



Seismic Response Analysis of Concrete Gravity Dam using Response Spectrum Analysis and Response History Analysis

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Abstract

The seismic analysis of concrete gravity dams has been a topic of considerable research in the earthquake literature. Because of the computational difficulty in performing a complete analysis of realistic dams considering different types of interactions, many simpler methods are adapted to assess the seismic performance of the concrete gravity dams. In this paper, the 2D analysis of the dry dam is performed using three types of analysis, namely response spectrum analysis (RSA), Base sliding method, and Response history analysis (RHA). Two slices are considered for the 2D analysis, one across the spillway section and the other across the highest non-overflow section. The seismic performances of these two slices are evaluated by these three types of analysis and compared. The example problem considers the Koyna dam subjected to the Koyna earthquake ground motion and its response spectrum. The performance evaluation is met with respect to three response quantities: displacement at the crest, peak maximum principal stress, and the maximum principal stress induced at the neck of the downstream where the slope changes. The results of the study show that (i) responses obtained by these three analyses significantly vary, (ii) both RSA and the base method underestimate the response by about 20-30%, (iii) the difference in response depends on the slices considered, and (iv) RSA appears to be not suitable for the design of the dam for earthquake analysis.

Keywords: Concrete gravity dam, Seismic performance, Comparison of RSA and RHA