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An Experimental Study on Self Compacting Concrete adding with Fibres

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Abstract **Self Compacting Concrete(SCC) is a type of concrete which is capable of flowing into the form work uniformly without segregation and bleeding, better finishes, easier placement, thinner concrete section, no vibration, safe working environment without any vibrator. SCC can eliminate the problem, since it was designed to consolidate under its own mass. This experimental study on mechanical performance of polypropylene fiber reinforced concrete (PFRC) under compression, split tensile and flexural loading. The cube compressive strength, split tensile strength and flexural strength of polypropylene fiber reinforced concrete was determined in the laboratory. The M25 grades of concrete mixes and polypropylene fibers and tested after 7 days and 28 dasys**

Keywords - ***Polypropylene fiber, mechanical properties, self-compacting concrete.***

I. INTRODUCTION

Self-Compacting Concrete (SCC), which flows under its own weight and does not require any external vibration for compaction, has revolutionized concrete placement. SCC, was first introduced in the late 1980's byJapanese researchers, is highly workable concrete. Such concrete should have a relatively low yield value to ensure high flow ability, a moderate viscosity to resist segregation and bleeding and must maintain its homogeneity during transportation placingand curing to ensure adequate structural performance and long termdurability.This paper describes a procedure specifically developed to achieve self compacting concrete such as slump flow, J-Ring, V- Funnel and L- Box are presented. Further,the mechanical characteristics Cube, Cylinder ,Prism.

II. LITERATURE REVIEW

Sahmaran et al. (2005) used straight and hooked-end steel fibres and performed tests in fresh and hardened states. They found that it is possible to attain self-compaction with 60 kg/m3 of fibre content. In order to maintain satisfactory workability in SCC reinforced with steel fibres, the volume of paste in the mix must be increased to yield better fibre dispersion.

Kou and Poon (2008) studied the effect of recycled glass (RG) cullet on workability and mechanical properties of SCC. River sand and 10 mm granite was replaced by RG cullet. It was found that increasing RG content in SCC results an increase in slump flow, blocking ratio and air content. Compressive strength, static elastic modulus and splitting tensile strength were reduced as the RG content in SCC was increased.

Ackay and Tasdemir (2011) investigated workability, mechanical behaviour and fracture properties of hybrid steel fibre reinforced self-compacting concretes (HSFRSCCs). Three different kinds of steel fibres with and without hooked-ends were mixed in the mixtures in two different volume fractions (0.75% and 1.5% of the total volume of concrete)

III. MATERIALS

The performance of concrete highly depends on the properties of materials used in the concrete. The ingredients of conventional concrete are cement, fine aggregate, coarse aggregate and water . The ingredients of our concrete are cement, fine aggregate, coarse aggregate, super plasticisers and viscosity modifying agent.

- CEMENT: Pozzalona Portland cement of specific gravity 2.8
- Fine Aggregate: Locally available zone II M-sand of specific gravity 2.5 confirming to IS 393- 1970 code book.
- Coarse Aggregate: Coarse aggregate are particles greater than 4.75 mm but generally ranging between 20mm to 4.75mm in diameter are preferred for construction. The rounded aggregates of size lesser than 20mm is used in this project. The specific gravity of the fine aggregate is 2.74.
- Water: Potable water for experiments.
- Super plasticizer: Masterglenium sky 8233 is

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the super plasticizer used to improve the workability and reduce the water content. It is based on modified polycarboxylic ether.

- Polypropylene Fibre: Fibres form a class of hair-like materials that occur as continous filaments or in discrete elongated pieces, similar to pieces of thread. Polypropylene Fibre a synthetic fiber formed from a polypropylene melt.
- Viscosity modifying agent: SUPERPLAST-PC 1085 is a cost effective admixture based on poly- carboxylic ether . Given its higher water reducing and slump retaining abilities than the traditional SNF super plasticizers, the product is ideal for use in mixes with higher water demand and slump life

Fig. 1 **Polypropylene fibre**

IV. METHODOLOGY

Trial mix proportion is to be determined and then tested for fresh state properties for SCC (test specified by EFNARC). Then cubes, cylinders and prisms of specified standard dimensions are to be casted and cured in water then 7 days and 28 days compressive , flexural , tensile strength are to be determined for various percentage of fibres by weight of cement or by volume of concrete.

ACCEPTANCE CRITERIA ON SCC

- SLUMP FLOW TEST
- L-BOX TEST
- V-FUNNEL TEST

SLUMP FLOW TEST: The slump cone is a hollow frustum made of thin steel sheet with internal dimensions, as the top diameter 10 cm. The bottom diameter is 20 cm and height is 30 cm. This vertical settlement is called slump. Slump is a measure of 0.7 and 0.8, measure the subsistence of the concrete in cm. For each mix take 10 kg CA, 5 kg FA and 2.36 kg of cement.0.14 Kg of silica fume.

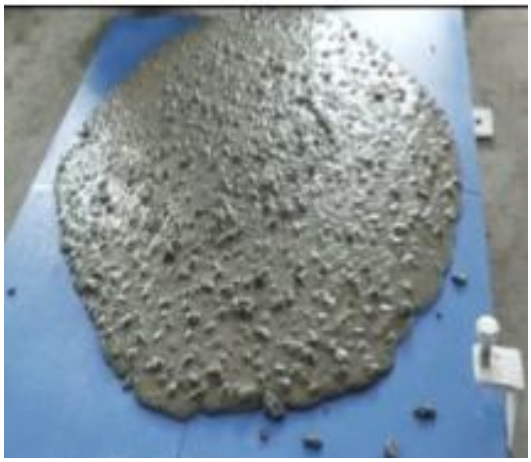

Fig. 2 **Slump flow test**

L-BOX TEST: The passing ability is determined using the L- box test. The height of the concrete at the end of the horizontal section is expressed as a proportion of that remaining in the vertical section (H2/H1). The specified requisite is the ratio between the heights of the concrete at each end or blocking ratio to be ≥ 0.8.

Fig. 3 **L-Box test**

V-FUNNEL TEST: The flowability of the fresh concrete can be tested with the V-funnel test, whereby the flow time is measured. The funnel is filled with about 12 litres of concrete and the time taken for it to flow through the apparatus is measured. T 5min is also measured with V-funnel, which indicates the tendency for segregation, wherein the funnel can be refilled with concrete and left for 5 minutes to settle. If the concrete shows segregation, the flow time will increase significantly. According to Khayat and Manai, a funnel test flow time less than 6s is recommended for a concrete to qualify for an SCC.

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Fig. 4 **V-Funnel**

V. RESULTS AND DISCUSSIONS

A. *Compressive Strength Test Results*

Comparison of Compressive Strength at 28 days test of conventional SCC and Fibre Reinforced SCC

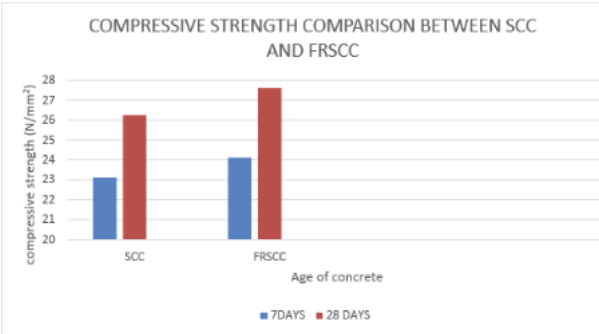

Fig. 5 **Comparison of average compressive strength**

B. *Flexural Strength Test Results*

Comparison of Flexural Strength At 28Days test of conventional SCC And Fibre Reinforced SCC

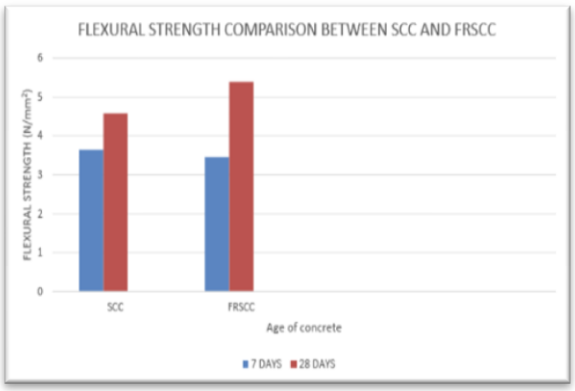

Fig. 5 **Comparison of average Flexural strength**

C. *Split Tensile Strength Test Results*

Comparison of Split Tensile strength at 28 days testof Conventional SCC and Fibre Reinforced SCC

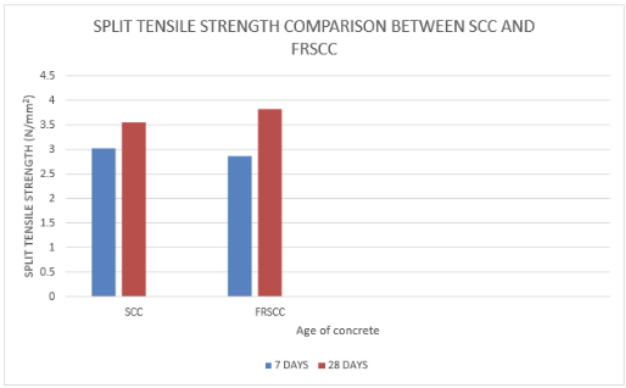

Fig. 6 **Comparison of average Spilt Tensile strength**

- The conventional compressive strength of concrete cubes at 28 days are found to be 23.11 kN/mm^2
- The fibre reinforced compressive strength of concrete cubes at 28 days are found to be 27.6 kN/mm^2
- The conventional flexural strength of concrete cubes at 28 days are found to be 4.58 kN/ mm^2
- The fibre reinforced flexural strength of concrete cubes at 28 days are found to be 5.39 kN/mm^2
- The conventional Split tensile strength of concrete cubes at 28 days are found to be 3.55 kN/mm^2
- The fibre reinforced Split tensile strength of concrete cubes at 28 days are found to be 3.82 kN/mm^2

VI. CONCLUSION

- The mix design for M25 of concrete was found using IS 10262-2009 and EFNARC and the mix ratio of concrete were found to be 1.1.7.1.1.
- The characteristic compressive strength, split tensile strength and flexural strength of conventional concrete of M25 was obtained.
- Flexural strength, Compressive strength, Split tensile strength for Self compacting concrete and Fibre Reinforced Self Compacting concrete were determined.
- Finally, it can be concluded with the support of those previously conducted tests that Fibre Reinforced Self Compacting Concrete proves to be of better purpose.

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