

Strength evaluation of wet reinforced silty sand by triaxial test

S.N. Moghaddas Tafreshi ¹, A. Asakereh ²

¹ Department of civil engineering, K.N. Toosi University of Technology

E-mail: nas_moghaddas@kntu.ac.ir

²Department of civil engineering, K.N. Toosi University of Technology

E-mail: asakereh@alborz.kntu.ac.ir

Abstract: Conventional investigations on the behavior of reinforced and unreinforced soils are often investigated at the failure point. In this paper, a new concept of comparison of the behavior of reinforced and unreinforced soil by estimating the strength and strength ratio (deviatoric stress of reinforced sample to unreinforced sample) at various strain levels is proposed. A comprehensive set of laboratory triaxial compression tests was carried out on wet (natural water content) non-plastic beach silty sand with and without geotextile. The layer configurations used are one, two, three and four horizontal reinforcing layers in a triaxial test sample. The influences of the number of geotextile layers and confining pressure at 3%, 6%, 9%, 12% and 15% of the imposed strain levels on sample were studied and described. The results show that the trend and magnitude of strength ratio is different for various strain level. It implies that using failure strength from peak point or strength corresponding to the axial-strain approximately 15% to evaluate the enhancement of strength or strength ratio due to reinforcement may cause hazard and uncertainty in practical design. Hence, it is necessary to consider the strength of reinforced sample compared with unreinforced sample at the imposed strain level. Only one type of soil and one type of geotextile were used in all tests.

Keyword: Triaxial test, soil reinforcements, geotextile, wet soil, strength, imposed strain

1. Introduction

Due to necessity of cost-saving, the reinforced soil has been widely used in geotechnical engineering applications such as construction of road and railway embankments, stabilization of slopes, improvement of soft ground, and so on. Numerous papers have investigated the beneficial effects of soil reinforcement to increase the strength (McGown et al. [1], Gray and AL-Refeai [2], Athanasopoulos [3], Krishnasawamy and Isacc [4], Chandrasekaran et al. [5], Haeri [6], Latha and Murthy [7], Xie [8], etc) using triaxial, direct shear, and plane strain tests. Athanasopoulos [3] carried out a series test using direct shear test in order to study the effect of particle size on the mechanical behavior of geotextile reinforced sand. The results conducted that dilatancy behavior of the reinforced sand was affected by aperture

ratio (defined as the ratio of the geotextile aperture size to the average sand particle size). Krishnasawamy and Isacc [4] performed cyclic triaxial tests to evaluate the liquefaction potential of sand with and without reinforcement. The results showed that the reinforced sand can be a promising solution to increase the safety against liquefaction. Chandrasekaran et al. [5] presented the results of the triaxial tests on both 100 and 200 mm diameters dry samples with woven and non-woven geotextiles. The results of tests showed that the deviatoric stress and axial strain at failure are increased with decreasing in distance of geotextile layers for both size samples. Haeri et al. [6] carried out triaxial compression tests in order to determine stress-strain and dilation characteristics of geotextile-reinforced dry beach sand. The results demonstrated that geotextile inclusion increases the peak strength, axial strain at failure, and ductility.