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An Experimental Study on Shear Performance of Sustainable Reinforced Concrete Beams

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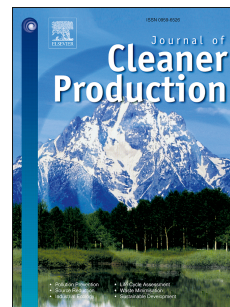
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1 An Experimental Study on Shear Performance of Sustainable Reinforced 2 Concrete Beams (Total word count: 6874)

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4 Abstract

5 The study reported in this paper investigates the shear capacity of full-scale reinforced
6 concrete beams fabricated with high volume fly ash and coarse recycled concrete aggregate
7 (RCA). The study involved testing 24 full-scale beams. The beams were fabricated with three
8 different longitudinal reinforcement ratios of 1.27%, 2.03%, and 2.71%. Four concrete
9 mixtures were employed for casting the beams: conventional concrete (CC) without any fly
10 ash or RCA as the reference; fly ash concrete with 50% of Class C fly ash replacement (FA50
11 beams); RCA concrete with 50% coarse RCA replacement (RCA50 beams); and sustainable
12 concrete (SC) proportioned with 50% Class C fly ash and 50% RCA. In order to evaluate the
13 performance of concrete in shear, the beams were cast without any stirrups in the shear zone.
14 The test results were compared with theoretical models provided by different design codes as
15 well as a shear data base for CC. The experimental results were also compared to analytical
16 approaches based on fracture mechanics as well as the modified compression field theory
17 method. On the average, the SC beams had a 10% lower shear capacity than the CC beams.
18 The average shear capacity of the SC beams was 18% and 16% lower than those of the FA50
19 and RCA50 beams, respectively.

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