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SOIL PROPERTIES AND THEIR IMPACT ON FOUNDATION DESIGN

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Abstract : Study of soil engineering is very much important in determining the design of foundation for any structure. Generally subsurface investigation is carried out before the construction of any structure for determining the load carrying capacity of the structure and to make the structure safe through various established method. we find various ways to economize the construction of foundation and remove the myths prevailing regarding the need of soil testing. We come up with data's that will help in suitably change the traditional practice that is followed in the construction of sub structure.

Index Terms **- Foundation Settlement, Soil investigations, subsurface conditions.**

I. INTRODUCTION

Soil investigations are not given due importance during the construction of any structure. this has led to the construction of weak structures which are not capable to transfer the load to the soil. we found that soil testing is not done properly at the builders site. Foundation construction is not done according to the guidelines, which are needed to be followed by considering the geotechnical properties of soil.

Water is the main enemy in expansive soils problems. There is either too much water, causing the soil to swell, or not enough, causing the soil to shrink. If all soil beneath a foundation swells uniformly or shrinks uniformly it is unlikely to cause a problem. But when only part of the foundation heaves or settles, differential movement causes cracks and other damage.

The proper design of civil engineering structures requires adequate knowledge of subsurface conditions at the sites of the structures and, when structures are to consist of earth or rock fill maternal, of subsurface conditions at possible sources of construction materials. The structures may be divided into three categories.

1. Structures for which the basic problem is the interaction of the structure and the surrounding ground. Such structures include foundations, retaining walls, bulkheads, tunnel linings, and buried pipes. The main point of interest is the load-deflection characteristics of the interface.
2. Structures constructed of earth such as highway fills, earth and rock fill dams, bases and sub bases for pavements, and backfill behind retaining walls. Besides the interaction of the earth structure with the adjacent ground, propones of the construction materials are required for determining the action of the earth structure itself.
3. Structures of natural earth and rock as natural slopes and cut slopes. In this case, knowledge of the properties of the natural materials is required.

II. DESIGN METHODOLOGY

We done the various test on soil like, Liquid limit, specific gravity, Shrinkage limit, permeability, falling head method, vane shear test, direct shear test, CBR, Rotary drilling.

Standard Penetration Test

The standard penetration test (SPT) is the most commonly used in-situ test, especially for cohesion less soil, which cannot be easily sampled. The test is externally useful for determining the relative density and the angle of shearing resistance of cohesion less soil. It can also be use to determine the unconfined compressive strength of cohesive soils.

Silty fine sands & fine sands below the water table develop pore pressure which is not easily dissipated. The pore pressure affects the resistance of the soil and hence the penetration no.(N). In granular soil, the overburden pressure affects the penetration resistance. As the confining pressure in cohesion less soils increases with the depth, the penetration number for soils at shallow depths is underestimated and that at greater depths is overestimated. For uniformity, the N-rule obtained from field tests under different effective overburden pressure are corrected to a standard effective overburden pressure.


Sample Collection (Standard Penetration Teat)

III. FILED/LABORATORY WORK & SOLUTION

Ground Water Table

During investigation, soil and ground water samples were collected for chemical analysis to determine their pH-value and contents of sulphates and chlorides in them. Classification of soil and water samples is based on the following table.

Sr. No	Class	Sulphates Content Expressed as SO_3		
		Soil		Ground Water
		Total SO Percent	SO_3 * g/L	In g/L
I	1	Less Than 0.20	Less Than 1.0	Less Than 0.30
II	2	0.20 to 0.50	1.0 to 1.90	0.30 to 1.20
III	3	0.50 to 1.00	1.90 to 3.10	1.20 to 2.50
IV	4	1.00 to 2.00	3.10 to 5.00	2.50 to 5.00
V	5	More Than 2.00	More Than 5.00	More Than 5.00

Soil type affects selection of types of foundations, foundation depth and foundation sizes. Following are the considerations for foundation based on soil types

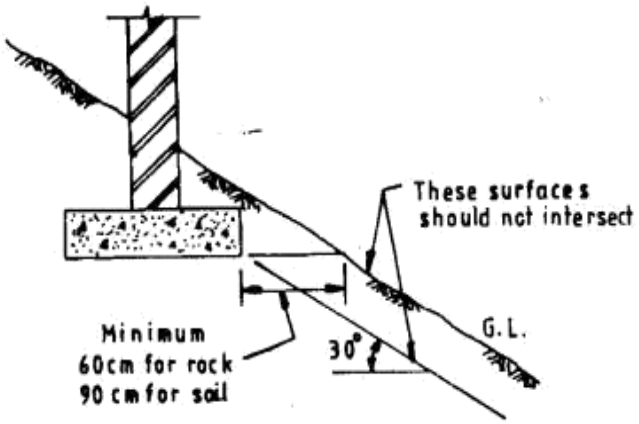
Soil Type	Foundation		Trouble areas
	Types	Reason for use	
Sand	Footings	Easy to construct and economical	Bearing capacity may be a problem but in most cases it is sufficient Excessive settlement in wet and loose deposits. Confining pressure is usually low.
	Retaining Structures	Must be used since sand cannot support themselves	
	Deep foundations (Piles)	Uses friction resistance but low in bearing capacity	
Clay	Footings	Economic but may have problem with bearing capacity in saturated clays	Low bearing capacity. Generally low shear strength when wet. High consolidation in soft clays Swelling is possible. Over-consolidated clays may contain cracks and fissures.
	Retaining Structures	Clays are self-supportive up to a certain height (critical). Must be used if height increases beyond the critical.	

	Deep foundations (Piles)	If bearing capacity is low, piles may be driven to rock. May change formation of clay.	

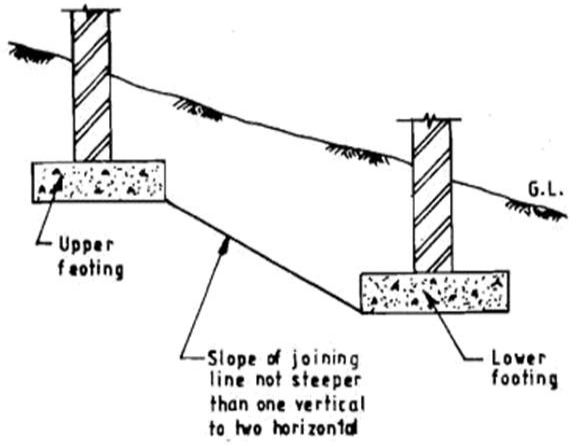
Soil Type	Nature of problem	Possible solution
Sand	Settlement	Loose sands must be compacted
		Lowering water table may result in sand densification
	Bearing Capacity	Compaction increases cohesion and friction thus bearing capacity increases
		Use of deep foundation
Clay	Consolidation	Lowering water table
		Pre-loading
		Drive pile to rock
	Bearing capacity	Compaction
		Use of deep foundations
	Expansion or swelling	Treat or stabilize soil
		Maintain constant water table
		Alter soil nature (similar to stabilization)
		Include swell pressure in design

Depth Of Foundation On Different Soils

In sloping grounds, the horizontal distance from the bottom edge of the footing to the ground surface shall be at least 60 cm for rock, and 90 cm for so the base from the outer edge should not intersect the sloping surface



Foundation on sloping ground



Foundation on granular soils

IV. Conclusion

The activities section includes the various task performed by the above mentioned people. The government agencies involved in the permissions for construction and building completion certificates. The contractor's responsible for the construction execution of building. The buyer buys the home or property. The structural engineer analysis the soli data. The consultancy work of third party inspection are the set of different activities performed. The soil testing laboratories are responsible for carrying out the field test and lab test. This is the most serious threat since the swelling potential of expansive soils is much greater than the shrinkage potential. Moisture gain can come from plumbing leaks, subsurface water like wet weather or a high water table, or surface water. Surface water is improper drainage of landscape water or rainwater.

REFERENCES

[1] Hsai-Yang Fang (2004) Foundation Engineering Handbook, Prof. civil engineering, Fritz engineering laboratory, Lehigh university..

[2] Bishop, A.W. (1966), the strength of soil as engineering materials, geotechnique, 16, pp. 91-128.

[3] Meyerhof, G.G. (1963), some recent research on the bearing capacity of foundation, Canadian geotechnical journal.

[4] Singh, A. and Mitchell, J.K. (1968), General stress-strain- time function for soils, journal of the soil mechanics and foundation division, ASSCE, 94, No-SM-1, pp.21-46

[5] Cartier, G. and Gigan, J.P. (1983), Experiments and observation on soil structures, european conference on soil mechanics and foundation engineering, Helsinki, Finland.