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F.S. ENGINEERS P. LTD

Soil Exploration & Foundation Design Division



SOIL EXPLORATION REPORT

GEOTECHNICAL INVESTIGATION

REPORT

OF

Construction of residential apartment Phase I at Sholinganallur, OMR Road, Chennai for M/s. NCC Urban Infrastructure Limited

P.N: 5672

F.S. ENGINEERS PVT LTD

Foundation & Structural Engineers

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SOIL EXPLORATION REPORT

PROJECT NO : **5672**

PROJECT NAME Construction of residential apartment Phase-1 at Sholinganallur, OMR Road, Chennai for M/s. NCC Urban Infrastructure Limited.

1. INTRODUCTION

M/s. NCC Urban Infrastructure Limited are proposing to construct residential apartment Phase-1 at Sholinganallur, OMR Road, Chennai at the location shown in Fig.1. Soil Exploration work was referred to this firm by M/s.NCC Urban Infrastructure Limited, Bangalore , with a view to determining the soil properties of the area and to arrive at the most suitable foundation system for the proposed structure. For this purpose twelve bore holes were bored upto depths varying from 6.0 to 12.0 M below ground level. The boreholes were terminated in the disintegrated rock / medium rock layer after drilling for the required depth. In addition, two Electrical Resistivity tests were conducted at site. The boreholes and ERT locations are given in Fig.1. The work comprised of conducting Standard Penetration Tests in the field and collecting samples for testing in the laboratory. The report presents the details of the work, analysis of test results and foundation recommendations made based on the analysis.

2. EXPLORATION TECHNIQUE

Rotary Drilling technique was adopted for boring in this area. Casing pipes and bentonite slurry were used to protect the sides of the boreholes. Standard Penetration Tests were conducted at change of layers and at specified intervals Disturbed samples were collected in plastic bags from all the layers for visual observation and classification tests. Undisturbed samples could not be collected since the soil layers met with were essentially cohesionless. Core samples were collected from medium rock layer.

3. SOIL PROFILE

The profile of the area as observed in the boreholes is given in Figs.2 to 13. The top soil of 0.3 M is non-uniform. The underlying layer is expansive cemented clay upto 2.0 to 6.0 M The underlying layers are cemented silt and disintegrated rock with medium rock appearing at depths varying from 6.0 to 9.0 M below ground level. Water table was met with at 2.0 M below ground level at the time of exploration.

4. ANALYSIS OF TEST RESULTS

The various tests conducted are:

1. Standard Penetration Test
2. Electrical Resistivity Test
3. Differential Free Swell Test
4. Grain Size Analysis
5. Determination of Specific Gravity
6. CBR Test
7. Crushing Strength of Rock
8. Chemical Analysis of Soil
9. Chemical Analysis of Water

An analysis of the results of these tests were presented in this section of the report

4.1 Standard Penetration Test

These tests were conducted at change of layers and at specified intervals, commencing the test at 1.5 M below ground level. The results are presented graphically in Figs. 2 to 13 The relative density of the cohesionless layers obtained from the N values are given in the bore logs.

4.2 Electrical Resistivity Test

These tests were conducted at two locations using four electrodes driven into earth along a straight line at equal intervals in eight directions. The current is passed through the two outer electrodes and voltage difference is observed between the two inner electrodes. The resistivity of the soil is proportional to the ratio of the voltage to current. The computed values of resistivity at these locations for different depths are given in Table- 3 and 4 and Figs.16 and 17

4.3 Differential Free Swell Test

This test was conducted by keeping equal volumes of dry powdered soil in water and in kerosene. The differential swell is given by,

$$Dfs = \frac{\text{Volume of soil in water} - \text{Volume of soil in kerosene}}{\text{Volume of soil in kerosene}}$$

The test was conducted on the samples collected from cemented clay layer. The results are given in Table –1. The differential swell noted is over 40%. .

4.4 Grain Size Analysis

Combined sieve and hydrometer analyses were conducted on the various samples collected. The results are given in Table-1. Based on the proportion of the different soil constituents, the soil is classified using the Triangular Chart.

4.5 Determination of Specific Gravity

The specific gravities of the soil grains were determined from the various samples collected. The results are given in Table-1. No abnormal value is noted in the test results.

4.6 Field CBR Test

California Bearing Ratio test was conducted on the samples collected in CBR mould. The values of CBR under soaked and unsoaked conditions are given Table- . 5

4.7. Crushing Strength of Rock

Core sample collected from medium rock was tested for determining the crushing strength of rock. The crushing strength of rock noted is given in Table – 2

4.8 Chemical Analysis of Soil

Soil samples collected from different depths were tested for determining sulphate, chloride, carbonate contents and pH value. The results are given in Table – 7

4.9 Chemical Analysis of Water

Water samples collected at the end of boring were tested for determining sulphate, chloride, carbonate contents and pH value. The results are given in Table -6

5. FOUNDATION ANALYSIS

5.1 Shallow Foundations

For the proposed structure shallow foundations can be given after removing the top expansive cemented clay layer present upto 2.0 to 6.0M. Excavations will have to be made upto 2 to 6.0 M. Foundation would be resting on the cemented sand/ cemented silt / disintegrated rock/medium rock layer.

The safe bearing capacity of the cohesionless cemented sand/cemented silt/disintegrated rock layers could be computed using the formula,

$$Q_a = (0.5\gamma \times B \times N_\gamma + \gamma D_f N_q) \div 2.5$$

where,

B = Width of footing

γ = Submerged unit weight of soil taken as 1 gm/cc,

D_f = Depth of surcharge

$N\gamma$ Nq = Bearing capacity factors based on the N values taken from Fig. 14.

Depth (M)	SBC (kg/cm^2)
2.0	1.5 (on cemented sand
3.0 down	Limited to 2.5 (On cemented sand)

When the foundations are placed on the disintegrated rock layer the SBC that could be adopted is 5.0 kg/cm^2 and the SBC that could be adopted in medium rock layer is 10.0 kg/cm^2.

The settlement would be within 25mm.

Over excavations in the foundation trenches should be refilled by lean concrete in general and 1:3:6 concrete in medium rock.

If the above suggested SBCs are not adequate to transfer the load and excavations are problematic, pile foundation is recommended.

5.2 Pile Foundation

Regular pile foundation can be given after seating the pile for 10 cms in the medium rock layer. The length of pile would thus vary from 6.1 to 9.1 M.

The piles could be designed as end bearing pile. The end bearing capacity of the pile could be computed using the formula,

Qe = 4 X N X As Tonnes

Where,

N = Standard Penetration Test value

As = Area of cross-section of pile expressed in sq.ft

When the piles are resting in the medium rock layer when rebound is noted in SPT, it could be seen that the structural capacity of the pile which is 50 kg/cm^2 for M-20 concrete would determine the allowable load.

The settlement of the pile foundations would be within 12mm.

M-20 concrete is recommended for the pile foundation to counteract the harmful effect of chloride chemicals present in soil and water.

6. FLOORING

Since the cemented clay is expansive, it is necessary to give a layer of CNS (Cohesive Non-Swelling) soil like murrum of 50 cms as the initial layer for plinth filling. As an alternative flooring can be designed as floor slab connected to the pile foundation.

7. EXCAVATION PROCEDURE

1. Vertical cuts could be given for excavation.

2. Slush formed by any water accumulation should be removed and refilled by lean concrete in general and 1:3:6 concrete in medium rock.

3. If water accumulates in the foundation trenches, dewatering should be done by pumping out water from a level lower than the foundation level to maintain downward flow of water. The downward flow of water should be maintained continuously upto 12 hours after laying the PCC.

4. The exposed side of excavation should be covered by plastic sheet during rainy season.

7. CONCLUSION

1. The area explored has got top soil of 0.3 M is non-uniform. The underlying layer is expansive cemented clay upto 2.0 to 6.0 M The underlying layers are cemented silt and disintegrated rock with medium rock appearing at depths varying from 6.0 to 9.0 M below ground level. No water table was met with in the boreholes at the time of exploration. However, perched water table is likely to occur during rainy seas

2. For the proposed structure shallow foundations can be given after removing the cemented clay layer present upto 2.0 to 6.0 M, resting the foundation on the cemented sand, cemented silt and disintegrated rock layer. The SBC that could be adopted at different depths for a minimum width of foundation of 1M are given in the report.

3. When the foundations are placed on the medium rock layer the SBC that could be adopted is 10.0 kg/cm^2

4. As an alternative, regular pile foundation is recommended with length of pile of 6.1 to 9.1 M, resting the pile after seating for 10 cms in the medium rock , utilizing the full structural capacity of 50 kg/cm^2 for M-20 concrete.

5. The settlement of the shallow foundation would be of small order and within 25mm and pile foundation would be within 12mm.

6. Over excavations in the foundation trenches should be refilled by lean concrete in general and 1:3:6 concrete in medium rock.

7. Suggested excavation procedure should be adopted while undertaking the construction.

F.S.ENGINEERS PVT.LTD
NEW NO.98, VELACHERY ROAD
GUINDY
CHENNAI – 600 032

(Dr.A. Verghese Chummar)
Director
Dated: July 31st, 2012

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai .

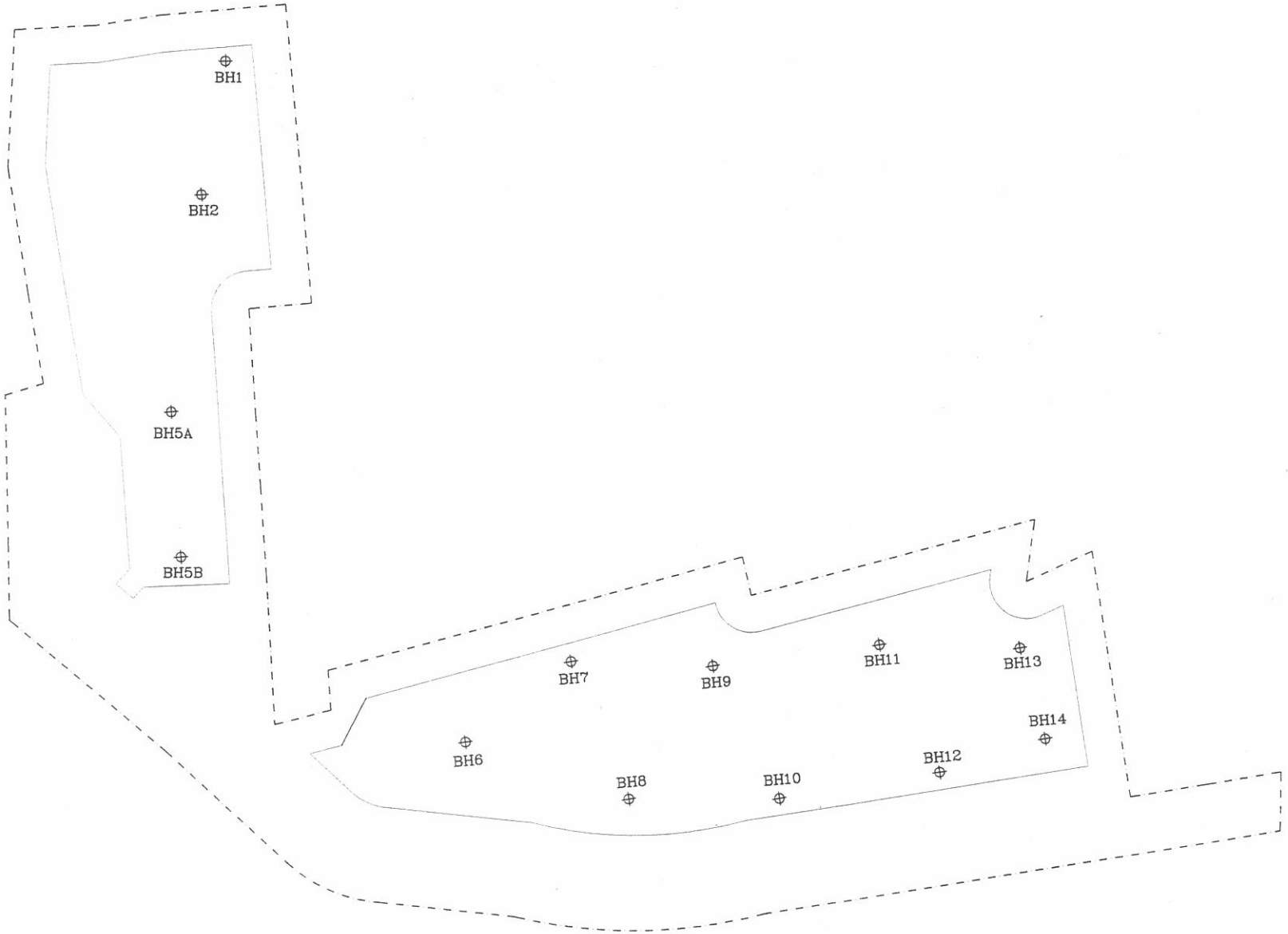


Fig : 1 SITE PLAN P N : 5672

F.S.ENGINEERS PVT LTD

SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

BORE HOLE NO : 1

TYPE OF BORING : ROTARY DRILLING

DATE OF COMMENCEMENT : 24.07.12

DATE OF COMPLETION : 24.07.12

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.45			1.50	10	30	STIFF	
3				2.75		3.00	14	30	STIFF	
4 5		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	2.75			4.50	20	30	V.STIFF	
6				5.50		6.00	>50	4	V.DENSE	
7 8 9		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	3.50			7.50	>50	0	V.DENSE	
				9.00		9.00			REBOUND	
10 11 12.00		MEDIUM ROCK MR2 (Yellowish Brown)		12.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY

FIG: 2

P.N : 5672

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 23.07.12

BORE HOLE NO : 2

DATE OF COMPLETION : 23.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.20			1.50	12	30	STIFF	
3 4 5		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	3.00	2.50		3.00	19	30	V.STIFF	
						4.50	29	30	V.STIFF	
6 7 8 9		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	3.50	5.50		6.00	>50	15	V.DENSE	
						7.50	>50	0	V.DENSE	
				9.00		9.00			REBOUND	
10 11 12.00		MEDIUM ROCK MR2 (Yellowish Brown)		12.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY

FIG: 3

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BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 23.07.12

BORE HOLE NO : 5A

DATE OF COMPLETION : 23.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.20			1.50	7	30	MEDIUM	
3 4 5		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	3.00	2.50		3.00	18	30	V.STIFF	
						4.50	20	30	V.STIFF	
6 7		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	2.00	5.50		6.00	>50	25	V.DENSE	
8 9 10 10.50		MEDIUM ROCK MR1 (Yellowish Brownish Grey)		7.50	↓	7.50			REBOUND	
				10.50						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY ↓

FIG: 4

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 24.07.12

BORE HOLE NO : 5B

DATE OF COMPLETION : 24.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1										
2						1.50	7	30	MEDIUM	
3		CEMENTED CLAY CMC1 (Brownish Grey)	5.70			3.00	12	30	STIFF	
4										
5						4.50	17	30	MEDIUM	
6				6.00		6.00			REBOUND	
7		MEDIUM ROCK MR1 (Brownish Grey)								
8										
9.00				9.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

FIG: 5

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→ END OF BORING | CORE RECOVERY ↓

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 23.07.12

BORE HOLE NO : 6

DATE OF COMPLETION : 24.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1		CEMENTED CLAY CMC1 (Brownish Grey)	1.70			1.50	7	30	MEDIUM	
2				2.00						
3		CEMENTED SILT CMSL1 (Yellowish Brownish Grey)	2.00			3.00	38	30	HARD	
4				4.00						
5		DISINTEGRATED ROCK DR1 (Brownish Grey)	2.00			4.50	>50	21	V.DENSE	
6				6.00		6.00			REBOUND	
7		MEDIUM ROCK MR1 (Yellowish Brownish Grey)								
8										
9.00 →				9.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING

FIG: 6

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 22.07.12

BORE HOLE NO : 7

DATE OF COMPLETION : 23.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1		CEMENTED CLAY CMC1 (Brownish Grey)	3.70			1.50	8	30	MEDIUM	
2										
3						3.00	15	30	STIFF	
4				4.00						
5		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	2.00			4.50	>50	20	V.DENSE	
6				6.00		6.00			REBOUND	
7		MEDIUM ROCK MR1 (Yellowish Brownish Grey)								
8										
9.00 →				9.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY ↓

FIG: 7

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 22.07.12

BORE HOLE NO : 8

DATE OF COMPLETION : 23.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1		CEMENTED CLAY CMC1 (Brownish Grey)	1.70							
2				2.00		1.50	6	30	MEDIUM	
3		CEMENTED SILT CMSL1 (Yellowish Brownish Grey)	2.00			3.00	14	30	STIFF	
4				4.00						
5		DISINTEGRATED ROCK DR1 (Brownish Grey)	2.00			4.50	>50	24	V.DENSE	
6				6.00		6.00			REBOUND	
7		MEDIUM ROCK MR1 (Yellowish Brownish Grey)								
8										
9.00 →				9.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING

FIG: 8

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 20.07.12

BORE HOLE NO : 9

DATE OF COMPLETION : 21.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1		CEMENTED CLAY CMC1 (Brownish Grey)	1.70			1.50	8	30	MEDIUM	
2				2.00						
3		CEMENTED SILT CMSL1 (Yellowish Brownish Grey)	2.00			3.00	15	30	STIFF	
4				4.00						
5		DISINTEGRATED ROCK DR1 (Brownish Grey)	2.00			4.50	>50	23	V.DENSE	
6				6.00		6.00			REBOUND	
7		MEDIUM ROCK MR1 (Yellowish Brownish Grey)								
8										
9.00 →				9.00						

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING

FIG: 9

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 20.07.12

BORE HOLE NO : 10

DATE OF COMPLETION : 21.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.20			1.50	6	30	MEDIUM	
3 4		CEMENTED SILT CMSL1 (Yellowish Brownish Grey)	1.50	2.50		3.00	14	30	STIFF	
5 6		DISINTEGRATED ROCK DR1 (Brownish Grey)	2.00	4.00		4.50	>50	0	V.DENSE	
7 8 9.00		MEDIUM ROCK MR1 (Yellowish Brownish Grey)		6.00 9.00		6.00			REBOUND	

REMARKS : ALL DIMENSIONS ARE IN METRES

END OF BORING

FIG: 10

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SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 19.07.12

BORE HOLE NO : 11

DATE OF COMPLETION : 19.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1		CEMENTED CLAY CMC1 (Brownish Grey)	4.20			1.50	9	30	STIFF	
2										
3						3.00	10	30	STIFF	
4										
5		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	1.00	4.50		4.50	23	30	V.STIFF	
6		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	1.40	5.50		6.00	>50	26	V.DENSE	
7				6.90		6.90			REBOUND	
8		MEDIUM ROCK MR1 (Yellowish Brownish Grey)								
8.90				8.90						

REMARKS : ALL DIMENSIONS ARE IN METRES

FIG: 11

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→ END OF BORING

↓ CORE RECOVERY

F.S.ENGINEERS PVT LTD

SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 19.07.12

BORE HOLE NO : 12

DATE OF COMPLETION : 20.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.20			1.50	7	30	MEDIUM	
3 4		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	1.50	2.50		3.00	14	30	STIFF	
5 6		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)	2.40	4.00		4.50	>50	0	V.DENSE	
7 8		MEDIUM ROCK MR1 (Yellowish Brownish Grey)		6.40		6.00	>50	0	V.DENSE	
8.40				8.40		6.40			REBOUND	

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING | CORE RECOVERY

FIG: 12

P N : 5672

F.S.ENGINEERS PVT LTD

SOIL EXPLORATION AND FOUNDATION DESIGN DIVISION

BORE LOG

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

DATE OF COMMENCEMENT : 18.07.12

BORE HOLE NO : 13

DATE OF COMPLETION : 19.07.12

TYPE OF BORING : ROTARY DRILLING

G.W.L : NIL

DEPTH BELOW GL	SOIL PROFILE	DESCRIPTION OF SOIL	THICKNESS OF LAYER	DEPTH AT WHICH SAMPLES ARE COLLECTED		STANDARD PENETRATION TEST DATA				GRAPHICAL REPRESENTATION OF PENETRATION RESISTANCE
				D.S	U.D.S	DEPTH AT WHICH TEST CONDUCTED	N - VALUE	PENETRATION IN " CMS "	RELATIVE DENSITY CONSISTANCY	10 20 30 40 50
		TOP SOIL TS	0.30	0.30						
1 2		CEMENTED CLAY CMC1 (Brownish Grey)	2.20			1.50	10	30	STIFF	
3 4		CEMENTED SILT CMSL1 (Yellowish Brownish Grey)	1.50	2.50		3.00	11	30	STIFF	
5		CEMENTED SAND CMS1 (Yellowish Greyish Brown)	1.00	4.00		4.50	20	30	V.STIFF	
6.00 →		DISINTEGRATED ROCK DR1 (Yellowish Greyish Brown)		5.00 6.00		6.00	>50	29	V.DENSE	

REMARKS : ALL DIMENSIONS ARE IN METRES

→ END OF BORING

FIG: 13

P.N : 5672

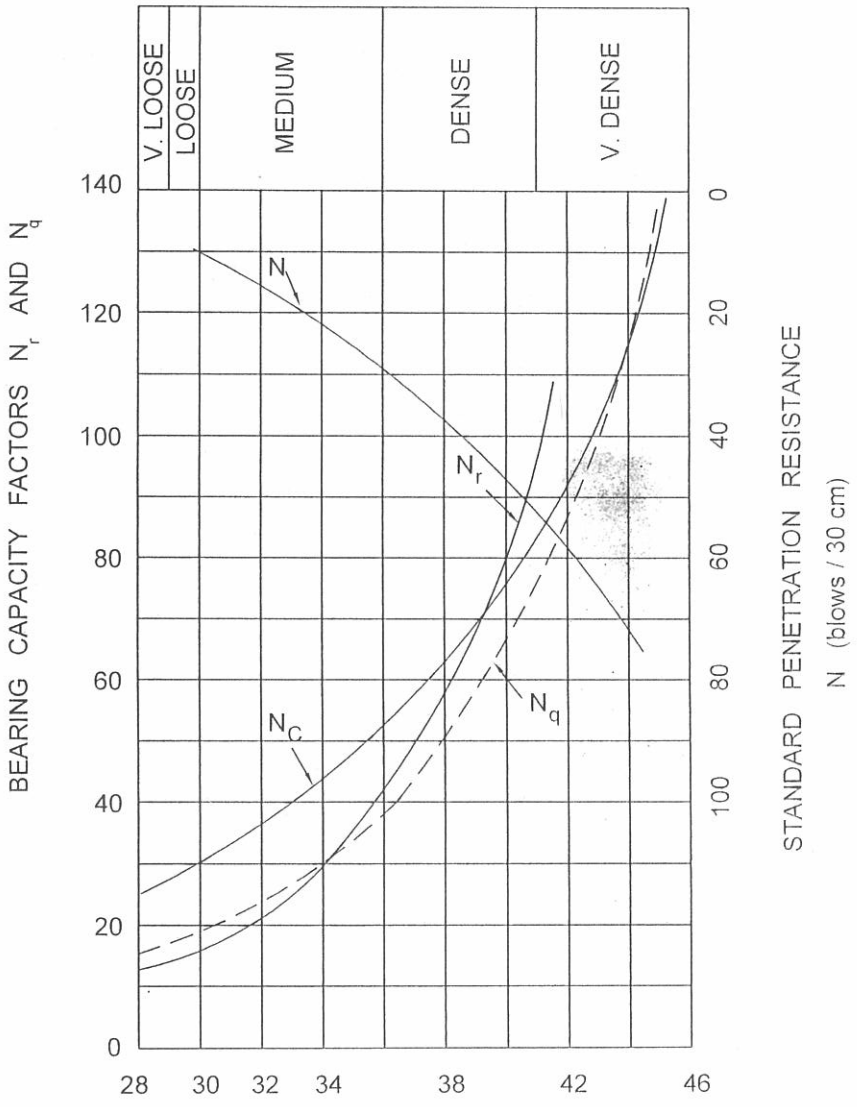


FIG. 14 CURVES SHOWING THE RELATIONSHIP BETWEEN Ø N_r N_q, N_c AND N

Ref : Foundation Analysis & Design.
Joseph. E. Bowles.

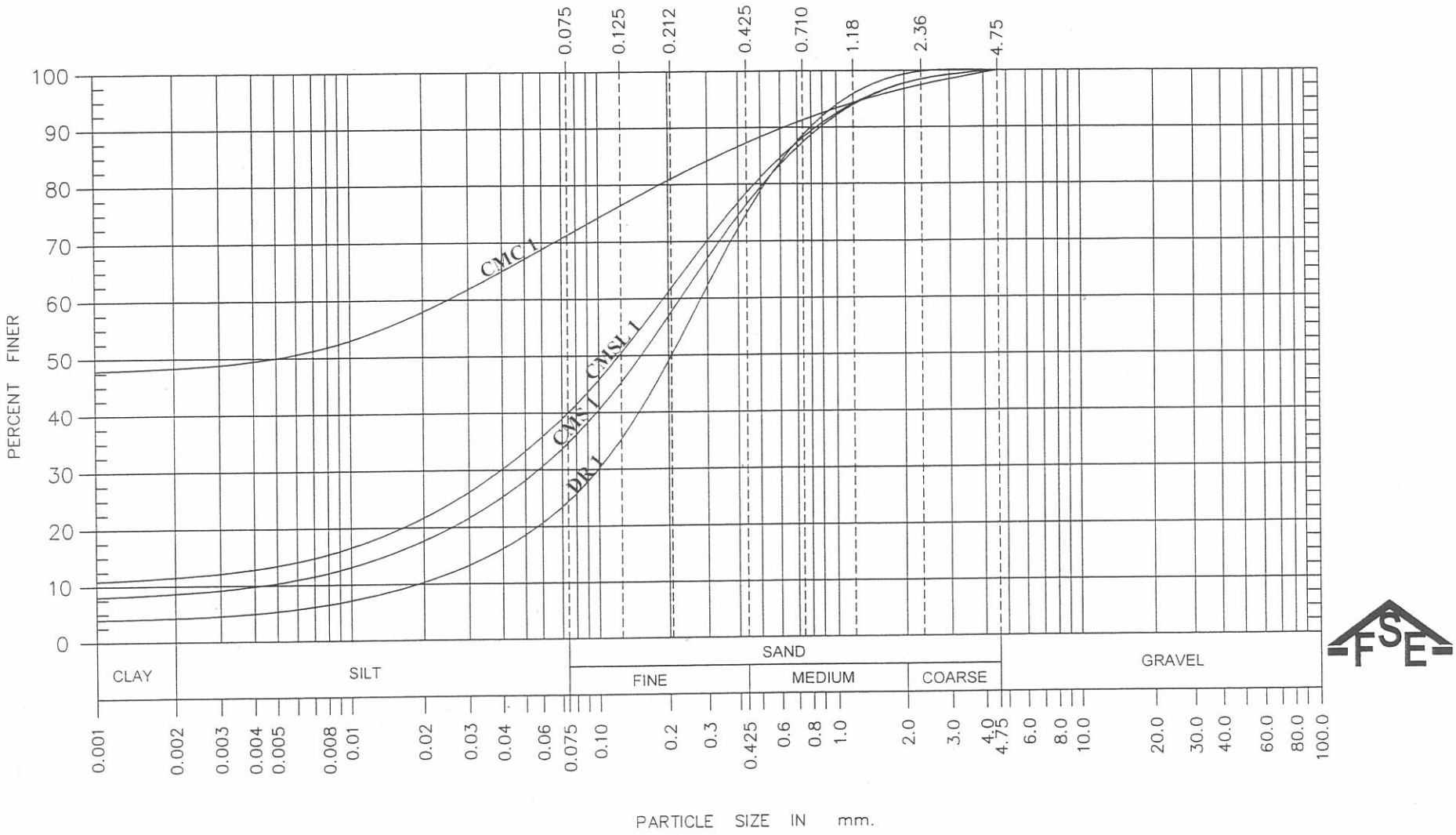


FIG. 15 GRAIN SIZE DISTRIBUTION CURVE

PN : 5672

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

ERT : 1 (BH - 12)

SCALE : 1cm = 50 Λ m

DATE : 28.07.12

MEAN RESISTIVITY : 68.06 Λm

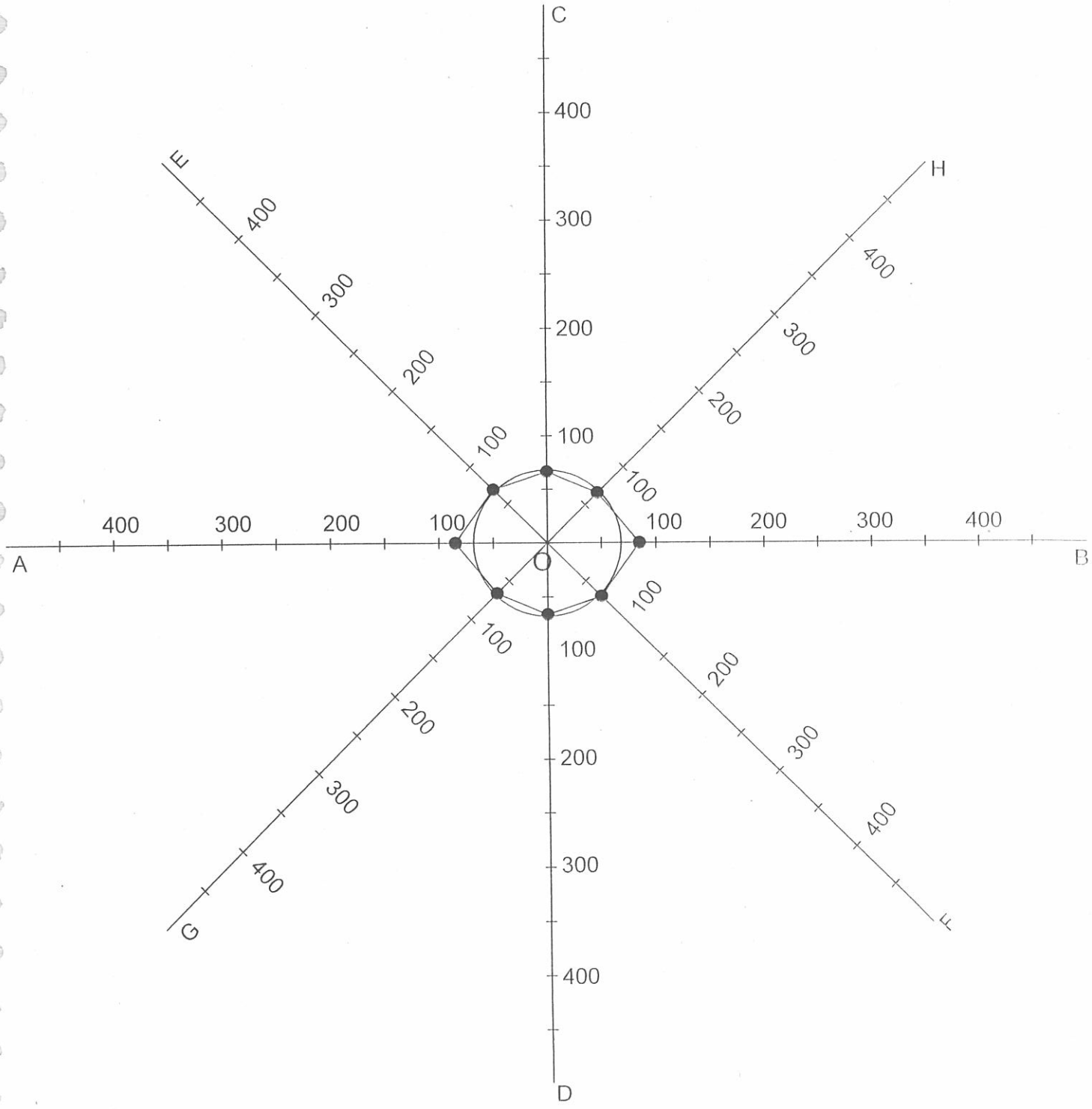


Fig : 16

P N : 5672

PROJECT : PROPOSED RESIDENTIAL APARTMENT PHASE-I FOR " M/s. NCC URBAN INFRASTRUCTURE LTD " AT SHOZHINGANALLUR , CHENNAI .

ERT : 2 (BH - 5B)

SCALE : 1cm = 50 Λ m

DATE : 28.07.12

MEAN RESISTIVITY : 66.15 Λm

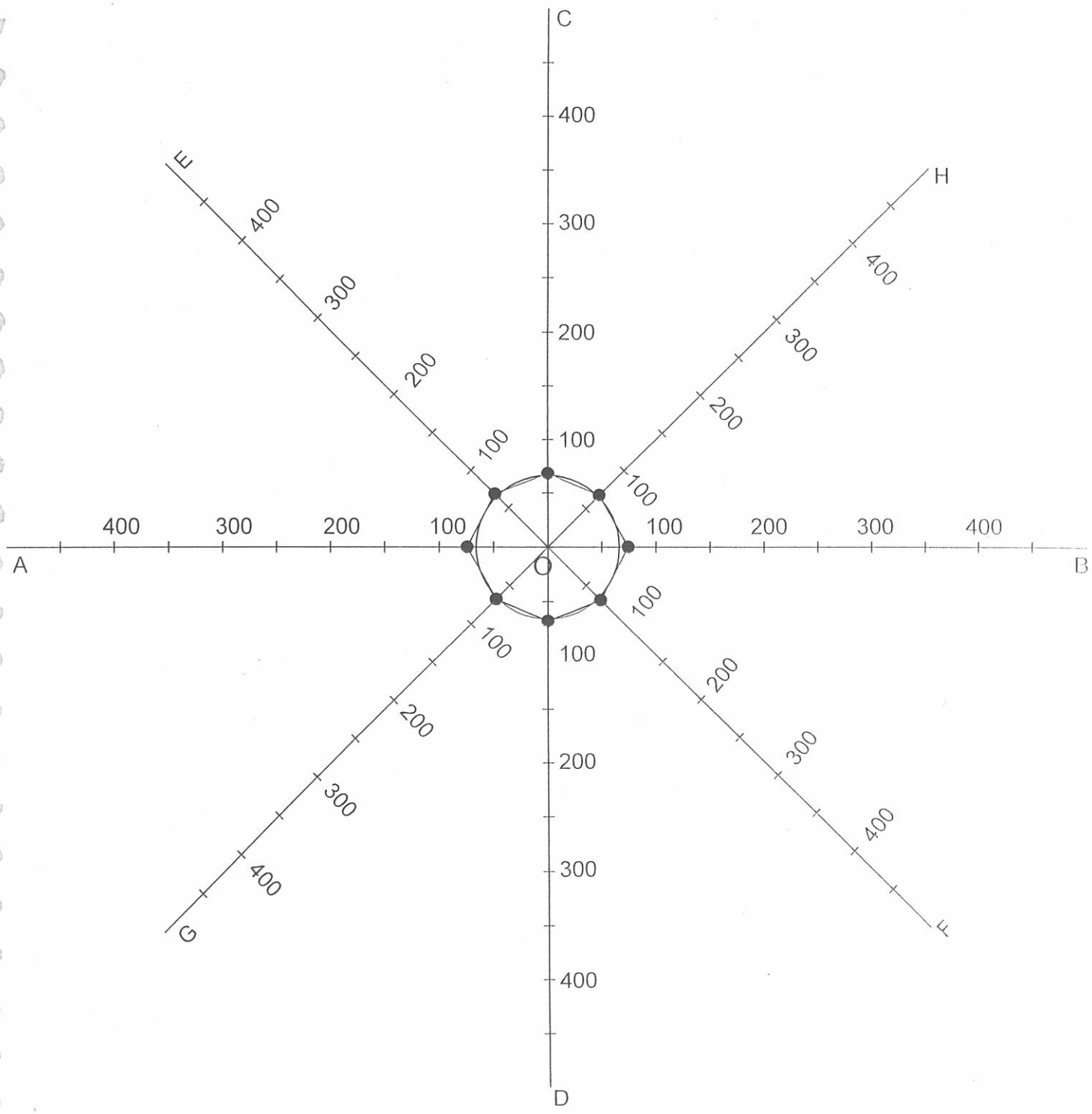


Fig : 17

P N : 5672

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai .

Sl.No Depth	Layer	W_l	W_p	W_n	Swell	Grain Size Distribution				Sp. Gr. G
						Clay	Silt	Sand	Gravel	
M		%	%	%	%	%	%	%	%	
1 2	3	4	5	6	7	9	10	11	12	13
BH.1										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.75	CMC1	44	32	25	45	48	23	29	-	2.63
2.75-5.50	CMS1	-	-	-	-	11	29	60	-	2.65
5.50-9.00	DR1	-	-	-	-	4 (not clay)	20	76	-	2.65
9.00-12.00	MR2	-	-	-	-	-	-	-	-	2.66
BH.2										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.50	CMC1	41	33	25	42	45	25	30	-	2.63
2.50-5.50	CMS1	-	-	-	-	8	26	66	-	2.65
5.50-9.00	DR1	-	-	-	-	5 (not clay)	15	80	-	2.65
9.00-12.00	MR2	-	-	-	-	-	-	-	-	2.66
BH.5A										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.50	CMC1	44	34	23	48	49	25	26	-	2.63
2.50-5.50	CMS1	-	-	-	-	12	30	58	-	2.65
5.50-7.50	DR1	-	-	-	-	6 (not clay)	15	79	-	2.65
7.50-10.50	MR1	-	-	-	-	-	-	-	-	2.66
BH.5B										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-6.00	CMC1	43	34	28	48	46	25	29	-	2.63
6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66
BH.6										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.00	CMC1	42	33	26	47	47	23	30	-	2.63
2.00-4.00	CMSL1	-	-	-	-	15	48	37	-	2.65
4.00-6.00	DR1	-	-	-	-	10 (not clay)	20	70	-	2.65
6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66

Sl.No	Depth	Layer	W_l	W_p	W_n	Swell	Grain Size Distribution				Sp. Gr. G
							Clay	Silt	Sand	Gravel	
M			%	%	%	%	%	%	%	%	
1	2	3	4	5	6	7	9	10	11	12	13
BH.7											
	0.00-0.30	TS	-	-	-	-	-	-	-	-	-
	0.30-4.00	CMC1	41	34	23	49	47	25	28	-	2.63
	4.00-6.00	DR1	-	-	-	-	4 (not clay)	19	77	-	2.65
	6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66
BH.8											
	0.00-0.30	TS	-	-	-	-	-	-	-	-	-
	0.30-2.00	CMC1	45	33	25	49	46	28	26	-	2.63
	2.00-4.00	CMSL1	-	-	-	-	8	17	75	-	2.65
	4.00-6.00	DR1	-	-	-	-	9 (not clay)	18	73	-	2.65
	6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66
BH.9											
	0.00-0.30	TS	-	-	-	-	-	-	-	-	-
	0.30-2.00	CMC1	43	32	27	42	50	24	26	-	2.63
	2.00-4.00	CMSL1	-	-	-	-	16	51	33	-	2.65
	4.00-6.00	DR1	-	-	-	-	5 (not clay)	20	75	-	2.65
	6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66
BH.10											
	0.00-0.30	TS	-	-	-	-	-	-	-	-	-
	0.30-2.50	CMC1	45	35	26	49	45	28	27	-	2.63
	2.50-4.00	CMSL1	-	-	-	-	17	50	33	-	2.65
	4.00-6.00	DR1	-	-	-	-	3 (not clay)	16	81	-	2.65
	6.00-9.00	MR1	-	-	-	-	-	-	-	-	2.66
BH.11											
	0.00-0.30	TS	-	-	-	-	-	-	-	-	-
	0.30-4.50	CMC1	41	34	23	44	49	25	26	-	2.63
	4.50-5.50	CMS1	-	-	-	-	10	30	60	-	2.65
	5.50-6.90	DR1	-	-	-	-	8 (not clay)	19	73	-	2.65
	6.90-8.90	MR1	-	-	-	-	-	-	-	-	2.66

Sl.No Depth	Layer	W_l	W_p	W_n	Swell	Grain Size Distribution				Sp. Gr. G
						Clay	Silt	Sand	Gravel	
M		%	%	%	%	%	%	%	%	
1 2	3	4	5	6	7	9	10	11	12	13
BH.12										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.50	CMC1	46	35	26	41	48	22	30	-	2.63
2.50-4.00	CMS1	-	-	-	-	10	28	62	-	2.65
4.00-6.40	DR1	-	-	-	-	5 (not clay)	18	77	-	2.65
6.40-8.40	MR1	-	-	-	-	-	-	-	-	2.66
BH.13										
0.00-0.30	TS	-	-	-	-	-	-	-	-	-
0.30-2.50	CMC1	44	34	27	43	47	25	28	-	2.63
2.50-4.00	CMSL1	-	-	-	-	18	48	34	-	2.65
4.00-5.00	CMS1	-	-	-	-	8	27	65	-	2.65
5.00-6.00	DR1	-	-	-	-	4 (not clay)	20	76	-	2.65

Table - 1 **Laboratory Test Result** P N : 5672

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai .

Crushing Strength Of Rock

BH No	Layer	Depth In Mts	Crushing Strength Of Rock In kg / cm^2
1	MR1	9.00-12.00	43
2	MR1	9.00-12.00	49
5A	MR1	7.50-10.50	51
5B	MR1	6.00-9.00	46
6	MR1	6.00-9.00	53
7	MR1	6.00-9.00	48
8	MR1	6.00-9.00	45
9	MR1	6.00-9.00	52
10	MR1	6.00-9.00	46
11	MR1	6.90-8.90	50
12	MR1	6.40-8.40	47

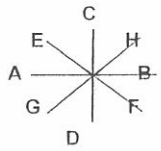
Table: 2

P.N : 5672

PROJECT : Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai .

ERT NO : 1 - (BH - 12)

DATE : 28.07.12

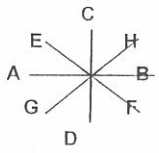


DIRECTION	SPACING BETWEEN ELECTRODS 'S' IN METRES	RESISTANCE R' IN OHMS	MEAN RESISTIVITY P=2IISR IN OHM-M	REMARKS
1	2	3	4	
AOB	0.50	44.00	138.16	
	1.00	15.00	94.20	
	2.00	7.00	87.92	
	3.00	5.00	94.20	
	5.00	3.00	94.20	
COD	0.50	41.00	128.74	
	1.00	12.00	75.36	
	2.00	6.00	75.36	
	3.00	3.00	56.52	
	5.00	2.00	62.80	
GOH	0.50	38.00	119.32	
	1.00	12.00	75.36	
	2.00	7.00	87.92	
	3.00	4.00	75.36	
	5.00	2.00	62.80	
EOF	0.50	36.00	113.04	
	1.00	14.00	87.92	
	2.00	6.00	75.36	
	3.00	3.00	56.52	
	5.00	2.00	62.80	

PROJECT : Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai .

ERT NO : 2 - (BH - 5B)

DATE : 25.07.12



DIRECTION	SPACING BETWEEN ELECTRODS 'S' IN METRES	RESISTANCE R' IN OHMS	MEAN RESISTIVITY P=2IISR IN OHM-M	REMARKS
1	2	3	4	
AOB	0.50	36.00	113.04	
	1.00	15.00	94.20	
	2.00	8.00	100.48	
	3.00	4.00	75.36	
	5.00	2.00	62.80	
COD	0.50	36.00	113.04	
	1.00	14.00	87.92	
	2.00	7.00	87.92	
	3.00	3.00	56.52	
	5.00	2.00	62.80	
GOH	0.50	32.00	100.48	
	1.00	15.00	94.20	
	2.00	8.00	100.48	
	3.00	3.00	56.52	
	5.00	2.00	62.80	
EOF	0.50	35.00	109.90	
	1.00	12.00	75.36	
	2.00	8.00	100.48	
	3.00	3.00	56.52	
	5.00	2.00	62.80	

Table : 4

P N : 5672

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai.

Field CBR Test Results

Sl.No	Bulk Density gm/cc	Dry Density gm/cc	Moisture content %	CBR Test Results			
				Unsoaked		Soaked	
				2.5mm penetration	5 mm penetration	2.5mm penetration	5 mm penetration
1.	2.15	1.72	12.36	8.69	9.22	6.25	6.22
2.	2.18	1.77	11.11	8.52	8.54	6.81	6.48
3.	2.20	1.71	11.70	9.38	8.42	6.92	6.10
4.	2.13	1.69	13.89	9.52	9.25	6.01	6.70
5.	2.19	1.75	12.53	8.31	8.45	6.55	6.91

Table - 5 Laboratory Tests Results P N : 5672

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai.

Chemical Analysis Of Water

Bh. No	P_H	SULPHATE SO_3 in %	CHLORIDE in %	CARBONATE in %
1	7.00	0.08	0.15	0.10
2	7.10	0.10	0.13	0.13
5A	7.30	0.11	0.14	0.12
5B	7.20	0.09	0.12	0.11
6	7.00	0.12	0.11	0.14
7	7.00	0.11	0.10	0.16
8	7.20	0.10	0.14	0.11
9	6.80	0.09	0.16	0.10
10	7.30	0.14	0.15	0.13
11	7.00	0.07	0.11	0.15
12	6.90	0.10	0.13	0.12
13	7.30	0.13	0.10	0.11

Table - 6

P.N.5672

Project: Proposed Residential Apartment Phase-I for " M/s. NCC Urban Infrastructure Ltd " at Sozhinganallur , Chennai.

Chemical Analysis of Soil

BH. No	P_H	SULPHATE SO_3 in %	CHLORIDE in %	CARBONATE in %
1	7.20	0.09	0.13	0.02
2	7.10	0.10	0.12	0.04
5A	7.00	0.08	0.10	0.03
5B	7.30	0.07	0.11	0.05
6	7.20	0.10	0.12	0.03
7	7.10	0.11	0.14	0.05
8	7.00	0.09	0.11	0.06
9	7.30	0.08	0.10	0.04
10	7.10	0.12	0.12	0.02
11	7.00	0.09	0.10	0.05
12	7.20	0.10	0.13	0.03
13	7.40	0.08	0.14	0.04

Table : 7

P.N : 5672

THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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