Performance evaluation of controlled steel frames under multilevel seismic loads

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Abstract
The goal of this research is to evaluate different structural control methods in enhancing the overall structural performance under seismic excitations. This study focuses on steel moment resisting frames and several types of possible controllers: (1) friction pendulum base isolation system; (2) linear viscous dampers; and (3) active tendon brace system. Two structures are selected from the SAC Phase II project, the three story system, and the nine story system. Simulations of these systems, both controlled and uncontrolled, are prepared using the three suites of earthquake records, also from the SAC Phase II project, that represent three different return periods. Several controllers are developed for each structure, and their performance is judged based on both roof and interstory drift and normalized dissipated hysteretic energy. Results indicate that structural control systems are effective solutions that can improve structural performance. All three control strategies investigated can significantly reduce the seismic demands on a structure, thereby reducing the expected damage to the structure.

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