

ABSTRACT

Steel-plate composite (SC) structures offer superior structural performance and accelerated construction schedules. However, potential construction flaws can compromise their integrity, which are not directly addressed by the existing codes and standards. These potential construction flaws such as voids in concrete, delamination or separation between steel faceplate and concrete infill, defective stud welding, CJP weld defects and plate-plate (module) weld misalignments can compromise their performance.

This study investigates the impact of potential flaws on SC structures under axial compression, pushout, and axial tension loading. The study also includes a literature review of potential non-destructive evaluation (NDE) methods used for detecting flaws in SC structures. Experimental and numerical analyses were conducted on scaled SC specimens with intentionally introduced flaws. Results indicate that within defined limits, most flaws do not significantly influence the load-bearing capacity of SC specimens, however, can influence the failure modes. Delamination (equals to plate thickness) can significantly affect the interfacial shear behavior and strength of the SC specimens. Steel plate-plate weld misalignment coupled with CJP weld defects can adversely affect both load-bearing capacity and ductility. This study provides guidance and outlines the reduction in strength and changes in behavior (such as failure mode and ductility) caused by above-mentioned flaws.