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Friction-based force-limiting connections for earthquake-resistant buildings

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Practical force-limiting connections between the floor-diaphragms and the vertical elements of the seismic force resisting systems in buildings have been developed [1]–[7]. The use of force-limiting connections (1) limits the force and acceleration responses of buildings (2) reduces the variability in the force and acceleration responses due to the ground motion variability, and (3) mitigates the effects of higher mode responses on the dynamic responses of buildings. Friction-based force-limiting connections can be designed to remain undamaged during earthquakes, and they can be reused after earthquakes. They are axially stiff, compact, easy-to-assemble, and can accommodate the seismic-induced three-dimensional kinematic requirements. The force-displacement response of friction-based force-limiting connections depends on the effect of machining tolerances, the materials used in the frictional interface (i.e., metallic and non-metallic materials), and the characteristics and the sequence of the loading displacement history (i.e., dwell-time, sliding velocity, cumulative sliding, and break-in effect). This presentation focuses on results from large scale tests of friction-based force-limiting connections. It highlights the limitations and needs for future research related to the use of practical friction-based force-limiting connections in earthquake resistant buildings.

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