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FINITE ELEMENT ANALYSIS OF OVAL-SHAPED YIELDING DAMPERS AND ENHANCING THEIR PERFORMANCE USING LATERAL STIFFENING PLATES

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Abstract:

Nowadays passive dampers are currently used as a tool to absorb most of the earthquake energy in structures. Among passive dampers, yielding dampers have proper efficiency in seismic loading. While yielding dampers reach through plastic limit, they use input energy of the structure for their plastic change.

Oval shaped dampers in chevron-braced steel frames attract a major part of seismic energy through their yielding and prevent buckling of braces like a fuse. Lateral strength of these dampers should be arranged to be optimum as the damper will not work with small strength. On the other hand, too much strength causes easy buckling of dampers and thus it is inefficient.

Furthermore, to enhance efficiency of yielding dampers, geometrical properties of damper must be defined in a way that most parts of damper reach yielding point. Oval-shaped damper might buckle under influence of shear forces resulting from lateral movement of frame and will have no appropriate energy dissipation. In such case, a small force is created within braces and frame practically behaves in bending behavior.

Increase in thickness of oval-shaped damper has no significant effect on enhancement of their performance and is not suitable option to solve this problem. Using stiffening plates in dampers significantly improves efficiency and prevents its buckling.

Keywords: damper_ yielding damper_ finite element_ ABAQUS_ oval-shaped