

Numerical analysis of stone column's behavior and comparing it with other soil improvement methods

Abstract:

Installing stone columns in the ground is an effective improvement technique to increase the load bearing capacity and reduce the consolidation settlement of the loose or weak cohesive soils. In addition to the increase in the bearing capacity and reduction in the settlement, stone columns can accelerate the dissipation rate of the excess pore water pressure generated by the surcharge, which expedites the ground improvement procedure. Due to these advantages, this technique has been widely used in the worldwide to improve the global mechanical properties of the soft and problematic soils.

In this study, the behavior of stone columns in saturated soft grounds are studied using Finite Element (FE) numerical method. For this purpose, stone column-improved ground is built considering the nonlinear behavior of the soil and stone columns. This model considers the effect of consolidation, and its accuracy is verified using the unit cell concept and the results of a real ground improvement project in Iran. In addition, a parametric study is performed using the verified FE model to investigate the effect of different material and geometric characteristics of the stone columns on the behavior of improved ground. At the end, the efficacy of the stone column method is compared with other methods of ground improvement technic. The Numerical Method used in this study was finite element and ABAQUS software was used.

Keywords: Soil improvement; Stone Columns; Numerical analysis; Finite element; Settlement reduction; Consolidation