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DETERMINATION OF PARAMETERS FOR A SEISMIC ANALYSIS OF THE VICTORIA DAM

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The Victoria dam is a doubly curved concrete arch dam. An extreme event such as an earthquake can cause severe damages to this important structure. Studies on the effects of earthquakes on the Victoria dam will be beneficial in structural appraisals after any unexpected loading events and for disaster management planning. However such analyses are complicated because there are several variable parameters that characterize an earthquake. This paper presents results from a basic earthquake analysis of the Victoria dam in order to identify the earthquake loading parameters that deserve particular attention in future detailed studies. Researchers have pointed out that in 3-D analysis of arch dams under earthquake loading stresses may be overestimated or underestimated due to several modeling approximations. In this study emphasis is placed on the trends rather than on precise values.

Linear time history analysis in SAP 2000 package was employed to determine the earthquake response of Victoria dam. Peak stresses in the dam were computed for different values of some of the earthquake parameters, viz. peak ground acceleration (pga), frequency content, and duration of ground motion. Koyna earthquake accelerograms were used as the basic input motion. They were scaled for pga values of 0.02g, 0.1g, and 0.15g. The analysis was performed for three frequency cases: actual frequency; frequency increased by 10%; frequency decreased by 10%. The durations of ground motion were set at 10, 20, and 30 seconds.

The peak stresses vary almost linearly with the pga (within the range of values used) for all frequency contents considered. They decrease with increasing frequencies (within the range studied) for all pga's. However the changes appear to be less pronounced for longer motion durations. Both these trends seem to apply regardless of the duration of ground motion. An explanation might be that all three durations considered are long in comparison to the largest natural period of the dam.

It is concluded that for moderate pga's the peak stresses from one value of pga may be scaled linearly to estimate the stresses for different pga's. The effects of changing frequencies cannot be so scaled. The length of the duration of ground motion seems to be of secondary importance, provided that it is long in comparison to the natural period of the dam.

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