University of Tehran
College of Engineering

A Thesis Submitted to the Graduate Office in Partial Fulfillment of the Requirements for the Degree of **Master of Science** in Civil Engineering

Experimental Assessment of FRP Wrapping on the Bond-Slip Behavior of Corroded Reinforcing Bar

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Abstract Corrosion of steel reinforcement is one of the main durability problems facing reinforced concrete infrastructures worldwide. The ability of carbon fiber reinforced polymer (CFRP) wrapping to enhance the bond of corroded reinforcing steel bars in concrete was investigated. Twenty-eight pullout specimens were constructed and tested in University of Tehran Construction Materials Laboratory; sixteen of which were strengthened with one or two layers of CFRP laminates. Test variables included the ratio of cover depth to rebar diameter c/db (1.53, 2, and 2.47), degree of corrosion (0, 2, 5 and 8% mass loss), and presence or absence of transverse CFRP wrapping. Corrosion was induced by means of an impressed current method. The magnitude of corrosion was measured as gravimetric loss in weight of the reinforcing bars. Following corrosion, the specimens were tested by bar pullout to determine the bond strength versus slip of the reinforcing bars. Unwrapped specimens failed by bond splitting, which typically consisted of a brittle crack formed at the same location where a corrosion induced expansion crack existed already. Strengthened specimens exhibited an increased bond strength and failure by bar pullout due to the confining effects of the CFRP strengthening.