INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 7, Issue 3 - V7I3-1777)
Available online at: https://www.ijariit.com

Improvement of Rigid Pavement with Geogrid Material

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ABSTRACT

We have seen the non uniformity, non consistency, loose soil, unstable soil while construction of roads. We have experimentally examined that geogrid can be added as an additional reinforcement. The benefit of Geogrid is that the geogrid increases the bearing ability of construction and reduces the spreading of gravels and soil. The Geogrid is also economical so the cost of construction can be reduced. Geogrid gives strength to the construction and increases life span of construction. Geogrid reinforcement is a method used in permanent paved roadways in two major application areas. They are: base reinforcement and subgrade stabilization. The strength and life of pavement is greatly affecting the type of sub- grade, sub base and base course materials. But in India most of the flexible pavements are mainly constructed over weak and problematic sub-grade. In base reinforcement, the geogrids are placed at the bottom of unbound layers of a flexible pavement system and improve the load-carrying capacity of the pavement under repeated traffic. In subgrade stabilization applications, the geogrid is used to build construction platform over weak subgrade to carry equipment and facilitate the construction of the pavement system without over deformations of the subgrade.

Keywords: *Non-uniformity, Consistency, Loose Soil, Stabilization, Subgrade, Sub Base, Deformation.*

1. INTRODUCTION

Inclusions of different sorts mixed with soil have been used for thousands of years. They were used in roadway construction in Roman days to stabilize roadways and their edges. These early attempts were made of natural fibers, fabrics or vegetation mixed with soil to improve road quality, particularly when roads were built on unstable soil. They were also used to build steep slopes as with several pyramids in Egypt and walls as well. Geosynthetics has been by the 'American society for testing and materials' (ASTM) committee D35 on synthetic as planar products manufacture from polymeric materials used. Geosynthetics are materials made from various types of polymers, used with geological materials like soil, rock etc. to enhance, improve or modify the behavior of various civil engineering works. Geosynthetics are available in a wide range of forms and materials, each to suit a slightly different use. Geosynthetics are used to stabilized terrain . they are generally polymeric o used to solve engineering problems. The polymeric nature of the products makes them suitable for use in the ground where high levels of durability are required.

2. BIAXIAL GEOGRID

In this project we have use biaxial geogrid.

- **Biaxial geogrid** is one types of geogrid which can be made from high polymer. Biaxial geogrid has high strength in both longitudinal and transverse direction. It is made through the process of extruding, sheet forming, punching and stretching. Biaxial geogrid has good bearing capacity. It can enhance soil structure and prevent soil erosion. This product is often used to prevent the

road from reflective and fatigue cracking. Biaxial geogrid can effectively improve the long term durability of subgrade and greatly reduces road maintenance costs.

- **Biaxial geogrid** has good resistance to long term degradation. It is suitable for various applications, such as embankment reinforcement, wall reinforcement, soil stabilization, slope protection and other permanent load bearing foundation reinforcement. BPM biaxial geogrid has the characteristics of good bearing capacity, stable aperture size, high elastic modulus, small deformation, high junction efficiency, quick installation and low maintenance costs. The biaxial geogrid is the ideal types of geogrid used in the reinforcement of parking lots, haul roads, landfills and airport runways. It is used to enhance the bearing capacity of railways and highways, to reinforce the durability of buildings and constructions, to prevent landslide and ground subsidence.

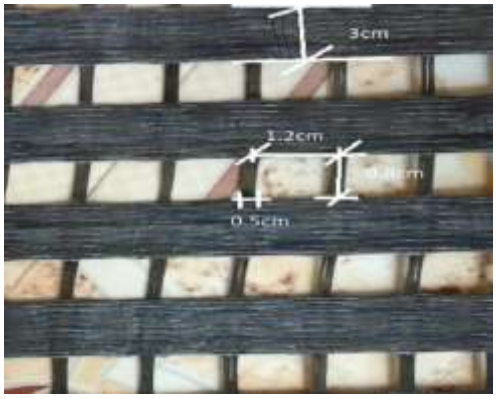

Fig. 1: Biaxial Geogrid

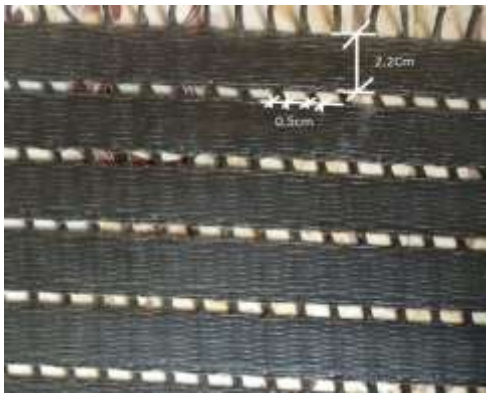

Fig. 2: Biaxial Geogrid

3. TESTING

Fig. 3:CTM Machine

We have checked compressive strength of block by using CTM machine. We made two block is made by concrete only and another is made up of concrete with geogrid. The strength of block is checked after 14 days.
Following are the reading of testing.

This test reading on block with 14 days. **M25 Grade** Concrete. From Fig.1 this sample 3 layers are used in concrete block.

Sample	Concrete Block	Concrete block + Geogrid Material
Area (cm^2)	225	225
Peak Load (KN)	424	359.5
Peak Stress(Mpa)	18.8	15.9

This test reading on block with 28days. **M25 Grade** Concrete

Sample	Concrete Block	Concrete block + Geogrid Material
Area (cm^2)	225	225
Peak Load (KN)	540	397.8
Peak Stress(Mpa)	24	17.6

But the result is not satisfactory. So we used M40 grade of concrete and checked the compressive strength after 14 days. And we come to know that the strength of concrete with geogrid block is more than the conventional concrete block.

This test reading on block with 14 days. **M40 Grade** Concrete. From Fig 2 this sample only 1 layer is used.

Attempt 1st

Sample	Concrete Block	Concrete block + Geogrid Material
Area (cm^2)	225	225
Peak Load (KN)	510.7	554.2
Peak Stress(Mpa)	22.6	24.6

Attempt 2nd

Sample	Concrete Block	Concrete block + Geogrid Material
Area (cm^2)	225	225
Peak Load (KN)	423.5	514.3
Peak Stress(Mpa)	18.8	22.8

Attempt 3rd

Sample	Concrete Block	Concrete block + Geogrid Material
Area (cm^2)	225	225
Peak Load (KN)	552.5	410.5
Peak Stress(Mpa)	24.5	17.7

4. COMPRESSIVE STRENGTH

The most common test for hardened concrete is the compressive strength, at a particular period of time, from the time of casting the concrete cubes. It is very important for engineers and technicians to obtain accurate results of compressive strengths of concrete. Compressive strength over a period of time also indicates the extent of quality control being exercised at An affect the compression strength of concrete, also some basic and advanced apparatus required for the test and the precautions for the test. It also discusses different types of cube failure that can occur.

4.1 Purpose of the test

Well we all know the basic purpose of the test and some other purposes of the tests are as follows:

- The compressive strength of cubes gives us the information of the potential strength of the concrete mix from which it is sampled.
- It helps in determining whether correct mix proportions of various mix proportions of various materials were used to get the desired strength.
- It helps in determining the time of removal of formwork or the time of taking the concrete structure into service.

- Compressive Strength for M25 grade cube

Cube	Days	Without geogrid	With geogrid
1	14	15.97N/mm^2	18.66 N/mm^2
2	28	24.02 N/mm^2	17.68 N/mm^2

- Compressive Strength for M40 grade cube

Cube	Days	Without geogrid	With geogrid
1	14	22.69 N/mm^2	24.63 N/mm^2
2	14	18.82 N/mm^2	22.85 N/mm^2
3	14	24.55 N/mm^2	18.24 N/mm^2

5. CONCLUSION

- After testing of cubes we have concluded that for M25 grade the concrete block is more in weight than the concrete block with geogrid material as we added three layers of Geogrid material.
- We took the test of M25 grade for 14days and 28 days .After testing we get to know that the strength of cement block is higher than the cement block with geogrid material.
- After that we used M40 grade and only one layer of the geogrid material and we found that effective.
- After the test of M40 grade for 14 days respectively. We found that the strength of concrete block with geogrid material is higher than concrete block as we have seen in the readings.

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