Settlement of Adjacent Existing Buildings Induced by Foundation Pit Excavation in Leaky Aquifers: Postprint

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Abstract

Taking the foundation pit project of Tanggu Station on Line B1 in Binhai New Area, Tianjin as the engineering background, the confined aquifer water level in this region is substantially lower than the groundwater table, and a leakage effect occurs under the influence of foundation pit dewatering and excavation. A numerical model for the deep foundation pit excavation process is established, utilizing numerical simulation methods to predict the deformation behavior of the retaining structure at varying excavation depths and to investigate the settlement patterns of existing buildings during the excavation progression. Considering the cross-formational seepage characteristics of confined water and adopting a fluid-solid coupling approach, this study examines the influence of stratum reconsolidation induced by confined water leakage on adjacent building settlement under accidental construction suspension scenarios at different excavation depths.

Full Text

Preamble

Study on Settlement of Existing Buildings Adjacent to Foundation Pit Excavation Considering Cross-Layer Seepage Effects in Aquifers

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Abstract

This study investigates the settlement of existing buildings adjacent to foundation pit excavation, using the Tanggu Station project on Line B1 in Tianjin's Binhai New Area as the engineering background. In this region, the confined

aquifer water level is substantially lower than the surface water level, resulting in cross-layer seepage effects under dewatering and excavation conditions. A numerical model of the deep excavation process is developed to predict the deformation behavior of retaining structures at various excavation depths and to characterize settlement patterns of adjacent buildings throughout the excavation sequence. Employing a fluid-solid coupling methodology that accounts for cross-layer seepage in confined aquifers, the study further examines how unexpected work stoppages at different excavation depths trigger strata re-consolidation via confined water cross-layer seepage, and how this process subsequently impacts the settlement of neighboring structures.

Keywords: Settlement prediction; Foundation pit excavation; Cross-layer seepage; Fluid-solid coupling

Note: Figure translations are in progress. See original paper for figures.