

Characterization of FRCM- and FRP-Masonry Bond Behavior

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ABSTRACT

The effectiveness of externally bonded (EB) composites, both fiber-reinforced polymer (FRP) and fiber-reinforced cementitious matrix (FRCM) composites, applied to masonry structures as an external tensile reinforcement is governed by the adhesion between the reinforcement to the substrate. The bond behaviour between composites and masonry can be experimentally assessed by means of single-lap shear, double-lap shear, and beam tests. The majority of the studies available in literature deals with the direct shear test (and in particular single-lap type), which is extensively used in laboratory testing. Information on the adhesion between the reinforcement and the substrate and the presence of defects in the application of the composite can be potentially obtained by means of pull-off tests, which are easily performed on site without the burden of building a test fixture necessary to conduct direct shear tests [1]. Although the Mode-II bond behaviour should be studied by performing direct shear tests, the outcomes of pull-off tests could be still valuable in practice. A relationship between the results obtained from the single-lap shear test and those obtained from the pull-off test has not been established, especially for FRCM composites.

In this paper, a comparison between two experimental campaigns is presented. In the first experimental program, two groups of masonry blocks made of fired-clay bricks and mortar joints, reinforced by a unidirectional steel fabric embedded in an epoxy resin and in a hydraulic lime-based mortar matrix were subjected to single-lap shear tests [2, 3]. In addition, to reproduce conditions that may be found in real buildings, direct shear tests were also carried out after applying the FRCM/FRP composites on salt laden masonry blocks. In the second experimental campaign, herein presented for the first time, pull-off tests were conducted on the same type of composites (same fibers and matrices) applied to fired-clay bricks belonging to same batch of bricks employed to manufacture the specimens tested in the first campaign. Results of the single-lap shear test are compared with those obtained in the pull-off test to determine if a relationship exists and whether pull-off test could be a suitable way to obtain information on bond in field applications.

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