Durability of Low Cost High Performance Fly Ash Concrete

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ABSTRACT

High-performance concrete (HPC) is usually produced using high quality materials. These constituents drastically increase the initial cost of HPC, thus hindering its more widespread usage. This research work intends to investigate the possibility of producing low cost enhanced performance concrete or even low cost HPC, with 90 day strengths in the range of up to 60 MPa, using low quality fly ash and locally available crushed aggregates.

The effect of the amount of fly ash was evaluated using 0, 20%, 40% and 60% cement replacement in mixtures with different quantities of total binder (400 kg/m^3, 500 kg/m^3 and 600 kg/m^3). Workability, mechanical and durability properties of the produced concretes were studied.

The results obtained indicate that it is possible to produce HPC with up to 60 MPa by replacing up to 40% of cement by fly ash and using local available crushed granite aggregates. Furthermore, it was observed that the workability and the durability, as measured by the chloride-ion diffusion coefficient, increased drastically when fly ash partially replaced Portland cement.

Based on the results obtained, it is possible to conclude that the use of fly ash in concrete is beneficial in terms of the workability and durability properties but was some disadvantages because early strengths are reduced.