SEISMIC FRAGILITY ANALYSIS OF CONCRETE GRAVITY DAMS

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ABSTRACT
This paper introduces a practical methodology with example for development of seismic fragilities for concrete gravity dams using nonlinear time-history seismic analyses with Latin Hypercube Simulation (LHS). Sliding at the dam base and lift joints are identified as two prominent failure modes of the dam. Random and uncertainty input variables influencing the seismic fragility are generated using LHS and randomly selected to develop seismic fragilities for both failure modes. Nonlinear seismic analyses are performed for ten trials at several ground motion levels until each trial indicates failure. The ground motion variable includes ten sets of acceleration time histories obtained from the actual earthquake recordings and matched to a target response spectrum. The probability of failure for each random nonlinear trial is calculated as a function of the peak failure acceleration associated with the incipient sliding. The calculated results are used to obtain the best-fit distribution to the data.