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Performance of Steel Frame with a Viscoelastic Damper Device under Earthquake Excitation

Authors : M. H. Mehrabi, S. S. Ghodsi, Zainah Ibrahim, Meldi Suhatril

Abstract : Standard routes for upgrading existing buildings to improve their seismic response can be expensive in terms of both time and cost due to the modifications required to the foundations. As a result, interest has grown in the installation of viscoelastic dampers (VEDs) in mid and high-rise buildings. Details of a low-cost viscoelastic passive control device, the rotary rubber braced damper (RRBD), are presented in this paper. This design has the added benefits of being lightweight and simple to install. Experimental methods and finite element modeling were used to assess the performance of the proposed VED design and its effect on building response during earthquakes. The analyses took into account the behaviors of non-linear materials and large deformations. The results indicate that the proposed RRBD provides high levels of energy absorption, ensuring the stable cyclical response of buildings in all scenarios considered. In addition, time history analysis was employed in this study to evaluate the RRBD’s ability to control the displacements and accelerations experienced by steel frame structures. It was demonstrated that the device responds well even at low displacements, highlighting its suitability for use in seismic events of varying severity.

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