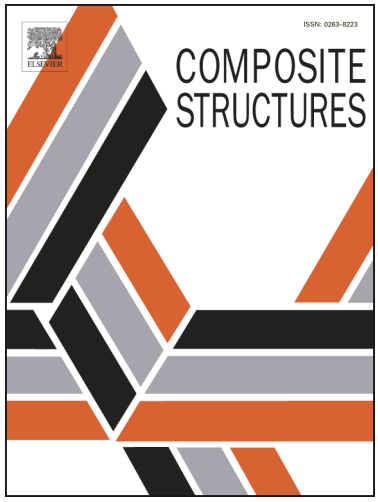

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Effect of Mechanical Fastening Pressure on the Bond Behaviors of Hybrid-Bonded FRP to Concrete Interface

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Abstract: Premature debonding failure of fiber-reinforced polymer (FRP) laminate is a primary reason for an accelerated onset of low working stress in the FRP of reinforced concrete (RC) structures strengthened with externally bonded (EB) FRP. Hybrid-bonded (HB) FRP can effectively prevent the debonding failure of FRP, leading to a significant enhancement in the ultimate strength of the HB-FRP system. The HB-FRP method mainly relies on external positive pressure provided by the anchoring device to improve the interfacial bond strength. Therefore, the magnitude of the positive pressure determines the strengthening effect of the anchoring system. This paper first optimizes the existing HB mechanical anchoring device. The positive pressure exerted on the FRP was adjusted by varying the torque to the anchoring device. The optimized anchoring device was used to study the bond behavior of the FRP-to-concrete interface under different torques. The test results showed that the debonding stress could be regulated by adjusting the torque, leading to a change in failure mode of the FRP-concrete interface. With the increase of torque, the utilization rate of FRP and ductility increased. When the torque was higher than a certain threshold, the FRP ruptured, after which, the continuously applied torque had no significant effect on the FRP-concrete interfacial bond behavior. Based on the experimental results, an ultimate bond strength model of

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