



Your trusted partner for buying, selling, and managing property,
ensuring hassle-free service with 100% transparency.

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate

+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified  RealEstate™





GEOMATRIX CONSULTANCY

(NABL accredited Laboratory as per ISO / IEC 17025-2017)



Corporate Office : No:22, P.T. Rajan Road 3rd Street (Thomas Street), Narimedu, Madurai-625002,
Branch Office : 5/13A, Kalaimagal Nagar 1st Cross street, 1st Main Road, Ekkattuthangal, Chennai-32
E-mail: geomatrixconsultancy@gmail.com, 0452-290 55 66, 75980 31360, 77087 58598, 78717 58597



SOIL INVESTIGATION REPORT

SOIL INVESTIGATION WORKS AND LABORATORY TESTING
SERVICES FOR THE CONSTRUCTION OF RESIDENTIAL
BUILDING AT THUVARIMAN VILLAGE IN MADURAI WEST TALUK
OF MADURAI DISTRICT.

REPORT No: 85 / RB / GMC / 24-25	DATE : 26.06.2024	REV : 0
----------------------------------	-------------------	---------

LOCATION : RS.NO : 22/5A, 22/5B, 22/6, 22/7A & 22/7B

VILLAGE : THUVARIMAN

TALUK : MADURAI WEST

DISTRICT : MADURAI

CLIENT : Mr. S. SEETHARAMAN,



M/S.VISVAS PROMOTERS PRIVATE LIMITED,
VASUDHARA ENCLAVE, NO.84, TPK ROAD,
ANDALPURAM, MADURAI - 625 003.



GEOMATRIX CONSULTANCY

NABL accredited Laboratory as per ISO / IEC 17025 - 2017
No.22,P.T.Rajan Road 3rd Street (Thomas Street)
Narimedu,Madurai - 625 002.

E-mail : geomatrixconsultancy@gmail.com, GSTIN : 33AFIPG8690P1ZR, PAN : AFIPG8690P



☎ : (0452)-2905566, Mobile : 7598031360, 7708758598, 7871758599, 6379128191

REPORT NO: 85 / RB / GMC / 24-25 DATED: 26.06.2024

To

Mr. S. SEETHARAMAN, M/S.VISVAS PROMOTERS PRIVATE LIMITED,
Vasudhara Endave, No.84, Tpk Road, Andalpuram,
Madurai – 625 003.

Respected Sir,

Sub: Submission Soil investigation Report - Reg

Name of work: Conducting Sub soil investigation works for the Construction of **RESIDENTIAL BUILDING** at Thuvariman Village in Madurai West Taluk of Madurai District.



We appreciate the opportunity of service to you on this project and trust this reports meet your needs at this time. This report summarizes the result of our investigation and contains geotechnical recommendations for design and construction of this project.

Based on the result of our geotechnical investigation, we believe that the proposed project is feasible from a geotechnical point of concern, provided the recommendations in this report are incorporated in the design and implemented during earthwork and construction of the project.

If you have any queries regarding this report, please contact us. We look forward to being of further assistance as construction begins.

No of Pages in this Report: 32

Respectfully submitted



Er.K.GANAPATHI
01/07/24
Er.K.GANAPATHI, B.E., M.E. (Soh Mech), F.I.E., F.I.V., D.Litt., (USA)
REGISTERED Geo-Tech Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
(MLPA Regn No. GTE 002 / 2019)
GEOMATRIX CONSULTANCY, (Regn. No. 330242233482E,
No.22, Thomas Street, Narimedu,
Madurai - 625 002. Ph: 7598031360, 7708758598
Email: geomatrixconsultancy@gmail.com

Re:

Any corrections made will invalidate this report.

Any clarifications / complaints of this report should be made in written within 30 days from the date of Issue of this report.

The test report shall not be reproduce in part / full without written permission of this laboratory.

Soil investigation ❖ Topo & Contour Survey ❖ Materials Test ❖ Non-Destructive Test

Construction of **RESIDENTIAL BUILDING** at Thuvariman
In Madurai West Taluk of Madurai District.

CONTENTS:

1. Introduction
2. Scope of work
3. Location & Description of Structure
4. Soil Investigation
 - 4.1. Field sampling
 - 4.2. Method of investigation
 - 4.2.1 Exploratory Bore Hole
 - 4.2.2 Standard Penetration test
 - 4.2.3 Sampling in Bore Holes
5. Description of Ground Water Table
6. Laboratory Tests
8. Abstract of Safe Bearing Capacity 9. Recommendations
10. **FIGURES:** Fig 1 - Plan showing the location of borehole.
Fig.2- Soil profile at borehole.
11. **TABLE** - Summaries of Lab Test Results.
12. **ANNEXURES**
 - A. Sample Format for Nature Moisture Content Test
 - B. Sample Format for Specific Gravity Test
 - C. Sample Format for Sieve Analysis Test
 - D. Sample Format for Liquid & Plastic limit Test
 - E. Sample Format for Direct shear Test
 - F. Sample Format for Density Test,
 - G. Sample Format for UCC Test
13. **CALCULATIONS:** Safe Bearing Capacity & Settlement Calculation.
14. **SITE PHOTOGRAPHS**
15. **REGISTERED GEOTECH ENGINEER CERTIFICATE COPY**



GEOMATRIX CONSULTANCY
(An ISO- 17025: 2017, NABL Certified Firm)
Madurai ,Ph :75980 31360



Construction of **RESIDENTIAL BUILDING** at Thuvariman
in Madurai West Taluk of Madurai District.

REPORT ON SUB-SOIL INVESTIGATION

1. INTRODUCTION:

Mr. S. SEETHARAMAN, M/S.VISVAS PROMOTERS PRIVATE LIMITED, located at Vasudhara Enclave, No.84, Tpk Road, Andalpuram, Madurai has proposed to construct a **RESIDENTIAL BUILDING** at Thuvariman Village in Madurai West Taluk of Madurai District. In order to get adequate data required for designing the foundations, he has conducted the sub-soil investigation and collects the samples to determine the foundation design parameters.

M/S.GEOMATRIX CONSULTANCY, Madurai, were entrusted with the work of conducting Sub-soil investigation, laboratory testing and preparing report with SBC Calculations and test results.

2. SCOPE OF WORK: The Scope of work includes the following:

- Making **three** boreholes of 150 mm dia using rotary driller to a depth of **10 m** or up to 1.00 m core drilling in hard rock whichever is met earlier.
- Conducting Standard penetration test as per **IS 2131-1981**(Reaffirmed 2002) at every **1.00 m /1.50m depth** intervals or change of soil strata and collecting disturbed /un disturbed soil samples.
- Conducting various laboratory tests on collected samples.
- Submitting recommendation for type and depth of foundation.
- Submitting report with SBC and settlement Calculations & laboratory test results in **two** hard copies.

3. LOCATION & DESCRIPTION OF STRUCTURE:

The proposed Construction of **RESIDENTIAL BUILDING** located at **Rs. No: 22/5A,22/5B,22/6,22/7A & 22/7B,** Thuvariman Village in Madurai West Taluk of Madurai District. As per the details issued by the client, the proposed construction is a RCC structure has **Ground + 2 floors** the unit will be comprised reinforced concrete elements (Column, Beam, Slab & etc.).



GEOMATRIX CONSULTANCY
(An ISO- 17025: 2017, NABL Certified Firm)
Madurai ,Ph :75980 31360



4. SOIL INVESTIGATION: The details of field investigation, tests carried out in the field & laboratory are presented as follows

4.1 FIELD SAMPLING: Three boreholes of 150 mm dia were made using Rotary drilling machine in this site on 26.06.2024 & 27.06.2024. SPT's was conducted at every 1.00 m / 1.50 m depth intervals and the disturbed and undisturbed samples were collected for identification and testing.

4.2 METHOD OF INVESTIGATION:

4.2.1 EXPLORATORY BORE HOLE:

Exploratory borehole was advanced using rotary washing method so that minimum disturbance is attributed to the soil below the boring depth. Borehole was always kept filled with drilling mud to prevent any negative hydrostatic pressure within the borehole. Boring through the soil was performed using TC bit & diamond drill bit with side jets for drilling mud. Standard penetration tests, disturbed sampling, field identification of soil & rock samples, etc., was carried out in these bore holes.

4.2.2 STANDARD PENETRATION TEST:

SPT was conducted at different depth in the borehole. SPT split spoon sampler of standard size was driven into the soil from borehole bottom using 63.5kg hammer falling from 75cm height. Blow counts for the penetration of every 15cm were recorded and the **N** is reported as the blow counts for 30cm penetration of the sampler leaving the first 15cm penetration as seating drive. SPT was conducted at a depth interval of 1.0m below the ground level.

4.2.3 SAMPLING IN BORE HOLES:

Soil collected in the SPT sampler is preserved in polythene covers and transported to laboratory. One more polythene cover was provided to prevent the loss of moisture during the transit period. Rock samples also collected using double tubes core Barrel and preserving in wooden core boxes and transported to laboratory to conduct various tests.

5. DESCRIPTION OF GROUND WATER TABLE:

Ground water table was not encountered during investigation.



GEOMATRIX CONSULTANCY
(An ISO- 17025: 2017, NABL Certified Firm)
Madurai ,Ph :75980 31360



Construction of **RESIDENTIAL BUILDING** at Thuvariman
in Madurai West Taluk of Madurai District.

6. LABORATORY TESTS: The collected soil samples were tested in ISO 17025: 2017, NABL Quality control Certified Laboratory as per relevant procedure in IS codes. The laboratory-testing scheme is so designed to obtain the design parameters for the foundations. The following parameters are evaluated:

- **Natural Moisture Content:** This test is conducted in all disturbed samples to find the water content in the soil samples as per IS 2720 (Part 2) : 1973
- **Specific Gravity:** This test is conducted in all disturbed soil samples to find Specific gravity of Soil as per IS 2720 (Part 3) : 1980
- **Sieve Analysis:** These test conducted to identify and classify the samples as per IS 2720 (Part 4) : 1985
- **Liquid Limit:** This test conducted in fine-grained soils to find the liquid Limit of the soil as per IS 2720 (Part 5) : 1985
- **Plastic Limit:** This test conducted in fine-grained soil to find plastic limit of the soil as per IS 2720 (Part 5) : 1985
- **Direct Shear Test:** This test conducted in coarse-grained soil to find the angle of shearing resistance of the soil as per IS 2720 (Part 13) : 1986
- **Unconfined Compression Test:** This test conducted in fine-grained soil to find Cohesion of the soil as per IS 2720 (Part 10): 1991. All the test results are presented in Tables 1 to 3.

7. DISCUSSION ON SOIL PROFILE: Based on the field and Lab test results, it's concluded that,

In BH-1 the sub soil profile consists of Brown coloured Clay mixed with Sand (0.00 – 7.00 m), Brown coloured Sand mixed with Clay (7.00 – 8.50 m), followed by Brown coloured Sand (8.50 – 10.00 m). In BH-2 the sub soil profile consists of Brown coloured Clay mixed with Sand (0.00 – 5.50 m), Brown coloured Sand (5.50 – 7.00 m), Brown coloured Sand mixed with Gravel (7.00 – 8.50 m), followed by Brown coloured Sand (8.50 – 10.00 m). In BH-3 the sub soil profile consists of Brown coloured Clay mixed with Sand (0.00 – 1.00 m), Brown coloured Sand mixed with Clay (1.00 – 2.00 m), Brown coloured Clay mixed with Sand (2.00 – 5.50 m), Brown coloured Sand mixed with Clay (5.50 – 8.50 m), followed by Brown coloured Sand (8.50 – 10.00 m). The detailed Layer formations are presented in Tables 1 to 3 and also in Fig 2.



GEOMATRIX CONSULTANCY

(An ISO- 17025: 2017, NABL Certified Firm)

Madurai ,Ph :75980 31360



Construction of **RESIDENTIAL BUILDING** at Thuvariman
In Madurai West Taluk of Madurai District.

8. ABSTRACT OF SBC CALCULATIONS: The summary of safe bearing capacity calculation for **Square & Rectangular Footing** presented as follows the model calculation sheet submitted at end of the Report.

SQUARE FOOTING					Recommended SBC Kn / m²
Safe Bearing Capacity in Kn / m²					
Depth	Size in m x m	BH 1	BH 2	BH 3	
2.10	1.2 X 1.2	135.73	152.57	183.85	135.00
	1.5 X 1.5	128.57	144.29	173.86	128.00
	1.8 X 1.8	123.80	138.97	167.42	123.00
	2.1 X 2.1	120.37	135.39	163.09	120.00
	2.4 X 2.4	117.90	132.82	159.95	117.00
	2.7 X 2.7	116.01	131.01	157.74	116.00
	3.0 X 3.0	114.50	129.61	156.01	114.00
2.40	1.2 X 1.2	141.39	161.38	194.72	141.00
	1.5 X 1.5	133.08	151.74	183.08	133.00
	1.8 X 1.8	127.64	145.55	175.60	127.00
	2.1 X 2.1	123.73	141.25	170.38	123.00
	2.4 X 2.4	120.88	138.23	166.71	120.00
	2.7 X 2.7	118.70	136.02	164.01	118.00
	3.0 X 3.0	117.00	134.39	162.00	117.00
2.70	1.2 X 1.2	146.96	170.30	205.73	146.00
	1.5 X 1.5	137.69	159.27	192.41	137.00
	1.8 X 1.8	131.48	152.10	183.74	131.00
	2.1 X 2.1	127.19	147.18	177.77	127.00
	2.4 X 2.4	123.95	143.63	173.46	123.00
	2.7 X 2.7	121.39	141.07	170.33	121.00
	3.0 X 3.0	119.40	139.12	167.94	119.00

**GEOMATRIX CONSULTANCY**

(An ISO- 17025: 2017, NABL Certified Firm)

Madurai ,Ph :75980 31360



Construction of **RESIDENTIAL BUILDING** at Thuvariman

in Madurai West Taluk of Madurai District.

SQUARE FOOTING					Recommended SBC Kn / m ²
Safe Bearing Capacity in Kn / m ²					
Depth	Size in m x m	BH1	BH2	BH3	
3.00	1.2 X 1.2	152.62	179.45	217.03	152.00
	1.5 X 1.5	142.29	166.89	201.86	142.00
	1.8 X 1.8	135.41	158.76	192.02	135.00
	2.1 X 2.1	130.55	153.15	185.22	130.00
	2.4 X 2.4	126.93	149.17	180.38	126.00
	2.7 X 2.7	124.18	146.19	176.74	124.00
	3.0 X 3.0	121.90	143.90	173.95	121.00
3.30	1.2 X 1.2	205.57	213.35	219.15	205.00
	1.5 X 1.5	190.18	197.31	203.62	190.00
	1.8 X 1.8	180.11	186.77	193.59	180.00
	2.1 X 2.1	173.08	179.38	186.78	173.00
	2.4 X 2.4	168.00	173.99	181.95	167.00
	2.7 X 2.7	164.14	169.83	178.36	164.00
	3.0 X 3.0	161.22	166.71	175.82	161.00
3.60	1.2 X 1.2	215.25	222.96	231.89	215.00
	1.5 X 1.5	198.25	205.27	214.52	198.00
	1.8 X 1.8	187.18	193.69	203.34	187.00
	2.1 X 2.1	179.41	185.53	195.64	179.00
	2.4 X 2.4	173.72	179.52	190.13	173.00
	2.7 X 2.7	169.40	174.95	186.15	169.00
	3.0 X 3.0	166.10	171.46	183.10	166.00

**GEOMATRIX CONSULTANCY**

(An ISO- 17025: 2017, NABL Certified Firm)

Madurai ,Ph :75980 31360



In Madurai West Taluk of Madurai District.

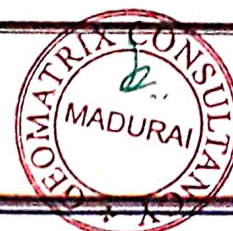
RECTANGULAR FOOTING						Recommended SBC Kn / m ²
Safe Bearing Capacity In Kn / m ²						
Depth	Length	Width	BH 1	BH 2	BH 3	
2.10 m	2.10	1.50	118.37	132.27	159.62	118.00
	2.40		119.40	132.79	160.30	119.00
	2.70		120.84	133.79	161.55	120.00
	3.00		122.55	134.95	163.00	122.00
2.40 m	2.10	1.50	121.71	138.19	167.02	121.00
	2.40		122.45	138.43	167.36	122.00
	2.70		123.69	139.17	168.30	123.00
	3.00		125.27	140.23	169.63	125.00
2.70 m	2.10	1.50	125.15	144.19	174.52	125.00
	2.40		125.61	144.07	174.43	125.00
	2.70		126.54	144.59	175.11	126.00
	3.00		127.89	145.46	176.22	127.00
3.00 m	2.10	1.50	128.49	150.24	182.09	128.00
	2.40		128.66	149.85	181.67	128.00
	2.70		129.48	150.10	182.03	129.00
	3.00		130.62	150.74	182.88	130.00
3.30 m	2.10	1.50	170.15	176.38	183.67	170.00
	2.40		169.36	175.63	182.67	169.00
	2.70		169.41	175.69	182.39	169.00
	3.00		170.08	176.50	182.74	170.00
3.60 m	2.10	1.50	176.55	182.59	192.75	176.00
	2.40		175.33	181.37	191.31	175.00
	2.70		175.06	181.18	190.85	175.00
	3.00		175.47	181.73	190.88	175.00



GEOMATRIX CONSULTANCY

(An ISO- 17025: 2017, NABL Certified Firm)

Madurai ,Ph :75980 31360



Construction of **RESIDENTIAL BUILDING** at Thuvariman
in Madurai West Taluk of Madurai District.

9. **RECOMMENDATIONS:** Based on the SBC and settlement calculations, site investigations the recommendations for foundation are as follows:

- 1) **ISOLATED COLUMN FOOTING / CONTINUOUS STRIP FOOTING** is recommended.
- 2) The recommended safe bearing capacities for various depth and size are presented above to design the foundation according to the load conditions and structural requirements.
- 3) For these Safe bearing capacity, the settlement also within the allowable limits (The SBC and Settlement calculations are presented at the end of this report)
- 4) Due to presence of Sand in the top layers, there are chances for **Soil sliding** occurs during earthwork excavation, Hence **proper precautions** will be followed during execution of foundation.
- 5) The foundation concrete shall be laid in dry condition if meets the water table during the execution.
- 6) The excavated soil for foundation is suitable for back filling.

Station: Madurai.

Date : 01.07.2024;



[Signature]
01/07/24
Er.K.GANAPATHI, B.E., M.E.(Soil Mech), F.I.E., F.L.V., D.Litt., USA.
REGISTERED Geo-Tech Engineer / Chartered Engineer
(CMDA Regn No. GTE / 19 / 04 / 022)
(DTCP Regn No. CGLRGN RGTE / 2019 / 08 / 012)
(MLPA Regn No. GTE 002 / 2019)
GEOMATRIX CONSULTANCY, (Regn. No. 330242233482E,
No.22, Thomas Street, Narimedu,
Madurai - 625 002. Ph: 7598031360, 7708758598
Email: geomatrixconsultancy@gmail.com



GEOMATRIX CONSULTANCY

(An ISO- 17025: 2017, NABL Certified Firm)

Madurai ,Ph :75980 31360

LOCATION MAP

LOCATION :

GPS COORDINATES

RS.NO : 22/5A,22/5B,22/6,22/7A & 22/7B

BH - 1 : N 09° 57' 17.56", E 78° 03' 43.96"

VILLAGE : THUVARIMAN

BH - 2 : N 09° 57' 16.55", E 78° 03' 43.18" &

TALUK : MADURAI WEST

BH - 3 : N 09° 57' 15.60", E 78° 03' 42.50"

DISTRICT : MADURAI



NOT TO SCALE

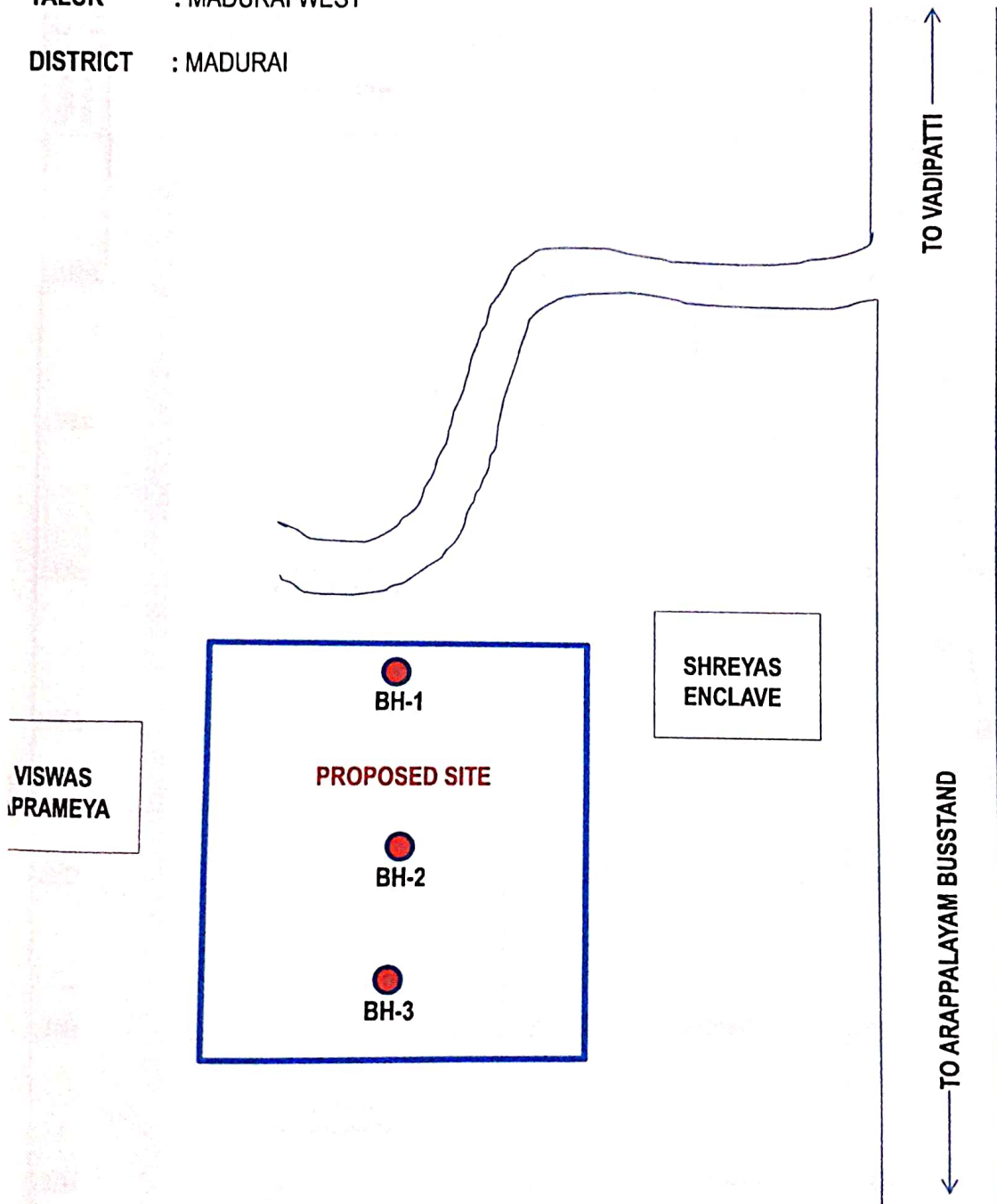


Fig 1 - PLAN SHOWING THE LOCATION OF BORE HOLES.

LEGEND :

● — BORE HOLE LOCATION

PREPARED BY



GEOMATRIX CONSULTANCY

(An ISO- 17025 : 2017, NABL Certified Firm)

No.22, Thomas Street,
Narimedu, Madurai - 625 002.

TITLE OF PROJECT

CONSTRUCTION OF **RESIDENTIAL**

THUVARIMAN VILLAGE IN MADURAI WEST TALUK OF

MADURAI DISTRICT.





Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Thuvaraman Village in Madurai West Taluk of Madurai District.

Report No 85 / RB / 2024-25 Dt : 26.06.2024

Bore Hole No. 1

Type of Boring Rotary

Started on 26.06.2024

Ended on 26.06.2024

BORELOG SHEET

Dia of Boring 150 mm

Total depth 10.00 m

Depth of Water Table NOT ENCOUNTERED

Co - ordinates N 09° 57' 17.56"

E 78° 03' 43.96"

Depth from Ground level	Soil Profiles	Description of Soil	Depth (m)	Type	15	30	45	N	Graphical Representation of SPT (N value)																Type of Sample
									0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
-1.00 m		Brown coloured Clay mixed with Sand	1.00	SPT	2	4	5	9																	DS
-2.00 m			2.00	SPT	4	6	9	15																	DS
-3.00 m			3.00	SPT	5	7	13	20																	DS
-4.00 m			4.00	SPT	7	11	14	25																	DS
-5.00 m			5.50	SPT	11	16	21	37																	DS
-6.00 m		Brown coloured Sand mixed with Clay	7.00	SPT	14 cm for 50 blows			>100																	DS
-8.50 m			8.50	SPT	11 cm for 50 blows			>100																	DS
-10.00 m		Brown coloured Sand	10.00	SPT	4 cm for 50 blows			>100																	DS

Disturbed soil sample

Washing Sample

CR = Core Recovery

RQD = Rock Quality Designation

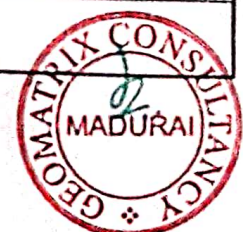




Fig : 2B - VERTICAL SOIL PROFILE at BOREHOLE - 2 LOCATION

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Thuvairman Village in Madurai West Taluk of Madurai District.

Report No	85 / RB / 2024-25 Dt : 26.06.2024	BORELOG SHEET						Dia of Boring		150 mm											
Bore Hole No.	2							Total depth		10.00 m											
Type of Boring	Rotary							Depth of Water Table		NOT ENCOUNTERED											
Started on	26.06.2024							Co - ordinates		N 09° 57' 16.55"											
Ended on	26.06.2024									E 78° 03' 43.18"											
Depth from Ground level	Soil Profiles	Description of Soil	Depth (m)	Type	15	30	45	N	Graphical Representation of SPT (N value)											Type of Sample	
									0	10	20	30	40	50	60	70	80	90	100		
-1.00 m		Brown coloured Clay mixed with Sand	1.00	SPT	2	1	4	5												5	DS
-2.00 m			2.00	SPT	3	5	7	12												12	DS
-3.00 m			3.00	SPT	4	5	8	13												13	DS
-4.00 m			4.00	SPT	6	8	13	21												21	DS
-5.50 m		Brown coloured Sand	5.50	SPT	21	13 cm for 50 blows		>100												100	DS
-7.00 m			7.00	SPT	11 cm for 50 blows		>100												100	DS	
-8.50 m		Brown coloured Sand mixed with Gravel	8.50	SPT	5 cm for 50 blows		>100												100	DS	
-10.00 m		Brown coloured Sand	10.00	SPT	SPT REBOUND (NO PENETRATION)		>100												100	DS	

DS - Disturbed soil sample

WS - Washing Sample

CR = Core Recovery

RQD = Rock Quality Designation



DS - Disturbed soil sample
WS - Washing Sample

CR = Core Recovery
RQD = Rock Quality Designation





Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Thuvariman Village in Madurai West Taluk of Madurai District.

Report No	85 / RB / 2024-25 Dt : 26.06.2024	BORELOG SHEET	Dia of Boring	150 mm
Bore Hole No.	3		Total depth	10.00 m
Type of Boring	Rotary		Depth of Water Table	NOT ENCOUNTERED
Started on	27.06.2024		Co - ordinates	N 09° 57' 15.60"
Ended on	27.06.2024			E 78° 03' 42.50"

Depth from Ground level	Soil Profiles	Description of Soil	Depth (m)	Type	15	30	45	N	Graphical Representation of SPT (N value)											Type of Sample
									0	10	20	30	40	50	60	70	80	90	100	
-1.00 m		Brown coloured Clay mixed with Sand	1.00	SPT	3	3	4	7												DS
-2.00 m		Brown coloured Sand mixed with Clay	2.00	SPT	4	5	7	12												DS
-3.00 m		Brown coloured Clay mixed with Sand	3.00	SPT	6	8	12	20												DS
-4.00 m			4.00	SPT	5	9	16	25												DS
-5.50 m			5.50	SPT	18	43	10 cm for 50 blows	>100												DS
-7.00 m		Brown coloured Sand mixed with Clay	7.00	SPT	34	13 cm for 50 blows		>100												DS
-8.50 m			8.50	SPT		9 cm for 50 blows		>100												DS
-10.00 m		Brown coloured Sand	10.00	SPT		SPT REBOUND (NO PENETRATION)		>100												DS

DS - Disturbed soil sample
WS - Washing Sample

CR = Core Recovery
RQD = Rock Quality Designation





GEOMATRIX CONSULTANCY
Geo-Tech. Consultants & Engineers

SUMMARY OF LAB TEST RESULTS

Report No: 85 / RB / 2024-25 Dt : 26.06.2024

TABLE - 1

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Thuvartman Village in Madurai West Taluk of Madurai District.

BH No : 1

Depth of soil (m)		Soil Description	Type of sample collected	IS Classification	Grain Size Analysis (%)					NMC	Index Properties (%)			Bulk Density (KN/m ³) γ_d	Dry Density (KN/m ³) γ_d	Porosity (%) n	Voids ratio (%) e	Specific Gravity	Cohesion "C" in (Kg/cm ²)	Angle of friction (ϕ)
From	To				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay		Liquid Limit (W _L)	Plastic Limit (W _P)	Plasticity Index (Ip)							
0.00	1.00	Brown coloured Clay mixed with Sand	DS	CH	6.33	0.59	8.85	19.11	65.12	14	32.12	10.58	21.54	16.79	14.73	0.43	0.77	2.60	0.24	12.00
1.00	2.00	Brown coloured Clay mixed with Sand	DS	CH	5.74	12.02	19.40	10.62	52.22	25	26.30	17.24	9.06	16.88	13.50	0.48	0.93	2.61	0.21	14.00
2.00	3.00	Brown coloured Clay mixed with Sand	DS	CH	3.17	2.09	6.09	9.41	79.24	21	38.50	22.16	16.34	17.19	14.21	0.45	0.81	2.57	0.43	5.00
3.00	4.00	Brown coloured Clay mixed with Sand	DS	CH	6.92	9.17	17.07	11.92	54.92	26	31.05	14.75	16.30	17.34	13.76	0.47	0.89	2.60	0.31	14.00
4.00	5.50	Brown coloured Clay mixed with Sand	DS	CH	1.51	1.13	10.61	27.19	59.56	21	32.56	15.25	17.31	17.38	14.36	0.45	0.82	2.61	0.36	13.00
5.50	7.00	Brown coloured Clay mixed with Sand	DS	CH	0.68	0.71	10.34	10.74	77.53	32	38.53	17.64	20.89	17.60	13.33	0.48	0.91	2.55	0.48	6.00
7.00	8.50	Brown coloured Sand mixed with Clay	DS	SC	16.49	6.63	39.01	18.61	19.26	14	NP	NP	NP	18.02	15.81	0.40	0.68	2.65	0.00	35.00
8.50	10.00	Brown coloured Sand	DS	SP	0.00	2.84	61.61	32.84	2.71	19	NP	NP	NP	18.39	15.45	0.42	0.73	2.68	0.00	36.00
10.00	-	Brown coloured Sand	DS	SP	0.64	5.25	65.43	26.33	2.35	16	NP	NP	NP	18.44	15.90	0.40	0.67	2.66	0.00	36.00
DS =		Disturbed Sample	NMC = Natural Moisture Content					NP = Non Plastic												





Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvartman Village in Madurai West Taluk of Madurai District.

TABLE - 2

BH No : 2

Depth of soil (m)		Soil Description	Type of sample collected	IS Classification	Grain Size Analysis (%)					NMC	Index Properties (%)			Bulk Density (K/m ³) _{vd}	Dry Density (K/m ³) _{vd}	Porosity (%) _n	Voids ratio (%) _e	Specific Gravity	Cohesion "C" in (kg/cm ²)	Angle of friction (φ)
From	To				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay		Liquid Limit (W _L)	Plastic Limit (W _P)	Plasticity Index (I _p)							
0.00	1.00	Brown coloured Clay mixed with Sand	DS	CH	4.97	0.65	8.46	24.46	61.46	11	36.20	18.53	17.67	16.52	14.88	0.43	0.74	2.59	0.22	13.00
1.00	2.00	Brown coloured Clay mixed with Sand	DS	CH	0.52	1.04	14.90	27.77	55.77	28	25.60	14.35	11.25	16.59	12.96	0.50	1.01	2.60	0.17	13.00
2.00	3.00	Brown coloured Clay mixed with Sand	DS	CH	0.00	0.10	16.24	32.83	50.83	25	29.36	18.55	10.81	17.10	13.68	0.48	0.91	2.61	0.26	15.00
3.00	4.00	Brown coloured Clay mixed with Sand	DS	CH	0.66	1.76	15.70	19.16	62.72	27	35.20	17.16	18.04	17.17	13.52	0.48	0.91	2.58	0.35	13.00
4.00	5.50	Brown coloured Clay mixed with Sand	DS	CH	0.00	0.20	13.87	21.43	64.50	22	39.60	22.05	17.55	17.28	14.16	0.45	0.83	2.59	0.36	13.00
5.50	7.00	Brown coloured Sand	DS	SP	4.78	8.47	67.45	11.59	7.71	15	NP	NP	NP	18.04	15.69	0.41	0.70	2.67	0.00	35.00
7.00	8.50	Brown coloured Sand mixed with Gravel	DS	SW	16.67	8.02	55.01	11.45	8.85	14	NP	NP	NP	18.15	15.92	0.40	0.66	2.65	0.00	36.00
8.50	10.00	Brown coloured Sand	DS	SP	0.00	0.00	63.12	29.82	7.06	17	NP	NP	NP	18.28	15.62	0.41	0.70	2.66	0.00	36.00
10.00	-	Brown coloured Sand	DS	SP	0.00	0.00	66.90	28.58	4.52	10	NP	NP	NP	18.44	16.76	0.37	0.60	2.68	0.00	36.00

DS = Disturbed Sample

NMC = Natural Moisture Content

NP = Non Plastic



SUMMARY OF LAB TEST RESULTS

Report No: 85 / RB / 2024-25 Dt : 26.06.2024

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

BH No : 3

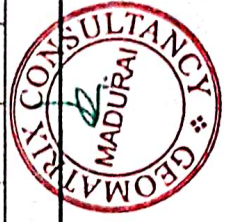
TABLE - 3

Depth of soil (m)		Soil Description	Type of sample collected	IS Classification	Grain Size Analysis (%)					NMC	Index Properties (%)			Bulk Density (kN/m ³) γ_b	Dry Density (kN/m ³) γ_d	Porosity (%) n	Voids ratio (%) e	Specific Gravity	Cohesion "C" in (kg/cm ²)	Angle of friction (ϕ)			
From	To				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay		Liquid Limit (W _L)	Plastic Limit (W _P)	Plasticity Index (I _p)										
0.00	1.00	Brown coloured Clay mixed with Sand	DS	CH	0.28	0.57	8.09	29.90	61.16	10	36.23	19.65	16.58	17.32	15.75	0.39	0.64	2.58	0.26	15.00			
1.00	2.00	Brown coloured Sand mixed with Clay	DS	SC	1.67	2.26	17.64	30.80	47.63	24	25.81	12.05	13.76	18.41	14.65	0.43	0.76	2.62	0.20	13.00			
2.00	3.00	Brown coloured Clay mixed with Sand	DS	CH	3.81	2.14	5.57	19.40	69.08	20	37.54	18.53	19.01	19.41	16.18	0.38	0.61	2.60	0.31	15.00			
3.00	4.00	Brown coloured Clay mixed with Sand	DS	CH	1.37	3.81	14.54	26.44	53.84	28	26.30	24.55	1.75	19.58	15.30	0.41	0.71	2.61	0.22	15.00			
4.00	5.50	Brown coloured Clay mixed with Sand	DS	CH	0.67	1.62	17.97	27.42	52.32	21	28.56	14.53	14.03	21.41	17.69	0.32	0.47	2.60	0.28	19.00			
5.50	7.00	Brown coloured Sand mixed with Clay	DS	SC	14.71	15.01	30.08	21.44	18.76	14	NP	NP	NP	22.41	19.66	0.26	0.35	2.65	0.00	32.00			
7.00	8.50	Brown coloured Sand mixed with Clay	DS	SC	10.64	9.34	48.26	20.63	11.13	17	NP	NP	NP	23.41	20.01	0.25	0.33	2.66	0.00	34.00			
8.50	10.00	Brown coloured Sand	DS	SP	0.00	0.70	76.05	20.14	3.11	10	NP	NP	NP	24.41	22.19	0.17	0.21	2.68	0.00	32.00			
10.00	-	Brown coloured Sand	DS	SP	0.00	7.01	68.68	21.48	2.83	3	NP	NP	NP	25.41	24.67	0.08	0.03	2.67	0.00	32.00			
DS =		Disturbed Sample																		NMC = Natural Moisture Content		NP = Non Plastic	

DS = Disturbed Sample

NMC = Natural Moisture Content

NP = Non Plastic





GEOMATRIX CONSULTANCY
Geo-Tech. Consultants & Engineers

NATURAL MOISTURE CONTENT TEST
(Test method As per IS 2720 (Part 2) - 1973)

Report No: 85 / RB / 2024-25 Dt : 26.06.2024

ANNEXURE - A

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvariman Village in Madurai West Taluk of Madurai District.

BH. No	2		2		2
Depth (m)	0.50 m		1.00 m		2.00 m
Wt of Tare (W) gm	82.76	83.59	85.19	86.25	99.81
Tare + Wet Soil (W_1) gm	379.67	380.56	461.63	462.75	463.25
Tare + Dry Soil (W_2) gm	351.45	352.02	380.48	381.29	391.25
Wt of Water ($W_3 = W_1 - W_2$) gm	28.22	28.54	81.15	81.46	71.25
Wt Dry Soil ($W_4 = W_2 - W$) gm	268.69	268.43	295.29	295.04	292.69
Water Content (%) = $(W_3 / W_4) \times 100$	10.50	10.63	27.48	27.61	24.44
Average Water Content (%)	11		28		25





GEOMATRIX CONSULTANCY
Geo-Tech. Consultants & Engineers

SPECIFIC GRAVITY TEST

(Test method as per IS 2720 (Part 3) - 1980)

Report No: 85 / RB / 2024-25 Dt : 28.06.2024

ANNEXURE - B

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvairman Village in Madurai West Taluk of Madurai District.

BH. No	2		2		2	
Depth (m)	0.50 m		1.00 m		2.00 m	
Bottle Number	1	2	1	2	1	2
Weight of empty Bottle (w_1) gm	55.49	55.49	55.49	55.49	55.49	55.49
Weight of bottle + Sample (w_2) gm	78.36	79.65	78.20	77.54	78.91	79.53
Weight of bottle + Sample + Water (w_3) gm	163.85	164.63	162.54	163.38	164.25	164.63
Weight of bottle + Water (w_4) gm	149.80	149.80	149.80	149.80	149.80	149.80
Specific Gravity = $(w_2 - w_1) / (w_4 - w_1) - (w_3 - w_2)$	2.59	2.59	2.60	2.60	2.61	2.61
Average value for Specific Gravity	2.59		2.60		2.61	





ANNEXURE - C

GRAIN SIZE ANALYSIS TEST
(Test method as per IS 2720 (Part 4) - 1985)

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

Weight of Soil taken for analysis Ws : 100.00 g

Borehole No. 3

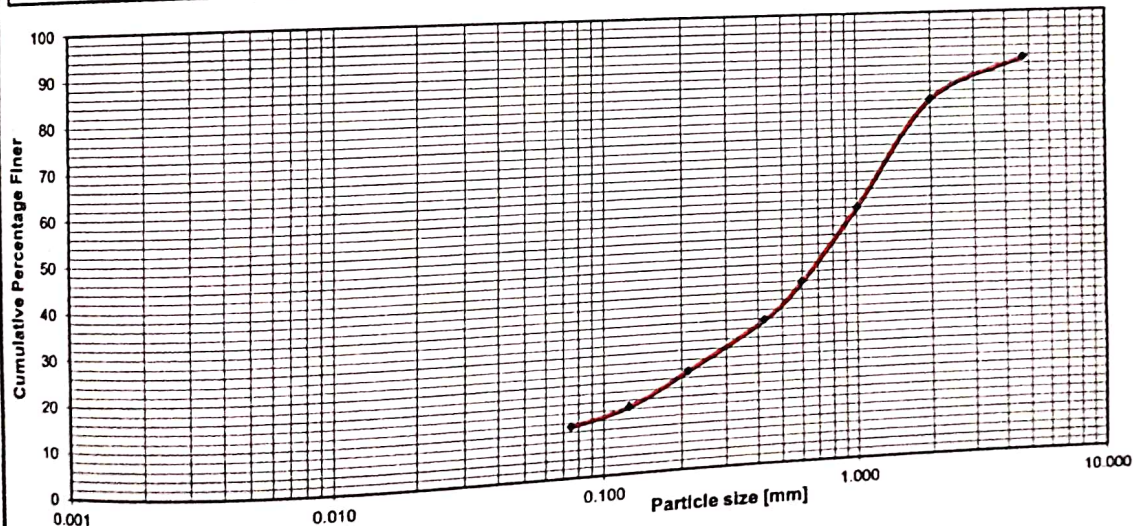
Weight of Soil more than 0.075mm IS Sieve : 88.87 g

Depth (m) 7.00 m

S.No.	Size of sieves	% Soil PSR % (1)	Cumulative % F % (2)	Average Sieve size (mm) (3)	Product of Columns (1) x (3)
1	4.750	10.64	89.36	4.750	50.54
2	2.000	9.34	80.02	3.375	31.52
3	1.000	24.13	55.89	1.500	36.20
4	0.600	16.09	39.80	0.800	12.87
5	0.425	8.04	31.76	0.513	4.12
6	0.212	10.32	21.44	0.319	3.29
7	0.125	6.88	14.56	0.181	1.25
8	0.075	3.43	11.13	0.113	0.39
9	passing 0.075				140.168

Average Particle Diameter = 1.4601

Silt			Sand			Gravel	
Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine



Soil description : Sand mixed with Clay

Based on Gradation Curve, the following sizes of Material (as per IS 1498 - 1970) are obtained

Classification of soil	%
Gravel	10.64
Course Sand	9.34
Medium Sand	48.26
Fine Sand	20.63
Silt & Clay	11.13





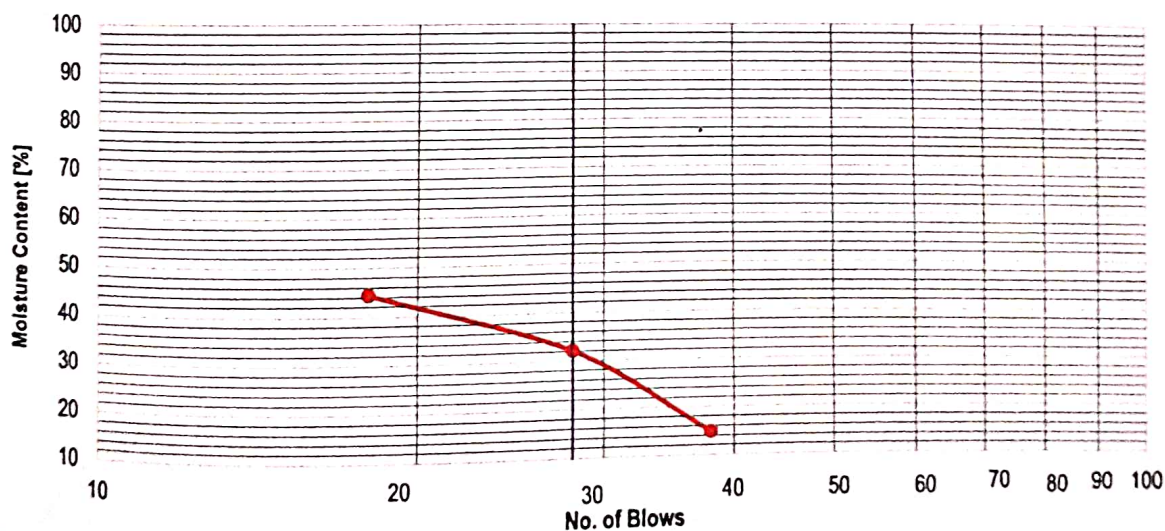
LIQUID LIMIT & PLASTIC LIMIT TEST

(Test method As per IS 2720 (Part 5) - 1985)

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

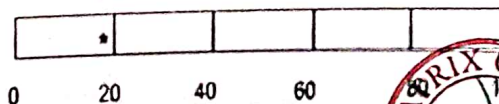
Report No	85 / RB / 2024-25 Dt : 26.06.2024
Borehole No	1
Depth	0.50 m

Description			Liquid Limit			Plastic Limit	
No. of Blows	N		18	28	38		
Weight of Wet Specimen + Container	WSC	g	79.25	74.59	74.04	67.26	72.97
Weight of Dry Specimen + Container	WDC	g	76.27	72.12	72.87	66.28	71.96
Weight of Container	WC	g	69.57	64.43	65.03	57.23	62.17
Weight of Water	WW	g	2.98	2.47	1.17	0.98	1.01
Weight of Dry Specimen	WD	g	6.70	7.69	7.84	9.05	9.79
Moisture Content	W	%	44.48	32.12	14.92	10.83	10.32



Liquid Limit	W_L :	32.12 %
Plastic Limit	W_P :	10.58 %
Plasticity Index	I_P :	21.54 %

Plasticity Index [%]





DIRECT SHEAR TEST
(Test method As per IS 2720 (Part 13) - 1986)

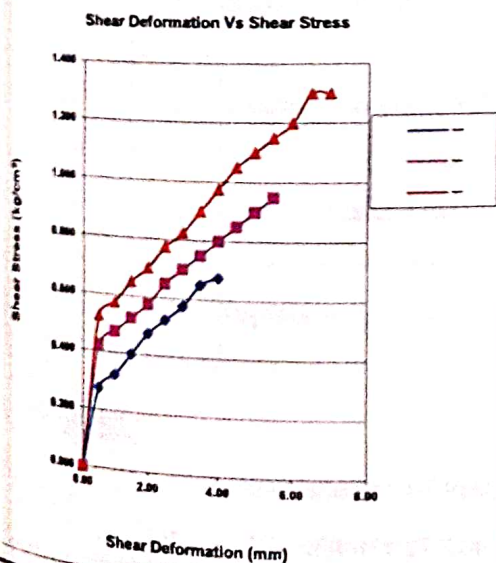
ANNEXURE - E

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

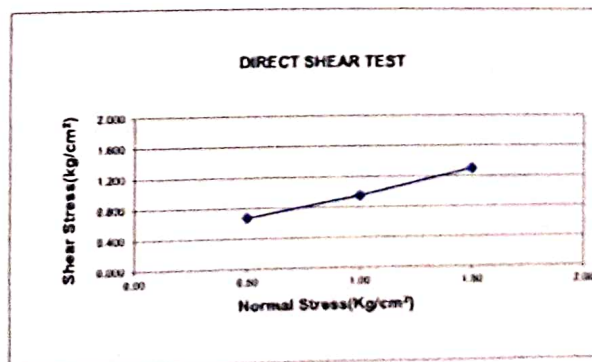
Borehole No	3
Depth (m)	5.50 m
Date of Test	29.06.2024

L.C of Dial gauge	:	0.01
Proving Ring Constant	:	0.81421
Area of the Specimen	:	36

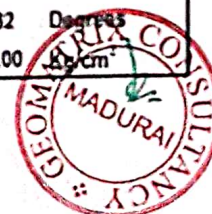
Trail-1				Trail-2				Trail-3			
Normal Stress: 0.5 kg/cm ²				Normal Stress: 1.0 kg/cm ²				Normal Stress: 1.5 kg/cm ²			
Horizontal Gauge Reading	Proving Ring Reading	Shear deformation	Shear Stress (kg/Cm ²)	Horizontal Gauge Reading	Proving Ring Reading	Shear deformation	Shear Stress (kg/Cm ²)	Horizontal Gauge Reading	Proving Ring Reading	Shear deformation	Shear Stress (kg/Cm ²)
0	0	0.00	0.000	0	0	0.00	0.000	0	0	0.00	0.000
50	12.17196	0.50	0.275	50	18.81122	0.50	0.425	50	23.2374	0.50	0.526
100	14.38505	1.00	0.325	100	21.0243	1.00	0.476	100	25.4505	1.00	0.576
150	17.70467	1.50	0.400	150	23.23738	1.50	0.526	150	28.7701	1.50	0.651
200	21.0243	2.00	0.476	200	25.45047	2.00	0.576	200	30.9832	2.00	0.701
250	23.23738	2.50	0.526	250	28.7701	2.50	0.651	250	34.3028	2.50	0.776
300	25.45047	3.00	0.576	300	30.98318	3.00	0.701	300	36.5159	3.00	0.826
350	28.7701	3.50	0.651	350	33.19626	3.50	0.751	350	39.8355	3.50	0.901
400	29.87664	4.00	0.676	400	35.40935	4.00	0.801	400	43.1551	4.00	0.976
				450	37.62243	4.50	0.851	450	46.4748	4.50	1.051
				500	39.83552	5.00	0.901	500	48.6879	5.00	1.101
				550	42.0486	5.50	0.951	550	50.9009	5.50	1.151
								600	53.114	6.00	1.201
								650	57.5402	6.50	1.301
								700	57.5402	7.00	1.301



Normal Stress (kg/cm ²)	Proving Ring reading at failure	Shear Stress (kg/cm ²)
0.50	29.87663754	0.676
1.00	42.04860098	0.951
1.50	57.54019082	1.301



1. Angle of Shearing Resistance (ϕ) = 32 Degrees
2. Cohesion (C) = 0.00 kg/cm²





DENSITY CALCULATIONS

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvariman Village in Madurai West Taluk of Madurai District.

Borehole No.	1
Depth (m)	0.50

Sl. No.	Description	Reading
1	Weight of Empty Box (gm)	3,393.00
2	Weight of Box + Soil (gm)	3,544.10
3	Weight of Soil (gm)	151.10
4	Volume of Box (cm ³)	90.00
5	Bulk Density (gm /cm ³)	1.679
6	Weight of Container (gm)	42.24
7	Weight of Container + Wet Soil (gm)	61.54
8	Weight of Container + Dry Soil (gm)	59.50
9	Moisture Content (%)	11.82
10	Dry Density (gm /cm ³)	1.501

RESULT

- 1 WET DENSITY OF SOIL = 1.679 t / m³
- 2 DRY DENSITY OF SOIL = 1.501 t / m³





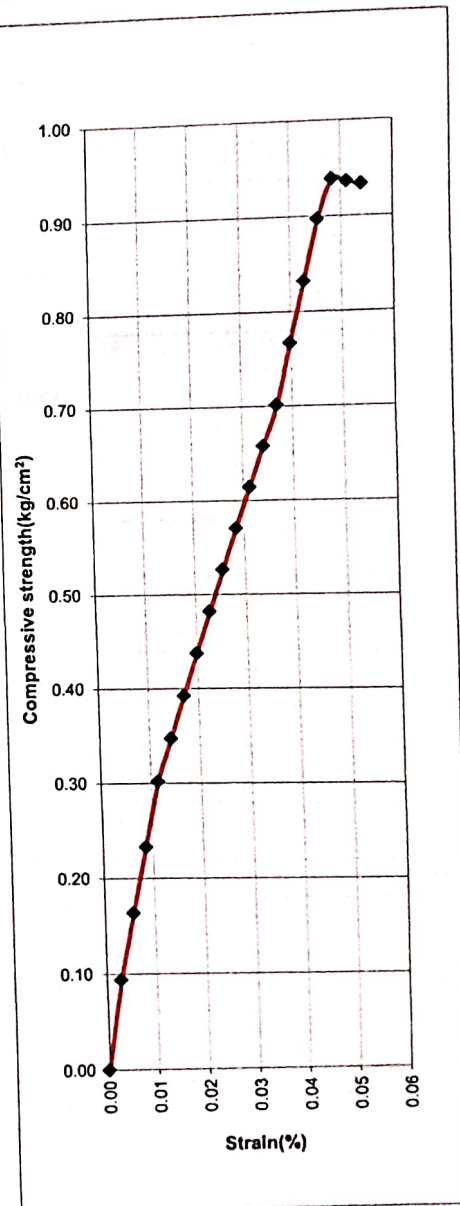
UNCONFINED COMPRESSION TEST
(Test method as per IS 2720 (Part 10) - 1995)

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

Diameter	38 mm
Length	88 mm
Constant	0.31530

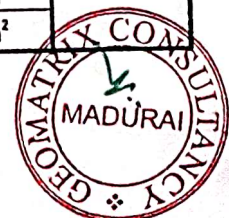
Borehole No	1
Depth (m)	5.50 m
Date of Test	29.06.2024

Deformation dial Reading	Axial deformation (mm)	Axial Strain (e)	Area (cm ²)	Proving Ring Readings	Axial force N (Kgf)	Compressive strength (kg/cm ²)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.00	0.00	0.00	11.35	0.00	0.000	0.00
25.00	0.25	0.00	11.38	3.38	1.066	0.09
50.00	0.50	0.01	11.41	5.92	1.866	0.16
75.00	0.75	0.01	11.45	8.45	2.666	0.23
100.00	1.00	0.01	11.48	10.99	3.465	0.30
125.00	1.25	0.01	11.51	12.68	3.999	0.35
150.00	1.50	0.02	11.55	14.37	4.532	0.39
175.00	1.75	0.02	11.58	16.06	5.065	0.44
200.00	2.00	0.02	11.61	17.75	5.598	0.48
225.00	2.25	0.03	11.65	19.45	6.131	0.53
250.00	2.50	0.03	11.68	21.14	6.664	0.57
275.00	2.75	0.03	11.72	22.83	7.197	0.61
300.00	3.00	0.03	11.75	24.52	7.731	0.66
325.00	3.25	0.04	11.79	26.21	8.264	0.70
350.00	3.50	0.04	11.82	28.75	9.063	0.77
375.00	3.75	0.04	11.86	31.28	9.863	0.83
400.00	4.00	0.05	11.89	33.82	10.663	0.90
425.00	4.25	0.05	11.93	35.51	11.196	0.94
450.00	4.50	0.05	11.96	35.51	11.196	0.94
475.00	4.75	0.05	12.00	35.51	11.196	0.93



RESULTS

qu = 0.939 kg/cm²
Cohesion = C = 0.480 kg/cm²





GEOMATRIX CONSULTANCY

Geo-Tech. Consultants & Engineers

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvaraman Village in Madurai West Taluk of Madurai District.

Report No: 85 / RB / 2024-25

BH NO : 1

CALCULATION 1

SAFE BEARING CAPACITY CALCULATIONS on SHALLOW FOUNDATIONS

TYPE OF FOOTING : SQUARE FOOTING

Length of footing (Assumed Value)	L =	1.50 m
Breadth of footing (Assumed Value)	B =	1.50 m
Foundation depth	D _f =	3.60 m
Correction Factor for Water Table	W =	0.50
Unit weight of soil	γ _{sat} =	1.724 T/m ³
Cohension	"C" =	3.10 T/m ²
Angle of shearing resistance(general shear)	φ =	14.00°
Angle of shearing resistance(Local shear)	φ' =	9.44° (Tan ⁻¹ (2/3 * tanφ))
Safety factor	F =	3.00
Effective Surcharge of Soil above Footing Base	q =	2.64 T/m ²
Type of soil	= Clay mixed with Sand	
Mode of failure	= Combined (GSF & LSF) Shear Failure	
Ground Water Table level (Assumed for worst Case - at the Ground level)	0 m From NGL	

The Bearing Capacity Factors are Given by the following equations

For GENERAL SHEAR FAILURE

$$\begin{aligned} N_q &= \tan^2 (45^\circ + \phi/2) (e^{m \tan \phi}) = 3.59 \\ N_c &= (N_q - 1) \cot \phi = 10.37 \\ N_\gamma &= 2 (N_q + 1) \tan \phi = 2.29 \end{aligned}$$

For LOCAL SHEAR FAILURE

$$\begin{aligned} N'_q &= \tan^2 (45^\circ + \phi'/2) (e^{m' \tan \phi'}) = 2.35 \\ N'_c &= (N'_q - 1) \cot \phi' = 8.11 \\ N'_\gamma &= 2 (N'_q + 1) \tan \phi' = 1.11 \end{aligned}$$



The Shape Factors

Shape of Footing	S_c	S_q	S_γ
CONTINUOUS STRIP FOOTING	1.0	1.0	1.0
SQUARE FOOTING	1.3	1.2	0.8
RECTANGULAR FOOTING	$1+0.2B/L$	$1+0.2B/L$	$1-0.4B/L$

SQUARE FOOTING	
$S_c =$	1.300
$S_q =$	1.200
$S_\gamma =$	0.800

The Depth Factor

$d_c =$	$1 + 0.2 D_f / B \times \tan (45^\circ + \phi'/2) =$	1.614
$d_q = d_\gamma =$	1 for $\phi' < 10^\circ$	1.000
$d_q = d_\gamma =$	$1 + 0.1 D_f / B \tan(45^\circ + \phi'/2)$ for $\phi' > 10^\circ =$	1.307

The Inclination Factor

$$i_c = i_q = 1 - \alpha / 90^\circ)^2 = 1.00 \quad i_\gamma = 1 - \alpha / \phi')^2 = 1.00$$

α = Inclination of the load to the vertical in degrees = 0

$$\begin{aligned} \text{Net Ultimate Bearing Capacity, } q_d &= \frac{1}{2} \left[(c N_c S_c d_c i_c) + (q (N_q - 1) S_q d_q i_q) + (0.5 \gamma B x N_\gamma S_\gamma d_\gamma i_\gamma) \right] \\ &= \frac{1}{2} \left[(0.5 \times 18 \times 1.3 \times 1.614 \times 1.0) + (100 \times (1.2 - 1) \times 1.2 \times 1.307 \times 1.0) + (0.5 \times 18 \times 1 \times 0.8 \times 1.307 \times 1.0) \right] \\ &= 60.63 \quad \text{T/sq.m} \end{aligned}$$

SAFE BEARING CAPACITY :

$$\text{SBC} = q_d / F.S = 20.21 \text{ T/sq.m} \quad \text{or} \quad 198.25 \text{ kN/m}^2$$

SETTLEMENT CALCULATIONS AS PER IS-8009-(part-1) 1998

Q_s = Pressure, S_i = Immediate settlement, I = Influence factor

B = width of foundation, μ = Poisson's ratio, E_s = Elastic Modulus

For,

Clay mixed with Sand

$$E_s = 30625 \text{ kN/m}^2$$

$$(\text{or}) E_s = 3062.50 \text{ t/m}^2$$

S_i = Immediate settlement =

$$= \frac{I \cdot Q_s \cdot B (1 - \mu^2) / E_s}{0.95 \times 20.21 \times (1.5 \times (1 - 0.25^2)) / 3062.5}$$

$$S_i = 0.0088 \text{ m}$$

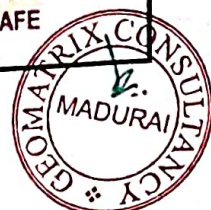
$$0.0088 \times 1000$$

Settlement =

$$9 \text{ mm} < 50 \text{ mm}$$

The Max Allowable Differential Settlement for Sand & Gravel is 50mm and for Silt & Clay is 75mm.

Hence SAFE





GEOMATRIX CONSULTANCY

Geo-Tech. Consultants & Engineers

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvallman Village in Madurai West Taluk of Madurai District.

Report No: 85 / RB / 2024-25

BH NO : 2

CALCULATION -2

SAFE BEARING CAPACITY CALCULATIONS on SHALLOW FOUNDATIONS

TYPE OF FOOTING : SQUARE FOOTING

Length of footing (Assumed Value)	L =	1.50 m
Breadth of footing (Assumed Value)	B =	1.50 m
Foundation depth	D _f =	3.60 m
Correction Factor for Water Table	W =	0.50
Unit weight of soil	γ _{soil} =	1.717 T/m ³
Cohension	"C" =	3.50 T/m ²
Angle of shearing resistance(general shear) φ =		13.00°
Angle of shearing resistance(Local shear) φ' =		8.75° (Tan ⁻¹ (2/3 * tanφ)
Safety factor	F =	3.00
Effective Surcharge of Soil above Footing Base	q =	2.58 T/m ²
Type of soil		= Clay mixed with Sand
Mode of failure		= Combined (GSF & LSF) Shear Failure
Ground Water Table level (Assumed for worst Case - at the Ground level) =		0 m From NGL

The Bearing Capacity Factors are Given by the following equations

For GENERAL SHEAR FAILURE

$$N_q = \tan^2 (45^\circ + \phi/2) (e^{\tan \phi}) = 3.26$$

$$N_c = (N_q - 1) \cot \phi = 9.81$$

$$N_\gamma = 2 (N_q + 1) \tan \phi = 1.97$$

For LOCAL SHEAR FAILURE

$$N'_q = \tan^2 (45^\circ + \phi'/2) (e^{\tan \phi'}) = 2.20$$

$$N'_c = (N'_q - 1) \cot \phi' = 7.82$$

$$N'_\gamma = 2 (N'_q + 1) \tan \phi' = 0.99$$



The Shape Factors

Shape of Footing	S_c	S_q	S_γ
CONTINUOUS STRIP FOOTING	1.0	1.0	1.0
SQUARE FOOTING	1.3	1.2	0.8
RECTANGULAR FOOTING	$1+0.2B/L$	$1+0.2B/L$	$1-0.4B/L$

SQUARE FOOTING	
$S_c =$	1.300
$S_q =$	1.200
$S_\gamma =$	0.800

The Depth Factor

$d_c =$	$1 + 0.2 D_f / B \times \tan (45^\circ + \phi'/2) =$	1.603
$d_q = d_\gamma =$	1 for $\phi' < 10^\circ$	1.000
$d_q = d_\gamma =$	$1 + 0.1 D_f / B \tan(45^\circ + \phi'/2)$ for $\phi' > 10^\circ =$	1.302

The Inclination Factor

$i_c = i_q =$	$1 - \alpha / 90) ^2 =$	1.00	$i_\gamma =$	$1 - \alpha / \phi) ^2$	1.00
---------------	-------------------------	------	--------------	-------------------------	------

$\alpha =$ Inclination of the load to the vertical in degree =

0

$$\text{Net Ultimate Bearing Capacity, } q_d = \frac{(c \times N_c \times S_c \times d_c \times i_c) + (q \times (N_q - 1) \times S_q \times D_q \times i_q) + (0.5 \times B \times \gamma \times N_\gamma \times S_\gamma \times D_\gamma \times i_\gamma \times W)}{(2/3) (c \times N_c \times S_c \times d_c \times i_c) + (q \times (N_q - 1) \times S_q \times D_q \times i_q) + (0.5 \times B \times \gamma \times N_\gamma \times S_\gamma \times D_\gamma \times i_\gamma \times W))^{1/2}}$$

$$= 62.77 \quad \text{T/sq.m}$$

SAFE BEARING CAPACITY :

$$\text{SBC} = q_d / F.s = 20.92 \text{ T/sq.m} \quad \text{or} \quad 205.27 \text{ kN/m}^2$$

SETTLEMENT CALCULATIONS AS PER IS-8009-(part-1) 1998

$Q_s =$ Pressure, $S_i =$ Immediate settlement $I =$ Influence factor

$B =$ width of foundation $\mu =$ Poisson's ratio $E_s =$ Elastic Modulus

For,

Clay mixed with Sand

$$E_s = 30625 \text{ kN/m}^2$$

$$(\text{or}) E_s = 3062.50 \text{ t/m}^2$$

$S_i =$ Immediate settlement =

$$= \frac{I \cdot Q_s \cdot B (1 - \mu^2) / E_s}{0.95 \cdot 20.92 \cdot (1.5 \cdot (1 - 0.25^2)) / 3062.5}$$

$$S_i = 0.0091 \text{ m}$$

$$0.0091 \times 1000$$

$$\text{Settlement} = 9 \text{ mm} < 50 \text{ mm}$$

The Max Allowable Differential Settlement for Sand & Gravel is 50mm and for Silt & Clay is 75mm.

Hence SAFE





GEOMATRIX CONSULTANCY

Geo-Tech. Consultants & Engineers

Name of Project: Sub Soil Investigation for the Construction of **RESIDENTIAL BUILDING** at Thuvariman Village in Madurai West Taluk of Madurai District.

Report No: 85 / RB / 2024-25

BH NO : 3

CALCULATION -3

SAFE BEARING CAPACITY CALCULATIONS on SHALLOW FOUNDATIONS

TYPE OF FOOTING : SQUARE FOOTING

Length of footing (Assumed Value)	L =	1.50 m
Breadth of footing (Assumed Value)	B =	1.50 m
Foundation depth	D _f =	3.60 m
Correction Factor for Water Table	W' =	0.50
Unit weight of soil	γ _{soil} =	1.958 T/m ³
Cohension	"C" =	2.20 T/m ²
Angle of shearing resistance(general shear) φ =		18.00°
Angle of shearing resistance(Local shear) φ' =		12.22° (Tan ⁻¹ (2/3 * tanφ)
Safety factor	F =	3.00
Effective Surcharge of Soil above Footing Base	q =	3.45 T/m ²
Type of soil		= Clay mixed with Sand
Mode of failure		= Combined (GSF & LSF) Shear Failure
Ground Water Table level (Assumed for worst Case - at the Ground level) =		0 m From NGL

The Bearing Capacity Factors are Given by the following equations

For GENERAL SHEAR FAILURE

$$N_q = \tan^2 (45^\circ + \phi/2) (e^{\gamma \tan \phi}) = 5.26$$

$$N_c = (N_q - 1) \cot \phi = 13.11$$

$$N_\gamma = 2 (N_q + 1) \tan \phi = 4.07$$

For LOCAL SHEAR FAILURE

$$N'_q = \tan^2 (45^\circ + \phi'/2) (e^{\gamma \tan \phi'}) = 3.04$$

$$N'_c = (N_q - 1) \cot \phi' = 9.40$$

$$N'_\gamma = 2 (N_q + 1) \tan \phi' = 1.75$$



The Shape Factors

Shape of Footing	S_c	S_q	S_γ
CONTINUOUS STRIP FOOTING	1.0	1.0	1.0
SQUARE FOOTING	1.3	1.2	0.8
RECTANGULAR FOOTING	$1+0.2B/L$	$1+0.2B/L$	$1-0.4B/L$

SQUARE FOOTING	
$S_c =$	1.300
$S_q =$	1.200
$S_\gamma =$	0.800

The Depth Factor

$d_c =$	$1 + 0.2 D_f / B \times \tan (45^\circ + \phi'/2) =$	1.661
$d_q = d_\gamma =$	1 for $\phi' < 10^\circ$	1.000
$d_q = d_\gamma =$	$1 + 0.1 D_f / B \tan(45^\circ + \phi'/2)$ for $\phi' > 10^\circ =$	1.330

The Inclination Factor

$$i_c = i_q = 1 - \alpha / 90^\circ)^2 = 1.00 \quad i_\gamma = 1 - \alpha / \phi')^2 = 1.00$$

α = Inclination of the load to the vertical in degrees = 0

$$\begin{aligned} \text{Net Ultimate Bearing Capacity, } q_d &= \frac{(c \times N_c \times S_c \times d_c) + (q \times (N_q - 1) \times S_q \times d_q \times i_q) + (0.5 \times B \times \gamma \times N_\gamma \times S_\gamma \times d_\gamma \times i_\gamma \times W')}{(2/3) (c \times N_c \times S_c \times d_c) + (q \times (N_q - 1) \times S_q \times d_q \times i_q) + (0.5 \times B \times \gamma \times N_\gamma \times S_\gamma \times d_\gamma \times i_\gamma \times W')} \\ &= 65.60 \quad \text{T/sq.m} \end{aligned}$$

SAFE BEARING CAPACITY :

$$\text{SBC} = q_d / F.s = 21.87 \text{ T/sq.m} \quad \text{or} \quad 214.52 \text{ kN/m}^2$$

SETTLEMENT CALCULATIONS AS PER IS-8009-(part-1) 1998

Q_s = Pressure, S_i = Immediate settlement I = Influence factor
 B = width of foundation μ = Poisson's ratio E_s = Elastic Modulus

For,

Clay mixed with Sand

$$\begin{aligned} E_s &= 30625 \text{ kN/m}^2 \\ \text{(or) } E_s &= 3062.50 \text{ t/m}^2 \\ S_i &= \text{Immediate settlement} = \frac{I \times Q_s \times B (1 - \mu^2) / E_s}{0.95 \times 21.87 \times (1.5 \times (1 - 0.25^2)) / 3062.5} \\ &= 0.0095 \text{ m} \end{aligned}$$

$$\text{Settlement} = 0.0095 \times 1000 = 9.5 \text{ mm} < 50 \text{ mm}$$

The Max Allowable Differential Settlement for Sand & Gravel is 50mm and for Silt & Clay is 75mm.

Hence SAFE



BOREHOLE - 1 SITE PHOTOS:



GEOMATRIX CONSULTANCY
(An ISO-17025: 2017, NABL Certified Firm)
Madurai ,Ph :75980 31360



BOREHOLE – 2 SITE PHOTOS:



GEOMATRIX CONSULTANCY
(An ISO-17025: 2017, NABL Certified Firm)
Madurai ,Ph :75980 31360



BOREHOLE - 3 SITE PHOTOS:



GEOMATRIX CONSULTANCY

(An ISO-17025: 2017, NABL Certified Firm)
Madurai , Ph :75980 31360





CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. K. GANAPATHI** has enrolled as Registered Geo-Technical Engineer (RGTE) with Chennai Metropolitan Development Authority (CMDA) who has the qualification of M.E.,(Soil Mechanics & Foundation Engg.), and experience in the relevant field for 6 years.

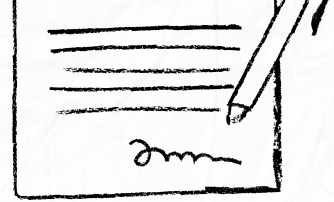
He has been given the Registration No.GTE/2019/04/022 Renewed on 23.04.2024. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto 22.04.2029.




(A. MEGANATHAN)
Superintendent





our services doesn't just end there



Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.



Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.



Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.



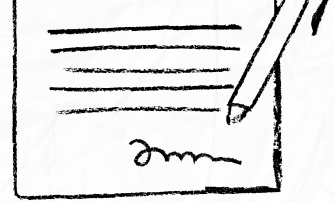
NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management



Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



 **empowering your real estate decisions
with smart tools**



Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter



Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer



Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator



Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary



Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management



We're honored to be part of your
real estate journey

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
[+91 9996 12 9996](tel:+919996129996)
www.verified.realestate