Effect of Size of Aggregate on Self Compacting Concrete

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Abstract **- Concrete is a adaptable extensively used construction material. Ever since concrete has been established as a material for construction, investigate ers have been trying to improve its quality and develop its presentation. Fresh changes in construction industry demand superior durability of structures. At present there is a large weight on presentation aspect of concrete. One such thought has lead to the development of Self Compacting Concrete (SCC). It is measured as "the most revolutionary development in concrete construction". SCC is a new kind of High presentation Concrete (HPC) with excellent deformability and segregation resistance. It can flow through and fill the gaps of reinforcement and corners of moulds without any need for vibration and compaction during the placing process**

I. INTRODUCTION

The adaptability and the appliance of concrete in the construction industry need not be emphasized. investigate on normal and high strength concrete has been on the agenda for more than two decades. . High Building elements made of high strength concrete are usually densely reinforced. This congestion of strengthening leads to serious problems while concreting. Densely reinforced concrete problems can be solved by using concrete that can be easily placed and spread in between the congested reinforced concrete elements. A highly homogeneous, well spread and dense concrete can be ensured using such a type of concrete. Self-compacting concrete (SCC) is a concrete, which flows and compacts only under gravity. It fill the mould completely with no any defects. More often than not self-compacting concretes have compressive strengths in the variety of 60-100 N/mm2. SCC is a new kind of High Performance Concrete (HPC) which has an excellent deformability and segregation resistance. By name it can be defined as a concrete, which can flow through and fill the gaps of reinforcement and corners of the moulds without any need for external vibration. SCC compacts itself due to its self weight and de-aerates almost completely while elegant in the formwork. SCC can also be used in situations where it is difficult or impossible to use mechanical compaction for fresh concrete, such as underwater concreting, cast in-situ pile foundations, machine bases and columns or walls with congested reinforcement. The high flow capability of SCC makes it possible to fill the formwork without vibration.

II. SOME OF THE COMPENSATION OF SELF COMPACTING CONCRETE ARE AS FOLLOWS

1. Less noise from vibrators and reduced danger from Hand Arm Vibration Syndrome (HAVS). And pace of placement, resulting in increased production efficiency.

2. Ease of placement, requiring fewer workers for exacting pour.

3. Superior assurances of adequate uniform consolidation.

4. Reduced wear and tear on forms from vibrator.

5. Reduced wear on mixers due to reduced shearing action and. Increased bond strength.

III. MEANS FOR ACHIEVING SELF-COMPATIBILITY:

Simply increasing the water content in a mix to achieve a flowable concrete like SCC is obviously not a viable option. The main mechanism controlling the balance between higher flow ability and stability are related to surface chemistry. The development of SCC has thus been strongly dependent on surface active admixtures as well as on the increased specific surface area obtained through the used fillers.

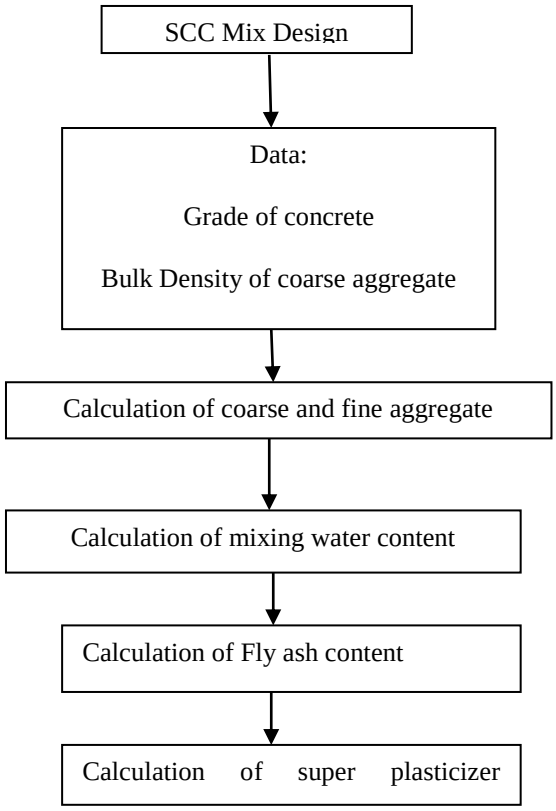
IV. THE FOLLOWING METHODS TO ACHIEVE SELF-COMPATIBILITY

(a) Limited aggregate content

(b) Low water-powder ratio

(c) Use of Super Plasticizer (SP)

V. FLOW CHART OF SCC MIX DESIGN



VI. PROPERTIES OF SCC FRESH SCC MIXES MUST MEET THREE KEY PROPERTIES

1. Ability to flow into and completely fill intricate and complex forms under its own weight

2. Ability to pass through and bond to congested reinforcement under its own weight.

3. High resistance to aggregate segregation.

VII. THE MAIN OBJECTIVE OF THE PRESENT INVESTIGATION

To study of effect of the size of aggregate on the strength and flow of M70 grade of Self compacting concrete by using Nansu mix design procedure. With the above objectives in mind the Investigational program is categorized as detailed below. Casting of 27 standard cubes, 27 standard cylinders and 27 standard prisms, covering M70 grade of concrete, three aggregate sizes, three periods of curing and three specimens of each type.

In this study, high strength (M70) of SCC with three different maximum size of aggregate (20, 12.5, 10 mm) were designed based on Nan Su method, to determine the effective maximum size of aggregate. The grade of concrete and age of curing were the parameters in the study.

VIII. INVESTIGATIONAL PROGRAM

The Investigational program consisted of casting and testing specimens for arriving at the maximum size of aggregate (20, 12.5, 10 mm). The mix proportion for M70 grade was arrived, taking the different sizes of aggregate into consideration. The effective size of aggregate was arrived for M70 grade of concrete, based on the mechanical properties and fresh properties of SCC. A total of 27 cubes of standard size 150 mm x 150 mm x 150 mm, 27 prisms of standard size 100 mm x 100 mm x 500 mm and 27 cylinders of 150 mm diameter and 300 mm height were cast for determining the compressive strength, flexural strength and split tensile strength respectively.

A. Fresh properties of M 70 grade SCC

S. No	Size of Aggregate	Slump Flow value	T50	V-Funnel	V-Funnel at T5 Minutes	L-Box H2/H1 (blocking ratio)
1	20 mm	720 mm	5 Sec	9 Sec	12 Sec	1
2	12.5 mm	725 mm	5 Sec	6 Sec	8 Sec	1
3	10 mm	735 mm	5 Sec	7 Sec	9 Sec	1

B. Compressive strength of M 70 grade SCC

Size of Aggregate	3 Days	7 Days	28 Days
20 mm	31.8	46.3	74
12.5 mm	36.2	49	77.1
10 mm	38.33	49.66	79.3

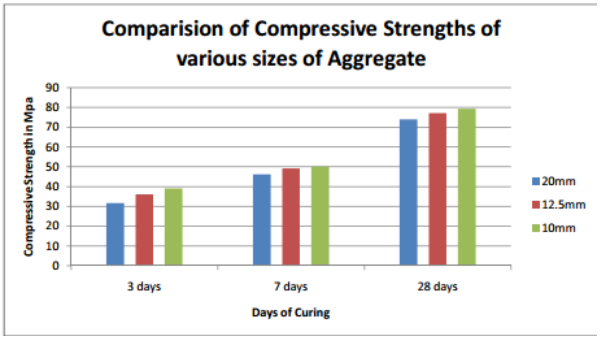
C. Split tensile strength of M 70 grade SCC

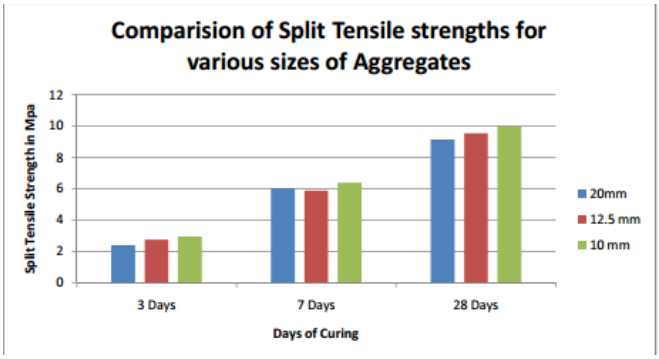
Size of Aggregate	3 Days	7 Days	28 Days
20 mm	2.4	6.04	9.15
12.5 mm	2.8	5.9	9.62
10 mm	2.85	6.36	9.95

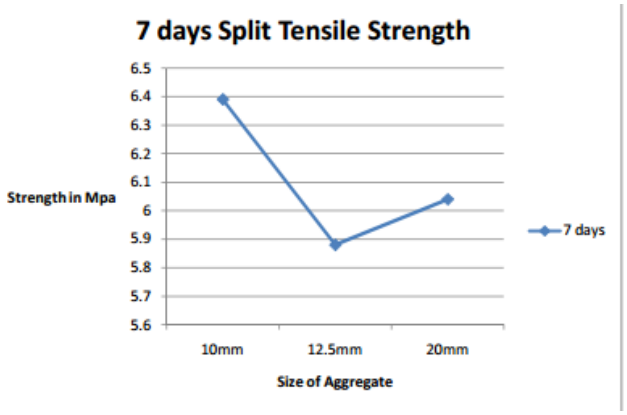
D. Flexural strength of M 70 grade SCC

Size of Aggregate	3 Days	7 Days	28 Days
20 mm	4.03	6.75	8.5
12.5 mm	4.6	7.47	9.13

IX. EFFECT OF SIZE OF AGGREGATE ON THE MECHANICAL PROPERTIES OF SCC







X. CONCLUSIONS

Based on the methodical and full Investigational study conduct on SCC mixes with an endeavor to develop piece mixes, the following are the conclusions arrived.

1. The mixes designed using the lower size of aggregate yielded better fresh properties than higher size of aggregates.

2. As the strength of concrete increases, the effective size of aggregate has decreased.

Significant contribution of the Project:

XI. SCOPE OF THE FUTURE WORK

1. The basic mix design methodology was presented may be extended to the more number of concrete strength ranges.

2. The investigations may be conducted with different mineral admixtures like Rice Husk Ash and GGBS apart from fly ash.

XII. ACKNOWLEDGEMENT

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