

Performance of pozzolan cement concrete in a high chloride-sulphate environment

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Abstract

This investigation was formulated to evaluate the performance of pozzolan (fly ash) concrete manufactured using the materials and in the aggressive sulphate-chloride environment of the Eastern Saudi Arabia. The concrete mixes were made with typical local aggregates consisting of finely graded beach/dune sands and crushed limestone. The experimental program was designed to vary fly ash substitution in the range from 0 to 40 per cent, the cement factor in the range from 500 to 750 lb/cu.yd. and four brands of cement having $C_3 A$ content from 0 to 9.5 per cent. The factorial combination of these factors giving rise to casting of 40 concrete mixes and more than 1200 samples.

The effectiveness of fly ash in producing quality concrete for the aggressive service conditions of this region were gauged by measuring compressive strength, permeability, pulse velocity and resistance to sulphate/chloride attack. Results show that concrete mixes incorporating 20 per cent fly ash added as a replacement of cement show the best performance when compared to mixes with 0 and 40 per cent. The beneficial effects of optimum fly ash addition in resisting sulphate attack is predominant for high $C_3 A$ cement concretes.

There is an excellent co-relation of results obtained by various techniques used to evaluate the performance of concrete against salt attack.