DURABILITY OF CONCRETE INCORPORATING GROUND GRANULATED BLAST-FURNACE SLAG FOR WATER INFRASTRUCTURES

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ABSTRACT
Concrete is a versatile and most popular construction material. Its long-term performance depends on the interactions with the service environment, in which the penetration of deleterious substances is highly significant. Concrete for water infrastructure needs to resist weathering action, chemical attack, and abrasion by way of absorption while maintaining its desired engineering properties when exposed. Ground Granulated Blast-Furnace Slag (GGBS) is a common addition to Portland cement (PC) composites. It has been demonstrated that GGBS improves the general performance of PC concrete, enhancing ultimate compressive strength and reducing heat of hydration and bleeding. It has also been suggested that GGBS may increase concrete durability in the marine environment. In order to investigate this theory, this research investigates the durability properties of GGBS concrete for applications as water infrastructures in marine environment.

Concrete cubes were cast at a constant water/binder ratio of 0.542 and cured for 28 days. Measurements of compressive strength, percentage of voids and rate of absorption were determined. The results from the investigation showed that the use of GGBS produces concrete with improved strengths at all replacement levels in comparison to that of PC concrete. The result also showed that the mix containing 30% GGBS gave the best overall performance with very good durability credentials, less voids, more compact and lower rate of water absorption, which is perfect fit for water infrastructures. This indicates that concrete incorporating GGBS exhibit a better pore structure compared to conventional concrete with just Portland cement. The durability potential of the concrete investigated containing GGBS increases with an increase in GGBS level up to 30% when compared to the control mix with 100% PC. This indeed suggests a good start in considering concrete to be selected for application in water infrastructure.

Keywords: Durability, ground granulated blast-furnace slag, Portland cement, water infrastructure.
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