

Improvement of Soft Subgrade Using Geosynthetics: A Dynamic Cone Penetration Test Investigation

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Abstract

Unpaved roads constructed on weak subgrade soil, rural areas, semi urban areas and mining areas generally face problems such as rutting, differential settlement, and reduced service life under repeated traffic loading. Improving the strength and stability of these roads are an important challenge in pavement construction. The present study investigates the effect of geosynthetic reinforcement on the performance of unpaved road using the dynamic cone penetration test. This research focuses on estimate the improvement in penetration resistance and load-bearing capacity of reinforced soil compared to unreinforced soil. In this study poorly graded sand (SP) was used as the subgrade and Geotextile and geogrid were selected as reinforcement. Laboratory model tests were conducted in a steel tank. Reinforcement layer was placed at 50 mm and 100 mm depth, within the soil, and DCPT was carried out to measure the penetration characteristics of the soil. The geogrid reinforced subgrade shows an increase of 300 % cone resistance while 200 % resistance is achieved using geotextile reinforced at 50 mm and 200 % cone resistance while 166.67 % resistance is achieved using geotextile reinforced at 100 mm when compared to unreinforced section. The results show that the addition of geosynthetic reinforcement significantly improved the strength and stiffness of the subgrade soil. Reinforced sections show lower penetration values and better resistance against the unreinforced section. The study highlights the potential of geosynthetic reinforcement as a practical and economical solution for enhancing the stability and durability of unpaved roads.

Keywords

Dynamic cone penetration test (DCPT), Dynamic cone penetrometer (DCP), Geosynthetic reinforcement, Subgrade, Unpaved roads.