ABSTRACT

Numerical models are made to study the behavior of inelastic buckling and the effect of connecting plate's thickness towards the compressive resistance of discontinuous bracing members in steel X-braced frames. The connection are bolted single shear splice connections commonly used for hollow steel section bracing members. Two sections of HSS are modeled in finite element analysis program ANSYS with 12 types of mid-connecting plate's thickness each section. The sections are both HSS 127x127x7.9 and HSS 102x102x6.4. The numerical model for inelastic buckling is validated against full-scale test data from past experiment. The numerical models are analyzed by considering large deflection method and geometric and material nonlinearities to gain better response of the X-braced frames. The material property is assumed as elastic perfectly plastic material without considering strain hardening. A quasi-static loads are assigned to the model until failure reached. The result is the numerical model has underestimated buckling resistance. Numerical models have lower buckling resistance than test data. Failure is generally indicated by the buckling that located on the gap between mid-connecting plates where overstress happens until the model reach optimum plate thickness. Failure occur on the HSS member when optimum connecting plate reached. The effect of connecting plate's thickness towards the compressive resistance is also studied. HSS 127x127x7.9 appears to have more effective effect than the HSS 102x102x6.4 one. Ratio of thickest plate's buckling resistance to thinnest plate's buckling resistance on HSS 127x127x7.9 is 1.55, the other is 1.13. HSS 102x102x6.4 has small effect because the section is suspected to have reached the optimum mid-connecting plate's thickness.

***Keywords**: inelastic buckling, X-bracing, single shear lap connection, finite element, non-linear analysis.*