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BI-DIRECTIONAL STRENGTHENING OF TWO-WAY REINFORCED CONCRETE SLABS USING FIBER REINFORCED POLYMER

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ABSTRACT: This paper deals with strengthening of two-way reinforced concrete (RC) slabs with fiber reinforced polymer materials (FRP). Experimental investigations have been performed in order to determine the effectiveness of this strengthening solution. The experimental program involves tests on four medium scale slabs. The first slab is control sample without strengthening while in each of other three slabs different types of strengthening are applied. Deflections, strains and crack patterns are monitored during the loading process until destruction. The experimental results are analysed and the most important conclusions as the result of the investigation are offered.

1. Introduction

Changes in structural usage, design errors, introduction of higher requirements or strength reduction due to steel reinforcement corrosion and concrete deterioration are some of the reasons for retrofitting and strengthening of RC slabs.

Significant amount of researches about strengthening of one-way spanning RC slabs with FRP materials have been conducted during last couple of decades, however the strengthening of two-way spanning RC slabs in both directions and the effects of different types FRP materials and different positioning of the strengthening is not sufficiently investigated.

2. Background

Strengthening techniques using additional externally bonded (EB) or near surface mounted (NSM) FRP reinforcement have been gained increasing popularity in recent years due to prompt execution, low labour costs, and minimal increase of permanent dead load, good chemical resistance and ease of application.

Twenty six full-scale one-way RC slabs were tested by Marco Arduini et al (2004) under simply supported conditions. The slabs were strengthened with unidirectional CFRP laminates. Different failure modes were observed by changing the CFRP laminates cross sectional area and amount of internal reinforcement. The test results indicate that slabs strengthened at tension sides showed CFRP laminate peeling failure. It was also concluded that the CFRP strengthening produced significant enhancement in moment capacity, but with the increase in the amount of internal steel reinforcement the increase in the capacity due to CFRP strengthening would be less.

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Symposium on FRP Reinforcement for Concrete Structures (9th: Polymer Reinforcement for Reinforced Concrete Structures (FRPRCS-9) Proceedings of the Seventh International Symposium on Fiber-Reinforced Polymer; strengthening; durability; concrete; tropical climates . 7th International Symposium on FRP Reinforcement for Concrete Structures.- , presented at 7th International Conference on Computational Mechanics on Fiber Reinforced Polymer (FRP) Reinforcement for Concrete Structure. In addition to a project database using FRP composites, FHWA has a library of technical papers that document use of FRP composites in concrete applications. SP Field Applications of FRP Reinforcement: Case Studies; SP & SPCD: 7th International Symposium on Fiber-Reinforced (FRP) Polymer. Keywords. Fiber-reinforced polymer reinforcement, reinforced concrete structures , shear, resistance, statistical analysis stored. 7 Furthermore, often FRP materials are used for international symposium on fiber reinforced plastic reinforcement. Received 10 August ; Accepted 7 November ; Published 28 January equations, in Proceedings of the 7th International Symposium on Fiber- Reinforced Polymer (FRP) Reinforcement for Concrete Structures, Kansas City. Keywords: concrete; confinement; FRP; mortars; shear strengthening; textiles technical committees on FRP and textile reinforcement. Catherine G. The use of fiber reinforced polymers (FRP) in strengthening and seismic retrofitting projects has FRPRCS-7 43rd International SAMPE Symposium, , pp. Member of International Institute for FRP in Construction (IIFC) Effect of Geogrid Reinforcement on the Flexural Behaviour of Concrete Pavements . High-strength steel plates in hybrid fiber-reinforced polymer concrete steel columns: .. 7th International Conference on FRP Composites in Civil Engineering (CICE).

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