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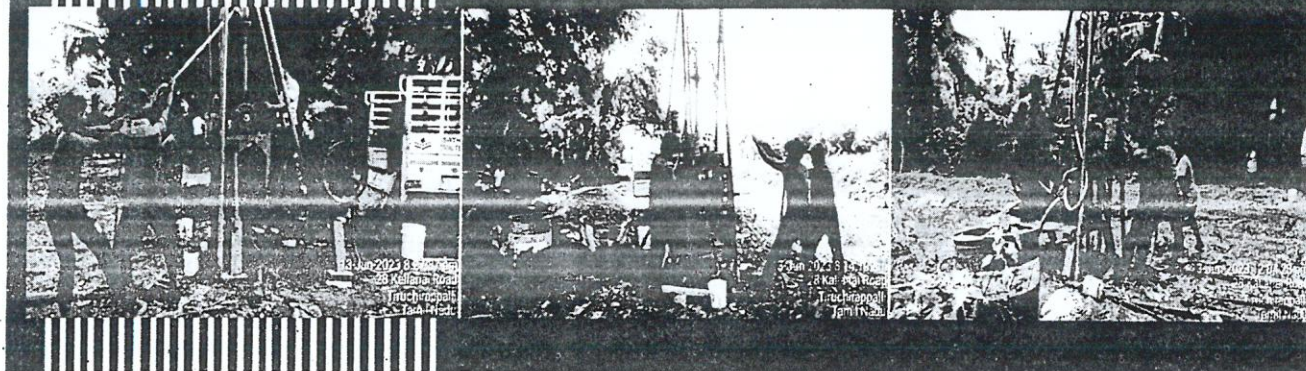
## GEOMATRIX CONSULTANCY

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



TC-9297

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## SOIL INVESTIGATION REPORT

SOIL INVESTIGATION WORKS AND LABORATORY TESTING SERVICES  
FOR THE CONSTRUCTION OF RESIDENTIAL BUILDING AT  
VELLITHIRUMUTHAM VILLAGE IN SRIRANGAM TOWN & TALUK OF  
TRICHY DISTRICT.

|                                 |                   |         |
|---------------------------------|-------------------|---------|
| REPORT No: 58/ RB / GMC / 23-24 | DATE : 13.06.2023 | REV : 0 |
|---------------------------------|-------------------|---------|

LOCATION : T.S 2535/1,2535/3, WARD-C, BLOCK NO - 52,  
TOWN & TALUK : SRIRANGAM  
DISTRICT : TRICHY

CLIENT : Mr.V.KAILASAM,  
NO.9,ROYAL ROAD, CANTONMENT,  
TRICHY-1.



# GEOMATRIX CONSULTANCY

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TC-8297

**REPORT NO: 58/ RB /GMC/ 23-24 DATED: 13.06.2023**

To

Mr.V.KAILASAM,

No.9, Royal Road, Cantonment,

Trichy-1

Respected Madam,

**Sub:** Submission Soil investigation Report - Reg

**Name of work:** Conducting Sub soil investigation works for the Construction of **RESIDENTIAL BUILDING** at Vellithirumutham Village in Srirangam Town & Taluk of Trichy 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: 24**

Respectfully submitted



*E.K. Ganapathi*  
17/06/23  
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**Note:**

- 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 Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

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8. Abstract of Safe Bearing Capacity
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10. **FIGURES:** Fig 1 - Plan showing the location of boreholes.  
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11. **TABLES 1 & 2** - Summaries of Lab Test Results.
12. **ANNEXURES**
  - A. Sample Format for Nature Moisture Content Test
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  - 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 Calculations. (BH-1 & 2).
14. **SITE PHOTOGRAPHS**
15. **REGISTERED GEOTECH ENGINEER CERTIFICATE COPY**



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Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

**REPORT ON SUB-SOIL INVESTIGATION**

**1. INTRODUCTION:**

Mr.V.KAILASAM, residing at No.9, Royal Road, Cantonment, Trichy has proposed to construct a **RESIDENTIAL BUILDING** at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District. In order to get adequate data required for designing the foundations, they have conducted the sub-soil investigation and collect 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 two 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 T.S 2535/1,2535/3, WARD-C, BLOCK NO – 52, Vellithirumutham Village in Srirangam Town & Taluk of Trichy District. As per the details issued by the client, the proposed construction is a RCC structure and the unit will be comprised reinforced concrete elements (Column, Beam, Slab & etc.).



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Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

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#### 4. SOIL INVESTIGATION:

The details of field investigation, tests carried out in the field & laboratory are presented as follows

##### 4.1 FIELD SAMPLING:

Two boreholes of 150 mm dia were made using Rotary drilling machine in this site on 13.06.2023. 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.



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Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

#### 5. DESCRIPTION OF GROUND WATER TABLE:

Ground water table was not encountered at during investigation.

#### 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 & 2**.

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

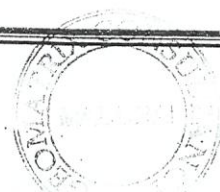
In **BH-1** the sub soil profile consists of Brown coloured **Clay mixed with Sand** (0.00-1.00m), Brown coloured **Sand mixed with Clay** (1.00-3.00m), followed by Brown coloured **Sand** (3.00-10.00m), In **BH-2** the sub soil profile consists of Brown coloured **Clay mixed with Sand** (0.00-1.00m), Brown coloured **Sand mixed with Clay** (1.00-3.00m), followed by Brown coloured **Sand** (3.00-10.00m), The detailed Layer formations are presented in **Tables 1 & 2** and also in **Fig 2**.



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## Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town &amp; Taluk of Trichy District.

8. **ABSTRACT OF SBC CALCULATIONS:** The summary of safe bearing capacity calculated is presented as follows:

| BH No                                     | Safe Bearing Capacity in kN / m <sup>2</sup> at the depth of |        |        |        |        |        |        |        |
|-------------------------------------------|--------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|
|                                           | 1.50 m                                                       | 1.80 m | 2.10 m | 2.40 m | 2.70 m | 3.00m  | 3.30m  | 3.60 m |
| 1                                         | 180.08                                                       | 190.84 | 252.75 | 287.57 | 324.21 | 362.21 | 403.36 | 444.70 |
| 2                                         | 175.59                                                       | 188.96 | 227.42 | 242.51 | 258.04 | 273.75 | 412.33 | 454.67 |
| Recommended SBC<br>in kN / m <sup>2</sup> | 175.00                                                       | 188.00 | 227.00 | 242.00 | 258.00 | 273.00 | 403.00 | 444.00 |

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

- 1) **ISOLATED COLUMN FOOTING** is recommended.
- 2) The recommended safe bearing capacities at every **0.30 m** interval from **1.50 m to 3.60 m** 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 : 17.06.2023

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LOCATION :

T.S 2535/1,2535/2, WARD-C, BLOCK NO - 52,

TOWN : SRIRANGAM

DISTRICT : TRICHY

LOCATION MAP

GPS COORDINATES

BH-1 : N 10° 50' 35.75", E 78° 42' 35.91" &

BH-2 : N 10° 50' 36.13", E 78° 42' 35.41"



NOT TO SCALE

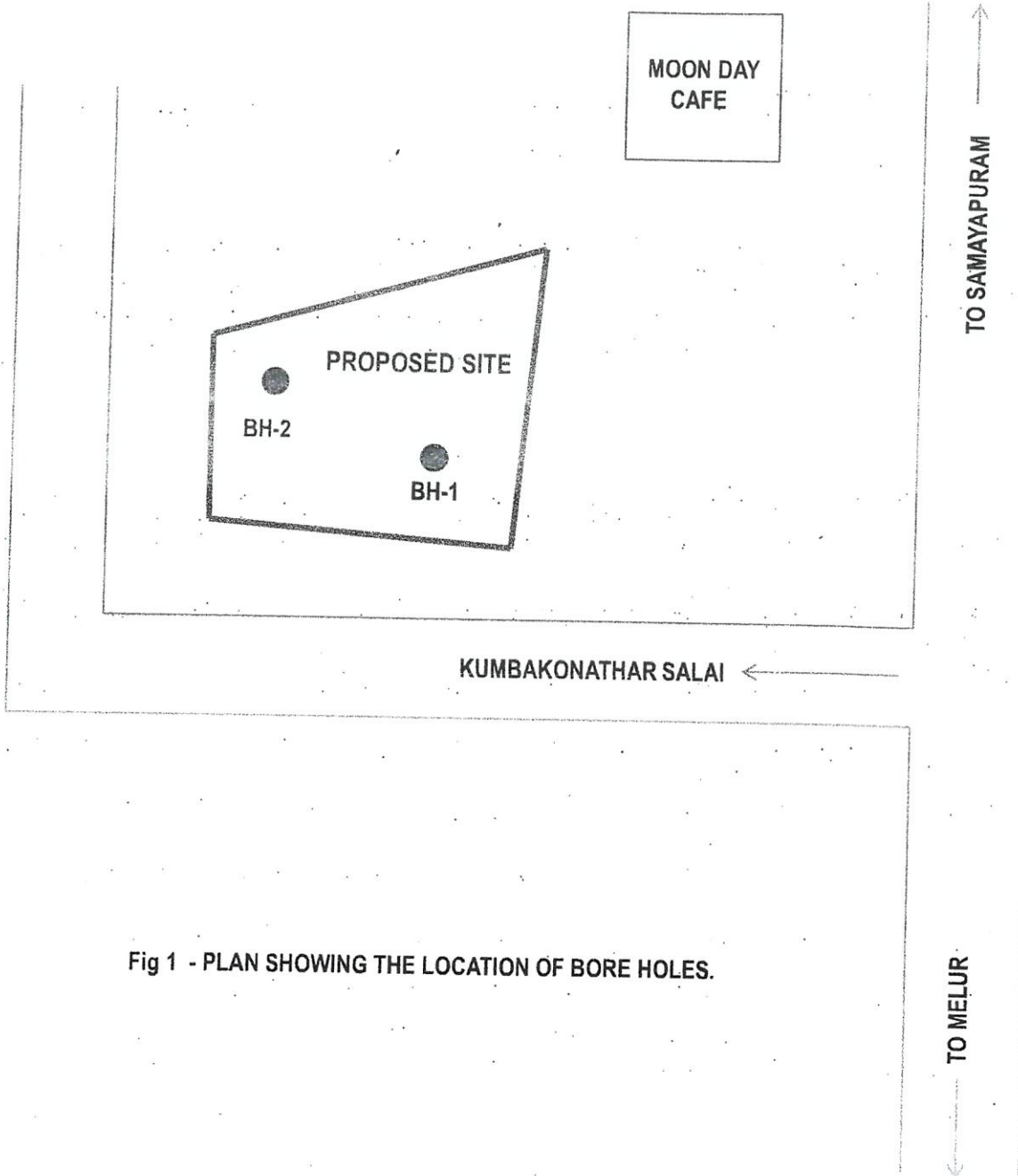


Fig 1 - PLAN SHOWING THE LOCATION OF BORE HOLES.

LEGEND :

● — BORE HOLE LOCATION

PREPARED BY



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Narimeedu, Madurai - 625 002.

TITLE OF PROJECT

CONSTRUCTION OF RESIDENTIAL BUILDING AT  
VELLITHIRUMUTHAM VILLAGE IN SRIRANGAM TOWN &  
TALUK OF TRICHY DISTRICT.



GEOMATRIX CONSULTANCY  
Geo-Tech Consultants & Engineers

Fig : 2A- VERTICAL SOIL PROFILE at BOREHOLE-1 LOCATION

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vallithirumutham Village in Srirangam Town & Taluk of Trichy District.

Report No 58/ RB/ 2023-24 Dt :13.06.2023

Bore Hole No. 1

Type of Boring Rotary

Started on 13.06.2023

Ended on 13.06.2023

BORELOG SHEET

Dia of Boring 150 mm

Total depth 10.00 m

Depth of Water Table NOT ENCOUNTERED

Co - ordinates N 10° 50' 35.75"

E 78° 42' 35.91"

| Depth from Ground level | Soil Profiles | Description of Soil                 | Depth (m) | Type | 15 | 30                           | 45                | N    | Graphical Representation of SPT (N value) | Type of Samples |
|-------------------------|---------------|-------------------------------------|-----------|------|----|------------------------------|-------------------|------|-------------------------------------------|-----------------|
|                         |               |                                     |           |      |    |                              |                   |      |                                           |                 |
| -1.00 m                 |               | Brown coloured Clay mixed with Sand | 1.00      | SPT  | 12 | 26                           | 3 cm for 50 blows | >100 |                                           | DS              |
| -2.00 m                 |               | Brown coloured Sand mixed with Clay | 2.00      | SPT  |    | 14 cm for 50 blows           |                   | >100 |                                           | DS              |
| -3.00 m                 |               |                                     | 3.00      | SPT  |    | 7 cm for 50 blows            |                   | >100 |                                           | DS              |
| -4.00 m                 |               |                                     | 4.00      | SPT  |    | SPT REBOUND (NO PENETRATION) |                   | >100 |                                           | DS              |
| -5.50 m                 |               |                                     | 5.50      | SPT  |    | SPT REBOUND (NO PENETRATION) |                   | >100 |                                           | DS              |
| -7.00 m                 |               | Brown coloured Sand                 | 7.00      | SPT  |    | SPT REBOUND (NO PENETRATION) |                   | >100 |                                           | DS              |
| -8.50 m                 |               |                                     | 8.50      | SPT  |    | SPT REBOUND (NO PENETRATION) |                   | >100 |                                           | DS              |
| -10.00 m                |               |                                     | 10.00     | SPT  |    | SPT REBOUND (NO PENETRATION) |                   | >100 |                                           | DS              |

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 Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

Report No 58/ RB/ 2023-24 Dt :13.06.2023

Bore Hole No. 2

Type of Boring Rotary

Started on 13.06.2023

Ended on 13.06.2023

BORELOG SHEET

Dia of Boring 150 mm

Total depth 10.00 m

Depth of Water Table NOT ENCOUNTERED

Co - ordinates N 10° 50' 36.13"

E 78° 42' 35.41"

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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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:58/ RB/ 2023-24 Dt:13.06.2023

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Velithirumtham Village in Srirangam Town & Taluk of Trichy District.

BH No : 1

TABLE-1

| Depth of soil (m) |       | Soil Description                    | Type of sample collected | IS Classification | Grain Size Analysis (%) |             |             |           |             | NMC | Index Properties (%) |                       |                          | Bulk Density<br>(KN/m <sup>3</sup> ) $\gamma_m$ | Dry Density<br>(KN/m <sup>3</sup> ) $\gamma_d$ | Porosity (%) $n$ | Voids ratio (%) $e$ | Specific Gravity | Cohesion "C" in (Kg/cm <sup>2</sup> ) | Angle of friction ( $\phi$ ) |
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| From              | To    |                                     |                          |                   | Gravel                  | Coarse Sand | Medium Sand | Fine Sand | Silt & Clay |     | Liquid Limit<br>(WL) | Plastic Limit<br>(WP) | Plasticity Index<br>(Ip) |                                                 |                                                |                  |                     |                  |                                       |                              |
| 0.00              | 1.00  | Brown coloured Clay mixed with Sand | DS                       | CH                | 0.00                    | 0.12        | 10.61       | 35.36     | 53.91       | 5   | 48.79                | 20.37                 | 29.42                    | 17.62                                           | 16.78                                          | 0.36             | 0.56                | 2.62             | 0.33                                  | 14.00                        |
| 1.00              | 2.00  | Brown coloured Sand mixed with Clay | DS                       | SC                | 0.35                    | 0.66        | 30.54       | 25.94     | 42.51       | 19  | 35.23                | 27.11                 | 8.12                     | 17.95                                           | 15.08                                          | 0.43             | 0.75                | 2.64             | 0.30                                  | 18.00                        |
| 2.00              | 3.00  | Brown coloured Sand mixed with Clay | DS                       | SC                | 9.04                    | 11.91       | 41.81       | 22.06     | 15.18       | 16  | NP                   | NP                    | NP                       | 18.45                                           | 15.91                                          | 0.40             | 0.68                | 2.67             | 0.00                                  | 35.00                        |
| 3.00              | 4.00  | Brown coloured Sand                 | DS                       | SP                | 0.00                    | 3.52        | 81.27       | 12.94     | 2.27        | 18  | NP                   | NP                    | NP                       | 18.48                                           | 15.66                                          | 0.42             | 0.71                | 2.68             | 0.00                                  | 35.00                        |
| 4.00              | 5.50  | Brown coloured Sand                 | DS                       | SP                | 2.56                    | 32.33       | 57.70       | 5.60      | 1.81        | 18  | NP                   | NP                    | NP                       | 18.56                                           | 15.73                                          | 0.41             | 0.68                | 2.85             | 0.00                                  | 35.00                        |
| 5.50              | 7.00  | Brown coloured Sand                 | DS                       | SP                | 0.00                    | 4.39        | 81.31       | 12.14     | 2.16        | 15  | NP                   | NP                    | NP                       | 18.63                                           | 16.20                                          | 0.40             | 0.65                | 2.68             | 0.00                                  | 36.00                        |
| 7.00              | 8.50  | Brown coloured Sand                 | DS                       | SP                | 0.00                    | 3.65        | 81.92       | 12.54     | 1.89        | 17  | NP                   | NP                    | NP                       | 18.89                                           | 16.15                                          | 0.39             | 0.65                | 2.66             | 0.00                                  | 36.00                        |
| 8.50              | 10.00 | Brown coloured Sand                 | DS                       | SP                | 0.00                    | 1.07        | 81.02       | 15.88     | 2.03        | 18  | NP                   | NP                    | NP                       | 19.12                                           | 16.20                                          | 0.39             | 0.64                | 2.65             | 0.00                                  | 36.00                        |
| 10.00             | -     | Brown coloured Sand                 | DS                       | SP                | 0.00                    | 0.51        | 76.84       | 17.32     | 5.33        | 16  | NP                   | NP                    | NP                       | 19.33                                           | 16.66                                          | 0.37             | 0.60                | 2.66             | 0.00                                  | 37.00                        |

DS = Disturbed Sample

NMC = Natural Moisture Content

NP = Non Plastic





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SUMMARY OF LAB TEST RESULTS

Report No:58/ RB/ 2023-24 Dt :13.06.2023

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Sirrangam Town & Taluk of Trichy District.

BH No : 2

TABLE-2

| Depth of soil (m) | To    | From | Soil Description                    | Type of sample collected       | IS Classification | Grain Size Analysis (%) |             |             |                  |             | NMC | Index Properties (%)              |                                    |                                       | Bulk Density<br>(K/m <sup>3</sup> ) $\gamma_m$ | Dry Density<br>(K/m <sup>3</sup> ) $\gamma_d$ | Porosity (%) $n$ | Voids ratio (%) $e$ | Specific Gravity | Cohesion "C" in (Kg/cm <sup>2</sup> ) | Angle of friction ( $\phi$ ) |
|-------------------|-------|------|-------------------------------------|--------------------------------|-------------------|-------------------------|-------------|-------------|------------------|-------------|-----|-----------------------------------|------------------------------------|---------------------------------------|------------------------------------------------|-----------------------------------------------|------------------|---------------------|------------------|---------------------------------------|------------------------------|
|                   |       |      |                                     |                                |                   | Gravel                  | Coarse Sand | Medium Sand | Fine Sand        | Silt & Clay |     | Liquid Limit<br>(W <sub>L</sub> ) | Plastic Limit<br>(W <sub>P</sub> ) | Plasticity Index<br>(I <sub>p</sub> ) |                                                |                                               |                  |                     |                  |                                       |                              |
| 0.00              | 1.00  |      | Brown coloured Clay mixed with Sand | DS                             | CH                | 0.00                    | 0.00        | 4.25        | 31.91            | 63.84       | 6   | 20.19                             | 19.51                              | 0.68                                  | 17.38                                          | 16.41                                         | 0.37             | 0.58                | 2.60             | 0.35                                  | 11.00                        |
| 1.00              | 2.00  |      | Brown coloured Sand mixed with Clay | DS                             | SC                | 0.16                    | 2.06        | 38.00       | 29.22            | 30.56       | 12  | 29.19                             | 24.04                              | 5.15                                  | 17.88                                          | 15.96                                         | 0.39             | 0.64                | 2.62             | 0.19                                  | 23.00                        |
| 2.00              | 3.00  |      | Brown coloured Sand mixed with Clay | DS                             | SC                | 0.00                    | 0.46        | 36.76       | 26.71            | 36.07       | 17  | 35.07                             | 24.22                              | 10.85                                 | 18.13                                          | 15.50                                         | 0.41             | 0.68                | 2.61             | 0.22                                  | 23.00                        |
| 3.00              | 4.00  |      | Brown coloured Sand                 | DS                             | SP                | 0.00                    | 1.22        | 80.31       | 17.18            | 1.29        | 9   | NP                                | NP                                 | NP                                    | 18.69                                          | 17.15                                         | 0.36             | 0.56                | 2.67             | 0.00                                  | 35.00                        |
| 4.00              | 5.50  |      | Brown coloured Sand                 | DS                             | SP                | 0.00                    | 0.35        | 75.54       | 19.87            | 4.24        | 9   | NP                                | NP                                 | NP                                    | 18.73                                          | 17.18                                         | 0.35             | 0.54                | 2.65             | 0.00                                  | 35.00                        |
| 5.50              | 7.00  |      | Brown coloured Sand                 | DS                             | SP                | 0.00                    | 0.37        | 72.99       | 22.06            | 4.58        | 12  | NP                                | NP                                 | NP                                    | 18.78                                          | 16.77                                         | 0.37             | 0.60                | 2.68             | 0.00                                  | 35.00                        |
| 7.00              | 8.50  |      | Brown coloured Sand                 | DS                             | SP                | 0.00                    | 0.28        | 72.39       | 22.02            | 5.31        | 16  | NP                                | NP                                 | NP                                    | 18.90                                          | 16.29                                         | 0.39             | 0.63                | 2.66             | 0.00                                  | 36.00                        |
| 8.50              | 10.00 |      | Brown coloured Sand                 | DS                             | SP                | 0.00                    | 0.31        | 72.14       | 21.66            | 5.89        | 16  | NP                                | NP                                 | NP                                    | 19.02                                          | 16.40                                         | 0.39             | 0.63                | 2.67             | 0.00                                  | 36.00                        |
| 10.00             |       |      | Brown coloured Sand                 | DS                             | SP                | 0.13                    | 0.32        | 72.18       | 20.50            | 6.87        | 10  | NP                                | NP                                 | NP                                    | 19.13                                          | 17.39                                         | 0.35             | 0.54                | 2.68             | 0.00                                  | 36.00                        |
| DS =              |       |      | Disturbed Sample                    | NMC = Natural Moisture Content |                   |                         |             |             | NP = Non Plastic |             |     |                                   |                                    |                                       |                                                |                                               |                  |                     |                  |                                       |                              |





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

Report No:58/ RB/ 2023-24 Dt :13.06.2023

ANNEXURE - A

Name of Project:Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

| BH. No                                                            | 1      |        | 1      |        | 1      |        |
|-------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|
| Depth (m)                                                         | 0.50 m |        | 1.00 m |        | 2.00 m |        |
| Wt of Tare (W) gm                                                 | 64.11  | 65.72  | 69.24  | 70.20  | 66.65  | 67.48  |
| Tare + Wet Soil (W <sub>1</sub> ) gm                              | 357.91 | 358.91 | 311.94 | 312.57 | 291.99 | 292.88 |
| Tare + Dry Soil (W <sub>2</sub> ) gm                              | 344.71 | 345.88 | 273.05 | 274.81 | 261.49 | 262.54 |
| Wt of Water (W <sub>3</sub> = W <sub>1</sub> -W <sub>2</sub> ) gm | 13.20  | 13.03  | 38.89  | 37.76  | 30.50  | 30.34  |
| Wt Dry Soil (W <sub>4</sub> = W <sub>2</sub> -W) gm               | 280.60 | 280.16 | 203.81 | 204.61 | 194.84 | 195.06 |
| Water Content (%) = (W <sub>3</sub> / W <sub>4</sub> )*100        | 4.70   | 4.65   | 19.08  | 18.45  | 15.65  | 15.55  |
| Average Water Content (%)                                         | 5      |        | 19     |        | 16     |        |





**SPECIFIC GRAVITY TEST**  
( Test method as per IS 2720 ( Part 3 ) - 1980 )

Report No:58/ RB/ 2023-24 Dt:13.06.2023

ANNEXURE - B

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Velithirumutham Village in Srirangam Town & Taluk of Trichy District.

| BH. No                                                 | 1      |        | 1      |        | 1      |
|--------------------------------------------------------|--------|--------|--------|--------|--------|
| Depth (m)                                              | 0.50 m |        | 1.00 m |        | 2.00 m |
| Bottle Number                                          | 1      | 2      | 1      | 2      | 1      |
| Weight of empty Bottle (w <sub>1</sub> ) gm            | 55.49  | 55.49  | 55.49  | 55.49  | 55.49  |
| Weight of bottle + Sample (w <sub>2</sub> ) gm         | 81.71  | 82.37  | 85.63  | 86.94  | 87.15  |
| Weight of bottle + Sample + Water (w <sub>3</sub> ) gm | 166.01 | 167.42 | 168.53 | 170.68 | 169.59 |
| Weight of bottle + Water (w <sub>4</sub> ) gm          | 149.80 | 150.80 | 149.80 | 151.16 | 149.80 |
| Specific Gravity = $(w_2 - w_1) / (w_4 - w_1 - w_2)$   | 2.62   | 2.62   | 2.64   | 2.64   | 2.67   |
| Average value for Specific Gravity                     | 2.62   |        | 2.64   |        | 2.67   |





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 Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

Weight of Soil taken for analysis Ws : 100.00 g

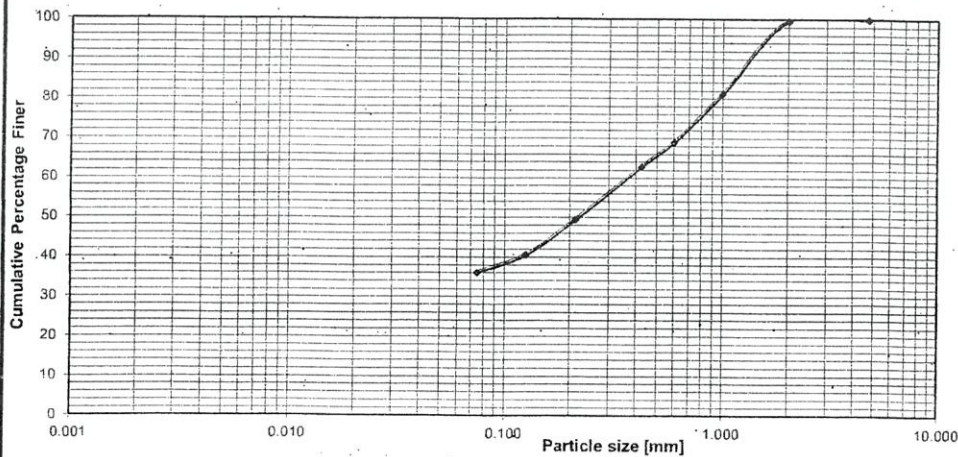
|              |        |
|--------------|--------|
| Bore Hole No | 2      |
| Depth (m)    | 2.00 m |

Weight of Soil more than 0.075mm IS Sieve : 63.93 g

| S.No. | Size of sieves | % Soil<br>PSR %<br>(1) | Cumulative %<br>F %<br>(2) | Average Sieve<br>size (mm)<br>(3) | Product of<br>Columns<br>(1) x (3) |
|-------|----------------|------------------------|----------------------------|-----------------------------------|------------------------------------|
| 1     | 4.750          | 0.00                   | 100.00                     | 4.750                             | 0.00                               |
| 2     | 2.000          | 0.46                   | 99.54                      | 3.375                             | 1.55                               |
| 3     | 1.000          | 18.38                  | 81.16                      | 1.500                             | 27.57                              |
| 4     | 0.600          | 12.25                  | 68.91                      | 0.800                             | 9.80                               |
| 5     | 0.425          | 6.13                   | 62.78                      | 0.513                             | 3.14                               |
| 6     | 0.212          | 13.36                  | 49.42                      | 0.319                             | 4.26                               |
| 7     | 0.125          | 8.90                   | 40.52                      | 0.181                             | 1.61                               |
| 8     | 0.075          | 4.45                   | 36.07                      | 0.113                             | 0.50                               |
| 9     | passing 0.075  |                        |                            |                                   | 48.431                             |

Average Particle Diameter = 0.5045

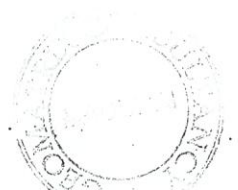
|      |      |        |        |      |        |        |        |
|------|------|--------|--------|------|--------|--------|--------|
| Clay | Fine | Medium | Coarse | Fine | Medium | Coarse | Gravel |
|------|------|--------|--------|------|--------|--------|--------|



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                 | 0.00  |
| Course Sand            | 0.46  |
| Medium Sand            | 36.76 |
| Fine Sand              | 26.71 |
| Silt & Clay            | 36.07 |





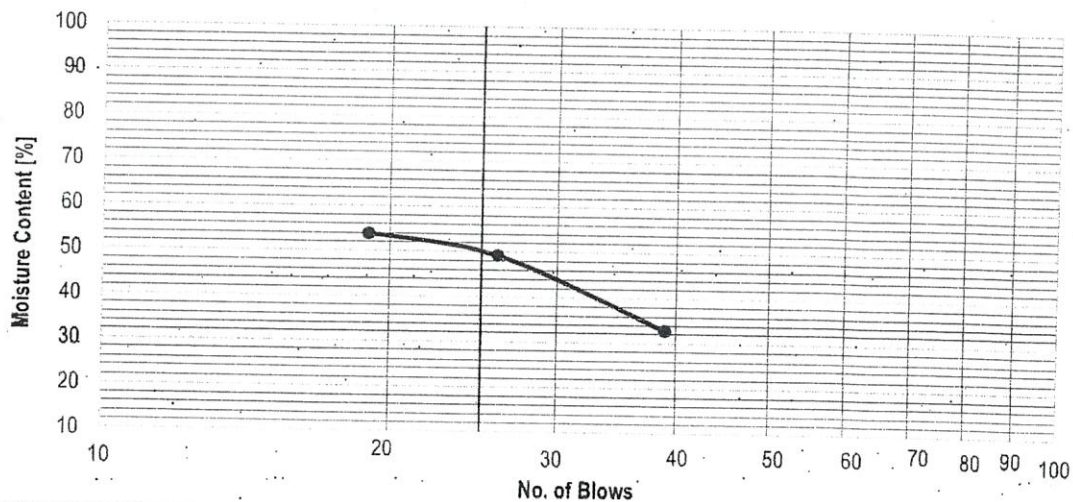
**LIQUID LIMIT & PLASTIC LIMIT TEST**

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

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

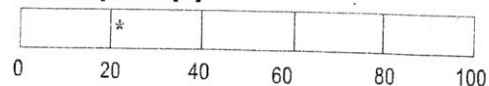
|             |                                |
|-------------|--------------------------------|
| Report No   | 58/ RB/ 2023-24 Dt :13.06.2023 |
| Borehole No | 1                              |
| Depth       | 0.50 m                         |

| Description                        |       | Liquid Limit |       |       | Plastic Limit |       |
|------------------------------------|-------|--------------|-------|-------|---------------|-------|
| No. of Blows                       | N     | 19           | 26    | 39    |               |       |
| Weight of Wet Specimen + Container | WSC g | 76.70        | 70.23 | 76.09 | 76.43         | 74.09 |
| Weight of Dry Specimen + Container | WDC g | 73.47        | 66.89 | 73.73 | 74.58         | 72.35 |
| Weight of Container                | WC g  | 67.47        | 60.09 | 66.53 | 65.46         | 63.84 |
| Weight of Water                    | WW g  | 3.23         | 3.34  | 2.36  | 1.85          | 1.74  |
| Weight of Dry Specimen             | WD g  | 6.00         | 6.80  | 7.20  | 9.12          | 8.51  |
| Moisture Content                   | W %   | 53.83        | 49.12 | 32.78 | 20.29         | 20.45 |



|                  |       |         |
|------------------|-------|---------|
| Liquid Limit     | $W_L$ | 49.79 % |
| Plastic Limit    | $W_P$ | 20.37 % |
| Plasticity Index | $I_P$ | 29.42 % |

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 Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

|              |            |
|--------------|------------|
| Borehole No  | 1          |
| Depth (m)    | 2.00 m     |
| Date of Test | 17.06.2023 |

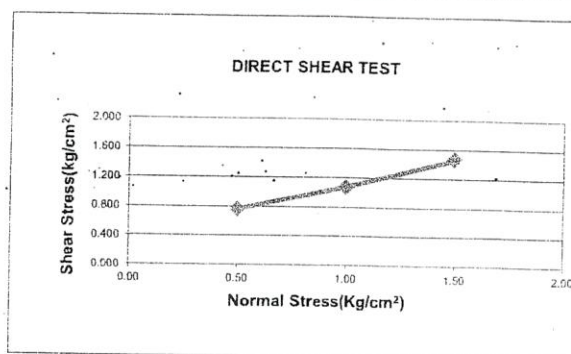
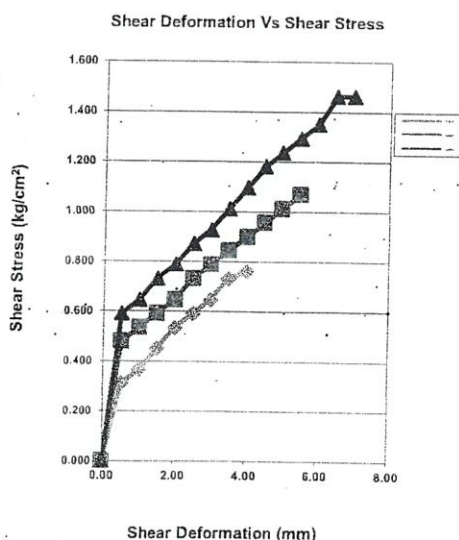
|                       |           |
|-----------------------|-----------|
| L.C of Dial gauge     | : 0.01    |
| Proving Ring Constant | : 0.81421 |
| Area of the Specimen  | : 36      |

| Trail-1                              |                      |                   |                                    |
|--------------------------------------|----------------------|-------------------|------------------------------------|
| Normal Stress:0.5 kg/cm <sup>2</sup> |                      |                   |                                    |
| Horizontal Gauge Reading             | Proving Ring Reading | Shear deformation | Shear Stress (kg/Cm <sup>2</sup> ) |
| 0                                    | 0                    | 0.00              | 0.000                              |
| 50                                   | 13.6798              | 0.50              | 0.309                              |
| 100                                  | 16.167               | 1.00              | 0.366                              |
| 150                                  | 19.8978              | 1.50              | 0.450                              |
| 200                                  | 23.6287              | 2.00              | 0.534                              |
| 250                                  | 26.1159              | 2.50              | 0.591                              |
| 300                                  | 28.6032              | 3.00              | 0.647                              |
| 350                                  | 32.334               | 3.50              | 0.731                              |
| 400                                  | 33.5776              | 4.00              | 0.759                              |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |

| Trail-2                              |                      |                   |                                    |
|--------------------------------------|----------------------|-------------------|------------------------------------|
| Normal Stress:1.0 kg/cm <sup>2</sup> |                      |                   |                                    |
| Horizontal Gauge Reading             | Proving Ring Reading | Shear deformation | Shear Stress (kg/Cm <sup>2</sup> ) |
| 0                                    | 0                    | 0.00              | 0.000                              |
| 50                                   | 21.1415              | 0.50              | 0.478                              |
| 100                                  | 23.6287              | 1.00              | 0.534                              |
| 150                                  | 26.1159              | 1.50              | 0.591                              |
| 200                                  | 28.6032              | 2.00              | 0.647                              |
| 250                                  | 32.334               | 2.50              | 0.731                              |
| 300                                  | 34.8212              | 3.00              | 0.788                              |
| 350                                  | 37.3085              | 3.50              | 0.844                              |
| 400                                  | 39.7957              | 4.00              | 0.900                              |
| 450                                  | 42.2829              | 4.50              | 0.956                              |
| 500                                  | 44.7702              | 5.00              | 1.013                              |
| 550                                  | 47.2574              | 5.50              | 1.069                              |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |

| Trail-3                              |                      |                   |                                    |
|--------------------------------------|----------------------|-------------------|------------------------------------|
| Normal Stress:1.5 kg/cm <sup>2</sup> |                      |                   |                                    |
| Horizontal Gauge Reading             | Proving Ring Reading | Shear deformation | Shear Stress (kg/Cm <sup>2</sup> ) |
| 0                                    | 0                    | 0.00              | 0.000                              |
| 50                                   | 26.1159              | 0.50              | 0.591                              |
| 100                                  | 28.6032              | 1.00              | 0.647                              |
| 150                                  | 32.334               | 1.50              | 0.731                              |
| 200                                  | 34.8212              | 2.00              | 0.788                              |
| 250                                  | 38.5521              | 2.50              | 0.872                              |
| 300                                  | 41.0393              | 3.00              | 0.928                              |
| 350                                  | 44.7702              | 3.50              | 1.013                              |
| 400                                  | 48.501               | 4.00              | 1.097                              |
| 450                                  | 52.2319              | 4.50              | 1.181                              |
| 500                                  | 54.7191              | 5.00              | 1.238                              |
| 550                                  | 57.2063              | 5.50              | 1.294                              |
| 600                                  | 59.6935              | 6.00              | 1.350                              |
| 650                                  | 64.668               | 6.50              | 1.463                              |
| 700                                  | 64.668               | 7.00              | 1.463                              |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |
|                                      |                      |                   |                                    |

| Normal Stress (kg/cm <sup>2</sup> ) | Proving Ring reading at failure | Shear Stress (kg/cm <sup>2</sup> ) |
|-------------------------------------|---------------------------------|------------------------------------|
| 0.50                                | 33.57761977                     | 0.759                              |
| 1.00                                | 47.25739078                     | 1.069                              |
| 1.50                                | 64.66800844                     | 1.463                              |



1. Angle of Shearing Resistance ( $\Phi$ ) = 35 Degrees
2. Cohesion (C) = 0.00 Kg/cm<sup>2</sup>





ANNEXURE - F

DENSITY CALCULATIONS

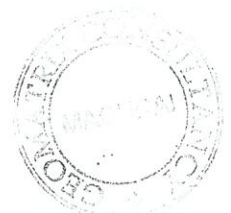
Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham

|              |      |
|--------------|------|
| Bore Hole 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)           | 3,551.60 |
| 3       | Weight of Soil (gm)                 | 158.60   |
| 4       | Volume of Box (cm <sup>3</sup> )    | 90.00    |
| 5       | Bulk Density (gm /cm <sup>3</sup> ) | 1.762    |
| 6       | Weight of Container (gm)            | 44.25    |
| 7       | Weight of Container + Wet Soil (gm) | 65.25    |
| 8       | Weight of Container + Dry Soil (gm) | 63.15    |
| 9       | Moisture Content (%)                | 11.11    |
| 10      | Dry Density (gm /cm <sup>3</sup> )  | 1.586    |

RESULT

- 1 WET DENSITY OF SOIL = 1.762 t / m<sup>3</sup>
- 2 DRY DENSITY OF SOIL = 1.586 t / m<sup>3</sup>





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Report No:58/ RB/ 2023-24' Dt :13.06.2023

ANNEXURE - G

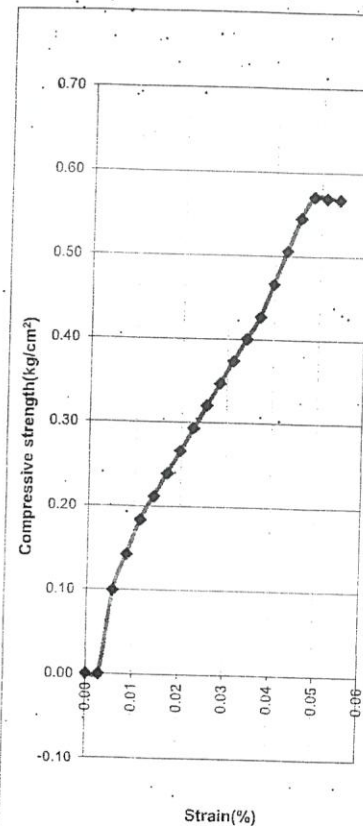
UNCONFINED COMPRESSION TEST  
( Test method as per IS 2720 ( Part 10 ) - 1995)

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

|          |         |
|----------|---------|
| Diameter | 38 mm   |
| Length   | 88 mm   |
| Constant | 0.31530 |

|              |            |
|--------------|------------|
| Bore Hole No | 1          |
| Depth (m)    | 1.00 m     |
| Date of Test | 17.06.2023 |

| Deformation dial Reading | Axial deformation (mm) | Axial Strain (e) | Area (cm <sup>2</sup> ) | Proving Ring Readings | Axial force N (Kgf) | Compressive strength (kg/cm <sup>2</sup> ) |
|--------------------------|------------------------|------------------|-------------------------|-----------------------|---------------------|--------------------------------------------|
| (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                   | 0.00                  | 0.000               | 0.00                                       |
| 50.00                    | 0.50                   | 0.01             | 11.41                   | 3.60                  | 1.135               | 0.10                                       |
| 75.00                    | 0.75                   | 0.01             | 11.45                   | 5.14                  | 1.622               | 0.14                                       |
| 100.00                   | 1.00                   | 0.01             | 11.48                   | 6.69                  | 2.109               | 0.18                                       |
| 125.00                   | 1.25                   | 0.01             | 11.51                   | 7.72                  | 2.433               | 0.21                                       |
| 150.00                   | 1.50                   | 0.02             | 11.55                   | 8.75                  | 2.757               | 0.24                                       |
| 175.00                   | 1.75                   | 0.02             | 11.58                   | 9.77                  | 3.082               | 0.27                                       |
| 200.00                   | 2.00                   | 0.02             | 11.61                   | 10.80                 | 3.406               | 0.29                                       |
| 225.00                   | 2.25                   | 0.03             | 11.65                   | 11.83                 | 3.731               | 0.32                                       |
| 250.00                   | 2.50                   | 0.03             | 11.68                   | 12.86                 | 4.055               | 0.35                                       |
| 275.00                   | 2.75                   | 0.03             | 11.72                   | 13.89                 | 4.379               | 0.37                                       |
| 300.00                   | 3.00                   | 0.03             | 11.75                   | 14.92                 | 4.704               | 0.40                                       |
| 325.00                   | 3.25                   | 0.04             | 11.79                   | 15.95                 | 5.028               | 0.43                                       |
| 350.00                   | 3.50                   | 0.04             | 11.82                   | 17.49                 | 5.515               | 0.47                                       |
| 375.00                   | 3.75                   | 0.04             | 11.86                   | 19.03                 | 6.001               | 0.51                                       |
| 400.00                   | 4.00                   | 0.05             | 11.89                   | 20.58                 | 6.488               | 0.55                                       |
| 425.00                   | 4.25                   | 0.05             | 11.93                   | 21.61                 | 6.812               | 0.57                                       |
| 450.00                   | 4.50                   | 0.05             | 11.96                   | 21.61                 | 6.812               | 0.57                                       |
| 475.00                   | 4.75                   | 0.05             | 12.00                   | 21.61                 | 6.812               | 0.57                                       |



RESULTS

qu = 0.571 kg/cm<sup>2</sup>

Cohesion = C = 0.300 kg/cm<sup>2</sup>



**GEOMATRIX CONSULTANCY**  
Geo-Tech. Consultants & Engineers

Name of Project: Sub Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

Report No:58/ RB/ 2023-24

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 <sub>f</sub> =                     | 3.60 m                                  |
| Correction Factor for Water Table                                       | W' =                                 | 0.50                                    |
| Unit weight of soil                                                     | γ <sub>soil</sub> =                  | 1.848 T/m <sup>3</sup>                  |
| Cohension                                                               | "C" =                                | 0.00 T/m <sup>2</sup>                   |
| Angle of shearing resistance(general shear)                             | φ =                                  | 35.00°                                  |
| Angle of shearing resistance(Local shear)                               | φ' =                                 | 24.96° (Tan <sup>-1</sup> (2/3 * tanφ)) |
| Safety factor                                                           | F =                                  | 3.00                                    |
| Effective Surcharge of Soil above Footing Base                          | q =                                  | 3.05 T/m <sup>2</sup>                   |
| Type of soil                                                            | = Dense Sand mixed with Clay         |                                         |
| 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**

$$N_q = \tan^2 (45^\circ + \phi/2) (e^{\gamma \tan \phi}) = 33.30$$

$$N_c = (N_q - 1) \cot \phi = 46.12$$

$$N_\gamma = 2 (N_q + 1) \tan \phi = 48.03$$

**For LOCAL SHEAR FAILURE**

$$N'_q = \tan^2 (45^\circ + \phi'/2) (e^{\gamma \tan \phi'}) = 10.62$$

$$N'_c = (N'_q - 1) \cot \phi' = 20.66$$

$$N'_\gamma = 2 (N'_q + 1) \tan \phi' = 10.81$$



### The Shape Factors

| Shape of Footing         | $S_c$      | $S_q$      | $S_y$      |
|--------------------------|------------|------------|------------|
| 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 |
| $S_y =$        | 0.800 |

### The Depth Factor

|               |                                                                     |       |
|---------------|---------------------------------------------------------------------|-------|
| $d_c =$       | $1 + 0.2 D_f / B \times \tan (45^\circ + \phi'/2) =$                | 1.922 |
| $d_q = d_y =$ | 1 for $\phi' < 10^\circ$                                            | 1.000 |
| $d_q = d_y =$ | $1 + 0.1 D_f / B \tan(45^\circ + \phi'/2)$ for $\phi' > 10^\circ =$ | 1.461 |

### The Inclination Factor

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

$\alpha$  = Inclination of the load to the vertical in degrees = 0

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

$$= 135.99 \quad \text{T/sq.m}$$

### SAFE BEARING CAPACITY :

$$\text{SBC} = q_d / F.s = 45.33 \text{ T/sq.m} \quad \text{or} \quad 444.70 \text{ kN/m}^2$$

### 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,

Dense Sand mixed with Clay

$$E_s = 136200 \text{ kN/m}^2$$

$$(\text{or}) E_s = 13620.00 \text{ t/m}^2$$

$S_i$  = Immediate settlement =

$$= \frac{I \times Q_s \times B(1 - \mu^2) / E_s}{0.95 \times 45.33 \times (1.5 \times (1 - 0.25^2)) / 13620}$$

$$S_i = 0.0044 \text{ m}$$

$$0.0044 \times 1000$$

$$\text{Settlement} = 4 \text{ mm} < 50 \text{ mm}$$

Hence SAFE

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



**GEOMATRIX CONSULTANCY**  
Geo-Tech. Consultants & Engineers

Name of Project: **Sub-Soil Investigation for the Construction of RESIDENTIAL BUILDING at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.**

Report No:58/ RB/ 2023-24

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 <sub>f</sub> =                     | 3.60 m                                  |
| Correction Factor for Water Table                                         | W' =                                 | 0.50                                    |
| Unit weight of soil                                                       | Y <sub>soil</sub> =                  | 1.869 T/m <sup>3</sup>                  |
| Cohension                                                                 | "C" =                                | 0.00 T/m <sup>2</sup>                   |
| Angle of shearing resistance(general shear)                               | φ =                                  | 35.00°                                  |
| Angle of shearing resistance(Local shear)                                 | φ' =                                 | 24.96° (Tan <sup>-1</sup> (2/3 * tanφ)) |
| Safety factor                                                             | F =                                  | 3.00                                    |
| Effective Surcharge of Soil above Footing Base                            | q =                                  | 3.13 T/m <sup>2</sup>                   |
| Type of soil                                                              | = Dense Sand mixed with Clay         |                                         |
| 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**

$$\begin{aligned}
 N_q &= \tan^2 (45^\circ + \phi/2) (e^{\pi \tan \phi}) = 33.30 \\
 N_c &= (N_q - 1) \cot \phi = 46.12 \\
 N_\gamma &= 2 (N_q + 1) \tan \phi = 48.03
 \end{aligned}$$

**For LOCAL SHEAR FAILURE**

$$\begin{aligned}
 N'_q &= \tan^2 (45^\circ + \phi'/2) (e^{\pi \tan \phi'}) = 10.62 \\
 N'_c &= (N'_q - 1) \cot \phi' = 20.66 \\
 N'_\gamma &= 2 (N'_q + 1) \tan \phi' = 10.81
 \end{aligned}$$



### The Shape Factors

| Shape of Footing         | $S_c$      | $S_q$      | $S_\gamma$ |
|--------------------------|------------|------------|------------|
| 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

|                    |                                                                   |       |
|--------------------|-------------------------------------------------------------------|-------|
| $d_c =$            | $1 + 0.2 D_f / B \times \tan (45^\circ + \phi'/2) =$              | 1.922 |
| $d_q = d_\gamma =$ | 1 for $\phi' < 10^\circ$                                          | 1.000 |
| $d_q = d_\gamma =$ | $1 + 0.1 D_f / B \tan(45^\circ + \phi'/2)$ for $\phi' > 10^\circ$ | 1.461 |

### The Inclination Factor

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

$\alpha$  = Inclination of the load to the vertical in degrees = 0

$$\text{Net Ultimate Bearing Capacity, } q_d = \frac{(c \times N_c \times S_c \times d_c) + (q \times (N_q - 1) \times S_q \times d_q \times i_q) + (0.5 \times B \times \gamma \times N_\gamma \times S_\gamma \times d_\gamma \times i_\gamma \times W)}{(c \times N'_c \times S_c \times d_c) + (q \times (N'_q - 1) \times S_q \times d_q \times i_q) + (0.5 \times B \times \gamma \times N'_\gamma \times S_\gamma \times d_\gamma \times i_\gamma \times W)}^{1/2}$$

$$= 139.04 \text{ T/sq.m}$$

### SAFE BEARING CAPACITY :

$$\text{SBC} = q_d / F.s = 46.35 \text{ T/sq.m} \quad \text{or} \quad 454.67 \text{ kN/m}^2$$

### 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,

**Dense Sand mixed with Clay**

$$E_s = 136200 \text{ kN/m}^2$$

$$(\text{or}) E_s = 13620.00 \text{ t/m}^2$$

$S_i$  = Immediate settlement =

$$= \frac{I \times Q_s \times B(1 - \mu^2) / E_s}{0.95 \times 46.35 \times (1.5 \times (1 - 0.25^2)) / 13620}$$

$$S_i = 0.0045 \text{ m}$$

$$0.0045 \times 1000$$

$$\text{Settlement} = 5 \text{ mm} < 50 \text{ mm}$$

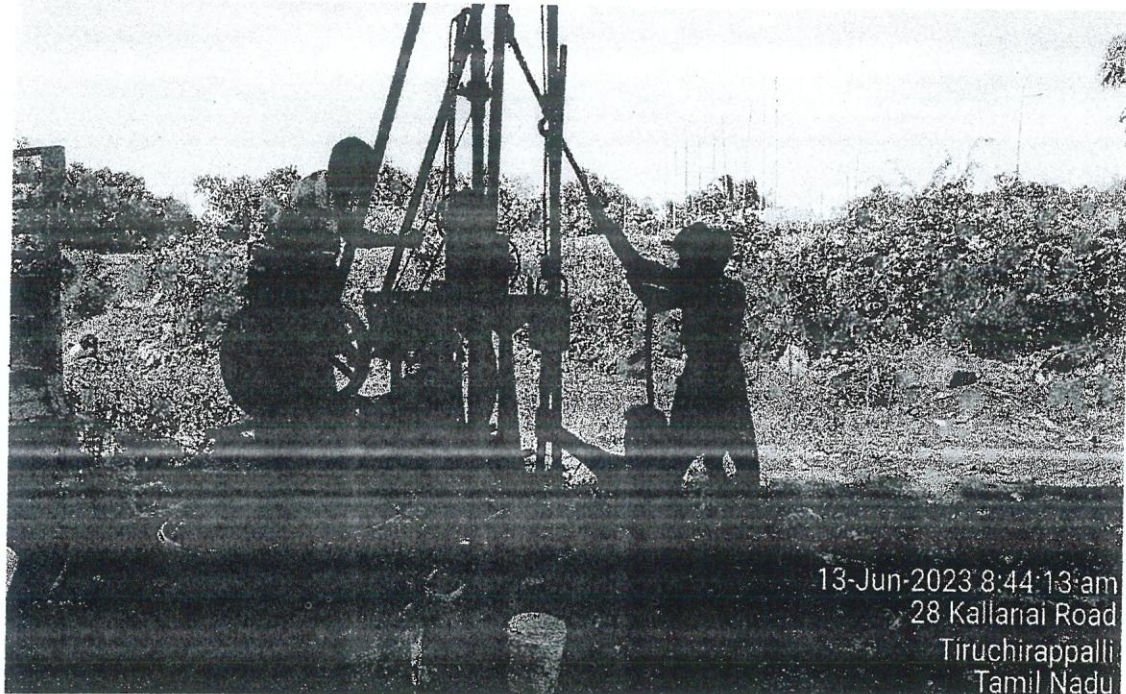
The Max Allowable Differential Settlement for Sand & Gravel is 50mm and for Silt & Clay is 75mm.

Hence SAFE

Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

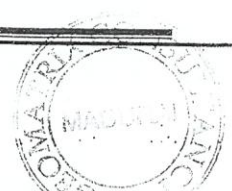
BOREHOLE -1 SITE PHOTOS:



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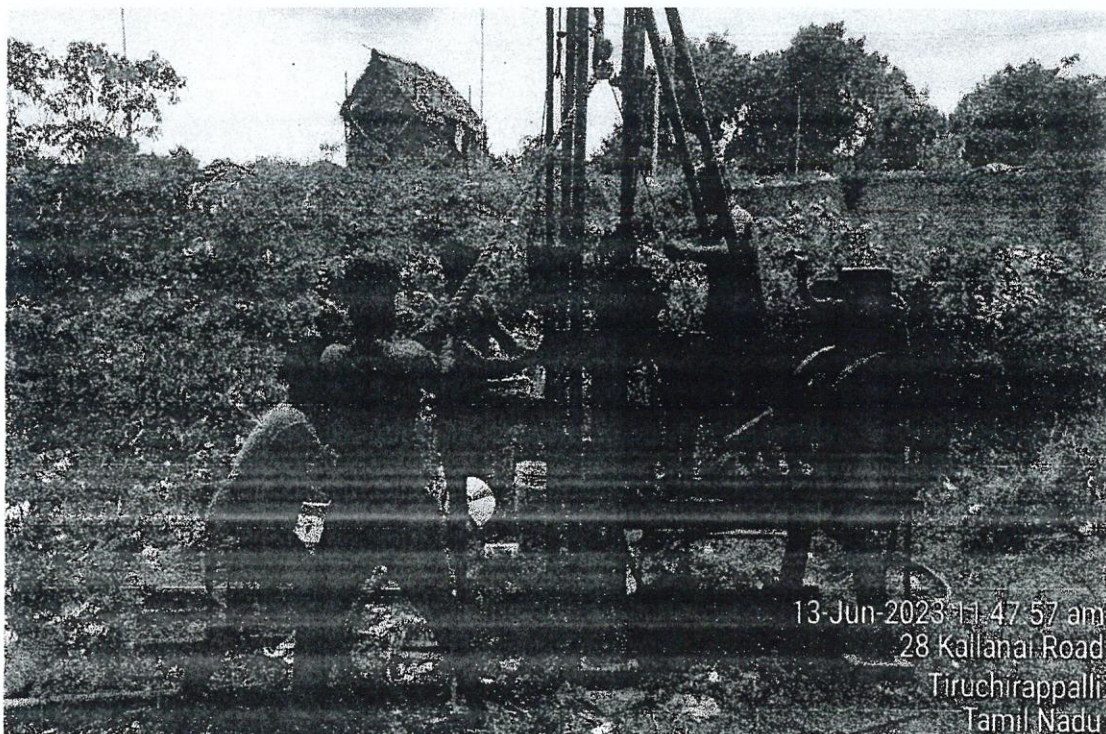
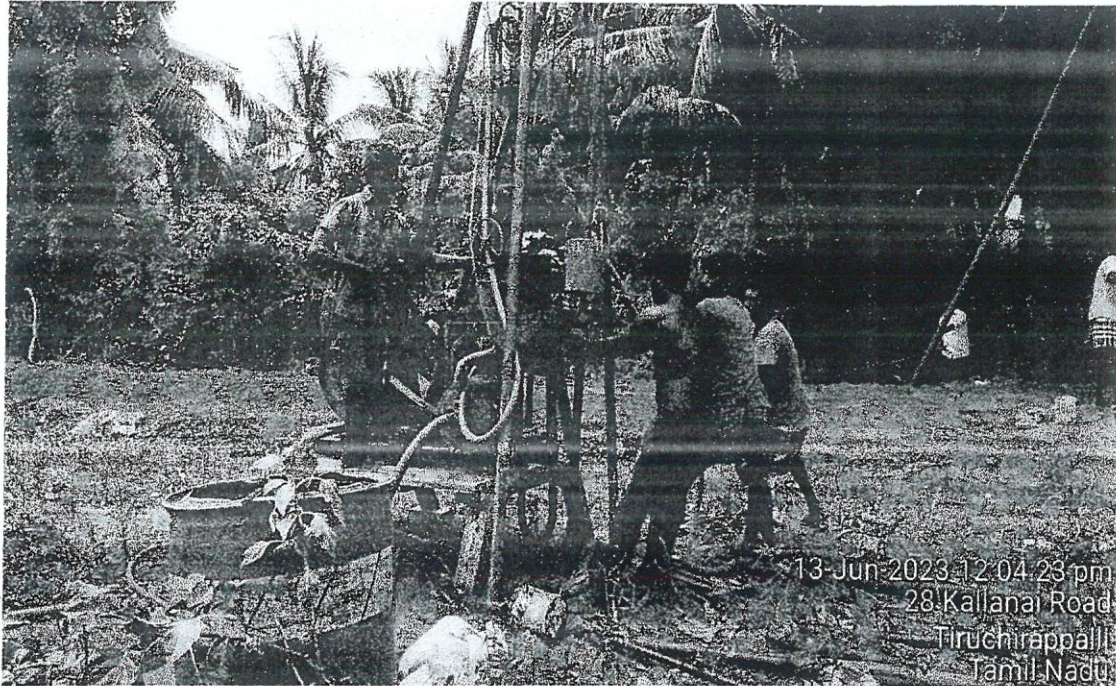
Madurai ,Ph :75980 31360



Construction of RESIDENTIAL BUILDING

at Vellithirumutham Village in Srirangam Town & Taluk of Trichy District.

BOREHOLE -2 SITE PHOTOS:



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DEPUTY DIRECTOR OF TOWN AND COUNTRY PLANNING  
CHENGALPATTU REGION  
No.124, Municipal Commercial Complex, G.S.T.Road, Chengalpattu - 603 001  
E-mail : [ddcplregion@gmail.com](mailto:ddcplregion@gmail.com), Phone : 044 - 27422144

### PROFESSIONAL REGISTRATION CERTIFICATE

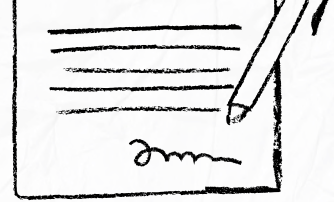
This is to certify that **Mr. K.GANAPATHI** has enrolled as **Registered Geo-Technical Engineer (RGTE)** with Deputy Director of Town and Country Planning, Chengalpattu Region who has the qualification of **M.E. (Soil mechanics and foundation Engg.)** and experience in the relevant field for **06 years**.

He has been given the Registration No. **CGLRGN/RGTE/2019/08/012** on **02.08.19**. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu is 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 **01.08.2024**.

Deputy Director,  
Chengalpattu Region





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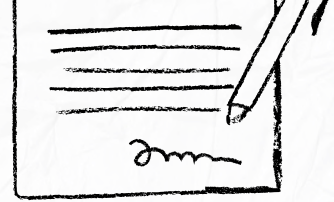
### **NRI & Investment Services**

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