Thanyathorn Amatavirakul 2008: Flexural Behavior of Reinforced Concrete Beam under Corrosion Using Finite Element Method. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Mr. Kitjapat Phuvorawan, Ph.D. 186 pages.

This thesis presents finite element analyses for predicting the flexural behavior of corroded reinforced concrete beams by taking into account the two main effects of corrosion i.e. the reduction of cross-sectional area of steel and the deterioration of bond stress between steel and concrete. The loss of cross-sectional area of corroded rebar was regarded as proportional to the increase of corrosion degree whereas the bond stress of corroded rebar was obtained by multiplying the bond stress of sound rebar by a normalized bond strength correction factor, R, which was derived from the ratio between the maximum bond stress of sound rebar and corroded rebar at various corrosion degree.

The models were generated and analyzed by a finite element program. The RC beams were analyzed as a three-dimensional (3-D) problem utilizing various elements for different materials. Concrete and steel were represented by a 3-D solid element and a 3-D truss element, respectively, incorporating nonlinear property of both materials. The slippage of rebar was represented by a nonlinear spring element joining a node of concrete element with a node of steel. The analysis results revealed that the model could well predict the flexural behavior of the corroded reinforced concrete beams. The ultimate loads obtained from the analyses were in the same order as from the experiment. Moreover, the model could present the stress distribution at the cross section of the beams as well as the bond strength in the rebar corresponding to the cracks.

Thanyathorn A. Kitjapat P. 22 / 05 / 08

Student's signature Thesis Advisor's signature