INTERNATIONAL CONGRESS ON
CIVIL ENGINEERING, ARCHITECTURE & RECREATION OF METROPOLISES
TUM CONGRESS
GERMANY - MÜNCHEN
MUNICH - GERMANY
SEPTEMBER 17-18, 2019

Numerical simulation of pull-out test and bi-axial polymer geogrids behavior in sandy soil

Fereidoun Rezaie*, Seyed Alireza Nosrati, Hassan Negahdar.

1. Department of Earth Science, Research Institute for Earth Sciences, Tehran, Iran, rezaie.f@ries.ac.ir
2,3. Department of Civil Engineering, Central Tehran Branch, Islamic Azad University, Tehran, Iran, Nosrat.alireza@gmail.com

Abstract

Finite element method based three-dimensional numerical simulation was used to study the behavior of bi-axial polymer geogrid buried in sandy soil. Thus, the ABAQUS software was used, which is one of the commercial software that solves equations through finite element method. After verifying the accuracy of numerical simulation with experimental results, the effect of mechanical characteristics on pull-out capacity was also investigated. These mechanical characteristics include friction angle, dilatation and elastic modulus of the soil, geogrid hardness, overhead amount and ultimately buried length, and longitudinal and transverse members spacing. Also, the contribution of each of the friction and bearing components was evaluated in different conditions. The results indicated that increasing the angle of soil friction can increase the pull-out force, which leads to the reinforcement of the bearing component. If the overhead is increased, then the pull-out force will increase in the sample as well. The failure mode in changed with the overhead increase. In the case of geogrid hardness increase in a certain displacement, overhead and soil remain constant. Due to greater flexibility, soft geogrid has a greater tendency to get pulled (length change); while, in harder geogrid the intensity of this tendency is lower. By distance increase of the longitudinal members, the amount of pull-out force decreases dramatically, indicating that in a bi-axial polymer geogrid, the pull-out resistance is proportional to the number of longitudinal members. By increasing the distance of the transverse members, the amount of pull-out force decreases, which is due to the creation of a low pull-out region behind the transverse member and also to the reduction of bearing resistance due to the loss of effective space in the transverse member.

Key words: numerical simulation, bi-axial polymer geogrid, pull-out test, failure mode, mechanical characteristics.