

# A Review on Geo-Synthetics in Civil Engineering

Akshay Dobariya<sup>1</sup> Vishal Gyanchandani<sup>2</sup> Piyush Dangar<sup>3</sup> Shaktisinh Solanki<sup>4</sup> Darshan Parmar<sup>5</sup>

<sup>1,2,3,4</sup>Student <sup>5</sup>Assistant Professor

<sup>1,2,3,4,5</sup>Department of Civil Engineering

<sup>1,2,3,4,5</sup>Dr. Shubhash Technical Campus, Junagadh, Gujarat, India

**Abstract**— Geo-synthetics Are Synthetics Products Used to Stabilize Terrain. They Are Generally Polymeric Products Used To Solve Civil Engineering Problems. This Includes Eight Main product categories; Geo-textiles, Geo-grids, Geo-nets, Geo-membranes, Geo-synthetics clay liners, Geo-foam, Geo-cells and Geo-composites. These Products Have a Wide Range of Applications And Are Currently Used In Many Civil, Geotechnical, Transportation, And Private Development Applications Including Rods, Rail rods, Retaining Structures, And Agriculture.

**Keywords:** Geo-Grid, Geo-Textile, Geo-Composites, Geo-Cells, Geo-Membranes

## I. INTRODUCTION

Geo-synthetics Are Synthetics Products Used to Stabilize Terrain. They Are Generally Polymeric Products Used To Solve Civil Engineering Problems. This Includes Eight Main product categories; Geo-textiles, Geo-grids, Geo-nets, Geo-membranes, Geo-synthetics clay liners, Geo-foam, Geo-cells and Geo-composites. These Products Have a Wide Range of Applications And Are Currently Used In Many Civil, Geotechnical, Transportation, And Private Development Applications Including Rods, Rail rods, Retaining Structures, And Agriculture.

## II. LITERATURE REVIEW

Geo-synthetics are made from synthetic polymers like polypropylene, high density polyethylene, nylon, etc. These materials are thin, bidimensional, flexible, anti-corrosive, nonbio-degradable, nontoxic and UV stabilized for longlife. By far, the largest area of application of these materials in civil engineering is geotechnical engineering. Although the use of textile in geotechnical engineering has come a long way, starting first in the form of cotton fabric in 1926 in road construction by the South Carolina Department of Highways, it is only during the last two decades that these various types of textiles made of synthetic polymers have been increasingly used. Their use ranges widely from construction of roads over poor subsoils to reinforcement of railway embankments and bridge abutments. This paper presents an update review of the literature and research on the use of geo-synthetics (geo-textiles, geo-grids and geo-membranes) for various geotechnical works all over the world.

## III. TYPES OF GEOSYNTHETICS

- Geo-grid
  - Geo-textile
  - Geo-composites
  - Geo-cells
  - Geo-membranes
- 1) Geo-grid: Geo-grid are plastics formed into a very open netlike configuration. It is good soil and aggregate

reinforcement due to its good tensile strength and stiffness. The resulting grid structure possesses large opening called apertures. These apertures enhance the interaction with soil and aggregate.

- 2) Geo-textile: They are made from synthetic fibres such as cotton, wool, or silk. They are made of flexible, porous fabric by standard weaving machinery or matted together in a random, or nonwoven manner.
- 3) Geo-composites: A geo-composites consist of combination of geo-textile and geo-grid; or geo-grid and geo-membrane; or geo-textile, geo-grid, and geo-membrane; or any one of these three materials with one another material (e.g. various soils, steel cables, or steel anchors).
- 4) Geo-cells: They are made of strips of polymer sheets, connected at staggered points in order to form a large honey comb mat when its strips pulled apart. The geo-cell with higher elastic modulus has higher bearing capacity.
- 5) Geo-membranes: Geo-membranes are impervious thin sheets of rubber or plastic material used for lining and covers of liquid or solid storage.

## IV. FUNCTION AND APPLICATIONS OF GEOSYNTHETICS

- 1) Filtration: Geo-synthetic materials perform filtration function, in which drains to prevent soils from migrating into drainage pipes. They are also used as filters below riprap coastal and river bank protection systems.
- 2) Drainage: Geo-textile and geo-composites can also used as drains, by allowing water to drain from or through soils of lower permeability. This is used for pavement edge drains, slope drains, and abutments and retaining wall drains.
- 3) Separation: Geo-textile are used as separators to prevent fine grained sub grade soils from being pumped into permeable, granular road bases and also it prevent road base materials from penetrating into the underlying soft sub grade. Separators maintain the design thickness and roadway integrity.
- 4) Reinforcement: Geo-synthetic materials also perform reinforcement function. Geo-grid and geo-textile reinforcement enables embankments to be constructed over very soft foundations. They are also used to construct slopes at steeper angles.
- 5) Fluid barrier: Geo-membranes, thin films geo-textile composites, geo-synthetic clay liners, and field coated geo-textile used as fluid barriers to flow of a gas or liquid from one location to another. This function has application in asphalt pavement, waste containment.
- 6) Protection: A protective cushion of nonwoven geo-textile is used to prevent puncture of geo-membranes from stones in adjacent soil or drainage aggregate during installation.

## V. PROPERTIES OF GEOSYNTHETICS:

### A. Physical Properties

- 1) Specific gravity
- 2) Unit mass ( weight )
- 3) Thickness
- 4) Stiffness

### B. Mechanical Properties

- 1) Compressibility
- 2) Tensile strength

### C. Tensile Properties

- 1) Geo-synthetic polymer
- 2) Manufacturing process

### D. Survivability Properties

- 1) Tearing strength
- 2) Static puncture strength

## VI. ADVANTAGES OF GEOSYNTHETICS

- 1) Geo-synthetic materials are cost effective for transport and installation.
- 2) Speedy construction, also require short period for construction.
- 3) Geo-synthetic are manufactured in factory, so that it minimizes the required number of field connections.
- 4) Geo-synthetic materials are economical.
- 5) Material Quality Control.

## VII. DISADVANTAGES OF GEOSYNTHETICS

- 1) Handling, storage and installation must be assured by careful quality control and quality assurance.
- 2) Long term performance of the particular formulated resin being used to make the geo-synthetic must be assured
- 3) by using proper additives including antioxidants, ultraviolet screeners, and fillers.

## VIII. CONCLUSIONS

- 1) A geo-synthetic reinforced soil is stronger and stiffer than soil without reinforcement.
- 2) Use of geo-synthetic material in road construction present better performance than traditional road construction.
- 3) Geo-synthetic provides cost effective construction for several civil engineering construction.
- 4) The geo-synthetic materials are formed by using waste materials which are hazards to environment. These
- 5) hazards materials are came under the use. Hence these geo-synthetics materials are pollution free materials, there
- 6) is no danger to environment from geo-synthetic materials. And also cost of material is less as compared to other materials. Hence the use of the geo-synthetic materials is more economical.

## REFERENCES

- [1] Ramya Krishna Vajrala, Raja Veerendra Yenigalla “Comparitive Study on Effect of Diverse Geosynthetics and Their Spacing on Soft Clayey Soil” Volume 8, Issue 1 May 2019.
- [2] APERNA VERMA Pursins Ph. D from MMMUT “ROLE OF GEOSYNTHETICS IN RURAL ROADS”
- [3] A.A.BHOSALE Assit. Professor, Dr. J. J. Magdum College of Engineering, Jaysinghpur Swapnil K Sutar, Dr. J. J. Magdum College of Engineering, “APPLICATION OF GEOTEXTILE USED IN ROAD PAVEMENT CONSTRUCTION” April 2017, Volume 5
- [4] Prateek Malik M. Tech Scholar, OITM Hisar, Haryana, India Nikhil VermaM. Tech Scholar, OITM Hisar, Haryana, India “Use of Geosynthetic Material to Improve the Properties of Subgrade Soil” Volume 4 Issue 01 January 2015.
- [5] D.A.Ogundare, A. O. Familusi, A. B. Osunkunle and J.O. Olusami “Utilization of Geotextile For Soil Stabilization” Department of Cvil Engineering, Federal Polytechnic Ede, Osun State, Nigeria Volume 7, Issue 8.
- [6] Murad AI Qurishee “Application of Geosynthetics in Pavement Design” Teaching Assistant, Dept. of Cvil and Chemical Engineering, University of Tennessee at Chattanooga, TN, USA, Volume 4, 7 July 2017.
- [7] A.K. Choudhary, K.S.Gill and J. N. Jha “Improvement in CBR values of expansive soil subgrades using geo-synthetics IGC J-233.
- [8] R. D. Holtz, “Geosynthetic for soil reinforcement” Ph. D.,P. E. Department of Civil &Environmental Engineering University of Washington Seattlr, November2001.