

# Analytical investigation of pressure-settlement response of footing supported by geocell reinforced bed

T. Shaghghi: E-mail address: [tahereh.shaghghi@gmail.com](mailto:tahereh.shaghghi@gmail.com)

S.N. Moghaddas Tafreshi (Corresponding Author): E-mail address: [nas\\_moghaddas@kntu.ac.ir](mailto:nas_moghaddas@kntu.ac.ir)

Civil Engineering Department, K.N. Toosi University of Technology, Tehran, Iran.

**ABSTRACT:** Geosynthetic material such as geotextile, geogride and geocell (as 3D-inclusion reinforcement) have been widely used in geotechnical engineering applications for, e.g., road construction layers, stable embankments over soft soil, longer-lasting road construction layers and expedient access over soft ground. An additional, possible, use would be to improve the bearing capacity of footings. Although, the analytical solutions on bearing capacity of planar reinforcements have most often been studied, there is a major lack of studies into the bearing capacity of footings when supported on geocell-reinforced soil. Thus, according to the widespread use of geocell-reinforced beds, providing an analytical approach to the design of shallow foundation and to explain its stress-settlement behavior can be very useful. Due to three-dimensional mechanism of geocell, the cell walls of geocell reinforcement keep the encapsulated soil from being displaced from the applied load by confining the material by hoop action of a cell thereby increasing the shear strength of the composite system. This paper presents a new analytical method based on the theory of pavement layers and theory of multi-layered soils for estimating pressure-settlement response of circular footings resting on reinforced sand bed with a single layer of Geocell. Elastic modulus of the unreinforced layers and geocell reinforced soil layer (geocell and soil inside the geocells' pockets) as a composite material, was evaluated by an equivalent composite material, which developed from triaxial compression tests on unreinforced and geocell-reinforced soil samples. Comparisons of the present analytical results with plate load test results show a favorable agreement, thus, this indicates the accuracy and appropriate performance of this method. Also, the parametric studies are carried out to investigate the influence of the dimensionless soil stiffness modulus, stiffness geotextile used in construction Geocell, height of geocell layer and diameter plate loading on the pressure settlement variations of footing.

**Keywords:** *Bearing capacity, Geocell, Settlement, Analytical method, Elastic modulus.*