Annex 14

Developing an Indian Standard for Determining the Flow Behaviour of Superplasticized Cement Paste Using Marsh cone test

Superplasticizers are inevitable component of today's concrete contributing to the quality and desired performance. The cement-superplasticizer interaction that is responsible for the tailored properties of the concrete depends on several factors, such as the chemical nature and molecular weight of the polymer, particle size distribution, composition of the binder, dosage of the admixture and ambient conditions (Aı¨tcin, 1998). Therefore, it is important to have a test method for assessing the response of the superplasticizer in order to determine the appropriate type of the superplasticizer and the required dosage for the given binder and application. The Marsh cone test has been widely used in several countries, including India, to evaluate the relative fluidity and the saturation dosage of the superplasticizer in the field and laboratory (Agullo et al., 1999; Jayasree and Gettu, 2008; Jayasree et al., 2011a; John and Gettu, 2014). Even though the superplasticizer is widely used in the construction industry in India, a specific IS code for determining its dosage for different binder compositions is not available.

Several doctoral, post graduate theses and journal papers have been published from IIT Madras involving the studies with Marsh cone for understanding the cement-superplasticizer interaction and to determine the saturation dosage of the superplasticizer (Jayasree and Gettu, 2008; Jayasree et al., 2011a; Jayasree and Gettu, 2010; Jayasree et al., 2011b; Jayasree and Gettu, 2012; John and Gettu, 2014). All these studies are conducted broadly as per the guidelines of ASTM C939 (2010), European standards BS EN 445 (2007), and French standard P 18-358 (available in local language). In the recommended test procedure, an initial volume of 1000 ml of the superplasticized cement paste is poured into a metal cone with a nozzle of diameter 8 mm and the time required for 500 ml of it to flow out is measured. The minimum dosage corresponding to a practically constant flow time can be taken as the saturation dosage of the superplasticizer.

Studies have confirmed that the flow time determined from Marsh cone test is a good indication of the relative fluidity of the superplasticized cement paste, and the saturation dosage obtained is appropriate for the particular superplasticizer for a given cement paste, and it can be correlated with concrete flow behaviour. Hence, it is important to have an IS code mentioning the Marsh cone test, test conditions, regulatory requirements, and to meet the technological and material advancements related to additive manufacturing (3D printing of concrete), ultra high-performance concrete etc. The standardization of the test method will lead to the optimized use of superplasticizer, enhancing workability, and avoiding ambiguity.

Keywords: Binder, cement-superpalsticizer interaction, relative fluidity, saturation dosage, superplasticizer, tailored properties

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