Postprint: A Calculation Method for Non-Limit Active Earth Pressure Considering the Effect of Soil State Transformation Prior to Excavation Instability

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Abstract

To expand the applicability of non-limit active earth pressure calculation prior to deep foundation pit instability and failure, a calculation method for non-limit active earth pressure considering time and displacement is derived based on the soil state transition effect before deep foundation pit instability and failure—namely, the fluid-like characteristics of cohesive soil and the division of the disturbed zone behind the retaining wall—by employing the soil rheological model and fluid motion momentum equation; the calculation equations are solved using COMSOL Multiphysics simulation software to obtain active earth pressure values concerning time and displacement before deep foundation pit instability and failure. Through comparison with experimental measured values and calculated values from existing literature, the results demonstrate that the non-limit active earth pressure calculation based on the soil state transition effect before foundation pit instability and failure is in closer agreement with experimental measured values, with an error within 3%, exhibiting higher accuracy; through analysis of the rheological parameters in the calculation model, the influence laws of soil's instantaneous elastic modulus, viscoelastic modulus, and viscosity coefficient on non-limit active earth pressure are obtained, among which the viscosity coefficient exhibits the most significant influence. The analysis results possess engineering guidance significance for the prevention and control of deep foundation pit instability and failure.

Full Text

Preamble

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