

Sustainable Development of Medium Strength Concrete Using Polypropylene as Aggregate Replacement

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Abstract : Plastic as an environmental burden is a well-rehearsed topic in the research area. This is due to its global demand and destructive impacts on the environment, which has been a significant concern to the governments. Typically, the use of plastic in the construction industry is seen across low-density, non-structural applications due to its diverse range of benefits including high strength-to-weight ratios, manipulability and durability. It can be said that with the level of plastic consumption experienced in the construction industry, an ongoing responsibility is shown for this sector to continually innovate alternatives for application of recycled plastic waste such as using plastic made replacement from polyethylene, polystyrene, polyvinyl and polypropylene in the concrete mix design. In this study, the impact of partially replaced fine aggregate with polypropylene in the concrete mix design was investigated to evaluate the concrete's compressive strength by conducting an experimental work which comprises of six concrete mix batches with polypropylene replacements ranging from 0.5 to 3.0%. The results demonstrated a typical decline in the compressive strength with the addition of plastic aggregate, despite this reduction generally mitigated as the level of plastic in the concrete mix increased. Furthermore, two of the six plastic-containing concrete mixes tested in the current study exceeded the ST5 standardised prescribed concrete mix compressive strength requirement at 28-days containing 1.50% and 2.50% plastic aggregates, which demonstrated the potential for use of recycled polypropylene in structural applications, as a partial by mass, fine aggregate replacement in the concrete mix.

Keywords : compressive strength, concrete, polypropylene, sustainability

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