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Hardened Properties of SFRSCC & PPFRSCC

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Abstract:- **SCC is a newly developed special concrete in which it fills the form work without any vibration. The present experimental work sets out to investigate the comparative study on Hardened properties of (SFRSCC) and (PPFRSCC). In the particular case the mix design followed was Nan-Su method for M70 grade concrete. While Flyash (Type Class F) is used as filler material having a specific gravity of 2.29. varied fibre content from 0% to 0.15% at the interval of 0.05% by volume fraction of cement. For this comparative study Crimped steel fibre of Aspect ratio 60 and Polypropylene fibre are used. The test conducted for this present experimental study are compressive, split tensile and Strength under flexures tests. Thus the present study highlights the validation of fibre usage and their effect on hardened properties.**

Keywords:-- **Comparison, Compression, Concrete, Crimped fibres, Flexure, Polypropylene fibres, Properties, Split tension, Mix design, SCC**

I. INTRODUCTION

The present day constructions have their own structural requirement to better suit the planned function of the structure. Hence, it is needed to develop a special type of concrete which has special properties in it. A SCC is a special concrete having various special properties. This SCC has a ability to fill the form work without any compaction or vibration. In this present experimental investigation cement quantity is reduced with respect to the total powder content by Fly ash. This is a residual obtained from the incineration of coal at high temperature in thermal power plants. The water cement ratio is reduced by adding super plasticizer (Master Glenium 8233) in appropriate dosage by trial and error method. A decrease in water cement ratio increases the strength under compression of SCC.

II. EXPERIMENTAL INVESTIGATION

1)Cement: For all the mixes in this project, 53 Grade (Birla Super), OPC was used. The cement was tested for codal specifications as per IS 12269-1897 to determine its properties like specific gravity, fineness and normal consistency test.

2)Fly ash:. The Fly ash used for this project is Class-F type having a specific gravity of 2.29 obtained from Raichur power plant.

3)Fine aggregate: Locally available river sand with confined Grading zone II of IS: 383-1970 having a specific gravity of 2.77.

4)Coarse aggregate: Locally available crushed granite stones of nominal size 12.5 mm as per IS:383-1970 with a specific gravity of 2.64.

5)Chemical Admixture: Master Glenium 8233 used as high range water-reducers. Ranges from 750ml to 1500ml for 100 kg of cementitious material.

6)Water: The water used is a potable drinking water.

7) Packing factor: Here S/a is taken as volume ratio of Fine aggregates to total aggregates as 50% with a PF of 1.05.

Table 1: Material properties

Material	Properties	Value
CEMENT	Specific gravity	2.96
	Consistency	33 %
FINE AGGREGATES	Specific gravity	2.77
	Bulk Density	1480 Kg/m^3
COARSE AGGREGATES	Specific gravity	2.64
	Bulk Density	1340 Kg/m^3
FLY ASH	Specific gravity	2.29
WATER	Specific gravity	1.0

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Table 2: Mix Design Calculations using Nan-Su method for M70 Grade

Material	Quantity	Unit
CEMENT	500	Kg/m^3
FINE AGGREGATES	777	Kg/m^3
COARSE AGGREGATES	703.5	Kg/m^3
FLY ASH	131.8	Kg/m^3
W/C ratio	0.33	

Fresh property tests for SCC:-

In order to determine workability and SCC properties following tests were carried out:

1. Slump flow test and
2. Measurement of T50 time.
3. J-Ring test
4. V-funnel flow test.
5. U-box test.
6. L-box test.

Trial	Chemical dosage per 100 kg	J ring	Slump flow		ELL- Box	V funnel		U Box		
		Height Difference (mm)	Horizontal (mm)	T_{50} cm (sec)	Blocking ratio (H_2/H_1)	(Tr) Flow (sec)	Flow at T_5 min (sec)	Left Limb (mm)	Right Limb (mm)	Diff in height (mm)
1	1200 ml	7	680	4	0.96	11.6	15.3	383	346	37
2	**1300 ml**	**2**	**695**	**3.5**	**0.95**	**10.12**	**11.72**	**328**	**336**	**8**
3	1400ml	12.5	700	4.3	0.98	8.7	13.3	341	328	13
values		10 mm	600-800	2-5 secs	0.8-1	6-12 sec	≤ Tr+3			Max 30 mm

Hardened property tests for SCC:-

1. Strength under compression

Tech ref: IS: 516 – 1959, Reaff 1999.the procedure of test is followed by using the above clause. The test specimen used is cube of dimension 150X150X150mm.

Age at Test Tests is been made at the ages seven, fourteen, and twenty eight days. In the present investigation, the strength under compression test has been conducted on concretes with different percentage of steel fibre and poly propylene fibre for M 70 grade of SCC at seven, fourteen, and twenty eight days are tested. A Total of 72 specimens were cast and tested.

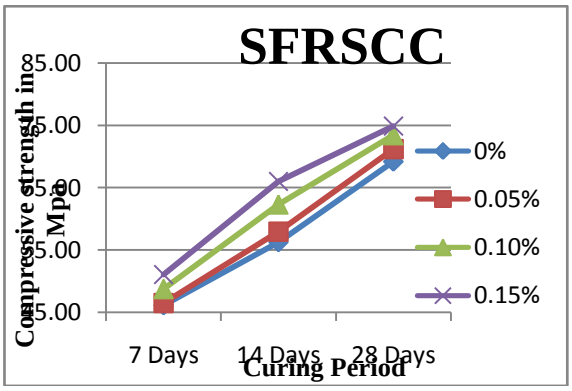

Fig1: Variation of compressive strength with different proportion of Steel fibres

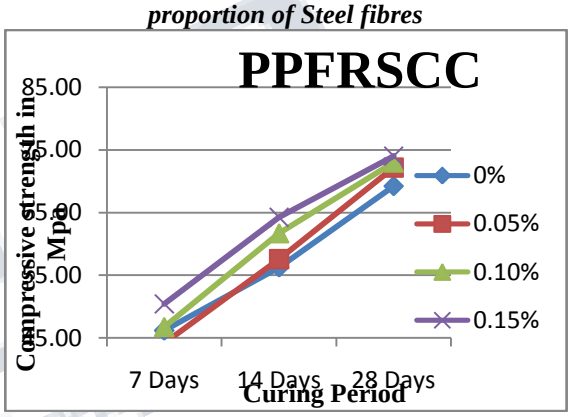

Fig2: Variation of compressive strength with different proportion of Polypropylene fibres

2. Splitting Tensile Strength of Concrete

Tech ref: IS 5816: 1999 (First Revision) This standard covers the procedure to find out the splitting tensile strength of moulded concrete cubes and cylinders.

Age at test Tests shall be made at the ages of seven, fourteen, *and* twenty eight days. A cylindrical specimen of dimensions (150mm dia and 300mm height) was used. Also a total of 72 specimens were casted for this test and were tested at 7, 14, 28 days.

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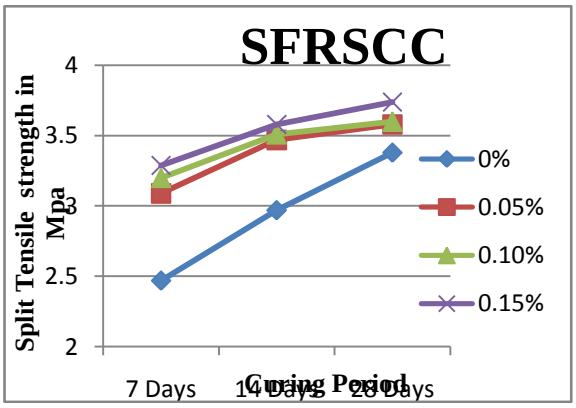

Fig3: Variation of Split tensile strength with different proportion of Steel fibres

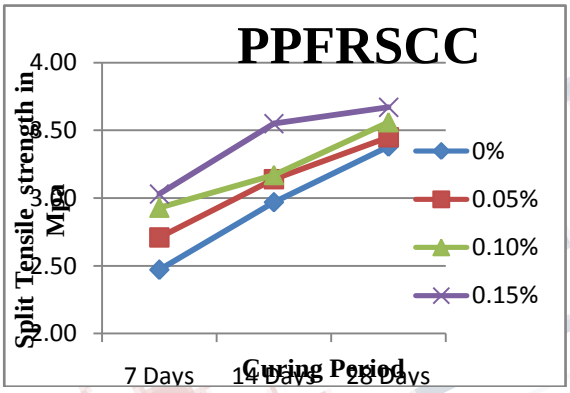

Fig4: Variation of Split tensile strength with different proportion of Polypropylene fibres

3. Strength under flexures test

Tech ref: IS516-1959 To determine the Flexural strength test of concrete, Flexural testing machine was used, test specimens were of prismoidal in shape with dimensions 500X100X100mm.

Age at test Tests shall be made at ages of seven, fourteen, and twenty eight days. Total 72 specimens were casted for different ages of test. A total of 72 specimens were casted for this test and were tested at 7, 14, 28 days.

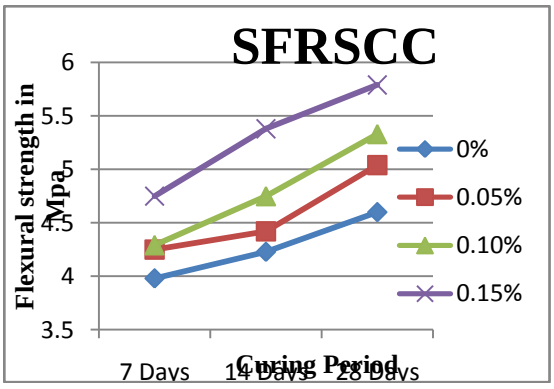

Fig5: Variation of Flexural strength with different proportion of Polypropylene fibres

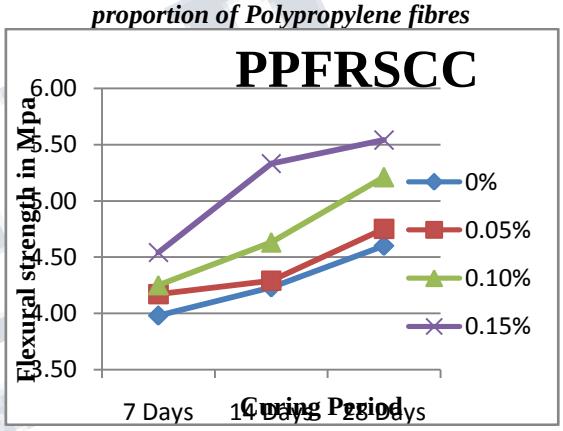

Fig6: Variation of Flexural strength with different proportion of Polypropylene fibres

III. CONCLUSION

1. It is noted that the results of strength under compression test increases with the increase in fibre content. The max strength is achieved at 0.15% of fibre content. The values varies for 0% and 0.15% of fibre from 69.2 MPa to 74.9 MPa for SFRSCC and 69.2 MPa to 74.01 MPa for PPFRSCC respectively.
2. It is noted that as the fibre content increases strength under splitting is also increased. The value varies from 0% and 0.15% of fibre from 3.38MPa to 3.74Mpa for SFRSCC and 3.38MPa to 3.67 Mpa for PPFRSCC respectively.
3. It is noted that the Strength under flexure increases from 0% and 0.15% of fibre content. The values are 4.6 MPa to 5.6 MPa for SFRSCC and 4.6 MPa to 5.54 MPa for PPFRSCC respectively.

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