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Top and seat angle connections subjected to elevated temperatures: Finite element and mechanical modeling

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The finite element (FE) simulations and the experimental results are used to develop a mechanical model to predict the beam axial force-temperature and rotation of top and seat angle connections with and without web angles when exposed to elevated temperatures. First, FE models are developed and validated against experimental results available in the literature at elevated temperature. Second, FE models are developed to conduct an extensive parametric study to investigate some major geometric parameters such as load ratio, beam length, angle thickness and gap distance that impact the behavior of these connections when exposed to fire. Third, a mechanical model, that considers the major geometric and material properties, is developed to predict the thermal axial force and rotation response. The mechanical model consists of multi-linear and nonlinear springs that predict each component stiffness, strength and rotation. The beam stiffness is included in the proposed model to predict beam-column connection assembly rotation and thermal axial forces and their effect on the connection response. The proposed model provides important insights into fire-induced thermal forces and deformations and their implications on the design of steel bolted top and seat angle connections with and without web angles under fire.

Biography

Sana N El Kalash completed her ME degree in Structural Engineering at the American University of Beirut (AUB) and is currently a PhD candidate at AUB. Her research focuses on experimental and analytical studies of steel connections resistance and demand under extreme loads, particularly earthquake and fire.

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