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Nonlinear Finite Element Modeling of Unbonded Steel Reinforced Concrete Beams

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Abstract : In this paper, a nonlinear Finite Element Analysis (FEA) was carried out using ANSYS software to build a model able of predicting the behavior of Reinforced Concrete (RC) beams with unbonded reinforcement. The FEA model was compared to existing experimental data by other researchers. The existing experimental data consisted of 16 beams that varied from structurally sound beams to beams with unbonded reinforcement with different unbonded lengths and reinforcement ratios. The model was able to predict the ultimate flexural strength, load-deflection curve, and crack pattern of concrete beams with unbonded reinforcement. It was concluded that when the when the unbonded length is less than 45% of the span, there will be no decrease in the ultimate flexural strength due to the loss of bond between the steel reinforcement and the surrounding concrete regardless of the reinforcement ratio. Moreover, when the reinforcement ratio is relatively low, there will be no decrease in ultimate flexural strength regardless of the length of unbond.

Keywords : FEA, ANSYS, unbond, strain
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