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Bearing capacity of a group of stone columns in soft soil
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Abstract
Installation of stone column is a viable, cost effective, and environmentally friendly ground-improvement technique. Columns are made of compacted aggregate and are installed in weak soil as reinforcements to increase the shear resistance of the soil mass and, accordingly, its bearing capacity. While a single stone column mostly fails by bulging, a group of stone columns together with the surrounding soil may fail by general, local, or punching shear mechanism, depending on the soil/columns/geometry of the system. The mode of failure of the reinforced ground could be identified based on the ground geometry and strength parameters of both stone column and soft soil. This paper presents an analytical model to predict the bearing capacity of soft soil reinforced with stone columns under rigid raft foundation subject to general shear-failure mechanism. The model utilizes limit-equilibrium method and the concept of composite properties of reinforced soil. The proposed theory was validated for the case of bearing capacity of footings on homogenous soil and via the laboratory and numerical results available in the literature for this case. Design procedure and charts are presented for practicing purposes. © 2014 American Society of Civil Engineers.

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