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CHENNAI SOIL LAB

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GEO – TECHNICAL REPORT

NAME OF THE PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) IN S.R.NO: 29 & 30, T.S.NO: 42, AT PLOT NO: E8, DOOR NO: 1/1, NANGANALLUR CO – OPERATIVE BUILDING SCHEME 42 nd STREET, NANGANALLUR, CHENNAI

CLIENT

M/S NITHYA BUILDERS,

NO: 8, 6TH MAIN ROAD,

NANGANALLUR,

CHENNAI

Job No: 3182

SEP - 2023

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REPORT ON SUB SOIL INVESTIGATION AND RECOMMENDATION

1. INTRODUCTION

1.1 Overview

1.1.1 The geotechnical investigation has been done to ascertain the soil properties and to aid the design of foundations for proposed construction of Residential building at Nanganallur

1.2 Authority

1.2.1 A comprehensive soil investigation programme has been conducted by authorization by the Client

2.1 Site Location:

2.1.1 The site for the proposed construction of Residential building at Nanganallur

2.2 Site Layout and Topography

2.2.1 The site is fairly level

2.2.2 The color of the soil surface is Brown.

2.3 The structure:

2.3.1 As per the client's information the proposed construction of Residential building at Nanganallur with Stilt floor and five upper floors

3. OBJECT OF INVESTIGATION:

i. For designing the foundation system of the proposed structure. The following data are required

a. Type of Foundation System
b. Depth below the Ground level at which the foundation system is to be laid
c. Allowable bearing pressure on the foundation's levels.

ii. To determine the above factor, the following information are required:

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a. The sub-Soil profile indicating thickness of the various soil strata, to a depth down to the influence zone below the foundations.
b. Engineering properties of the Soil strata at various levels.
c. Physical Characteristics of the Soil Strata.
d. Variation of the Strength of the Soil Strata with depth.

The object of conducting Field and laboratory investigation and analysis is to get data for the parameters and for providing the recommendation

4. SCOPE OF INVESTIGATION:

a. Sinking 2 boreholes down to 6.00m, depth or refusal strata (where N value is > 50 whichever is met earlier, as required by the client.
b. Conducting Standard Penetration test at Regular Intervals.
c. Recording ground water table levels, if met with.
d. Conducting relevant laboratory test on soil samples recovered.
e. Preparation and submission of a technical report containing the details of the test carried out, their analysis and recommendation regarding the foundation system to be adopted.

5. FIELD INVESTIGATION

5.1 General Details

i. Weather Conditions:

Weather was clear during field investigation which was carried out on Fourth week of September 2023

ii. Locations of Tests

The locations of the boreholes were shown by the client.

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5.2 Boreholes:

5.2.1 The boreholes were progressed by Rotary method.

5.2.2 The boreholes were terminated at refusal strata, where further drilling and penetration was not possible. The refusal Strata encountered in the form of Soft Disintegrated Rock. The N Value in the strata is >50. The terminated depth of boreholes is given in the following table.

Bore Hole No	Terminated depth from Existing G.L (m)
1	6.00m
2	6.00m

5.2.3 Standard Penetration Test was performed in the borehole. The standard split spoon sampler, attached to a string of drill rods was lowered to the bottom of the hole and allowed to rest under self-weight. The drill rods were connected to driving assembly which consisted of a hoisting equipment, a drive weight (Hammer) of 63.5kg, and a guide to ensure a 75cm free fall of hammer on an anvil. The number of hammer blows that were required to penetrate the sampler through three runs of 150mm each was recorded. Initial driving of 150mm was disregarded and the number of blows required to drive the sampler through the remaining 300mm is called BLOW COUNT or PENETRATION NUMBER, N. At the end of the test, the sampler was withdrawn and the soil extracted for subsequent testing in the laboratory. If the penetration was less than 30cm for 50 blows, it is considered as refusal and the actual penetration was recorded.

5.2.4 Undisturbed soil samples were recovered by thin-walled samplers conforming to IS 2132. These tubes had an area ratio of less than 10%. The diameter of Soil samples was 50mm and its length was 45cm. The ends of sample tube were sealed by wax to prevent loss/ Ingress of moisture and labeled.

6. GROUND WATER TABLE

Ground water table was encountered at 3.00m in the borehole-drilled depth.



7. LABORATORY INVESTIGATION

Laboratory tests were conducted on disturbed soil samples to determine the engineering parameters for the analysis of bearing capacity of the foundation strata. The following laboratory tests were conducted on soil samples collected as per IS: 2720.

a. Natural Moisture Content
b. Grain size analysis
c. Liquid limits
d. Direct shear test
e. Specific Gravity

8. SUB SOIL PROFILE

From the visual identification and laboratory test results of the samples obtained from boreholes, it is concluded that the sub soil is basically made-up of two distinctive layers they are

For BH-1

Layers	Depth (m)	Type of Soil	"N" Value
1	0.00-3.00m	Gravel with Sandy Clay	16>55
2	3.00-6.00m	Gravel with Sand	>55

For BH-2

Layers	Depth (m)	Type of Soil	"N" Value
1	0.00-3.00m	Gravel with Sandy Clay	14>55
2	3.00-6.00m	Gravel with Sand	>55

The soil profile details are presented in the bore-chart

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9. RECOMMENDATION

The recommendation for the proposed structure Residential building at Nanganallur is given below:

(a) Types of Foundation	:	Isolated open footing
(b) Depth of foundation level	:	2.30m below the existing ground
(c) Allowable bearing pressure	:	25 T/m^2 / 256.851 kN

Note: The recommendation given in this report have been arrived at on the basis of design with the parameters which have been judiciously adopted by giving due consideration result from field and laboratory investigation as well as Chennai Soil Lab experience in working in various types of soil and rock condition all over India. Open shallow isolated column footings located at a depth of 2.30m below the G.L can be adopted

10. CONSTRUCTION ADVISORY

a. The soil of each stratum has been described with name, color etc. During excavation any variation in the nature of the soil and its condition from those given in this Report should be noted and appropriate action should be taken.

11. LIMITATIONS

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

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12. REFERENCES

A list of IS codes referred for providing the recommendation and that which might be required to implement the same has been given below

Field Investigation

IS: 1498 – 1970: Classification and identification of Soils for general engineering purposes (First Revision) (Amendment 2)

IS: 1892 – 1979: Code of Practice for Sub Surface investigation for Foundations (First Version)

IS: 2132 – 1986: Code of practice for thin-walled tube sampling of Soils (Second Revision)

Laboratory Tests:

IS: 2720 – 1983 (Part 1): Method of test for Soils: Preparation of dry Soil Samples for Various Tests (Second Revision)

IS: 2720 – 1980 (Part 2): Method of test for Soils: Determination of water content (Second revision) Amendment I

IS: 2720 – 1980 (Part 3/ Sec 1): Method of test of Soils: Determination of Specific Gravity: Fine grained Soils. (First Revision)

IS: 2720 – 1980 (Part 3/ Sec 2): Method of test of Soils: Determination of Specific Gravity: Fine, Medium & Coarse-grained Soils (First revision)

IS: 2720 – 1985 (Part 4): Method of test for Soils: Grain Size Analysis (Second revision)

IS: 2720 – 1985 (Part 5): Method of test for Soils: Determination of Liquid Limit and Plastic Limit (Second revision)

IS: 2720 – 1977 (Part 40): Method of test for Soils: Determination of free Swell Index of Soils

Foundation Construction:

IS: 1080 – 1986: Code of Practice for design and Construction of Shallow foundation on Soils (other than raft, Ring and shell) (Second revision)

IS: 1904 – 1986: Code of practice for design and construction of foundation in Soils: General requirements (Third revision)

IS: 6403 – 1981: Code of practice for determination of bearing capacity of shallow foundations: First revision (Amendment)

IS: 8009 – 1976 (Part 1): Code of practice for calculation of settlements of foundations: Shallow foundations subject to symmetrical static vertical load (Amendment)

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DETERMINATION OF BEARING CAPACITY OF SHALLOW FOUNDATIONS
(Based on IS: 6403-1981)

Footing size = 2.00m x 2.00 m

Depth of foundation = 2.30 m

Ground Water table level = 3.00 m

Submerged density (γ') of soil above footing base = 0.80 t/m³

Bulk density (γ) of soil below footing base = 1.80 t/m³

Factor of safety = 2.50

Shape factor	Depth factor	Inclination factor
Sq = 1.20	Dq = 1.20	Iq = 1.00
Sγ = 0.80	Dγ = 1.20	Iγ = 1.00

Water table correction factor (w') = 0.50

Effective surcharge at base level (q) = 1.84 t/m²

Ultimate Net B.C = Qult_n = q * (Nq - 1)* Sq * dq * iq +0.5 *B*γ * Nγ * Sγ * dγ * iγ *w'

Angle of internal Friction (ø) = 30.00 deg

Bearing Capacity factors

Nq = 18.40
Nγ = 22.40

Thus Qult_n = 65.456 / 2.50

Allowable Bearing Capacity (Qall) = 26.182 T/m²

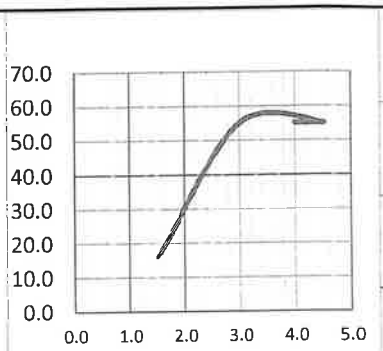
Say = 25 T/m² / 256.851 kN

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BORE LOG-1

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

BH.NO	: 1	G.W.L	3.00m
Type of Boring	: Rotary	Dia of Boring	:150mm
Started on	22.09.2023	Location	: Ref. Fig
Ended on	22.09.2023	Total Depth	6.00m
		Site	Nanganallur

R.L of Layers	Soil Profiles	Soil Description	SPT Details					Type of Samples	IS Classification	Graphical Presentation of Soil Strata with
			Depth (m)	15	30	45	N			
1.50		Gravel with Sandy clay	1.50	5	6	10	16	SPT	SM	
3.00			3.00	50/37cm Balance			>55	SPT		
4.50		Gravel with Sand	4.50	50/44cm Balance			>55	SPT		
6.00			6.00	55/Rebound			>55	SPT		

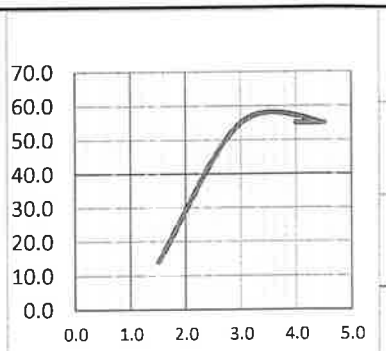
Bore Hole Terminated 6.00m Below G.L

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BORE LOG-2

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

BH.NO	: 2	G.W.L	3.00m
Type of Boring	: Rotary	Dia of Boring	:150mm
Started on	22.09.2023	Location	: Ref. Fig
Ended on	22.09.2023	Total Depth	6.00m
		Site	Nanganallur

R.L of Layers	Soil Profiles	Soil Description	SPT Details					Type of Samples	IS Classification	Graphical Presentation of Soil Strata with
			Depth (m)	15	30	45	N			
1.50		Gravel with Sandy clay	1.50	6	6	8	14	SPT	SM	
3.00			3.00	50/39cm Balance			>55	SPT		
4.50		Gravel with Sand	4.50	50/44cm Balance			>55	SPT		
6.00			6.00	55/Rebound			>55	SPT		

Bore Hole Terminated 6.00m Below G.L

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PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

Bore Hole No:	1			Ground Water Level:	3.00m

LABORATORY TEST RESULTS

N' Value	Depth (m)	Soil Description	IS-Classification	Index Properties (%)						Specific Gravity	Grain Size Analysis (%)					Direct Shear	
				Natural Moisture Content (NMC)	Liquid Limit	Plastic Limit	Plastic Index	Consisitancy index (%)	Free Swell Index (%)		Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Cohesion, C (kg/Sq.cm.)	Angle of friction
16	1.50	Gravel with Sandy Clay		15						2.46	6	3	21	27	43		
>55	3.00			14						2.47	24	9	21	17	29		
>55	4.50	Gravel with Sand		12						2.48	2	21	74	0	3		
>55	6.00			10						2.50	2	18	76	0	4		

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PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

Bore Hole No: 2 | **Ground Water Level:** 3.00m

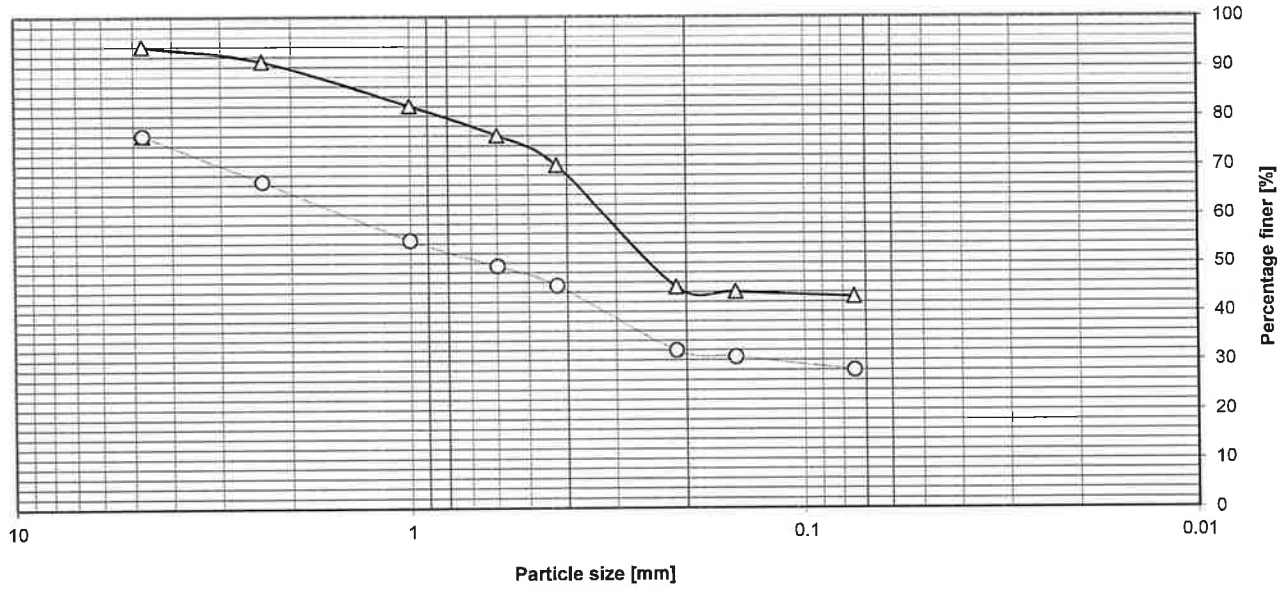
LABORATORY TEST RESULTS

N' Value	Depth (m)	Soil Description	IS-Classification	Index Properties (%)						Specific Gravity	Grain Size Analysis (%)					Direct Shear	
				Natural Moisture Content (NMC)	Liquid Limit	Plastic Limit	Plastic Index	Consisitancy index (%)	Free Swell Index (%)		Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Cohesion, C (kg/Sq.cm.)	Angle of friction
14	1.50	Gravel with Sandy Clay		18						2.45	7	3	23	25	42		
>55	3.00			16						2.48	27	11	19	15	28		
>55	4.50	Gravel with Sand		13						2.48	3	20	75	0	2		
>55	6.00			11						2.50	2	20	77	0	1		

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GRAIN SIZE DISTRIBUTION CHART

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

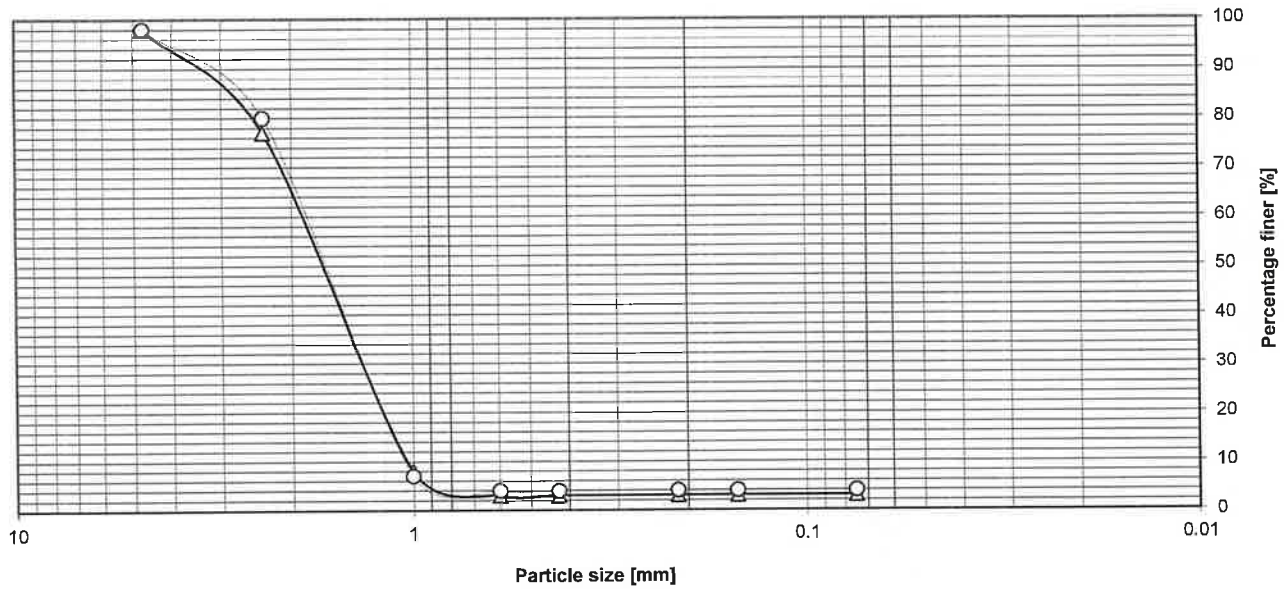


		Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	
		Gravel			Sand			Silt			CLAY
		>4.75mm			2.36mm to 0.075mm			0.075mm to 0.002mm			<0.002mm
BH-1	Depth:1.50m	△	6		3	21	27	43			
BH-1	Depth:3.00m	○	24		9	21	17	28			

CHENNAI SOIL LAB * CHENNAI-107 *

GRAIN SIZE DISTRIBUTION CHART

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

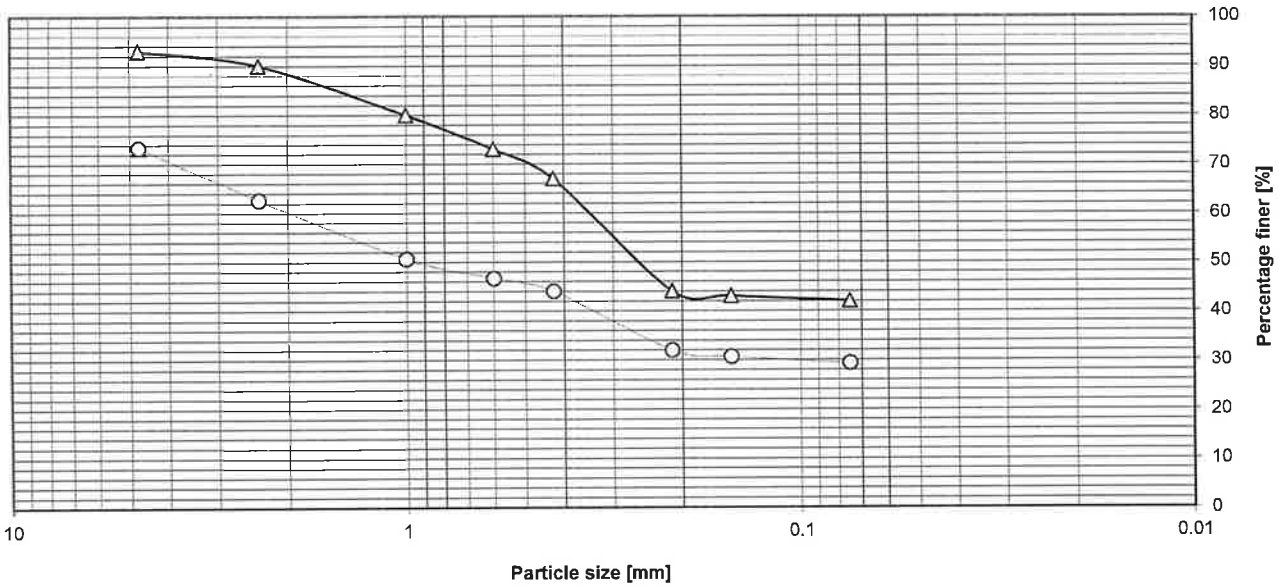


		Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	
		Gravel			Sand			Silt			CLAY
		>4.75mm			2.36mm to 0.075mm			0.075mm to 0.002mm			<0.002mm
BH-1	Depth:4.50m	△	2		21	74	0	3			
BH-1	Depth:6.00m	○	2		18	76	0	4			

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GRAIN SIZE DISTRIBUTION CHART

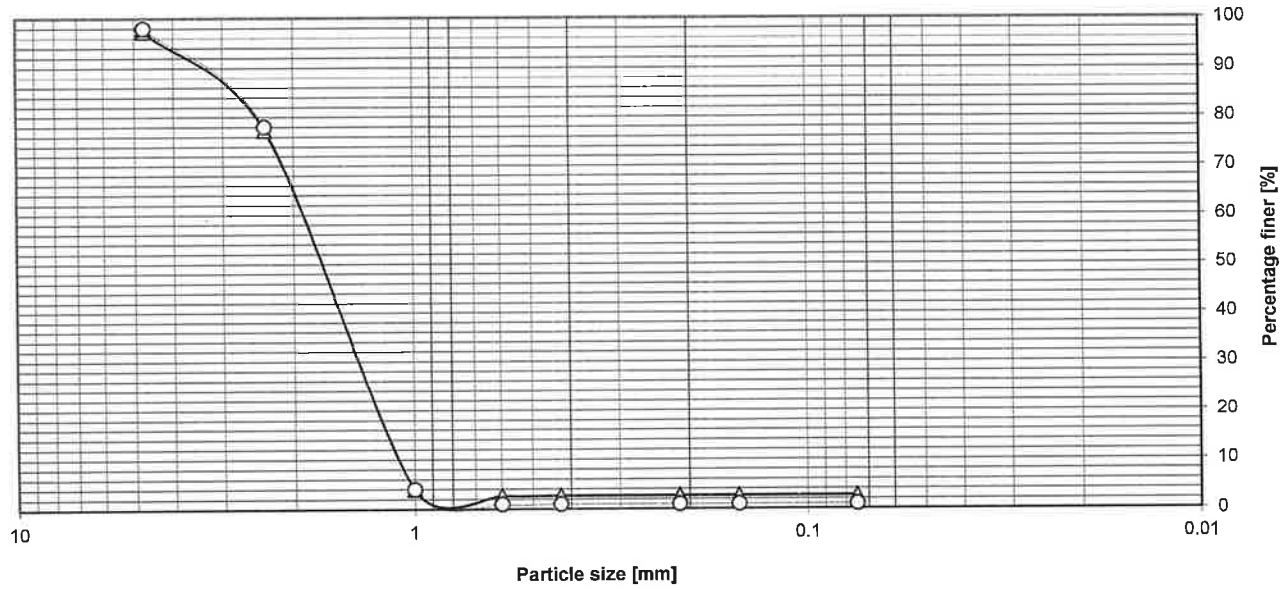
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		Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	
		Gravel			Sand			Silt			CLAY
		>4.75mm			2.36mm to 0.075mm			0.075mm to 0.002mm			<0.002mm
BH-2	Depth:1.50m	△	7		3	23	25	42			
BH-2	Depth:3.00m	○	27		11	19	15	29			

GRAIN SIZE DISTRIBUTION CHART

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR



		Coarse	Medium	Fine	Coarse	Medium	Fine	Coarse	Medium	Fine	
		Gravel			Sand			Silt			CLAY
		>4.75mm			2.36mm to 0.075mm			0.075mm to 0.002mm			<0.002mm
BH-2	Depth:4.50m	△	3		20	75	0	3			
BH-2	Depth:6.00m	○	2		20	77	0	1			

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PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

Natural Moisture Content Data Sheet

BH.No/ Pit no	1		1		1		1		2		2	
Depth (m)	1.50		3.00		4.50		6.00		1.50		3.00	
Tare No	1	2	3	4	5	6	1	2	3	4	5	6
Wt of Tare (gr)	26.00	25.00	25.00	24.00	25.00	22.00	25.00	24.00	26.00	26.00	27.00	24.00
Tare + Soil (gr)	37.00	38.00	36.00	37.00	39.00	37.00	38.00	37.00	38.00	36.00	38.00	36.00
Tare+Dry soil (gr)	35.50	36.30	34.60	35.40	37.50	35.30	36.80	35.80	36.20	34.50	36.50	34.40
Wt of Water (gr)	1.50	1.70	1.40	1.60	1.50	1.70	1.20	1.20	1.80	1.50	1.50	1.60
Wt Dry soil (gr)	9.50	11.30	9.60	11.40	12.50	13.30	11.80	11.80	10.20	8.50	9.50	10.40
Water Content	15.79	15.04	14.58	14.04	12.00	12.78	10.17	10.17	17.65	17.65	15.79	15.38
Average Water Content (%)	15		14		12		10		18		16	

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

Natural Moisture Content Data Sheet

BH.No/ Pit no	2		2									
Depth (m)	4.50		6.00									
Tare No	1	2	3	4								
Wt of Tare (gr)	26.00	23.00	26.00	23.00								
Tare + Soil (gr)	38.00	35.00	41.00	36.00								
Tare+Dry soil (gr)	36.60	33.60	39.50	34.70								
Wt of Water (gr)	1.40	1.40	1.50	1.30								
Wt Dry soil (gr)	10.60	10.60	13.50	11.70								
Water Content	13.21	13.21	11.11	11.11								
Average Water Content (%)	13		11									

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SPECIFIC GRAVITY TEST

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BH.No	1
Depth(m)	1.50

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.43	95.73
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.46	2.46
Average value G_s			2.46	

BH.No	1
Depth(m)	3.00

Pycnometer number			9	10
Weight of bottle	w_1	g	37.50	35.50
Weight of bottle + soil	w_2	g	48.00	46.00
Weight of bottle + soil + water	w_3	g	93.25	95.75
Weight of bottle full of water	w_4	g	87.00	89.50
Weight of soil	w_2-w_1	g	10.50	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.47	2.47
Average value G_s			2.47	

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SPECIFIC GRAVITY TEST

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BH.No	1
Depth(m)	4.50

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.46	95.77
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.48	2.48
Average value G_s			2.48	

BH.No	1
Depth(m)	6.00

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.50	95.80
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.50	2.50
Average value G_s			2.50	

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SPECIFIC GRAVITY TEST

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

BH.No	2
Depth(m)	1.50

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.42	95.72
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.45	2.45
Average value G_s			2.45	

BH.No	2
Depth(m)	3.00

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.47	95.77
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.48	2.48
Average value G_s			2.48	

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SPECIFIC GRAVITY TEST

PROJECT: PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (S+5) AT NANGANALLUR

BH.No	2
Depth(m)	4.50

Pycnometer number			2	4
Weight of bottle	w_1	g	35.00	38.50
Weight of bottle + soil	w_2	g	45.00	49.00
Weight of bottle + soil + water	w_3	g	89.47	95.77
Weight of bottle full of water	w_4	g	83.50	89.50
Weight of soil	w_2-w_1	g	10.00	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.48	2.48
Average value G_s			2.48	

BH.No	2
Depth(m)	6.00

Pycnometer number			9	10
Weight of bottle	w_1	g	37.50	35.50
Weight of bottle + soil	w_2	g	48.00	46.00
Weight of bottle + soil + water	w_3	g	93.29	95.79
Weight of bottle full of water	w_4	g	87.00	89.50
Weight of soil	w_2-w_1	g	10.50	10.50
Specific gravity	$\frac{w2-w1}{(w4-w1)-(w3-w2)}$		2.49	2.49
Average value G_s			2.49	

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

PROFESSIONAL REGISTRATION CERTIFICATE

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

She has been given the Registration No.GTE/2019/04/016 Renewed on 03.04.2024. She 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 02.04.2029.



(A. MEGANATHAN)
Superintendent

VASANTHI PADMANABAN M.Tech.,
CHENNAI SOIL LAB
CMDA Reg No: GTE/19/04/016
DTCP Reg No. CGLRGN/RGTE/2019/08/011
No.2/49, Bajanai Koil Street, Koyambedu,Ch-10
Cell: 9444469824, 9551754271



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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

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Vastu & Property Management Tools

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