Contribution ID: **54** Type: **Poster Presentation**

Analytical Investigation of Soil Settlement and Pore Pressure in Poroelastic Systems

Abstract

This study addresses the analytical solutions for one-dimensional consolidation problems, focusing on classical problems fundamental to geomechanics. Two key problems are examined: Terzaghi's consolidation problem and the loading by fluid pressure in a poroelastic medium. The analysis begins with revisiting Terzaghi's consolidation theory under poroelastic conditions, deriving solutions for pore pressure and settlement. Specifically, the governing equations are transformed into a homogeneous diffusion equation under certain conditions, yielding explicit solutions for both pore pressure and displacement. Subsequently, the impact of an applied fluid pressure on the surface of a soil stratum is explored. Solutions are derived by superposing two loading modes, resulting in comprehensive expressions for pressure and displacement profiles over time. The results elucidate the settlement characteristics and the dissipative nature of energy in these processes. The analytical solutions show that the initial pore pressure distribution is proportional to the applied load and decays over time, while the settlement progresses from an initial value to a final steady state. For the fluid pressure loading case, the surface settlement initially increases and then rebounds, illustrating the complex interaction between pore fluid pressure and soil deformation. This analytical framework not only reinforces the classical consolidation theory but also provides a robust basis for validating numerical models in poroelastic media.

Student presentation contest

Opt in

Journal Submission

Consider for Journal Submission

Student Poster Contest

Not Interested

Primary author: Ms DAVATGAR, Yeganeh

Co-author: Dr ABDOLLAHIPOUR, Abolfazl

Presenter: Ms DAVATGAR, Yeganeh

Track Classification: Geotechnique/Soil Mechanics