

# Behaviour of Geotextile in Flexible Pavement

Mayura M. Yeole<sup>1</sup>, Twinkal P.Thakur<sup>2</sup>, Yogita Gurav<sup>3</sup>, Yash Agrawal<sup>4</sup>  
<sup>1,2,3,4</sup> Department of Civil Engineering, PCCOER

**Abstract-** The paper discusses the problem of the soft soil and solution to overcome it. The use of geotextile as a reinforcement in soil in the emphasizing point of research which is been reflected into the paper. The test California bearing ratio been performed to check the behaviors of soil when induced/combined with geotextile. The result of such are been discussed below.

**Index Terms-** OMC (optimum moisture content), MDD (maximum dry density), CBR (California bearing ratio).

## I. INTRODUCTION

As it is known that engineer faces the challenges while constructing structure on soft soil (black cotton soil). It may poses problem which includes low bearing capacity excessive settlement thus produces undulation on the road surface which causes failure leading to accident and losses in life of human being. In INDIA the black cotton soil spread over 5.46 lac sqkm i.e. 16.6% of the total area across the maharastra , telangana , Andra Pradesh, Gujarat and tamil nadu.

Due to such immense spread of black cotton soil in INDIA it becomes a crucial factor to be considered to avoid the losses of the life. Hence this can be achieved by improving structural stability of the soil it is done by homogenising the soil with such material which may impart in improving the property of the soil thus the material are geosynthetic it is defined as the planer product manufactured from polymeric material used with soil and rock as an integral part of the manmade project , structure this will be further divided into the geotextile, geogrid, geomembranes ,erosion control blanket and mat, geosynthetic liner geo net, geocomposite drainage material etc.

This paper thus discusses the use of geotextile material into soil; the result and the test carried out are discussed below.

## II. TEST ANALYSIS ON THE SOIL WITH GEOTEXTILE

The modified proctor test has been performed on to the soil with and without geotextile for the reading of the OMC and MDD which are 14.35% for pure soil and 11.38 % for the soil with geotextile. Thus the reading obtained are been used in finalising the CBR test methodology. The test that where performed where for soaked condition that has been taken at different depth with different layer of the geotextile material. The position of the depth and layer are as below.

Srno	Depth in cm (from bottom)	Layer
1	12.5(only soil)	-
2	4.37	1
3	5.83	1
4	8.75and 12.55 from bottom	2
5	13.12 and 3.8 cm above ¾ <sup>th</sup> From bottom	2

## III CBR TEST

It is the ratio of forces per unit area required to penetrate a soil mass with standard circular piston at the rate of 1.25mm/min to that required for the corresponding penetration of a standard material. Tests are performed out on natural or compacted soil in water soaked or unsoaked condition and the result so obtained are compared with the curve of standard test.

Mould specification of CBR;  
 Diameter of mould: 150mm  
 Height of mould: 175mm  
 Height of CBR soil specimen: 125mm

Formula:

CBR- (Test load)/(Standard load)\*100

The following table thus provides the value of the CBR taken on the black cotton soil with us use of geotextile in one and in two layer that has been carried out at different depth.

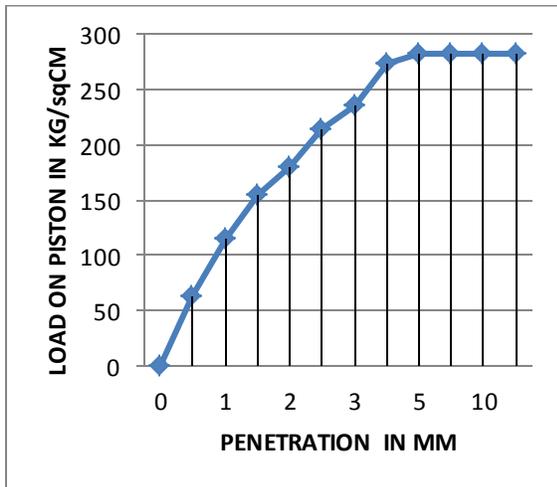
Table no.2

Geotextile position in cm from depth	Layer	CBR values in %
Only soil	-	6.8
4.37 cm from bottom	One	35.6
5.83 cm from bottom	One	17.1
8.75 and 12.55 cm from bottom	two	36.1
13.12 and 3.8 cm above ¼ <sup>th</sup> From bottom	two	31.3

GRAPHS FOR CBR TEST

TABLE NO.3

PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	62
1	115
1.50	155
2.0	180
2.50	214
3.0	235
4.0	274
5.0	282
7.50	282
10.0	282
12.50	282



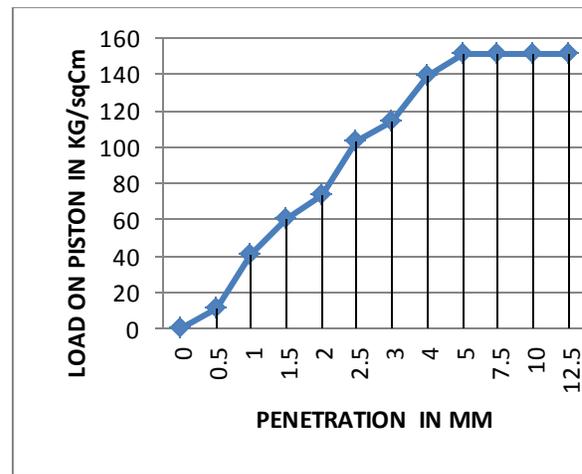
Graph for one layer at 0.25

The above graph represents that when one layer of geotextile used in soil at the depth of 0.25 provides gradual increase in the load on piston upto 4 cm after which the laod on piston is seen to be uniform at 282 kg/cm<sup>2</sup>

TABLE NO.4

PENETRATION	LOAD ON PISTON IN KG
-------------	----------------------

INMM	PER CMsq
0	0
0.50	11
1	41
1.50	60
2.0	74
2.50	103
3.0	114
4.0	139
5.0	151
7.50	151
10.0	151
12.50	151

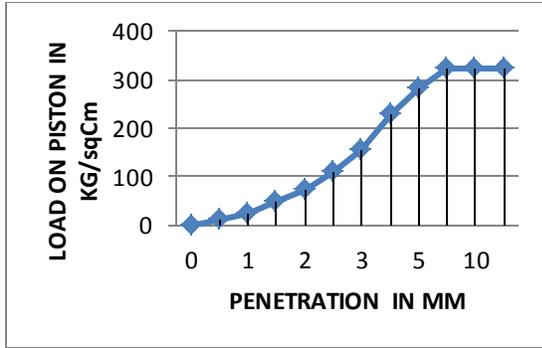


Graph for one layer depth 0.33

The above graph represents that when one layer of geotextile used in soil at the depth of 0.33 provides gradual increase in the load on piston upto 5 cm after which the laod on piston is seen to be uniform at 151 kg/cm<sup>2</sup>

TABLE NO.5

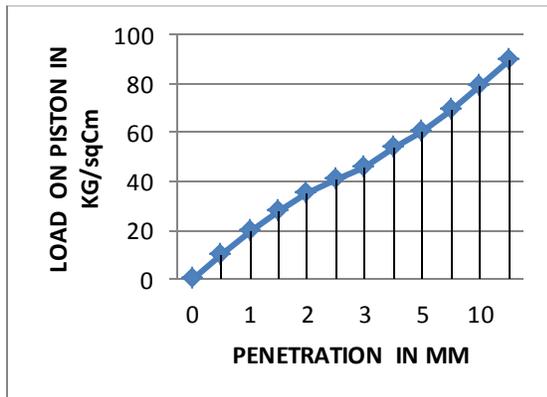
PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	12
1	25
1.50	48
2.0	74
2.50	102
3.0	154
4.0	230
5.0	282
7.50	323
10.0	323
12.50	323



Graph for 2 layer 0.75+ 3.8

TABLE NO.6

PENETRATION INMM	LOAD ON PISTON IN KG PER CMsq
0	0
0.50	10
1	20
1.50	28
2.0	35
2.50	41
3.0	46
4.0	54
5.0	60
7.50	69
10.0	79
12.50	90



Graph for pure soil

The above graph represents that when geotextile absent in soil the load of the piston is supposed to be gradually increasing ranging from 0 to 90 kg/cm<sup>2</sup>

#### IV CONCLUSION

The graphs provided give the clear idea of the behaviour of geotextile material with respect to depth of the soil. However the piston load of 323

kg/cm<sup>2</sup> and The CBR values of 36.1 % was found maximum at the depth of 8.75 and 12.55cm from bottom when two layer of geotextile were used respectively. The series of test has thus proved that as the depth of the geotextile increases the strength of the soil increases up to a certain limit after which it remains constant.

#### REFERENCES

- [1] Prof. Mayura M.Yeole, Geotextile Can Be worth Their Cost in Pavement, *IOSR Journal of engineering (IOSRJEN)*.
- [2] IS2720(PART16)-1987,CBR Test Manual, Page No.-1-6.
- [3] ZORNBERG,JORGE G."Advance in the use of geosynthetic in pavement design."Geosynthetics INDIA 11,23-24 September 2007,IIT Madras Chennai.
- [4] Shubham chaudhare, improvement of CBR for clayey sand sub grade using woven geotextile,INDIA geotechnical conference IIT madras Chennai India, 15-17 December 2017.
- [5] S. A. Naeini and M. Mirzakanlari "The Effect of Geotextile and Grading on the Bearing Ratio of Granular Soils" *EJGE Volume 13*
- [6] Gomaa K. M. Moussa Transportation Dept., Faculty of Eng., Alexandria University, Alexandria, Egypt "The optimum location of geotextile reinforcement In asphalt layers" *Alexandria Engineering Journal, Vol. 42 (2003), No. 1, 103-110*
- [7] Gregory S. Cleveland Bituminous Engineer Texas Department of Transportation "Geosynthetics in flexible and rigid pavement Overlay systems to reduce reflection Cracking" October 2002 Texas Transportation Institute.
- [8] Guidelines for 1993 AASHTO pavement design. Revised – May 2003.
- [9] S. S. Bhosale; Bharat R. Kambale "Laboratory Study for Evaluation of Membrane Effect of Geotextile in Unpaved Road" The 12th International Conference of International Association for Computer Methods and Advances in Geomechanics (IACMAG) 1-6 .
- [10] Fannin, R.J., O. Sigurdsson (1996) "Field observations on stabilization of unpaved roads with geosynthetics" *ASCE Journal of Geotechnical Engineering* 122 (7), 544–553.