

Statistical Evaluation for Strength of Soil-cement Columns Subjected to Vertical Loading

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Soil-cement columns formed by deep mixing method or jet grouting are widely used in ground improvement to enhance vertical bearing capacity, lateral bearing capacity or shear capacity of soils. The material properties of cement-treated soils are usually with high variation. In this paper, the vertical bearing capacity of soil-cement columns is considered in a statistical approach. The sources of variations are considered as two parts: a deterministic radial mean-trend and stochastic fluctuations about the trend. The former is described by deterministic functions, and the latter are described by cylindrical random fields. Three-dimensional finite element analysis is conducted to examine the effects of these two sources of variations. Monte-Carlo simulations are conducted to examine the mean value and variance in responses. Parametric studies are conducted to investigate how the variations in strength of cement-treated soils affect the vertical bearing capacity of soil-cement columns.

Keywords: Soil-cement column, Radial trend, Stochastic fluctuation, Random finite element method