

Micro-Mechanics Modeling of Soil Arching in an Active Trapdoor Problem

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Soil arching effect is taking place during an underground excavation such as soft ground tunneling, where the soil pressure is transferred from a yielding support to an adjacent non-yielding support. The redistribution of pressure in the vicinity of the excavation is important so that the support system for underground structures can be properly designed. The soil arching theory can be understood and modeled through an active trapdoor problem. In this paper, we employ the discrete element method to model an active trapdoor problem. The simulated numerical results are compared with a series of geotechnical centrifuge model tests, where an active trapdoor was open under 75-g level. The effects of overburden pressure on the trapdoor, the shape and size of the trapdoor as well as the opening speed of the trapdoor are discussed.

Keywords: Soil arching, Trapdoor, Underground excavation, Discrete element method