Use Of A Novel Rate-Independent Damper For Performance Improvement Of A Seismically Isolated Building Structure

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It is common concerned that seismically isolated structures may suffer excessive seismic responses when subjected to extreme earthquake-induced ground motion containing dominating low-frequency components. To suppress those responses, various damping devices have been used and incorporated into the isolation layer with increased damping. Supplementing damping by using traditional damping devices is indeed beneficial in reducing the excessive isolator displacement but sometimes at the expense of floor response acceleration. A novel rate-independent damping device consisting of Maxwell and negative stiffness elements in parallel was recently found by the authors to be advantageous over traditional damping devices, because it can simultaneously control response displacement and floor acceleration of low-frequency structure subjected to strong ground motion. In this study, we further investigated the seismic performance of a seismically isolated building structure incorporated with such a novel rate-independent damper when subjected to long-period ground motion induced by extreme earthquake events. For this purpose, both near- and far-field recorded ground motion were used for nonlinear response history analyses of the controlled building structure, with the nonlinearity of the novel damping device considered. Numerical examples illustrated the benefit of the proposed method in improving the performance of seismically isolated building structures.