

GEO-SYNTHETICS IN PAVEMENT DESIGN

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Abstract :- Geo-synthetics are an established family of geo natural use in wide variety of civil engineering applications many polymers (plastics), polyolefin and polyester rubber, fiber glass, and natural materials are sometimes used. Geo-synthetics may be used to function as a separator, filter, planner drain, reinforcement, protection and or as a liquid and gas barrier the various type of Geo-synthetic.

Keywords: Geo-synthetics material like Geo-nets, Road Pavement, Strength, life of Pavement, improve stabilization of pavement.

1. INTRODUCTION

Geo-synthetics are synthetic products and polymeric products used to solve civil engineering problems. The different synthetic products are: Geotextiles, Geo-grids, Geo-nets, Geo-synthetic clay liners, Geo-membrane, Geo-foam, And Geo-composites. Geo-synthetic reinforcement is possible in improving the engineering characteristics of the pavement material as well as layer.

It is improves the pavement service life, provide the strength protects from frequent damage and decrease the frequent maintance. Geo-synthetic's with reinforcement function can play a vital role as they not only improve the load bearing capacity but at the same time reduce deformation.

The soil geo-synthetics-aggregate provide some benefits such as the reduction of shear stress on the sub grade layer , reduction of permanent lateral displacement of granular material increasing of stiffness and confinement of base material.

Synthetic material in form of strong flexible sheets, permeable or water tight are in is to improve soil

Quality and better performance in geotechnical engineering .geotextile are also known as filter fabrics, road rugs and geo-synthetics. Some geotextiles are made of Biodegradable material such as mulch matting and netting.

Geotextile are permeable fabrics which, when use in association with soil, have the ability to separate, filter, reinforce protect or drain. Typically made from polypropylene or polyester.

2 Why used geotextile in road construction

- The presence of soft/loose soil at ground level
- Loose soil demand higher thickness of granular materials resulting high cost of construction
- Alternatively attempts of rousingly thickness of pavement layer to make an economic construction
- If CBR is less then to we can apply geotextile for reinforcement
- Restore the natural landscape and reserve sustainability
- The presence black cotton soil at ground level then used to geosynthetics material
- To maintain the ground stabilization in rainy season i.e. prevent the road pavement for a deformation, embankment control
- Presentation of intermixing of two layers of dissimilar materials.
- Prevents pumping of soil into base/sub base course.

3. METHODOLOGY

1. Surface preparation
2. Laying of geotextiles
3. Base course preparation
4. Surface course preparation

Clear and grade the installation area. Remove all sharp objects and large stones. Cut trees and shrubs flush with the subgrade. Removal of top soil AND vegetation mat is not necessary, but is recommended where practical.

Excessively soft spots or voids may be unsuitable for a geo-synthetic installation.

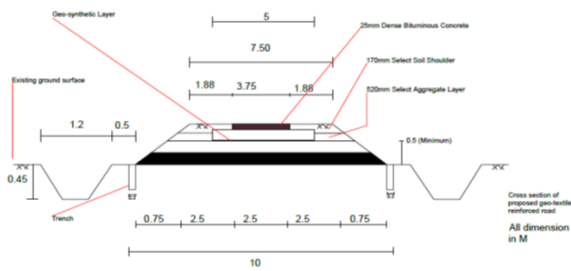


Fig no.1. Installation of Geo-textile.

Fill this area with select material and compact prior to geo-synthetic installation. The problem area may be enhanced by using a geo-synthetic the bottom of the excavation prior to backfilling.

It is the structure of flexible pavement, in such type of road, first of all, water bound macadam surface is prepared then subgrade layer are properly placed and compacted .Then sub base layer are prepared and compact with the help roller .

The paving fabric is placed onto the tack coat with its fuzzy side leaving the smooth side up using a manual or mechanical lay-down equipment capable of providing smooth installation without wrinkling or folding. Today most paving fabric is applied using tractor-mounted rigs. Slight tension can be applied during paving fabric installation to minimize wrinkling. However, stretching is not recommended, because it will reduce the thickness, changing the bitumen retention properties of the fabric. Too little elongation may results in wrinkles. Too much elongation produce excessive stretch, thinning the geo-synthetic so that it may not be thick enough the bituminous concrete on a hot day. Wrinkles and overlaps can causes cracks in the new overlay if not properly handled during construction process.

Final compaction is achieved with vibratory compactor, first without vibration for several passes, then with full vibration. Any weak spots found during final compaction usually indicate inadequate aggregate thickness at those spots.

4. Results

CBR Value obtained using with water content 15% & 20% added.

In this test Geo-textile material placed at three difference layer 3/4L, 1/2L, 1/4L and one mold is without Geo-textile material. Then following results are getting.

Condition of Specimen	UCS Value	
	Water content (15%)	Water content (20%)
Without Geotextile	18.5	9.40
Geotextile at ¾ L	15.3	13.6
Geotextile at ½ L	37.5	16.5
Geotextile at ¼ L	42.3	18.4

Table no.1 CBR Test

CONCLUSION

Geo-textiles are cost effective way to insure better drainage & Stabilization of sub grades. Geo-textiles effectiveness depend upon the strength of the fabric and proper installation. Limits of applicability are defined by subgrade strength, aggregate characteristics, design requirements, and geo-synthetic characteristics. The geo-synthetic materials are commonly utilized in pavements for three dissimilar purposes, waterproofing, strain absorbing, and reinforcement.

REFERENCES

1. Zorn berg, J.G. (2011 Advances in the Use of “Geo-synthetic in Pavement Design”. 23-24 September 2011, IIT Madras, Chennai
2. Murad Al Qurishee “Application of Geo-synthetics in Pavement Design” volume 04 issue 07 July 2017
3. Jay Narendrabhai Panchal “Comparison of Advanced Geo-synthetic Road Pavement and Conventional (Asphalt/Bitumen) Road Pavement” Volume 4 Issue 8 August -2017
4. Mohamed Rehan Karim An overview on the “use of geo-synthetics in pavement structures” Iran e-issue 2395-0056
5. Dewey W. White “Geo-textiles to improve pavement” for general aviation airports Miscellaneous paper gl-91-3 (omb no 0704-0188) Feb-1991
6. Satish Naik Application of “geo-synthetics in road sector” 3rd Indian oil petrochemical conclave, 2014
7. Dan Warszawa, Mendota Using “Geo-synthetics Improve Road Performance” Vol no 04 issue 07 Feb2014
8. Van Zanten, R. V. (1986). “Geotextiles and Geomembranes” in Civil Engineering, A. A. Balkema Publ., Rotterdam, The

9. Netherlands, 685 pgs.
10. Van Santvoort, G. P. T. M., Translator (1995). "Geosynthetics in Civil Engineering", A. A. Balkema Publ., Rotterdam, the Netherlands, 105 pgs.
11. Jewell, R. A. (1996). Soil Reinforcement With Geotextiles, CIRIA Publishers, London, England, 332 pgs.
12. Holtz, R. D., Christopher, B. R. and Berg, R. R. (1997). "Geosynthetics Engineering", BiTech Publishers, Ltd., Richmond, B.C., Canada, 452 pgs.
13. Pilarczyk, K. W. (2000). "Geosynthetics and Geosystems in Hydraulic and Coastal Engineering", A. A. Balkema Publ., Rotterdam, The Netherlands, 913 pgs.
14. Rowe, R. K. (Ed.), (2001). "Geotechnical and Geoenvironmental Engineering Handbook", Kluwer Academic Publishers, Boston, US, 1088 pgs.