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Review

Strengthening of steel structures with fiber-reinforced polymer composites

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ABSTRACT

Over the past two decades, fiber-reinforced polymer (FRP) composites have gradually gained wide acceptance in civil engineering applications due to their unique advantages including their high strength-to-weight ratio and excellent corrosion resistance. In particular, many possibilities of using FRP in the strengthening and construction of concrete structures have been explored. More recently, the use of FRP to strengthen existing steel structures has received much attention. This paper starts with a critical discussion of the use of FRP in the strengthening of steel structures where the advantages of FRP are appropriately exploited. The paper then provides a critical review and interpretation of existing research on FRP-strengthened steel structures. Topics covered by the review include steel surface preparation for adhesive bonding, selection of a suitable adhesive, bond behavior between FRP and steel and its appropriate modeling, flexural strengthening of steel beams, fatigue strengthening of steel structures, strengthening of thin-walled steel structures against local buckling, and strengthening of hollow or concrete-filled steel tubes through external FRP confinement. The paper concludes with comments on future research needs.

Contents

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