

**GEO-TECHNICAL INVESTIGATION FOR THE CONSTRUCTION OF PROPOSED
220/110KV RECEIVING - STATION AT BYADAGI, IN BYADAGI TALUK, HAVERI
DISTRICT.**

1.0 General

This report consists of the details about the various field tests and laboratory tests performed to evaluate the Geotechnical characteristics of the site and the recommendations made based on the results of the tests.

2.0 Scope of the work

The scope of work involves conducting both field tests and laboratory tests at **12 locations**, the data obtained by which is used for the characterization of the soil, estimation of safe bearing capacity which is required for carrying out analysis and design of foundations and also recommend or suggest treatment methods where required.

BH No.	Co-ordinates		BH No.	Co-ordinates	
	Northing	Easting		Northing	Easting
BH-1	1619120	552435	BH-7	1619151	552308
BH-2	1619243	552430	BH-8	1619255	552323
BH-3	1619357	552411	BH-9	NA	NA
BH-4	1619334	552274	BH-10	NA	NA
BH-5	1619280	552198	BH-11	NA	NA
BH-6	1619182	552194	BH-12	NA	NA

3.0 Analysis and discussion based on field and laboratory investigations

This consists of

- Topography of the soil
- Drilling bore holes and conducting Standard penetration test (SPT)
- Conducting suitable laboratory tests on collected samples in each of the strata to determine Index and Engineering properties.

3.1 Boring and Sampling

150mm diameter boring was carried out in accordance with IS: 1892:- 1979 Code of Practice for sub-surface investigation of foundation (1992) using Auger Boring at 12 locations only. The bore holes locations are shown in figure1. The undisturbed samples were collected at an interval of 1.5m or at every change in strata, whichever occurred earlier.

3.2 Field Investigations

Standard Penetration Test

The standard penetration tests were conducted at relevant depths within the boreholes to determine the penetration resistance value (N) as per IS -2131- 1981. In this method, a standard split tube sampler (50.8 mm OD and 35 mm ID) is driven by dropping a 65 kg hammer on top of the driving collar with a free fall of 750mm. The length of the sampler is 600mm. The sampler is first driven through 150mm as a seating drive. It is further driven through 300mm. The number of blows required to drive the sampler for 300mm beyond the seating drive is recorded as the penetration resistance value N. Refusal is said to have been reached when the sampler penetration is less than 150mm for 50 blows or 300mm for 100 blows

TABLE 1: Sub soil profile data

BH No.	Depth (m)	Description
1 to 4	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Reddish green completely weathered rock
5	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Brownish yellow sandy Silt with gravels
6	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Brownish silty Sand with gravels
7, 8 & 10	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Yellowish green soft dis-integrated rock
9	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Yellowish green completely weathered rock
11	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Reddish pink sandy gravels
12	0.0 to 1.0m depth	Top over burden
	1.0m up to termination depth	Reddish to brownish yellow completely weathered rock

Conclusions based on the study

1. The SPT values indicate that the soil strata up to termination depth are very dense strata was encountered and have high strength in considering of shear parameters and bearing pressure
2. The water table was not encountered at any depth during the time of investigation in any of the bore holes
3. The silt/sand with gravels/CWR presence in the soil is found to be low compressible in nature
4. On the detailed result obtained by the tests, considerable bearing capacity is seen and foundation depth is 1.5m so one can go for shallow recommendation.

4. RECOMMENDATIONS

4.1 Depth and type of foundation

We strictly recommend the foundation depth of minimum **1.5m depth** from the existing ground level and can founded on shallow foundations for less than width of footing, if there is sufficient stabilization. This may be either isolated footing. For load bearing walls continuous footing shall be employed.

4.2 Safe bearing capacity

In geotechnical engineering, bearing capacity is the capacity of soil to support the loads applied to the round the bearing capacity of soil is the maximum average contact pressure between the foundation and the soil which should produce shear failure in the soil. Based on the shear criterion the SBC and based on the settlement criterion the allowable bearing pressure has been worked out as per IS 6403-1982 & IS 8009 (Part -I) -1976. Individual footing/combined footing may be designed using the recommended safe bearing capacity, with factor of safety of 3.0, against shear failure and for an allowable settlement of 25mm

TABLE: 2 Recommended Safe Bearing Capacity

Depth from Natural Ground Level (m)	Net SBC, kN/m^2
1.5	300

Note 1: During excavations, in case any variation is noticed in the strata/seepage, same shall be brought to the notice of geotechnical engineer for review of net SBC recommended.

5. PRECAUTIONS

1. Proper compaction should be given before the foundation programme due to lesser depth
2. If any site leveling and grading takes place, it is important that foundation trenches in areas of "fill"(if any) be taken to the specified depth below the top of existing ground level.
3. If any loose pockets of soil wherever encountered should be completely removed and back filled with well compacted earth. Thereafter a layer of 40-50 mm size stone aggregate should be rammed into the back filled earth. A leveling course of lean concrete should then be laid over the aggregate course and construction of foundation can be taken up subsequently.
4. The columns should be tied with R.C.C beam at plinth level.



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LABORATORY TEST RESULTS

**TABLE: 3 ATTERBERG'S LIMITS, GRAIN SIZE DISTRIBUTION AND SHEAR
PARAMETERS**

BH No.	Depth, m	NMC, (%)	Atterberg's limits, %		Grain Size Distribution, %					Density, kN/m ³	Shear Parameters	
			LL	PL	G	CS	MS	FS	Silt & Clay		c, (kN/m ²)	φ, (deg)
BH-1	1.5	7.8	40.6	NP	26.7	8.2	11.8	19.4	33.9	--	--	--
BH-2	1.7	8.5	--	--	25.7	15.4	10.2	20.1	28.6	--	--	--
BH-3	1.5	8.6	--	--	30.4	15.2	13.5	17.1	23.8	--	--	--
BH-4	1.5	8.1	--	--	24.8	16.9	10.4	19.1	28.8	--	--	--
BH-5	1.5	13.5	34.2	NP	15.4	6.7	10.2	15.0	52.7	--	--	--
BH-6	1.5	11.4	--	--	11.8	16.5	23.8	16.6	31.3	--	--	--
BH-7	1.5	8.7	35.7	NP	26.5	15.3	6.5	17.1	34.6	--	--	--
BH-8	1.5	10.4	34.6	NP	18.5	7.5	12.3	20.9	40.8	--	--	--
BH-9	1.8	10.1	36.8	NP	13.2	9.8	14.7	21.5	40.8	--	--	--
BH-10	1.7	9.3	--	--	23.1	14.2	13.1	20.2	29.4	--	--	--
BH-11	2.0	8.2	--	--	12.7	26.9	30.9	22.1	7.4	--	--	--
BH-12	1.7	9.7	32.3	NP	17.5	16.4	20.1	17.6	28.4	--	--	--

G- Gravel. CS-Coarse Sand, MS-Medium Sand, FS-Fine Sand LL-Liquid Limit, PL-Plastic Limit, NMC-Natural
Moisture Content



BORE LOGS **BORE HOLE NUMBER BH: 1**

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.5m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
	0.5		0.5	--	DS	01	
Reddish green completely weathered rock	1.0		1.5	>50/RS	SPT	01	Water table was not encountered at any depth during the time of investigation

* RS=Refusal Strata

Fig.1. Bore log at BH: 1



BORE HOLE NUMBER BH: 2

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.7m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Reddish green completely weathered rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.2		1.7	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.2. Bore log at BH: 2



BORE HOLE NUMBER BH: 3

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.5m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Reddish green completely weathered rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.3. Bore log at BH: 3



BORE HOLE NUMBER BH: 4

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.5m

Type of Boring: auger
Inclination: Vertical

Sampler used: Shell tube
Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Reddish green completely weathered rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.4. Bore log at BH: 4



BORE HOLE NUMBER BH: 5

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.5m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Brownish yellow sandy Silt with gravels	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.5. Bore log at BH: 5



M/s Karnataka Surveyors, Bangalore

BORE HOLE NUMBER BH: 6

Ground water level: Nil
 Diameter of Boring: 150mm
 Termination Depth: 1.5m

Type of Boring: auger
 Inclination: Vertical

Sampler used: Shell tube
 Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Brownish silty Sand with gravels	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.6. Bore log at BH: 6



M/s Karnataka Surveyors, Bangalore

BORE HOLE NUMBER BH: 7

Ground water level: Nil
 Diameter of Boring: 150mm
 Termination Depth: 1.5m

Sampler used: Shell tube
 Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Yellowish green soft dis-integrated rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.7. Bore log at BH: 7



BORE HOLE NUMBER BH: 8

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.5m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Yellowish green soft dis-integrated rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.0		1.5	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.8. Bore log at BH: 8



BORE HOLE NUMBER BH: 9

Ground water level: Nil
 Diameter of Boring: 150mm
 Termination Depth: 1.8m

Type of Boring: auger
 Inclination: Vertical

Sampler used: Shell tube
 Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Yellowish green completely weathered rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.3		1.8	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.9. Bore log at BH: 9



BORE HOLE NUMBER BH: 10

Sampler used: Shell tube
Date of Boring: 10-11-20

Type of Boring: auger
Inclination: Vertical

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 1.7m

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
	0.5		0.5	--	DS	01	
Yellowish green soft dis-integrated rock	1.2		1.7	>50/RS	SPT	01	Water table was not encountered at any depth during the time of investigation

* RS=Refusal Strata

Fig.10. Bore log at BH: 10



BORE HOLE NUMBER BH: 11

Ground water level: Nil
Diameter of Boring: 150mm
Termination Depth: 2.0m

Type of Boring: auger
Inclination: Vertical

Sampler used: Shell tube
Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Reddish pink sandy gravels	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.5		2.0	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.11. Bore log at BH: 11



BORE HOLE NUMBER BH: 12

Ground water level: Nil
 Diameter of Boring: 150mm
 Termination Depth: 1.7m

Type of Boring: auger
 Inclination: Vertical

Sampler used: Shell tube
 Date of Boring: 10-11-20

DESCRIPTION	Thickness of Strata	Legend	Depth m	N-Value	Sample		Remarks
					Type	No.	
Top over burden			0.0	--	--	--	
Reddish to brownish yellow completely weathered rock	0.5		0.5	--	DS	01	Water table was not encountered at any depth during the time of investigation
	1.2		1.7	>50/RS	SPT	01	

* RS=Refusal Strata

Fig.12. Bore log at BH: 12

