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Seismic Performance of Steel Shear Wall Using Experimental and Numerical Analysis

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Abstract : Steel plate shear walls (SPSWs) are a robust lateral load resistance structure because of their high flexibility and efficient energy dissipation when subjected to seismic loads. This research investigates the seismic Performance of an innovative infill web strip (IWS-SPSW) and a typical unstiffened steel plate shear wall (USPSW). As a result, two 1:3 scale specimens of an IWS-SPSW and USPSW with a single story and a single bay were built and subjected to a cyclic lateral loading methodology. In the prototype, the beam-to-column connections were accomplished with the assistance of semi-rigid end-plate connectors. IWS-SPSW demonstrated exceptional ductility and shear load-bearing capacity during the testing process, with no cracks or other damage occurring. In addition, the IWS-SPSW could effectively dissipate energy without causing a significant amount of beam-column connection distortion. The shear load-bearing capacity of the USPSW was exceptional. However, it exhibited low ductility, severe infill plate corner ripping, and huge infill web plate cracks. The FE models were created and then confirmed using the experimental data. It has been demonstrated that the infill web strips of an SPSW system can affect the system's high Performance and total energy dissipation. In addition, a parametric analysis was carried out to evaluate the material qualities of the IWS, which can considerably improve the system's seismic performances. These properties include the steel's strength as well as its thickness.

Keywords : steel shear walls, seismic performance, failure mode, hysteresis response, nonlinear finite element analysis, parametric study.
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