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Technological infrastructure for reducing the clinker content in concretes: Fly ash with CEMII cements

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Abstract

The study deals with the behavior of different types of fly ash in concretes made with CEMI and CEMII cements with the objective of characterizing the efficiency of fly ash added directly to the concrete and resolve whether the use of blended cements compromises the efficiency of the fly ash.

The experimental work included characterizing the properties of concretes with different contents of cement and fly ash, as well as similar additions of fly ash using inert calcium carbonate filler with similar size gradation to resolve chemical and physical (filler) effects. Mortar specimens were also studied to characterize pozzolanic activities as defined by the standards. The properties characterized were strength and durability which was assessed by air and water penetration tests.

1. No correlation was found between the standard activity index in mortars and the actual activity in concretes.
2. The standard mortar activity tests did not show clear cut advantage of using CEMI and in numerous cases the opposite was observed. Therefore the recommendations in standards to use higher efficiency coefficient for fly ash in CEMI concretes should be questioned and each case should be judged on its own.
3. The lack of clear cut correlations between the activity in mortars and in concretes can be explained by the need to consider not just the pozzolanic effect but also a filler effect which may become more significant in concretes. This effect is sensitive to the particle size distribution of the cement and the fly ash.
4. This conclusion indicates that in order to determine the activity of fly ash added to concretes prepared with blended cements there is a need to develop test methods to characterize the behavior in the concrete.
5. The trends observed in this study indicate that the efficiency of fly ash added to concrete with blended cements can be as high as or higher than with those of CEMI. From a practical point of view this implies that the activation of the

fly ash in the blended cement does not necessarily compromises the activity of additional fly ash added directly to the concrete.

6. The tests carried out here indicate that the durability of the concretes with fly ash was not inferior to that of the straight Portland cement concrete in spite of the limited water curing which was employed during the first 7 days only.