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Prediction of Residual Strength Capacities of Reinforced Concrete Structures under Different Corrosion Conditions

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Corrosion of reinforcement embedded in concrete is a significant problem in the world. Chloride induced corrosion is a major problem for reinforced concrete (RC) structures. Due to corrosion, cross-sectional steel area is reduced causing the RC structures become structurally inadequate. Conventional design guidelines do not provide any design procedures to predict the residual flexural strength capacity of corroded RC structures. Therefore, a method which can be used to predict the percentage reduction of the ultimate load bearing capacity of RC structures, subjected to different corrosion conditions is discussed in this paper. Several RC beams were cast and 'electrochemical corrosion technique' was adopted to corrode the reinforcement bars of the specimens. There, the reinforcement bars of the specimens were connected to a positive terminal (anode), and a copper bar is connected to a negative terminal (cathode). Specimens were immersed in NaCl solution which has a concentration of 5% by weight to provide electrical contact between the anode and the cathode. After the specimens were corroded with different corrosion conditions, they were tested under static load to determine the remaining flexural strength capacities. It was revealed from the results that the flexural strength capacity was reduced with the increase of the severity of the corrosion conditions.

Keywords: flexural strength, reinforced concrete, steel corrosion, strength reduction