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Finite element analysis on fire resistance of collar plate reinforced CHS T-joints

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Summary

A group of finite element models, reinforced circular hollow section (CHS) T-joints, are established to investigate the fire resistance compared with the un-reinforced by using finite element program ABAQUS in this paper. Sequentially coupled thermal-stress analysis is used to simulate the process of tubular T-joint under different loading levels in the condition of fire. The heat properties of the steel use the specified values in Eurocode 3. The fire resistance performance of collar plate reinforce CHS T-joints and the un-reinforced models are studied under different loading levels. The applied loads are 20%, 40%, 60% and 80% of the static strength respectively. The displacement, deformation and reaction force at fixed chord ends of the reinforced CHS T-joints are compared with the un-reinforced ones. Beyond that, the geometric parameters of tubular T-joint, such as I2, I3 and , also affect the fire resistance. Several conclusions are drawn that the collar plate can enhance the axial stiffness of chord and the performance of fire resistance of T-joint. The deformation decreases comparing with the unreinforced T-joint. The counter-force is also affected by the collar plate welded on the chord. In addition, the place of local buckling transfers from the intersection between chord and brace to the vicinity of collar plate during heating. Finally, some prospects and advice are proposed to guide the future work.