# Modeling of the Flexural Fatigue Capacity of RC Beams Strengthened with FRP Sheets Based on Finite-Element Simulation.

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## Abstract:

In this study, a three-dimensional finite-element analysis (FEA) was conducted to study the parameters that affect the maximum flexural fatigue capacity of RC beams strengthened with fiber-reinforced polymer (FRP) sheets. Forty-seven specimens were designed and analyzed by using FEA. Additionally, a fatigue capacity prediction model was developed to reflect the influences of the major parameters, including the fatigue behavior of steel reinforcement, FRP sheets, and FRP-to-concrete bonding; and the influences of minor parameters, such as the yield strength of steel reinforcement, concrete strength, width and thickness of the FRP sheet, and other parameters. The results of experiments on 181 beams reported in the literature were analyzed to verify the accuracy of the proposed model. The mean values of 1.05 and 1.02 and the corresponding coefficients of variation of 17.12 and 16.06% were determined by comparing the calculation results from the proposed model with the experimental data. These results reflect the superior accuracy of the proposed model in predicting the fatigue capacity of RC beams with and without FRP strengthening.

## Keywords:

Finite element, Flexural fatigue load, Fiber-reinforced polymer sheets, RC beam, Fatigue load model

## Published In:

Journal of Structural Engineering , 1943-541X , NULL