A LABORATORY-BASED APPROACH FOR JUDGING SELF-COMPACTIBILITY OF CONCRETE

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Recent remarkable changes in the construction environment are demanding improved technology for the production of high-performance concrete with less environmental impacts, and far greater workability, strength and durability. A class of concrete, meeting the above requirements is called Self-Compacting Concrete (SCC). Self-Compacting Concrete, which has excellent deformability and resistance to segregation and can be filled in heavily, reinforced formwork, under gravity alone. Mixes possessing these characteristics while fresh almost eliminate noise pollution in concreting, and demand minimal energy input in concreting.

Workability of concrete is described in the shortest and the most incomplete way as the ability to work with. Routinely, the adequacy of workability of an ordinary concrete mix for a given application is judged in terms of a single test such as, slump test. Nevertheless, such a brief statement and a single test are inadequate to describe self-compactibility. Concrete is considered self-compactible if it has three major properties at acceptable levels. These properties are filling ability, passing ability and segregation resistance.

A number of tests are available to gauge each of these properties. Self-compactibility of concrete is judged by applying criteria on these test results. Since, the self-compactibility of concrete is application-specific, the test should be done on prototype.

This paper is on judging self-compatibility of concrete based on laboratory procedures. The experiments were carried out on concrete in all three parameters explained above. Twenty seven different mix proportions were tested. In these mixes dolomite powder having Blaine fineness 160 m^2/kg was used as filler. In addition, Portland cement having Blaine fineness 366 m^2/kg and fine aggregate having fineness modulus 3.16 also used. The mixes were prepared in a range of w/p (water / powder) ratio 0.65-0.90, w/c (water / cement) ratio 0.4 – 0.6 and the superplasticizer dosage 2.5-3.5 L/100kg of cement. Coarse aggregate was 20mm, and its quantity was 28-35 % by the volume of mix.

The tests on the concrete carried out for measuring the filling ability, passing ability, and segregation resistance were slump flow by Abram's cone, and T50cm slump flow test, J-ring test, and V- funnel test at T5 minutes. The limiting values of the concrete, which give a self-compacting mix, are as follows. For the slump flow Abrams cone test, the diameter should be between 600 mm and 800 mm; T 50 cm slump flow test, the time should be between 2 to 5 sec; and for J-Ring, the maximum height difference should be less than 10 mm.

Based on those results, the self-compactibility of the 27 mixes was judged. The mixes with water content of 200 L/m^3, coarse aggregate content of 25 % by volume of the mix, the combinations of w/c ratios, w/p ratios, and superplasticizer dosages given below produce self-compacting concrete.

w/c ratio by mass	0.4	0.5	0.6
w/p ratio by volume	0.77 - 0.90	0.65 - 0.77	0.65 - 0.77
Superplasticizer dosage *(L/100kg of cement)*	3.0-3.5	3.0-3.5	2.5-3.5