

Seismic Integrity Determination of Dams in Urban Areas

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Abstract : The urban and economic development of cities demands the construction of water use and flood control infrastructure. Likewise, it is necessary to determine the safety level of the structures built with the current standards and if it is necessary to define the reinforcement actions. The foregoing is even more important in structures of great importance, such as dams, since they imply a greater risk for the population in case of failure or undesirable operating conditions (e.g., seepage, cracks, subsidence). This article presents a methodology for determining the seismic integrity of dams in urban areas. From direct measurements of the dynamic properties using geophysical exploration and ambient seismic noise measurements, the seismic integrity of the concrete-faced rockfill dam selected as a case of study is evaluated. To validate the results, two accelerometer stations were installed (e.g., free field and crest of the dam). Once the dynamic properties were determined, three-dimensional finite difference models were developed to evaluate the dam seismic performance for different intensities of movement, considering the site response and soil-structure interaction effects. The seismic environment was determined from the uniform hazard spectra for several return periods. Based on the results obtained, the safety level of the dam against different seismic actions was determined, and the effectiveness of ambient seismic noise measurements in dynamic characterization and subsequent evaluation of the seismic integrity of urban dams was evaluated.

Keywords : risk, seismic, soil-structure interaction, urban dams

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