Evaluation of Geomechanical and Geometrical Parameters' Effects on Hydro-Mechanical Estimation of Water Inflow into Underground Excavations

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Abstract : In general, mechanical and hydraulic processes are not independent of each other in jointed rock masses. Therefore, the study on hydro-mechanical coupling of geomaterials should be a center of attention in rock mechanics. Rocks in their nature contain discontinuities whose presence extremely influences mechanical and hydraulic characteristics of the medium. Assuming this effect, experimental investigations on intact rock cannot help to identify jointed rock mass behavior. Hence, numerical methods are being used for this purpose. In this paper, water inflow into a tunnel under significant water table has been estimated using hydro-mechanical discrete element method (HM-DEM). Besides, effects of geomechanical and geometrical parameters including constitutive model, friction angle, joint spacing, dip of joint sets, and stress factor on the estimated inflow rate have been studied. Results demonstrate that inflow rates are not identical for different constitutive models. Also, inflow rate reduces with increased spacing and stress factor.

Keywords : distinct element method, fluid flow, hydro-mechanical coupling, jointed rock mass, underground excavations

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