

A Parametric Study and Design Equation of Reinforced Concrete Deep Beams Subjected to Elevated Temperature

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Abstract

Reinforced concrete may be subjected to temperature due to climatic change or fire. However, deep beams can be exposed to various temperatures. This study will be treated and focused on the criteria of thermal analysis of deep beams. Many lectures are verified by nonlinear finite element method. Also, a parametric study is carried out to investigate the effect of some factors on the behavior of deep beams exposed to elevated temperature. The models are analyzed by the finite element method using (ANSYS) package. These factors are temperature, concrete compressive strength, and the shear span-to-effective depth (a/d) ratio. The results show that when the temperature increases with constant compressive strength and (a/d) ratio, the load capacity and deflection at failure are decreased, while when compressive strength increased, the load capacity and deflection at failure are increased for the same (a/d) ratio and the same temperature. Finally, the results show that the load capacity decreases and deflection increases with an increase in (a/d) ratio for the same temperature and same compressive strength. In addition to the parametric study, the proposed model to predict the strength of the deep beams exposed to high temperature is derived using artificial neural network by MATLAB and SPSS facilities. The error (R) had been (0.99) and square value ($R^2 = 0.98$). This means that the model is efficient and the error is very small