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STUDY ON REINFORCEMENT EFFECT AND PERMEABILITY CHARACTERISTICS OF GEOTEXTILE ON C- ϕ SOIL

Revathi U G[1], Sheik Mohamed Hasan Ali A K[2], Siva Shanmugan R[3], Suba Lakshmi R[4], Moganraj M[5]

[1,2,3,4]*Students, Department of civil enginnering, SRM Valliammai Engineering College, Chengalpattu, Tamilnadu*
[5] *Assistant professor, Department of civil engineering, SRM Valliammai Engineering College, Chengalpattu, Tamilnadu*

Abstract – *Tremendous growth rate of population will reduce the good land for construction and it enforced the engineers to improve the capacity of soil by means of reinforcement. Geotextile is a good material acts as an alternative economical soil reinforcement. This project is to study the reinforcement effect and permeability characteristics of geotextile on c-ϕ soil. This journal presents the comparison results of Permeability test, Direct Shear test, CBR test conducted on c-ϕ soil samples with and without geotextile at variable heights. Non-woven typed geotextiles are used for this study. The strength of soil depends upon the type of geotextile, height of placing of geotextile and number of layers in soil. Model making is done with the help of c-ϕ soil and non-woven geotextile fabrics under the conditions of above mentioned test results. The result of this study are presented in the form of comparison table and graphical form.*

Key Words: Reinforcement, Geotextile, Non-woven fabrics, C- ϕ soil, Permeabilty, Shear, CBR, Compaction

1. INTRODUCTION

Nowadays various alternatives are accessible to increase the behavior of poor soil. Geotextiles are widely used sheet materials for reinforcement and there are wide verities of geotextiles available in the market based on the manufacturing methods. Geotextiles are very frequently used in various environmental and civil engineering projects because geotextiles are environmental friendly and cost effective.

Reinforcement and soil together are treated as composite material. This study is to find the behavior of reinforced soil and the unreinforced soil under various test conditions. Similarly, the permeability characteristics are also studied to find the behavior of reinforced and unreinforced soil.

2. NEED FOR STUDY

Road construction without geotextile may cause the soil erosion during wind season and rainy season. Soil with less bearing capacity will also leads to serious problems. To overcome these problems this experimental study is held. Some important need for this study is to

1) Reinforcing the soil by using geotextile
2) To decrease the process of wind and water erosion of soil by using geotextile
3) To prevent the erosion of soil and to allow water to drain off simultaneously
4) To improve and stabilize the strength of soil

3. SCOPE

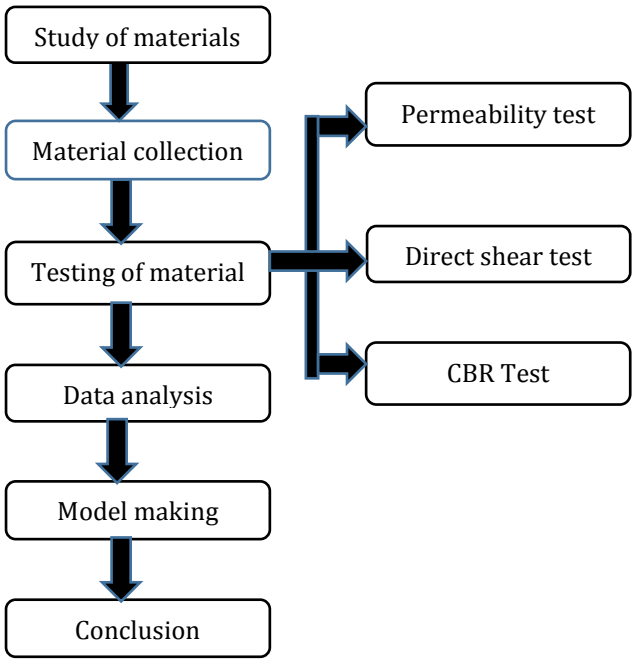
1) The main applications are erosion control, soil filtration, road sub-base separators, reinforcing soils in embankments and retaining walls, and protection of geo-membrane
2) Geotextiles are large sheets that save soil in rainy days and binds strongly
3) It is widely used for separation and filtration in the road constructions
4) It protects from the removal and migration of small aggregate and gravels

4. OBJECTIVE

The main objective of this study are mentioned as follows

1) To find out the reinforcement effect of geotextile on c-ϕ soil
2) To find out the permeability characteristics of geotextile on c-ϕ soil
3) To improve the tensile strength of the soil

4. METHODOLOGY



5. METERIAL COLLECTION

Fig.5.1 Non woven geotextile

Fig.5.2 C- ϕ soil

6. TEST RESULTS

6.1 Determination of percentage of Finess Passing Through

Table 6.1 Percentage of fines passing through

Testing condition	Soil sample taken (g)	Passing through sieve (g)	% of passing (g)
Without geotetile	250	157	62.8
With geotextile	250	57	22.8

6.2 Permeability Test

Table 6.2.1 Permeability with various conditions

S.no	List of Experiments	k_t (cm/s)
1	Without geotextile	0.0015
2	C-Φ soil under full coverage of geotextile	0.0016
3	Geotextile at the ¼th height of permeameter	0.0015
4	Geotextile at the ½th height of permeameter	0.0010
5	Geotextile at the ¾th height of permeameter	0.0005

6.3 Direct Shear Test

Table 6.3.1 Direct shear test with various conditions

Normal stress kg/cm²	Shear stress kg/cm²	
	Without geotextile	With geotextile
0.5	0.49	0.68
1	0.83	0.98
1.5	1.18	1.35

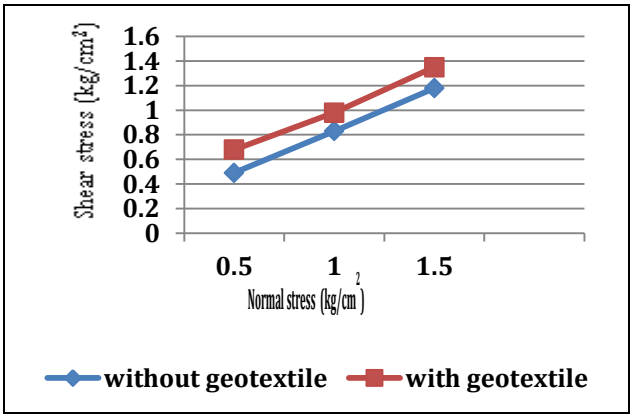


Chart 6.3.1 Graphical comparison of direct shear test

6.4 Proctor Compaction Test

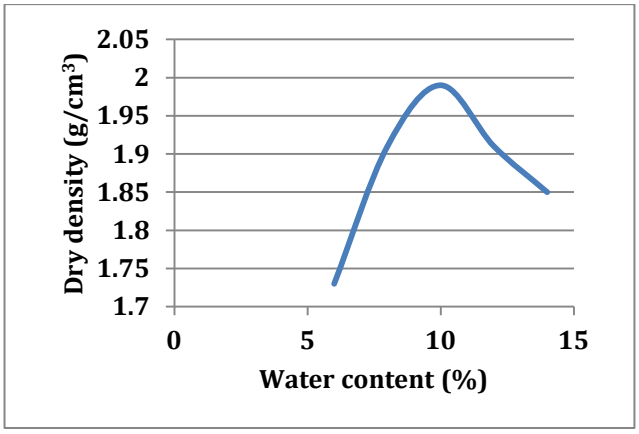


Chart 6.4.1 Graphical representation of proctor compaction test

From this graph, the optimum moisture content for the c-ϕ soil is 10%.

6.5 California Bearing Ratio Test

6.5.1 CBR test without geotextile

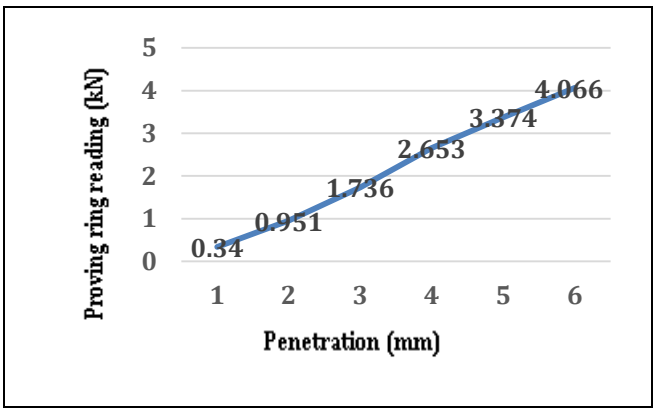


Chart 6.5.1.1 Graphical representation of CBR test without geotextile

6.5.2 CBR with geotextile at the height of h/3 from bottom

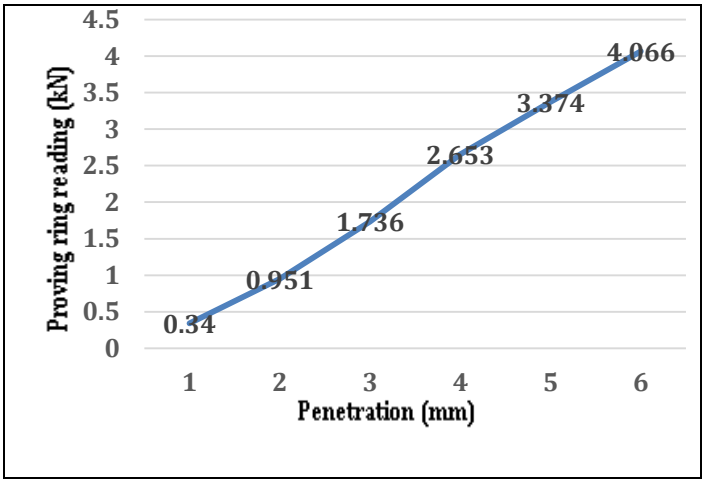


Chart 6.5.2.1 Graphical representation of CBR test with geotextile at h/3 from bottom

6.5.3 CBR with geotextile at the height of h/3 from top

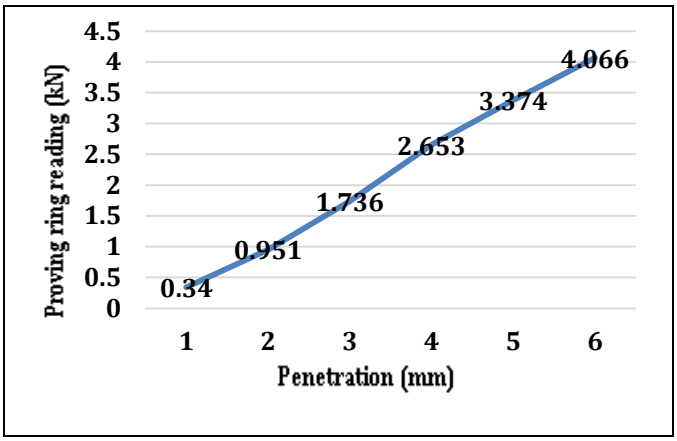
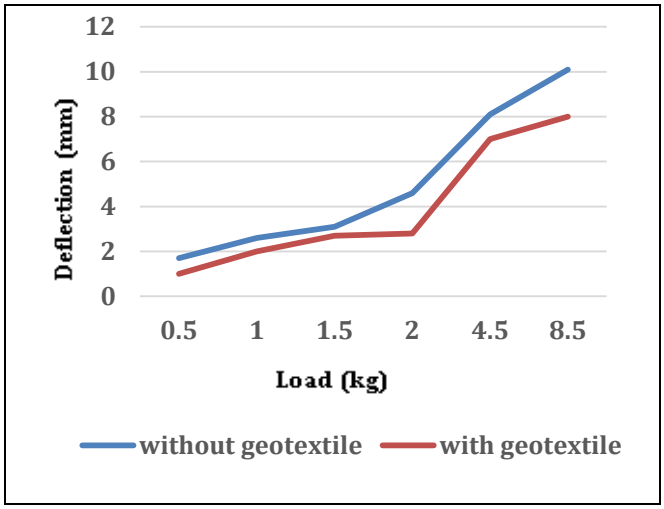


Chart 6.5.3.1 Graphical representation of CBR test with geotextile at h/3 from top

7. MODEL MAKING

The model making is prepared in a mould dimension of (49 x 37 x 39) cm. The bed layer is provided and compacted for 5cm. The bed layer is provided and compacted for 5cm. Similarly, the same procedure is repeated for the condition with geotextile and it is placed at the height of h/3 from top and the soil is compacted well. The model is provided with the steeper slope and the slope is maintained until it reaches its upper level. Similarly the load is given to the setup and deflections are noted by using magnetic gauge and failures are noted. In this without the layer geotextile, the soil gets fail and are developed to further layer of soil. But in this setup with geotextile, the soil gets fail only before the layer of

geotextile. The geotextile will helps us to prevent the further failure of soil on other layers.



8. CONCLUSION

This project mainly interprets the Study of reinforcement effect and permeability characteristics of geotextile. This project consist of Permeability Test, Direct Shear Test, CBR Test. By using geotextile we can increase the strength and stiffness of the weak soil. This study helps to know the behavior of soil under various loading and environmental conditions. The behavior of soil is analyzed based on the above mentioned experimental soil tests. By using geotextile as a reinforcement we can improve soil stability, permeability characteristics, strength as well as the reinforcement effect in road construction and in hilly slopes. This project reveals the presence of **geotextile at the height of h/3 from top of c-ϕ soil will have higher permeability, higher reinforcement effect and excessive strength.**

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BIOGRAPHIES

REVATHI U G
Student, B.E. Department of Civil Engineering, SRM Valliammai Engineering college, Chennai.

SHEIK MOHAMED HASAN ALI A K
Student, B.E. Department of Civil Engineering, SRM Valliammai Engineering college, Chennai.

SIVA SHANMUGAN R
Student, B.E. Department of Civil Engineering, SRM Valliammai Engineering college, Chennai.

SUBA LAKSHMI R
Student, B.E. Department of Civil Engineering, SRM Valliammai Engineering college, Chennai.

Mr. M. MOGANRAJ, M.E.,
Assistant professor(O.G),
Department of civil engineering,
SRM valliammai engineering college, Chennai.