Flexural behavior of concrete beams reinforced with different types of fibers

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ABSTRACT
Enhanced tensile properties of fiber reinforced concrete make it suitable for strengthening of reinforced concrete elements due to their superior corrosion resistance and high tensile strength properties. Recently, the use of fibers as strengthening material has increased motivating the development of numerical tools for the design of this type of intervention technique. This paper presents numerical analysis results carried out on a set of concrete beams reinforced with short fibers. To this purpose, a database of experimental results was collected from an available literature. A reliable and simple three-dimensional Finite Element (FE) model was defined. The linear and nonlinear behavior of all materials was adequately modeled by employing appropriate constitutive laws in the numerical simulations. To simulate the fiber reinforced concrete cracking tensile behavior an approach grounded on the solid basis of micromechanics was used. The results reveal that the developed models can accurately capture the performance and predict the load-carrying capacity of such reinforced concrete members. Furthermore, a parametric study is conducted using the validated models to investigate the effect of fiber material type, fiber volume fraction, and concrete compressive strength on the performance of concrete beams.

KEYWORDS
Finite element modeling; Reinforced concrete; Synthetic fibers; Mineral fibers; Steel fibers

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