WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Overview of Geo Grids in Construction of Pavement: - A Review

[1]Mr. Rahul Dadarao Solao, [2]Mr. Badal Harinkhede, [2]Mr. Vishal Gajghate

[1]M-Tech Transportation Engineering Final Year Student, G H Raisoni University Saikheda.
[2]Assitant Professor, Civil Engineering Department, School of Engineering Technology, G H Raisoni University Saikheda.

ABSTRACT:-

After the USA, Indian has the world's second-biggest road network. The roads, however, are not generating the intended outcomes due to a low CBR value. During the rainy season, India's roads are beset by problems such as the formation of potholes, ruts, cracks, and localised depression and settlement. These are primarily caused by the subgrade's insufficient bearing capacity when saturated with water. Most subgrade soil has low CBR values of 2-5%. The overall pavement thickness rises exponentially as the CBR value of the subgrade soil drops in the CBR approach of pavement design which boosts construction costs. As a result, the use of geogrid material to boost bearing capacity has been investigated. to make use of geogrid material to boost The bearing capacity of the subgrade. Laboratory and simulated field CBR tests are performed on soil samples with and without the inclusion of the geogrid layer, as well as by varying its placement in the mould. The CBR value of the subgrade is raised by employing geogrid, which reduces the pavement thickness by up to 40%.

KEYWORDS: Reinforcement, Geogrids, CBR Value, and Flexible Pavement

1. INTRODUCTION

Geosynthetics, a well-known family of geomaterials, are used in an assortment of civil engineering uses. Geosynthetics comprise a variety of polymers (plastics) that are often used in everyday life. Polyolefins and polypropylene are the most common, but rubber, fibreglass, and organic products are also used on occasion. Geosynthetics can be used as a separator, filter, planar drain, strengthening, cushion/protection, and/or liquid and gas barrier. The many types of geosynthetics that are available and their applications are discussed in the sections that follow. The existence of cozy/loose soil at the ground's level is the largest issue for engineers while developing roadways in India's plains and coastal regions. Road construction over that loose soil is costly since heavier granular materials are required. Alternatively, attempting to cut down on the thickness of the concrete layer in order to create a more cost-effective the building process would result in early pavement deterioration, rendering the road impassable soon after construction. This condition may worsen if there is insufficient or no drainage. Poor drainage and weak subgrade conditions plague certain Indian states located in high-rainfall zones. Here's an example: One of the major issues that engineers confront when creating roadways in India is the presence of soft/loose soil at ground level. plains and coastal areas. Building expenses are high due to the necessity for heavier granular materials to be utilised to create roadways over this loose soil. Attempting to build a road with a thinner pavement layer, on the other hand, may result in early pavement breakdown, rendering the road inaccessible soon after construction. This issue might worsen if there is little or no drainage at all. Specific states in India that are based in areas where there is heavy rainfall are affected due to inadequate elimination and weak subgrade conditions.

Fig 1. Geogrid Pattern

LITERATURE REVIEW

S. C Janardhan (2017)

(i). He performed various comparative studies of geosynthetics in geotechnical projects in this study. It supplements the data supplied by R N swami.

(ii). Some issues with their design

(iii). A novel technique to overcoming obstacles through the use of geosynthetics.

(iv). A recent project demonstrating the innovative usage of geosynthetics. This study focuses on the innovative application of geosynthetics in the development of clay dams, resistance obstructions, saturate obstructions, peeling gradients, maritime security measures, the foundations railway abutments, walls for retaining, walls, and pavements.

S. K Goyel & Tanmunj (2021)

They discovered that the kind of sub-grade, sub-base, and base course materials had a significant impact on pavement quality and longevity. The kind and quality of sub-grade soil are the most significant. However, in India, the majority of flexible pavements must be built over a weak and problematic sub-grade. Because the California bearing ratio (CBR) of these sub-grades is so low, more pavement thickness is required. The scarcity of adequate sub base and base materials for pavement building has prompted a quest for a cost-effective technique of converting locally available problematic soil to suitable construction materials.

Agrawal Y & Chintamani Das (2018)

They discovered that the quality and longevity of pavement is substantially influenced by the They spoke about the essay, which discusses the problem of soil that is soft and various remedies. The report emphasises the use of geotextile materials as a strengthening in soil as a study stressing point. A California bearing ratio test was performed to determine how the soil's behaviour altered after geotextile was introduced or matched with it. They used the Modified Proctor Teston on the soil with and without geotextile to determine the OMC and MDD, which are 14.35% for pure soil and 11.38% for soil with geotextile. As a result, the CBR test procedure was developed based on the reading. The test which was carried out was for soaking.

S.A. Naeini, and R. Moayed (2019)

CBR and plate load testing were performed on both geotextile-reinforced and unreinforced subgrades. It was discovered that substituting synthetic geosynthetic geotextiles for coir leads in only a 5% increase in the elastic moduli of the coir reinforced layer. They investigated the durability of coir by speeding up its degrability. It has been demonstrated that phenol-treated coir has a longer lifetime. A compilation of Rao's geosynthetics work.

Rupinderpal Singh, Dr. Pardeep Kumar Gupta(2018)

According to the study's "Application of Geosynthetics in Flexible Pavement," deficient subgrade soils' essential engineering and geotechnical attributes may be enhanced by adding geosynthetics such as woven or non-woven geotextile. When geotextile is buried at various depths in the subgrade soil, the thickness of the pavement and construction expenses are lowered, with the lowest cost happening when the geotextile is buried closer to the top of the mould. CBR tests were done on the soil's strength using woven geotextile laid in a single layer at depths of 0.33H, 0.66H, and 0.8H (H-height of mould in CBR test) from the mold's bottom. Whenever the Woven Geotextile was employed, and the flexible pavement was designed for 100MSA fatigue and rutting life at 90% reliability.

Conclusion on literature review

The present investigation's purpose, in connection to this study, is to analyse the pavement's CBR values by placing geogrids at various depths with varied layers.

The major purpose is to assess how much the thickness of the road will be reduced. The purpose of this research is to see if employing geogrid to thin out road pavement is successful.

Methodology

The methodology adopted in this study includes:

- Material collection & Simpleton
- Experiment Formation
- Compaction Factor test method Preformation on Sample

SELECTION OF SOIL SAMPLE AND GEOGRID Soil:

The soil is collected from Pit.

3 samples are collected from a depth of 5m at an interval of 0.5KmGeogrid. The geogrid is collected. The grade of the geogrid is G-150/60.

EXPERIMENTAL ANALYSIS AND TEST

TENSILE STRENGTH TEST:-

One rib with three connections in the direction of concern must be present in test specimens. For clamping, use junctions at each end of the specimen; the central node symbolises the repetition unit. Three specimens should be tested in each direction.

CONCLUSION:-

[1]. Geosynthetics is a well-established method among the possibilities for geotechnical engineering projects.

[2]. Nonetheless, in geotechnical projects that utilise them, ingenuity is still required.

[3]. This study demonstrates the benefits of using geotextiles as filters in earth dams.

[4]. The use of exposed geo membranes as a possible solution for resistive covers the use of geotextiles as a capillary barrier in unsaturated soil.

[5]. Integral geosynthetic reinforced bridge abutments, utilised to reduce the "bump at the end of the bridge."

References:-

[1]. Charles Anum Adams, Nana Yaw Amofa, Richter Opoku Volume 3, Effect of geogridreinforced subgrade on layer thickness design of low volume bituminous sealed road pavements, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

[2]. Jeong Ho, Investigation of geogrid-reinforced flexible pavement performance over expansive clay.

[3]. J. P. Giroud and Jie Han, Design method for geogrid-reinforced unpaved roads.

[4]. Dr. D.S.V. Prasad, Dr. M. Anjan Kumar, Dr. G.V.R. Prasada Raju Behavior of reinforced sub bases on expansive soil sub grade.

[5]. D S V Prasad, Evaluation of different reinforced expansive soil subgrade-a laboratory model, B V C Engg.College, Odalarevu-533210, AP.

[6]. R. Kumar, V.K. Kanaujia, and D. Chandra, Engineering behavior of fiber-reinforced pond ash and silty sand, Geosynthetics International, 1999, 509-518.

[7]. G.V. Rao,and G.V.S. Raju, Pavements (New Delhi, India: Tata Mc Graw Hill, 1990).

[8]. Cancelli, F. Montanelli, P. Rimoldi, and A. Zhao, Full scale laboratory testing on geosynthetics reinforced paved roads, Proc. of the International Symposium of Earth Reinforcement, Fukuoka, Kyushu, Japan, 1996, 573-578.

[9]. F. Montanelli, A. Zhao, and P. Rimoldi, Geosynthetics-reinforced pavement system: Testing and design, Proc. of Geosynthetics "97, IFAI, Long Beach, California, USA, 2, 1997, 619 –632.

[10]. S.A. Naeini, and R. Moayed, Effect of plasticity index and reinforcement on CBR value of soft clay, International Journal of Civil Engineering, 2009, 124 –130.

[11]. S.B. Dhule, S.S. Valunjkar, S.D. Sarkate, and S.S. Korrane, Improvement of flexible pavement with use of geogrid, Electronic Journal of Geotechnical Engineering, 2011, 269 –279