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FRP-MASONRY BOND DEGRADATION UNDER MOISTURE CONDITIONS

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Masonry, FRP, bond, deterioration, moisture

ABSTRACT

External Strengthening of masonry structures with fiber reinforced polymers (FRPs) has become a popular method in the last years. The efficacy and reliability of this strengthening technique depends intrinsically on the bond between the composite material and the masonry substrate. Hence, investigation of the long-term durability of the bond is a key issue in performance prediction of the strengthened structures in their service life [1-3]. Extensive experimental studies have been performed on durability of bond in FRP strengthened concrete elements [3-6], while the available literature on FRP-masonry elements is still few, see e.g. [7-9].

The most common environmental factors which a strengthened element is exposed to during its service life are moisture variations, temperature variations, and alkaline and acidic environments. Since most of the environmental factors and deterioration processes are dependent or coupled with moisture, a full understanding of its effects on deterioration of bond is a key step in durability modeling of FRP-strengthened masonry elements [6].

The objective of this study is to investigate the effects of different moisture levels on the bond performance of GFRP strengthened masonry elements.

In this regard, masonry bricks were strengthened glass fiber reinforced polymer (GFRP) sheets following a wet layup procedure. The strengthened specimens were exposed to two different moisture conditions of 70% R.H. and 100% R.H. in 23℃ temperature for 1 month. The deterioration of the bond behavior was then investigated by performing pull-off and single-lap shear bond tests on the exposed specimens immediately after exposure. Some of the specimens were also put in the laboratory conditions for 10 days, after exposure, to study the reversibility of the observed deterioration.

The preliminary results are shown in Fig.1 and Fig.2, respectively. It was observed that the moisture conditioning has resulted in a decrement of debonding and pull-off strength, being the 100% R.H. exposure more severe as it was expected. The observed reduction due to 100% R.H. exposure was 6% in the bond strength and 26% in pull-off strength.

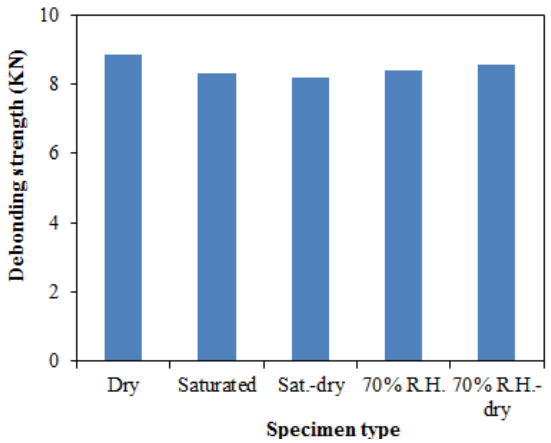

Figure 1: Debonding strength of the specimens after conditioning.

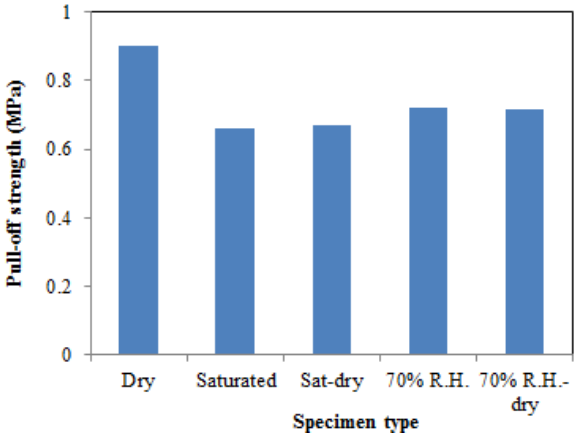

Figure 2: Pull-off strength of the specimens after conditioning.

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