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Structural performance of ultra-high-performance concrete beams with different steel fibers

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ABSTRACT

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Sectional analysis
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In this study, ten large ultra-high-performance concrete (UHPC) beams were fabricated and tested. The experimental parameters included reinforcement. Two different reinforcement ratios ($\rho_f = 0.94\%$ and 1.50%) and steel fiber (fibers) were adopted. In addition, three different fiber lengths ($l_f = 13, 1$ steel fibers and one fiber length ($l_f = 30$ mm) for the twisted steel fiber specimen, a UHPC matrix without fiber was also considered. Test result steel fibers significantly improved the load carrying capacity, post-response, but it decreased the ductility. Specifically, with the inclusion approximately 27–54% higher load carrying capacity and 13–73% low addition, an increase in the length of smooth steel fibers and the use of improvements of post-peak response and ductility, whereas no noticeable capacity, post-cracking stiffness, and cracking response were obtained.

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Effect of fiber type and content on the flexural behavior of high strength concrete beams with low reinforcement ratios

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ARTICLE INFO

ABSTRACT

Keywords:
High strength concrete
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The effect of fiber type and fractions on the flexural behavior of High Strength Concrete (HSC) beams were investigated experimentally. The main were fiber type, the volume fraction of fiber and axial reinforcement ratio specimens containing both fiber reinforced concrete (RC) and conventional concrete. The specimens were tested using four-point loading method. Three aspects of bending regions of beams using four-point loading method. Three aspects of and ultimate flexural loads, (ii) variation of the neutral axis depth and (iii) moment-rotation response of beams. The results show that the addition of carbon fiber significantly improves the yielding load level of HSC beams, while addition of carbon fiber has that load, increasing the volume fraction of steel and carbon fiber causes the decline of the HSC beams with low reinforcement ratio and makes the behavior of the beams more brittle manner. Therefore, an optimum ductility number based on fracture mechanics principles is determined to determine the minimum reinforcement ratio supplying sufficient ductility of fibers.

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Shear Strengthening of High Strength Concrete Beams That Contain Hooked-End Steel Fiber

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ARTICLE INFO

ABSTRACT

Keywords:
shear; hooked-end steel fiber; span to depth ratio; ductility

Abstract: Steel fiber has been used successfully in concrete mixtures to control volumetric changes, including shrinkage. However, the feasibility of the use of steel fiber has been restricted to non-structural construction, such as 'slab on ground'. Recently, researchers have attempted to expand the applications of steel fiber to replace structural reinforcement (rebar) and have shown promising results in its substitution for shear reinforcement. Few studies have been conducted to ensure the feasibility of using steel fiber in structural components, however. This experimental study was designed to investigate the shear performance of steel fiber-reinforced concrete beams using the tensile strength of steel fiber and the shear span-to-depth ratio as variables. The experimental results indicate that the tensile strength of steel fiber significantly affects the shear strength of steel fiber-reinforced concrete beams, regardless of the shear span-to-depth ratio, and that steel fiber can play a role in shear reinforcement of concrete beams.

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A comparison of machine learning- and regression-based models for predicting ductility ratio of RC beam-column joints

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ARTICLE INFO

ABSTRACT

Keywords:
Beam-column joints
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Machine learning
ANN
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Seismic response of Reinforced Concrete (RC) beam-column joints has always been evaluated by researchers due to their undesirable influence on the overall behavior of RC building frames under seismic loads. In the present study, an attempt has been made to predict displacement ductility ratio of RC joints using machine learning (Artificial Neural Network and Random Forest) and regression-based (linear, nonlinear and ridge) methods. Therefore, a dataset including the results of over 170 experimental studies conducted on RC joints was collected from the international peer-reviewed publications. Parameters reflecting beam and column dimensions (length, cross section width and depth), reinforcement detailing (longitudinal and transverse reinforcement of beams and columns), material properties (concrete compressive strength, yield strength of longitudinal and transverse reinforcement) and retrofitting techniques were considered as input variables for predicting the output parameter, displacement ductility ratio. The predicted and actual values were compared together and the efficiency of the models was assessed by Taylor diagram and performance metrics including RMSE, MAE, MAPE and R². The evaluation results proved the high reliability of proposed models for predicting ductility of RC joints.

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Reference Mismatch

Quality Check

Creating Dataset

Hyper Parameters

MO- ANN

Parallel

Chain

Metric Check

Metric Check

Metric Check

Model Performance Comparison and Explainable A.I

Pre-processing

Data Mismatch

Train and Test ML models

Literature Review