Abstract

Bolted field-splicing during steel girder erection presents many challenges that may need to be addressed in the field by the ironworker. Girder rotations, especially when erecting curved girders, may make align bolt-holes between the splice elements difficult due to the tolerances required from the conventional design prescribed by AASHTO (American Association of State Highway and Transportation Officials) design specifications. This thesis seeks to develop a novel bolted splice design that allows for greater tolerances during erection, primarily through the use of battered web splice plates. The novel design allows for faster girder erection with self-correcting geometry to account for girder rotations, and with easier alignment of splice elements and bolt holes. Potentially lengthy traffic closures may be mitigated and more girders may be erected within the work shift.

Finite element analysis was performed to verify that the novel splice design is comparable in strength to the conventional splice design. Ocel (2017) performed finite element modeling using Abaqus on an example splice design to investigate the splice design method that is currently implemented into the 8th edition of the AASHTO LRFD Bridge Design Specification. This thesis used LARSA to perform the finite element analysis in a similar manner. The example splice analyzed by Ocel (2017) using Abaqus was also analyzed using LARSA to validate that the LARSA analysis output is comparable. Then a case study design splice was analyzed, comparing the conventional design with the novel design at the design moment and shear loads. Resultant stresses and bolt forces were analyzed to verify the capacity of the novel splice design and to suggest further development.