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Soil Investigation at Basar Village, Telangana State

G. Anitha[1], Mahammad Haseena[2] and B. Vinod[3]

[1,2]Student, RGUKT-Basar
[3]RGUKT-Basar
E-mail: [1]anitha111243@gmail.com, [2]rassia.md@gmail.com, [3]iitbvinod@gmail.com

Abstract—*Sub-soil investigation of a proposed construction site is located at Adilabad district of the RGUKT campus Telangana, India. Sub-soil investigation was carried out to determine the suitability of the soil to host civil engineering structures. The investigation involved excavation of trial pits and obtaining both disturbed and undisturbed samples for laboratory analysis. Classification tests were carried out and it showed that the soil samples analyzed is composed mainly of stiff silty clay which originated from the ground level at a depth of 2m. Analysis showed that the soil is loose in characteristics and hence pile foundation is needed for the proposed structure in RGUKT campus. This implies that the potential for swelling and shrinking of soil when wet and dry condition could have negative impact on the stability of structures placed on them is low. Therefore, soils stability and suitability have bad in engineering characteristics necessary for construction work and with a mean allowable bearing capacity of the soils have moderate strength capable of carrying normal civil engineering structures.*

Keywords*: swelling, potential, strength*

1. INTRODUCTION

Large areas of RGUKT campus consists of soil with high clay contents which have low strength and bearing capacity. This problem has an influence on construction of infrastructures in a particular area[1]. The solution to this problem is by adding different chloride compounds including (NaCl, MgCl2 , CaCl2) on the engineering properties of silty clay soil. Various amounts of salts (2%, 4%, and 8%) were added to the soil to study the effect of salts on the compaction characteristics, consistency limits and compressive strength of soil[2]. Moreover the properties of silt can be effectively altered by using nano particles such as nano-clay plays significant role in stabilizing soil for the early strength. Also, suitable strength in stabilized soil and bearing capacity for silty soil during civil projects are achieved by adding homogenized distribution of Nano particles[3]. Silt in fact can essentially be viewed as very fine sand. The grain size boundary between sand and silt is set at 0.074mm. Clay bears little resemblance to sand and silt. The grain size boundary between silt and clay is generally set at 0.002mm [4].

This paper presents the soil investigation based on 10 Bore Holes, conducted at IIIT Basara, Telangana. The main purpose of Soil Investigation is to obtain and understand the geotechnical information on the subsoil condtion required for the construction of infrastructure as a result ten bore holes of 150mm diameter were drilled for conducting field and laboratory tests on the UDS samples collected.

The objective of exploration work was to determine the subsoil condition and which type of foundation is required for the construction of infrastructure at RGUKT.

To fulfill the objectives, the work carried out is comprises of

- Drilling 10boreholes of 150mm diameter upto the maximum depth of 12m below existing ground level in order to know the surface stratification, conducting necessary filed tests and to collect UDS(Undisturbed soil sample) for laboratory testing.
- Testing soil sample in the laboratory to determine the physical and engineering properties of the soil samples, and
- Analyzing all filed and laboratory data to know which type of foundations is suitable for the proposed structure.

2. SOIL PROFILE

Soil profiles of bore holes(BH) is as given below

- In BH-1,stiff silty clay was found from ground level up to a depth of 2m,followed by stiff silty clay with weathered rock pieces up to 4m, medium stiff silty clay with weathered rock pieces up to 5m, stiff silty clay with weathered rock pieces up to 8m, medium dense clayed sand with weathered rock pieces up to 9.5m, followed by very dense sand up to 11m, at which depth the bore hole was terminated.
- In BH-2, medium siff clay with weathered rock pieces occur from ground level to a depth of 4m, followed by medium stiff silty clay with weathered rock pieces up to 6.5m, very stiff silty clay with weathered rock pieces up to 9.5m, medium dense silty sand up to 11m, very dense silty sand up to 12m, followed by very dense clayey sand where the bore hole was terminated.
- In BH-3, medium stiff clay originated from the ground level up to a depth of 3m, by stiff silty clay up to 6.5m,

stiff clay with weathered rock pieces up to 9.5m, very stiff sandy clay with weathered rock pieces up to 11m, followed by very dense silty sand up to 12m and later depths the bore hole was terminated.

- In BH-4, medium stiff silty clay occurs from ground level up to a depth of 2m, followed by stiff silty clay up to 3m,very stiff silty clay up to 4m, stiff silty clay up to 5m, very stiff silty clay with gravel up to 6.5m, stiff silty clay with rock pieces up to 8m, hard silty clay with rock pieces up to 11m, very dense silty sand up to 12m, followed by very dense soft disintegrated rock up to 12m and the the bore hole was terminated thereafter.
- In BH-5, stiff silty clay occurs from ground level up to a depth of 2m, followed by very stiff silty clay with gravel up to 3m, stiff silty clay with gravel up to 4m, stiff silty clay up to 6.5m, stiff silty clay with rock pieces up to 8m, very stiff silty clay with rock pieces up to 9.5m. very stiff sandy clay up to 11m, followed by soft disintegrated rock up to 12m, at which depth the bore hole was terminated.
- In BH-6 had medium stiff silty clay occur from groud level up to a depth of 2m, followed by stiff silty clay up to 4m, stiff silty clay with rock pieces up to 6.5m,very stiff silty clay with gravel up to 9.5m, followed by hard rock up to 9.5m, at which depth the bore hole was terminated.
- In bore hole BH-7,medium stiff silty clay occurs from ground level up to a depth of 2m, followed by medium stiff silty clay up to 3m, medium stiff silty clay with rock pieces up to 4m, stiff silty clay with rock pieces up to 5m, very stiff silty clay with gravel up to 6.5m, stiff silty clay with gravel up to 8m, soft disintegrated rock up to 9.5m, very stiff silty clay with gravel up to 11m, followed by soft disintegrated rock later which depth the bore hole was terminated.
- In bore hole BH-8, silty clay was identified from ground level up to a depth of 3.5m, followed by stiff silty clay with rock pieces up to 4.5m, stiff silty clay up to 5.5m, very stiff silty clay with rock pieces up to 6.5m, very stiff silty clay up to 8m, very stiff silty clay with rock pieces up to 10m, followed by soft disintegrated rock, at which depth the bore hole was terminated.
- In BH-9, medium stiff silty clay was observed from ground level up to a depth of 2.5m, followed by medium stiff silty clay with rock pieces up to 8m, very stiff silty clay with rock pieces up to 10m, followed by hard silty sandy clay with rock pieces, at which depth the bore hole was terminated.
- The soil profile of BH-10, soft silty clay was observed from ground level up to a depth of 3.5m, followed by medium stiff silty clay with rock pieces up to 5.5m, very stiff silty clay with rock pieces up to 10m, followed by hard silty sandy clay with rock pieces, where the bore hole was terminated.

3. DISCUSSIONS ON FIELD AND LABORATORY TESTS

The field data and laboratory classification reveals in general, the proposed site is having single major layer up to the depth of investigation i.e. 12m.

The results of laboratory tests conducted on the undisturbed soil samples collected from 10different bore holes and the field bore log data, the following recommendations are made for suitable type of foundations for the proposed structures.

Ground water table was met at a depth of 0.5m to 2m below the existing ground level in all the bore holes.

All the laboratory tests were carried out as per relevant Indian Standards. All the samples were identified and classified as per relevant Indian Standard, IS:1498 The following laboratory tests were carried out to determine the physical and engineering properties of undisturbed and disturbed soil samples.

1. Atterberg's limit-(IS 2720 part -5 1985)
   (i). Liquid limit

   (ii). Plastic limit

Table1: Atterberg's Limits for the Soil

Test Results	**Project: Soil Investigation for the Proposed structures at IIIT, Basaa, T elangana.**	**Boring Start:05.10.2013 Boring End:06.10.2013**		
		Location Basar IIIT		
Depth, mtrs	Soil Description	Atterberg Limit		
		Liquid Limit(%)	Plastic Limit(%)	Plasticity Index
2.5	Clay	66	24	42
4.5	Silty Clay	65	23	42

4. CONCLUSION

For any proposed structure at any place before construction we have to investigate the nature and characteristics of the soil profile. Based on the results we can adopt which type of foundation is suitable for the soil.

Sub soil stratification of proposed site up to depth of investigation is as below.

From 0 to 2m: Stiff silty clay

From 2 to 4m: Stiff silty caly with weathered rock pieces.

From 4 to 8m: Medium stiff silty clay with weathered rock pieces.

From 8 to 9.5m:Medium dense clayey sand with weathered rock pieces.

From 9.5 to 12m: Very dense sand.

Ground water table was met at a depth of .5m to 2m below the existing ground level in all the bore holes

Based on the results of laboratory test conducted on disturbed and undisturbed soil samples collected from the bore holes and field Bore log data, the following recommendations are made for suitable type foundation for the proposed structures are:

1. Under-reamed piles
2. Open foundation

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