Corrosion resistance and bond strength of epoxy-coated steel bars

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Arabian Journal for Science and Engineering
Vol. 23, Issue.2C, 1998

Abstract: Epoxy-coated steel bars are increasingly used to enhance the useful service-life of reinforced concrete structures. However, the effectiveness of epoxy coating may be compromised due to the inadvertent presence of holidays and surface damage. Additionally, the bond strength of coated bars is expected to be less than that of the uncoated bars and may be further impaired due to prolonged exposure to thermal variations. Part of this research was designed to evaluate the bond strength between concrete and the epoxy-coated bars when exposed to thermal variations. The influence of holidays and coating damage on the corrosion-resistance of epoxy-coated bars was also investigated by measuring the corrosion current density at regular intervals. The results indicated that the critical bond strength of concrete specimens made with epoxy-coated bars was less than those made with uncoated bars. Further, the slip in the former concrete specimens was more than that in the latter. The corrosion current density measurements indicated that the defect-free epoxy-coated bars were in a passive state of corrosion in concrete specimens contaminated with up to 2% chloride, by weight of cement. However, the long-term maintenance-free performance of structures containing epoxy-coated bars with 0.5, 1, and 1.5% coating damage or three holidays per linear foot and concrete contaminated with 2% chloride, by weight of cement, may not be assured. The long-term performance of epoxy-coated bars with more than the ASTM A 775 allowable limits on holidays and coating damage was satisfactory in concrete specimens contaminated with up to 1% chloride, by weight of cement.