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Analyse the Behaviour of Self Compacting Concrete with Various Admixture

Prof. Kumbhar A. N., Mrs. Patil P. D., Akshay Krushnaji Veer, Akshay Dhanaji Mohite, Shrikant Shankar Kadam, Chaitanya Vaman More, Premkumar Vijay Hivare
Department of Civil Engineering
Shree Santkrupa Institute of Engineering and Technology, Ghogaon, Karad, India

Abstract: *Self-compacting concrete (SCC) is an innovative concrete that does not require vibration for placing and compaction. It is able to flow under its own weight, completely filling formwork and achieving full compaction, even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. The fluidity and segregation resistance of SCC ensures a high level of homogeneity, minimal concrete voids and uniform concrete strength, providing the potential for a superior level of finish and durability to the structure. SCC is often produced with low water-cement ratio providing the potential for highearly strength, earlier demoulding and faster use of elements and structures.*

Keywords: Self-compacting concrete

I. INTRODUCTION

Self-compacting concrete (SCC) is an innovative concrete that does not require vibration for placing and compaction. It is able to flow under its own weight, completely filling formwork and achieving full compaction,even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. The fluidity and segregation resistance of SCC ensures a high level of homogeneity, minimal concrete voids and uniform concrete strength, providing the potential for a superior level of finish and durability to the structure. SCC is often produced with low water-cement ratio providing the potential for highearly strength, earlier demoulding and faster use of elements and structures.

The elimination of vibrating equipment improves the environment on and near construction and precast sites where concrete is being placed, reducing the exposure of

workers to noise and vibration Self-compacting concrete (SCC) is an pioneering concrete that does not involve shuddering for insertion and compaction. It is able to gush under its own load, completely filling form work and achieve the full compaction, even in the occurrence of congested support. The hardened concrete is dense, uniform and has the same property and durability as standard vibrated concrete.

Making concrete structure without compaction has been done in the past. Like placement of concrete underwater by the use of termie without compaction. Inaccessible areas were concreted using such techniques. The production of such mixes often used expensive admixtures and very large quantity of cement. But such concrete was generally of lower strength and difficult to obtain. This lead to the development of Self Compacting Concrete (SCC) whose concept was first initiated by Japan in the mid of 1980s.

The application of SCC aims at obtaining a concrete of high performance, better and more reliable, improved durability, high strength and faster construction. For SCC it is generally important to use superplasticizers in order to obtain high mobility. Some volume of powdered materials such as silica fume, fly ash, glass filler, stone powder, etc. is also involved. Self compacting concrete has been successfully used in Japan, Denmark, France, U.K., etc.

II LITERATURE REVIEW

Bui *et al.* (2002) discussed a speedy method in order to test the resistance tosegregation of Self- compacting concrete. Extensive test programme of SCC withdifferent water-binder ratios, paste volumes, combinations between coarse and fineaggregates and various types and contents of mineral admixtures was carried out. Thetest was helpful in concluding

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the method along with the apparatus used for examiningthe segregation resistance of SCC in both the directions (vertical and horizontal).

Lachemi and Hossain (2004) presented the research on the suitability of four types of Viscosity Modifying Agent (VMA) in producing SCC. Fresh and hardened properties of SCC were studied by adding different VMA to SCC. The deformability through restricted areas can be evaluated using v-funnel test. In this test, the funnel was filled completely with concrete and the bottom outlet was opened, allowing the concrete to flow out. The time of flow from the opening of outlet to the seizure of flow was recorded. Flow time can be associated with a low deformability due to high paste viscosity, higher inter particle friction or blockage of flow. Flow time should be below 6 sec for the concrete to be considered as SCC. All the mix performed well with no significant segregation and jamming of aggregate was noticed.

Cengiz (2005) used fly-ash with SCC in different proportional limit of 0%, 50% and 70% replacement of normal Portland cement (NPC). He investigated the strength properties of self compacted concrete prepared using HVFA (high volume fly ash). Concrete mixtures made with water-cementitious material ratios ranged from 0.28 to 0.43 were cured at moist and dry curing conditions. He investigated the strength properties of the mix and developed a relationship between compressive strength and flexural tensile strength.

Ferrara *et al.* (2006) evaluated the HLSCC for all the basic properties namely flowability, segregation resistance ability and filling ability of fresh concrete. The tests of slump flow (for measuring of flowability) and the time which is required to reach the 500 mm of slump flow (S) (for measuring of segregation resistance ability) of HLSCC satisfied the expected capacity level in all mixes, the time is noted which is required to completely flow through V-funnel (S) (for measuring of segregation resistance ability) only satisfied the level in most of the LC mixed concrete (mix no. 2-4) and one of mixed concrete (mix no. 6).

Kumar (2006) reported the history of SCC development and its basic principle, different testing methods to test high-flowability, resistance against segregation, and passing ability. Different mix design methods using a variety of materials has been discussed in this paper, as the characteristics of materials and the mix proportion influences self-compact ability to a great extent, also its applications and its practical acceptance at the job site and its future prospects have also been discussed. Orimet test was performed, the more dynamic flow of concrete in this test simulates better the behavior of a SCC mix when placed in practice compared with the Slump-flow variation. The Orimet/J-ring combination test shows great promise as a method of assessing filling ability, passing ability and resistance to segregation.

Khatib (2008) investigated the properties of self-compacting concrete prepared by adding fly ash (FA). FA was used as a replacement for Portland Cement (PC). PC was replaced 0-80% by fly ash For all the mixes water binder ratio was maintained as 0.36. Strength properties as well as the workability, shrinkage, absorption and ultrasonic pulse velocity were studied in this research. Fromthe observations it was concluded that 40% replacement of FA resulted in strength of more than 65 N/mm2 at 56 days. On increasing the amount of fly ash the high absorption values were obtained and absorption of less than 2% was exhibited.

Grdić *et al.* (2008) presented the properties of self compacting concrete, mixed with different types of additives: silica fume and fly ash. L-box test was used to assess the passing ability of SCC to flow through tight openings including spaces between reinforcing bars and other obstructions without segregation or blockage. L- Box has arrangement and the dimensions by difference with the height of the horizontal section of the box, these three measurements are used to calculate the mean depth of concrete as h2 mm. The same 4procedure was used to calculate the depth of concrete immediately behind the gate h1 mm.

The passing ability was calculated from the following equation:

$Pa = h2/h1$ where;

Pa is the passing ability and the value of Pa ranged between 2-10 mm.

h1 and h2 are the height in mm at near and far end of passing ability respectively.

Heba (2011) presented an experimental study on SCC with two cement contents; the work involved three types of mixes, the first considered different percentages of fly ash, the seconds used different percentages of silica fumes and the third used mixtures of fly ash and silica fume. It was concluded that higher the percentages of fly ash the higher the values of concrete compressive strength until 30% of FA, however the higher values of concrete compressive strength is obtained from mix containing 15% FA.

Sahmaran *et al.* (2007) presented a paper on study of fresh and mechanical properties of a fibre reinforced self-compacting concrete incorpating high-volume fly ash in mixtures containing fly ash. Fifty percent of cement by weight was replaced with fly ash. It was found that the slump flow diameters of all mixtures were in the range of 560-700 mm which was in acceptable range and the slump flow time was recorded to be less than 2.9 seconds conducted a research on developing a SCC with cement replacement up to 80% in all the mixes and examining its fresh properties. Result show that the fly ash acts as a lubricant material; it does not react with superplasticizer and produce a repulsive force and the superplasticizer may only act on the cement. As a result, the larger the amount of fly ash contained, lesser the superplasticizer needed

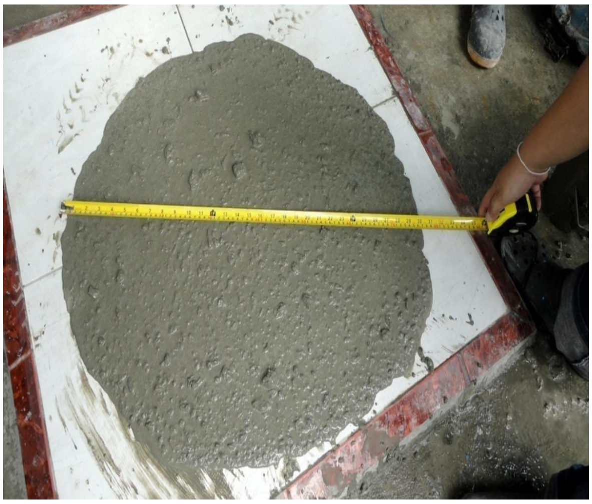
III. METHODOLOGY

Casting of plain cement concrete block of standard size. (6 Blocks)
Casting of self compacting concrete blocks with Plasticizer admixture. (6 Blocks)
Casting of self compacting concrete blocks with super-plasticizer.(Sika Viscocrete). (6 Blocks)
Casting of self compacting concrete blocks with Plasticizer admixture and polypropylene fiber in percentage.(6 Blocks)
Casting of self compacting concrete blocks with super-plasticizer and polypropylene fiber in percentage. (6 Blocks)

Mix Design

Mx Designation	Mix -1	Mix -2	Mix -3
Cement Kg/m3	260	270	287
Fly Ash Kg/m3	130	160	155
Fine Agg Kg/m3	870	980	975
Coarse Agg Kg/m3	760	790	737
Sika Visco Crete (kg/m3)	1.6	2.5	2.65
Water (Kg/m3)	190	190	190
Slump value	490mm	530mm	600 mm

Slump Flow Test



IV. TEST RESULTS

Sr. No	Element	Observation in 7 days			Observation in 28 days		
1	Ordinary	13.5 N/mm2	14.1N /mm2	13.2 N/mm2	19.8 N/mm2	20.1 N/mm2	19.9 N/mm2
2	Self Compacting	22.7 N/mm2	23.4 N/mm2	23.1 N/mm2	33.6 N/mm2	31.2 N/mm2	32.8 N/mm2

V. CONCLUSION

This research work focusses on the effect of superplasticizer &plasticizer on Self Compacting Concrete. An Increase in the dosage resulted in a decrease in the workability and compressive Strength of the self-compacting concrete.
In general, the use of superplasticizer improves the performance of self-compacting concrete in the fresh state.
Through all the superplasticizer used for the study it was observed that is a better superplasticizer than the rest of the superplasticizer selected the fresh and hardened result acquired

REFRENCES

[1]. Ghazi F Kheder, Rand S Al Jaidiri. 2010. "New Method for Proportioning SelfConsolidating Concrete BasedOn Compressive Strength Requirements". ACI Materials 107(5):490-497.
[2]. Goodier C. 2001. "Self-Compacting Concrete". European Network of Building Research Institutes (ENBRI). 17:6
[3]. Khayat KH. 1998. Viscosity-enhancing admixtures for cement-based materials - An overview. Cement and Concrete Composites, No.20, 2-3: 171-188.
[4]. Newman J, Choo BS. Advanced concrete technology concrete properties. Elsevier Butterworth Heinemann,2003.
[5]. Okamura H, Ozawa K. 1995. "Mix design for self-compacting concrete". Concrete Library of Japanese Society of Civil Engineers 25(6):107-120.
[6]. Okamura H, Ouchi M. 1999. "Self-compacting concrete development, present use and future". In: The 1st International RILEM Symposium on Self-Compacting Concrete. Skarendahl A, Petersson O, editors, RILEM Publications. S.A.R.L, France. 3-14.
[7]. Ozawa K, Maekawa K, Kunishima M, Okamura H. 1989. "Development of high performance concrete based on the durability design of concrete structures". 445- 450.
[8]. Nagamoto N., Ozawa K., Mixture properties of Self-Compacting, HighPerformance Concrete, Proceedings, Third CANMET/ACI International Conferences on Design and Materials and Recent Advances in Concrete Technology, SP- 172, V. M. Malhotra, American Concrete Institute, Farmington Hills, Mich. 1997, p. 623-637.
[9]. Khayat K.H., Ghezal A., Utility of Statistical models in Proportioning Self Compacting Concrete, Proceedings, RILEM International symposium on Self-Compacting Concrete, Stockholm, 1999, p. 345- 35.