World Academy of Science, Engineering and Technology
International Journal of Structural and Construction Engineering
Vol:11, No:05, 2017

Seismic Fragility of Weir Structure Considering Aging Degradation of Concrete Material

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Abstract : This study presented the seismic fragility framework of concrete weir structure subjected to strong seismic ground motions and in particular, concrete aging condition of the weir structure was taken into account in this study. In order to understand the influence of concrete aging on the weir structure, by using probabilistic risk assessment, the analytical seismic fragility of the weir structure was derived for pre- and post-deterioration of concrete. The performance of concrete weir structure after five years was assumed for the concrete aging or deterioration, and according to after five years’ condition, the elastic modulus was simply reduced about one–tenth compared with initial condition of weir structures. A 2D nonlinear finite element analysis was performed considering the deterioration of concrete in weir structures using ABAQUS platform, a commercial structural analysis program. Simplified concrete degradation was resulted in the increase of almost 45% of the probability of failure at Limit State 3, in comparison to initial construction stage, by analyzing the seismic fragility.

Keywords : weir, FEM, concrete, fragility, aging
Conference Title : ICCSEE 2017 : International Conference on Civil, Structural and Earthquake Engineering
Conference Location : Singapore, Singapore
Conference Dates : May 04-05, 2017