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GEOGRID USED IN ROAD CONSTRUCTION

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***Abstract* — -** Geogrid reinforcement is gaining acceptance as an effective way of improving on the properties of naturally occurring soils for road pavement construction. In many tropical countries, weak lateritic subgrades are common and often rejected after proof rolling during construction due to poor strength. The specific objectives of this research were to 1) Determine the effect of strength of geogrid reinforcement material on the California Bearing Ratio of a sample of relatively poor lateritic subgrade material under soaked and unsoaked conditions and 2) Establish the effect of geogrid reinforced subgrade on the design thickness of low volume paved roads. A natural lateritic subgrade soil was selected and tested without reinforcement. Then by placing a layer of a tri-axial geogrid above the third layer within the sample height, the effects of geogrid reinforcement on California Bearing Ratio values are investigated. This was undertaken for two strengths of geogrid in both soaked and unsoaked conditions. The California Bearing Ratios of the soil–geogrid subgrade was used to determine the pavement layer thicknesses for a low volume paved road using the Transport Research Laboratory Road Note 31 method of pavement design. The results indicate that base course layer thickness reduction as a result of geogrid reinforcement for a subgrade decreases with increasing traffic class. A minimum of 15% base course layer thickness reduction was observed for a surface dressed road with natural gravel base course.

Keywords:-Geogrid reinforcement, California Bearing Ratio, Lateritic subgrades, Pavement layer thicknesses.

I. INTRODUCTION

Low volume paved and unpaved roads usually serve as access roads to rural areas, towns and districts. They play a very important role in rural economy, resource industries (forest, mining) and transportation to agricultural production areas. When low volume roads are built on poor subgrade soils, large deformations can occur, which increase maintenance cost and lead to interruption of traffic service. In many tropical countries like Ghana, lateritic subgrades are common and often rejected after proof rolling during construction due to poor strength. Cost associated with poor subgrades include relatively larger sub-base and base thicknesses, right-of-way purchases as a result of relocation of road corridors and eventually longer construction periods with associated opportunity costs. The purpose of this research was to determine the effect of tri-axial geogrids on road pavements. The specific objectives of the research were to 1) Determine the effect of strength of geogrid reinforcement material on the California Bearing Ratio (CBR) of a sample of relatively poor lateritic subgrade material under soaked and unsoaked conditions. 2) Establish the effect of geogrid reinforcement on the design thickness of low volume paved roads in the tropics.

II. PROBLEM STATEMENT

High volume traffic pavements transfer their traffic load typically on asphalt or concrete treated surface over a base course layer & distribute the load on subgrade. When the subgrade soil is weak or unable to support adequate traffic loads for long time duration due to either traffic or environmental loads, there will permanent deformation in the pavement. Improvement of load carrying capacity of the conventional unreinforced pavements is costly. Some smart materials can offer low life-cycle cost by improving structural capacity as well as reducing of deformation and thickness of pavement that are construction cost efficient, eco-friendly, beneficial for the community, and useful for engineering purpose

III. LITERATURE REVIEW

Geosynthetics material are polymeric products that are used in roads, airfields, railroads, embankments, retaining structures, reservoirs, canals, dams, erosion control, sediment control, landfill liners, landfill covers, mining, aquaculture and agriculture for separation, reinforcement, filtration, drainage, and containment. There are eight types of Geosynthetics: geogrids, geotextiles, geocomposites, geonets, geomembranes, geosynthetic clay liners, geofoam, and geocells. In this chapter, much effort has been made to discuss the use of geosynthetics in pavement design.

Dhule et al. (2011) showed that the CBR value of an unsoaked soil increases with increasing percentage of geogrid reinforcement. Rao et al. (1989); Shetty and Shetty (1989); Rao and Raju (1990); Ranjan and Charan (1998) presented results of series of laboratory CBR tests (soaked and unsoaked) on silty sand (SM) reinforced with randomly distributed polypropylene fibres. The results showed that the CBR value of the soil increased significantly with increase in fibre content. The increase in CBR was observed to be 175% and 125% under soaked and unsoaked conditions respectively with addition of 3% fibres by weight.

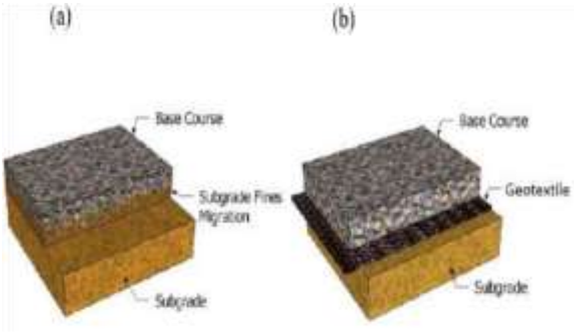
IV.Methodology

In our project, Geogrid used in road construction we apply the following steps ,

Step-1 : Selection of site
Step-2: Soil Sample collection
Step-3: Laboratory testing: Soil Particle-Size Distribution, Soil Atterberg Limits (liquid limit, plastic limit, shrinkage limit), Specific gravity, Proctor compaction test, determination of the moisture content of the soil, California Bearing Ratio (CBR)
Step-4: Traffic load count and pavement modeling
Step-5: Preparation of Estimate
Step-6: Geogrid selection & placement

Table 1: Comparison of thickness & displacement with & without Geogrid in pavement

Reinforcement Type	Subgrad CBR (%)	HMA Thickness (cm)	Base Thickness (cm)	Displace in HMA (cm)	Displace in Base Layer (cm)	Displace in Subgrade (cm)
None	4.4	7.6	14.8	0.4	1.2	1.3
Geogrid	5.7	7.3	14.5	0.8	0.3	1.3



V. RESULT AND CONCLUSION

According to our research, Base course thickness reduction as a result of geogrid reinforcement for a subgrade soil tends to decrease with increasing traffic volume.

Base course reduction benefits accruing from the use of geogrids may be felt most in lower volume roads especially in areas where water may drain into the lower layers of pavements as may occur with unsealed shoulders and under conditions of poor surface maintenance where the roadbase may be pervious or in high rainfall areas.

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