

## Size Effects on Structural Performance of Concrete Gravity Dams

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**Abstract :** Concern about seismic safety of concrete dams have been growing around the world, partly because the population at risk in locations downstream of major dams continues to expand and also because it is increasingly evident that the seismic design concepts in use at the time most existing dams were built were inadequate. Most of the investigations in the past have been conducted on large dams, typically above 100m high. A large number of concrete dams in our country and in other parts of the world are less than 50m high. Most of these dams were usually designed using pseudo-static methods, ignoring the dynamic characteristics of the structure as well as the characteristics of the ground motion. Therefore, it is important to carry out investigations on seismic behavior this category of dam in order to assess and evaluate the safety of existing dams and improve the knowledge for different high dams to be constructed in the future. In this study, size effects on structural performance of concrete gravity dams subjected to near and far-fault ground motions are investigated including dam-water-foundation interaction. For this purpose, a benchmark problem proposed by ICOLD (International Committee on Large Dams) is chosen as a numerical application. Structural performance of the dam having five different heights is evaluated according to damage criterions in USACE (U.S. Army Corps of Engineers). It is decided according to their structural performance if non-linear analysis of the dams requires or not. The linear elastic dynamic analyses of the dams to near and far-fault ground motions are performed using the step-by-step integration technique. The integration time step is 0.0025 sec. The Rayleigh damping constants are calculated assuming 5% damping ratio. The program NONSAP modified for fluid-structure systems with the Lagrangian fluid finite element is employed in the response calculations.

**Keywords :** concrete gravity dams, Lagrangian approach, near and far-fault ground motion, USACE damage criterions

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