Public Abstract
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Graduation Term:FS 2007
Department:Civil Engineering
Degree:PhD
Title:A Constitutive Model for Fiber-Reinforced Soils

Use of fiber inclusions to improve the properties of compacted soil is becoming increasingly common in geotechnical engineering projects. However, the technique requires extensive testing before it can be implemented. A proposed constitutive model to predict the mechanical properties of fiber-reinforced soils is based on the superposition of the response of unreinforced soil and that of the fibers. Consolidated-undrained and consolidated-drained triaxial compression tests on both unreinforced and reinforced silty and Ottawa sand specimens were performed to develop a constitutive model for predicting the stress-strain-volume-pore pressure response of fiber-reinforced soil. The results showed that the effective stress friction angle and cohesion intercept increased significantly for both fiber-reinforced silty and Ottawa sand. Results of the laboratory tests indicate the shear strength parameters of fiber-reinforced silty sand and Ottawa sand are strain dependent. Moreover, it was found that fiber-reinforcement provides both a deviatoric and a hydrostatic contribution to the stresses in the specimens. The model was found to be capable of predicting the deviatoric stress well for all reinforced silty sand and Ottawa sand. The predicted pore pressure and volumetric strain closely match well for the observed response up to large strains. In drained tests, the deviatoric and hydrostatic stresses matched reasonably well and mimicked the measured behavior.