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Seismic Fragility of Base-Isolated Multi-Story Piping System in Critical Facilities

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Abstract : This study is focused on the evaluation of seismic fragility of multi-story piping system installed in critical structures, isolated with triple friction pendulum bearing. The concept of this study is to isolate the critical building structure as well as nonstructural component, especially piping system in order to mitigate the earthquake damage and achieve the reliable seismic design. Then, the building system and multi-story piping system was modeled in OpenSees. In particular, the triple friction pendulum isolator was accounted for the vertical and horizontal coupling behavior in the building system subjected to seismic ground motions. Consequently, in order to generate the seismic fragility of base-isolated multi-story piping system, 21 selected seismic ground motions were carried out, by using Monte Carlo Simulation accounted for the uncertainties in demand. Finally, the system-level fragility curves corresponding to the limit state of the piping system was conducted at each T-joint system, which was commonly failure points in piping systems during and after an earthquake. Additionally, the system-level fragilities were performed to the first floor and second floor level in critical structures.

Keywords : fragility, friction pendulum bearing, nonstructural component, seismic
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