



Consolidation in Unsaturated Soils with Body Forces

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ABSTRACT

Soil consolidation is a transient process by which soil volume is decreased due to the coupling between deformation of a porous medium and interstitial fluid flows. The influence of body force has been conventionally ignored in the consolidation theory of poroelasticity for either saturated or unsaturated soils. In the current study, gravity effect is well taken account in the coupled diffusion equations derived by Lo et al. (2014) for describing one-dimensional consolidation in unsaturated soils, thus leading to additional first-order time-derivative terms. Finite-difference approach is used to solve those equations. Numerical calculations are then conducted with respect to various initial water saturations and soil heights for unsaturated clays as illustrative examples. The result is compared to that typically obtained with neglecting body forces to quantify the impact of gravity on consolidation in unsaturated soils.

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