

Seismic Assessment of Passive Control Steel Structure with Modified Parameter of Oil Damper

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Abstract : Today, the passively controlled buildings are extensively becoming popular due to its excellent lateral load resistance circumstance. Typically, these buildings are enhanced with a damping device that has high market demand. Some manufacturer falsified the damping device parameter during the production to achieve the market demand. Therefore, this paper evaluates the seismic performance of buildings equipped with damping devices, which their parameter modified to simulate the falsified devices, intentionally. For this purpose, three benchmark buildings of 4-, 10-, and 20-story were selected from JSSI (Japan Society of Seismic Isolation) manual. The buildings are special moment resisting steel frame with oil damper in the longitudinal direction only. For each benchmark buildings, two types of structural elements are designed to resist the lateral load with and without damping devices (hereafter, known as Trimmed & Conventional Building). The target building was modeled using STERA-3D, a finite element based software coded for study purpose. Practicing the software one can develop either three-dimensional Model (3DM) or Lumped Mass model (LMM). Firstly, the seismic performance of 3DM and LMM models was evaluated and found excellent coincide for the target buildings. The simplified model of LMM used in this study to produce 66 cases for both of the buildings. Then, the device parameters were modified by $\pm 40\%$ and $\pm 20\%$ to predict many possible conditions of falsification. It is verified that the building which is design to sustain the lateral load with support of damping device (Trimmed Building) are much more under threat as a result of device falsification than those building strengthen by damping device (Conventional Building).

Keywords : passive control system, oil damper, seismic assessment, lumped mass model

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