Strengthening of Reinforced Concrete Slab by HPFRCC Material

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Abstract

A great part of the structures in the world must be strengthened due to some reasons including age of the structures, changing the use of them, revisions in the structural codes and occurrence of natural disasters. Reinforced concrete buildings are widely constructed in the world. Hence, different methods have been proposed for strengthening of these buildings. High performance fiber reinforced cementitious composites (HPFRCC) are cement matrices with strain hardening behavior under tension loading. In these composites, the cement mortar with only fine aggregates is reinforced by random distributed fibers and may be used for various applications, such as rehabilitation of structural members. Multiple cracking in the HPFRCC occurs due to bridging and pull out mechanisms of the fibers in this material and subsequently, the strain hardening response is observed. In this paper, HPFRCC layers with different thicknesses have been used for strengthening of the existing reinforced concrete slab. Capacity curves of these strengthened slabs are determined using finite element method and compared with that of reinforced concrete slab. Results show that using HPFRCC material in these members concludes to more ultimate load and ductility compared to those of reinforced concrete slab. With increasing the total height of the strengthened models by HPFRCC, softening occurred in the capacity curves of these models. This softening behavior concludes to decrease the ultimate loads of the strengthened models by HPFRCC and concrete by 15.4 % and 8.55 % respectively. In the strengthened models with no variation in the total height, this softening behavior is negligible.

Key words: Ductility, HPFRCC, slab, strengthening, ultimate load.

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