PERFORMANCE ON HYBRID FIBRE REINFORCED HIGH STRENGTH SELF COMPACTING CONCRETE

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***Abstract*- Concrete is one of the principal materials for structures and it is widely used all over the world. In any case, the heterogeneous structure of solid outcomes some unfortunate impacts.The most spectacular disadvantage of concrete may be thought as its exceedingly complex structure, which results many internal stress concentration zones. Thus, some internal micro-cracks mostly occurred in fresh or hardened state in concrete. Such micro-cracks exist at cement paste–aggregate interfaces within concrete even prior to any load and environmental effects. once concrete is subject to fast or impact loading it will suffer failure because it is inherently weak in tension. The inclusion of fibers may go some way to mitigate this weakness. It is also reasonable to produce concrete using admixtures such as Brass Coated Micro Steel fibre and Polyester fibre. The experimental work is carried out on M70 grade concrete by adding 0.5%,1%, 1.5%,2%,2.5% and 3% of Brass Coated Micro Steel Fibre and Polyester fibre . From the experimental study, it is observed that the compressive strength and flexural strength increase with control mix.**

Keywords*:S*elf-compacting concrete, Flexural Strength, Compressive Strength, Split Tensile Strength, Polyster fibers . Brass Coated Micro Steel Fibre

- INTRODUCTION

Hence, several studies ultimately news different waste management methods that involves each eco economical parameters. In the row, recent studies have been paid their concentrate on the development materials which has fine and course aggregates.

Generally, the existing studies focused on alternatives for these construction aggregates, but still there is enough room to explore further Concrete consolidated by shivering apparatus to blow Consolidation is a method to achieve good concrete with excellent strength and durability.But in self-compacting concrete (SCC) there is no need of any internal or external vibration for compaction as it consolidated by its own passing and filling abilities.

Investigation performed on self-compacting concrete (SCC) found to be stronger day by day. Various industrial by products, used successfully in the manufacturing of durable SCC which is fly ash, silica fume and ground granulated blast furnace slag, steel slag and copper slag etc he experimental results revealed that mixing rubber particles with the polyester matrix decreased both the compressive and tensile strengths of the composite.

The use of fibers are increasing day by day in the concrete.
To increase the physical properties of concrete there are use a different types of fiber. After adding different fibers like steel fiber, polymer fiber ,basalt fiber they are using in concrete and self compacting concrete.

- MATERIAL AND PROPERTIES

M70 grade concrete is produced using materials with properties discussed below:

i. Cement

In this study, cement used is Coromandel king of 53 grade of ordinary Portland cement. Specific gravity and standard consistency are found to be 3.15 and 28 %, respectively as per IS 12269-1987

ii. Fine Aggregate

Locally available sand passed through 4.75mm sieve having a specific gravity of 2.1 and fineness modulus 3.04 is used as fine aggregates. Bulk density is found to be 1094 kg/m^3 in loose state and 1162 kg/m^3 in compacted state with a water absorption rate of 1.583%.

iii. Coarse Aggregate

Coarse aggregates of 20 mm ware used having specific gravity 2.6 and fineness modulus 7.18.

iv. Water

Potable water free from all types of acids, organic and inorganic impurities, is used for proper mixing and curing of concrete.

v. Brass Coated Micro Steel Fibres (13mm)

Brass Coated Micro Steel Fibre as shown in Figure 1 used in High Performance densified concrete has more aximum content of carbon. They are available in different diameters &

length sizes. Addition of brass coated micro steel fibres into the concrete improves the crack resistance of the concrete. Tables I and II show physical and chemical properties of brass coated micro steel fibres .

Figure 1: Brass Coated Micro Steel Fibre (13 mm)

TABLE I- PHYSICAL PROPERTIES OF BRASS COATED MICRO STEEL FIBRES

Properties	Technical Data
Diameter	0.2mm
Ultimate Tensile Strength	2800 N/mm^2
Length	13 mm (± 10%)
Surface Finish	Brass Coated
Aspect Ratio	65

TABLE II- CHEMICAL PROPERTIES OF BRASS MICRO STEEL FIBRES

Constituent	Standard Value	Test Results
%C	0.72 - 0.80	0.76
% Mn	0.50 – 0.80	0.65
% Si	0.10 – 0.30	0.19
% S (Max)	0.035	0.015
% P (Max)	0.035	0.03
% Ni (Max)	0.20	0.12
% Cr (Max)	0.15	0.11
% Mo (Max)	0.05	0.01
% Cu (Max)	0.25	0.19
Al	0.01	-

vi. Polyester fibre

Polyester fiber showed in figure 2 used as fiber as hybrid fiber in the self compacting concrete. Table III shows the physical Properties the polyester fibre

Figure 2: Polyester fibre

TABLE III- PHYSICAL PROPERTIES OF POLYESTER FIBRES

Properties	Technical Data
Shape	Triangular
Effective Diameter	20 microns
Specific Gravity	1.34-1.39
Young's Modulus	>5000 Mpa
Elongation	20-60 %

- EXPERIMENTAL WORK

The c oncrete of M70 grade is produced by following steps discussed below:

(i) Mix Proportion

The mix proportion shown in Table V is found for a M70 grade concrete as per EFNARC Guidelines.

TABLE IV- MIX PROPORTION FOR M-70 CONCRETE

Material	Weight (kg/m^3)
Cement	583
Silica Fume	55
Water	189.9
Fine Aggregate	841

Coarse Aggregate	722
w/c ratio	0..32
Super Plasticizer	9.495

- TESTS

Compression test, Split tensile strength and Flexural test are performed to find mechanical properties as mentioned below:

i. Compression Test

Compression test is carried out on cube specimens. of sizes (150mm × 150mm × 150mm). After filling concrete into moulds, layers are tamped by tamping rod by three equal layers of 25 blows. Moulds are vibrated properly in order to avoid the air voids in concrete. Specimens are tested on compression testing machine after 7 and 28 days of curing. Load is given gradually at the rate of 5.2kN per second till specimens fail.

ii. Flexural Test

Flexural test is carried on beams sizes (150mm × 150mm × 700mm) tested on two point loading flexural testing machine as per IS: 516-1959 and flexural strength at failure is noted

iii. Split Tensile Strength

Split tensile test is carried out on (300mm length and 150mm diameter) moulds. Cylinders are not in position of resisting direct tension loadings, as concrete gets cracks when applied to tensile forces so it is necessary for determining tensile strength

- RESULTS AND DISCUSSION

i. Compression Test

Figures 3 shows compressive strength for mix of different percentage for 7 and 28 days.

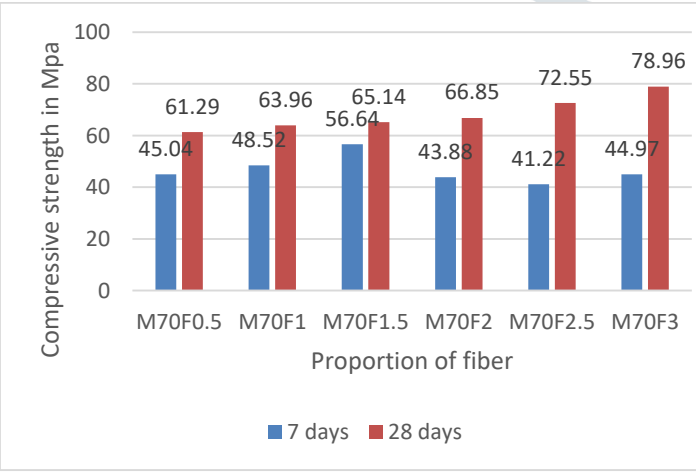
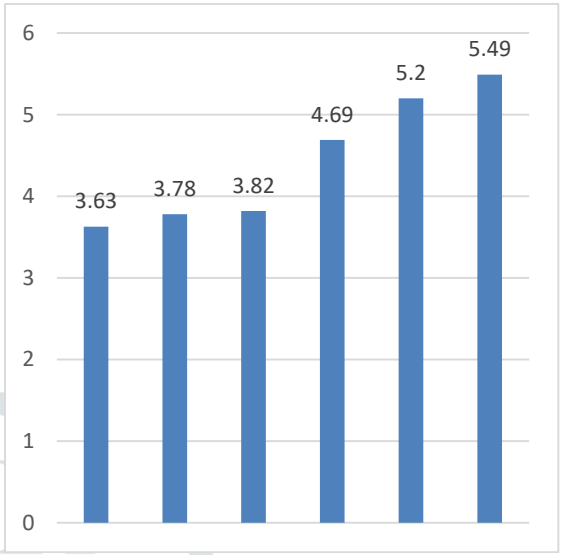


FIGURE3: COMPRESSIVE STRENGTH FOR 7&28 DAYS

ii. Flexural Test

Figure 5 shows flexural strength results for mix with different percentage of fibre.

FIGURE 5: FLEXURAL STRENGTH FOR 28 DAYS



- CONCLUSION

i. The optimum percentage of fibre is 3% in the self compacting concrete.
ii. After 7 days and 28 days compressive strength is increased.
iii. After 28 days Flexural strength is increased.

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