Behavior of Short Reinforced Crumb Rubber Concrete Columns Subjected to Elevated Temperatures

Abstract:

This paper presents experimental and numerical investigations to study the performance of heated reinforced crumbed rubber concrete short columns under axial compression load. The experimental program of this study includes testing of nine columns. The mixtures of these columns have been produced by replacing the fine aggregate with crumb rubber at designated replacement levels of zero, 10%, and 20% by total fine aggregate volume. Three columns have been kept as control columns, while the other six columns have been exposed to elevated temperatures of 400ºC and 600oC for a period of 3 hours. The heated columns have been left to cool down at room temperature and then axially loaded till failure. The experimental results have been utilized for validation of finite element models which have been developed using the well-known Finite Element (FE) software; ANSYS. The experimental results have shown that the percentage of loss in the residual axial capacity and the secant stiffness of columns increases as the exposure temperature increased to 400oC and 600oC. Increasing the rubber amount led to a decrease in the strength and the stiffness magnitudes. Nevertheless, the ductility was significantly improved by using crumb rubber. Furthermore, the constructed FE models have succeeded in simulating the temperature distribution across the column's cross section and in predicting its ultimate axial load capacity.