

## Seismic Performance of Nuclear Power Plant Structures Subjected to Korean Earthquakes

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**Abstract :** Currently, the design response spectrum (i.e., Nuclear Regulatory Commission - NRC 1.60 spectrum) with the peak ground acceleration (PGA) 0.3g (for Safe Shutdown Earthquake level) is specified for designing the new nuclear power plant (NPP) structures in Korea. However, the recent earthquakes in the region such as the 2016 Gyeongju and the 2017 Pohang earthquake showed that the possible PGA of ground motions can be larger than 0.3g. Therefore, there is a need to analyze the seismic performance of the existing NPP structures under these earthquakes. An NPP model, APR-1400, which is designed and built in Korea was selected for a case study. The NPP structure is numerically modeled in terms of lumped-mass stick elements using OpenSees framework. The floor acceleration and displacement of components are measured to quantify the responses of components. The numerical results show that the floor spectral accelerations are significantly amplified in the components subjected to Korean earthquakes. A comparison between floor response spectra of Korean earthquakes and the NRC design motion highlights that the seismic design level of NPP components under an earthquake should be thoroughly reconsidered. Additionally, a seismic safety assessment of the equipment and relays attached to main structures is also required.

**Keywords :** nuclear power plant, floor response spectra, Korean earthquake, NRC spectrum

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