

Stabilization of Subgrade Soil By Using Geo Grids

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Abstract- Stabilization is the process which involves enhancing the physical properties of the soil in order to improve its strength, durability etc., by blending or mixing with additives. The different types of methods used for soil stabilization are; soil stabilization using cement, soil stabilization using lime, soil stabilization using bitumen, chemical stabilization and a new emerging technology of stabilization that is stabilization of soil by using geo-synthetics.

Geo-synthetics are synthetic products made from various types of polymers which either woven or non-woven. These are used to enhance the characteristics of soil and have provided a practical way of constructing civil engineering structures economically. In this study, the results of studies on the performance of geogrids within sub grade soils are carried out experimentally utilizing the California Bearing ratio (CBR) testing arrangement.

The sub grade soil is subjected to the following laboratory tests; Particle size analysis, Atterberg's limits, Specific gravity test, Compaction test and CBR tests are conducted on soil samples with and without the inclusion of geogrid layer and also by varying the position of it in the mould. Use of geogrid increases the CBR value of the sub grade and thereby reduces the pavement thickness. It reduces the intensity of stress on sub grade.

It was found that for the two samples the CBR values increased at 3H/4 height when compared to H/2, H/4 heights from the bottom. The optimum height of placement was found at a height of 3H/4 from the bottom.

Keywords- Stabilization, Sub grade soil, geo-grids, CBR test.

I. INTRODUCTION

Roads are arteries of a city and thus they constitute an integral part of acity. Lowermost layer of a pavement is called subgrade and it usually consist of soil present at the site. Roads often have to be constructed across this weak and compressible soil. Whenever a road needs to be built on such soil with low CBR value, settlement may take place during or after construction, with serious consequence in the lifespan of the road. It is therefore a common practice to distribute the

traffic loads in order to decrease the stress on the soil sub-grade. This is generally done by placing a geo grids as a reinforcement layer.

Use of Geo-grids serves as a solution to these problems. Geogrids increase the strength of sub-grade soil and modify some of its properties so that strength and lifespan of the road is increased. The project provides an overview of the current Geo-synthetics technologies and highlights the function that geo-grids perform in enhancing the performance and extending the service life of paved road.

Looking at the poor road condition of some states of India use of geogrid is thought for road construction to improve the performance of roads. Geogrid a geosynthetic manufactured from polymers is selected for this purpose.

TYPES OF GEO-SYNTHETICS

The principal types of geosynthetics are:

1. Geotextiles
2. Geogrids
3. Geonets
4. Geomembranes
5. Geocomposites
6. Geostrips
7. Geocells/Geowebs
8. Geo-others.

1. Geo textiles: They form the largest group of geosynthetics. They are textiles in the traditional sense, but consist of synthetic fibers rather than natural fibers such as cotton, wool or silk. Geotextiles are mainly of two types, namely woven and non- woven.

2. Geo grids: This is a small but rapidly growing segment of geosynthetics area. They are manufactured from selected polymers by extension or by aligning molecular chains of polymers. A geogrid is a synthetic planar structure formed by a regular network of tensile elements with aperture of sufficient size to allow interlocking with surrounding soil, rock, earth or any other geotechnical material, and is characterized by high dimensional stability and high tensile

modulus of elongation. The main functions of geogrids are separation and reinforcement.

3. **Geo nets:** They are usually formed by a continuous extrusion of polymeric ribs at acute angles to one another. When the ribs are opened, relatively large apertures are formed in a netlike configuration. Their design function is completely within the drainage area where they have been used to convey fluids of all types.
4. **Geo membranes:** Geomembranes represent the second largest group of geosynthetics . The materials are “impervious” thin sheets of rubber or plastic material used primarily for linings and covers of liquid or solid storage facilities. Thus the primary function is always as a liquid or vapour barrier.
5. **Geo composites:** A geocomposite consists of a combination of geotextile and geogrid, or geogrid and geomembrane or geotextile, geogridandgeomembrane or any one of these three materials with another material like deformed plastic sheets, steel cables or steel anchors. The major function encompasses the entire range of functions listedforgeosyntheticslikeseparation,reinforcement,drainage ,filtrationandmoisturebarrier.Theapplicationareasaremanyandgrowing steadily.
6. **Geostrips:**Geostripsare usedassoilreinforcementintheform ofcutfabric or long strips. They are generally produced from polypropylene and high density polyethylene. They can be connected with the anchors at the ends. The anchors may be in the form of loops, rings, or spirals, which may help in confining soil elements.
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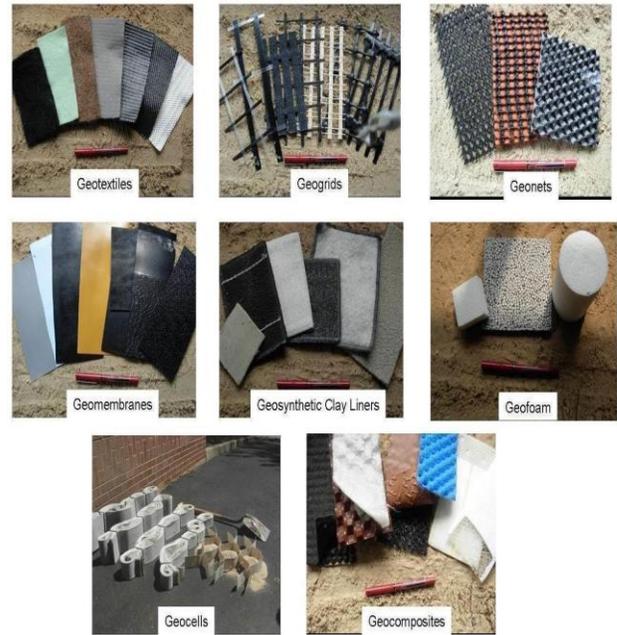


Fig-1.1TypesofGeo-synthetics

Typeof Geosynthetic (GS)	Separation	Reinforcement	Filtration	Drainage	Containment
Geotextile (GT)	√	√	√	√	
Geogrid (GG)	√	√			
Geonet (GN)				√	
Geomembrane (GM)					√
Geosynthetic Clay Liner (GCL)					√
Geopipe (GP)				√	
Geofam (GF)	√				
Geocells (GL)		√		√	
Drainage cell (DC)		√	√	√	
Geocomposite (GC)	√	√	√	√	√

Types of Geogrids

Based on the manufacturing process involved in geogridsit can be of

- a) Extruded Geogrid
- b) WovenGeogrid
- c) BondedGeogrid

Based on which direction the stretching is done during manufacture, geogrids are classified as

- a) Uniaxial geo grids
- b) Biaxial Geo grids

Biaxial Geogrids:

Here during the punching of polymer sheets, the stretching is done in both directions. Hence the function of tensile strength is equally given to both transverse and longitudinal direction.

Types of Geogrids

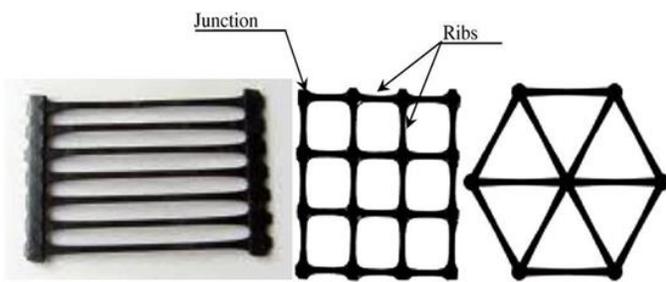
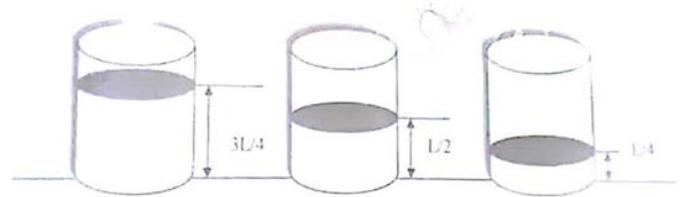


Fig-1.2

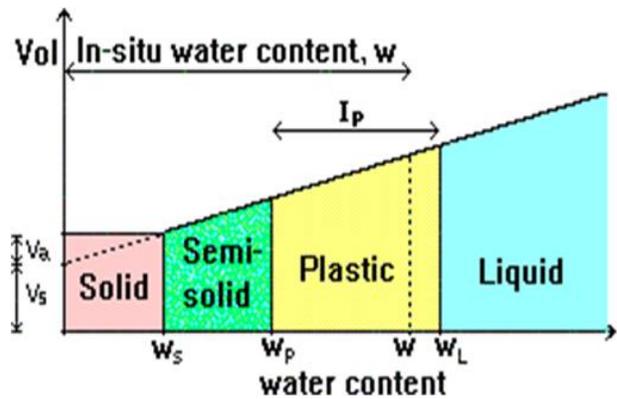
1. Uniaxial Geogrid 2. Biaxial Geogrid 3. Triaxial Geogrid.

Experimental Programme

- Collection of soil samples from the locations has mentioned above.
- Using these dry samples, the basic laboratory tests like Dry sieve analysis, Specific gravity, Atterberg's limit, Heavy compaction are to be performed, to know the grain size distribution, specific gravity of the samples, liquid and plastic limits, maximum dry density and optimum moisture content of soil samples respectively.
- Using the above optimum moisture contents of the two soil samples, UCC and CBR tests are performed separately to find the unconfined compressive strength and CBR value at 2.5mm penetration.
- CBR test is repeated by adding the layers of geogrids placed at a height of $h/4$, $h/2$, $3h/4$ of the total height of the soil sample.
- Compare the C.B.R values of normal soil sample and reinforced geo-grids soil sample.



Sand	2.63-2.67
Silt	2.65-2.7
Clay and Silty clay	2.67-2.9
Organic soil	<2.0



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APPENDIX

This is to certify that the dissertation entitled "STABILIZATION OF SUBGRADE SOIL BY USING

GEOGRIDS being submitted by **B.DELHI RAJA** with Regd.No. **423232913005** in partial fulfillment of the requirements for the award of **MASTER OF TECHNOLOGY in civil engineering with the specialization of TRANSPORTATION ENGINEERING** is an authentic work carried out by **Mrs M.MADHURIM.Tech,Phd** under their supervision and guidance. To the best of my knowledge, the matter embodied in this seminar report has not been submitted to any other University/institute for award of any degree of engineering

ACKNOWLEDGEMENT

Would like to express my sincere gratitude to all those who supported and guided me through the course of this project. First and foremost, I am deeply thankful to my research **Mrs M.MADHURI, M.Tech, Phd** professor and **Dr. M.MADHURI, M.Tech. Ph.D** for their invaluable guidance, unwavering support, and continuous encouragement. Their expert advice and insightful feedback were instrumental in shaping the direction and quality of this research,

Would also like to extend my gratitude to the faculty and staff of the civil engineering at **SANKETIKA VIDYA PARISHAD ENGINEERING COLLEGE** for providing the Necessary Resources and a Conducive Research Environment. Special thanks to their assessment in the laboratory experiments and material preparation, which greatly facilitated the research process.

Am also grateful to my colleagues, [**SVP ENGINEERING COLLEGE**], For their constructive discussions, teamwork, and friendship, their collaboration Helped enhance the overall outcome of this project. I Would Like To Acknowledge Any External Organizations, Institutions, For Funding Bodies For Providing Financial Support, Materials, Or Any Necessary Tools that contributed to the successful completion of this study. Finally, I wish to thank my family and friends for their emotional support, understanding, and patience during the course of this research. Their constant encouragement gave me the strength to overcome challenges and continue with my work. Feel free to adjust the names and specific details to suit your actual acknowledgments.

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