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Scale effect on the behavior of circular footing on geogrid-reinforced sand using numerical analysis

Abstract

Using plate load test to evaluate the scale effects of shallow foundation bearing capacity on geogrid-reinforced sand is expensive because large boxes need to be built, and the devices to apply the loads to the reinforced soil are complex. Consequently, the finite element method is an alternative to investigate this phenomenon. In this study, a series of 3D axi-symmetry finite element models were developed to study the scale effect on the bearing capacity of circular footings resting on geogrid-reinforced sand. First, a 100 mm-diameter circular foundation supported by geogrid-reinforced sand was simulated in order to validate the finite element model with laboratory tests. Subsequently, different models were made by increasing the diameter of the foundation and the diameter of the geogrid in the same proportion. Modelling results indicated that as the foundation diameter increased, the bearing capacity of unreinforced and reinforced soil decreased. Likewise, the benefit obtained from the reinforcement was less when the model size was increased.