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FRP Confinement of Heat-Damaged Circular RC Columns

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Abstract: To investigate the effectiveness of using fiber reinforced polymer (FRP) sheets in confining heat-damaged columns, fifteen circular RC column specimens were tested under axial compression. The effects of heating duration, stiffness and thickness of the FRP wrapping sheets were examined. Two specimen groups, six each, were subjected to elevated temperatures of 500 °C for two and three hours, respectively. Eight of the heat-damaged specimens were wrapped with unidirectional carbon and glass FRP sheets. Test results confirmed that elevated temperatures adversely affect the axial load resistance and stiffness of the columns while increasing their ductility and toughness. Full wrapping with FRP sheets increased the axial load capacity and toughness of the damaged columns. A single layer of the carbon sheets managed to restore the original axial resistance of the columns heated for two hours yet, two layers were needed to restore the axial resistance of columns heated for three hours. Glass FRP sheets were found to be less effective; using two layers of glass sheets managed to restore the axial load carrying capacity of columns heated for two hours only. Confining the heat-damaged columns with FRP circumferential wraps failed in recovering the original axial stiffness of the columns. Test results confirmed that FRP-confining models adopted by international design guidelines should address the increased confinement efficiency in heat-damaged circular RC columns.