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Damage of a concrete gravity dam under the effect of the hydrodynamic loads

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Abstract : For the proper design of vital structures as a dam, in order to avoid considerable damage in downstream of the structure, a deepen study must be established. The hydrodynamic behavior is very important for the determination of the damages through the dam body, which have effects on the failures and consequences on the internal resistance and the stability of the structure. This work attempts to elucidate the effect of seismic loading and inertia through the variation of Peak Ground Acceleration (PGA) and the time of seismic recording. A damage model based on a continuous approach and taking into account the tensile strength of the concrete and the elastic deformations is applied. The Koyna dam situated in India with a height of 103 m, which experienced in 1967 a considerable earthquake causing the rupture of the structure is taken as an example of application for our study, two seismic records are applied, the first is that of Koyna in December 1967 with a duration of 10 seconds, and the other that of Saguenay in Canada in November 1988 of a duration of 15 seconds with intensities less than the first. We noted that the acceleration considerably induces the horizontal displacements at the crest dam which lead to more important damages going from downstream to upstream causing the rupture of the structure, on the other hand the duration of the recording with weak intensities does not cause significant damage.

KEYWORDS : Crack ; Dam ; Hydrodynamic