

Improvement of Ultimate Bearing Capacity of Black Cotton Soil By Using Murum Bed and Geo-Grid

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Abstract— The abnormal behavior of expansive soil creates difficulties in construction. Many of studies were carried out to improve the stability of black cotton soil. In most of cases it is advised to alter the subgrade soil by high strength soil such as sand or murum. But it was found that this may costs more and project becomes expensive. In the present study we are investigating suitability of murum bed in black cotton soil at a certain depth without replacing total soil bed along with a layer of geo-grid. Effect of use of murum in soil bed increases the strength by considerable margin. Geo-grid holds the murum densely and avoid the formation of cracks in soil bed. Load carrying capacity of soil increases and firm suitable foundation available for construction.

Keywords: Black cotton soil, Murum, Geo-grid.

I INTRODUCTION

Foundation is the lower most part of the structure but very important part of any structure whether it is onshore or offshore structure. Foundation is the part of structure which receive highest amount of load from superstructure and distribute it to ground soil. So it is necessary to have foundation strong enough to sustain the load of superstructure. Total performance of any structure depends on the performance of foundation. As foundation plays vital role in the construction, so it should be designed properly. Design of foundation comprises two major parts: one is the ultimate bearing capacity of soil below foundation and second is the allowable settlement that a footing can undergo without any failure of superstructure. Ultimate bearing capacity means the load that the soil can sustain without shear failure; while, settlement consideration involves determination of the settlement caused by load from superstructure which should not exceed the allowable value for the stability and function of the super structure. Ultimate bearing capacity problem can be solved with the help of either analytical solution or experimental study. In our country, the commonly available rocks are of either basalt or laterite. The materials obtained from disintegration of laterite are widely used in admixture of clay and coarse fraction and known as lateritic gravel. This material is

known as murum. Naturally available murum have low strength, which decrease ultimate bearing capacity of soil. A suitable use of murum along with Geo-grid will not only improve its Index properties but also its strength. Experimental study is propose to carry out in laboratory by adding murum in soil bed in a layer with appropriate thickness. Also murum can be packed in between Geo-grid to hold murum firmly. Use of Geo-grid also prevents the formation of cracks in soil bed and failure plane will not developed in the soil.

II OBJECTIVES OF THE STUDY

1. To study the behaviour of footing under loading.
2. To study the complex nature of black cotton soil.

III LITERATURE REVIEW

Anil Kumar Thakur, Anil Kumar Saxena, T. R. Arora

^[1] In the year 2013 method suggested for the use of black cotton soil by adding coarse sand and Granular sub-base. In this study investigation were made for the determination of suitability of waste quarry soil obtained from disintegration of laterite stone by adding the soil with suitable percentage of river/nalla sand. It is concluded that the mixture of the murum mixed with 25% of sand full fill the requirement for granular sub base material recommended by Ministry of rural development (MORD)

B. M. Patil, K. A. Patil,^[2] In the year 2013 method suggested for the improvement in properties of subgrade soil by using murum and RBI grade 81. In this study is was found that the CBR value of subgrade soil improved by using moorum with RBI Grade 81 and cost of construction was reduced to great extent. From CBR test, it was found that the soaked CBR value of soil was improved by 476.56% i.e. 2.56% to 14.76% by stabilizing soil with 20% moorum and 4% RBI Grade 81.

Shripad S. Somvanshi, Prof. Dr. V. J. Sharma, Mr. Bhanudas Abhale,^[3] In the year 2017 experimental study carried out on Load Settlement behavior on Silt Clay Loam (Soft Murum) with or without Geogrid. In this study the prototype structure of working foundation was prepared and tested under cyclic load of various vertical load and eccentricities of a size of square and circular footing. The effect on bearing capacity of soil due to inclusion of reinforcement into the soil at various positions was also

analyzed. In this experimental investigation it was seen that as the load eccentricity goes on increasing there is decrease in the load carrying capacity.

IV MATERIAL USED

A. SOIL:

Locally available soil was collected from nearby place of CSMSS campus, Aurangabad. Several lab tests were conducted on soil to the index properties of soil and type of soil. From the test it was concluded that soil is clayey soil, of low plasticity which was coarse and inorganic in nature (ML). IS: 2720 Part 5 1970 and IS: 2720 Part 3 Sect 2 1981 was used to determine index properties of soil. The following table represents the physical properties of soil.

Table 1. Engineering and Geotechnical properties of soil

Sr.No.	Test Properties	Result
1.	Specific gravity	2.6
2.	Natural Water Content (%)	20.50
3.	Sieve Analysis	
	% of Gravel	10.27
	% of Sand	80.33
	% of Fines	9.40
4.	Cc Coefficient of Curvature	1.34
5.	Cu (Uniformity Coefficient)	12.32
6.	Optimum moisture content (%)	15
7.	Maximum dry density (g/cc)	1.85
8.	Unconfined Compressive Strength (kg/cm ²)	1.76

B.MURUM:

The weathered rock when fragments into pieces and which is non-plastic in nature is known as murum. The granular murum is collected from nearby hilly area and tested in the laboratory for soaked CBR test. The properties of murum used for experimental studies are as given in table 2.

Table 2: Basic Properties of Murum

Sr. No.	Properties of Murum	Value
1	Max. Dry Density	1.86
2	Optimum Moisture Content	12.25
3	Soaked CBR (%)	7.96

C.GEOGRID:

Geo-grids are distinguished by the relatively high tensile strength and a uniformly distributed group of large openings in between longitudinal and transverse rib. These openings are called aperture. The openings

allow sand particle on either side of the mounted geogrid to come in direct contact which increases the interaction between the geogrid and murum.

V TESTING METHODOLOGY.

To the determination of index properties lab testing were carried out. Specific Gravity was measured with the help of Pycnometer method. Water content in the soil was measured by Oven drying method. Mechanical sieve analysis was performed for particle size distribution. Modified proctor was used to find out maximum dry density and optimum moisture content. Unconfined compressive strength was determine with the help of unconfined compression machine. Guidelines were followed which laid down in Indian Standards Codes of practice.

VI CONCLUSION

It is found that murum can be used to increase the ultimate bearing capacity of soil. Out of available Geo-textiles, Geo-grid is suitable for murum as it increases the interaction between the Geo-grid and murum.

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