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# Analysis and Case Study of Geosynthetic Material in Road Construction

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**ABSTRACT:** Geotextiles, which is now an effective engineering technology, has acquired wide spread applications in pavement construction. Geotextiles are most widely used under paved and unpaved road-ways, and this is referred to as the application of separation / stabilization. In addition, geotextiles used in paved and unpaved roads provide many advantages: separation, stabilization, strengthening and filtration.

## I. INTRODUCTION

Geosynthetic are an established family of geomaterials used in a wide variety of civil engineering applications. Many polymers (plastics) common to everyday life are found in Geosynthetic. The most common are polyolefin and polyester; although rubber, fiberglass, and natural materials are sometimes used. Geosynthetic may be used to function as a separator, filter, planar drain, reinforcement, cushion/protection, and/or as a liquid and gas barrier. The various types of Geosynthetic available, along with their specific applications, are discussed in subsequent sections.

### Objectives-

1. To do a brief comparison and cost estimation of Geo-synthetics used road pavement and a normal road pavement.
2. For improving ground stabilization of road, runaways (for bearing vehicle loads).
3. To provide economy and sustainability to the roadpavement.

## II. METHODOLOGY

For this dissertation work it is proposed to carry out the work in the following phases.

**I:** Collection of information through literature review and or preliminary study on site.

**II:** Collection of data through questionnaires' devised in the same regards.

**III:** Finding over engineering in different projects by comparing data collected

**IV:** Develop a model to assess the over engineering (OE) in a construction project.

**V:** Validation of the model for selected case study

## III. LITERATURE REVIEW

### 1. USE OF GEOSYNTHETIC MATERIALS IN ROAD CONSTRUCTION(Aug 2020)

The author states that geotextiles, which is now an effective engineering technology, has acquired wide spread applications in pavement construction.

From the paper we understand Geosynthetics have been widely used to serve a variety of roles that greatly lead to roadways performing well. These provide isolation, filtration, stabilization, stiffing, drainage, barrier, and safety functions. Any or more of these different features is used in at least six major roadway applications.

A geocomposite is an engineered polymeric material in the form of manufactured sheets or bars, consisting of at least one geosynthetic portion used in applications for geotechnical environmental and transport engineering.

### 2. Effectiveness of using Geosynthetic Material for Improvement of Road Construction and Performance - Case Study on AdisAbab (Feb 2017)

The author states thatThe research is concerned with the Effectiveness of geosynthetic to improve performance of pavement. It has been done on road construction projects under Addis Ababa Road Authority.



From the paper we understand it is easy to develop that geosynthetic materials can improve the performance of road. Geomembrane, in this study reviewed, tended to perform better for bases, especially where subgrade strengths were below a CBR of 3 (MR of 30 MPa).

By reducing the undercut and thickness of base and subbase material, geomembranes can save initial construction cost of road also the life cycle cost by increasing the design life of the road.

**3. COMPARATIVE STUDY OF GEOSYNTHETICS USED AND UNUSED ROAD PAVEMENT AND CASE STUDY(May 2021)**

The author states that In the areas having soft strata, or low strength of subgrade and also in rainy season, numerous incidents like road sinking, flowing of the road pavement, potholes occur every year. These scenarios happen because of the less or no drainage provided, no reinforcement to the subgrade and lack of clear separation between various layers of road pavement.

From the paper we understand to overcome these situations, we must provide a proper drainage mechanism, reinforcement and the separation to the road pavement.

A Geo-synthetic material consists of synthetic fibres and are composed of yarns. These yarns are made up of polypropylene or polyester resins.

**4. Application of Geosynthetics in Pavement Design (July 2017)**

The author states that geosynthetics have been widely used in recent thirty years for separation, reinforcement, filtration, drainage, and containment functions of the pavement design.

From the paper we understand Geosynthetics with reinforcement function can play a vital role as they not only improve the load bearing capacity but at the same time reduce deformation.

Acceptable design guidelines for designing geosynthetic reinforced pavements.

**5. TOMORROW WITH GEOSYNTHETICS: A COST EFFECTIVE BUILDING CONSTRUCTION MATERIAL (Nov 2016)**

The author states that over the last three decades geosynthetics are being increasingly used in civil engineering applications like road construction, high embankments, retaining structures and erosion control.

From the paper we understand geosynthetics are relatively light and flexible; possess a high tensile strength, even extensible during application of loads.

It is demonstrated by using Geosynthetics in different applications of civil engineering (especially highway engineering) that Geosynthetics are well developed.

**6. Studies on geosynthetic-reinforced road pavement structures (Aug 2016)**

The author states that many of the pavement structures fail well before their design life owing to the poor quality of construction materials, inadequate compaction, inadequate preparation of the subgrade, overloading, etc.

From the paper we understand the performance of the geocells as surface confinement layers and as reinforcement layers has been reported by several researchers in the past.

The performance of highway pavements is governed by the strength and stiffness of the pavement layers. The cost and duration of construction are dependent on the availability of aggregate materials for construction.

**IV. RESULT**

**Results of Sample Collected-**

Test No.	Liquid Limit Test Results					Plastic Limit Test Result		
	1	2	3	4	5	1	2	3
Number of blows	32	27	24	23	16			
Mass of wet soil sample+Container (gm)	30.54	34.65	35.80	28.88	34.87	18.75	20.35	25.37
Mass of dry soil sample +container (gm)	26.98	28.78	28.30	22.78	25.65	17.80	19.11	23.22
Mass of container (gm)	10.23	11.88	9.72	10.87	10.45	13.50	13.45	13.52



Water Content (%)	21.36	34.73	40.36	51.21	60.65	22.09	21.90	22.16
Summery of Results	Liquid Limit- 40					Plastic Limit- 22		

**Compaction Test**

Dosage	Standard Proctor compaction		Modified Proctor Compaction	
	MDD (g/cc)	OMC (g/cc)	MDD (g/cc)	OMC (%)
1	1.68	18	1.91	14
2	1.71	17.5	1.98	13
3	1.74	16.5	1.99	12.5
4	1.85	15	2.01	12
5	1.90	13.5	2.02	11

**CBR Test Result (California Bearing Ratio)-**

Geotextile Position in mm from top	CBR Test No.			Avg. CBR	% Increase n CBR
	1	2	3		
No geotextile	11.1	11.3	11.1	11.17	Nil
25	14.5	14	14.9	14.47	29.55
50	11.5	11.4	11.7	11.53	3.28
100	11.5	11.3	11.7	11.50	2.99
25 & 75	15.2	15.9	15.2	15.43	38.21
50 & 75	13.7	14	13.5	13.73	22.99
50 & 100	11.3	12	11.5	11.70	4.78

**V. CONCLUSION**

From the above analysis taken on both soil sample and material it is of economic benefit to Introduce the use of geotextiles in road construction as it reduces the act of “borrowing to fill” when the in-situ soil can easily be enhanced by use of geosynthetics.

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