

POINT HEAT SOURCE INDUCED TEMPERATURE INCREMENT AND EXCESS PORE WATER  
PRESSURE OF THE STRATA

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Abstract

Closed-form solutions for excess pore water pressure and temperature increment of the strata that results from an instantaneous point heat source buried in the strata are developed in this paper. The analytical solutions are derived for different cases of boundary conditions. The first case is for hydraulic boundary conditions with the half space treated as pervious or impervious during thermal consolidation. The second case is for thermal boundary conditions with the half space regarded as isothermal or adiabatic on the consolidation process. The formulations of the mathematical model are based on non-isothermal Biot's three-dimensional poro-mechanical theory. Closed-form solutions are derived by using Laplace-Hankel integral transform techniques. The solutions can be utilized to test numerical models and numerical simulations of the thermoelastic processes of the strata near the heat sources.

Keyword : Closed-form Solution, Half Space, Instantaneous Heat Source, Integral Transform.