ABSTRACT

Block shear is a limit state that should be accounted for during the design of steel tension members. Experimental test results for structural tees in tension, bolted to connections only through the flanges has shown a block shear failure path termed as alternate path block shear failure (ABS). This study reports numerical study using finite element method in predicting the strength of structural tees in tension, that are connected through their flanges and investigating that ABS might be indicated. Non-linear time history analysis is used in this study. Strength predicted by finite element method is also compared with AISC 360-10's prediction and ABS strength prediction which is based on Epstein's formulas. Finite element results show good accuracy in predicting strength compared with experimental test results by 1 – 16% difference. Results show that strength predicted from Epstein's formulas give more conservative results than the strength predicted by finite element method and experimental results. Analyses also proves that connection length affects the strength of the member. Longer connection gives higher strength. Moreover, analyses show that bending deformation exists. This study shows that structural tees, bolted to connections only through the flanges do not undergo block shear failure path assumed by AISC. Stress distribution path resulting from finite element method depicts the indication of ABS.

Keywords: block shear, structural tees, alternate path block shear failure, ABS, finite element method, AISC