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BOND BEHAVIOR OF FABRIC REINFORCED GEOPOLYMERIC MATRIX-CONCRETE JOINTS

by

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Abstract

This research aimed to examine the potential use of a geopolymeric matrix as a sustainable alternative to commercial mortars in carbon fabric-reinforced matrix composites. Single-lap shear tests were conducted to examine the bond behavior at the fabric-matrix interface. Test parameters included the type of matrix (geopolymeric and cementitious matrices), the type of fabric (unidirectional and bidirectional) and the bonded length (50 to 300 mm). The geopolymeric matrix was a blend of fly ash/ground granulated blast furnace slag activated by an alkaline solution of sodium silicate and sodium hydroxide. The bond behavior of the geopolymeric-matrix specimens was characterized and compared to that of similar specimens with a cementitious matrix. The specimens failed due to fabric slippage/debonding at the fabric-matrix interface or a fabric rupture. Few specimens failed by debonding at the substrate-matrix interface. The type of matrix had no effect on the effective bond length, which was in the in the range of 150 mm to 170 mm. The geopolymeric-matrix specimens exhibited comparable or higher ultimate loads relative to those of their cementitious-matrix counterparts. The use of a bidirectional fabric impaired the penetrability of the matrix. As such, the ultimate loads of the specimens with a unidirectional fabric tended to be higher than those of their counterparts with a bidirectional fabric. This was more pronounced in the specimens with a geopolymeric matrix. New bond-slip models that characterize the bond behavior at the fabric-matrix interface for geopolymeric- and cementitious-matrix specimens were developed..

Keywords: Single-lap, shear, FRCM, FRGM, strengthening.