

HIGH-STRENGTH HVFA CONCRETE CONTAINING CLEAN COAL ASH

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Reference: CBU-1997-01

ABSTRACT

This project was carried out to establish high-volume use technologies for manufacture of cement-based products using ashes generated from combustion of high-sulfur coals. A clean coal ash is defined as the ash derived from SO₂ control technologies. The entire project was completed in two phases (Phase I and Phase II).

Phase I work was directed toward developing mixture proportions through laboratory investigations. In this phase, fifteen coal ash samples were obtained from eight different sources burning high-sulfur coals to represent a spectrum of these coal ashes. These ashes were characterized for their physical, chemical, mineralogical, and microstructural properties. Based on these properties, two sources of both conventional (Class F) and clean coal ashes were selected for further investigation. Two additional ash samples were prepared by blending these selected conventional and clean coal ashes. Using these six different ash samples, nineteen concrete mixtures were proportioned for initial testing and evaluation. Based on the results obtained from the initial testing, twenty-seven additional concrete mixtures were proportioned for performance evaluation under laboratory conditions. Based on laboratory results, optimum mixture proportions were established.

Phase II investigation involved field testing and evaluation of a few selected mixtures established in Phase I. These mixtures were composed of non-air entrained concretes incorporating conventional fly ash for structural applications and air entrained concrete mixtures for use in normal concrete construction. The results revealed that non-air entrained ready-mixed concrete can be manufactured for up to 60% fly ash content for structural applications and air entrained concrete for up to 30% fly ash content for normal concrete construction.