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EVALUATION OF EFFECTIVE PERFORATION PATTERNS OF STEEL PLATE SHEAR WALLS

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Abstract
Since several decades, Steel Plate Shear Walls (SPSWs), which consist of thin steel plates inserted within a surrounding steel frame, were used as resistant systems of buildings against seismic loads. In order to reduce the stresses to boundary frame members, these systems can be appropriately weakened by some holes.
The distribution level of stresses around the holes is dependent on their dimension, number and location. In order to avoid fracture phenomena, such concentrations of stresses can be checked through the evaluation of equivalent plastic strains in the steel plate.
In the current study, firstly a benchmark experimental test on a perforated SPSW has been simulated by the ABAQUS non-linear numerical analysis software.
Subsequently, a parametric FEM analysis on SPSWs with different holed configurations has been carried out aiming at assessing the fracture distribution around holes and the energy dissipation of tested devices.
Finally, the achieved results have been compared with those achieved from using the best perforation pattern defined by the AISC code, allowing to select the optimal holed configuration able to exhibit the highest dissipative behavior.

Keywords:
Steel Plate Shear Panels-Fracture-Perforation