Numerical Behaviour of Stone Column in Soft Clayey Soil

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Abstract. Soft clayey soils present a geotechnical challenge due to their low shear strength and high compressibility. The finite element package, ABAQUS, is used to perform a comprehensive numerical analysis on stone columns. The study investigates the bearing capacity and vertical and lateral deformations of soft clayey soils due to installing stone columns in them. The numerical model using the unit cell concept investigates the influence of varying two main physical parameters, i.e. the stone column material strength (φ), and the native soil cohesion (c). Moreover, this study utilizes variable numerical models to study the effect of the ratio between column length and its diameter, (L/d), on the efficiency of stone columns as a soil-enhancing method for weak clayey soil conditions. The influence of the stone column length on the occurred failure mode was studied. The outcomes demonstrated that using stone columns improves the behaviour of soft clayey soil, where the bearing capacity is enhanced and the soil surface settlement is reduced. Furthermore, using stone column filling materials with higher friction angles enhanced the stability of the system, and the optimum values of native soil cohesion and stone column materials friction angle are 30 kPa and 40 °, respectively. Also, the outcomes illustrated that increasing the applied pressure controls the bulging length of *SC*, where the bulging length was 2.5*d*, 3*d*, and 3.5*d* for the applied pressure of 50.0 kPa, 100.0kPa, and 150.0 kPa, respectively.