

Early-Age Strength and Workability of Basalt Fiber Reinforced-Concrete Made with Recycled Aggregates – A Pilot Study

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Abstract - This research presents the combined effect of replacing natural aggregates by recycled concrete aggregates (RCA) and incorporating basalt fibers on the workability, 7-day compressive strength, and 7-day splitting tensile strength of concrete mixes. Three target design compressive strengths were used (30, 45, and 60 MPa). Untreated RCA were used in addition to two types of basalt fibers at volume fractions ranging from 0 to 3%. The basalt fiber types used in this work had lengths of 20 and 43 mm. Locally available desert dune sand was utilized in concrete mixes as a sustainable replacement to conventional crushed fine aggregates. The experimental results showed that the incorporation of basalt fibers resulted in a significant decrease in the workability of fresh concrete. The retention of 7-day compressive strength in basalt fiber-reinforced RCA concrete was superior when the design strength was 30 MPa rather than 45 and 60 MPa. The 7-day splitting tensile strength of RCA-based concrete was effectively restored upon the addition of basalt fibers. It exceeded that of the control mixes with higher basalt fiber volume fractions and 43 mm-long basalt fibers.

Keywords: Basalt fiber, recycled concrete aggregates, dune sand, sustainability, compressive strength, splitting tensile strength