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Experimental studies on a combined damper for repairable steel moment connections

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In this paper results of cyclic tests on a new connection system able to passively dissipate energy in steel structures are presented. The connection system was mainly constituted of a rubber layer and several steel bolts. The rubber layer was meant to transfer the vertical and its share of the horizontal reactions, while the steel bolts were used mainly for hysteretic energy dissipation. Twelve samples of the proposed connection were tested cyclically. Between different samples, thickness of the rubber layer, steel type of the bolts, loading rate and arrangement of the steel bolts were varied. Results of the cyclic experiments are summarized as follows- (1) All of the samples exhibited stable cycles of hysteresis behavior with no pinching up to large inelastic deformations. (2) No strength and stiffness degradations were observed in the samples. (3) The samples with thinner thicknesses of the rubber layer and those with stainless steel bolts illustrated maximum energy dissipation capacities. (4) Shape of the hysteresis curves of the proposed connection is not sensitive to the load rating, because the nonlinear behavior is governed by yielding of the steel bolts in lateral movement. Therefore they can be active under different types of earthquake loading. (5) Nonlinear behavior of the proposed connection is also insensitive to arrangement of the steel bolts as aligned or non-aligned and to the bolts being uniform or variable in section. Finally, in a separate paper, a much larger number of R-SCD connections have been analyzed under cyclic loading. In addition to the above facts, concentration of the inelastic deformations in the bolts away from the story beam and column and connection plates has been confirmed in that work.

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