

A Finite Element Model to Study the Behaviour of Corroded Reinforced Concrete Beams Repaired with near Surface Mounted Technique

Authors : B. Almassri, F. Almahmoud, R. Francois

Abstract : Near surface mounted reinforcement (NSM) technique is one of the promising techniques used nowadays to strengthen reinforced concrete (RC) structures. In the NSM technique, the Carbon Fibre Reinforced Polymer (CFRP) rods are placed inside pre-cut grooves and are bonded to the concrete with epoxy adhesive. This paper studies the non-classical mode of failure 'the separation of concrete cover' according to experimental and numerical FE modelling results. Experimental results and numerical modelling results of a 3D finite element (FE) model using the commercial software Abaqus and 2D FE model FEMIX were obtained on two beams, one corroded (25 years of corrosion procedure) and one control (A1CL3-R and A1T-R) were each repaired in bending using NSM CFRP rod and were then tested up to failure. The results showed that the NSM technique increased the overall capacity of control and corroded beams despite a non-classical mode of failure with separation of the concrete cover occurring in the corroded beam due to damage induced by corrosion. Another FE model used external steel stirrups around the repaired corroded beam A1CL3-R which failed with the separation of concrete cover, this model showed a change in the mode of failure from a non-classical mode of failure by the separation of concrete cover to the same mode of failure of the repaired control beam by the crushing of compressed concrete.

Keywords : corrosion, repair, Reinforced Concrete, FEM, CFRP, FEMIX

Conference Title : ICCUE 2018 : International Conference on Civil and Urban Engineering

Conference Location : Paris, France

Conference Dates : June 25-26, 2018