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ENERGY DISSIPATION DEVICES AND FOUNDATION STRENGTHENING

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ABSTRACT

Existing new retrofitting structural schemes are being used in Mexico to enhance the resistance of existing buildings to earthquake forces. There are accompanied by improvements to and innovative uses of traditional concentrically-braced frames incorporating energy dissipative devices, to act as a first defense line against seismic forces.

This novel design approach identifies the energy dissipated by some special devices, specifically located at strategic locations in the structure, as the largest portion of the total earthquake's input energy, leaving only a small part of it, to be dissipated by the non-linear behavior of the structure, or ductility. Other types of energy dissipation like the kinetic energy and elastic strain energy (potential energy), represent a small portion only on the Energy balance equation.

The advantages of these schemes is that they recognize the very possible fact that the existing structural framing may not be capable of performing in a fully ductile manner, as demonstrated in recent strong earthquakes in Mexico City (1985), Northridge (1994) and Kobe (1995).

Thus, most part of the structure remains elastic during an intense earthquake, while the largest source of energy dissipation takes place in a controlled manner at the stable histeresis cycles of such special devices. As a consequence of it, large amounts of additional internal damping values are also incorporated in the structure, which in turn reduce the magnitude of the accelerations during an earthquake.

This paper presents a case study in which ADAS devices had been installed, and discusses appropriate issues of its design, construction, displacement compatibility and force-transfer mechanisms. It also presents the procedures followed in the revision and strengthening of its foundation and reviews the information recorded by eight accelerometers installed on the building, from several medium-to-strong earthquakes during the last 18 months.