



Evaluation and Comparison of Seismic behavior of Steel Plate Shear Wall Containing Circular and Rectangular Openings under Cyclic Load

Mohammad Mohammadi Dehcheshmeh ^{1*}, Moslem Malekmohammadi ²

^{*1} Assistant Professor, Department of Civil Engineering, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran

(m.mohammadi.dehcheshmeh@iaushk.ac.ir)

² Ph.D. Candidate, Department of Civil Engineering, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran

(Date of received: 08/09/2021, Date of accepted: 24/12/2021)

ABSTRACT

Considering this point that Iran is located in the seismic belt, buildings must have enough strength against seismic loads. One of the methods against seismic load is the utilization of steel plate shear walls. Steel plate shear wall has been taken into account considerably in recent four decades in such a way that in many countries including the USA, and Japan using this system has become usual and common for strengthening of buildings against earthquake. Performed studies show a good performance of this system against lateral loads. Evaluation of seismic behavior of shear walls in various conditions can be a good guideline for optimum design of these walls. In this research, three different models of the shear wall have been built in finite element software of ABAQUS, and seismic properties of them including displacement and corresponding force or yielding limit, displacement and corresponding force or ultimate limit, absorbed energy and initial stiffness have been evaluated. Important results were obtained from performed research such as the existence of opening in steel plate shear wall in any state creates weak seismic performance in the wall, however, it can be profitable economically. Creating of opening in the middle plate of the shear wall in an amount of 17% can decrease the absorbed energy level of an earthquake by up to 15%. The seismic properties of shear walls containing rectangular and circular openings do not differ greatly from each other, therefore it is suggested that rectangular openings be used so that in addition to easier construction, the surrounding of the opening can be strengthened with FRP plates in case it was needed.

Keywords:

Steel plate shear wall, Opening, Seismic load, Finite element analysis, ABAQUS