

Comparative Study of Different Soil Parameters Using Blending Technology

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Abstract – The soil is the only material which supports the structural foundation of buildings, dams and roads. In About one third of Indian areas are covered with black cotton soil, which occurs in western and central parts of India. Many areas are covered with silt and clay soils as these possess poor bearing capacity problems during the construction or during the life service of structures. For the poor engineering properties of these soils, it has forced Engineers to improve the bearing capacity problem by improving the engineering properties of soil by using different soil stabilization methods. Black Cotton soil is one which when associated with as engineering structure and in presence of water will show a tendency to swell or shrink causing the structure to experience moments which are largely unrelated to the direct effect of loading by the structure. Black cotton soil is not suitable for the construction work on account of its volumetric changes. It swells and shrinks excessively with change of water content. Such tendency of soil is due to the presence of fine clay particles which swell, when they come in contact with water, resulting in alternate swelling and shrinking of soil due to which differential settlement of structure takes place, but as we all know that red soil has low swelling and shrinkage properties and high load bearing capacity also. so, to stabilize black cotton soil here we use red soil to overcome the properties of black cotton soil and to increase the load bearing capacity of soil.

Keywords- Blending, Black cotton soil, red soil.

I- INTRODUCTION

These methods of soil stabilization involve of replacing of soil or using complex methods of chemical stabilization. The clay of medium to high compressibility characterized by high swelling and shrinkage properties which covers the area of west Maharashtra regions has become a challenge to the engineers in construction. This soil when becomes dry is very hard but loses its strength properties completely when it is in wet condition. Therefore, it is very important to know various properties of soil such as physical and engineering properties. Soil can be stabilized by chemically or mechanically. The chemical stabilizers are the substances that can enter in the natural reactions of the soil and control the moisture which is getting into the clay particles. These methods of soil stabilization involve of replacing of soil or using complex methods of chemical stabilization. The clay of medium to high compressibility characterized by high swelling and shrinkage properties which covers the area of west Maharashtra regions has become a challenge to the engineers in construction. This soil when becomes dry is very hard but loses its strength properties completely when it is in wet condition. Therefore, it is very important to know various properties of soil such as physical and engineering properties. Soil can be stabilized by chemically or mechanically. The chemical stabilizers are the substances that can enter in the natural reactions of the soil and control the moisture which is getting into the clay particle. We all know that red soil

has slow swelling and shrinkage properties, and high load bearing properties also. So, to stabilized black cotton soil here we use red soil to overcome properties of black cotton soil and to increase the bearing capacity of soil.

II-METHODOLOGY

In this comparative study we performed Sieve analysis, Liquid limit, Plastic limit, Free swell index, Light compaction test, and light compaction with different proportion of soil mix. After performing all the above test for Black cotton soil and Red soil, we got the results which are shown in following table.

1. Black cotton soil

Table 1- Properties of Black cotton soil.

Sr.no	Properties	Content
1	Grain size distribution	
	D10	0.0017 mm
	D30	0.0045 mm
	D60	0.02 mm
2	(Cc)	11.76
	(Cu)	0.60
3	Liquid limit	47.1 %
4	Plastic limit	12.8 %
5	Plasticity index	34.3 %
6	Swelling index	20 %
7	Maximum dry density	1.397 gm/cc
8	Optimum moisture content	29

2. Red soil

Table 2 -Properties of red soil

Sr.no	Properties	Content
1	Grain size distribution	
	D10	0.0018 mm
	D30	0.0045 mm
	D60	0.03 mm
2	(Cc)	16.67
	(Cu)	0.38
3	Liquid limit	51 %
4	Plastic limit	15.44 %
5	Plasticity index	35.56 %
6	Swelling index	20 %
7	Maximum dry density	1.42 gm/cc
8	Optimum moisture content	26 %

The results of Light compaction with different proportions are given below,

Table 3 -Compaction test result

Proportion		MDD (gm/cc)	OMC (%)
BC soil (%)	Red soil (%)		
20	80	1.427	31
30	70	1.357	33.9
40	60	1.314	34.9
50	50	1.348	34.2
60	40	1.371	30.3
70	30	1.398	29.7
80	20	1.415	27.6

From above we got a highest MDD i.e., 1.427 gm/cc and the corresponding proportion is 20% of BC soil and 80% of red soil.

Percentage increase in MDD

Table 4 -Percentage increase in MDD

% Increment for different soil		% Increased
MDD of BC soil	1.397 gm/cc	2.15%
MDD of Red soil	1.420 gm/cc	0.49%
MDD of mixed proportion	1.427/cc	

III- CONCLUSION

Earlier studies were mainly concentrated on different types of soil like BC soil, Laterite soil and only some studies were conducted on sandy soil. In the previous work the black cotton soil is mixed with red soil to find out suitable blend and to overcome drawbacks of black cotton soil.

From the current revision, the subsequent conclusions can be made.

- According to the sieve analysis the black cotton soil and red soil are found as fined grained soil.
- To understand the flow characteristic of soil Liquid limit and plastic limit tests are done, and found as 47.1 % and 12.8 % for BC soil and 51.5 % and 15.5 % and also the plasticity index for respective soil is 34.1% and 36.5 %.
- The free swell index of both BC soil and red soil are found as 20 % and 30 %.

- According to the standard proctor test the Maximum Dry Density and Optimum Moisture Content for black cotton soil and red soil are found as 1.397 gm/cc & 23 % and 1.42 gm/cc and 26%.
- Black cotton soil is mixed with red soil and the suitable blend is found out, which increases MMD of BC soil and red soil by 2.147 % and 0.49 % respectively.

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