

REVIEW PAPER ON-GEOSYNTHETICS

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Abstract: *Geosynthetics are the revolutionary products in all over the world. They has tremendous uses all over the civil engineering either it will be in road construction, for reinforcement or in increasing bearing capacity, soil stabilization etc. Geosynthetic also used for soil reinforcement such as soft foundations, steep slopes, backfills of retaining walls and abutments. Generally there are 8 main types of geosynthetic materials. Different type of materials has different application due to its change in properties like materials used while manufacturing, thickness of materials, cost of materials etc. The geosynthetic materials are widely used in civil engineering. As each and every type or geosynthetic materials has great application, it has also huge advantage too. These materials are generally manufactured by using raw materials which are easily available in nature tremendous manner. The size of each and every materials is lesser than other options to it. The construction and installation of these materials is very easy and speedy. In few words, geosynthetics are very useful, very economical and easy to handling and installation materials.*

Key Words: (*Geosynthetics , Stabilization, Geofoam, Geocell, Geogrid, Advantage & Disadvantage of Geosynthetics*)

1. INTRODUCTION

Geosynthetic means it is planer product manufactured from a polymeric materials used with soil, rock, earth, or other geotechnical-related materials as an integral part of a civil engineering project, structure, or system. Geosynthetic materials are made from synthetic polymers such as polypropylene, polyester, polyethylene, polyamide, PVC, etc. These materials are highly resistant to biological and chemical degradation. Nat Ural fibers such as cotton, jute, bamboo, etc., could be used as geotextile and geogrids. Geotextile are either woven or nonwoven. Woven geotextile are made of monofilament, multifilament, or yarns, or of silt films and tapes. Although waving process is very old, nonwoven textile manufacture is a modern industrial development.

Geosynthetics are synthetic products used to stabilize the terrain. They are generally polymeric products used to solve civil engineering problems. This includes eight main products i.e. geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geofoam, geocell and geocomposites. The polymeric nature of the products makes them suitable for the use in the ground where high levels of the durability required. They can also used in exposed applications. Geosynthetic are available in a wide range forms and materials. These products have wide application and are currently used in many civil engineering, geotechnical, transportation, geoenvironmental, hydraulic, and private development applications including roads, airfields, railroads, and embankments, retaining structures, reservoirs, canals, mining, aquaculture and agriculture.

Stabilization is being used for variety of engineering works, the most common application of geosynthetics in roads and airfield pavements, where the main objective is to be increase the stability or strength of soil and to reduce cost of construction. The three primary applications soil reinforcement using geosynthetics are (1) reinforcement the base of embankments constructed on very soft foundations, (2) increasing the stability and steepness of slopes, and (3) reducing earth pressure behind retaining walls and abutments. In the first two applications, geosynthetics permit construction that otherwise would be cost prohibitive or technically not feasible. In the case of retaining walls, significant cost savings are possible in comparison with conventional retaining wall construction. Other reinforcement and stabilization applications in which geosynthetics have also proven to be very effective include roads and railroads, large area stabilization, and natural slope reinforcement.

2. TYPES OF GEOSYNTHETICS

- Geogrid
- Geotextile
- Geocomposites
- Geocells
- Geomembranes
- Geosynthetic clay liners

- Geopipes
- Geofoam

1) Geogrid: Geogrid 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) Geotextile: 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) Geocomposites: A geocomposites consist of combination of geotextile and geogrid; or geogrid and geomembrane; or geotextile, geogrid, and geomembrane; or any one of these three materials with one another material (e.g. various soils, steel cables, or steel anchors).

4) Geocells: 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 geocell with higher elastic modulus has higher bearing capacity.

5) Geomembranes: Geomembranes are impervious thin sheets of rubber or plastic material used for lining and covers of liquid or solid storage.

6) Geosynthetic clay liners: Geosynthetic clay liners are the newest subset within geosynthetic materials. These are sandwiched between two geotextile or bounded to a geomembrane.

7) Geopipe: Geosynthetic material still available today is buried plastic pipe. The critical nature of leachate collection pipes coupled with high compressive loads makes geopipe a bonafide member of the geosynthetic family.

8) Geofoam: Geofoam is manufactured in large blocks which are lightweight and thermally insulating mass buried within soil. The most common type of polymer used in manufacturing of geofoam is polystyrene.

3. FUNCTION AND APPLICATIONS OF GEOSYNTHETICS

1. Filtration: Geosynthetic 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: Geotextile and geocomposites 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: Geotextile are used as separators to prevent fine grained subgrade soils from being pumped into permeable, granular road bases and also it prevent road base materials from penetrating into the underlying soft subgrade. Separators maintain the design thickness and roadway integrity.

4. Reinforcement: Gesynthetic materials also perform reinforcement function. Geogrid and geotextile reinforcement enables embankments to be constructed over very soft foundations. They are also used to construct slopes at steeper angles.

5. Fluid barrier: Geomembranes, thin films geotextile composites, geosynthetic clay liners, and field coated geotextile 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 geotextile is used to prevent puncture of geomembranes from stones in adjacent soil or drainage aggregate during installation.

4. PROPERTIES OF GEOSYNTHETICS:

Physical Properties

1. Specific gravity
2. Unit mass (weight)

3. Thickness

4. Stiffness

Mechanical Properties

1. Compressibility

2. Tensile strength

Tensile Properties

1. Geosynthetic polymer

2 Manufacturing process

Survivability Properties

1. Tearing strength

2. Static puncture strength

3. Impact strength

4. Bursting strength

5. Fatigue strength

5. ADVANTAGES OF GEOSYNTHETICS

- Geosynthetic materials are cost effective for transport and installation.
- Speedy construction, also require short period for construction.
- Geosynthetic are manufactured in factory, so that it minimizes the required number of field connections.
- Geosynthetic materials are economical.
- Material Quality Control.

6. DISADVANTAGES OF GEOSYNTHETICS

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

7. CONCLUSIONS

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

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