

عنوان مقاله:

NUMERICAL STUDY AND NONLINEAR MODEL OF THE EFFECT OF GUSSET-REINFORCED STIFFENER ON THE STEEL PLATE SHEAR WALLS WITH OPENING

محل انتشار:

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خلاصه مقاله:

The steel shear wall has been considered as a lateral load-bearing system in the design and seismic rehabilitation due to the numerous advantages. The high absorption and bearing capacity and the post-buckling behavior of steel shear walls are significant in the nonlinear behavior of the system. The extremely high strength and stiffness of the system controls the lateral displacement of the structure and ensures the good performance under the moderate lateral loads. The ductility of steel plates in steel shear walls results in the good performance under the strong seismic loads. Various regulations, including the Canadian Steel Structural Design Code and the FEMA450, provide the criteria for the design of steel shear walls. In recent years, the requirements for the design of special steel shear walls have been incorporated into the AISC341 and ASCE7 regulations for the seismic design of steel structures. In this paper, the seismic behavior of the steel shear wall with circular opening and stiffeners strengthened with gusset plate has been numerically studied, which has not been considered in previous studies. Initially, the selected numerical method was validated by laboratory results in previous studies. Then, four samples of single-story steel shear walls of similar dimensions and sizes and identical openings were modeled and analyzed in ABAQUS software for two different arrangements of stiffeners with gusset plate in two cases where the gusset stiffener is placed on the one side or both sides of the steel shear wall and the gusset plates are placed every 15 cm one at top and one at bottom of the stiffener. By analyzing the results of the analysis and the pushover curves obtained for each model, the seismic parameters such as strength, stiffness, ductility and energy absorption of the panels were compared. The results of the analysis of the nonlinear models showed that the local or global buckling was not observed in the columns. Also, a better seismic behavior was observed in the sample with the rhombic gusset stiffener that is placed at the rhombus vertices 1 cm away from the horizontal and vertical boundary members and the stiffeners were welded back to back on the both sides of the shear wall. In addition, according to the results observed in the steel shear wall with the gusset stiffener that is welded to the steel shear wall on one side, it showed a good behavior, and due to the ease of implementation of the steel shear wall with the gusset stiffener on one side, it was recommended for the project implementation.

کلمات کلیدی:

Steel Plate Shear Walls, Gusset-reinforced stiffener, Energy absorption, Ductility

