THE IMPACT OF FLANGE DIMENSIONS OF VERTICAL LINK BEAM ON ITS SEISMIC PERFORMANCE

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Reducing casualty and financial loss due to earthquakes in recent years have been the focus of researchers in order to develop vibration controllers and dampers. One of useful methods is to use passive control which reduces seismic demand and at the same time increases the ductility of the system. Among the passive dampers, using shear panels is one of the most effective and simplest methods.

These shear panels or vertical link beams are not embedded in floor so they can be easily replaced after earthquakes. These dampers dissipate a major part of the input energy resulting in a minimized damage of the structural parts of system.

This paper presents a numerical study on the impact of flange dimensions of vertical link beams on their seismic performance. Despite most previous research projects in which wide-flange I sections are considered for the vertical link beam, here the objective is to investigate the possibility of using narrowe flange.

The first model is on an IPE160 section for vertical link beam having experimental results (Figure 1) to compare and verify the output of the modelling process (Zahrai, 2014). First, the paper tries to show what happens if the flange of IPE160 becomes wider. So, the first model is *a vertical link beam* which resembles the IPE160 but with a twice flange width. The results show that wider flange has approximately no impact on dissipating seismic energy. It only becomes a little stiffer which is negligible.

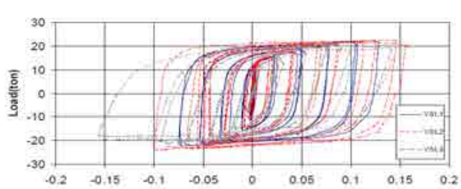

Figure 1. Experimental hysteretic behavior of shear panel for 3 samples

The other part of the paper, tries to investigate if the flange of IPE160 becomes narrower (half of the tested sample). So there is a model that its flange width is reduced to 41mm (Figure 2). The results show that the stiffness of the system is reduced, and consequently the forces including yield forces are reduced as well. However, according to the results, stable hysteresis curve with sufficient energy dissipation is seen if the thickness of the web increases or the link length becomes shorter and there would be the same performance like IPE160 (Figures 3 and 5).

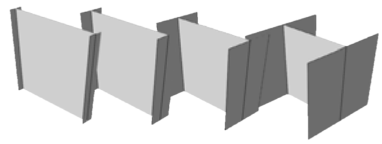

Figure 2. Models with different flange wide

In the other model, a section is used which have properties like the IPE160, but the flange width is reduced to 20.5mm (Figure 4). The results are approximately similar to the previous model; i.e., there is no stiffness reduction with respect to the previous model (Figure 6).

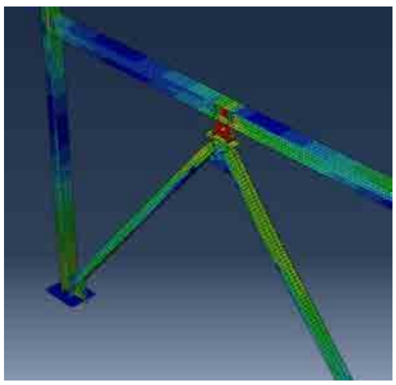

Figure 3. Modeling vertical link beam in abaqus

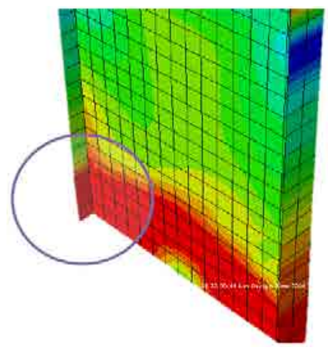

Figure 4. Negligible buckling in model with 20.5mm flange width

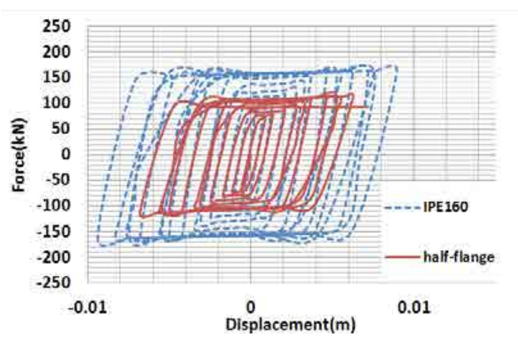

Figure 5. Reducing system stiffness rather to tested sample

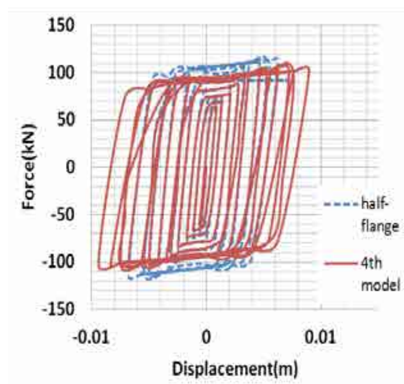

Figure 6. Same performance though the wide of flange is reduced

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