Secondary Aseismic Damping To Protect Tension-Only Braced Structures From Degrading With Seismic Strikes

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Tension-only braced structures consisting of weak columns, through beams and tension-only braces (TOBs) are widely used in prefabricated steel structures. In this paper, contrary to previous studies, the performance of tension-only braced structures is verified to degrade with seismic strikes, once the plasticity in the TOBs is generated. Tension-only braced structures are especially vulnerable under long duration or mainshock and aftershocks coupling strikes for lack of secondary aseismic system. Therefore, a space-saving secondary aseismic damping idea with the asymmetrical friction damper is proposed accordingly. The damping force is relatively small to the yield force of TOB, so that it also can be applied in retrofitting. Nonlinear time history analyses were carried out on the structures with and without secondary aseismic damping. The structure without secondary damping degraded with seismic strikes and collapsed. Conversely, inter-story drifts and peak floor accelerations were both successfully reduced in the structure with secondary aseismic damping, which means the secondary aseismic damping is good for both structural and non-structural components.