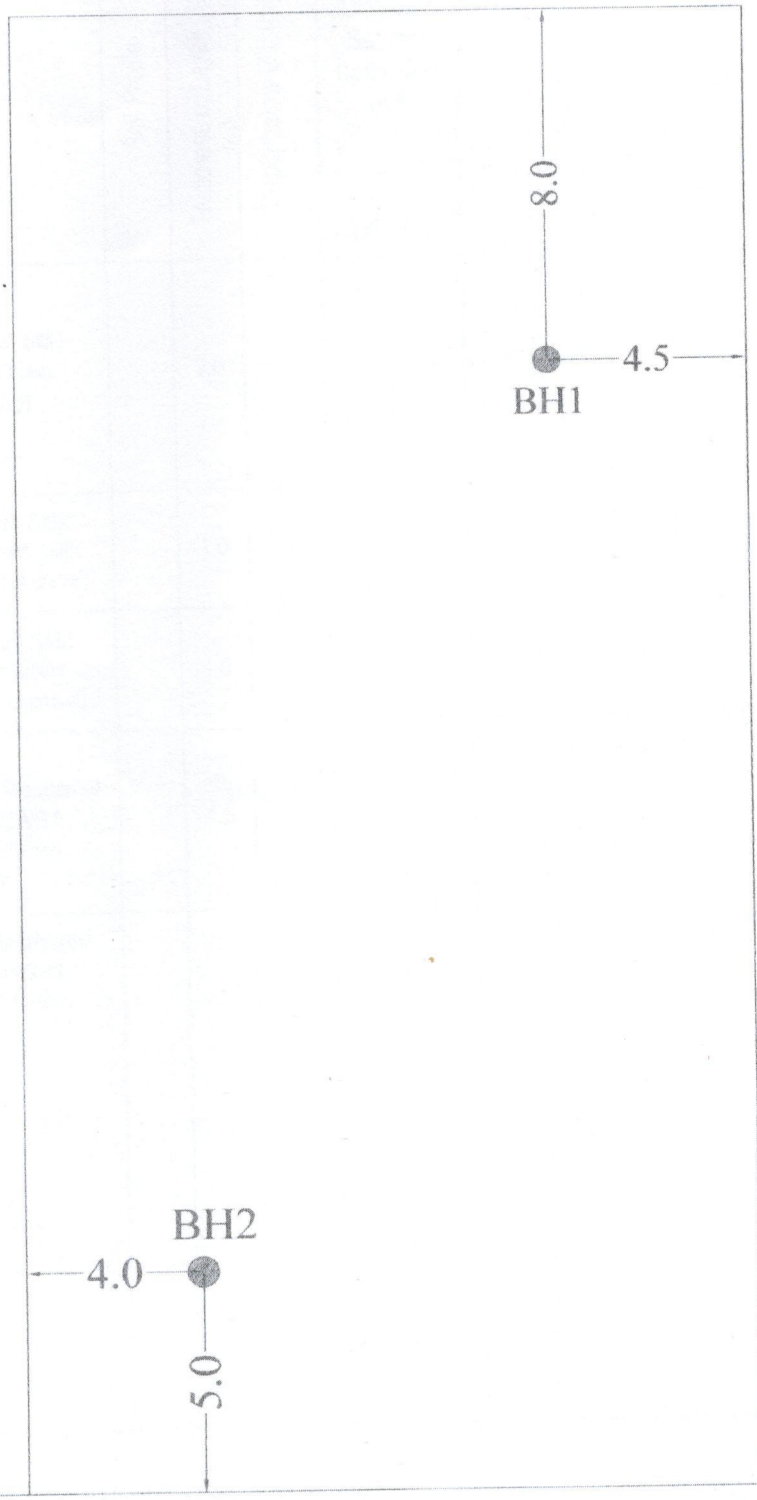


Figure No. 1 : Site Plan

Dimensions are in Metre

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Project No. ALMS_GTI_956

Sheet No.: 10

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BORE LOG

Project No. : ALMS_GTI_956
Bore Hole No. : 1
Method of Boring : Semi mechanised rotary wash boring

Date: 6.9.2023
G.W.L.: 1.2m^

Description Of Soil	Soil Profile	Thickness of Layer (m)	Depth below G.L.(m)	Depth of Sample Collection (m) UDS.	Depth of Sample Collection (m) DS.	Standard Penetration Tests: Depth (m)	N – Value	Relative Density / Consistency	Graphical Representation (10 20 30 40)
Silty Sand, SM1 Reddish Brown (with clay)		2.0	2.0		1.0	1.0	11 (4/5/6)	Medium	
					2.0	2.0	16 (6/6/10)	Medium	
Silty Sand, SM2 Greyish Brown, (with clay & traces of gravel)		1.0	3.0		3.0	3.0	41 (19/26/15)	Dense	
Silty Sand, SM3 Yellowish Brown (with traces of gravel)		1.0	4.0		4.0	4.0	*50 [50(6cm)/-/-]	V.V.Dense	
Completely Weathered Rock, CWR1 Greyish Brown		1.6	5.6		5.6	5.6	&30 [30(0cm)/-/-]	V.V.Dense	
Highly Weathered Rock, HWR1 Greyish Brown									

Note:
1. Bore hole was terminated at 5.6m depth.
2. ^ Since, bentonite slurry was sticking to the wall & prevented the seepage of water, actual ground water level may vary.
3. * Value for initial 6cm penetration.
4. & Value for initial 0cm penetration & rebounded.

For NAAGHAPPA SHELTERS
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Figure No.: 2

Sheet No.: 11

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BORE LOG

Project No. : ALMS_GTI_956
Bore Hole No. : 2
Method of Boring : Semi mechanised rotary wash boring

Date: 7.9.2023
G.W.L.: 1.2m^

Description Of Soil	Soil Profile	Thickness of Layer (m)	Depth below G.L.(m)	Depth of Sample Collection (m) UDS.	Depth of Sample Collection (m) DS.	Standard Penetration Tests: Depth (m)	N – Value	Relative Density / Consistency	Graphical Representation (10 20 30 40)
Silty Sand, SM1 Greyish Brown (with traces of clay)		2.0	2.0		1.0	1.0	14 (4/6/8)	Medium	
Silty Sand, SM2 Whitish Brown (with gravel)		1.0	3.0		3.0	2.0	19 (7/8/11)	Medium	
Silty Sand, SM3 Greyish Brown (with gravel)		1.0	4.0		4.0	3.0	*50 [25/50(9cm)/-]	V.V.Dense	
Completely Weathered Rock, CWR1 Greyish Brown		1.8	5.8		5.8	4.0	&50 [50(2cm)/-/-]	V.V.Dense	
Highly Weathered Rock, HWR1 Greyish Brown						5.8	$30 [30(0cm)/-/-]	V.V.Dense	

Note:

1. Bore hole was terminated at 5.8m depth.
2. ^ Since, bentonite slurry was sticking to the wall & prevented the seepage of water, actual ground water level may vary.
3. * Value for 9cm penetration.
4. & Value for initial 2cm penetration.
5. $ Value for initial 0cm penetration & rebounded.

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Figure No.: 3

Sheet No.: 12



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