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Experimental investigation of the fastening parameters influencing the interfacial behavior of composite-steel anchored lap connections

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Fiber reinforced polymers (FRPs) are extensively used in several engineering fields due to their superior properties. In structural engineering applications, fiber polymers have been recently used for retrofitting and strengthening of existing structures. Bonded FRP-steel systems are widely used for rehabilitation purposes. However, the brittle failure at the composite-steel interface weakens those systems. This paper reports on recent experimental outcomes of an on-going multiphase research project that is being conducted at the United Arab Emirates University (UAEU). The project aims for investigating the effectiveness and performance of mechanically fastened composite FRP-steel systems. The current paper investigates the response of hybrid FRP-steel lap connections along with the associated inter-facial behavior under different fastening parameters. The experimental program includes testing of 24 specimens to explore the influence of clamping torque, number of washers' thickness, and clearance between bolt and FRP hole on the load carrying capacity and ductility of the assembly. Experimental results show insignificant increase in the ultimate load of the connection associated with increasing the clamping torque. The presence of washers affects the failure mode of the connection and has significant effect on the load carrying capacity of the assembly. However, economical evaluation for the optimal number of washers-per-bolt is necessary for practical applications. Experimental outcomes reveal also that bolt-hole clearance influences both the stiffness and failure mechanism of the composite FRP-steel connections.

Biography

Omnia R AbouEl-Hamd is a Graduate Teaching Assistant at the Department of Civil and Environmental Engineering at the UAE University. She completed her BSc degree in Civil Engineering from UAE University in 2013 with distinction (Honors degree). She is currently involved in the structural engineering research area for the fulfillment of her MSc degree.

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