

## Impact of Welding Distortion on the Design of Fabricated T-Girders Using Finite Element Modeling

**Authors :** Ahmed Hammad, Yehia Abdel-Nasser, Mohamed Shamma

**Abstract :** The main configuration of ship construction consists of standard and fabricated stiffening members which are commonly used in shipbuilding such as fabricated T-sections. During the welding process, the non-uniform heating and rapid cooling lead to the inevitable presence of out-of-plane distortion and welding induced residual stresses. Because of these imperfections, the fabricated structural members may not attain their design load to be carried. The removal of these imperfections will require extra man-hours. In the present work, controlling these imperfections has been investigated at both design and fabrication stages. A typical fabricated T-girder is selected to investigate the problem of these imperfections using double-side welding. A numerical simulation based on finite element (FE) modeling has been used to investigate the effect of different parameters of the selected fabricated T-girder such as geometrical properties and welding sequences on the magnitude of welding imperfections. FE results were compared with the results of experimental model of a double-side fillet weld. The present work concludes that: Firstly, in the design stage, the optimum geometry of the fabricated T- girder is determined based on minimum steel weight and out- of- plane distortion. Secondly, in the fabrication stage, the best welding sequence is determined on the basis of minimum welding out- of- plane distortion.

**Keywords :** fabricated T-girder, FEM, out-of-plane distortion, section modulus, welding residual stresses

**Conference Title :** ICAPMW 2020 : International Conference on Advanced Physical Metallurgy of Welding

**Conference Location :** Rome, Italy

**Conference Dates :** January 16-17, 2020