



ABSTRACT:

Consolidation in multi-layered soils: a hybrid computation scheme

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ABSTRACT

A new approach for computing one-dimensional consolidation in layered soils is presented. Traditionally, Terzaghi's one-dimensional consolidation equation is solved using an explicit finite difference scheme. The explicit approach requires that the timestep remains below some threshold that depends on layer thickness and permeability. For scenarios with large permeability contrasts between layers, a large number of timesteps may be needed to reach a consolidated state. The explicit method therefore becomes impracticably slow as the permeability contrast between layers increases. To overcome this, an implicit approach may be used in which the timestep can be much larger. The implicit solution is always stable, however for very short timesteps, the solution may be inaccurate.

A new method is presented here that uses the traditional explicit approach for short times, and then adaptively switches to an implicit solution to compute results at long times. This hybrid strategy significantly speeds up the required calculation time without sacrificing accuracy. Examples are presented showing the accuracy and speed of this new technique.