

Use Of E-Plastic Waste In Concrete As A Partial Replacement Of Coarse Mineral Aggregate

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Abstract

The accelerated increase of the population growth rate in the world and the current lifestyle based on consumerism considerably increased the amount of waste generated by the human activity. Specifically, e-plastic waste causes significant damage to the environment because of its difficult degradation process. This paper aims to establish the feasibility of using e-plastic waste in concrete as a partial replacement of coarse mineral aggregate. Considering a control mix without e-plastic waste designed for a compressive strength of 21 MPa, tests on concrete mixes with 40, 50 and 60% of e-plastic waste aggregate to determine the fresh and hardened properties were carried out. A reduction in the compressive strength as the percentage of e-plastic waste increases was observed, the maximum reduction being 44% with respect to the control mix. In addition, a significant reduction as much as 22% in the density of the concrete mixes with e-plastic waste was recorded, which means that lighter elements can be produced with this type of concrete. Two new equations based on regression analysis of the experimental data from this study were proposed. These equations estimate the reduction in the compressive strength of concrete mixes with e-plastic waste aggregate at 14 and 28 days. A cost analysis and a practical alternative to introduce this waste material into the market are also presented.

Keywords

Aggregates; Compressive Strength; E-Plastic Waste; Recycling; Social Housing; Waste Management.