

## **An Innovative Mass Damper Enabled By Three Different Types Of Masses And Internal Vibro Impacts**

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To take advantage of linear, nonlinear, and impact-type mass dampers, an innovative vibro-impact tri-mass damper (VITM) is proposed. The VITM consists of three masses including a linear oscillator, a nonlinear oscillator, and a free mass between them. The vibro impacts occur between the adjacent masses within the VITM and thus large structural responses otherwise aroused by the vibro impacts between the device and the structure can be avoided. First, the working principles and mathematical descriptions of the VITM are developed. The VITM is then compared with four existing control devices on a three-story primary structure under impulsive excitations. Following the parametric study of the VITM, its robustness against frequency and energy changes is investigated. Finally, the VITMs are applied to the seismic protection of the structure. With small device damping requirement and space demand, the VITM demonstrates as an effective and affordable control strategy with great potential.