



## Enhancement Punching Shear in Flat Slab Using Mortar Infiltrated Fiber Concrete

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### Abstract

In this paper, improving the punching shear of slab column connection using mortar infiltrated fiber concrete is studied. Eight specimens of reinforced concrete slabs identical in dimension and reinforcement were tested, six of them were casting with hybrid concrete (normal strength concrete and mortar infiltrated fiber concrete) and two specimens were cast with normal strength concrete as control specimens. All specimens were tested under vertical loading. The mortar infiltrated fiber concrete was cast monolithically with the normal strength concrete at different thickness at one and a half times of the effective depth (1.5d) at the center of the slab, once at all the thickness of cross section of the slab and the others at half thickness either tension or compression face of the slabs all cases cast with two types of fiber. The vertical load was applied upward through a square column with a dimension of (100 mm). In all slabs, no failure in mortar infiltrated fiber concrete was observed. The test results showed that the use of mortar infiltrated fiber concrete improves the punching shear strength for some cases according to the type of fibers and the location of casting mortar infiltrated fiber concrete in slabs. The enhancement in punching shear strength due to using mortar infiltrated fiber concrete at 1.5d square shape (265 mm) ranged from 4% to 46% compared with the control specimens.

**Keywords:** Improvement Punching Shear; Mortar Infiltrated Fiber Concrete; Hybrid Concrete.

### 1. Introduction

The flat plate slab is susceptible to punching shear failure. This type of failure is catastrophic because no visible signs are shown before failure. There are actually specific punching shear strength formulas for slab column connections such as those suggested by ACI 318 [1] and BS 8110 [2] codes. These formulas were developed for slab casted using normal strength concrete; so, they might not be applicable to strengthened slab using mortar infiltrated fiber concrete. The classical strengthening techniques using to avoiding sudden punching failure, include the use of transverse pre-stressed reinforcement, steel plates and bolts, increase the thickness of the slab around column or use of a larger column cross-section and use of an epoxy bonding steel plate. Further focus has been given to use advanced composite materials to strengthen especially fibers in all different types, to prevent sudden punching shear failure. In this study using the mortar infiltrated fiber concrete as a strengthening material. Mortar infiltrated fiber concrete is a comparatively modern material differentiated from Fiber Reinforced Concrete (FRC) in two aspects that is fiber volume fraction and manufacturing process.

Mortar infiltrated fiber concrete was developed to incorporating large amounts of fibers in cement composites, to get a very high strength property. The researchers began to use a large variety of fibers. Mortar infiltrated fiber concrete has high strength as well as large ductility and far significant potential for structural applications [3-7]. The

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