

## **Abstract**

Since early 1970s, steel plate shear walls have been used in many steel structures as the main lateral load-resisting system. These systems initially have been implemented using stiffeners or thick steel plates. Later on with the expansion of research in the field of nonlinear-postbuckling behavior of steel plates, unstiffened steel plate shear walls with slender plates have become widely used in several buildings. Steel plate shear walls are ductile systems with high energy dissipation capacity and in comparison with concrete shear walls have many advantages including easy erection, low construction cost and light weight.

On the other hand precast concrete structures have their own advantages and disadvantages, high speed and low cost construction besides high accuracy of erection are just some of the reasons behind the increased demand for precast concrete elements for the last 100 years, however some problems regarding the stability of the structure and beam-column connections have restricted the use of these systems to low seismic regions. This thesis investigates the seismic behavior of combined steel plate shear wall and precast concrete structures. First, nonlinear static analysis of finite element and tension-strip models of a 3 storey precast concrete frame with steel plate shear wall is conducted. Second, nonlinear static analysis of strip models of several 5 and 10 storey frames with different types of beam-column connections is conducted in order to compare the resultant push-over shapes and to compute the ductility and behavior factors of these frames.

The results of these analyses show that steel plate shear walls increase the stiffness and the ultimate strength of precast concrete structures significantly. Despite the fact that different semi-rigid beam-column connections can increase the stiffness and the ultimate strength of the precast concrete structures, these connections have very little impact on the ductility and considering the low construction cost of hinge beam-column connections, it seems that steel plate shear walls can be used as the main lateral load-resisting system in precast concrete structures with hinge beam-column connections.