

Strength of Soft Clay Reinforced with Polypropylene Column

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Abstract : Granular columns is a technique that has the properties of improving bearing capacity, accelerating the dissipation of excess pore water pressure and reducing settlement in a weak soft soil. This research aims to investigate the role of Polypropylene column in improving the shear strength and compressibility of soft reconstituted kaolin clay by determining the effects of area replacement ratio, height penetrating ratio and volume replacement ratio of a singular Polypropylene column on the strength characteristics. Reinforced kaolin samples were subjected to Unconfined Compression (UCT) and Unconsolidated Undrained (UU) triaxial tests. The kaolin samples were 50 mm in diameter and 100 mm in height. Using the PP column reinforcement, with an area replacement ratio of 0.8, 0.5 and 0.3, shear strength increased approximately 5.27%, 26.22% and 64.28%, and 37.14%, 42.33% and 51.17%, for area replacement ratios of 25% and 10.24%. Meanwhile, UU testing showed an increase in shear strength of 24.01%, 23.17% and 23.49% and 28.79%, 27.29 and 30.81% for the same ratios. Based on the UCT results, the undrained shear strength generally increased with the decrease in height penetration ratio. However, based on the UU test results Mohr-Coulomb failure criteria, the installation of Polypropylene columns did not show any significant difference in effective friction angle. However, there was an increase in the apparent cohesion and undrained shear strength of the kaolin clay. In conclusion, Polypropylene column greatly improved the shear strength; and could therefore be implemented in reducing the cost of soil improvement as a replacement for non-renewable materials.

Keywords : polypropylene, UCT, UU test, Kaolin S300, ground improvement

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