بحث رقم (٧)

عنوان البحث (باللغة التى نشر بها) :

“Effect of elevated temperature on axially and eccentrically loaded columns containing Polyvinyl Alcohol (PVA) fibers”

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Polyvinyl Alcohol (PVA) fiber was developed more than 80 years ago in Japan. They are heavily used in nonstructural applications and in Engineered Cementitious Composites (ECC) mainly for beams and thin slabs sections. There are gaps in the research regarding their performance in other structural elements and at elevated temperatures. The aim of this work is to study the behavior of reinforced concrete columns containing PVA fibers after being subjected to elevated temperatures and then loaded either concentrically or eccentrically. A total of thirty-six reinforced concrete columns, having constant longitudinal reinforcement, were experimentally tested under different load eccentricity ratios (0.0, 0.50, and 1.0). Different ratios of PVA, 0.75%, 1.50%, 2.25% were included in the concrete mixes. The studied columns were exposed to elevated temperature before loading. It was observed that columns containing PVA fibers had higher ultimate loads, higher ultimate deflection, less crack widths, higher ultimate deflection, higher energy absorption, and higher temperature resistance compared to normal reinforced concrete columns. In addition, these columns didn’t show any sign of spalling due to the fiber bridging effect of PVA fibers unlike other studied normal reinforced concrete columns without fibers. It was found that addition of 1.50% fiber content showed better performance for centrically loaded columns while this was raised to be 2.25% for eccentrically loaded columns. The ultimate load of the columns exposed to elevated temperature rapidly decreased with increasing the duration of temperature to different magnitudes depending on the percentage inclusion of PVA fibers. It was found that ductility and energy absorption for columns including 1.5% PVA were higher than their companions without fibers after temperature exposure. It was observed that the energy absorption of eccentric columns exposed to temperature for up to two hours was still higher than that of their companions without fibers by 40% for eccentricity ratio of 1.0.