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REPORT ON GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF COMMERCIAL BUILDING (B+S+5) IN NAVA INDIA COIMBATORE.

REPORT NO : AGIS/C-885/24 **Dt: 09.03.2024**

CLIENT : M/s. Sanbrix Properties Pvt. Ltd.
Sanbrix Square,
No : 70, Third Floor East power House road,
11th St, Tatabad,
Coimbatore, Tamil Nadu 641012

ALZUM GEOCIVIL INTEGRATED SERVICES
Experts in all types of Structures

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REPORT ON GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF COMMERCIAL BUILDING (B+S+5) IN NAVA INDIA COIMBATORE

1.0 GENERAL

The Client has requested for the Testing Services for suitable foundation based on soil investigation for the proposed construction of Commercial Building (B+S+5) in Nava India Coimbatore. Bore hole soil investigation was carried out on 06/03/24 and 07/03/24 upto the desired depths by Alzum Geocivil Integrated Services, Coimbatore.

The scope of work includes drilling of 2 bore holes upto hard strata / desired depth conducting standard penetration test at every 1.0/1.5m or at any change of soil strata, soil sampling at desired locations and to obtain design parameters for the design of foundation. The soil data was analyzed for offering recommendation on suitable foundation. This report presents salient details of Geotechnical investigation, soil analysis, evaluation of bearing capacity along with recommendation on foundation to be adopted and depth of foundation for the building. The building is proposed to have Basement, Stilt and Five floors. It requires that the minimum depth of foundation will be 5.0m from ground level.

2.0 FIELD INVESTIGATIONS

Field investigation is accomplished by drilling 2 exploratory bore hole namely BH01 and BH02. BH01 and BH02 were drilled upto 7.0m and 8.0m depth respectively from the ground levels. The location of the bore hole were decided as per codal provisions and in consultation with the client and is shown in Annexure I.

2.1 ROTARY BORING

The subsurface was explored using rotary drilling technique supplemented with bentonite mud circulation. Rotary drilling technique was adopted using Calyx machine in the field. In this method, boring is effected by the cutting action of a rotating bit that is kept in firm contact with the bottom of the hole.

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The bit is attached to the lower end of a hollow drill rod that is rotated by a suitable chuck. The mud returning upwards through the annular space between the drill rods and the side of the hole bring the cutting to the surface. Standard Penetration Test was conducted at 1.0m/1.50m or at every change of strata. In each bore hole apart from conducting Standard Penetration Tests, attempt was made to collect core samples in rock stratum and observation of water table.

2.2 STANDARD PENETRATION TEST

It is the most commonly used in situ test. The test measures the penetration resistance of the split spoon sampler, when it is driven into the soil, at the bottom of a borehole in a standard manner. The N-value, which is the number of blows required to achieve 300mm penetration of the soil, indicates the relative density of sand or gravel, the consistency of other soil such as silts or clays and the strength of weak rocks. The test is described in IS 2131 - 1981. The split spoon sampler is attached to stiff drill rod and lowered to the bottom of the bore hold. A standard blow consists of dropping a mass of 63.5kg free fall through 750 mm on to an anvil at the top of the rods and ensuing that this amount of dynamic energy is transferred to the sampler as much as possible.

The number of blows required to achieve each 150mm penetration is recorded for a full penetration of 450mm. The initial 150mm penetration is referred to as seating drive and the blows required for this penetration are not considered as this zone is in disturbed soil. The next 300mm of penetration is referred to as the test drive and the number of blows required to achieve this fully is termed the penetration resistance or N-value. The total number of blows (N) required, to advance the spoon into the bore, for another two successive 15cm (a total of 30 cm) is recorded as a measure of the soil relative density or consistency as given in Table 1 and Table 2.

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TABLE 1 CORRELATION FOR SATURATED SAND/NON – PLASTIC SILT

RELATIVE DENSITY	PENETRATION VALUE(Blows/Ft)
Very loose	0 to 4 Blows
Loose	5 to 10 Blows
Medium	11 to 30 Blows
Dense	31 To 50 Blows
Very Dense	> 50 Blows

TABLE 2 CORRELATION FOR SATURATED CLAY/PLASTIC SILT

RELATIVE DENSITY	PENETRATION VALUE (Blows/Ft)
Very Soft	0 to 2 Blows
Soft	3 to 4 Blows
Medium Stiff	5 to 8 Blows
Stiff	9 To 16 Blows
Very Stiff	17 To 32 Blows
Hard	>32 Blows

2.3 ROCK CORING

Rock samples were extracted by Rotary drilling technique using double tube core barrel of 76mm diameter, filter with a diamond bit. The extracted cores for every run, not exceeding 1.0 meter were arranged in the core boxes and the T.C.R as well as R.Q.D values were measured. The appropriate estimation of the properties of the encountered rock strata can be obtained by referring to the borehole logs and the following description shown in Table 3 and Table 4.

TABLE 3

R.Q.D %	ROCK QUALITY
90 – 100	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 - 25	Very Poor

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TABLE 4

RECOVERY %	DESCRIPTION OF ROCK
0 – 20	Rock is treated as soil
20 – 35 with SPT > 50 blows / 30 cm	Soft or disintegrated rock
35 – 50	Intermediate rock
50 – 85	Medium rock
>85	Sound rock

2.4 SAMPLING

Soil samples were collected through Split spoon sampler. The samples thus collected were carefully transported to the geotechnical laboratory.

3.0 LABORATARY TESTS

The operations to be performed in the laboratory depend upon the type of the nature of data required for the problem at hand. In case of cohesion less material, like sand, the laboratory tests are usually minimum and the design parameters are worked out from field test data such as SPT- N value, Core resistance and plate load test data.

In the case of cohesive soils, the programme of laboratory testing can vary from carrying out simple tests such as unconfined tests to comprehensive study of soil behaviour using Triaxial shear tests and consolidation tests.

Following laboratory tests are conducted.

For cohesion less, soil

- Specific gravity
- Sieve analysis
- Direct shear test

For cohesive soil

- Specific gravity
- Natural moisture content
- Atterberg's limits
- Sieve Analysis
- Unconfined compression test
- Consolidation test
- Triaxial test

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The results of the laboratory tests are shown in Annexure II and the result of particle size distribution is shown in Annexure III.

4.0 SOIL PROFILE

BH01

The bore hole is drilled up to a depth of 7.0m and terminated. Filled up soil exists at top for a thickness of 0.60m followed by Brown Clay and its thickness is 1.30m. Below Brown Clay, Silty Gravel in the form of kankar exists measuring 2.90m thickness. Below this layer, Weathered Rock occurs and it extends upto the depth of exploration of 7.0m. The SPT N value is greater than 50 from 2.00m depth onwards. The stiffness of soil increases with increase in depth. Water table is not met within the depth of exploration. The core recovery values varies from 10% to 20%. Rock Quality Designation (RQD) is 0%.

The bore log showing SPT N Value is shown in Annexure IV.

BH02

The bore hole is drilled up to a depth of 8.0m and terminated. Brown clay exists at top for a thickness of 1.80m followed by Silty Gravel in the form of kankar. The thickness of kankar is 2.70m. Below this layer, Weathered Rock occurs and its thickness is 1.40m. Below Weathered Rock, Soft Rock exists and it extends upto depth of exploration of 8.0m. The SPT N value is greater than 50 right from 2.00m depth onwards. The stiffness of soil increases with increase in depth. Water table is not met within the depth of exploration. The core recovery ranges from 12% to 24%. Rock Quality Designation (RQD) is 0%.

The bore log showing SPT N Value is shown in Annexure IV.

5.0 GROUND WATER TABLE

Ground water table is not met within the depth of exploration. The water table reduction factors are however taken into consideration in the foundation analysis.

6.0 FOUNDATION ANALYSIS

6.1 SAFE BEARING CAPACITY

The bearing capacity of granular soil depends upon the unit weight and angle of internal friction of the soil. These two properties of granular soils are determined by standard penetration tests. Observed N value of 50 is adopted in the evaluation of bearing capacity.

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The allowable bearing pressure based on shear failure has been established empirically by the following equation,

Safe bearing capacity (SBC) = q =0. $314N^2B.Rw2 + 0.943 (100 + N^2)$ Df. Rw1

N : SPT value

D_f : Depth of foundation in m

B : Minimum size of the foundation (taken as 2.0m)

Rw1& Rw2 : Water table correction

The allowable bearing pressure based on settlement failure is,

The safe bearing pressure, q_s, (in kN/m2) corresponding to a settlement of 25mm is given by

$$q = 1.36 (N-3)\left(\frac{B + 0.3}{2 \times B}\right)^2 \times S.Rd. Rw1$$

Where, B : Maximum size of the footing (taken as 2.0m)

R : Water table correction factor (For the worst case, taken as 0.5)

The detailed Calculation for bearing capacity is shown in Annexure V.

7.0 DISCUSSIONS

The first layer of soil is of Brown clay. The thickness of this layer varies from 1.30m to 1.80m. The second layer is Silty gravel in the form of whitish Kankar. The thickness of this layer varies from 2.70m to 2.90m. The third layer is Weathered Rock. The thickness of Weathered Rock varies from 1.40m to 2.20m. The fourth layer is Soft Rock. This layer extends upto the depth of exploration and continuous for a large depth. The core recovery value ranges from 10% to 24%. The RQD is zero. The SPT N value obtained is greater than 50 right from 2.0m depth onwards. The stiffness of soil increases with increase in depth. The foundation shall be rested on SDR/Soft rock. Shallow foundation shall be preferred in the foundation. The Allowable bearing capacity of soil is worked out from 2.0m depth onwards based on shear failure criterion and settlement criterion are shown under Recommendations. Water table reduction factors are considered in evaluating Bearing Capacity of soil. Water table was not found to

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exist within the depth of collaboration.

8.0 RECOMMENDATIONS

8.1 DEPTH OF FOUNDATION

a) The Minimum depth of foundation shall be taken as 4.00m from the respective ground level such that the foundation is rested on Weathered rock.

b) The Stiffness of soil increases with increase in depth.

8.2 ALLOWABLE NET SAFE BEARING CAPACITY

a) The allowable bearing capacity of soil corresponding to the depth of foundation is shown in the table below.

b) The engineering properties of soil and SPT N value are considered for the evaluation of safe bearing capacity.

c) The water table reduction factors are considered.

Depth in m	SBC in kN/m2
2.0m	317.003
3.0m	343.982
4.0m	364.217
5.0m	384.451
6.0m	418.175
7.0m	451.898

8.3 TYPE OF FOUNDATION

a) The type of foundation depends upon the founding strata, loading intensity at the foundation level and configuration at loading points.

b) Framed structure with Isolated footing shall be provided for the proposed structure.

c) The size of the foundation shall be decided by the design engineer, based on the allowable bearing capacity recommended

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9.0 PRECAUTIONS

a) It shall be ensured that proper drainage arrangements for rainwater/sullage shall be made such that it does not enter the foundation.

10.0 LIMITATIONS

a) The soil investigation has been carried out at locations in the site chosen by the clients so as to represent the entire site. The recommendations provided in this report are hence valid only for these test locations. However, if there is any change in sub soil conditions and properties at places between or beyond chosen test locations, Geocivil Integrated Services may be contacted for further advice.

b) With passage of time, the recommendations may vary due to manmade and naturals environment changes

For Alzum Geocivil Integrated Services

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FIGS., FIE, C.Eng., MIEEE., MISTE
Principal Consultant
Professor of Civil Engg (Retd)
Govt College of Technology, Coimbatore.

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11.0 REFERENCES

LIST OF IS CODE

LABORATORY TESTS

1.	IS 2720 (Part 1) – 1983	: Preparations of soil samples
2.	IS 2720 (Part 2) – 1983	: Determination of Water Content
3.	IS 2720 (Part 4) – 1983	: Grain Size Analysis
4.	IS 2720 (Part 5) – 1983	: Atterberg's Limits
5.	IS 2720 (Part 11) – 1983	: Determination of shear strength parameters using Triaxial Shear apparatus

FIELD INVESTIGATIONS

1.	IS 1498 - 1970	: Classification and Identification of soils for General Engineering Purposes
2.	IS 1892 – 1979	: Code of practice for Subsurface Investigation of Foundations
3.	IS 2131 – 1981	: Method for Standard Penetration Test for Soil
4.	IS 2132 – 1986	: Code for practice for Thin Walled Tube Sampling of Soil
5.	IS 6403 – 2004	: Determination of Bearing Capacity of Shallow Foundation
6.	IS 2911-(part1/sec-2)-2010	: Design of Construction of Pile foundation
7.	IS 8009 (Part-1) 1976	: Calculations of settlements of foundation

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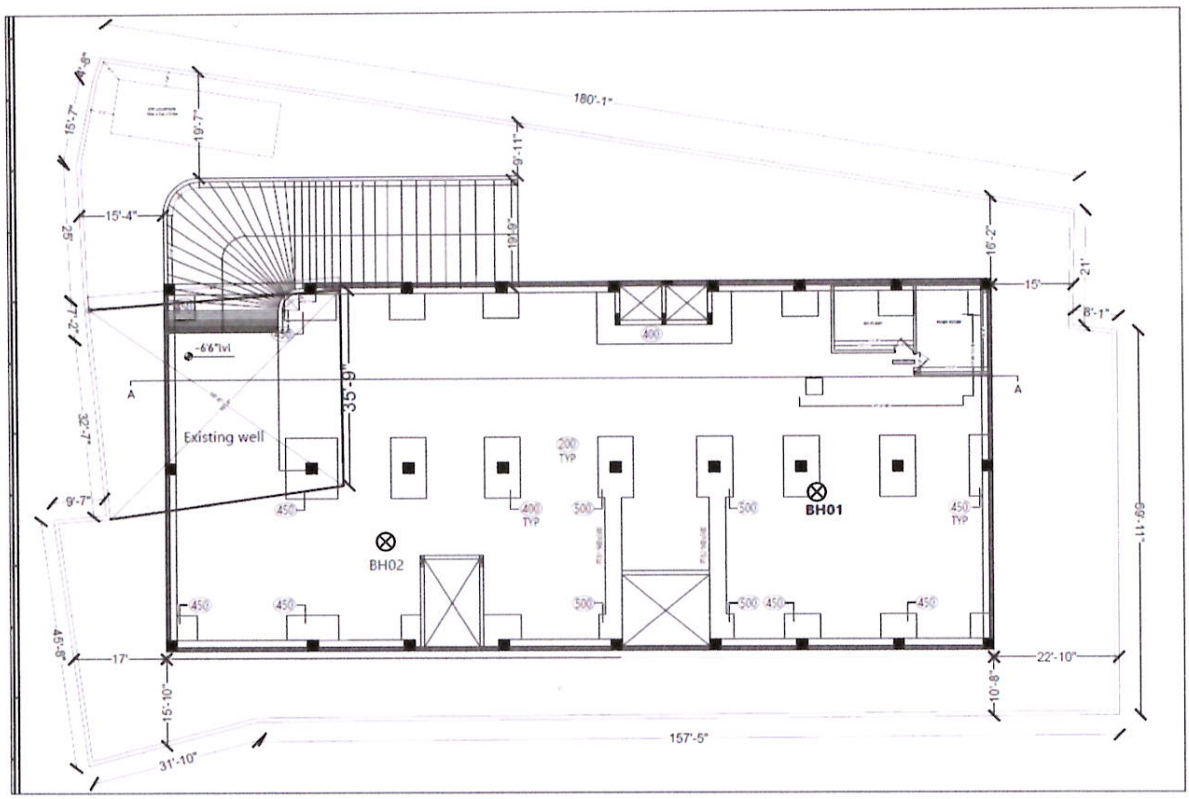
ANNEXURE – I

BOREHOLE LOCATION

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ANNEXURE – II

LAB TEST RESULTS

Ref: AGIS/CBE/2023-24/C-885/DOC 001 REV

Name of work	**REPORT ON GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF COMMERCIAL BUILDING (B+S+5) IN NAVA INDIA COIMBATORE.**																		
Soil Investigation done by: ALZUM GEOCIVIL INTEGRATED SERVICES, CBE					**Bore hole id** BH-01			**Location:** Mentioned on Site Plan			**Ground Water Level: NIL**			**Work Commenced On**		06.03.2024			
														Work Completed On		06.03.2024			
SOIL PROFILE AND DEPTH IN METRES	DEPTH OF SAMPLING	IS SOIL CLASSIFICATION	NATURAL WET DENSITY (kN/m³)	NATURAL MOISTURE CONTENT %	INDEX TEST			SIEVE ANALYSIS			SPECIFIC GRAVITY	SHEAR TEST		STANDARD PENETRATION TEST		Rock Parameters		
					LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	GRAVEL %	SAND %	SILT & CLAY %		COHESION C kN/m²	ANGLE OF INTERNAL FRICTION °	DEPTH OF TESTING m	OBSERVED N VALUE	Core Recovery %	RQD%	Free swell, %
	0.6	FILLED UP										-	-	1.0	12	NIL	NIL	NIL
	1.0	CH	16.92	7.30	49	25	24	6.30	35.40	58.30	2.59	-	-					
	2.0	GM	22.17	3.81	Non-Plastic			55.31	27.59	17.10	2.68	-	-	2.0	>50	NIL	NIL	NIL
	3.0	-	-	-	-			-	-	-	-	-	-	3.0	>50	NIL	NIL	NIL
	4.0	-	-	-	-			-	-	-	-	-	-	4.0	>50	NIL	NIL	NIL
	5.0	-	-	-	-			-	-	-	-	-	-	5.0	>50	10	NIL	NIL
	6.0	-	-	-	-			-	-	-	-	-	-	6.0	>50	11	NIL	NIL
	7.0	-	-	-	-			-	-	-	-	-	-	7.0	>50	20	NIL	NIL

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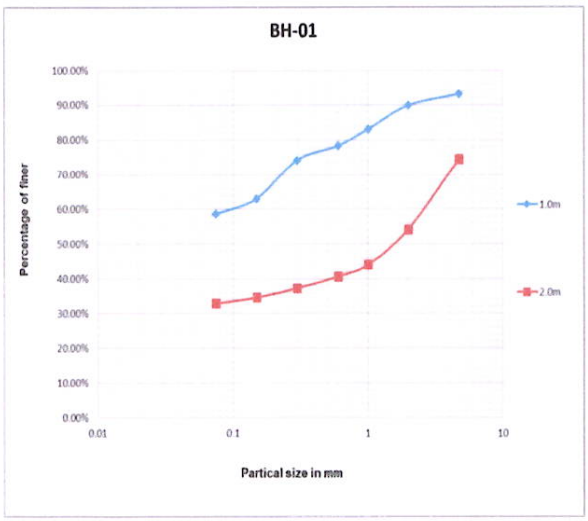
Name of work	**REPORT ON GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF COMMERCIAL BUILDING (B+S+5) IN NAVA INDIA COIMBATORE.**																	
Soil Investigation done by: ALZUM GEOCIVIL INTEGRATED SERVICES, CBE					**Bore hole id** BH-02			**Location:** Mentioned on Site Plan			**Ground Water Level: NIL**			**Work Commenced On**	07.03.2024			
														Work Completed On	07.03.2024			
SOIL PROFILE AND DEPTH IN METRES	DEPTH OF SAMPLING	IS SOIL CLASSIFICATION	NATURAL WET DENSITY (kN/m³)	NATURAL MOISTURE CONTENT %	INDEX TEST			SIEVE ANALYSIS			SPECIFIC GRAVITY	SHEAR TEST		STANDARD PENETRATION TEST		Rock Parameters		
					LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	GRAVEL %	SAND %	SILT & CLAY %		COHESION C kN/m²	ANGLE OF INTERNAL FRICTION °	DEPTH OF TESTING m	OBSERVED N VALUE	Core Recovery %	RQD%	Free swell, %
	1.0	CH	17.92	8.30	48	26	22	8.38	38.42	53.20	2.59	-	-	1.0	15	NIL	NIL	30
	2.0	GM	22.21	4.12	Non-Plastic			53.59	29.72	16.69	2.68	-	-	2.0	>50	NIL	NIL	NIL
	3.0	-	-	-	-			-	-	-	-	-	-	3.0	>50	NIL	NIL	NIL
	4.0	-	-	-	-			-	-	-	-	-	-	4.0	>50	NIL	NIL	NIL
	5.0	-	-	-	-			-	-	-	-	-	-	5.0	>50	NIL	NIL	NIL
	6.0	-	-	-	-			-	-	-	-	-	-	6.0	>50	NIL	NIL	NIL
	7.0	-	-	-	-			-	-	-	-	-	-	7.0	>50	12	NIL	NIL
	8.0	-	-	-	-			-	-	-	-	-	-	8.0	>50	24	NIL	NIL

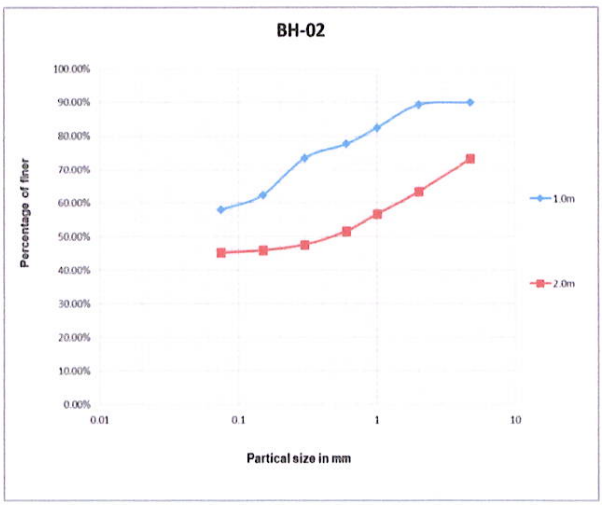
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ANNEXURE – III

SIEVE ANALYSIS RESULTS





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ANNEXURE – IV

FIELD BORE LOG

BH-01

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www.alzumgeocivilservices.com, e-mail to : alzumgeocivil@gmail.com
Off. No: 044 2405406, Mobile no:9994255322

FIELD BOREHOLE LOG

PROJECT :Geotechnical Investigation for proposed construction of Commercial Building (B+S+5)
SITE :Nava India Coimbatore
COORDINATES:N 11.02235287, E 76.9904880
B.H.No. : BH01

DIA & TYPE OF BORING : 100mm Rotary boring with drilling mud circulation
DIA OF BORING : 100mm
GROUND WATER TABLE: NIL
PROJECT NO :AGIS/C-885/24
REDUCED LEVEL :

DATE OF START : 06/03/2024
TIME OF START : 12.30 pm
DATE OF FINISH :06/03/2024
TIME OF FINISH : 6.00 pm

	Description of Strata(GL)	BIS	Log of BH	Depth (m)	1st 15cm	2nd 15cm	3rd 15cm	N	Penetration Resistance 0 10 20 30 40 50	Qu kN/m²	Core Recovery %	RQD %	Remarks
0.00	Filled up			1.00	4	5	7	12		----	NIL	NIL	
1.00	Brown Clay	CH		2.00	9	18	50/8	>50		----	NIL	NIL	Spoon sample
2.00	Kankar (Silty Gravel)	GM		3.00	50/5		--	>50		----	NIL	NIL	Drilling
3.00				4.00	50/3		--	>50		----	NIL	NIL	
4.00	Weathered Rock			5.00	50/3		--	>50		----	10	NIL	7+3 =10
5.00				6.00	50/3		--	>50		----	11	NIL	4+3+4=11
6.00				7.00	50/3	--	--	>50		----	20	NIL	9+2+3+4+2=20
7.00													

Bore hole terminated at 7.0m from machine setting level.

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BH-02

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Off. No: 044 2405406, Mobile no:9994255322

FIELD BOREHOLE LOG

PROJECT :Geotechnical Investigation for proposed construction of Commercial Building (B+S+5)
SITE :Nava India Coimbatore
COORDINATES:N 11.02235287, E 76.9904880
B.H.No. : BH02

DIA & TYPE OF BORING : 100mm Rotary boring with drilling mud circulation
DIA OF BORING : 100mm
GROUND WATER TABLE: NIL
PROJECT NO :AGIS/C-885/24
REDUCED LEVEL :

DATE OF START : 07/03/2024
TIME OF START : 3.30 pm
DATE OF FINISH :07/03/2024
TIME OF FINISH : 8.00 pm

Description of Strata(GL)	BIS	Log of BH	Depth (m)	1st 15cm	2nd 15cm	3rd 15cm	N	Penetration Resistance 0 10 20 30 40 50	Qu kN/m²	Core Recovery %	RQD %	Remarks
0.00												
Brown Clay	CH		1.00	4	6	9	15		----	NIL	NIL	
1.00			2.00	22	50/5	--	>50		----	NIL	NIL	Spoon sample
2.00												
Kankar (Silty Gravel)	GM		3.00	50/4	--	--	>50		----	NIL	NIL	
3.00			4.00	50/4	--	--	>50		----	NIL	NIL	
4.00												Drilling
5.00			5.00	50/3	--	--	>50		----	NIL	NIL	
Weathered Rock			6.00	50/2	--	--	>50		----	NIL	NIL	
6.00												
Soft Rock			7.00	50/2	--	--	>50		----	12	NIL	9+3=12
7.00			8.00	50/2	--	--	>50		----	24	13	13+3+3+5=24
8.00												

Bore hole terminated at 8.0m from machine setting level.

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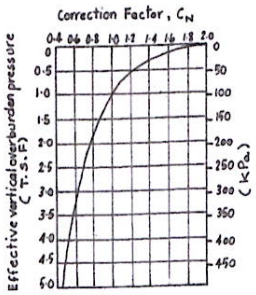
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ANNEXURE – V

SAFE BEARING CAPACITY

Allowable bearing capacity calculation

Width of the footing, B	=	2 m
Depth of foundation, Df	=	4 m
Unit weight of soil	=	18 kN/m^3
Submergible unt wt	=	8 kN/m^3
Avg. observed N value	=	57
Eff. overburden pressure at foundation level	=	32 kN/m^3
Overburden correction factor	=	1
N value after overburden corretion, N'	=	57
Depth of GWT	=	0 m
Dialtancy corretion, N''	=	NA
Factor of Safety	=	3
Rw1	=	0.5
Rw2	=	0.5
Ultimate Bearing capacity based on shear	=	0.314xN'^{2}xBxRw1+0.943x(100+N'^{2})xDfxRw2
	=	7336.4 KN/m^2
Safe bearing capacity based on shear	=	2445.47 KN/m^2
Safe bearing capacity based on settlement	=	1.36x(N'-3)x((B+0.3)/2B)^{2}xSxRdxRw)
Settlement for Sand	=	25 mm
Depth factor, Rd	=	1+Df/B <2
Rd	=	1.2 Say
Water table factor, Rw	=	0.5+0.5(Dw/B) 0.5<Rw<1
Rw	=	0.5 Since GWT is below 0m from EGL
Qs	=	364.217 kN/m^2 For 25mm controlled Settlement
Allowable Bearing Pressure at Df depth is	=	**364.217** kN/m^2



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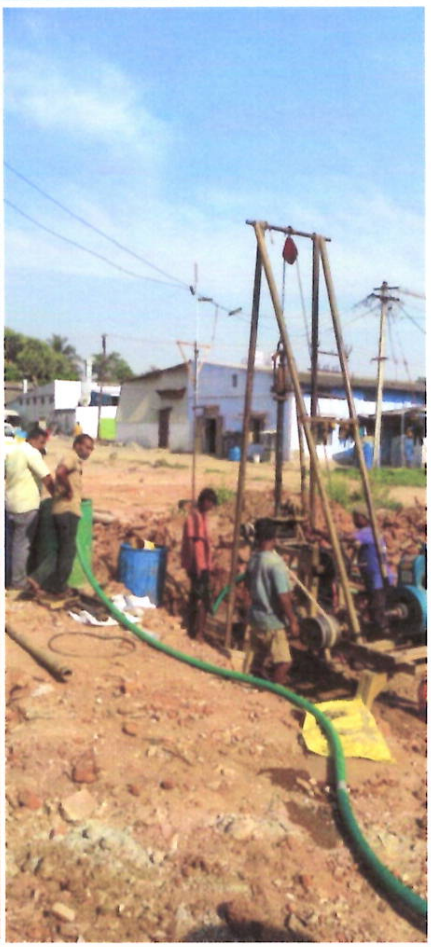
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ANNEXURE – VI

WORKING PHOTOS







For ALZUM GEOCIVIL INTEGRATED SERVICES

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our services doesn't just end there

Buying & Selling Services

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

Legal & Documentation Services

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

Property Development & Approvals

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

NRI & Investment Services

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

Compliance & Special Services

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



empowering your real estate decisions with smart tools

Property Valuation & Cost Estimation

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

Ownership, Compliance & Legal Verification

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

Zoning & Land Use Analysis

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

Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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