OHN10110871244
Finite Element Modeling of Pullout Test on Geogrid Embedded in Pluviated and Compacted layer of Sand

M.R. Abdi [1], A.R. Zandieh[2]
1- Associate Professor, Faculty of Civil Engineering, KNT University, Tehran, Iran.
2- PhD Student, Faculty of Civil Engineering, KNT University, Tehran, Iran.

Corresponding Author's E-mail (Ali.Zandieh_2007@Yahoo.com)

Abstract
Reinforcements like bars, strips, textiles and grids are used for the reinforcement of soil walls, but the use of grids type of reinforcements is still under consideration and there is still a need of study the probable use of grids reinforcement in reinforced soil retaining walls. Pullout test is commonly used to predict actual field pullout behavior of reinforcements. In this paper, pullout test modeled with geogrid reinforcements embedded sand, clay and clay with thin layers of sand, under five different normal pressures of 5,25,50,75 kPa and 100 kPa. Finite element method (Plaxis V8) is used to compare the pullout behavior results. Normal pressures modeled and an optimum sand layer thickness was determined. Effect of sand layers combined with the geogrid reinforcement increased with increasing in normal pressures. The improvement was more pronounced at higher normal pressures. Test results indicate that provision of thin layers of sand on both sides of the geogrid is very effective in improving the pullout strength.
Keywords: Numerical Modeling (Plaxis V8), Geogrid, Clay, Sand, Pullout test

1. Introduction

This direction Reinforced soil retaining walls with planar reinforcement like textiles and grids have been used commonly for many applications like flyover abutments, retaining soil and industrial materials, roads and for hilly areas. The rapid acceptance of soil reinforcement can be attributed to a number of factors, including low cost, aesthetics, reliability, simple construction techniques, and the ability to adapt to different site conditions. However, these economic benefits have often been limited by the availability of good-quality granular material. Elias, Christopher.(1996) shows These materials have been the preferred backfill material due to their high strength and ability to prevent development of pore water pressure. Build up of pore water pressure, lower frictional strength and compatibility as well as higher post-construction creep potential are the main concerns expressed about the use of cohesive soils in soil reinforcement. These concerns may represent unrealistic restrictions in actual practice, where many highway embankments are constructed of compacted clays (Zornberg and Mitchell., 1994). One potential solution for reinforcing marginal soils is the use of permeable geosynthetics that function not only as reinforcement but also as lateral drains.Pullout tests are necessary in order to study the interaction behavior between soil and geosynthetics in the reinforced zone; hence, the resulting properties have direct implications on the design of reinforced soil structures. Pullout test behavior has been studied by several researchers to understand various factors affecting the pullout response of reinforcement, i.e., box size, sample size, sleeve length, front as well as side wall conditions, test speed, etc. The displacement-controlled monotonic loading has been applied to the geogrid specimen in most of the above studies.(Farrag et al., 1993; Sobhi and Wu, 1996; Sugimoto et al., 2001; Palmeira, 2004; Moraci and Recalcati, 2006 and Teixeira et al., 2007). Especially, Bergado et al.(2003) and Khedkar and Mandal (2007) simulated the pullout tests by finite element method based software 'Plaxis'. Many researchers (Bergado et al., 1987; Palmeira and Milligan, 1989; and Nernheim, 2005) made clear that geometry of the reinforcement is one of the important factors in pullout study. Present study aims are at understanding the interaction betweensoil and grids reinforcement Embedded in Thin Layers of Sandy soil within a clay soil under working surcharge pressures. Pullout testes are modeled with grids reinforcements under normal pressures of 5,25,50,75 kPa as well as 100 kPa. For this study finite element method analysis with the help of computer software 'Plaxis V8' can be used. This paper presents results of embedding reinforcements in thin layers of granular material within a clay soil