Modifiction of Soil Properties with Time- A Case Study of Railway Bridge of Jaipur City

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***Abstract*:-Soil is most important factor to be included before construction of any project requires good bearing soil strata. If the soil strata are not suitable for huge project like dam retaining wall, over under bridge, high rise buildings. Then it needs to be stabilized.**
A site of railway over bridge in Jaipur was selected for collecting previous data of ten year ago. The railway over bridge was constructed in 2006. The data of properties of soil was collected from there & now the properties of soil nearby location of railway over bridge sitapura was tested & then both properties were compared then some properties are found to be differ from 2006.

Keywords— SPT ,bearing capacity,GSD,Shear strength,CBR value, FSI.

I. INTRODUCTION

Soil contains various properties, it may be harmful for health agriculture & as well as in construction or engineering properties of soil. In aspect of construction soil is tested for specific gravity, water content, bulk density etc. These properties affect the bearing capacity of soil. These properties may reduce or increase due to various factors like rise in water table, impact of pollution. These factors affect to long time create a greate impact on soil properties

Even the bearing capacity of soil depends on the grain size of soil. The classification of soil by grain size is also done construction of a project requires reconnaissance before starting construction. This reconnaissance requires testing of soil, location of site & pollution impacts on site.

II. OBJECTIVE

The objective of this research is to compare the soil properties of 10 years, to find the properties differed from previous & its causes, recommendation for stabilization of soil & best suitable method in all aspect for a specific location.

III. RESEARCH APPROACH

The tests based on Indian Standards in 2006 & as well as in 2016 were conducted. The test were conducted at the depths as 3m & 4.5m. The properties like water content, specific gravity, sieve analysis, bulk density, dry density, CBR value, free swell index, shear strength, atterberg limits, standard penetration was determined. These all properties were compared & the properties which differ were selected. Then causes of changing properties were found out.Then recommendation were given for those

IV. TEST SAMPLE, METHOD & OBSERVATIONS

a. **Specific gravity** by pycnometer method is adopted determining the specific gravity as this gives appropriate results. Specific gravity determined by this method is 2.47

b**. Moisture content** is evaluated by oven drying method. The average moisture content at 1.5 & 4.5 meter is 14.9%.

c**. Bulk Density** is determined by in-situ method or SPT (standard penetration test) at depth 1.5, 3.0, 4.5&6.0 meter. Average bulk density is 1.92 gm/cc and dry density is 1.67 gm/cc.

d**. Grain size distribution** has been done to find out percentage of silt and sand. Hydrometer was conducted to find out clayey particles percentage.

Table 1: Analysis of Soil Particle

Types of soil	Percentage (%)
Clay	01.38
Silt	07.82
Fine sand	67.00
Medium sand	07.40
Coarse sand	09.80

On the basis of this result can be predicted that the soil is silty sand.

e**. Plasticity index or Atterberg: -** plasticity index is evaluated by determining liquid limit with the help of cone penetrometer.

Table 2: Liquid Limit of Soil Sample

Depth (meter)	Liquid limit W_L (%)	Average W_L (%)
1.5	22.57	21.8
4.5	21.03	

The soil is of non plastic nature.

f. Swelling Index: - Swelling index is the parameter of determining the swelling capacity of soil. To determine the swelling index the soil sample in water and a standard solution is compared. The kerosene is such a solution which is not swallowed in the soil.

g. Direct Shear Test: - Direct shear **test** was conducted to determine the cohesion, angle of internal friction and Mohr's failure envelope. The condition was taken as no drainage was allowed during deviator stage.
The observations are as follows:-
Plan (LXB) cm^2 = 6.2X6.2
Height of sample, cm = 2.5cm
Area of sample = 6x6 cm^2
Volume of sample = 90 cm^3
Weight of direct shear box, gm = 2856gm
Weight of shear box +sample = 2680gm
Density of sample = 1.96gm/cc
Normal load = 4kg
Loading rate =
Vertical dial least count = 0.01
Horizontal dial least count = 0.01

Table 3: Analysis of Normal and Shear Stress on Soil Sample

Sr.no.	Proving ring load KN (least count 0.02)	Horizontal dial gauge dH (least count 0.01)	Vertical dial gauge (least count 0.01)	Corrected area $A=A_0(1-dH/3)$	Normal stress (σ) Kg/cm^2	Shear stress(τ) Kg/cm^2
1.	0.09	80.00	5.00	26.40	0.1515	0.00340
2.	0.1	105.00	10.00	23.40	0.1709	0.00427
3.	0.11	130.00	20.00	20.40	0.1960	0.00539
4.	0.12	200.00	20.00	16.80	0.2380	0.00714

Table 4: Comparison of Soil properties

Sr. No.	Soil Properties	Average Value of Varying Depth In 2006	Average Value of Varying Depth In 2016
1.	Sieve Analysis		
	Clay %	3.2 %	21 %
	Silt %	13.25 %	6.30 %
	Fine Sand	78.10 %	67.0 %
	Medium Sand	2.50	7.4 %
	Coarse Sand	2.05	9.8 %
	Gravel	0.0	0.0
	Nile		
2.	Atterberg		
	Liquid Limit	28.55 %	21.8 %
	Plastic Limit	NIL	NIL
	Plastic Index	-	-
3.	Bulk Density	1.58 g/cc	1.92 g/cc
4.	Moisture Content	3.84	14.81
5.	Dry Density	1.51 g/cc	1.83 g/cc
6.	Specific gravity	1.65	1.98
7.	Shear Parameters		
	C	0.0	0.0
	Φ	31.0	31.8

V. CONCLUSION

Average liquid limit of soil has been decreased. It may be due to change in grain size of particles. Liquid limit decreases when the diameter of particles increases, water absorption capacity of soil particles decreases.
Generally all the properties of soil depend upon particle size. As the particle size changes moisture content, specific gravity, bulk density, shear resistance, permeability, effective stress and bearing capacity of soil is affected. Thus it can be concluded that soil properties changes with time.

VI. REFERENCES