

INFLUENCE OF FLY ASH ON FLOWABILITY OF FRESH MORTAR

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ABSTRACT

Self-compacting concrete is a concrete that can be compacted into every corner of formwork, purely by means of its own weight and without the need for vibrating compaction. It requires co-existing of high flowability and no segregation simultaneously. In order to satisfy those requirements, concrete must have limitation of aggregate content, high amount of powder and using superplasticizer. Both of cement powder and superplasticizer are the most expensive ingredients in concrete. Pozzolanic material was introduced to replace amount of cement in order to reduce the cost and improve durability of concrete. Fly ash, one of the most widely used pozzolans, was believed to capable the minimization of SP dosage and maintains moderate flowability due to its physical characteristics. It is well known that flowability of fresh concrete is mainly affected by the flowability of the fresh mortar. Flowability of fresh mortar containing Ordinary Portland cement and polycarboxylate based was measured for several combinations of fly ash replacement ratio, SP dosage and water–powder ratio. The influence of fly ash on flowability was evaluated by functions of flow area and funnel speed. The relationship among SP dosage, fly ash replacement ratio and water–powder ratio was investigated. Within 75% fly ash replacement ratio, the relationship between fly ash replacement ratio and both of index represent amount of free water (A) and index represent SP dispersing effect (B) were clarified. From those relationships, the method to predict the flowability of mortar which used any fly ash replacement ratio was developed by interpolation of the index represent free water of pure cement mortar and binary mixes, and interpolation of the index of SP dispersing effect of those. Totally 4 mixes have to be mixed in order to predict the flowability of fresh mortar, 2 mixes of pure cement mortar and 2 of binary mixture. After that the chart represents the flowability of those cement and fly ash will able to be constructed. With using that chart the flowability of considered mix can be estimated. On other hand, the proper SP dosage and water–powder ratio are also able to be predicted according to any fly ash replacement ratio.