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Performance Based Seismic Retrofit of Masonry Infiled Reinforced Concrete Frames Using Passive Energy Dissipation Devices

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Abstract : The paper presents a plastic analysis procedure based on the energy balance concept for performance based seismic retrofit of multi-story multi-bay masonry infilled reinforced concrete (R/C) frames with a 'soft' ground story using passive energy dissipation (PED) devices with the objective of achieving a target performance level of the retrofitted R/C frame for a given seismic hazard level at the building site. The proposed energy based plastic analysis procedure was employed for developing performance based design (PBD) formulations for PED devices for a simulated application in seismic retrofit of existing frame structures designed in compliance with the prevalent standard codes of practice. The PBD formulations developed for PED devices were implemented for simulated seismic retrofit of a representative code-compliant masonry infilled R/C frame with a 'soft' ground story using friction dampers as the PED device. Non-linear dynamic analyses of the retrofitted masonry infilled R/C frames is performed to investigate the efficacy and accuracy of the proposed energy based plastic analysis procedure in achieving the target performance level under design level earthquakes. Results of non-linear dynamic analyses demonstrate that the maximum inter-story drifts in the masonry infilled R/C frames with a 'soft' ground story that is retrofitted with the friction dampers designed using the proposed PBD formulations are controlled within the target drifts under near-field as well far-field earthquakes.

Keywords : energy methods, masonry infilled frame, near-field earthquakes, seismic protection, supplemental damping devices
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