Study on Effect of Size of Aggregate on Self Compacting Concrete of Grade M70

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Abstract- **Concrete is a versatile widely used construction material. Ever since concrete has been accepted as a material for construction, researchers have been trying to improve its quality and enhance its performance. Recent changes in construction industry demand improved durability of structures. There is a methodological shift in the concrete design from a strength based concept to a performance based design. At present there is a large emphasis on performance aspect of concrete. One such thought has lead to the development of Self Compacting Concrete (SCC). It is considered as "the most revolutionary development in concrete construction". SCC is a new kind of High Performance 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. The guiding principle behind self-compaction is that "the sedimentation velocity of a particle is inversely proportional to the viscosity of the floating medium in which the particle exists".**

The other features of mix proportion of SCC include low water to cementitious material ratio, high volume of powder, high paste to aggregate ratio and less amount of coarse aggregate. One of the popularly employed techniques to produce Self Compacting Concrete is to use fine materials like Fly Ash, GGBFS etc; in concrete, besides cement, the idea being to increase powder content or fines in concrete. The original contribution in the field of SCC is attributed to the pionee ring work of Nan Su et al; who have developed a simple mix design methodology for Self Compacting Concrete. In this method, the amount of aggregate required is determined first, based on Packing Factor (PF). This will ensure that the concrete obtained has good flow ability, self-compacting ability and other desired SCC properties. The European Federation of Producers and Applicators of Specialist Products for Structures (EFNARC) [2005] have also laid down certain guidelines for fresh properties of SCC.

The present investigation is aimed at developing high strength Self Compacting Concrete of M70 Grade. The parameters of study include grade of concrete and effect of size of aggregate. The existing Nan Su [2001] method of mix design was based on packing factor for a particular grade of concrete, obtained on the basis of experimental investigation. SCC characteristics such as flow ability, passing ability and segregation resistance have been verified using slump flow, L box and V funnel tests.

I. INTRODUCTION

The versatility and the application of concrete in the construction industry need not be emphasized. Research on normal and high strength concrete has been on the agenda for more than two decades. As per IS: 456–2000[Code of Practice for Plain and Reinforced Concrete], concretes ranging 25 – 55 MPa are called standard concretes while those above 55 MPa can be termed as high strength concrete. Concretes above 120/150 MPa are called ultra-high strength concrete. High strength concrete has numerous applications worldwide in tall buildings, bridges with long span and buildings in aggressive environments. Building elements made of high strength concrete are usually densely reinforced. This congestion of reinforcement 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 fills the mould completely without any defects. Usually self-compacting concretes have compressive strengths in the range of 60-100 N/mm2. However, lower grades can also be obtained and used depending on the requirement. SCC was originally developed at the University of Tokyo in Japan with the help of leading concrete contractors during 1980's to be mainly used for highly congested reinforced structures in seismic

regions. As durability of concrete structures was an important issue in Japan, an adequate compaction by skilled labours was required to obtain durable concrete structures. This requirement led to the development of SCC. The development of SCC was first reported in 1989. High strength concrete can be produced with normal concrete. But these concretes cannot flow freely by themselves, to pack every corner of moulds and all gaps of reinforcement. High strength concrete based elements require thorough compaction and vibration in the construction process. SCC has more favourable characteristics such as high fluidity, good segregation resistance and distinctive self-compacting ability without any need for external or internal vibration during the placing process. It can be compacted into every corner of formwork purely by means of its own weight without any segregation. Hence, it reduces the risk of honey combing of concrete.

II. LITERATURE REVIEW

1. S.Grunewald, F. Laranjeira, J.Walraven, A. Aguado and C. Molins, (2012)

This paper discusses the potential for an improved performance of fibres in self-compacting concrete. Significant differences were observed between conventional and SCC at a given fibre type and dosage concerning the variation of results and flexural performance. Mechanical testing and image studies on concrete cross-sections

2. Valeria Corinaldesi and Giacomo Moriconi (2011) . The authors have investigated the properties of SCC using three types of fibers, namely, Steel, Poly-Vinyl-Alcohol and Polypropylene high tough fibers. They have added limestone powder and recycled

3.Alessandro P. Fantilli, Paolo Vallini and Bernardino Chiaia (2011).This paper reports the behavior of plain SCC and steel fibre SCC under multi-axial compression. In the first stage, the loading is applied in the form of confining pressures and hydraulic stress was applied at the later stage till failure. They reported that the ductility in.

4. Joaquim Barros, Eduardo Pereira and Simao Santos (2007) This paper deals with the study of the behavior of light weight precast SFRSCC panels used for building facades. Attempts were made to obtain the SFRSCC post crack behavior. These panels are studied to assess the effect of age on the SFRSCC fracture behavior

5. R.L. Sreenivasa, Ph.D. Thesis (2010) Experiments were conducted to find out the axial compressive strength and stiffness of unfilled, concrete filled (M20) and RC filled GFRG wall panels. It is found that there is a substantial increase in Axial strength and stiffness with filling of wall panels. Similar increase.

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