CONSOLIDATION SETTLEMENT DUE TO A POINT SINK WITH COMPRESSIBLE CONSTITUENTS

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Abstract

Based on Biot's linearized quasi-static elasticity theory of fluid-infiltrated porous materials, the constituent compressibilities of fluid and solid are taken into fully account on the mathematical modelling. The study is focused on the analytic solutions of transient consolidation due to a point sink. Using Laplace-Hankel integral transforms to solve the presented model, closed-form solutions of horizontal displacement, settlement and excess pore fluid pressure of the strata are derived. The compressibility of solid skeleton and pore fluid are important on transient consolidation deformation process. However, the long-term consolidation behaviors due to groundwater withdrawal are not directly dependent on the compressibility of poroelastic constituents of the saturated aquifer.

Keyword：Closed-form Solution, Consolidation Settlement, Golden Ratio, Groundwater Withdrawal.