

Structural Performance of Recycled Coarse Aggregate Concrete Beams Containing Waste Glass Powder and Waste Aluminum Fibers

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Abstract:

The main goal of this paper is to evaluate the flexural and shear performance of reinforced concrete (RC) beams containing recycled coarse aggregate (RCA), waste aluminum fiber (WAF) and waste glass powder (WGP). Five concrete mixes contained different percentages of (0 and 100%) RCA, (0, 1%, 2%, and 3%) WAF with a fixed percentage of 20% of WGP as cement substitution were investigated. Ten RC beams (two beams for each) were tested, five beams were designed to fail in flexure and the last five beams were designed to fail in shear. Results showed that using a combination of RCA and WAF has an adverse influence on the slump of concrete mixes. The compressive strength decreased by full substitution of natural coarse aggregate (NCA) with RCA. Conversely, adding WAF resulted in an improvement in mechanical characteristics of recycled coarse aggregate concrete (RCAC) mixes. The results revealed that the full substitution of NCA with RCA results in an adverse impact on the capacity, toughness, initial stiffness and ductility of tested beams. The load carrying capacity of tested RCAC beams was increased with the addition of WAF. The optimum percentage of WAF that can be added to RCAC to give optimistic responses to the overall behavior of tested beams is 1%.