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Improving Flexural Behavior of Textile Reinforced Concrete One Way Slab by Removing Weft Yarns with Different Percentages

Omar H. Hussien [a*], Amer M. Ibrahim [a], Suhad M. Abd [a]

[a] *College of Engineering, University of Diyala, Baqubah, Diyala, Iraq.*

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Abstract

Textile reinforced concrete that developed at recent years is composed of the continuous textile fabric incorporated into the cementitious matrix. The geometry of the textile reinforcements has a great influence on the TRC overall behavior since it affects the bond efficiency perfectly. The effect of weft yarns removing on the flexural behavior of (1500 × 500 × 50) mm one way slabs was investigated, eight layers of the carbon fabric were used with (50%, 67% and 75%) removing of weft yarns in addition to one specimen without removing. The four one- way slabs were casted by hand lay-up method, cured for (28) days and tested in flexure using four points method. The bending capacity and the bond efficiency factor were calculated according to the conditions of the equilibrium models by comparing with experimental results. The results revealed that with higher removing proportion there was a perfect improvement in the flexural capacity, higher first crack load, eminent post cracking stiffness, higher average concrete strain and lower ultimate mid span deflection and higher toughness and ductility. Furthermore, the results clarified that there is an optimum percent of weft yarns removing at which the damage occurrence around the weft yarns is significantly reduced, and this negative effect constriction overcome the positive anchoring effect.

Keywords: TRC; Weft Yarn Removing; One -Way Slab; Carbon Fabric; Hand Lay-Up.

1. Introduction

The brittleness nature of concrete with the slight tensile strength and low strain capacity promotes the demand for reinforcing with different reinforcements types. The textile reinforcements such as carbon, AR glass and Kevlar are mostly preferred in reinforcing concrete members as compared as compared with the other reinforcing materials due to their excellent properties in term of high tensile strength and modulus of elasticity. Moreover, premium ductility and non-corrosive nature are major characteristics for textile reinforcements when compared to short dispersed fibers and steel reinforcements, in addition, to their low weight to strength ratio, strain hardening behavior and yielding multiple micro cracks [1]. Furthermore, the flexible design possibility that the textile reinforcement exhibits considered a central characteristic made the use of such reinforcement materials is perfectly attractive [2].

The high performance fibers which are mentioned previously can be made up as filament, tows or yarns and fabric, used as a reinforcing material. The yarns or twos consists of many hundreds or thousands of continuous length (7-30) μm diameter filaments the external sleeve filaments are perfectly contact with the concrete matrix rather than the internal core filaments. Indeed, the actual percentage of the sleeve filaments which are in the direct contact with the matrix cannot be accurately evaluated for the reason of the complex micro structure of both textile and matrix. However, the number of filaments is inversely proportional with the bonding due to the penetration effect and the bond of single roving cannot indicate the bond of fabric in addition to the fabric geometry effect [3]. The sleeve filaments that represent

* Corresponding author: ekhel199276@gmail.com

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