

Nonlinear analysis of stability of rock wedges in the abutments of an arch dam due to seismic loading

Abstract. Investigation of the stability of arch dam abutments is one of the most important aspects in the analysis of this type of dams. To this end, the Bakhtiari dam, a doubly curved arch dam having six wedges at each of its abutments, is selected. The seismic safety of dam abutments is studied through time history analysis using the design-based earthquake (DBE) and maximum credible earthquake (MCE) hazard levels. Londe limit equilibrium method is used to calculate the stability of wedges in abutments. The thrust forces are obtained using ABAQUS, and stability of wedges is calculated using the code written within MATLAB. Effects of foundation flexibility, grout curtain performance, vertical component of earthquake, nonlinear behavior of materials, and geometrical nonlinearity on the safety factor of the abutments are scrutinized. The results show that the grout curtain performance is the main affecting factor on the stability of the abutments, while nonlinear behavior of the materials is the least affecting factor amongst others. Also, it is resulted that increasing number of the contraction joints can improve the seismic stability of dam. A cap is observed on the number of joints, above which the safety factor does not change incredibly.