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Effects of Increased Slenderness in Short Heat-Damaged RC Columns Confined with FRP Composites

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Abstract: Twenty six circular RC columns were tested under axial compression to explore the confinement effects of fiber reinforced polymer (FRP) sheets on the performance of heat-damaged short columns. The effects of increased column slenderness, level of heat-induced damage and stiffness of the FRP wrapping system were examined. Columns with l/r ratios of 12.5 and 18.75 were subjected to 500 ?C for one, two and three hours. Eighteen heat-damaged columns were wrapped using unidirectional carbon and glass FRP sheets over their full heights. Test results showed that FRP wrapping significantly enhanced the axial resistance, toughness, ductility and deformation capacity of the heat-damaged columns but failed to restore their axial stiffness. Increasing the stiffness of the FRP jacket resulted in further enhancements in axial resistance, stiffness and toughness of the heat-damaged columns while adversely affecting their ductility. CFRP jackets with a confinement modulus of 0.65 GPa managed to reinstate, and even exceed, the original strength of heat-damaged columns. The effectiveness of FRP confinement of heat-damaged columns increased significantly with increasing damage level and decreasing column slenderness. The heat- and confinement-induced increases in column slenderness had no tangible effects on buckling stability of the test columns that were originally of low slenderness.