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Effects of Geometrical Parameters on Static Strength of Tubular KT-Joints at Fire Condition

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Abstract : This paper aims to study the structural behavior of tubular KT-joints subjected to axial loading at fire induced elevated temperatures. At first, a finite element (FE) model was developed and validated against the data available from experimental tests. Then, a set of 810 FE analyses were performed to study the influence of temperature and dimensionless geometrical parameters (β, γ, θ, and τ) on the ultimate strength and initial stiffness. The joints were analyzed under two types of axial loading and five different temperatures (20 ºC, 200 ºC, 400 ºC, 550 ºC, and 700 ºC). Results show that the ultimate strength and initial stiffness of KT-joints decrease considerably by increasing the temperature. In the joints having bigger values of the β, the temperature elevation leads to less reduction in ultimate strength; while in the joints with bigger values of the γ, the temperature elevation results in more reduction in ultimate strength. The influence of the θ on the ultimate strength is independent from the temperature. To our knowledge, there is no design formula available for determining the ultimate strength of KT-joints at elevated temperatures. Hence, after parametric study, two equations were developed through nonlinear regression, for calculating the ultimate strength of KT-joints at elevated temperatures.

Keywords : axial loads, fire condition, parametric formula, static strength, tubular KT-joint
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