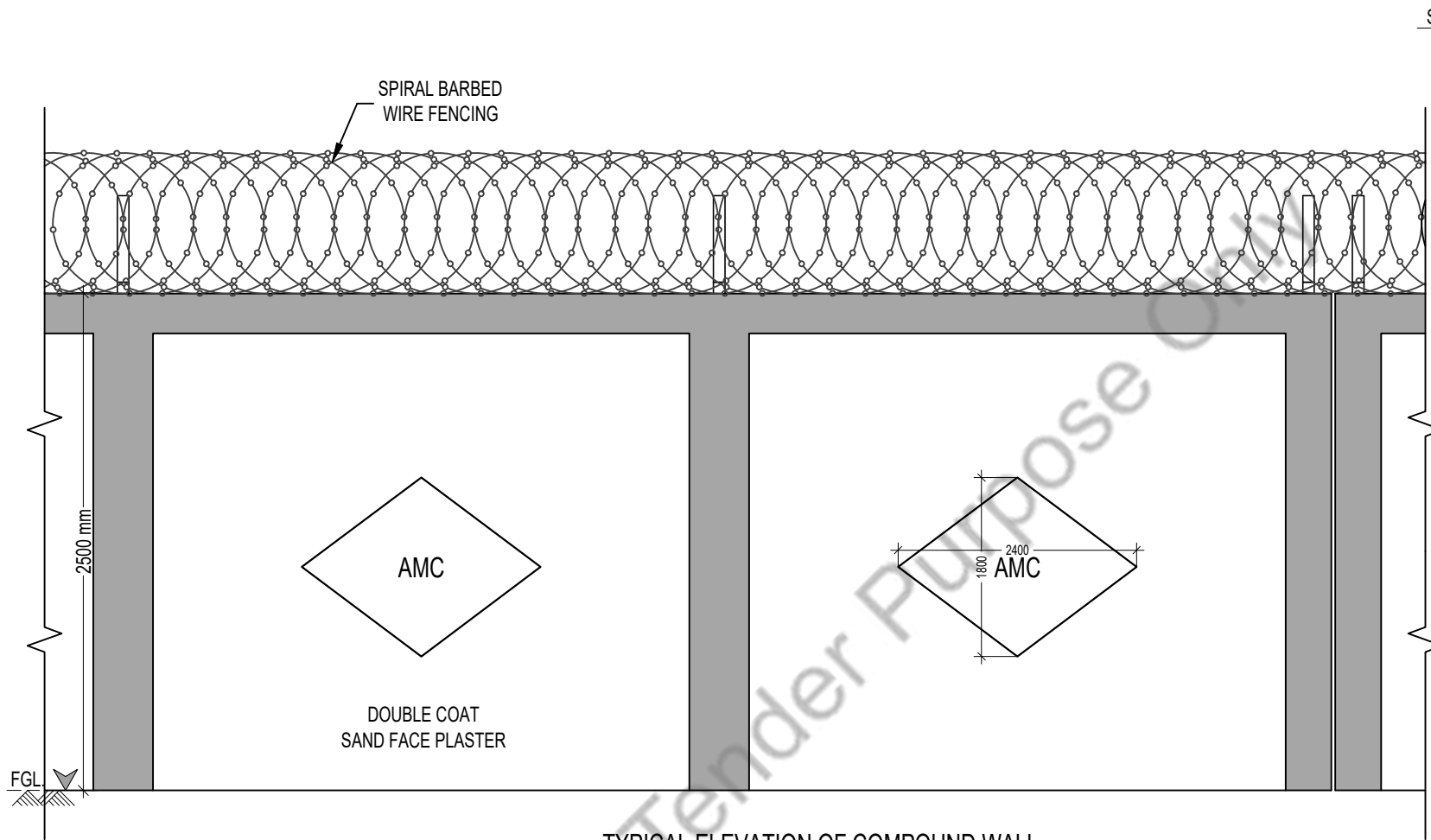


**SECTION – 9**  
**DRAWINGS**

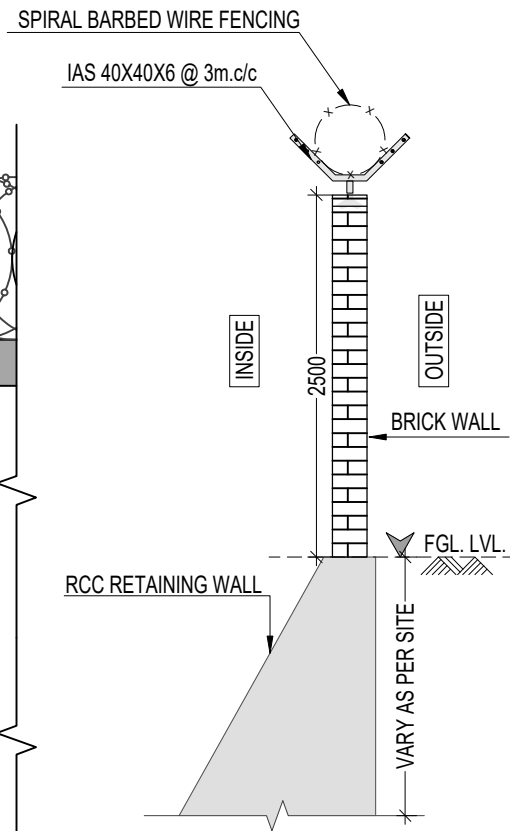








TYPICAL ELEVATION OF COMPOUND WALL

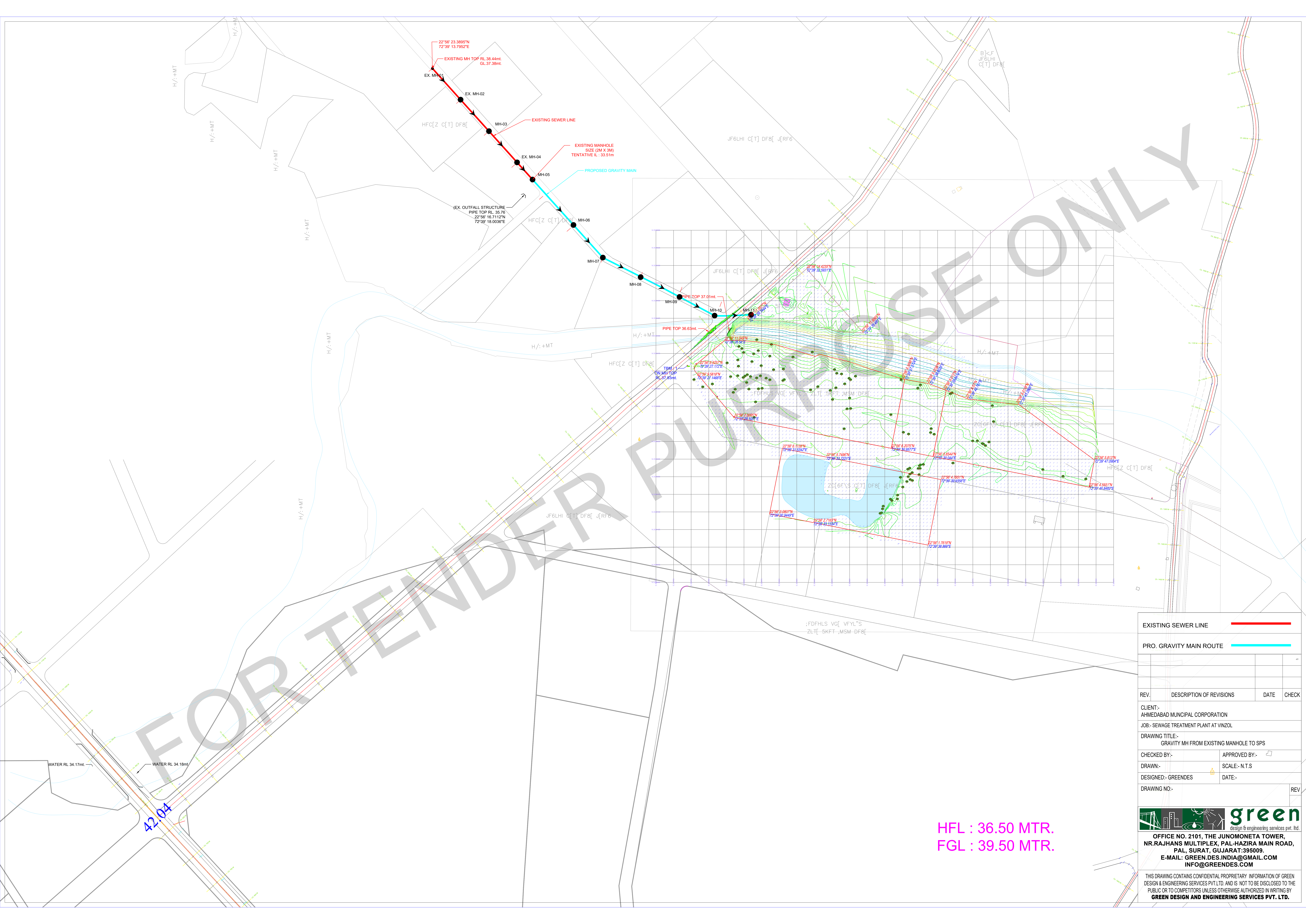


C/S OF COMPOUND WALL

CLIENT:- AHMEDABAD MUNICIPAL CORPORATION	
JOB:- SEWAGE TREATMENT PLANT AT VINZOL	
DRAWING TITLE:- TYPICAL SECTION OF COMPOUND WALL.	
CHECKED BY:-	APPROVED BY:-
DRAWN:-	SCALE:-
DESIGNED:-	DATE:-
DRAWING NO:- GREEN/AMC/VINZOL/COMPOUND WALL - 01	
REV R0	
 <b>green</b> design & engineering services pvt. ltd.	
OFFICE NO. 2101, THE JUNOMONETA TOWER, NR.RAJHANS MULTIPLEX, PAL-HAZIRA MAIN ROAD, PAL, SURAT, GUJARAT:395009. E-MAIL: GREEN.DES.INDIA@GMAIL.COM INFO@GREENDES.COM	
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Note: THE COMPOUND WALL SECTION SHOWN IN THE DRAWING REPRESENTS THE TYPICAL SECTION ABOVE THE FINISHED GROUND LEVEL (FGL). FURTHERMORE, FROM THE EXISTING GROUND LEVELS UP TO THE FGL, ANY RCC RETAINING WALL OR WALL ON PILE FOUNDATION/FOOTING, AS REQUIRED BASED ON SITE CONDITIONS, SHALL BE INCLUDED IN THE BIDDER'S SCOPE OF WORK.





EXISTING SEWER LINE

PRO. GRAVITY MAIN ROUTE

REV.	DESCRIPTION OF REVISIONS	DATE	CHECK

CLIENT:-  
AHMEDABAD MUNICIPAL CORPORATION

JOB:- SEWAGE TREATMENT PLANT AT VINZOL

DRAWING TITLE:-  
GRAVITY MH FROM EXISTING MANHOLE TO SPS

CHECKED BY:-  
DRAWN:-  
DESIGNED:- GREENDES  
DRAWING NO:-

APPROVED BY:-  
SCALE:- N.T.S  
DATE:-  
REV

OFFICE NO. 2101, THE JUNOMONETA TOWER,  
NR.RAJHANS MULTIPLEX, PAL-HAZIRA MAIN ROAD,  
PAL, SURAT, GUJARAT:395009.  
E-MAIL: GREEN.DES.INDIA@GMAIL.COM  
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HFL : 36.50 MTR.  
FGL : 39.50 MTR.





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**TECHNICAL REPORT ON GEOTECHNICAL INVESTIGATION  
WORK FOR CONSTRUCTION OF NEW SEWAGE  
TREATMENT PLANT AT VINZOL AT RAMOL HATHIJAN  
WARD EAST ZONE OF AMC.**

**CLIENT NAME:**

**GREEN DESIGN & ENGINEERING SERVICES PVT.LTD.**

**REPORT NO.**

**STCS/2026-27/0401/01/01**

**APRIL – 2026.**

**REPORT PREAIED BY**

**SHREEJI TECHNICAL CONSULTANCY SERVICE,  
SARKHEJ, AHMEDABAD – 382210.**



## INTRODUCTION

Client was proposed "Geotechnical Investigation Work for Consultancy Service for Survey, Planning, DPR, Designing, Estimate, Tendering and Related work for construction of New Sewage treatment Plant at Vinzol at ramol hathijan ward East zone of AMC." Geotech work awarded to Shreeji Technical Consultancy Services, carrying out all field activity and they assigned Sample testing and find out soil bearing capacity & reporting to Shreeji Technical Consultancy Services for the testing of sample and calculation of Safe Bearing Capacity for the project. Soil investigations were envisaged to evolve various soil parameters in order to carry out engineering analysis and foundation design. Broad objectives of the investigation are as follows,

To evaluate the parameters of soil at the proposed site.

To assess the engineering parameters and to estimate the safe bearing capacity of soil

## FIELD INVESTIGATION

### Boring

The exploratory boreholes of 100/150mm diameter were drilled by Auger drilling method.

The depth of the test bore at the proposed location is as under:

### Disturbed Samples

Disturbed samples were collected during the boring and also from the split spoon sampler. The samples recovered were logged, labeled and placed in polythene bags and sent to laboratory for testing.

### Undisturbed Samples

Undisturbed soil samples were collected in thin-walled Shelby tubes and using piston type sampler as per IS-2132. The samples were sealed with wax, labeled and transported to our laboratory at Sarkhej, Ahmedabad for testing.

### Standard Penetration Test

The Standard Penetration Tests (SPT) (IS-2131, 1981) was carried out in the bore hole at predetermined depths. It gives indirect evaluation of strength-deformation characteristics of the sub soil. The test includes driving a split spoon sampler using a 63.5 kg hammer with a free fall of 750mm. The first 15cm is considered as seating drive. The No. of blows required to penetrate next 30 cm is reported as N-value. Empirical relations are established to correlate N-Value with the shear

Parameters or bearing capacity of soil. A disturbed soil sample is collected inside the split spoon sampler which can be used to find soil classification and In-situ water content.

If the no. of blows exceeds 50 before desired penetration is achieved, it is reported as N- value  $\geq 50$  with the actual penetration achieved.





### Ground Water Table

Ground Water table Details during the time of investigation in the month of work & Depth was mentioned in bore log.

### LABORATORY INVESTIGATION

The laboratory tests on soil samples were started immediately after the receipt of the same in the laboratory. Following laboratory tests are carried out to determine the physical and engineering properties of undisturbed and disturbed soil samples.

1. Dry Density and Natural Moisture Content (IS - 2720, Part – II)
2. Particle Size Analysis (IS - 2720, Part – IV, 1985)
3. Atterberg's Limit (IS -2720, Part – V, 1985)
4. Specific Gravity (IS -2720, Part – III, 1980)
5. Shear Test (IS: 2720, Part-XI)
6. Density and Moisture content (IS 13030:1991)
7. Specific Gravity (IS 1122-1974)
8. Unconfined Compressive Strength of Rock (IS 9143-1979)

**Scale of Weathering Grades of Rock Mass (IS : 4464)**

Terms	Description	Grade	Interpretation
Fresh	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.	I	CR > 90 %
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discoloured by weathering.	II	CR between 70% to 90%
Moderately Weathered	Less than half of the rock material is decomposed or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as core stones.	III	CR between 50% to 70%
Highly Weathered	More Than half of the rock material is decomposed or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as core stones.	IV	CR between 10% to 50%
Completely Weathered	All rock material is decomposed and / or disintegrated to soil. The original mass structure is still largely intact.	V	CR between Zero to 10%
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI	CR = Zero% But N > 50





Relation between RQD and in-situ Rock Quality, IS: 13365 (part-1) Annex B	
RQD Classification	RQD%
Excellent	90-100
Good	75-90
Fair	50-75
Poor	25-50
Very Poor	00-25

Rock Strength	Compressive Strength (Mpa)	Compressive Strength (Kg/cm <sup>2</sup> )
Extremely weak	<2	<20
Very weak	2-10	20-100
Weak	10-25	100-250
Average	25-50	250-500
Strong	50-100	500-1000
Very strong	100-250	1000-2500
Extremely strong	>250	>2500

### Field Dry Density & Natural Moisture Content

The weight of undisturbed soil sample with sampler (Shelby tube) is determined after removing paraffin wax and loose soil. The total length of soil sample recovery is determined after deducting empty length from the total length of sampler. The volume of soil mass retained in sampler is thus determined from the known inside diameter of sampler and total length of soil mass. The soil mass is then removed and the average moisture content is determined by keeping the soil sample along with crucible in oven at 100-105 degree centigrade for 24 hours. The empty weight of the sampler is then found out. From the total weight of sampler with soil mass, the weight of empty sampler is deducted. The field density is then found out as

$$\text{Field density (bulk)} = \frac{\text{weight of soil mass}}{\text{volume of soil mass}}$$

$$\text{Field dry density} = \frac{\text{Field bulk density}}{1 + w}$$

Where w is water content.





## Particle Size Analysis

The sieve analysis is carried out in accordance with IS-2720, Part-IV, 1985. The results are presented in the form of Grain size distribution curve. Representative soil sample is obtained from the bulk soil sample collected or received from site by method of coning and quartering. Quantity of soil taken will be dependent on the maximum size of particle size present in the soil. Sieve analysis is conducted in two parts:

### 1) Soil fraction retained on 4.75mm ISS

Soil portion retained on 4.75 ISS is weighed. The sample is then separated into various fractions by sieving through the following sieves:

100-, 75-, 19- and 4.75-mm ISS

While sieving through each sieve, sieve is agitated so that sample rolls in irregular motion over the sieve, at no time the particles are pushed through; Care is also taken to see that no individual soil particles are broken, though particles adhering one another are rubbed by rubber pestle when required. Care is also taken not to over load the sieve beyond the permitted maximum load for respective sieve.

The mass of the material retained on each sieve is recorded the percentage of soil retained on each sieve is then calculated on the basis of the total mass of soil taken and from these results.

### 2) Soil fraction passing 4.75 ISS

The portion of the soil passing 4.75 mm ISS is oven dried at 105°C to 110°C. The portion is coned & quartered to obtain required representative quantity of the material. The material is weighed and placed in tray/bucket filled with water for soaking and loosening the adhered cohesive materials. The soaked soil specimen is then washed on 75 micron IS Sieve until the water passing the sieve is almost clear. The material retained on 75 micron IS Sieve is then transferred in a tray, dried in oven.

Sieve analysis is then conducted on a nest of sieves (viz. 2 mm, 425 and 75 micron ISS) either by hand or by using mechanical sieve shaker. The fraction retained on each of the sieves is weighed separately and masses recorded. Cumulative mass of soil fraction retained on each sieve is then calculated. The weights are then converted into cumulative percentage retained and passing on the basis of the mass of the sample passing 4.75 ISS taken. The combined gradation on the basis of the total sample taken for analysis.





### Atterberg's Limit

Liquid and Plastic Limits are determined by using procedure given in IS: 2720, Part-V, 1985. The results are given in result sheet. The weight of cone plus rod and plate is 148 gm. A soil sample weighing about 150gm from the thoroughly mixed portion of soil passing 425 microns was used for testing. The thoroughly wet soil paste is transferred to the cylindrical trough 150mm diameter and 50mm high of the cone penetrometer apparatus and levelled up to the top of trough. The penetrometer is adjusted such that the cone point just touches the surface of the soil paste in trough. The scale of the penetrometer is adjusted to zero and the vertical rod is released so that the cone is allowed to penetrate into the soil paste under its own weight. The penetration is noted after 30 sec. from the release of the cone. The reading is considered if the penetration reading is between 20mm and 30 mm. The moisture content of the soil paste corresponding to this is determined. The liquid limit of the soil which corresponds to the moisture content of a paste which would give 25 mm penetration of the cone is determined using formula:

$$W_{LL} = W_x + 0.01 (25 - W) (W_x + 15)$$

For determination of plastic limit, a soil sample weighing at least 20 gm from the soil sample passing 425micron IS sieve is thoroughly mixed with water such that it can be easily moulded with fingers. A ball is formed with about 8 to 10 gm of this soil & is rolled between the fingers and the glass plate with just sufficient pressure to roll the mass into a thread of uniform diameter of 3mm throughout its length. The soil is then kneaded together to a uniform mass and rolled again. The process is continued until the thread crumbles. The pieces of crumbled soil thread are collected and moisture content is determined and reported as plastic limit.

### Specific Gravity

The specific gravity of soil solids is determined by a 50ml density bottle. The weight ( $W_1$ ) of the empty dry bottle is taken first. A sample of oven-dried soil about 10-20 g cooled in a desiccator, is put in the bottle, and weight ( $W_2$ ) of the bottle and the soil is taken. The bottle is then filled with distilled water gradually removing the entrapped air either by applying vacuum or by shaking the bottle. The weight ( $W_3$ ) of the bottle, soil and water (full up to the top) is then taken. Finally, the bottle is emptied completely and thoroughly washed and clean water is filled to the top and the weight ( $W_4$ ) is taken.

$$\text{Specific Gravity (G)} = \frac{(W_2 - W_1)}{(W_2 - W_1) - (W_3 - W_4)}$$





### **Shear Test**

Direct shear test is carried out using shear box with the specimens (60mm x 60mm x 25mm). Specimen with plain grid plate at the bottom of the specimen and plain grid plate at the top of the specimen is fitted into position in the shear box housing and assembly placed on the load frame. The serrations of the grid plates are kept at right angle to the direction of shear. The loading pad is kept on the top grid plate. The required normal stress is applied and the rate of longitudinal displacement/shear stress application so adjusted that no drainage can occur in the sample during the test (1.25mm/min). The upper part of the shear box is raised such that a gap of about 1mm is left between the two parts of the box. The test is conducted by applying horizontal shear load to failure or to 20 percent longitudinal displacement whichever occurs first. The test is repeated on identical specimens.

### **Sub Soil Stratification**

The general stratification is reported below after completing the boring work for Three Boreholes location Up to 15.0m. depth and as per norms samples were collected and tested in the laboratory at Sanand cross road, SG Highway, Ahmedabad.





APPENDIX-1-A

BH - 1

Summary of Net Safe Bearing Pressure for Isolated Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP t/m <sup>2</sup>		Recomm. Net SBP t/m <sup>2</sup> for (50 mm Permissible Settlement)
				Shear Criterion C & $\Phi$ value	Settlement Criteria (50 mm Permissible Settlement)	
1.5	1.5	Square	1.5x1.5	13.80	> 14	13.8
1.5	1.5	Square	2x2	14.51	> 15	14.5
1.5	1.5	Square	2.5x2.5	15.36	> 16	15.4
1.5	1.5	Square	3x3	16.27	> 17	16.3
2.0	2.0	Square	1.5x1.5	17.95	> 18	17.9
2.0	2.0	Square	2x2	18.40	> 19	18.4
2.0	2.0	Square	2.5x2.5	19.09	> 20	19.1
2.0	2.0	Square	3x3	19.90	18.32	18.3
2.5	2.5	Square	1.5x1.5	22.39	> 23	22.4
2.5	2.5	Square	2x2	22.51	> 23	22.5
2.5	2.5	Square	2.5x2.5	23.00	21.89	21.9
2.5	2.5	Square	3x3	23.67	20.49	20.5
3.0	3.0	Square	1.5x1.5	27.12	26.88	26.9
3.0	3.0	Square	2x2	26.84	23.74	23.7
3.0	3.0	Square	2.5x2.5	27.09	21.89	21.9
3.0	3.0	Square	3x3	27.60	20.49	20.5

Conclusion & Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m , 2m, 2.5m , and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excavation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





APPENDIX-1-A

BH - I

Summary of Net Safe Bearing Pressure for Raft Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP t/m <sup>2</sup>		Recomm. Net SBP t/m <sup>2</sup> for (75 mm Permissible Settlement)
				Shear Criterion C & $\phi$ value	Settlement Criteria (75 mm Permissible Settlement)	
1.5	1.5	Square	6x6	22.2	> 23	22.2
1.5	1.5	Square	7x7	24.2	> 25	24.2
1.5	1.5	Square	8x8	26.3	24.7	24.7
1.5	1.5	Square	9x9	28.4	24.7	24.7
2.0	2.0	Square	6x6	25.6	24.7	24.7
2.0	2.0	Square	7x7	27.6	24.7	24.7
2.0	2.0	Square	8x8	29.6	24.7	24.7
2.0	2.0	Square	9x9	31.6	24.7	24.7
2.5	2.5	Square	6x6	29.0	27.6	27.6
2.5	2.5	Square	7x7	31.0	27.6	27.6
2.5	2.5	Square	8x8	33.0	27.6	27.6
2.5	2.5	Square	9x9	35.0	27.6	27.6
3.0	3.0	Square	6x6	32.5	27.6	27.6
3.0	3.0	Square	7x7	34.4	27.6	27.6
3.0	3.0	Square	8x8	36.4	27.6	27.6
3.0	3.0	Square	9x9	38.4	27.6	27.6

Conclusion & Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m, 2m, 2.5m, and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





APPENDIX-1-A

BH - 2

Summary of Net Safe Bearing Pressure for Isolated Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP t/m <sup>2</sup>		Recomm. Net SBP t/m <sup>2</sup> for (50 mm Permissible Settlement)
				Shear Criterion C & $\Phi$ value	Settlement Criteria (50 mm Permissible Settlement)	
1.5	1.5	Square	1.5x1.5	15.31	> 16	15.3
1.5	1.5	Square	2x2	16.11	> 17	16.1
1.5	1.5	Square	2.5x2.5	17.06	> 18	17.1
1.5	1.5	Square	3x3	18.08	> 19	18.1
2.0	2.0	Square	1.5x1.5	19.90	> 20	19.9
2.0	2.0	Square	2x2	20.41	> 21	20.4
2.0	2.0	Square	2.5x2.5	21.19	> 22	21.2
2.0	2.0	Square	3x3	22.09	> 23	22.1
2.5	2.5	Square	1.5x1.5	24.82	> 25	24.8
2.5	2.5	Square	2x2	24.96	> 25	25.0
2.5	2.5	Square	2.5x2.5	25.51	24.75	24.8
2.5	2.5	Square	3x3	26.27	23.26	23.3
3.0	3.0	Square	1.5x1.5	30.07	> 31	30.1
3.0	3.0	Square	2x2	29.75	28.38	28.4
3.0	3.0	Square	2.5x2.5	30.04	26.29	26.3
3.0	3.0	Square	3x3	30.61	24.68	24.7

Conclusion & Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m , 2m, 2.5m , and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





## APPENDIX-1-A

BH - 2

## Summary of Net Safe Bearing Pressure for Raft Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP t/m <sup>2</sup>		Recomm. Net SBP t/m <sup>2</sup> for (75 mm Permissible Settlement)
				Shear Criterion C & $\Phi$ value	Settlement Criteria (75 mm Permissible Settlement)	
1.5	1.5	Square	6x6	24.7	> 25	24.7
1.5	1.5	Square	7x7	27.0	> 28	27.0
1.5	1.5	Square	8x8	29.3	27.6	27.6
1.5	1.5	Square	9x9	31.7	27.6	27.6
2.0	2.0	Square	6x6	28.5	> 29	28.5
2.0	2.0	Square	7x7	30.7	> 31	30.7
2.0	2.0	Square	8x8	33.0	31.3	31.3
2.0	2.0	Square	9x9	35.3	31.3	31.3
2.5	2.5	Square	6x6	32.3	31.3	31.3
2.5	2.5	Square	7x7	34.5	31.3	31.3
2.5	2.5	Square	8x8	36.7	31.3	31.3
2.5	2.5	Square	9x9	39.0	31.3	31.3
3.0	3.0	Square	6x6	36.2	33.2	33.2
3.0	3.0	Square	7x7	38.3	33.2	33.2
3.0	3.0	Square	8x8	40.5	33.2	33.2
3.0	3.0	Square	9x9	42.7	33.2	33.2

## Conclusion &amp; Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m , 2m, 2.5m , and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





APPENDIX-1-A

BH - 3

Summary of Net Safe Bearing Pressure for Isolated Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP $t/m^2$		Recomm. Net SBP $t/m^2$ for (50 mm Permissible Settlement)
				Shear Criterion C & $\Phi$ value	Settlement Criteria (50 mm Permissible Settlement)	
1.5	1.5	Square	1.5x1.5	18.93	> 19	18.9
1.5	1.5	Square	2x2	19.95	> 20	20.0
1.5	1.5	Square	2.5x2.5	21.16	> 22	21.2
1.5	1.5	Square	3x3	22.46	> 23	22.5
2.0	2.0	Square	1.5x1.5	24.58	> 25	24.6
2.0	2.0	Square	2x2	25.24	> 26	25.2
2.0	2.0	Square	2.5x2.5	26.23	24.75	24.8
2.0	2.0	Square	3x3	27.39	23.26	23.3
2.5	2.5	Square	1.5x1.5	30.65	30.30	30.3
2.5	2.5	Square	2x2	30.84	26.74	26.7
2.5	2.5	Square	2.5x2.5	31.55	24.75	24.8
2.5	2.5	Square	3x3	32.52	23.26	23.3
3.0	3.0	Square	1.5x1.5	37.13	30.30	30.3
3.0	3.0	Square	2x2	36.75	26.74	26.7
3.0	3.0	Square	2.5x2.5	37.12	24.75	24.8
3.0	3.0	Square	3x3	37.86	23.26	23.3

Conclusion & Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m , 2m, 2.5m , and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





APPENDIX-1-A

BH - 3

Summary of Net Safe Bearing Pressure for Raft Foundation

Depth below EGL(mtr)	Depth below NGL(mtr)	Type of Foundation	Size/Dia. of Foundation (mtr)	Net SBP t/m <sup>2</sup>		Recomm. Net SBP t/m <sup>2</sup> for (75 mm Permissible Settlement)
				Shear Criterion C & $\Phi$ value	Settlement Criteria (75 mm Permissible Settlement)	
1.5	1.5	Square	6x6	30.9	> 31	30.9
1.5	1.5	Square	7x7	33.8	31.3	31.3
1.5	1.5	Square	8x8	36.8	31.3	31.3
1.5	1.5	Square	9x9	39.7	31.3	31.3
2.0	2.0	Square	6x6	35.5	31.3	31.3
2.0	2.0	Square	7x7	38.3	31.3	31.3
2.0	2.0	Square	8x8	41.2	31.3	31.3
2.0	2.0	Square	9x9	44.1	31.3	31.3
2.5	2.5	Square	6x6	40.1	31.3	31.3
2.5	2.5	Square	7x7	42.9	31.3	31.3
2.5	2.5	Square	8x8	45.8	31.3	31.3
2.5	2.5	Square	9x9	48.6	31.3	31.3
3.0	3.0	Square	6x6	44.9	31.3	31.3
3.0	3.0	Square	7x7	47.6	31.3	31.3
3.0	3.0	Square	8x8	50.4	31.3	31.3
3.0	3.0	Square	9x9	53.2	31.3	31.3

Conclusion & Recommendation:-

- Ground water table Details at the time of investigation which is mentioned in borlog.
- Based on observations, for proposed structure, it is required to have open foundations.
- For this purpose safe bearing pressure is given at depth 1.5 m to 3 m below EGL.
- The Soil Testing Results of the field and laboratory tests are summarized in the Annexure. The foundation type in the present case is a Square footing having tentative widths 1.5m , 2m, 2.5m , and 3m influence zone below the base of the foundation is approx. 1.5 X width of footing but limited to the termination depth of the borehole.
- Any variation in stratification in any of the foundation location shall be studied thoroughly before executing the foundation work. S.B.C. is recommended by considering all the parameters affecting to
- S.B.C. is recommended by considering all the parameters affecting to soil At the field as well as in the laboratory.
- After completion of work, Extra care should be taken to prevent water percolation below footing by plinth coverage.
- It is recommended to compact the foundation soil before placing the foundation by using rammer or numeric compactor, or provided rubble sand mixture below the foundation.
- During Excation of footing Support must be provided In case of water table Reached at the time of construction.
- The Soil can be use for plinth refilling work.





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.00	0.00	0.00	0.00	0.00
	Φ	degree	28.0	28.0	28.0	28.0	28.0
Anclination Angle			0	0	0	0	0
FDD (Y)		kN/m <sup>3</sup>	15.69	15.69	15.69	15.69	15.69
Water Content (%)		%	7.80	7.80	7.80	7.80	7.80
Specific Gravity			2.64	2.64	2.64	2.64	2.64
Void Ratio			0.68	0.68	0.68	0.68	0.68
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	1.50	2.00	2.50	3.00	1.50
	Length (L)	(mt)	1.50	2.00	2.50	3.00	1.50
Depth of Foundation		(mt)	1.50	1.50	1.50	1.50	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.000	0.000	0.000	0.000	0.000
	φ	degree	22.55	22.55	22.55	22.55	22.55
Bearing capacity factors	Nc	-	17.52	17.52	17.52	17.52	17.52
	Nq	-	8.28	8.28	8.28	8.28	8.28
	Nγ	-	7.72	7.72	7.72	7.72	7.72
Shape Factors	Sc	-	1.30	1.30	1.30	1.30	1.30
	Sq	-	1.20	1.20	1.20	1.20	1.20
	Sγ	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	dc	-	1.30	1.22	1.18	1.15	1.40
	dq	-	1.15	1.11	1.09	1.07	1.20
	dγ	-	1.15	1.11	1.09	1.07	1.20
Inclination Factors	ic	-	1.00	1.00	1.00	1.00	1.00
	iq	-	1.00	1.00	1.00	1.00	1.00
	iγ	-	1.00	1.00	1.00	1.00	1.00
Water table Correction		Wγ	1	1	1	1	1
Net Safe bearing Pressure		T/m <sup>2</sup>	13.8	14.5	15.4	16.3	17.9





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	$\Phi$	degree	28.0	28.0	28.0	28.0	28.0
Anclination Angle			0	0	0	0	0
FDD (Y)			15.69	15.69	15.69	15.69	15.69
Water Content (%)			7.80	7.80	7.80	7.80	7.80
Specific Gravity			2.64	2.64	2.64	2.64	2.64
Void Ratio			0.68	0.68	0.68	0.68	0.68
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	6.0	7.0	8.0	9.0	6.0
	Length (L)	(mt)	6.0	7.0	8.0	9.0	6.0
Depth of Foundation			1.5	1.5	1.5	1.5	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	$\Phi$	degree	22.6	22.6	22.6	22.6	22.6
Bearing capacity factors	$N_c$	-	17.52	17.52	17.52	17.52	17.52
	$N_q$	-	8.28	8.28	8.28	8.28	8.28
	$N_\gamma$	-	7.72	7.72	7.72	7.72	7.72
Shape Factors	$S_c$	-	1.30	1.30	1.30	1.30	1.30
	$S_q$	-	1.20	1.20	1.20	1.20	1.20
	$S_\gamma$	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	$d_c$	-	1.07	1.06	1.06	1.05	1.10
	$d_q$	-	1.04	1.03	1.03	1.02	1.05
	$d_\gamma$	-	1.04	1.03	1.03	1.02	1.05
Inclination Factors	$i_c$	-	1.00	1.00	1.00	1.00	1.00
	$i_q$	-	1.00	1.00	1.00	1.00	1.00
	$i_\gamma$	-	1.00	1.00	1.00	1.00	1.00
Water table Correction			1	1	1	1	1
Net Safe bearing Pressure			22.2	24.2	26.3	28.4	25.6





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.00	0.00	0.00	0.00	0.00
	Φ	degree	29.0	29.0	29.0	29.0	29.0
Anclination Angle			0	0	0	0	0
FDD (Y)		kN/m <sup>3</sup>	15.79	15.79	15.79	15.79	15.79
Water Content (%)		%	8.10	8.10	8.10	8.10	8.10
Specific Gravity			2.66	2.66	2.66	2.66	2.66
Void Ratio			0.68	0.68	0.68	0.68	0.68
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	1.50	2.00	2.50	3.00	1.50
	Length (L)	(mt)	1.50	2.00	2.50	3.00	1.50
Depth of Foundation		(mt)	1.50	1.50	1.50	1.50	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.000	0.000	0.000	0.000	0.000
	Φ	degree	23.31	23.31	23.31	23.31	23.31
Bearing capacity factors	Nc	-	18.44	18.44	18.44	18.44	18.44
	Nq	-	8.95	8.95	8.95	8.95	8.95
	N <sub>γ</sub>	-	8.58	8.58	8.58	8.58	8.58
Shape Factors	Sc	-	1.30	1.30	1.30	1.30	1.30
	Sq	-	1.20	1.20	1.20	1.20	1.20
	S <sub>γ</sub>	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	dc	-	1.30	1.23	1.18	1.15	1.41
	dq	-	1.15	1.11	1.09	1.08	1.20
	d <sub>γ</sub>	-	1.15	1.11	1.09	1.08	1.20
Inclination Factors	ic	-	1.00	1.00	1.00	1.00	1.00
	iq	-	1.00	1.00	1.00	1.00	1.00
	i <sub>γ</sub>	-	1.00	1.00	1.00	1.00	1.00
Water table Correction		W <sub>γ</sub>	1	1	1	1	1
Net Safe bearing Pressure		T/m <sup>2</sup>	15.3	16.1	17.1	18.1	19.9





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	Φ	degree	29.0	29.0	29.0	29.0	29.0
Anclination Angle			0	0	0	0	0
FDD (Y)		kN/m <sup>3</sup>	15.79	15.79	15.79	15.79	15.79
Water Content (%)		%	8.10	8.10	8.10	8.10	8.10
Specific Gravity			2.66	2.66	2.66	2.66	2.66
Void Ratio			0.68	0.68	0.68	0.68	0.68
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	6.0	7.0	8.0	9.0	6.0
	Length (L)	(mt)	6.0	7.0	8.0	9.0	6.0
Depth of Foundation		(mt)	1.5	1.5	1.5	1.5	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	ϕ	degree	23.3	23.3	23.3	23.3	23.3
Bearing capacity factors	Nc	-	18.44	18.44	18.44	18.44	18.44
	Nq	-	8.95	8.95	8.95	8.95	8.95
	N <sub>γ</sub>	-	8.58	8.58	8.58	8.58	8.58
Shape Factors	Sc	-	1.30	1.30	1.30	1.30	1.30
	Sq	-	1.20	1.20	1.20	1.20	1.20
	S <sub>γ</sub>	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	dc	-	1.08	1.07	1.06	1.05	1.10
	dq	-	1.04	1.03	1.03	1.03	1.05
	d <sub>γ</sub>	-	1.04	1.03	1.03	1.03	1.05
Inclination Factors	ic	-	1.00	1.00	1.00	1.00	1.00
	iq	-	1.00	1.00	1.00	1.00	1.00
	i <sub>γ</sub>	-	1.00	1.00	1.00	1.00	1.00
Water table Correction		W <sub>γ</sub>	1	1	1	1	1
Net Safe bearing Pressure		T/m <sup>2</sup>	24.7	27.0	29.3	31.7	28.5





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing	Isolated Footing
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.00	0.00	0.00	0.00	0.00
	Φ	degree	29.5	29.5	29.5	29.5	29.5
Anclination Angle			0	0	0	0	0
FDD (Y)		kN/m <sup>3</sup>	15.98	15.98	15.98	15.98	15.98
Water Content (%)		%	7.90	7.90	7.90	7.90	7.90
Specific Gravity			2.65	2.65	2.65	2.65	2.65
Void Ratio			0.66	0.66	0.66	0.66	0.66
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	1.50	2.00	2.50	3.00	1.50
	Length (L)	(mt)	1.50	2.00	2.50	3.00	1.50
Depth of Foundation		(mt)	1.50	1.50	1.50	1.50	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.000	0.000	0.000	0.000	0.000
	Φ	degree	24.93	24.93	24.93	24.93	24.93
Bearing capacity factors	Nc	-	20.62	20.62	20.62	20.62	20.62
	Nq	-	10.59	10.59	10.59	10.59	10.59
	N <sub>γ</sub>	-	10.78	10.78	10.78	10.78	10.78
Shape Factors	Sc	-	1.30	1.30	1.30	1.30	1.30
	Sq	-	1.20	1.20	1.20	1.20	1.20
	S <sub>γ</sub>	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	dc	-	1.31	1.24	1.19	1.16	1.42
	dq	-	1.16	1.12	1.09	1.08	1.21
	d <sub>γ</sub>	-	1.16	1.12	1.09	1.08	1.21
Inclination Factors	ic	-	1.00	1.00	1.00	1.00	1.00
	iq	-	1.00	1.00	1.00	1.00	1.00
	i <sub>γ</sub>	-	1.00	1.00	1.00	1.00	1.00
Water table Correction		W <sub>γ</sub>	1	1	1	1	1
Net Safe bearing Pressure		T/m <sup>2</sup>	18.9	20.0	21.2	22.5	24.6





**Bearing Pressure Based on C &  $\Phi$  Values based on IS 6403: - (Shear Criterion)**

The main aim of the Investigations is to determine type of foundation, placement depth and safe bearing pressure for the proposed structure.

$$Q_{nd} = C N_c S_c d_c i_c + q (N_q - 1) S_q d_q i_q + 0.5 B D D N_r S_r d_r i_r W'$$

The Soil Testing Results of the field and laboratory tests are summarized in the Appendix-1. The foundation type in the present case is a Square footing.

Sr No			1	2	3	4	5
Shape of Foundation			Square	Square	Square	Square	Square
Type of Foundation			Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation	Raft Foundation
Factor of Safety			2.5	2.5	2.5	2.5	2.5
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	$\Phi$	degree	29.5	29.5	29.5	29.5	29.5
Anclination Angle			0	0	0	0	0
FDD (Y)		kN/m <sup>3</sup>	15.98	15.98	15.98	15.98	15.98
Water Content (%)		%	7.90	7.90	7.90	7.90	7.90
Specific Gravity			2.65	2.65	2.65	2.65	2.65
Void Ratio			0.66	0.66	0.66	0.66	0.66
Failure Type			MSF	MSF	MSF	MSF	MSF
Size of Fdn.	Width (B)	(mt)	6.0	7.0	8.0	9.0	6.0
	Length (L)	(mt)	6.0	7.0	8.0	9.0	6.0
Depth of Foundation		(mt)	1.5	1.5	1.5	1.5	2.0
Shear Parameter	C	kN/m <sup>2</sup>	0.0	0.0	0.0	0.0	0.0
	$\Phi$	degree	24.9	24.9	24.9	24.9	24.9
Bearing capacity factors	$N_c$	-	20.62	20.62	20.62	20.62	20.62
	$N_q$	-	10.59	10.59	10.59	10.59	10.59
	$N_\gamma$	-	10.78	10.78	10.78	10.78	10.78
Shape Factors	$S_c$	-	1.30	1.30	1.30	1.30	1.30
	$S_q$	-	1.20	1.20	1.20	1.20	1.20
	$S_\gamma$	-	0.80	0.80	0.80	0.80	0.80
Depth Factor	$d_c$	-	1.08	1.07	1.06	1.05	1.10
	$d_q$	-	1.04	1.03	1.03	1.03	1.05
	$d_\gamma$	-	1.04	1.03	1.03	1.03	1.05
Inclination Factors	$i_c$	-	1.00	1.00	1.00	1.00	1.00
	$i_q$	-	1.00	1.00	1.00	1.00	1.00
	$i_\gamma$	-	1.00	1.00	1.00	1.00	1.00
Water table Correction		$W_\gamma$	1	1	1	1	1
Net Safe bearing Pressure		T/m <sup>2</sup>	30.9	33.8	36.8	39.7	35.5





APPENDIX-1.2-A																				
Calculation of Safe Bearing Pressure based on N value as per IS 8099 (Settlement Criteria)																				
BH - 1																				
WIDTH OF FOOTING, B (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00
LENGTH OF FOOTING, L (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	13	13	13	13	13	13	13	13	13	13	13	13	14	14	14	14	14	14	14	14
SETTLEMENT, S (mm) PER 10 T/m2 PRESSURE	20.7	23.4	25.5	27.3	20.7	23.4	25.5	27.3	18.6	21.1	22.8	24.4	18.6	21.1	22.8	24.4	18.6	21.1	22.8	24.4
ALLOWABLE SETTLEMENT, Sa (mm)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
q <sub>na,s</sub> FOR ALLOWABLE SETTLEMENT (t / m2) , = {q <sub>na,s</sub> = Sa * 10 / (S) * w' }	24.2	21.3	19.6	18.3	24.2	21.3	19.6	18.3	26.9	23.7	21.9	20.5	26.9	23.7	21.9	20.5	26.9	23.7	21.9	20.5





APPENDIX-1.2-A																				
Calculation of Safe Bearing Pressure based on N value as per IS 8009 (Settlement Criteria)																				
BH - 1																				
WIDTH OF FOOTING, B (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
LENGTH OF FOOTING, L (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	13	13	13	13	13	13	13	13	14	14	14	14	14	14	14	14	14	14	14	14
SETTLEMENT, S (mm) PER 10 T/m <sup>2</sup> PRESSURE	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2
ALLOWABLE SETTLEMENT, S <sub>a</sub> (mm)	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
q <sub>na,s</sub> FOR ALLOWABLE SETTLEMENT (t / m <sup>2</sup> ) , = {q <sub>na,s</sub> = S <sub>a</sub> * 10 / (S) * w' <sup>3</sup> }	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6





APPENDIX-1.2-A																		
Calculation of Safe Bearing Pressure based on N value as per IS 8009 (Settlement Criteria)																		
	BH - 2																	
WIDTH OF FOOTING, B (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00
LENGTH OF FOOTING, L (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	14	14	14	14	15	15	15	15	15	15	15	15	15	15	15	15	16	16
SETTLEMENT, S (mm) PER 10 T/m <sup>2</sup> PRESSURE	18.0	21.1	22.8	24.4	16.5	18.7	20.2	21.5	16.5	18.7	20.2	21.5	15.6	17.6	19.0	20.3	19.0	20.3
ALLOWABLE SETTLEMENT, Sa (mm)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
qna,s FOR ALLOWABLE SETTLEMENT (t / m <sup>2</sup> ), = {qna,s = Sa * 10 / (S) * w' }	26.9	23.7	21.9	20.5	30.3	26.7	24.8	23.3	30.3	26.7	24.8	23.3	32.1	28.4	26.3	24.7	26.3	24.7





APPENDIX-1.2-A																
Calculation of Safe Bearing Pressure based on N value as per IS 8009 (Settlement Criteria)																
BH - 2																
WIDTH OF FOOTING, B (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
LENGTH OF FOOTING, L (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	14	14	14	14	15	15	15	15	15	15	15	15	16	16	16	16
SETTLEMENT, S (mm) PER 10 T/m <sup>2</sup> PRESSURE	27.2	27.2	27.2	27.2	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	22.6	22.6	22.6	22.6
ALLOWABLE SETTLEMENT, S <sub>a</sub> (mm)	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
q <sub>na,s</sub> FOR ALLOWABLE SETTLEMENT (t / m <sup>2</sup> ) , = {q <sub>na,s</sub> = S <sub>a</sub> * 10 / (S) * w' }	27.6	27.6	27.6	27.6	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	33.2	33.2	33.2	33.2





APPENDIX-1.2-A																				
Calculation of Safe Bearing Pressure based on N value as per IS 8009 (Settlement Criteria)																				
BH - 3																				
WIDTH OF FOOTING, B (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00
LENGTH OF FOOTING, L (m) =	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00	1.50	2.00	2.50	3.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SETTLEMENT, S (mm) PER 10 T/m2 PRESSURE	16.5	18.7	20.2	21.5	16.5	18.7	20.2	21.5	16.5	18.7	20.2	21.5	16.5	18.7	20.2	21.5	16.5	18.7	20.2	21.5
ALLOWABLE SETTLEMENT, Sa (mm)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
qna,s FOR ALLOWABLE SETTLEMENT (t / m2) , = {qna,s = Sa * 10 / (S) * w' }	30.3	26.7	24.8	23.3	30.3	26.7	24.8	23.3	30.3	26.7	24.8	23.3	30.3	26.7	24.8	23.3	30.3	26.7	24.8	23.3





APPENDIX-1.2-A																
Calculation of Safe Bearing Pressure based on N value as per IS 8009 (Settlement Criteria)																
BH - 3																
WIDTH OF FOOTING, B (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
LENGTH OF FOOTING, L (m) =	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00	6.00	7.00	8.00	9.00
PLACEMENT DEPTH, Df (m)	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	2.50	2.50	2.50	2.50	3.00	3.00	3.00	3.00
AVERAGE CORRECTED N-VALUE	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
SETTLEMENT, S (mm) PER 10 T/m <sup>2</sup> PRESSURE	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
ALLOWABLE SETTLEMENT, S <sub>a</sub> (mm)	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
q <sub>na,s</sub> FOR ALLOWABLE SETTLEMENT (t / m <sup>2</sup> ), = {q <sub>na,s</sub> = S <sub>a</sub> * 10 / (S) * w' }	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3





## APPENDIX-1.2.1

BH-1

**Sample Calculation of Safe Bearing Pressure based on N value as per IS 8009  
(Settlement Criteria)**

$Q_{na,s}$  for Allowable Settlement ( $t / m^2$ )

$$Q_{na,s} = S_a * 10 / (S) * w'$$

Where,

Permissible Settlement( $S_a$ ) = 50 mm

Width of Footing,  $B$  = 1.50 m

Depth of Foundation,  $D_f$  = 1.50 m

Average Corrected N-Value = 13

Settlement per 10 T/m<sup>2</sup> Pressure,  $S$  = 20.7 mm

$$Q_{na,s} \text{ FOR ALLOWABLE SETTLEMENT (t / m}^2\text{) , = } 24.2 \text{ t/m}^2$$

$$\{q_{na,s} = S_a * 10 / (S) * w'\} =$$

## OBSERVED AND CORRECTED N-VALUE

Borehole No.		BH - 1			Bulk Density of Sample(gm/cc)			1.72		
Depth of Borehole		15.0 m			Ground Water Table(m)			Not Met With		
BH.No.	Depth (m)	No.of Blow for Sampler Penetration			N-Value (Last 30 cm)	Effective Overburden Pressure (t/m2)	Correction factor for Over Burden	Corrected N-for Over Burden	Correction Factor for Water Table (Dilatancy)	Corrected N after Correction
		0-15 cm	15-30 cm	30-45 cm						
BH-1	1.5	3	4	5	9	3	1	13	13	13
BH-1	4.5	4	6	8	14	8	1	15	15	15
BH-1	7.5	10	15	19	34	13	1	32	32	32
BH-1	10.5	12	17	21	38	18	1	30	30	30
BH-1	12.0	13	18	24	42	21	1	32	32	32
BH-1	13.5	15	20	26	46	23	1	33	33	33
BH-1	15.0	17	21	28	49	26	1	34	34	34





## APPENDIX-1.2.1

BH - 2

**Sample Calculation of Safe Bearing Pressure based on N value as per IS 8009  
(Settlement Criteria)**

 $Q_{na,s}$  for Allowable Settlement ( $t / m^2$ )

$$Q_{na,s} = S_a * 10 / (S) * w'$$

Where,

Permissible Settlement( $S_a$ ) = 50 mm

Width of Footing, B = 1.50 m

Depth of Foundation,  $D_f$  = 1.50 m

Average Corrected N-Value = 14

Settlement per 10  $T/m^2$  Pressure, S = 18.6 mm

$$Q_{na,s} \text{ FOR ALLOWABLE SETTLEMENT (t / m}^2\text{) , = } 26.9 \text{ t/m}^2$$

$$\{Q_{na,s} = S_a * 10 / (S) * w'\} =$$

## OBSERVED AND CORRECTED N-VALUE

Borehole No.	BH - 2				Bulk Density of Sample(gm/cc)		1.74			
Depth of Borehole	15.0 m				Ground Water Table(m)		Not Met With			
BH.No.	Depth (m)	No. of Blow for Sampler Penetration			N-Value (Last 30 cm)	Effective Overburden Pressure (t/m <sup>2</sup> )	Correction factor for Over Burden	Corrected N-for Over Burden	Correction Factor for Water Table (Dilatancy)	Corrected N after Correction
		0-15 cm	15-30 cm	30-45 cm						
BH-2	1.5	4	5	5	10	3	1	14	14	14
BH-2	4.5	5	7	9	16	8	1	17	17	17
BH-2	7.5	12	16	21	37	13	1	34	34	34
BH-2	10.5	13	18	23	41	18	1	33	33	33
BH-2	12.0	15	20	26	46	21	1	35	35	35
BH-2	13.5	17	22	28	50	23	1	36	36	36
BH-2	15.0	19	24	31	55	26	1	38	38	38





APPENDIX-1.2.1

BH - 3

Sample Calculation of Safe Bearing Pressure based on N value as per IS 8009  
(Settlement Criteria)

$Q_{na,s}$  for Allowable Settlement ( $t / m^2$ )

$$Q_{na,s} = S_a * 10 / (S) * w'$$

Where

Permissible Settlement( $S_a$ ) = 50 mm

Width of Footing,  $B$  = 1.50 m

Depth of Foundation,  $D_f$  = 1.50 m

Average Corrected N-Value = 15

Settlement per 10 T/ $m^2$  Pressure,  $S$  = 16.5 mm

$$Q_{na,s} \text{ FOR ALLOWABLE SETTLEMENT (t / m}^2\text{) , } = 30.3 \text{ t/m}^2$$

$$\{Q_{na,s} = S_a * 10 / (S) * w'\} =$$

OBSERVED AND CORRECTED N-VALUE										
Borehole No.		BH - 3			Bulk Density of Sample(gm/cc)		1.72			
Depth of Borehole		15.0 m			Ground Water Table(m)		Not Met With			
BH.No.	Depth (m)	No. of Blow for Sampler Penetration			N-Value (Last 30 cm)	Effective Overburden Pressure (t/m <sup>2</sup> )	Correction factor for Over Burden	Corrected N-for Over Burden	Correction Factor for Water Table (Dilatancy)	Corrected N after Correction
		0-15 cm	15-30 cm	30-45 cm						
BH-3	1.5	4	5	6	11	3	1	15	15	15
BH-3	4.5	6	7	7	14	8	1	15	15	15
BH-3	7.5	9	11	15	26	13	1	24	24	24
BH-3	10.5	12	13	16	29	18	1	23	23	23
BH-3	12.0	13	15	18	33	21	1	25	25	25
BH-3	13.5	15	17	19	36	24	1	26	26	26
BH-3	15.0	18	19	22	41	26	1	28	28	28





**ANNEXURE: 1**

**BORE LOGS**

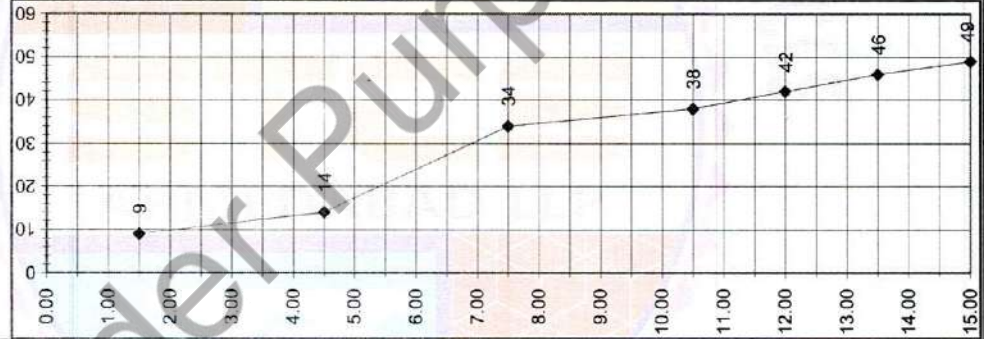




# BORELOG

BORELOG																			
BORE HOLE NO : 1					Depth of Borehole : 15.00 mtr.					Depth of Water table : Not Met With									
Method of Boring	Casing	Bore Diameter	G.W.L.	Depth ( M)	Visual Soil Description	PENETRATION TEST (N-VALUES)			S.P.T. No. of Blows			N- Value	Un Disturbed Sample	Disturbed Sample	Rock Sample	CR %	RQD%	Remark	
						N1	N2	N3											
Machine Drilling/ Hand Drilling	Not Used/ Used	150 mm.	Not Met With	0.0	Blackish Brownish coloured, Fine to Medium grained, Silty clay with Low plasticity, Granular Material 0.0 to 0.9 m.									0.0					
				1.5		3	4	5			9		1.5						
				3.0							14								
				4.5		4	6	8					4.5						
				6.0															
				7.5	Brownish to yellowish Non-Plastic silty sand 0.9 to 4.1 m	10	15	19			34		7.5						
				9.0															
				10.5	Brownish to yellowish Non-Plastic silty sand with Gravels 4.1 to 15.0m.	12	17	21			38		10.5						
				12.0		13	18	24			42		12.0						
				13.5		15	20	26			46		13.5						
				15.0		17	21	28	49		15.0								

Depth (m)	N-Value
1.5	9
4.5	14
7.5	34
10.5	38
12.0	42
13.5	46
15.0	49



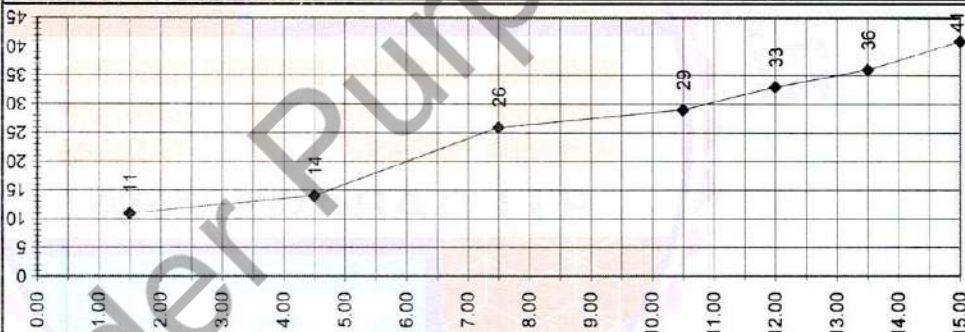



# BORELOG

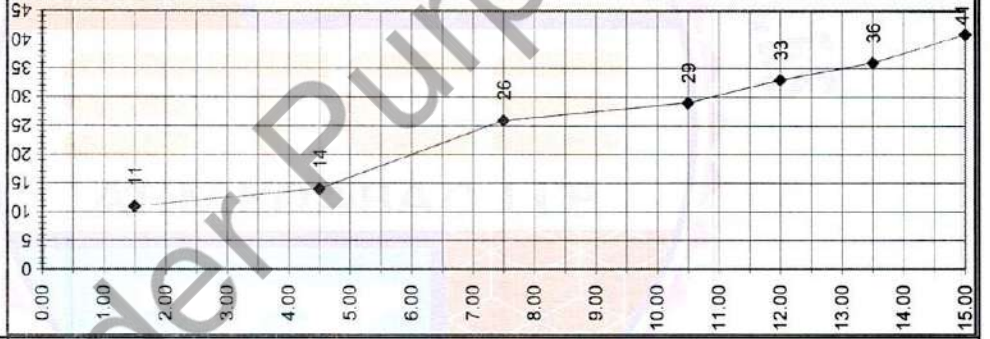
BORELOG																						
BORE HOLE NO : 2					Depth of Borehole : 15.00 mtr.					Depth of Water table : Not Met With												
Method of Boring	Casing	Bore Diameter	G.W.L.	Depth ( M)	Visual Soil Description	PENETRATION TEST (N-VALUES)			S.P.T. No. of Blows			N- Value	Un Disturbed Sample	Disturbed Sample	Rock Sample	CR %	RQD%	Remark				
						N1	N2	N3														
Machine Drilling/ Hand Drilling	Not Used/ Used	150 mm.	Not Met With	0.0	Blackish Brownish coloured, Fine to Medium grained, Silty clay with Low plasticity, Granular Material 0.0 to 0.4 m.																	
				1.5		4	5	5	10		1.5											
				3.0						3.0												
				4.5		5	7	9	16		4.5											
				6.0	Brownish to yellowish Non-Plastic silty sand 0.4 to 3.5 m				12	16	21	37		7.5								
				7.5									9.0									
				9.0	Brownish to yellowish Non-Plastic silty sand with Gravels 3.5 to 15.0m.				13	18	23	41		10.5								
				10.5					15	20	26	46		12.0								
				12.0					17	22	28	50		13.5								
				13.5					19	24	31	55		15.0								
				15.0																		



# BORELOG

BORE HOLE NO : 3					Depth of Borehole : 15.00 mtr.			Depth of Water table : Not Met With										
Method of Boring	Casing	Bore Diameter	G.W.L.	Depth ( M)	Visual Soil Description	PENETRATION TEST (N-VALUES)			S.P.T. No. of Blows			N- Value	Un Disturbed Sample	Disturbed Sample	Rock Sample	CR %	RQD%	Remark
						N1	N2	N3										
Machine Drilling/ Hand Drilling	Not Used/ Used	150 mm.	Not Met With	0.0	Filled Up Material 0.0 to 0.20 m							0.0						
				1.5			4	5	6	11		1.5						
				3.0							3.0							
				4.5			6	7	7	14		4.5						
				6.0	Blackish Brownish coloured, Fine to Medium grained, Silty clay with Low plasticity, Granular Material 0.2 to 2.0 m.		9	11	15	26	6.0	7.5						
				7.5														
				9.0	Brownish to yellowish Non-Plastic silty sand 2.0 to 5.6 m						9.0							
				10.5			12	13	16	29		10.5						
				12.0	Brownish to yellowish Non-Plastic silty sand with Gravels 5.6 to 15.0m.		13	15	18	33		12.0						
				13.5			15	17	19	36		13.5						
				15.0			18	19	22	41		15.0						







**ANNEXURE: 2**  
**TABLE FOR SOIL CHARACTERISTIC**



SUMMARY OF EXPLORATION DATA																					BH - I	
Depth in mtr.	Sample No. & Type	Visual Description of Soil & Stratum No.	Particle Size Analysis				Atterberg's Limits			IS Classification	Dry Density gm/cc	Natural Moisture Wn %	Shrinkage Limit %	Shear Parameters		Specific Gravity Gs	Free Swell Index(%)	Swelling pressure (kg/cm <sup>2</sup> )	For			
			Gravel % - 4.75 mm & above	Sand % - 0.075 to 4.75 mm	Silt % - 0.002 to 0.075 mm	Clay % - Less than 0.002 mm	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion kg/sq.cm.	Degree				CR%	RQD%	Unconfined Comp. Strength kg/sq.cm	Water Absorption (%)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
0.00	DS		2	34	64	31.2	15.2	16	CL	-	-	-	-	-	-	-	-	-	-	-	-	
1.50	SPT		0	68	32	18.1	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
3.00	UDS		0	72	28	18.2	Non Plastic		SM	1.60	7.8	-	0.00	28.0	2.64	-	-	-	-	-	-	
4.50	SPT		4	61	35	19.3	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
6.00	UDS	Blackish Brownish coloured, Fine to Medium grained, Silty clay with Low plasticity, Granular Material 0.0 to 0.9 m.	3	65	32	19.4	Non Plastic		SM	1.65	8.4	-	0.00	31.0	2.66	-	-	-	-	-	-	
7.50	SPT	Brownish to yellowish Non-Plastic silty sand 0.9 to 4.1 m	4	60	36	20.1	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
9.00	UDS	Brownish to yellowish Non-Plastic silty sand with Gravels 4.1 to 15.0m.	6	57	37	20.4	Non Plastic		SM	1.68	9.1	-	0.00	32.0	2.65	-	-	-	-	-	-	
10.50	SPT		4	62	34	20.2	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
12.00	SPT		7	61	32	18.8	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
13.50	SPT		10	58	32	19.3	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	
15.00	SPT		8	60	32	19.8	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	





BH -2

## SUMMARY OF EXPLORATION DATA

Depth in mtr.	Sample No. & Type	Visual Description of Soil & Stratum No.	Particle Size Analysis						Atterberg's Limits			IS Classification	Dry Density gm/cc	Natural Moisture Wn %	Shrinkage Limit %	Shear Parameters		Specific Gravity Gs	Free Swell Index(%)	Swelling pressure (kg/cm <sup>2</sup> )	For					
			Gravel % - 4.75 mm & above	Sand % - 0.075 to 4.75 mm	Silt % - 0.002 to 0.075 mm	Clay % - Less than 0.002 mm	Liquid Limit	Plastic Limit	Plasticity Index	Cohesion kg/sq.cm.	Degree					CR%	RQD%				Unconfined Comp. Strength kg/sq.cm.	Water Absorption (%)				
0.00	DS	3	4	40	56		29.1	14.3	14.8	CL	-	-	-	-	-	-	-	-	-	-	-	19	20	21	22	
1.50	SPT		0	63	37		19.3	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3.00	UDS		0	66	34		20.1	Non Plastic		SM	1.61	8.10	-	0.00	29.0	-	-	-	-	-	-	-	-	-	-	
4.50	SPT		3	58	39		20.3	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6.00	UDS		4	61	35		20.4	Non Plastic		SM	1.66	8.25	-	0.00	30.5	-	-	-	-	-	-	-	-	-	-	-
7.50	SPT		5	63	32		21.1	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS		4	66	30		21.3	Non Plastic		SM	1.68	9.35	-	0.00	32.0	-	-	-	-	-	-	-	-	-	-	-
10.50	SPT		3	64	33		21.4	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	SPT		6	59	35		20.4	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13.50	SPT		12	57	31		19.8	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	SPT	10	61	29		22.3	Non Plastic		SM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	



SUMMARY OF EXPLORATION DATA																					BH -3	
Depth in mtr.	Sample No. & Type	Visual Description of Soil & Stratum No.	Particle Size Analysis				Atterberg's Limits			IS Classification	Dry Density gm/cc	Natural Moisture Wn %	Shrinkage Limit %	Shear Parameters		Specific Gravity Gs	Free Swell Index(%)	Swelling pressure (kg/cm <sup>2</sup> )	For			
			Gravel % - 4.75 mm & above	Sand % - 0.075 to 4.75 mm	Silt % - 0.002 to 0.075 mm	Clay % - Less than 0.002 mm	Liquid Limit	Plastic Limit	Plasticity Index					Cohesion kg/sq.cm.	Degree				CR%	RQD%	Unconfined Comp. Strength kg/sq.cm	Water Absorption (%)
0.00	DS	Filled Up Material 0.0 to 0.20 m	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
1.50	SPT		3	43	54	28.1	14.3	13.8	CL													
3.00	UDS		0	58	42	19.9	Non Plastic	Non Plastic	SM	1.63	7.90			0.00	29.5	2.65						
4.50	SPT		0	61	39	20.1	Non Plastic	Non Plastic	SM													
6.00	UDS		3	58	39	18.8	Non Plastic	Non Plastic	SM	1.66	8.40			0.00	30.5	2.66						
7.50	SPT	Blackish Brownish coloured, Fine to Medium grained, Silty clay with Low plasticity, Granular Material 0.2 to 2.0 m.	4	60	36	17.2	Non Plastic	Non Plastic	SM													
9.00	UDS		3	57	40	20.4	Non Plastic	Non Plastic	SM	1.70	8.80			0.00	31.5	2.66						
10.50	SPT	Brownish to yellowish Non-Plastic silty sand 2.0 to 5.6 m  Brownish to yellowish Non-Plastic silty sand with Gravels 5.6 to 15.0m.	6	61	33	17.9	Non Plastic	Non Plastic	SM													
12.00	SPT		5	55	40	18.1	Non Plastic	Non Plastic	SM													
13.50	SPT		9	61	30	18.5	Non Plastic	Non Plastic	SM													
15.00	SPT		8	58	34	19.1	Non Plastic	Non Plastic	SM													





## **ABBREVIATIONS**

qns,sh = Net safe bearing pressure from shear criteria ( T/m<sup>2</sup> )

c,  $\phi$  = shear parameters Nc, Nq, Ny = Bearing Capacity factors based on  $\phi$  for General Shear Failure

Nc', Nq', Ny' = Bearing Capacity factors based on  $\phi'$  for Local Shear Failure

where,  $\phi' = \tan^{-1}(0.67 \tan \phi)$

B = Width of footing

D = Depth of footing

q' = Effective Overburden at the footing Level after construction

$\gamma$  = unit weight of soil

Dw = depth of GWT from Ground Level

Rw = Water Table Correction,

Sc, Sq, Sv = Shape factors

ic, iq, iv = inclination factors.

dc, dq, dv = Depth factors

Rd = Depth Factor (Fox's Chart, fig. 12, IS-8009 Part-I)

Rr = Rigidity Factor (page21, IS-8009 Part-I), 0.8 to 1.0

Si = Immediate Settlement,

q = net bearing pressure kN/m<sup>2</sup> for settlement calculation.

B = width of footing

$\mu$  = Poisson's ratio

Es = Young's Modulus

I = Influence Factor

Sc = Consolidation Settlement

Cc = Compression Index

e<sub>0</sub> = Initial Void Ratio

H = Thickness of Layer

p' = existing eff. Pressure at middle of layer due to overburden

$\delta p'$  = Additional Pressure at middle of layer (Fig. 18, IS-8009, pt-I)

mv = Coefficient of Volume Change

$\Delta p$  = Increase in pressure at middle cohesive soil layer.

$\lambda$  = Over consolidation Factor : Table – 1, IS: 8009 (Part – 1)

G.L. = Ground Level (Existing)

G.W.T. = Ground Water Table

SPT = Standard Penetration Test

RD = Running Distance

UDS = Undisturbed Soil Sample

DS = Disturbed Soil Sample

R.L. = Reduced level from Bench Mark.

RQD = Rock Quality Designation for Rock

CR = Core recovery of Rock



## **REFERENCES LIST OF IS CODES**

1. IS:1892-1979(Reaffirmed 2004)-Code of practice for Subsurface Investigations for foundation Investigations.
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3. Indian Standard, Classification & Identification of Soils for General Engineering Purpose, IS -1498-1970.
4. SP 36 (Part :1 ) :1987 - Compendium of Indian Standards on Soil Engineering Part :1, Laboratory Testing of Soils for Civil Engineering Purpose SP 36 (Part :1 ) :1987
5. IS 6403 – 1981 - Indian Standard Code of Practice for Determination of Allowable Bearing Pressure on Shallow Foundations. IS 6403 – 1981
6. IS 8009 (Part-I) – 1975 - Code of Practice for Settlement of Shallow Foundations Pressure on Shallow Foundations.
7. IS 2950 (part-1) -1998 Code of Practice for Design and Construction of Raft Foundations.

## **REFERENCE BOOKS :**

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- 2 Murthy V.N.S. : Soil Mechanics & Foundation Engineering, Dhanpat Rai & Sons, Delhi,1974
- 3 Nayak N.V., Foundation Design Manual, Dhanpat Rai & sons
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- 6 Tomlinson, J., Foundation Engineering, ELBS Pub.

