World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:13, No:07, 2019

Numerical Study on the Ultimate Load of Offshore Two-Planar Tubular KK-Joints at Fire-Induced Elevated Temperatures

Authors : Hamid Ahmadi, Neda Azari-Dodaran

Abstract : A total of 270 nonlinear steady-state finite element (FE) analyses were performed on 54 FE models of two-planar circular hollow section (CHS) KK-joints subjected to axial loading at five different temperatures (20 ºC, 200 ºC, 400 ºC, 550 ºC, and 700 ºC). The primary goal was to investigate the effects of temperature and geometrical characteristics on the ultimate strength, modes of failure, and initial stiffness of the KK-joints. Results indicated that on an average basis, the ultimate load of a two-planar tubular KK-joint at 200 ºC, 400 ºC, 550 ºC, and 700 ºC is 90%, 75%, 45%, and 16% of the joint's ultimate load at ambient temperature, respectively. Outcomes of the parametric study showed that replacing the yield stress at ambient temperature with the corresponding value at elevated temperature to apply the EN 1993-1-8 equations for the calculation of the joint's ultimate load at elevated temperatures may lead to highly unconservative results that might endanger the safety of the structure. Results of the parametric study were then used to develop a set of design formulas, through nonlinear regression analyses, to calculate the ultimate load of two-planar tubular KK-joints subjected to axial loading at elevated temperatures.

Keywords : ultimate load, two-planar tubular KK-joint, axial loading, elevated temperature, parametric equation
Conference Title : ICACEE 2019 : International Conference on Advances in Civil and Environmental Engineering
Conference Location : Rome, Italy
Conference Dates : July 22-23, 2019