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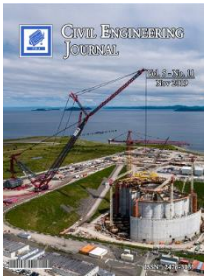

Performance of Circular Footing on Expansive Soil Bed Reinforced with Geocells of Chevron Pattern

Sanjeev Kumar [a*], Anil Kumar Sahu [b], Sanjeev Naval [c]

[a] *Research Scholar, IKGPTU, Kapurthala (Punjab), India.*

[b] *Professor, Department of Civil Engineering, Delhi Technological University, Delhi, India.*

[c] *Associate Professor, Department of Civil Engineering, DAV Institute of Engineering & Technology, Jalandhar, India*

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Abstract

Results from laboratory model tests performed on circular footing are presented in this paper to understand the performance of geocell reinforced expansive soil. Naturally occurring expansive soil was used in this study as subsoil. Geocells of chevron pattern fabricated from geotextile made up of polypropylene were used to reinforce the soil bed. The parameters studied in this testing program were the placement depth of the geocell mattress, pocket size of geocell and the height of geocell mattress. Contrary to other researchers; the improvement in the performance of reinforced bed is evaluated at a settlement level equal to the failure settlement of unreinforced soil bed. The performance of reinforced bed is evaluated through two non-dimensional factors viz. bearing capacity improvement factor (I_f) and settlement reduction factor (PRS%). Test results indicated that with the introduction of geocell as reinforcement, a substantial improvement in bearing capacity and decrease in footing settlement can be achieved. Bearing capacity of reinforced bed increases by more than 200% and 81% reduction in footing settlement was achieved by using geocell mattress of optimal dimensions and placing it just below the footing base.

Keywords: Circular Footing; Expansive Soil; Geocell Mattress; Chevron Pattern; Bearing Capacity.

1. Introduction

Due to rapid urbanization, need arises to construct structures on expansive soils. But there is difficulty in building any infrastructure facility over such soils due to its shrinkage and swelling properties. The development of any area depends upon the growth of infrastructure mainly roads, railways, buildings etc. Since the shear strength of these soils is very low, stability of structures built on such soils is a challenging job as there is a possibility of large consolidation settlement and bearing capacity failures. In order to build safe and stable structures, the expansive soils underneath need to be treated for the improvement of its bearing capacity. Reinforcing soils is one of the effective and reliable techniques to improve their strength since reinforcing soils improve bearing capacity & stability and reduce lateral deformation & settlement [1-3]. Different types of materials with many shapes and techniques are currently in use in civil engineering projects. Using fibres like polyesters, polypropylene, glass fibres, steel bars, natural fibres viz. jute, coir, sisal, palm etc. has been recognized as an effective reinforcement for soil [2, 4-6]. To improve foundations, roads, and construction of wall polymeric fibres and grids, metallic strips and meshes have been extensively used as planner reinforcement over the recent few decades [6-13]. Amongst various stabilizing techniques available providing high strength geosynthetic

* Corresponding author: snjvbansal67@gmail.com

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