

Investigating the Impact on Compressive Strength of Concrete by Incorporating Plastics

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In Guyana, there are little to no resource recovery practices done for the management of plastic bottle waste, which consequently leads to an abundance of plastic bottles as litter in streets, water bodies, and the surrounding environment. The waste infiltration in these areas poses a risk of floods, degradation of land and marine species, and most importantly, causes adverse effects to the health of both humans and the environment. Research has posited several innovative alternatives for plastic bottle diversion from landfills or overall disposal to address this growing challenge. This research investigated the compressive strength of hollow concrete blocks (HCB) when plastic Polyethylene Terephthalate (PET) bottle flakes are integrated as partial aggregate substitutes for sand as a possible diversion strategy. Plastic bottles labelled PET 1 were hand chipped into 5.73mm flakes and added into the modified cement mix to make two sets of HCB, where plastic flakes replaced five percent and ten percent of the sand respectively. The compressive strength was tested at seven, fourteen, and twenty-eight day intervals. After 28 days, only the ten percent blocks surpassed the Guyana National Bureau of Standards' non-load bearing standard of 500 lbs/In², with a reading of 555 lbs/In². This therefore meant that these HCBs may be used for construction purposes that did not require load support such as beams, fences, and wall partitions. The results suggest that the integration of PET flakes in HCBs may be a possible diversion strategy, however further research is needed on the percentage replacement for non-load bearing HCBs as well as to explore the possibility of producing load bearing HCBs.

Keywords: Polyethylene terephthalate (PET), Plastic bottles, Hollow concrete blocks (HCB), Load-bearing, Non-load bearing, Plastic pollution