Experiment on different T-joint characteristics for laser-welded I-core galvanized steel sandwich plates

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ABSTRACT

The sandwich plate is one of the lightweight structures that have been utilized in lightweight applications. One of the topologies, such as I-core, was designed to evaluate the mechanical behavior when subjected to 3-point bending test. A theoretical formula for an I-core sandwich plates was discussed on the bending stiffness. In this project, galvanized steel elements (faceplate and core) were fabricated through welding. The manufacturing process for both galvanised steel and PVC foam was mentioned in detail, and the laser weld geometry parameters were summarized. Significantly, T-joint were made into different weld dimension characteristic. Hence, special equipment was used to assemble the elements. Overall, the study shows a positive outcome. It can be seen that with and without rootgap divide the centric and eccentric characteristic curve. The sequence from higher to lower stiffness is as follows: centric + no rootgap > eccentric + no rootgap > centric + rootgap > eccentric + rootgap. An ideal characteristic generates higher stiffness than other failures by inserting PVC foam: for instance, eccentric + no rootgap presented 5.2% difference from ideal. Furthermore, faceplate failure mode is a noticeable deformation displayed during the experiment, such as face wrinkling and face yielding. Meanwhile, debonding is also a notable failure mode, demonstrated at the T-joint and PVC foam. Therefore, this study provides a useful understanding of strength and stiffness via different T-joint weld dimension characteristics and failure mode of I-core sandwich plates.

KEYWORDS: I-core sandwich plate, 3-point bending test, T-joint characteristic, Failure mode

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