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Evaluation of Hybrid Viscoelastic Damper for Passive Energy Dissipation

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Abstract : This research examines the performance of a hybrid passive control device for enhancing the seismic response of steel frame structures. The device design comprises a damper which employs a viscoelastic material to control both shear and axial strain. In the design, energy is dissipated through the shear strain of a two-layer system of viscoelastic pads which are located between steel plates. In addition, viscoelastic blocks have been included on either side of the main shear damper which obtains compressive strains in the viscoelastic blocks. These dampers not only dissipate energy but also increase the stiffness of the steel frame structure, and the degree to which they increase the stiffness may be controlled by the size and shape. In this research, the cyclical behavior of the damper was examined both experimentally and numerically with finite element modeling. Cyclic loading results of the finite element modeling reveal fundamental characteristics of this hybrid viscoelastic damper. The results indicate that incorporating a damper of the design can significantly improve the seismic performance of steel frame structures.

Keywords : cyclic loading, energy dissipation, hybrid damper, passive control system, viscoelastic damper
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