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Prediction of Excess Pore Pressure Variation of Reinforced Silty Sand by Stone Columns During Liquefaction

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Abstract : Liquefaction has been responsible for tremendous amounts of damage in historical earthquakes around the world. The installation of stone columns is widely adopted to prevent liquefaction. Stone columns provide a drainage path, and due to their high permeability, allow for the quick dissipation of earthquake generated excess pore water pressure. Several excess pore pressure generation models in silty sand have been developed and calibrated based on the results of shaking table and centrifuge tests focusing on the effect of silt content on liquefaction resistance. In this paper, the generation and dissipation of excess pore pressure variation of reinforced silty sand by stone columns during liquefaction are analyzedwith different silt content based on test results. In addition, the installation effect of stone columns is investigated. This effect is described by a decrease in horizontal permeability within a disturbed zone around the column. Obtained results show that reduced soil permeability and a larger disturbed zone around the stone column increases the generation of excess pore pressure during the cyclic loading and decreases the dissipation rate after cyclic loading. On the other hand, beneficial effects of silt content were observed in the form of a decrease in excess pore water pressure.

Keywords : stone column, liquefaction, excess pore pressure, silt content, disturbed zone, reduced permeability
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