

# Utilization of Geo Grids In The Stabilization Progression of Black Cotton Soil

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## Abstract

The performance of the soil within the styles depends upon the characteristics of soil. So, the testing of soil with relevance to determination of its physical properties, and also the analysis of affects of alternative factors like discharge conditions etc., forms the foremost essential part of the event of soil engineering. It is through analysis solely that style and construction ways are changed to offer most safety or economy, and new ways are evolved. The information of theoretical soil mechanics presumptuous the soil to be perfect elastic identical and uniform materials helps in predicting the behavior of the soil within the field. So, this project involves within the soil stabilize parameters of black cotton soil by victimization the geo artificial material referred to as geo grid of woven and non-woven geo textile materials that is employed to strengthen the soil in many conditions. The check involves in substitution the soil in CBR testing mould with four styles of ratios like 1/2, 1/3, 2/3, (1/3 and 2/3)<sup>rd</sup> of the equipment conditions so as to search out the CBR % values of woven and non-woven geo textile and compare their results.

**Keywords:** Geo synthetics, Geo grids, Geo textiles, woven and Non-woven materials, Stabilization

## I. INTRODUCTION

Currently daily the erosion conditions are common because of the loose snap index among the assorted classes of soils. And so, the enhancement of black cotton soil parameters by victimization the artificial material referred to as Geo grid is seen during this paper. A geo grid may be a geo artificial material accustomed reinforces soils and similar materials. Geo grids are usually adapted for reinforce retentive walls, likewise as sub bases or sub soils below roads or structures. Compared to soil, geo grids are robust in tension. This certain typermits them to

transfer forces to a biggerspace of soil than would well be the case. Geo-grids are generally manufactured from compound materials, like polyester, synthetic resin or polypropene. They'll be woven or unwoven from yarns, heat-welded from strips of fabric or created by punching a daily pattern of holes in sheets of fabric, then stretched into a grid.

## A. APPLICATIONS AND BENEFITS OF GEO-GRID:

Geo grids methods are reliable and value effective solutions, simple and fast construction, longer operational life and lower maintenance value in various space of application. A geogrid is extremely strong in tension (and therefore classified by tensile strength). While soil will typically pull apart under tension, the use of a geogrid will allow forces to transfer throughout a much larger area than would otherwise be the case. A number of applications used in the field of Sub surface emptying, Pavement and rail track separation, underneath pavement, geo membrane protection system in lowland, steep slope surface, mound over soft soils, lining system support, lake closures. It's necessary to place in correct prospective and if then the savings in prices achieved and also the extra edges are mostly accountable for use of those materials in follow.

## B. PROPERTIES OF MATERIALS:

**Material used:** Bi-axial Geo- grid (woven and Non-woven material)



The various index tests like sieve analysis, liquid limit, plastic limit, moisture content, specific gravity, compaction factor, UCC strength and CBR value for natural black cotton soil were conducted to find the physical index properties in an appropriate manner.

**II. TEST RESULTS**

**A. INDEX PROPERTY TEST RESULTS ON NATURAL BLACK COTTON SOIL:**

**LIQUID LIMIT:**

The liquid limit is the moisture content at which the groove, formed by a standard tool into the sample of soil taken in the standard cup, closes for 10 mm on being given 25 blows in a standard manner. This is the limiting moisture content at which the cohesive soil passes from liquid state to plastic state.

S.no	Weight of dry soil (gm)	Quantity of water added (ml)	Percentage of water added (%)	No of blows
1	100	24	24	55
2	100	25	25	35
3	100	26	26	23
4	100	27	27	18
5	100	28	28	15
6	100	29	29	12

Table-1.1

The liquid limit value for the black cotton soil is 26.5 %

**PLASTIC LIMIT:**

The soil moisture content at which any increase in the moisture content will cause a semi-solid soil to become plastic. The limit is defined as the moisture content at which a thread of soil just crumbles when it is carefully rolled out to a diameter of 1/8 inch.

Empty weight of the container (w <sub>1</sub> ) gm	Weight of the container + wet soil (w <sub>2</sub> ) gm	Weight of the container +dry soil (w <sub>3</sub> ) Gm	Plastic limit $(W_2 - W_3) / (W_2 - W_1) * 100$
83	108	106	8.6%

The Plastic Limit for the black cotton soil sample is 8.6%

**MOISTURE CONTENT:**

The soil moisture content of soil is the quantity of water it contains. Water content is used in a wide range of scientific and technical areas and is expressed as a ratio, which can range from 0 (completely dry) to the value of the materials' porosity at saturation.

Empty weight of the container (w <sub>1</sub> ) gm	Weight of the wet soil (w <sub>2</sub> ) gm	Weight of the dry soil (w <sub>3</sub> ) Gm	$(W_2 - W_3) / (W_2) * 100$
97	20	16	20%

Table-1.3

Thus, the moisture content for the soil sample is 20% and from the proctor compaction test the maximum dry unit weight of the clay soil = 1.67 gm/cc

**TABLATIONS OF CBR TEST RESULTS FOR WOVEN GEO GRID:**

MIX RATIOS		0	1/3 WOVEN	1/2 WOVEN	2/3 WOVEN	1/3 AND 2/3 WOVEN
S.NO	PENETRATION (mm)	LOAD (N)	LOAD (N)	LOAD (N)	LOAD (N)	LOAD (N)
1	0	0	0	0	0	0
2	0.5	0.1096	0.1781	0	0.2192	0.438
3	1	0.1644	0.2466	0	0.3014	0.63
4	1.5	0.2192	0.3288	0.1906	0.4795	0.822
5	2	0.2740	0.3866	0.3014	0.685	1.041

6	2.5	0.3288	0.4384	0.5617	0.9864	1.233
7	3	0.3562	0.4932	0.8494	1.1371	1.452
8	3.5	0.3836	0.548	1.0686	1.3289	1.698
9	4	0.4110	0.5754	1.2741	1.5344	1.863
10	4.5	0.4110	0.6302	1.4522	1.7125	2.082
11	5	0.4384	0.6576	1.5618	1.8769	2.246

GRAPH COMPARISON OF CBR TEST RESULTS FOR WOVEN GEO GRID:

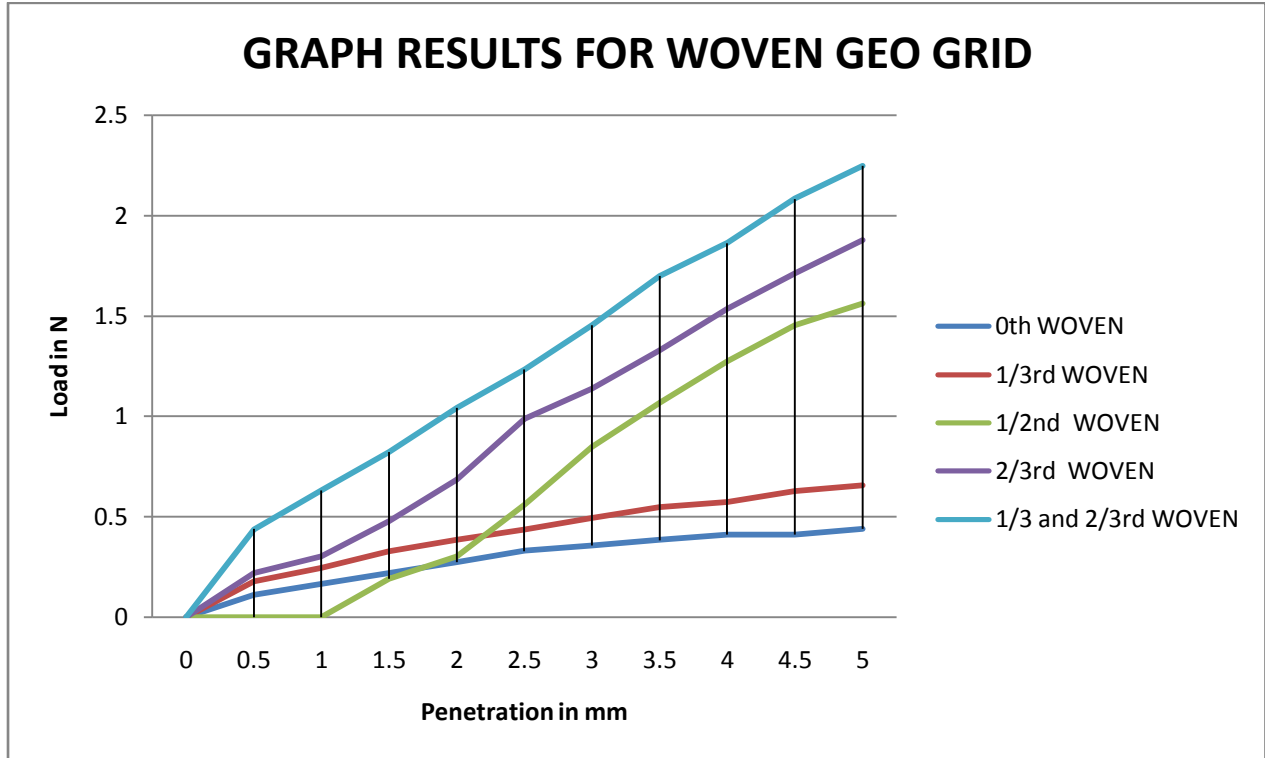


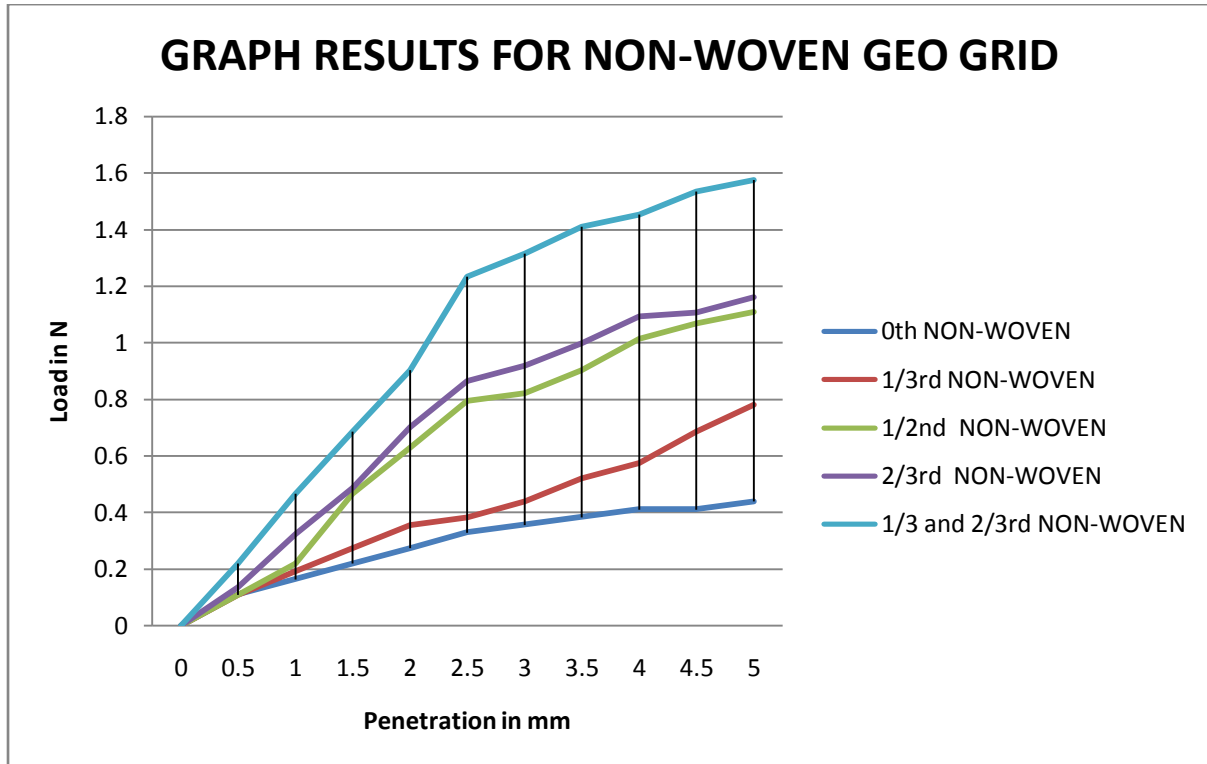
Figure 1.1

TABULATION OF CBR TEST RESULTS FOR NON-WOVEN GEO GRID:

MIX RATIOS		0	1/3 NON-WOVEN	1/2 NON-WOVEN	2/3 NON-WOVEN	1/3 AND 2/3 NON-WOVEN
S.NO	PENETRATION (mm)	LOAD (N)	LOAD (N)	LOAD (N)	LOAD (N)	LOAD (N)
1	0	0	0	0	0	0
2	0.5	0.1096	0.1096	0.1096	0.135	0.2192
3	1	0.1644	0.1918	0.2192	0.324	0.4658
4	1.5	0.2192	0.274	0.4658	0.486	0.685
5	2	0.2740	0.3562	0.6302	0.702	0.9042
6	2.5	0.3288	0.3836	0.7946	0.864	1.233
7	3	0.3562	0.4384	0.822	0.918	1.3152
8	3.5	0.3836	0.5206	0.9042	0.999	1.4111
9	4	0.4110	0.5754	1.0138	1.093	1.4522
10	4.5	0.4110	0.685	1.0686	1.107	1.5344
11	5	0.4384	0.7809	1.1097	1.161	1.5755

Table 1.5

**GRAPH COMPARISON OF CBR TEST RESULTS FOR NON-WOVEN GEO GRIDS:**



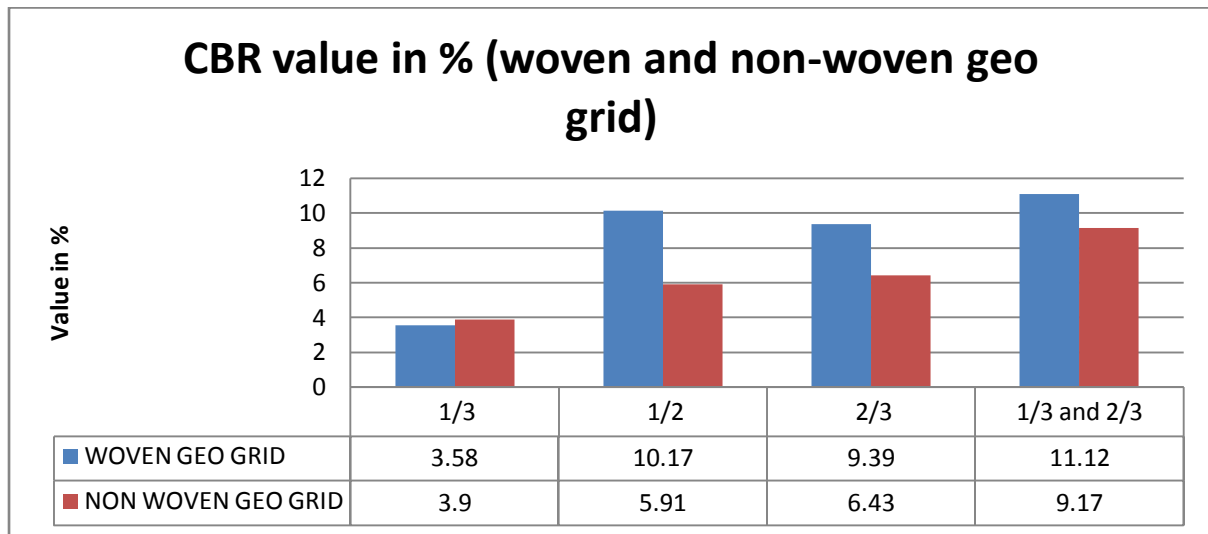
The graph is drawn between Penetration on the x-axis and Load on the y-axis. The point corresponding to 2.5 mm and 5 mm penetration are noted and the CBR value is calculated.

**COMPARISONS OF CBR VALUE IN %:**

TYPE OF SOIL	MATERIAL USED	POSITION OF GEOTEXTILE	CBR VALUE %
CLAY SAMPLE	NATURAL SOIL	0	2.49
	WOVEN GEOTEXTILE	1/3 <sup>rd</sup>	3.58
		1/2 <sup>nd</sup>	10.17
		2/3 <sup>rd</sup>	9.39
		1/3 <sup>rd</sup> and 2/3 <sup>rd</sup>	11.12
	NON-WOVEN GEOTEXTILE	1/3 <sup>rd</sup>	3.90
		1/2 <sup>nd</sup>	5.91
		2/3 <sup>rd</sup>	6.43
		1/3 <sup>rd</sup> and 2/3 <sup>rd</sup>	9.17

Table 1.6

GRAPH COMPARISON OF WOVEN AND NON-WOVEN GEO-GRID CBR VALUE IN %:



**Conclusion**

Natural black cotton soil is tested for its index properties. CBR test is conducted to search out its strength parameters. Two styles of Geo grids were used. The Geo grid is supplemented to the soil sample in a fraction of one-third, middle, two-third and both one-third & two-third position. The strength is found to be inflated from 2.49% to 11.12% by accumulating the Woven Geo grids and from 2.49% to 9.17% by adding the Non-Woven Geo grids. The extreme CBR value achieves at the (1/3 and 2/3)<sup>rd</sup> position. Woven Geo grid indicates better enhancement in strength than Non-woven Geo grid.

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