GLASS FIBER REINFORCED POLYMER BARS AS THE TOP MAT REINFORCEMENT FOR BRIDGE DECKS

by

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(ABSTRACT)

The primary objective of this research was to experimentally investigate material and bond properties of three different types of fiber reinforced polymer (FRP) bars, and determine their effect on the design of a bridge deck using FRP bars as the top mat of reinforcement. The properties evaluated include the tensile strength, modulus of elasticity, bond behavior, and maximum bond stress. The experimental program included 47 tensile tests and 42 beam end bond tests performed with FRP bars. Tensile strength of the bars from the tensile testing ranged from 529 MPa to 859 MPa. The average modulus, taken from all the testing, for each type of bar was found to range from 40 GPa to 43.7 GPa. The maximum bond stress from the beam end bond tests ranged from 9.17 MPa to 25 MPa. From the tests, design values were found in areas where the properties investigated were related. These design values include design tensile strength, design modulus of elasticity, bond coefficient for deflection calculations, bond coefficient for crack width calculations, and development length. The results and conclusions address design concerns of the different types of FRP bars as applied in the top mat of reinforcement of a bridge deck.

A secondary objective was to evaluate the disparity in results between direct pullout tests, and beam end bond tests. Results from the experimentally performed beam end bond test were compared to previous literature involving the direct pullout tests. Results from the performed beam end bond tests were higher than all of the literature using direct pullout results. No recommendations were given on the disparity between the two test methods.

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