Behavior of the Concrete Core at the Critical Zones of Concrete Filled Steel Tube Columns after Using CFRP Composites as Additional Reinforcement


Abstract:

This study proposed Carbon fiber reinforced polymers (CFRP) as additional transverse reinforcement at the critical zones of concrete filled steel tubular (CFST). An experimental study consisted of five main sets of specimens representing the ends of columns, such as those merging in through beam-column connections, was conducted. Each main set of specimens investigated the behavior of the concrete core for a specific case of CFST or CFRP wrapped CFST (CFCFST), and each main set comprised three similar specimens to get more accurate results. All specimens were 160 mm external diameter and 320 mm height and had the same concrete grade. The thicknesses of the steel tubes used were 2 and 3mm. The numbers of (CFRP) layers used were one and two layers. The results showed that one and two CFRP outer layers added to CFST greatly improved the concrete compression. Response showed 29% and 54% increase in the concrete core compressive strength, respectively. The increase in the steel tube thickness from 2mm to 3 mm caused 20% increase in the concrete core compressive strength. A new analytical model with a sufficient accuracy was driven to predict the concrete core strength for both CFST and CFCFST cases.

Keywords:

Concrete, Steel tube, Fiber reinforced polymer (FRP), Confinement, Buckling.

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