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Effects of Polyester Geo – Textiles On CBR Of Road Sub Base

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Abstract
Polyester Geo - textiles have been successfully used for reinforcement of soil to improve bearing capacity. In this paper the Polyester Geo - textiles as a tensile materials have been used for reinforcement of different kind of soils. Laboratory California bearing ratio (CBR) tests were performed to investigate the load – penetration behavior of different 3 kinds of soils (B. C. Soil, Murum & both soil) with Polyester Geo – textiles. Samples of soil tested for CBR without reinforcement & samples are also tested with Polyester Geo – textiles. Laid at various distance from top (i.e 1/3, 2/3 & half distance) of compacted thickness of soil suitability for improvement of sub –grade in all aspect is calculated. Result shows that soil sample murum with Polyester Geo – textiles laid at $1/3^{rd}$ distance from top are most economical & increases the CBR to considerable extent.

Key Words: Polyester Geo – Textiles, Soil Murum, Mixed Soil, Reinforced Soils, CBR Tests.

Introduction

The use of Geo – textile in many engineering applications has become more apparent and has proven to be an effective means of soil improvement. Polyester Geo – textiles have also used in many civil – engineering works like air port, road works, flyovers, drainage works etc. The results showed that Polyester Geo - textiles layer placed between sub base & sub grade can significantly improves the bearing capacity of sub grade soil. Experiments for improvement of CBR & reduction of thickness of sub grades are made Different kinds of soils have different CBR values. If it is reinforced with Polyester Geo textile it increases the CBR value. Further investigations are made for economical improvement of CBR value of sub grade soil. To have comprehensive economically feasible results one should under go a experiments like kind of soil Polyester type at what distance Geo textiles should be laid gives improved CBR values with economically is tried to find out in this paper. Comparative investigation has stated that mostly black cotton soil prone areas are feasible to use of Geo – textiles. Geo textiles are more efficient as compared to use of conventional technique for BC soil.

A) Details of Material used :

01. Black cotton soil
02. Murum
03. Mix soil (50 % B. C. Soil and 50% Murum)
04. Polyester Geo - textile

B) Properties of Material :

Table 1, Properties of material found in laboratory tests

Sr. No	Material	Dry Weight in gms	Normal Weight in gms	Persant-age of W.C.	MDD g/cm ^{3}	OMC %	Liquid limit	Plastic Index
1	Black cotton soil	920	1000	8.69	1.652	17.13	60.52	20.60
2	Murum	960	1000	4.16	1.924	10.19	Non Plastic	Non Plastic
3	Mix soil (50 % B. C. Soil & 50% Murum)	945	1000	5.82	1.813	14.17	-	-
4	Polyester Geo - textile	23	30	30.43	-	-	-	-

C) Details of Experimental Studies :

Table 2, CBR of Soil samples without Polyester Geo – textile reinforcement

Sr. No.	Material	CBR (%)
1	Black cotton soil	1.75
2	Murum	16.07
3	Mix soil (50 % B. C. Soil and 50% Murum)	4.30

Table 3, CBR of Soil samples with Polyester Geo – Textile reinforcement

Sr. No.	Material	CBR of Soil samples after laying Polyester Geo – textile at different distance from top		
		1/3rd distance	½ distance	2/3rd distance
1	Black cotton soil	4.30	3.02	2.07
2	Murum	21.16	19.89	17.34
3	Mix soil (50 % B. C. Soil and 50% Murum)	6.64	5.89	5.09

Series of CBR tests are carried out to find out best suitable combination.

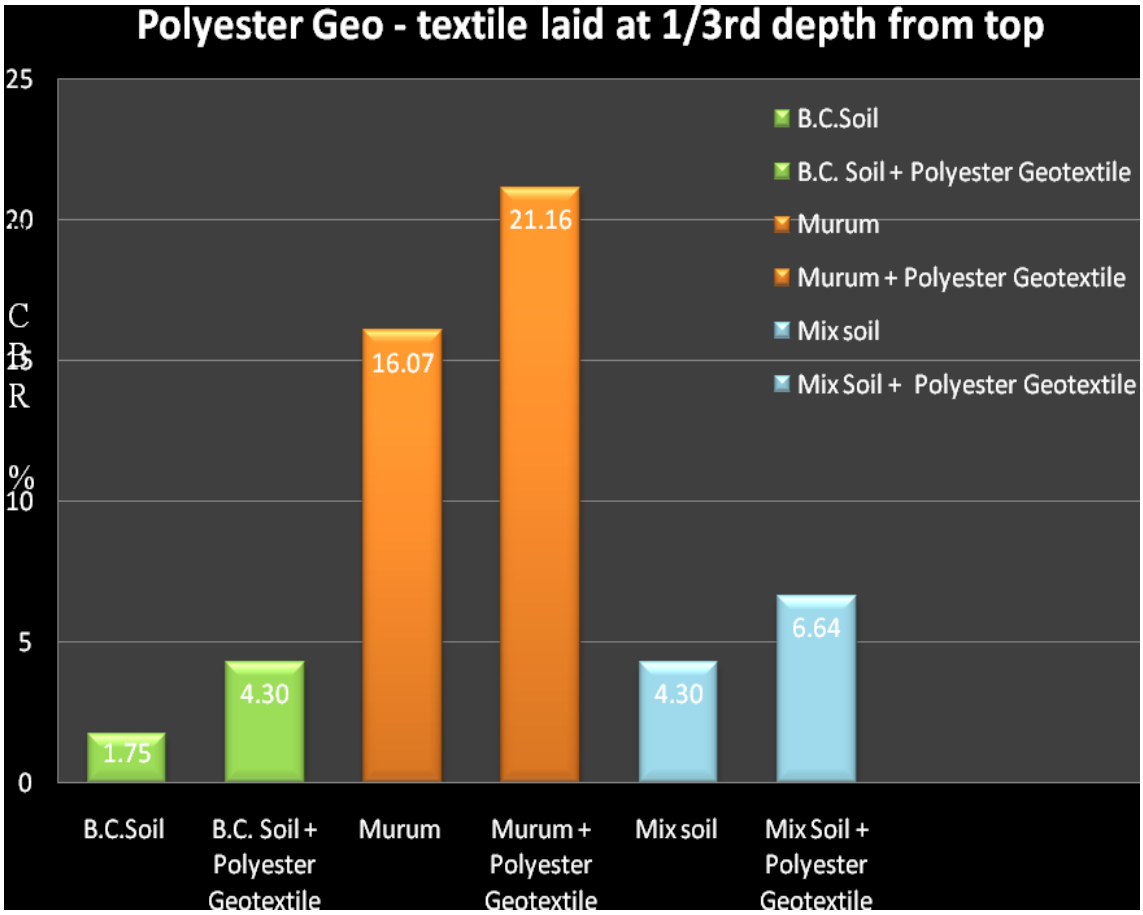

Figure 1, CBR of soil samples before and after polyester geo-textile laying

CBR Test Procedure

The soil was placed in three layers at the mould. Each of layers was compacted by 56 blows of a rammer dropped from a distance of 304 mm. In the test thickness was 40 mm. A woven Polyester Geo textile sheet was used at the interface as reinforcement. Then it is soaked for 96 hours and tested in CBR test apparatus in laboratory, reading are recorded and CBR is calculated. This CBR is expressed in percentage.

Result and Discussion

The experimental moisture content of soil and the dry density of soil and the results achieved during determined samples for the CBR were compacted. After, the CBR test, the CBR values were obtained by compacting penetration one of the best combination suggested is Black Cotton soil + Polyester Geo – textile. Different soils with Polyesters Geo – textile at different height are tested and results are obtained. The graphical representations of original CBR values and increased CBR values after reinforcement of Polyester Geo – textile shows the more economical & suitable combination for strengthening of sub grade. The Polyester Geo textile laid at 1/3rd distance from top gives best results and allowed to reduce the thickness of sub grade.

Similarly murum soil with Polyester Geo – textile sample also gives best results. The site where murum is available, Polyester placed at 1/3rd distance from top increases CBR value of sub grade and altimetry strengthens the sub grade for experiments, a site near Aurangabad is selected, murum samples are collected CBR for murum is 16.07 %. And when same is tested by reinforcing Polyester Geo – textile at 1/3rd distance from top increase CBR value up to 21.16 % thus here CBR value increases 1.31 times than old one. The economically and best combination suggested is that Black Cotton soil and Polyester Geo – textile. The B. C. soil available at site whose CBR is tested is 1.75 % it increased to 4.30 % that means 2.45 times and if sub grade is made up of mix soil and Polyester Geo - textile is laid at 1/3rd distance from top of sub grade gives CBR 6.64 % which is in result increase CBR up to 1.54 times. This also suggests decreasing the thickness of sub grade.

Conclusion

A series of CBR test was under taken to investigate the effect of Polyester – Geo textiles on various soil samples, the major inclusion from this study are summarized as fallows.

1. The inclusion of reinforcing Polyester Geo - textile materials in soils improves strength of sub grade soils. It implies that Polyester Geo - textiles reinforced soils in roads will perform better than un-reinforced ones and increases load carrying capacity of soils.
2. The improvement of soil strength of CBR with Polyester Geo - textile material depends upon type of Polyester Geo – textiles used and its placing distance from top layer. The effect is significant for soils having no more fine percent.
3. The introduction of Polyester – Geo textile reinforcement in soil leads to decrease surface penetration & deformation.
4. In the uniform deposit of murum type soil, introduction of a single layer of Polyester Geo - textile reinforcement from top $1/3^{rd}$ distance of sub grade soil, increases significantly CBR values and soil strength.
5. Polyester Geo - textiles having less opening area and having high tensile strength can improve CBR of soil.

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