



Effect of valley shape on the seismic response of earthfill dam - a 3D numerical parametric study

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When dams are to be constructed in seismic prone areas, dynamic analysis in addition to static analysis has to be performed. For a given earthquake loading, the results of the dynamic analysis depend on many parameters of which the properties of the materials of the dam body contribute more. In addition to the material properties of the dam body, the topographic conditions of a site can amplify or attenuate the input earthquake loading during seismic analysis of earth fill dams. This is because the irregular surface of the dam site has direct effect on the dynamic response of constructed structures on it. In order to study the amplification or attenuation effect of the topographic site conditions of a site, a three dimensional dynamic simulation of a hypothetical earth fill dam resting on a trapezoidal shape of a valley has been carried out. The shape of the trapezoid has been varied so that a parametric study of the geometrical shape factors will be dealt. This paper presents the results of a numerical parametric study on the amplification/attenuation seismic response of an earth fill dam resting on a trapezoidal valley site, subjected to earthquake loading. The calculations have been executed in time domain by using an explicit finite difference based numerical code, FLAC3D and elasto-plastic Mohr-Coulomb constitutive behavior model. Finally, a relationship between the amplification and geometrical shape factors of the valley has been created so that the results of the simulation will be applicable in practice. Moreover, conclusions regarding the importance of the topographic conditions on the seismic response of earth fill dams are forwarded.

Key words: topography, earthquake loading, dynamic response, simulation, elasto-plastic, amplification.