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PII: S0263-8223(18)30558-0
DOI: https://doi.org/10.1016/j.compstruct.2018.03.005
Reference: COST 9452

To appear in: *Composite Structures*

Received Date: 7 February 2018
Accepted Date: 6 March 2018

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Abstract

The application of composite materials to strengthen existing structural elements is a valid alternative to traditional strengthening techniques. Fiber reinforced cementitious matrix (FRCM) composites have been successfully employed to strengthen existing reinforced concrete (RC) and masonry structures in bending, shear, torsion and to confine axially loaded elements. Although failure of FRCM strengthened elements depends on different parameters, such as the composite and substrate geometrical and mechanical properties, debonding at the matrix-fiber interface is generally the failure mechanism. Therefore, the study of the bond behavior of FRCM composites is a key topic to develop reliable design procedures. Numerous experimental campaigns were carried out recently to study the bond behavior of different FRCM composites. An analytical model is employed in this paper to describe the bond behavior of FRCM-concrete joints and different trilinear cohesive material laws are defined based on the experimental results. The experimental and corresponding analytical load response, strain profile, slip profile, and shear stress profile along the bonded length are compared. An analytical formulation of the bonded length needed to fully develop the stress-transfer mechanism at the matrix-fiber interface, i.e. the effective bond length, is provided for the trilinear cohesive material law employed.

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