

Partial Replacement of Fine Aggregate by Crumb Rubber and Strengthening by Silica

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Abstract

As modernisation has been going at a rapid pace, waste tires from automobiles, clothing, furniture, and footwear now have turned into a major contributor to global solid waste. Disposing of them in landfills can lead to uncontrolled fires, harmful emissions, and disturbance in the ecosystem. Recycling and re-using waste rubber in the form of rubberised concrete in construction contributes to minimizing the effects of rubber waste on the environment. Samples of rubberised concrete of M20 were prepared by partially replacing fine aggregate with crumb rubber in the percentages of 2.5%, 5%, 7.5%, and 10% using the water-cement ratio of 0.49. The study dealt with the test of freshening properties covering the workability and density of concrete followed by hardened properties tests of water absorption capacity and compressive strength. The result shows that an increase in rubber content in concrete increases the workability and water absorption capacity while reducing the density and compressive strength of the concrete when compared with standard concrete. However, the addition of silica by 2% of the mass of cement in the rubberised concrete tends to decrease workability and water absorption capacity but shows positive results in the compressive strength of the concrete. The overall study suggested that the limit of replacement of fine aggregate by crumb rubber in concrete is up to 5% for high load-bearing structures and up to 10% for light and non-load-bearing structures like footpaths, concrete barricades, arena pavements, and building facades.

Keywords: *construction material, crumb rubber, fine aggregate, rubberised concrete, silica, traditional concrete, waste tire*