

Concrete Arch-Gravity Dam on Guadalfeo River: Seismic Hazard Analysis and Numerical Methods for the Performance of the Structure's Body

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ABSTRACT

The focus of this presentation is to describe the seismic hazard assessment on the site of Rules dam, in Granada province - southern Spain - and its total seismic response. The seismic hazard assessment has been made following traditional criteria: analysis of catalogues, isolation of source zones, determination of stochastic Poisson process, choice of attenuation relations and results. The selection of earthquakes, the Deterministic Seismic Hazard Assessment (DSHA) and the Probabilistic Seismic Hazard Assessment (PSHA) procedure are important to define the Operating Basis Earthquake (OBE) and Safety Evaluation Earthquake (SEE) in order to analyze the consequences of a dam failure and to estimate minor damage acceptance. Time-history analysis will be carried out to identify the main characteristic earthquakes by using the European strong motion database. The dam analysis using software needs to be done to calculate the dam-fluid period, the flexible and rigid hydrodynamic pressure and the maximum arch stress and maximum cantilever stress. The interaction fluid-structure is important in order to study the behavior of critical elements in the case of an empty or full reservoir. There are other factors which can affect the dam's behavior such as the vertical component of the earthquake and the silt in the reservoir bottom: the vertical pressure of the reservoir is subject to these two factors. The concrete arch gravity dam needs to be modeled in two- and three-dimensional in accordance to classic theoretical method and current codes. A dam is an extremely strategic work which needs to be carefully designed to avoid environmental damage to water reservoirs and to nearby facilities and human security. Given that the recent sources of hazard in Spain are from 2015, it would be advisable to reassess the seismic hazard, particularly related to existing dams of category A - in accordance to Spanish code - in areas of high seismicity.