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Seismic Response of Idealized Three Storey Frame Equipped with Magnetorheological-shape Memory Alloy hybrid Damper

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Abstract

The requirement of more spaces for residential and business offices and advancement in construction technology attracts civil engineers and contractors to build high-rise and asymmetrical buildings worldwide. Such buildings are more vulnerable during seismic and wind loadings. The present study is focused on vibration mitigation of 3-storey buildings using a Magnetorheological (MR)-shape memory alloy (SMA) hybrid damper. The seismic response of an idealized three-storey frame equipped with an MR-SMA damper is investigated using numerical analysis. To perform the analysis of the idealized building, the Simulink tool is used for the constitutive modeling of SMA and MR dampers along with the state space equation. To check the effectiveness of the proposed damper, a displacement response of a controlled frame with MR-SMA damper is compared with an uncontrolled frame. Further, the results show that the MR-SMA damper is capable of reducing the displacement of the structure significantly.

Keywords: Shape memory alloy, Magnetorheological fluid, Earthquake, Buildings