

EFFECT OF FOUNDATION FLEXIBILITY AND IMPEDANCE CONTRAST ON THE RESPONSE OF GRAVITY DAMS

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ABSTRACT

The complexity of the interactions between the three structural systems of gravity dam viz. dam-reservoir-foundation rock, compel the designers to adopt various simplified methods for the dynamic analysis. While these methods are necessary for the ease of computation they offer, it is imperative that interaction between the components of the coupled system be modeled properly and the results of these simplified methods be interpreted in an appropriate manner. This paper deals with study of responses of the dam to variation in the major material properties such as Young's modulus and Poisson's ratio for the foundation rock over a range of expected values. Koyna dam deepest non-overflow monolith has been analyzed for its response to the recorded Koyna ground motion under various impedance contrast values and Poisson's ratios. The properties of the dam concrete are treated as constants at the actual experimental values. Foundation and the structure are analyzed under 2-D linear elastic conditions. The results show that the Soil-Structure-Interaction is greatly influenced by the impedance contrast between the dam and the foundation. Comparison of the dam responses obtained in this study with the published literature and the actual behavior of the dam during 1967 Koyna earthquake, validates the study conducted and emphasizes the importance of correct values of material properties for the dam and foundations.

KEYWORDS: Gravity Dam, Earthquake Ground Motion, Soil-Structure Interaction, Acceleration Time History, Impedance Ratio