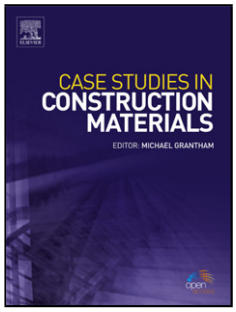

Title: Experimental Study and Shear Strength Prediction for Reactive Powder Concrete Beams

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Experimental Study and Shear Strength Prediction for Reactive Powder Concrete Beams.
Shear behavior of RPC beams: Experimental investigation #XPS#amp; shear strength prediction.

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Abstract
Eighteen reactive powder concrete (RPC) beams subjected to monotonic loading were tested to quantify the effect of a novel cementitious matrix materials on the shear behavior of longitudinally reinforced RPC beams without web reinforcement. The main test variables were the ratio of the shear span-to-effective depth (a/d), the ratio of the longitudinal reinforcement (#XPS#rho;$_w$), the percentage of steel fibers volume fractions (V_f) and the percentage of silica fume powder (SF). A massive experimental program was implemented with monitoring the concrete strain, the deflection and the cracking width and pattern for each RPC beam during the test at all the stages of the loading until failure. The findings of this paper showed that the addition of micro steel fibers (L_f/D_f#XPS#9617;=#XPS#9617;13/0.2) into the RPC mixture did not dramatically influence the initial diagonal cracking load whereas it improved the ultimate load capacity, ductility and absorbed energy. The shear design equations proposed by Ashour et al. and Bunni for high strength fiber reinforced concrete (HSFRC) beams have been modified in this paper to predict the shear strength of slender RPC beams without web reinforcement and with a/d#XPS#9617;#XPS##x2265;#XPS#9617;2.5. The predictions of the modified equations are compared with Equations of Shine et al., Kwak et al. and Khuntia et al. Both of the modified equations in this paper gave satisfied predictions for the shear strength of the tested RPC beams with COV of 7.9% and 10%.

Keywords: Beams; Ductility; Crack width; Absorbed energy; Reactive powder concrete; Steel fibers.

#BODY

1. Introduction:

In recent years, reactive powder concrete (RPC), which is also called ultra-high performance concrete (UHPC), has provided an attractive use of composite materials in several structural applications such as, bridges, high rise structures, nuclear power plants#XPS##x2026;etc. In general, the term reactive powder concrete is used for a kind of new cementitious material with the presence of a very fine quartz sand (less than 0.6#XPS#9617;mm (0.236 in)), eliminating coarse aggregate, adding a very effective pozzolanic material and embedding a particular quantity of micro steel fibers in the cementitious matrix to exhibit significant tensile strength and outstanding performance. RPC has a significant improvement in the mechanical and physical properties because the conception of RPC is mainly based on creating a homogenous material with a less defect of voids and microcracks, which leads to enhance the ultimate load capacity of the constructional members with a superior ductility, energy absorption, tensile strain-hardening behavior, crack control capability and durability that provide a greater structural reliability in comparison with traditional concrete (RC) or fiber reinforced concrete (FRC) structures[<REFNUMLINK>1#XPS#ndash;5</REFNUMLINK>].

As a rule, the shear performance of beams can be of critical importance and it is approved that the shear capacity depends significantly on the tension property because shear failure usually occur #XPS#ldquo;when the principal tensile stress within the shear span exceeds the tensile strength of concrete and a diagonal crack propagates through the beam web#XPS#rdquo;, based on Khuntia and Stojadinovic [<REFNUMLINK>31</REFNUMLINK>].