

Residual strength of ultrahigh-performance hybrid fibre-reinforced concrete columns subjected to high temperatures

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Abstract

The main goal of this research is to experimentally investigate the effects of hybrid fibres on the residual strength of ultrahigh-performance fibre-reinforced concrete (UHPFRC) columns subjected to high temperatures. Eight UHPFRC mixtures incorporating various types of fibres, namely, steel fibre (SF), polypropylene fibre (PP), polyvinyl alcohol fibre (PVA) and natural jute fibre (JF), were designed. Sixteen UHPFRC columns (two columns for each mixture) were tested under axial loading. Eight columns were tested at room temperature (unheated), and the other eight were subjected to 500 °C for 30 minutes. Results indicated that the hybrid fibres were effective in overcoming explosive spalling at high temperatures. The combination of polymer fibres (PP, PVA and JF) in addition to SF effectively improved the residual strength and fire resistance of heated UHPFRC columns. Moreover, the ultimate load capacity of the tested columns was compared with those calculated by the ACI 318-2014 design code and an existing theoretical approach.