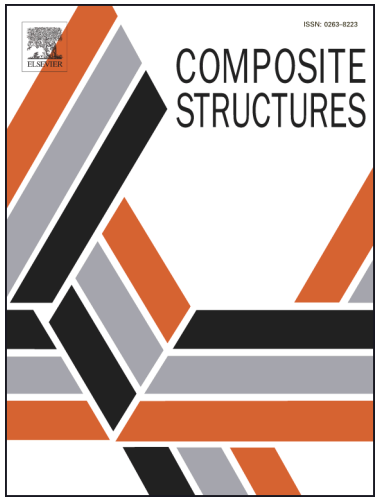

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Experimental study on the bond behaviour of a transversely compressed mechanical anchorage system for Externally Bonded Reinforcement

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Abstract

This paper presents an experimental programme aiming at studying the bond behaviour of carbon-FRP (CFRP) for externally bonded reinforcement (EBR) systems mechanically anchored to concrete. Eleven large scale pull-out tests were carried out using concrete blocks of 200 mm × 500 mm × 800 mm. In each block a single CFRP laminate was mounted using the EBR technique and mechanically fixed to concrete through a commercial mechanical anchorage with different levels of transverse compression. The blocks were tested under a pull-out configuration until failure. The study of the CFRP EBR system comprises not only the mechanical anchorage but also the subsequent CFRP EBR laminate bonded to concrete. The debonding load is observed to be dependent on the laminate width, as expected, and a good relationship between the experimental results and analytical predictions is found. A model of the local bond shear stress-slip law in the bonded zone is adopted and calibrated to the experimental results taking into account the roughness of the concrete surface. Moreover, the effects of the laminate width and the compressive stress level on the anchorage effectiveness are evaluated. Results show that the mechanical anchorage generally provides adequate transverse compression of the CFRP laminate to concrete surface.

Keywords: bond behaviour, CFRP, EBR, transverse compression

1. Introduction

Fibre reinforced polymers (FRP) have emerged as technical and economically viable materials for strengthening applications of reinforced concrete (RC) elements in countless applications worldwide [1–3].