# REPORT ON SOIL INVESTIGATION WORK AT THE PROPOSED CONSTRUCTION OF B+G+2 STORIED INVESTMENT BUILDING AT SURYA NAGAR, BHUBANESWAR, ODISHA.

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Submitted to Chief Engineer, Division Office Jeevan Prakash, Unit-VII Surya Nagar, Bhubaneswar

Geotech Consultant

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#### 1.0 INTRODUCTION

For the design of foundation of structures at any site it is essential to have accurate & reliable information on the soil/rock strata met at the site to required depth. Geotechnical Investigations form an important part of the site investigation in any construction project. The objectives of the sub surface investigation is to provide the owner/Architect/Structural designer/Builder with adequate information about the existing geological features at the site and to enable them to design appropriate foundation system capable of supporting the loads to be transferred by the structure to the under lying soil/rock strata without causing any distress.

#### 2.0 THE PROJECT

Jeevan Prakash, Unit-VII, Surya Nagar Bhubaneswar has plan to construct the proposed Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

#### 3.0 SCOPE OF WORK

The scope of geotechnical investigation work undertaken at the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar, comprised of drilling 3 nos of bore holes, at locations indicated by the client. Each bore holes were drilled upto a depth of 10.0 m below existing ground level at the demarkated locations. Drilling in soil/rock was undertaken at the demarkated locations by installing a rotary drilling machine fitted with 150 mm dia cutters/Nx size diamond drilling bits.

SPT was conducted at 1.5 m depth interval in soil/rock strata below ground level upto termination of drilling at 10.0 m depth. Field N values obtained at each depth have been reported in the Record of Boring and Summarised Data Sheets.

The scope of work also included determination of properties of soil / rock met at the site through laboratory testing as per the provisions of relevant I.S code and preparing a geo-technical report indicating the properties of soil/rock encountered at the site and suggesting the type

of foundation considered suitable for the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

### 4.0 INVESTIGATION

The geotechnical investigations undertaken at the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar comprised of drilling 3 Nos of bore holes, Each bore holes were drilled upto a depth of 10.0 m below existing ground level over the demarkated location.

The scope of geotechnical investigation also included conducting SPT and collecting soil/rock samples, conducting laboratory tests, analysing the results of test and preparing a geotechnical report indicating the properties of soil/rock encountered at the site and suggesting the type of foundation considered suitable for the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

#### 5.0 FIELD WORK

The field work comprised of locating the bore hole points, installing the mechanical drilling rig at the site and drilling 3 Nos of bore holes, Each bore hole were drilled upto a depth of 10.0 m below existing ground level at the locations as suggested by the client.

Drilling was resorted to by using a mechanical drilling rig with rotary drilling tools such as diamond drill bits.

Drilling is effected by the cutting action of a rotating tool bit kept in firm contact with the bottom of the bore hole. The bit is carried at the end of the hollow jointed drill rods. The drill rod is rotated by a suitable chuk. Bentonite slurry of required consistency is circulated continuously through the hollow drill rods. The slurry returns to the ground surface through the annular space between the drill rod and the wall of the bore hole/casing. The slurry flowing out of the cutter bottom gets mixed up with the cut soil/rock and flows to the ground surface and returns back to the slurry tank. The process is continuous and is used through out the drilling process.

#### 6.0 SAMPLING

SPT samples were collected at 1.5 m depth interval upto 10.0 m depth below ground level. SPT samplers were used to conduct SPT at different depths and collect disturbed soil samples from the strata below existing ground level at each location. SPT was conducted in soil at 1.5 m depth interval as indicated in the Record of Boring.

Field N values obtained from SPT at each depth have been reported in the borelog and summarised data sheets.

### 7.0 INSITU TESTS

Insitu tests such as SPT measure the consistency of cohesive soil deposits and relative density of cohesionless soil deposits/rocks. The procedure consists of measuring the resistance offered by the soil/ rock strata to the advancement of a device called Split Spoon Sampler. A standard split spoon sampler is used for the test. The sampler is advanced into the soil strata vertically, due to the free fall of a 63.5 kg. hammer falling through a height of 750 mm. Number of blows required to produce three successive 150 mm or less of penetration is recorded. The sum of the total number of blows required to produce the last 300mm or less of penetration is taken as the 'N' value or the Standard Penetration Resistance of the soil/rock at the depth under consideration. In case of very hard, compact soil/rock strata, total penetration of less than 300 mm is achieved. In such cases, the depth of penetration and the number of blows are recorded. The 'N' values recorded during field work at the above site have been reported in the record of boring and summarised data sheets.

### 8.0 GROUND WATER TABLE

Location of the position of ground water table with respect to the proposed depth of foundation below existing ground level plays an important part in the design of foundation. Position of ground water table influences many engineering properties of soil including its bearing capacity. The position of ground water table fluctuates during wet and dry seasons.

PAGE - 4
RAY INFRATECH

The depth of ground water table was ascertained by observing the level of free standing water in the washed and cleaned bore hole 24 hours after the completion of boring. The recorded depth of water level in the bore holes have been reported in the record of boring and summarised data sheets.

### 9.0 LABORATORY TESTS

The soil/rock samples collected from the field are subjected to laboratory tests to determine the relevant properties. Laboratory tests were conducted as per the provisions of the work order and in conformity with the relevant code of practice prescribed by the Bureau of Indian Standards. The tests conducted in the laboratory included Specific gravity, Atterberg limits (LL & PL), Grain size analysis, and Free swell index (DFS). Results of tests have been reported in summarised data sheets, grain size curves.

#### 10.0 BORELOG

The bore log was prepared using the field data and Laboratory test results obtained on soil/rock samples collected from the bore holes at different depths at the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

The field data have been reported in the Record of Boring & Summarised Data sheets. The Laboratory test results on soil samples collected at site have been reported in the Summarised data Sheets, tables and graphs.

### 10.1 Bore Hole No. 1

Bore hole No.1 was drilled upto a depth of 10.0 m below existing ground level at the demarkated location.

SPT was conducted at 1.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate

refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Silty sand and Gravel (SM).

SPT was conducted at 3.0 m depth. Field N value of 23 has been recorded at this depth. The soil sticking to the SPT shoe was analysed and found to be Silty sand and Gravel (SM).

SPT was conducted at 4.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Silty sand and Gravel (SM).

SPT was conducted at 6.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Silty sand (SM).

SPT was conducted at 7.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 9.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 10.0 m depth. T There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

Drilling was terminated at 10.0 m depth.

Ground water table was not struck during drilling upto to 10.0 m depth.

### 10.2 Bore Hole No. 2

Bore hole No.2 was drilled upto a depth of 10.0 m below existing ground level at the demarkated location.

SPT was conducted at 1.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Silty sand and Gravel (SM).

SPT was conducted at 3.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 4.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 6.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 7.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 9.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 10.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate

PAGE -7

refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

Drilling was terminated at 10.0 m depth.

Ground water table was not struck during drilling upto to 10.0 m depth.

### 10.3 Bore Hole No. 3

Bore hole No.2 was drilled upto a depth of 10.0 m below existing ground level at the demarkated location.

SPT was conducted at 1.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

Micaceous sand stone with CR=8.0 % and RQD=0.0 % was met from 1.5 m to 3.0 m depth.

SPT was conducted at 3.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil from the SPT shoe slipped during extraction.

Micaceous Gritty sand stone with CR=8.66 % and RQD=0.0 % was met from 3.0 m to 4.5 m depth.

SPT was conducted at 4.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil from the SPT shoe slipped during extraction.

Micaceous Gritty sand stone with CR= $7.0\,\%$  and RQD= $0.0\,\%$  was met from  $4.5\,m$  to  $6.0\,m$  depth.

SPT was conducted at 6.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate

RAY INFRATECH PAGE -8

refusal to penetration at this depth. The soil from the SPT shoe slipped during extraction.

Micaceous Gritty sand stone with CR=6.0 % and RQD=0.0 % was met from 6.0 m to 7.5 m depth.

SPT was conducted at 7.5 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil from the SPT shoe slipped during extraction.

SPT was conducted at 9.0 m depth. There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

SPT was conducted at 10.0 m depth. T There was refusal to penetration at this depth, therefore field N value of 50 has been recorded to indicate refusal to penetration at this depth. The soil sticking to the SPT shoe was analysed and found to be Poorly graded Sand (SP).

Drilling was terminated at 10.0 m depth.

Ground water table was not struck during drilling upto to 10.0 m depth.

#### 11.0 FOUNDATION ANALYSIS

The proposed site for the construction of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

Two nos of bore holes, at locations indicated by the client. Each bore holes were drilled upto a depth of 10.0 m below existing ground level by using a mechanical drilling rig installed at each location.

The details of the type of soil/rock met at different depths under each bore hole have been reported in the Record of Boring and Summarised Data Sheets.

RAY INFRATECH PAGE -9

The soil/rock strata encountered upto 10.0 m depth is predominantly Silty sand and Gravel (SM)/Poorly graded sand (SP) as shown in the Record of Boring.

The average Corrected 'N' value of 30 was obtained indicating the soil strata to the compact.

It is proposed to place Isolated column footings of size 1.5 m x 1.5 m and 2.0 m x 2.0 m at 2.0 m/2.5 m/3.0 m depth below ground level.

SBC of soil under Isolated Column footings of size 1.5 m x 1.5 m placed at 2.0 m depth is estimated at 238.7 kN/m<sup>2</sup> or say 200.0 kN/m<sup>2</sup> i.e 20.0 t/m<sup>2</sup>.

SBC of soil under Isolated Column footings of size 2.0 m x 2.0 m placed at 2.0 m depth is estimated at 238.0 kN/m<sup>2</sup> or say 200.0 kN/m<sup>2</sup> i.e 20.0 t/m<sup>2</sup>.

SBC of soil under Isolated Column footings of size 1.5 m x 1.5 m placed at 2.5 m depth is estimated at 303.7 kN/m<sup>2</sup> or say 250.0 kN/m<sup>2</sup> i.e 25.0 t/m<sup>2</sup>.

SBC of soil under Isolated Column footings of size 2.0 m x 2.0 m placed at 2.5 m depth is estimated at 297.6 kN/m<sup>2</sup> or say 250.0 kN/m<sup>2</sup> i.e 25.0 t/m<sup>2</sup>.

SBC of soil under Isolated Column footings of size 1.5 m x 1.5 m placed at 3.0 m depth is estimated at 373.6 kN/m<sup>2</sup> or say 300.0 kN/m<sup>2</sup> i.e 30.0 t/m<sup>2</sup>.

SBC of soil under Isolated Column footings of size 2.0 m x 2.0 m placed at 3.0 m depth is estimated at 360.8 kN/m<sup>2</sup> or say 300.0 kN/m<sup>2</sup> i.e 30.0 t/m<sup>2</sup>.

### 12.0 RECOMMENDATIONS

Considering the properties of soil/rock encountered at the proposed site of Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar.

(i) Isolated column footings of sizes 1.5 m x 1.5 m and 2.0 m x 2.0 m

RAY INFRATECH PAGE -10

may be placed at 2.0 m /2.5 m/3.0 m depth below existing ground level.

- (ii) SBC of soil under footings of sizes  $1.5 \text{ m} \times 1.5 \text{ m}$  and  $2.0 \text{ m} \times 2.0 \text{ m}$  placed at 2.0 m depth below ground level may be taken as  $200.0 \text{ kN/m}^2$  i.e  $20.0 \text{ t/m}^2$ .
- (iii) SBC of soil under footings of sizes 1.5 m x 1.5 m and 2.0 m x 2.0 m placed at 2.5 m depth below ground level may be taken as 250.0 kN/m² i.e 25.0 t/m².
- (iv) SBC of soil under footings of sizes  $1.5 \text{ m} \times 1.5 \text{ m}$  and  $2.0 \text{ m} \times 2.0 \text{ m}$  placed at 3.0 m depth below ground level may be taken as  $300.0 \text{ kN/m}^2$  i.e  $30.0 \text{ t/m}^2$ .

Foundation Engineering Consultant

### COMPUTATION OF AVERAGE CORRECTED N VALUE

Name of the site:

Construction of B+G+2 storied Investment Building at Surya Nagar, Bhubaneswar

**Soil Properties:** 

 $\gamma_{\text{sub}} = 10.0 \text{ kN/m}^3$ 

	Field N value (Nf) Over		/ sub	N value				
Depth	1-НЯ	(P) factor (			Correction factor (CN) =0.77log 2000 P	corrected for over burden pressure (N=N <sub>f</sub> x C <sub>N</sub> )	N value Corrected for dilatancy	
1.5	50	50	50	50	15.0	1.64	81.81	48.41
3.0	23	50	50	41	30.0	1.40	57.58	36.29
4.5	50	50	50	50	45.0 1.27		63.44	39.22
6.0	50	50	50	50	60.0	1.17	58.63	36.82
7.5	50	50	50	50	75.0	1.10	54.90	34.95
9.0	50	50	50	50	90.0	1.04	51.85	33.43
10.0	50	50	50	50	100.0	1.00	50.09	32.54

Average correct N value = 261.65/7 = 37.37 or say 30.0

Allowable bearing capacity of soil (qa)  Or say	238.7 kN/m 200.0 kN/m	
Factor of safty (FS)	2.5	2
The ultimate net bearing capacity of soil (q <sub>d</sub> )	596.8 kN/m	4
Water table correction factor (w')	0.5	
$i_{\gamma}$	1.0	
$\mathbf{i_q}$	1.0	
Inclination factor :	The state of the s	
$\mathbf{d}_{\mathbf{y}}$	1.23	
$\mathbf{d_q}$	1.23	
Depth factor:	1.70	
Overburden pressure (q) VNφ=V(tan(45+(φ/2))^2	1.73	
Overburden pressure (a)	0.8 20.0 kN/m	2
$S_{q}$	1.2	
Shape factor:		
$N_q \ N_{\gamma}$	18.40 22.40	
Bearing capacity factors :		
B L	1.5 m 1.5 m	
Size of footing:		
Proposed depth of foundation (Df)	2 m	
Submerged density of soil ( $\gamma_{sub}$ )	10.0 kN/m	
Angle of internal friction( $\phi$ ) = 36.1° or say Bulk density of soil ( $\gamma$ )	20.0 kN/m	3
0	30 .0°	
Average N Value (N <sub>av</sub> )	30	E STOLEN TO THE PERSON OF THE

Or say	200.0	
Allowable bearing capacity of soil (qa)	238.0	kN/m <sup>2</sup>
Factor of safty (FS)	2.5	585
The ultimate net bearing capacity of soil (q <sub>d</sub> )	595.1	kN/m <sup>2</sup>
Water table correction factor (w')	0.5	
	1.0	
	10	
nclination factor :	THE TENDER STATES	
Depth factor:		
/Nφ=v(tan(45+(φ/2))^2	1.73	
Overburden pressure (q)	20.0	kN/m <sup>2</sup>
	0.8	•
$S_{q}$	1.2	
Shape factor:		
$N_{\mathbf{r}}$	22.40	
$N_{f q}$	18.40	
Bearing capacity factors :	day of the second	
	2.0 2.0	
Size of footing:		
Proposed depth of foundation (Df)	2	m
Submerged density of soil (Ysub)		
Bulk density of soil (y)		kN/m³ kN/m³
Angle of internal friction( $\phi$ ) = 36.1° or say		.00
	30	0
Average N Value (Nav)	20	

30
30 .0° 20.0 kN/m³ 10.0 kN/m³
2.5 m
1.5 m 1.5 m
18.40 22.40
0.8
25.0 kN/m <sup>2</sup>
1.73
1.29
1.29
1.0
1.0
0.5
759.3 kN/m <sup>2</sup>
2.5
303.7 kN/m <sup>2</sup> 250.0 kN/m <sup>2</sup>
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Average N Value (Nav)	30
Angle of internal friction( $\phi$ ) = 36.1° or say	30 .0°
Bulk density of soil (y)	20.0 kN/m <sup>3</sup>
Submerged density of soil (Ysub)	10.0 kN/m <sup>3</sup>
Proposed depth of foundation (Df)	2.5 m
Size of footing:	
$\mathbf{B}$	2.0 m
L	2.0 m
Bearing capacity factors:	20th - 20 20 1 to 47 = 42 1
$N_{\mathbf{q}}$	18.40
$\mathbf{N}_{\mathbf{y}}$	22.40
Shape factor:	
$S_{q}$	1.2
$S_{\gamma}$	0.8
Overburden pressure (q)	$25.0 \text{ kN/m}^2$
√Nφ=√(tan(45+(φ/2))^2	1.73
Depth factor:	
$\mathbf{d_q}$	1.22
$\mathbf{d}_{\gamma}$	1.22
Inclination factor :	reconstruction to the second
$\mathbf{i_q}$	1.0
$\mathbf{i}_{m{\gamma}}$	1.0
Water table correction factor (w')	0.5
The ultimate net bearing capacity of soil (q <sub>d</sub> )	744.1 kN/m <sup>2</sup>
Factor of safty (FS)	2.5
Allowable bearing capacity of soil (qa)	297.6 kN/m <sup>2</sup>
Or say	250.0 kN/m <sup>2</sup>

Size of footing:	Market for the second	
B	1.5 m	
Bearing capacity factors:	1.5 m	
$N_{q}$	18.40 22.40	
Shape factor:	1.1. Marin 22.40	
S <sub>q</sub> S.	1.2	
Overburden pressure (q)	0.8	
VNφ=V(tan(45+(φ/2))^2	30.0 kN/m <sup>2</sup> 1.73	
Depth factor:	1.70	
$\mathbf{d_q}$	1.35	1
$\mathbf{d}_{\mathbf{q}}$	1.35	
Inclination factor:		
$\mathbf{i_q}$	1.0	
$i_{\gamma}$	1.0	
Water table correction factor (w')	0.5	
The ultimate net bearing capacity of soil (qd)	933.9 kN/m <sup>2</sup>	
Factor of safty (FS)	2.5	
Allowable bearing capacity of soil (qa)	373.6 kN/m <sup>2</sup>	
Or say	300.0 kN/m <sup>2</sup>	

Or say	250.0 kN/m <sup>2</sup>
Allowable bearing capacity of soil (qa)	297.6 kN/m <sup>2</sup>
Factor of safty (FS)	2.5
The ultimate net bearing capacity of soil (qd)	$744.1 \text{ kN/m}^2$
Water table correction factor (w')	0.5
	1.0
i <sub>o</sub>	1.0
Inclination factor:	
$\mathbf{d}$	1.22
$d_{o}$	1.22
Depth factor:	
$\sqrt{N}\phi = \sqrt{(\tan(45+(\phi/2))^2}$	1.73
Overburden pressure (q)	25.0 kN/m <sup>2</sup>
S.	0.8
S <sub>0</sub>	1.2
Shape factor:	
$\mathbf{N}$	22.40
$N_{\mathbf{q}}$	18.40
Bearing capacity factors :	
	2.0 m
Size of footing:	2.0 m
Proposed depth of foundation (Df)	
Submerged density of soil (Y <sub>sub</sub> )	2.5 m
Bulk density of soil (γ)	10.0 kN/m <sup>3</sup>
Bro or milerance in the second se	20.0 kN/m <sup>3</sup>
25.0	30 .0°
Average N Value (N <sub>av</sub> )	30

### GEOTECH RESEARCH LABORATORY, RAY INFRATECH 50B-HIG DUPLEX, BDA COLONY, BARAMUNDA, BHUBANESWAR-751003

### Chemical Test on soil sample

Project Name

: Geotechnical and other Investigation work for proposed B+G+2 storied Investment Building at Surya Nagar,

Bhubaneswar, Odisha.

Name of Client

: Jeevan Prakash, Unit-VII, Surya Nagar, Bhubaneswar

Location

: Unit-VII, Surya Nagar, Bhubaneswar

BH No.

: 1

Date of receiving of sample

:01.02.2022

Date of Testing

:01.02.2022 - 09.02.2022

Sr. No.	Test Parameters	Test Parameters Standard Methods						
1	рН	IS 2720-Part -26 -1987	6.85					
2	Chloride (mg/l)	EPA670/2.74.007	21.49					
3	Sulphate as SO <sub>3</sub> (mg/l)	IS-2720-Part-27-1977	9.21					

# GEOTECH RESEARCH LABORATORY, RAY INFRATECH 50B-HIG DUPLEX, BDA COLONY, BARAMUNDA, BHUBANESWAR-751003

### Chemical Test on soil sample

Project Name

: Geotechnical and other Investigation work for proposed

B+G+2 storied Investment Building at Surya Nagar,

Bhubaneswar, Odisha.

Name of Client

: Jeevan Prakash, Unit-VII, Surya Nagar, Bhubaneswar

Location

: Unit-VII, Surya Nagar, Bhubaneswar

BH No.

: 2

Date of receiving of sample

:01.02.2022

Date of Testing

: 01.02.2022 - 09.02.2022

Sr. No.	Test Parameters	Standard Methods	Result
1	рН	IS 2720-Part -26 -1987	6.79
2	Chloride (mg/l)	EPA670/2.74.007	20.49
3	Sulphate as SO <sub>3</sub> (mg/l)	IS-2720-Part-27-1977	9.34

### GEOTECH RESEARCH LABORATORY, RAY INFRATECH 50B-HIG DUPLEX, BDA COLONY, BARAMUNDA, BHUBANESWAR-751003

### Chemical Test on soil sample

Project Name

: Geotechnical and other Investigation work for proposed

B+G+2 storied Investment Building at Surya Nagar,

Bhubaneswar, Odisha.

Name of Client

: Jeevan Prakash, Unit-VII, Surya Nagar, Bhubaneswar

Location

: Unit-VII, Surya Nagar, Bhubaneswar

BH No.

: 3

Date of receiving of sample

:01.02.2022

: 01.02.2022 - 09.02.2022

Date of Testing		: 01.02.2022 - 09.02.2022						
Sr. No.	Test Parameters	Test Parameters Standard Methods						
1	Н	IS 2720-Part -26 -1987	6.93					
2	Chloride (mg/l) EPA670/2.74.007		21.99					
3	Sulphate as SO <sub>3</sub> (mg/l)	IS-2720-Part-27-1977	8.72					

### Foundation Engineering Consultants 50-B, H.I.G. Duplex, Baramunda, Bhubaneswar - 751 003 RECORD OF RORING

RECORD OF BORING

Construction of B+G+2 storied Investment

Bored for Jeevan F			Nogor	DDCD	1 000	Cons	tru dir	ctio	on o	of E Surv	al	Va Vac	z s	B	nec	an	esy	yar
Bored for <u>Jeevan F</u>	rakash.	Unit-VII. Si	ırya Nagai.	יוכםם	Crow	nd water level	-	N	ot :	Stru	uck							
Ground surface level .					Grou	sampler used	(C)											
Type of boring :		y Drilling					9.0	1.20	022	2								
Diameter of boring _		mm/Nx			Date	started			_		_	_						
Inclination:	Vertic	al			Date	completed			1,0	1.20	120	_						
Boring No	1				Reco	orded	_		_		_	_		_		_		
Description of Strata	Soil		Depth from	S a	m	p l e s No. blow	S	tan No	dar of	d Po	ene ws	tra for	t101 r 30	1 I 100	ests nm			Remarks
	Group	of stratum	Ground Surface	Туре	NO.	counts												
							s	2 2	2 %	35	2:	200	5.3	1 05	7.5	S 50	35	-
		$\overline{\mathbf{m}}$								Ш		$\perp$	Ц	Ц	$\perp$	Щ	Н	-
							Д	Ц	Ц	$\coprod$	1	Щ	H	H	+	H	H	-
Silty sand and Gravel	SM	11111111111	1.50	SPT	1	4,27,50,5=50	Ц	Ц	Ц	Щ	$\perp$	4	H	$\perp$	4	H	H	-
oney saire and orange		1111111111					Ц	Ц	Ц	44	1	4	H	+	4	H	H	-
		1					Ц	Ц	$\coprod$	1	4	H	H	+	+	H	H	-
Silty sand and Gravel	SM	1	3.00	SPT	2	5,10,13=23	Ц	Н	H	<i>{</i> }	+	H	H	+	H	H	H	-
only sure and orange		1					Н	H	H	H	+	H	H	+	Н	H	H	
		1			_		H	H	H	+	1	H	H	+	H	H	H	
Silty sand and Gravel	SM		4.50	SPT	3	7,18,50(10.0)=50	11	H	H	H	+	H	H	+	H	H	H	
		]			-		Н	H	H	+	+	╁	Н	+	H	H	H	
			100	CDT	-	50 -50	Н	H	H	+	+	H	$\forall$	+	H	H	H	1
Silty sand	SM		6.00	SPT	4	50 <sub>(0.0)</sub> =50	Н	H	H	+	+	+	$\forall$	$^{+}$	H	H	Ħ	
		- N. 1871	.]	-	+		H	H	$\forall$	H	+	H	H	+	$\dagger$	Ħ	H	
	GD.		7.50	SPT	5	50 <sub>0.0)</sub> =50	H	$\dagger \dagger$	H	Н	H	Ħ	$\dagger$	1	$\dagger \dagger$	Ħ	T	
Poorly graded Sand	SP		7.50	1011	+	(0.0)	H	$\dagger \dagger$	Н	Н	H	1	H	1	Ħ	Ħ		
		- (4)		+	+		Ħ	Ħ	T	Н	Н	Ħ	$\top$		11	11		
	- an		9.00	SPT	6	50 <sub>mm</sub> =50	Ħ	$\forall$	+	H	H	Ħ	T	I	11	T	T	
Poorly graded Sand	SP		9.00	51 1	+	900	Ħ	$\forall$	$\top$	H	П	1	T	П	H			
	-	- Y. N. Y	10.00	SPT	17	50 <sub>mm</sub> =50	Ħ	Н	$\top$	T	Ħ	Ħ	1	П	11	T		
Poorly graded Sand	SP	_ <del></del>	10.00	51 1	+	30 mm	T	T	T	T	П			П	11		П	
		-	+	1	+		+	$\top$	T	$\parallel$	11							
		-	+	+	+		+	$\top$	1	$\prod$	11	T		П				
	-	-	+	+	+		+	1	1	1	11		П	П				
	-	-	+		+		+		1	11							$\prod$	
	+	<del>                                     </del>	+		$\top$		1										П	
	-	1	1	1					I									
	-	<del>                                     </del>	+	+	+		1	$\prod$									$\prod$	
	+	<del>                                     </del>		+	+		1	$\prod$	$\prod$								$\prod$	
	+	-		+	+		T	T	T	T			$\prod$					

### Foundation Engineering Consultants 50-B, H.I.G. Duplex, Baramunda, Bhubaneswar - 751 003 RECORD OF BORING

Bored forJeevan	Prakash	Unit-VII S	Surva Naga	r. BBS	Ross	Cons Bu	struction of B+G+2 storied Investment ilding at Surya Nagar, Bhubaneswar
						and water level	Not Struck
Ground surface level		ry Drilling					SPT
Type of boring:		mm/Nx		_		sampler used	10.01.2022
Diameter of boring _				_		started	11 01 2022
Inclination:	2					completed	
Boring No				_	Reco	orded	
Description of Strata	Soil	Thickness	Depth from	S a	m	p l e s	Standard Penetration Tests Remarks
	Group		Ground	Туре	No.	20	No. of Blows for 300 mm.
		stratum	Surface			counts	
		1			_		252488448838688888
		<b>.</b>					
01	63.6	4	1.50	op#	+.	14 20 50 50	
Silty sand and Gravel	SM	1111111111111	1.50	SPT	1	14,28,50 <sub>10.0</sub> =50	<del>╒┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋┋</del>
	+	- "5985"	1		-		
Poorly graded Sand	SP	-   "	3.00	SPT	2	8,50,550	
1 oonly graded band	5.	-   1	3.00	0	+	7,5 (7,5)	
		) ('m gy' ,					
Poorly graded Sand	SP		4.50	SPT	3	50 <sub>(5.0)</sub> =50	
		_ 1 1 1 1 1 10		anm	ļ.	50 50	
Poorly graded Sand	SP		0.00	SPT	4	50 <sub>(0.0)</sub> =50	
	-	_		-	+-		<del>                                     </del>
Poorly graded Sand	SP		7.50	SPT	5	50 <sub>(0,0)</sub> =50	
- Tooliy graded Sand	1 31	-	The same of the sa		+	(0,0)	
	1	-\;`\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	"	l			
Poorly graded Sand	SP		9.00	SPT	6	50 <sub>(0.0)</sub> =50	
Poorly graded Sand	SP		10.00	SPT	7	50 <sub>(0,0)</sub> =50	
	-	-	-	-	$\vdash$		
		ļ	+	-	+		
	-	-	-	-	+	<b> </b>	╂╂╂╂╂╂╂╂╂┼┼┼┼┼┼┼┼┼╂╂╂
	-	-	+	-	+		
	+	-	<u> </u>	_	+		<del>                                      </del>
			1		+		

### Foundation Engineering Consultants 50-B, H.I.G. Duplex, Baramunda, Bhubaneswar - 751 003

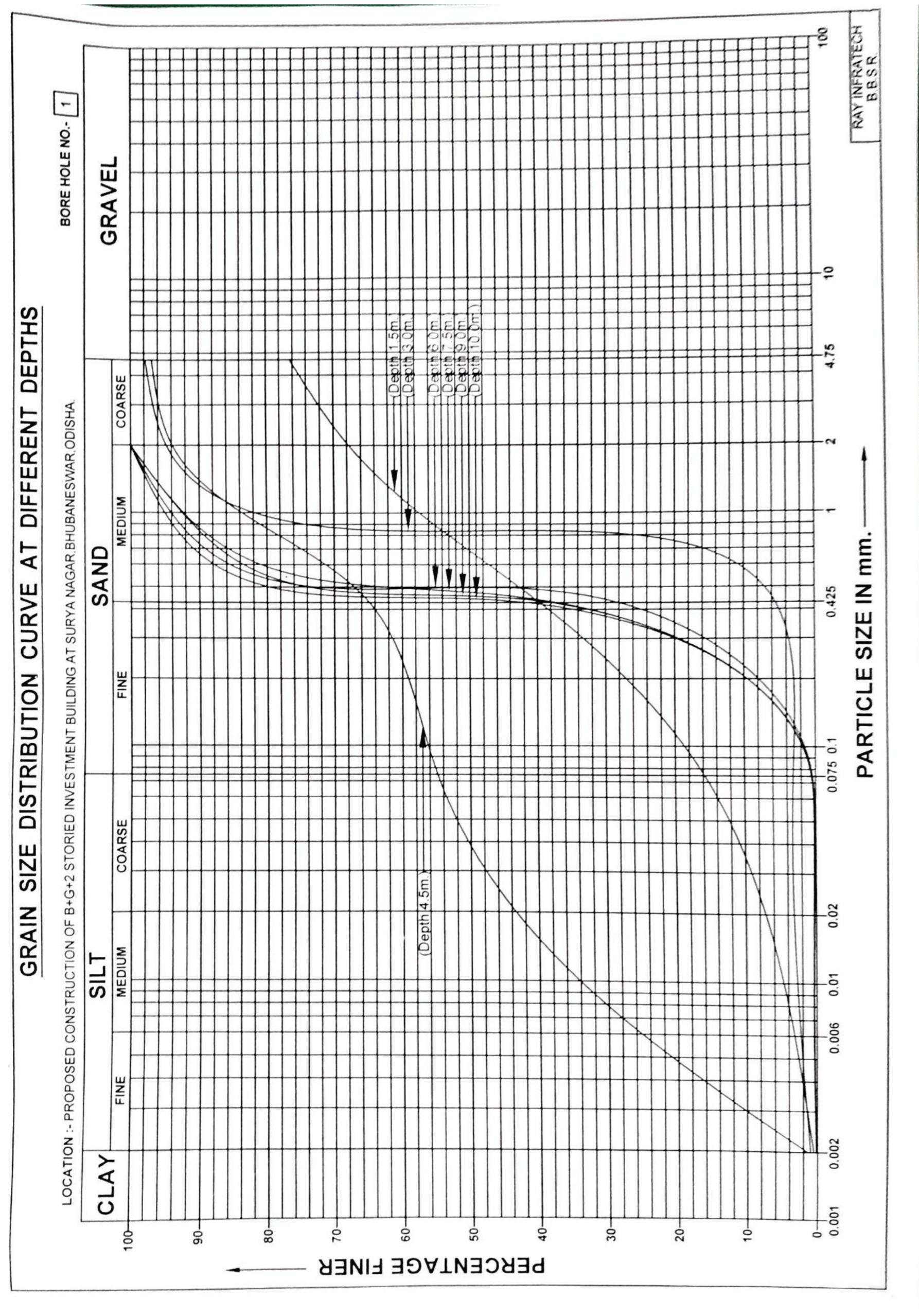
RECORD OF BORING

					Const	110	in	of	D.	+C	+2	ct	Ori	ec	Tr	We	stment				
och H	nit VII. Qur	a Nagar F	RSR .																		
												<u> </u>	., .	2110	u D	4110	<u> </u>				
D : D !!!'									CDT												
					10.00	12.01.2022															
						_			_		_	_	_	_							
veru	cai				28.25 (c. 19.25																
Recorded																					
Soil	Thickness	Depth from	S a	m	p l e s	Standard Penetration Tests										Remarks					
Group	of	Ground	Туре	No.	0.00	1	No.	of E	3lo	ws	for	r 3(	00 1	nn	n.						
	stratum	Surface			counts																
	. **** 1657. * 1					2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2															
						Н	+	$\mathbb{H}$	+	₩	+	Н	Н	+	Н	H	+				
SP	1		SPT	1	14.28.50 =50	$\dagger$	$\dagger$	+	+	$\dagger \dagger$	$\dagger$	$\dagger \dagger$	$\dagger$	+	$\dagger$	H					
- 01		1.50	011		11,20,50100	T		$\sqcap$	T	Ħ	T	П					CR=8.0 %				
			Core			T						П					RQD=0.0 %				
		3.00	SPT	2	8,50, =50						I	П					Sample slippe				
									Ц	Ц	1	Ц		Ц		Ш	CR=8.66 %				
			Core				Ц	Ш	Ц	4	1	Ц	1	Ц	$\perp$	$\perp$	RQD=0.0 %				
		4.50	SPT	3	50 <sub>(5.0)</sub> =50	Щ	Ш	Ш	Ц	4	1	Ц	$\perp$	Ц	1	1	Sample slippe				
						Щ	Н	Ш	Ц	44	1	$\mathbb{H}$	$\perp$	Н	+	-	CR=7.0 %				
			-			$\parallel$	1	$\sqcup$	H	$\mathbb{H}$	+	Н	+	H	+	#	RQD=0.0 % Sample slippe				
		6.00	SPT	4	50 <sub>(0.0)</sub> =50	H	H	H	H	$\mathcal{H}$	+	H	+	H	+	H					
			Core	$\vdash$		₩	₩	₩	Н	+	+	H	+	Н	+	₩	CR=6.0 %				
		7.50	-	+	50 -50	₩	H	+	Н	+	+	Н	+	H	+	╫	RQD=0.0 % Sample slippe				
_	- "' C.C '		SFI	)	30 <sub>m.n</sub> -30	H	$\dagger \dagger$	+	Н		*	+	+	H	+	H	gampic suppe				
		·	+	+		H	H	H	H	H	H	+	$\dagger$	H	$^{\dagger}$	H					
SP	- (1)	9.00	SPT	6	50, =50	Ħ	Ħ	$^{\dagger\dagger}$	H	+	$\dagger$	+	$\dagger$	H	1	$\dagger \dagger$					
-				T	(0.0)	Ħ	Ħ	$\dagger \dagger$	Ħ	$\top$	1	$^{\dagger}$	H	Ħ	T	Ħ					
SP	- C C.	10.00	SPT	7	50,00=50	Ħ	Ħ	$\dagger \dagger$	T		П		T	T	T	$\dagger \dagger$					
					****	П	П	$\prod$								П					
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						П		Ш					П								
Ì						П	$\coprod$	$\prod$		$\prod$			$\coprod$			$\prod$					
						Щ	$\coprod$	$\coprod$	1	$\coprod$	Ц	1	$\coprod$	1	$\coprod$	$\coprod$					
				1		$\coprod$	$\mathbb{H}$	$\coprod$	+	#	$\downarrow$	1	H	+	$\prod$	H	-				
				1		Щ	Щ	4	+	$\coprod$	$\perp$	1	H	+	H	$\mathbf{H}$					
	1											П									
-		+		_			$\top$					$\Box$	$\top$		$\sqcap$						
	Rota 150 Vertic 3	Rotary Drilling 150 mm/Nx Vertical 3  Soil Thickness of stratum  SP	Rotary Drilling 150 mm/Nx  Vertical 3  Soil Thickness Open Ground Surface  SP 1.50  4.50  6.00  7.50	Rotary Drilling	Rotary Drilling	Rotary Drilling	Rotary Drilling	Rotary Drilling   Soil sampler used   Soil s	Soil   Thickness   Depth from   Surface   Sept   Surface   Sept   Sept	Rotary Drilling	Rotary Drilling	Rotary Drilling	Rotary Drilling	Rotary Drilling   Soil sampler used   SPT   12.01.2022	Rotary Drilling	Rotary Drilling	Rotary Drilling				

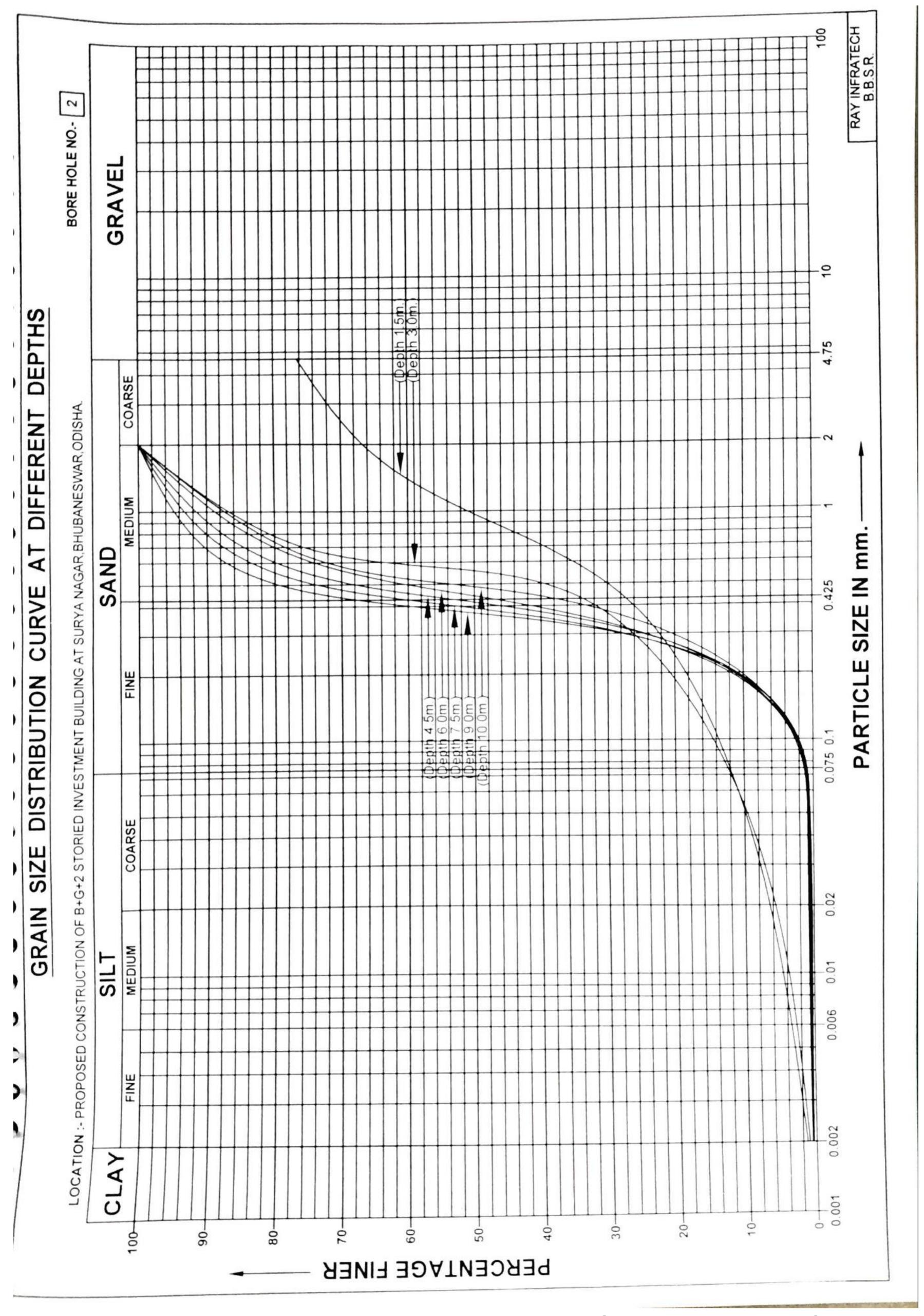
PROLECT CONSTRUCTION OF THE SEARCH FLOOR ALONG NEW MININGENICE HALL BANKER FLOOR AND ASSET TO SERVING NEW MININGENICE HALL BANKER FLOOR OF THE PROPERTY RAY WITH STATE OF BORNE HALL STATE TO BOOK HALL BUILDING AND ASSET TO SEASON OF THE PROPERTY OF THE																	
STATE   CONSTRUCTION of BH-C†-2 Started Investment Building at Surya Night. Billibranessure   Building at Surya Night. Building at Surya Nig																	
STATE   STAT		<del>-</del>	UC Compressive STRENGTH qu kN/m² un soaked														
STATE   STAT		11.202 11.202 1 Struc		Γ													$\neg$
September   State   Construction of B+G+2 storied Investment Building at Surya Nagar. Brubaneswar   SummARis EDDATA SHEET		<b>-</b>							П								
September   State   Construction of B+G+2 storied Investment Building at Surya Nagar. Brubaneswar   SummARis EDDATA SHEET		TER	COHESION KN\m <sub>5</sub>														
Set   Construction of B+G+2 storted Investment Building at Sun Analysis Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of B+G+2 storted Investment Building at Sun As Set   Construction of Set   Constructio		NCEM ETION ND WA	SPECIFIC GRAVITY					T			$\top$						
STT   Silty sand and Gravel   SM   SN   SN   SN   SN   SN   SN   SN		APL!						T			$\top$		$\Box$	1			$\neg$
STT   Silty sand and Gravel   SM   SN   SN   SN   SN   SN   SN   SN	8	5 P.	UNITWEIGHT	_				_	$\sqcup$		$\perp$		$\sqcup$				$\Box$
STT   Silty sand and Gravel   SM   - Np   - 0.00   0.00		유유물운			8		જ		8		8		প্ত		8		ଷ
SPT   Silty sand and Gravel   SM   - Np   - 0.00   0.00	SWAF	DAT GRC DEP	0707078578		0.54		1.0				-		0.20		0.20		0.20
SPT   Silty sand and Gravel   SM   - Np   - 0.00   0.00	BANE				100		2.09				0.26		0.40		0.32		0.35
SECTECH RESEARCH LABORATORY, RAY INFRATEGE									96.6						1000		41.02
SPT   Sorty graded Sand   SPT   SPT   Poorty graded Sand   SPT   SPT   Poorty graded Sand   SPT   SPT   Poorty graded Sand   SPT   SPT   SPT   Poorty graded Sand   SPT   SPT   SPT   Poorty graded Sand   SPT	TECH	Ш							79.07				63.0				
SPT   Silty Sand and Gravel   SM   SPT   Silty Sand   SPT   SPT   Silty Sand   SPT   SPT   Sporty graded Sand   SPT   SPT   Sporty graded Sand   SPT	INFR	ubanes			8.68		3.04		2.98		00.0		00.0		00.0		000
SPT Silty sand and Gravel SPT Silty sand SPT SPT Silty sand SPT SPT Silty sand SPT	RAY		GRAVEL + 4.75 mm		120				13		8		8		8		8
SPT Silty sand and Gravel SPT Silty sand and Gravel SPT Silty Sand SPT SPT Silty Sand SPT Silty Sand SPT	ATORY	/a /			0.00		0.00		0.00				+			1	$\dashv$
SPT Silty sand and Gravel SPT Silty Sand and Gravel SPT Silty Sand SPT Poorly graded	ABOR	s at Su			ı		1		1	1		+					
SPT Silty sand and Gravel SPT Silty Sand and Gravel SPT Silty Sand SPT Poorly graded	CH L	uildin			ď		ď		S.	1	Š		S <sub>C</sub>	$\top$	N d		å.
SPT Silty sand and Gravel SPT Silty Sand and Gravel SPT Silty Sand SPT Poorly graded	SEAF	nent B	to the same of the		1		1				L		,	$\dagger$			
SPT Silty sand and Gravel SPT Silty Sand and Gravel SPT Silty Sand SPT Poorly graded		nvestr													$\Box$		$\exists$
SPT Silty sand and Gravel  SPT Silty sand	GEOTE	+ 2	GROUP LETTER SYMBOL		SM		SM		SM		SM		SP		SP		SP
SAMPLE TYPE         SAMPLE TYPE         PR         PR <td></td> <td>Construction of B+(NO. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td> <td>DESCRIPTION OF SOIL GROUP</td> <td></td> <td>and</td> <td></td> <td>Silty sand and Gravel</td> <td></td> <td>sand and</td> <td></td> <td>Silty Sand</td> <td></td> <td>graded</td> <td></td> <td>graded San</td> <td></td> <td>graded</td>		Construction of B+(NO. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	DESCRIPTION OF SOIL GROUP		and		Silty sand and Gravel		sand and		Silty Sand		graded		graded San		graded
ОБ В В В В В В В В В В В В В В В В В В В		[	39YT 3J9MA2		SPT		SPT		-		++			+	+	+	$\dashv$
		PROJ BORE TYPE DIAMI	DEPTH FROM GL. ™		1.50		3.00		4.50		+		20	+	+		

- 1	GEOTECH RESEARCH LABORATORY, RAY INFRATECH, BHUBANESWAR - 751 003	G+2 storied Investment Building at Surya Nagar, Bhubaneswar  DATE OF COMP  GROUND RL.  DEPTH OF GRO	SYMBOL  COMPRESSION  LIOUID LIMIT %  (%)  PLASTIC LIMIT %  (%)  LIOUID LIMIT %  (%)  LIOUID LIMIT %  (%)  PLASTIC LIMIT %  (%)  THEE SANELL %  COARSE SAND  HOEX  OUG COMPRESSION  THEE SAND  + 0.002 mm  CLAY  OLOS mm  HEES SAND  + 0.002 mm  ACOARSE SAND  + 0.002 mm  CLAY  OLOS mm  HEES SAND  + 0.002 mm  ACOARSE SAND  + 0.002 mm  CLAY  OLOS mm  ACOARSE SAND  + 0.002 mm  SILT  HEES SANELL %  OLOS MM  THEE SAND  + 0.002 mm  SILT  HOLOS mm  CLAY  OLOS MM  THEE SAND  + 0.002 mm  SILT  THE SAND  THEE OF INTERNAL  OLOS WM  STREWGTH QU KNIM'  STREW	d and Gravel SM - 0.00 23.58 9.73 39.48 15.19 10.69 1.33 50	Sp. 21,05 11,06 1,26 50			Dung	-	aded Sand	raded Sand SP - Np - 0.00 0.00 0.00 39.85 58.84 0.71 0.60 50		raded Sand SP - Np - 0.00 0.00 32.46 66.46 0.68 0.40 50	
		struction ( 2 - Rotary Dr RE HOLE	DESCRIPTION OF SOIL GROUP	sand and (				Poorly graded Sand	-	graded San	graded		graded	
9 2 2 3 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6		IS 등 등 I	34YT 3J9MA2	28		1	1 1	1	+			+	+	

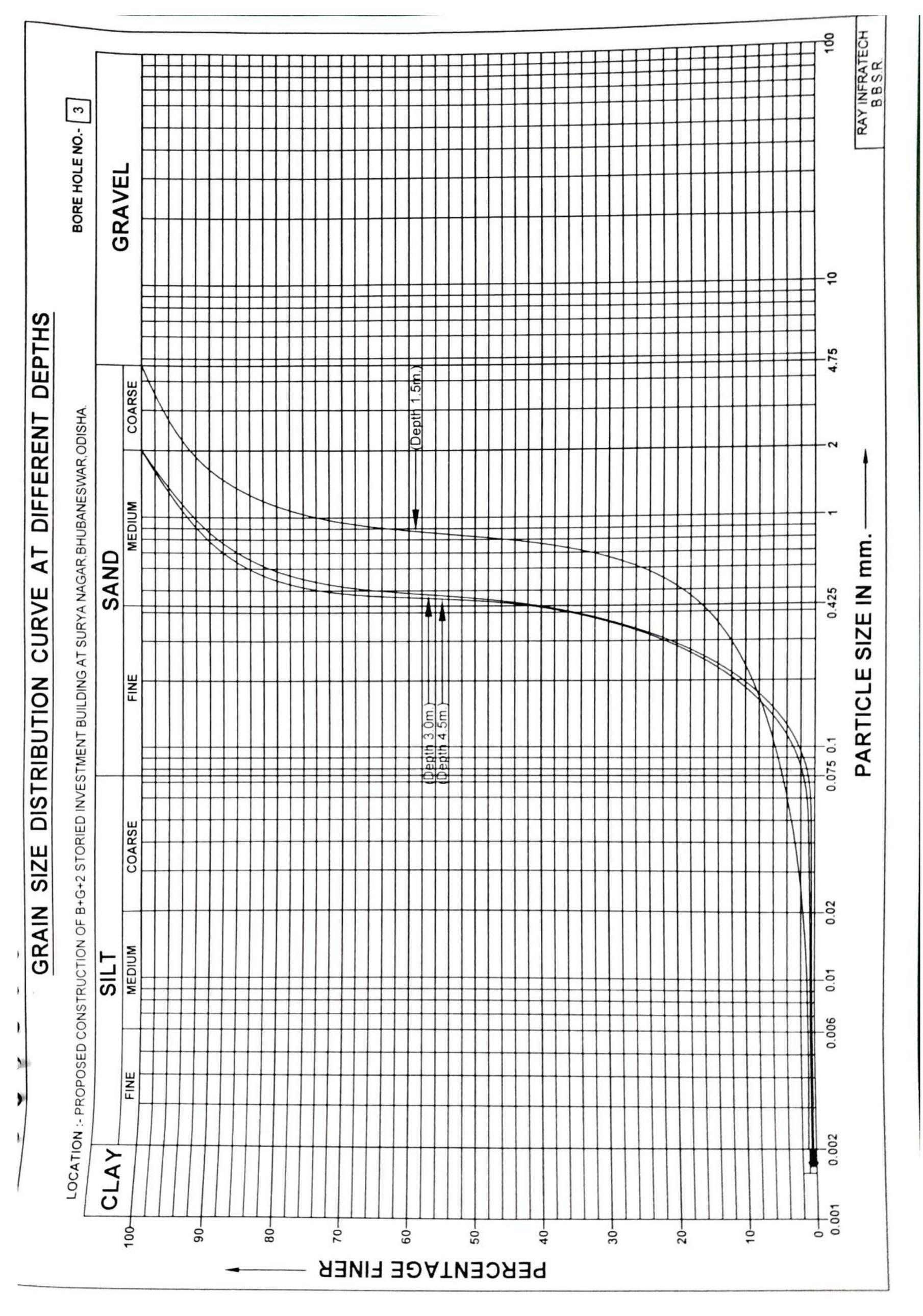
BHUBANESWAR - 751 003	DATE OF COMMENCEMENT - 12.01.2021  DATE OF COMPLETION - 12.01.2021  GROUND RL.  DEPTH OF GROUND WATER - Not Struck	+ 0.002 mm -0.002 mm -0.003 mm -0.003 mm -0.004 kN/m² SPECIFIC GRAVITY COMPRESSION LUC COMPRESSION SPECIFIC GRAVITY SPECIFIC GRAVITY -0.002 mm -0.		51 1.14 50		98			20			98			8		56 0.20 50		.00 0.64 50
된다		MEDIUM SAND + 0.425 mm FINE SAND + 0.075 mmm		76.45 11.75 3.													59.58 39.66 0.		58.28 40.08 1
INFRA	ala s nubanes	COARSE SAND + 2.00 mm		7.15													0.00		0.00
RA ED	SED D	GRAVEL + 4.75 mm		0.00													0.00		0.00
ATOR	MARI urya Na	DIFFERENTIAL FREE SWELL %		0.00													0.00		00.00
S E	at S	% X3QNI YTISITSAJ9 ( <sub>q</sub> l)		1													1	$\perp$	1
RCH L	Building	PLASTIC LIMIT % (w <sub>p</sub> )		Np													ď		Z <sub>D</sub>
RESEARCH	tment	LIQUID LIMIT % (w <sub>L</sub> )		1													1		1
	Invest	ARUTZIOM JARUTAN % TNETNOD																	
GEOTECH	r+2 storied Investment	GROUP LETTER SYMBOL		SP													SP		SP
	F - Construction of B+G NO. 3 BORING - Rotary Drilling R OF BORE HOLE - 150 mm	DESCRIPTION OF SOIL GROUP		Poorly graded Sand	Micaceous Sand stone		Micaceous	Gritty Sand Stone		Micaceous	Gritty Sand Stone		Micaceous	Gritty Sand Stone			Poorly graded Sand		Poorly graded Sand
	PROJECT - CO BORE HOLE NO. TYPE OF BORING DIAMETER OF BO	39YT 3J9MA2		SPT	Core	SPT		Core	SPT		Core	SPT		Core	SPT		SPT		SPT
	PROJECT . BORE HOL TYPE OF BOT	DEPTH FROM GL. m		1.50		3.00			4.50			6.00			7.50		9.00		10.00



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