

# Stabilization of Black Cotton Soil by using Geo Grid in the Construction of Flexible Pavements

T.V Sai Krishna<sup>1</sup>, S.B. Chowda Reddy<sup>2</sup>, K. Shyam Chamberlin<sup>3</sup>

1Student, Department of civil engineering, K L University, Vijayawada , India

2Student, Department of civil engineering, K L University, Vijayawada, India

3Assistant professor, Department of civil engineering, K L University, Vijayawada, India

**Abstract:-** Soil Stabilization can be done in many ways. Soil Stabilization is mainly done to improve the strength of soil and bearing capacity of sub grade soil. Geo grid is most used stabilizer in stabilization of soil in flexible pavements. Geo grids are mainly used for reinforcement of soils for different kind of works in construction. In this work, the main discussion is about the stabilization of black cotton soil in flexible pavements by using geo grids. The increase in CBR value of black cotton soil by using geo grid determines the increase in strength of black cotton soil in flexible pavements.

**Keywords:-** Geo-grids, black cotton soil, CBR test.

## I. INTRODUCTION

India is a country with huge population which require a large amount of constructions. Soil stabilization is much important process in construction. Soil stabilization is process of improving the soil performance by increasing its tensile strength, bearing capacity and also increases the strength of pavement. Black cotton soil will have high swelling and shrinkage and they exhibit high moisture content. Bearing capacity decreases in black cotton soil because of nature of black cotton soil.

Flexible pavement consists of 4 layers which are sub grade, sub base, base, surface course. Sub grade layer is main layer which is mostly used for stabilization of soil. Geo grids are major type of geo synthetics used in reinforcement of soil in constructions. Geo grid is used as stabilizing agent for soil. Mostly geo grids are used in black cotton soil to increase its strength. CBR test is done to determine the strength of soil sub grade in flexible pavement. CBR test increases the bearing capacity soil. CBR test is done for both sub base and granular sub base materials in flexible pavements. CBR method is standardised method used for flexible pavements according to Indian road congress guidelines. Strength increase by introduction of geo grids can be seen by doing CBR test.

### ➤ Objectives

- To improve bearing capacity of black cotton soil.
- To increase the strength of pavement by using geo grids.
- To reduce the cost of the project and also reduce thickness of pavement.
- To increase the structural integrity of black cotton soil used in construction of pavement.

## II. EXPERIMENTAL INVESTIGATION

In this project, the soil is collected from kl university surroundings. The soil used is black cotton soil. Different tests have been done to determine the properties of soil. The tests done are liquid limit, plastic limit, compaction test. Compaction test is main test as it determines the optimum moisture content of soil which is used in CBR test. We can see test results from table 1.

Properties of black cotton soil	
Liquid limit	64.5
Plastic limit	34.3
Optimum moisture content (%)	13.6
MDD without geo grid	1.69

Table 1. Properties of soil

## III. METHODOLOGY

CBR test is main test which determine the strength of soil sub grade in flexible pavement. For the project, we have taken two soil specimens. CBR test is conducted on soil specimen without geo grid. In other specimen, Geo grid is used as a stabilizing agent and CBR test is conducted for this specimen also. The CBR test is done for sub grade layer of flexible pavement. The geo grid used in project is secugrid40/40 which is regularly used for pavement reinforcement.

## IV. RESULTS AND DISCUSSION

Penetration behavior of Black cotton soil against compression is examined. Load penetration curve is plotted for 2 specimens. Load is measured in kg. We can see different load values for different penetrations in Table2. We can see more load penetration in specimen with geo grid than specimen without geo grid from Chart1.

Penetration (mm)	Load on piston Kg(Without Geo-grid)	Load on piston Kg (With Geo-grid)
2.5	24	54.4
5	32	78.4
7.5	37.1	91
10	40.2	99.3
12.5	44.9	107

Table 2. Observation table for load (Kg) for specimen with Geo-grid and for specimen without Geo-grid

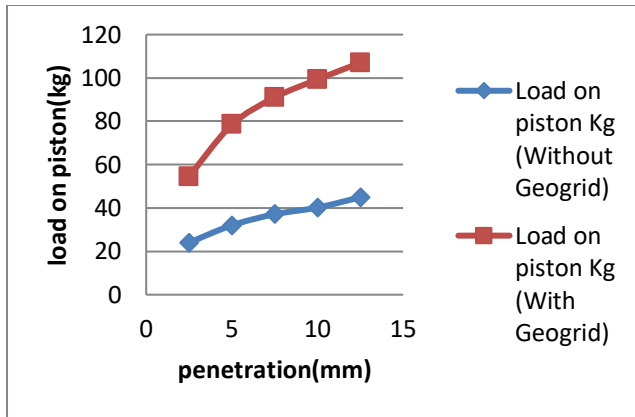


Chart-1: Load on piston (Kg) Vs Penetration (mm)

CBR values are calculated for penetration of load at 2.5 mm and 5 mm. CBR is measure of resistance of material to standard plunger in flexible pavements. The CBR value at 2.5mm penetration should be higher than CBR value at 5mm (IS-2720-16-1979). CBR value for soil specimen with Geogrid is 3.96% which is higher than that of soil specimen without geo grid which is 1.81. CBR test results are tabulated in table no. 3

Penetration (mm)	CBR value % (without geo grid)	CBR Value % (with geo grid)
2.5	1.81	3.96
5	1.65	3.79

Table 3. CBR value without and with geogrid

## V. CONCLUSION

From the project, We known that soil specimen with geo grid have more CBR value than soil specimen without Geo-grid. The increase in CBR value indicates increase in strength of soil with Geo-grid. The increase in CBR value also indicates increase in bearing capacity of soil. These CBR values are correlated with thickness of flexible pavements. Thus, study has been concluded that CBR value of black cotton soil can be increased by using Geo-grid as a soil stabilizer.

## REFERENCES

[1]. Vivek Singh Pundir and Ved Prakash “Effect of soil stabilizers on the structural design of flexible pavements” Pelagia Research Library, Advances in Applied Science Research, 2015, 6(8):134-147.

[2]. Mr.Akolade “Reinforcement of Subgrade Soils with the Use of Geo grids” International Journal of Science and Research (IJSR) Paper ID: 02014772 Volume 3 Issue 6, June 2014.

[3]. S.Sugandini, Dr .M. Madhuri “Stabilization of soils using Geosynthetics” Vol-3 Issue-6 2017,IJARIE-ISSN(O)-2395-4396.

[4]. Zornberg, J.G “Advances in use of Geosynthetics in Pavement Design.”, Proceedings of the Second National Conference on Geosynthetics, India '11, India Institute of Technology Madras, Chennai, India,September 23-24, Vol. 1, pp. 3-21.

[5]. Mrs. neetu B. ramteke, prof Anil kumar saxena, prof T .R Arora “A Review: Effect of Geo-grid reinforcement on soil” International Journal Of Core Engineering & Management(IJCEM) Volume 1, Issue 4, July 2014 .