

## ABSTRACT

Nguyen, Nam Thanh. M.S.C.E., Purdue University, August 2011. Shear Yielding Strength of Gusset Plate in Lap Splice Joints. Major Professors: Amit Varma, Mark Bowman

Fillet welded Lap Splice Joints are commonly used to connect tension members to a single gusset plate. In most cases, the shear yielding strength, or Base Metal Shear Yielding (BMSY) strength, of the gusset plates controls the capacity of the connection. The stress from tension members is transferred to the gusset plate through fillet welds, causing the yielding of the gusset plate. In current engineering practice, designers use the “Shear of Elements in Shear” equation from the AISC-05 to estimate the BMSY strength of gusset plates. The gross area subjected to shear is assumed to be the product of weld length and thickness of the gusset plate. However, the approach does not account for the material adjacent to the weld. Shear stress can travel away from the welds, increasing the gross area and total BMSY strength of the gusset plate.

Six lap welded specimens were tested in this research to serve two purposes. One specimen was used to study the stress profiles on the gusset plate and tension members. The remaining specimens were tested to determine the actual shear yielding strength of the gusset plates. A new analytical mode was created from test results to predict shear yielding strength more accurately. In addition, fifteen finite element models were analyzed to study the effects of the geometric parameter such as weld length, edge distance, and weld separation. The results of the research provide designers flexibility to increase the BMSY strength of the gusset plate, thus possibly increasing the capacity of the connection.