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Modified Side Plate Design to Suppress Lateral Torsional Buckling of H-Beam for Seismic Application

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Abstract : One of the method to solve the lateral torsional buckling (LTB) problem is by using side plates to increased the buckling resistance of the beam. Some modifications in designing the side plates are made in this study to simplify the construction in the field and reduce the cost. At certain region, side plates are not added: (1) At the beam end to preserve some spaces for bolt installation, but the beam is strengthened by adding cover plate at both flanges and (2) at the middle span of the beam where the moment is smaller. Three small scale full span beam specimens are tested under cyclic loading to investigate the LTB resistant and the ductility of the proposed design method. Test results show that the LTB deformation can be effectively suppressed and very high ductility level can be achieved. Following the test, a finite element analysis (FEA) model is established and is verified using the test results. An intensive parametric study is conducted using the established FEA model. The analysis reveals that the length of side plates is the most important parameter determining the performance of the beam and the required side plates length is determined by some parameters which are (1) beam depth to flange width ratio, (2) beam slenderness ratio (3) strength and thickness of the side plates, (4) compactness of beam web and flange, and (5) beam yield strength. At the end of the paper, a design formula to calculate the required side plate length is suggested.

Keywords : cover plate, earthquake resistant design, lateral torsional buckling, side plate, steel structure
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