AN EXPERIMENTAL STUDY ON SELF COMPACTING CONCRETE

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ABSTRACT

Self-compacting concrete is one of the most revolutionary developments in the field of concrete research. This concrete can be placed and compacted in to every corner of a formwork, purely by means of its self weight thereby eliminating the need of either external energy input from vibrators or any type of compacting effort. There is a current trend in all over the world to utilize the treated and untreated industrial by- products, domestic wastes etc. as raw materials in concrete. These not only help in the reuse of the waste materials but also create a cleaner and greener environment. This study aims to focus on the possibility of using fly ash and silica fume (micro silica) in preparation of self-compacting concrete. The project report deals with the ingredient of these mixtures (silica fume, fly ash, super plasticizer, cement) by examining their specific role in self compacting concrete.

KEYWORDS: Self-compact Concrete, Filling Ability, Highly Engineered Concrete, Higher Fluidity, Placement In Sections Heavily Reinforced, Super Plasticizer, High Segregation Resistance, Portland Cement, Particles Smaller Than 0.125mm i.e. 125 Micron Size, Well Graded Cubical Or Rounded Aggregate, Ordinary Potable Water Of Normally pH 7, Glenium SKY 784, Improve Freeze-Thaw Resistance , Slump Flow By Abrams Cone , T50cm Slump Flow, J-ring, V-funnel, Time Increase, V-funnel at T5minutes.

The development of new technology in the material science is progressing rapidly. In last three decades, a lot of research was carried out throughout globe to improve the performance of concrete in terms of strength and durability qualities. Consequently concrete has no longer remained a construction material consisting of cement, aggregate, and water only, but has becomes an engineered custom tailored material with several new constituents to meet the specific needs of construction industry. The growing use of concrete in special architectural configurations and closely spaced reinforcing bars have made it very important to produce concrete that ensures proper filling ability, good structural performance and adequate durability. In recent years, a lot of research was carried out throughout the world to improve the performance of concrete in terms of its most important properties, i.e. strength and durability.

Concrete technology has under gone from macro to micro level study in the enhancement of strength and durability properties from 1980's onwards. Till 1980 the research study was focused only to flow ability of concrete, so as to enhance the strength however durability did not draw lot of attention of the concrete technologists.

Self compacting concrete is highly engineered concrete with much higher fluidity without segregation and is capable of filling every corner of form work under its self weight only (Okamura 1997). Thus SCC eliminates the needs of vibration either external or internal for the compaction of the concrete without compromising its engineering properties.

This concrete was first developed in Japan in late 80's to combat the deterioration of concrete quality due to lack of skilled labours, along with problems at the corners regarding the homogeneity and compaction of cast in place concrete mainly with intricate structures so as to improve the durability of concrete and structures. After the development of SCC in Japan 1988, whole Europe started working on this unique noise free revolution in the field of construction industry. The last half of decade 1991-2000 has remained very active in the field of research in SCC in Europe. That is why, Europe has gone ahead of USA in publishing specifications and guidelines for self compacting concrete (EFNARC 2002). Now, all over the world, a lot of research is going on, so as to optimize the fluidity of concrete with its strength and durability properties without a drastic increase in the cost.

RESULTS

All the expected results for workability and compressive strength test have been achieved satisfactorily for both the cases (i.e. single blending and double blending). Results show that use of micro silica increases compressive strength but reduce workability.

DISCUSSION

Generally SCC is used in situations for concrete requiring high strength say over 40 N/mm^2 up to 100 N/mm^2 or more. Production of such high strength concrete would require the use of low water/binder ratio. Binder generally includes micro silica also. To restore the workability or even to have higher level of workability

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needed for SCC, a higher dose of superplasticiser is needed. Very high dosage of superplasticiser could lead to two major problems.

Firstly all the superplasticiser available in market are not suitable for application at high dosage. Therefore it is important to choose the one that could be used without causing adverse side effect such as excessive retardation, at the same time the one that can retain the slump for sufficiently long time. The superplasticiser based on naphthalene or melamine is generally not suitable for SCC.

Another point of consideration is that, there is tendency for using relatively large binder paste volume in order to achieve both high strength and self compacting properties. From all round performance points of view, the use of a large binder paste volume is undesirable as it would lead to higher heat of hydration, greater shrinkage and creep.

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