

Evaluation of Floor Response Spectra of Base Isolated Structure for the Seismic Fragility Assessment

Jung Han Kim¹, Min Kyu Kim², In-Kil Choi³

¹ Senior Researcher, Korea Atomic Energy Research Institute, Korea

² Principal Researcher, Korea Atomic Energy Research Institute, Korea

³ Principal Researcher, Korea Atomic Energy Research Institute, Korea

Introduction

Floor response spectra (FRS) represent the seismic load to equipment in a structure such as containment building or auxiliary building of nuclear power plants. For the seismic fragility assessment of equipment, the FRS need to be evaluated by increasing seismic intensity. In case of conventional nuclear power plants, the FRS can be calculated only for a reference seismic intensity level. It's because the structure has enough strength to be assumed to behave linearly until equipment of interest fails. However, the base isolated structure has basically non-linear behaviour and the FRS need to capture the nonlinear increase by increasing seismic intensity.

In this research, the nonlinear increase of FRS is evaluated in the increment of seismic level. The numerical model has simple representative structural model and non-linear link element for the seismic isolation system under the structure. The FRS is quantified for different frequency ranges of the isolation mode and structural modes. The methodology is developed to express the function of FRS with regard to seismic intensity level. Finally, the result is applied to the estimation of fragility curve and the screen out criteria of equipment in the seismically isolated structures.