On the Undrained Bearing Capacity of Soils Under Large Deformations

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Abstract:

In this study, the Arbitrary Lagrangian-Eulerian (ALE) method is employed to analyse the bearing capacity of an undrained soil layer under rigid strip footings, with a particular focus on the influence of large deformations. The ALE approach is implemented using the operator split technique, which decouples the material displacements from the mesh displacements. The primary objective of the study is to show how large deformations affect the response of soil to footing loads. This investigation presents that the bearing capacity of the undrained soil layer is influenced not only by its undrained shear strength but also by its stiffness. This dual dependence highlights the critical role of deformation-induced changes in the soil's mechanical response. The findings show the importance of accounting for shear strength as well as stiffness when evaluating the bearing capacity of undrained soils under conditions involving significantly large deformations.