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Performance-based evaluation of the steel structures were rehabilitated by steel plate shear wall with tension-bracing

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Abstract

The seismic rehabilitation of existing buildings in earthquake prone regions is considered by governments, specially regard to buildings with high importance usage. So, the optimized rehabilitation methods under consideration of economic problems and guidance of building codes for different situation should be considered. In this study, non-linear performance analysis of existing and strengthened steel structures by a thin steel plate as a supplemental shear wall system for a 7-stories structure is performed according to FEMA-356. In the proposed system, the plate and surrounding boundary elements are installed in the middle of the bay, separate from existing columns. This geometry intends to eliminate the need to strengthen the existing columns, as these typically would have been designed only for the combined forces of gravity and seismic loads. The system employs supplemental elements as tension-only elements to speed up the construction work and to enforce strict capacity design principles and the last experimental tests had showed the efficiency of these tendons. In this method damage ratios of the structural members and global performance levels are determined as well as modal properties and story drift ratios after non-linear finite elements analysis for each structure. Hinges production and distribution of those showed the efficiency of columns in structures and due to energy absorption and high ductility of this system, also the conclusion showed the noticeable decreasing in drift ratios for various stories.

Keywords: Seismic Rehabilitation, Ductility Capacity, Nonlinear Static (Pushover) Analysis, Steel Plate Shear Wall, Drift Ratio.

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