

NUMERICAL STUDY ON RESIDUAL STRESSES IN HIGH STRENGTH Q690 COLD-FORMED CIRCULAR HOLLOW SECTIONS

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ABSTRACT

Cold-formed circular hollow sections (CFCHS) are manufactured by a number of methods such as cold bending and roll forming, and then welding. These manufacturing processes will generate different levels of residual stresses within the sections, which will affect their structural performance.

In this paper, a numerical study on residual stresses in high strength Q690 cold-formed circular hollow section is reported. A two-dimensional finite element model is presented to simulate the cold bending process of Q690 steel plates. These residual stresses were then incorporated into a three-dimensional finite element model, and a coupled thermomechanical analysis was carried out to the model to simulate welding. Consequently, a finite element modelling approach was established in which the residual stresses induced by both the cold bending process and the welding process were successfully incorporated for subsequent structural modelling.

Keywords: High strength steel, circular hollow sections, residual stress, finite element modeling.