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Ground Behaviour Around a Tunnel Using Various Soil Models

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ABSTRACT

Finite Element (FE) analyses are used world widely in geotechnical engineering to obtain the soil displacement caused by tunnelling. The surface settlement induced by tunnelling predicted by FE is known to be wider and shallower than the field measurements particularly for stiff clays with high coefficient of earth pressure at rest, K_0. It has been recognized that neglecting the non-linearity, anisotropy and threedimensional effects of the soil model as well as K_0 condition can be the reasons of this discrepancy. Unfortunately, such numerical studies were only limited to the problem in the plane strain condition whereas tunnelling is obviously a three dimensional (3D) problem. This paper compares 3D FE modelling of tunnel constructions in stiff soil of London Clay using non-linear soil model with low and high K_0 regimes. It was found that modelling using isotropic non-linear soil with low value of K_0 gave the best matched-fit data on the observed greenfield surface settlement as opposed to the other soil models. In addition, the model is able to replicate the steady-state condition of ground movement after the completion of tunnel construction that is when the tunnel face has passed seven times of the tunnel diameter beyond the boundary point. This steady-state condition is not possible to simulate using other soil models.