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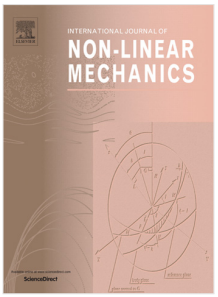

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Experimental investigation of an impact-based, dual-mode vibration isolator/absorber system

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Abstract

This paper considers the novel use of a displacement-limited isolated secondary system for the protection of both an acceleration sensitive object and the primary system housing the object. The amplitude-dependent non-linear behavior is harnessed to operate in two modes—vibration isolator and vibration absorber—depending on the disturbance intensity. The model considered in this experimental study is a three-story moment-resisting steel frame with a displacement-limited isolation system on the second floor. In the experimental study the frame is tested on a shaking table under harmonic excitations with the isolation system under three configurations: locked, isolated without impacts, and isolated with impacts. It is found that the accelerations sustained by the isolated mass are effectively reduced while operating in the linear vibratory regime at small-to-moderate disturbance amplitudes, and then the primary structure drifts are reduced in the non-linear vibratory regime at large disturbance amplitudes through the initiation of impacts. Based on these findings, it is concluded that this impact-based, dual-mode vibration isolator/absorber system has the potential to become a practical and effective way to reduce potential damage over a range of hazard levels.

Keywords: isolation, vibro-impact, dynamic interaction, secondary system

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