Flexural Behaviour of Carbon Textile Reinforced Concrete (CTRC) Panel

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Abstract

Textile-reinforced concrete (TRC) is novel high performance composite material blooming in the 21st century globally. It can be used as not only strengthening material but as a structural load bearing component. This paper aims to investigate the flexural behaviour of carbon textile-reinforced concrete (CTRC) panel through four-point bending test. Optimising the mix using particle packaging for the TRC with grade of mix as M50 using binders were used for the study. Flexural strength and toughness were observed to improve with the increase of the number of textile layers. The textiles were manually prestressed the first-crack flexural stress and pre-cracking flexural stiffness of the CTRC. The results highlight that the behaviour of carbon textile reinforcement under pure flexure performs well with flexural cracks forming only at the pure bending zone. The flexural behaviour of only 4-layer textiles were limited to this study considering the over reinforced design criteria. Further, the performance can be enhanced while optimising the no of layers of textiles(i.e.) the minimum textile reinforcement percentage required in further research.

Keywords: Carbon Textile Reinforced Concrete (CTRC), flexural behaviour, TRC, fine-grained cementitious matrix.

1 Introduction

The growing interest in cost-effective solutions for the structural components has gradually oriented research towards the optimisation of high-performance cement based composited originally conceived for new lightweight constructions. Textile reinforced concrete (TRC) [1-3] describes high performance, cementitious composites containing wo or three-dimensional fabrics made of carbon or alkali resistant glass [4,5]. Their quasi-static tensile behaviour is marked by an extensive strain hardening phase, during which multiple controlled cracking develops in the fine-grained concrete matrix. TRCs high tensile ductility, strength and stiffness enables their applications as thin, slender structural sections. The resistance to corrosion of the textiles permits reduced concrete covers and structural depths and supersedes additional protective polymer layers [6,7]. The higher tensile strength of reinforcement fibres such as carbon. Compared to typical steel allows for further optimisation of cross-sectional designs. With smart use of these materials, large resource savings can be realised in specific areas of concrete construction [8,9]. However, successful dissemination of TRC in practice depends on the

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