

MARTI and MRSD: Newly Developed Isolation-Damping Devices with Adaptive Hardening for Seismic Protection of Structures

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Abstract : In this paper, a summary of analytical and experimental studies into the behavior of a new hysteretic damper, designed for seismic protection of structures is presented. The Multi-directional Torsional Hysteretic Damper (MRSD) is a patented invention in which a symmetrical arrangement of identical cylindrical steel cores is so configured as to yield in torsion while the structure experiences planar movements due to earthquake shakings. The new device has certain desirable properties. Notably, it is characterized by a variable and controllable-via-design post-elastic stiffness. The mentioned property is a result of MRSD's kinematic configuration which produces this geometric hardening, rather than being a secondary large-displacement effect. Additionally, the new system is capable of reaching high force and displacement capacities, shows high levels of damping, and very stable cyclic response. The device has gone through many stages of design refinement, multiple prototype verification tests and development of design guide-lines and computer codes to facilitate its implementation in practice. Practicality of the new device, as offspring of an academic sphere, is assured through extensive collaboration with industry in its final design stages, prototyping and verification test programs.

Keywords : seismic, isolation, damper, adaptive stiffness

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