

Application of Geo Synthetics in Civil Engineering

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Abstract— Geo synthetics have become well established construction materials for geotechnical and environmental applications in most parts of the world. Because they constitute manufactured materials, new products and applications are developed on a routine basis to provide solutions to routine and critical problems alike. Results from recent research and from monitoring of instrumented structures throughout the years have led to new design methods for different applications of geo synthetics.

Keywords: Application, Geo Synthetics, Civil Engineering

I. INTRODUCTION

A planar product manufactured from polymeric material used with soil, rock, earth or other geo technical engineering related materials as an integral part of a man-made project structure or system.

Families of Geo synthetics:

- Geo textiles.
- Geo grids.
- Geo nets.
- Geo membranes.
- Geo synthetic clay liners.
- Geo pipes.
- Geo composites.

II. OVERVIEW

A. Geo Textiles:

They are indeed textiles in the traditional sense, but consist of synthetic fibers rather than natural one such as cotton, wool or silk. Thus biodegradable is not a problem.

They are made into a flexible, porous, fabric by standard weaving machinery or are matted together in a random, or non-woven manner.

B. Geo Grids:

Geo grids are plastics formed into a very open, grid like configuration i.e. they have large apertures.

Geo grids are either stretched in one or two directions for improved physical properties or made on weaving machinery by unique methods. Used primarily as reinforcement of unstable soil and waste masses.

C. Geo Nets:

They are usually formed by a continuous extrusion of parallel sets of polymeric ribs at acute angles to one another. When the ribs are opened, relatively large apertures are formed into a netlike configuration.

Their design function is completely within the drainage area where they have been used to convey fluids of all types.

D. Geo Membrane:

The materials themselves are "impervious" thin sheets of rubber or plastic material used primarily for linings and

covers of liquid- or solid-storage or disposal facilities. Thus the primary function is always as a liquid or vapor barrier.

E. Geo Synthetic Clay Liners:

Geo synthetic Clay Liners (or GCLs) are the newest subset within Geo synthetic materials. They are rolls of factory fabricated thin layers of bentonite clay sandwiched between two Geotextiles or bonded to a Geo membrane.

Structural integrity is maintained by needle punching, stitching or adhesive bonding. They are used as a composite component beneath a Geo membrane or by themselves as primary or secondary liners providing hydraulic barrier.

F. Geo Pipes:

Perhaps the original Geo synthetic material still available today is buried plastic pipe.

The critical nature of leachate collection pipes coupled with high compressive loads makes Geo pipe a bonafide member of the Geo synthetics family. The function is clearly drainage.

G. Geo Composites:

A Geo composite consists of a combination of Geotextile and Geo grid; or Geo grid and Geo membrane; or Geotextile, Geo grid, and Geo membrane; or any one of these three materials with another material (e.g., various soils, deformed plastic sheets, steel cables, or steel anchors).

III. LITERATURE REVIEW:

A. J Anitha:

The road laid on bases formed of weaker soil leads to large deformations, causing increases in maintenance cost and interruption of traffic service. And if the subgrade layer of pavement consists of expansive soil (black cotton soil), due to its susceptibility to moisture change and results in subsequent high swelling and shrinkage characteristics. These soils possess less strength and bearing capacity and thereby results in increasing the thickness of pavement. There are many stabilization methods available to improve engineering properties of these types of soft subgrade soil. Use of geo-synthetics over a soft subgrade (expansive soil) found to be one of the feasible and economic solutions to strengthen road pavement and thereby increasing service life.

B. Institute Of Technology, Bombay:

Geo-synthetics are made from synthetic polymers like polypropylene, high density polyethylene, nylon, etc. These materials are thin, dimensional, and flexible, anti-corrosive, non-bio-degradable, nontoxic and UV stabilized for long-life. 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 sub-soil 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 (geotextiles, geo-grids and geo-membranes) for various geotechnical works all over the world.

IV. CONCLUSION

- Determine the function of the Geo synthetic component in question.
- Determine required properties (filtration size, in-plane or cross-plane hydraulic flow capacity, required tensile strength and modulus).
- For Geotextile providing separation only, specify required properties on the basis of “survivability”.
- In specifications, reference required material properties to the standard “INDEX” tests such as Strength (tensile, burst, tear), Filtration (FOS), Permeability and Drainage capacity.
- Better to provide required properties and examples of specific products that will meet the specifications.

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