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STRENGTH APPRAISAL BY FIBRE EINFORCEMENT IN CONCRETE

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ABSTRACT

This paper presents the Compressive strength of high strength concrete with the replacement of cement with Alccofine and Fly ash, also addition of polypropylene fibre to increase bonding strength. The necessity of high strength concrete is increasing because of demands in construction industry. Efforts for improving the performance of concrete over the past few years suggest that cement replacement materials along with mineral and chemical admixtures can improve the strength and durability characteristics of concrete. An experimental program was carried out to explore its effects on compressive, flexural strength under atmospheric curing condition. The main aim of the investigation program is to study the effect of cement replacement material alccofine and Fly ash content mix by varying content such as 5%, 7.5%, 10%,12.5% and finding the optimum Mineral Admixture content also effect of Polypropylene fibre mix by varying content such as 1%,1.5% & 2% and finding the optimum Polypropylene fibre content. The concrete specimens were tested for mechanical properties of concrete, namely, cube compressive strength, flexural strength.

Keywords: *Compressive strength, Alccofine, Fly ash, Polypropylene fiber, Flexural strength.*

I. INTRODUCTION

During years, many innovations and modernizations in concrete have occurred for betterment of concrete properties. Regular concrete with Portland cement has been used for several years until the concept of HSC concrete came in demand. Before the concrete with grade greater than M40 were classified under HSC but after years the criteria is changed to M60. . It needs many efforts for getting that level strength such as taking under consideration the qualities of the materials used in concrete and the compaction and mixing of the concrete where the other criteria. After several years of the regular concrete the new methodology of concrete mixing came to account and that was usage of admixtures both chemical and minerals. The chemical admixture is in form of Plasticizers and Superplasticizer required for HSC. And the mineral admixtures are materials like fly ash, silica fume and Alccofine. Alccofine is the most recent admixture introduced by

Ambuja cements- India. Which not only is the substitute to silica fume but also improves the strength of concrete to level. polypropylene is resistant to fatigue, most plastic living hinges, such as those on flip-top bottles, are made from this material. However, it is important to ensure that chain molecules are oriented across the hinge to maximise strength.

II. EXPERIMENTAL PROGRAM

Experimental program has been designed to provide results of Alccofine and Fly ash with polypropylene for making High Strength concrete.To check the performace of Alccofine nd Fly ash various proportion are studied in investigation.

A) MATERIAL USED

1) **Cement-** Ordinary cement-53 grade (Ambuja cement) Have been used in investigation.The cement was tested according to IS 12262:1987.

Table 1.Physical properties of cement

SR.NO.	DESCRIPTION OF TEST	RESULTS
1	Fineness of cement (residue on IS sieve no. 9)	2%
2	Standard consistency of cement	30-25%
3	Setting time of cement a) Initial Setting time b) Final Setting time	 40 minute 10 hr.
4	Compressive strength of cement a) 3 days b) 7 days	 33.56 N/mm2 43.43 N/mm2

2) **Fine aggregate-** Locally available river sand is used.

Table 2.Physical properties of Fine aggregate

SR. NO.	PROPORTY	RESULTS
1	Particle shape, Size	Round, 4.75mm
2	Fineness modulus	2.96
3	Silt content	1.6%
4	Specific Gravity	2.60

3) **Course aggregate**- Course aggregate of 10mm and 20mm size are used.

Table 3.Physical properties of course aggregate

SR. NO.	PROPERTY	RESULTS
1	Particle shape, Size	Angular, 10mm and 20mm
2	Fineness modulus of 20mm aggregate	7.4
3	Fineness modulus of 10mm aggregate	6.57
4	Specific Gravity	2.65
5	Water absorption	0.40%

4) **Alccofine**-

ALCCOFINE is a specially processed product based on slag of High glass content with high reactivity obtained through the process of controlled granulation. Alccofine have used conforming to ASTM 989-99.

Fig 1. Alccofine bag

Table 4.Physical and Chemical properties of Alccofine

Chemical Analysis	Mass%	Physical Analysis	Range
CaO	32-34	Bulk Density	600-700 kg/m^3
Al_2O_3	18-20	Surface Area	12000 cm^2/gm
Fe_2O_3	1.8-2	Particle shape	Irregular
SO_3	0.3-0.7	Partical size, D_{10}	< 2 micron
MgO	8-10	D_{50}	<5 micron
SiO_2	33-35	D_{90}	<9 micron

5) Fly ash

6) **Polypropelene fibre**- Polypropylene is a thermoplastic it is by product of oil refining process. The long 12mm straight polypropylene fibre is used.

Fig. 2. PPF (polypropylene fibre)

B) MIX DESIGN-

Alccofine and Fly ash proportion is varied from 5%,7.5%,10%,12.5% and Polypropylene content is Varied from 1%,1.2%,2% respectively.

Table 5.Mix design of M60 grade

Water	Cement	Fine aggregate	Coarse aggregate
158.08 kg/m3	416 kg/m3	771.42 kg/m3	1042.245 kg/m3
0.38	1	1.85	2.50

C) EXPERIMENTAL PROCESS-

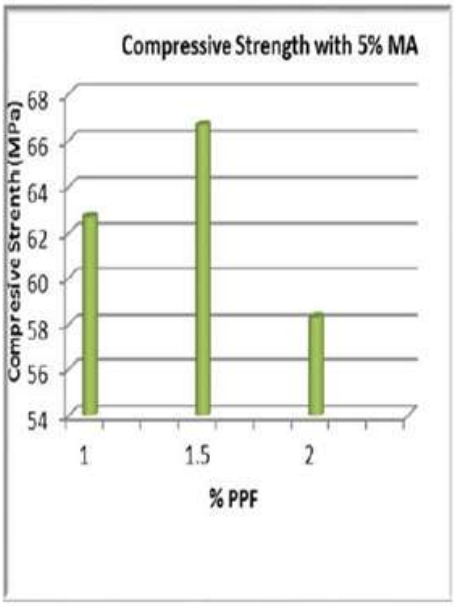
The specimen of Standard cube (150mm X 150mm X 150mm) used for compressive strength. And specimen of Standard Beam (100mm X 100mm X 500mm) used for Flexural test. They have tested after 28days water curing.

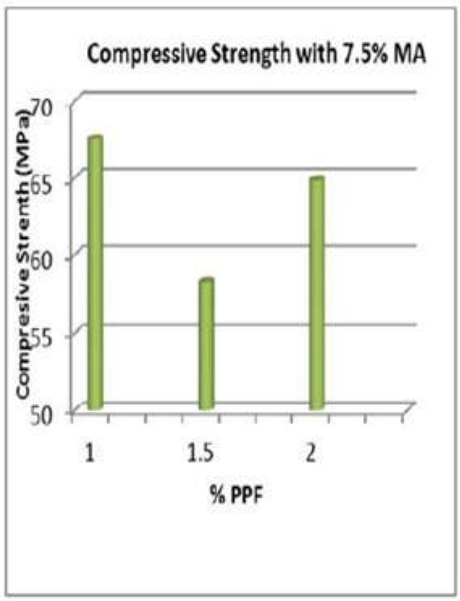
Fig.3. Compressive test

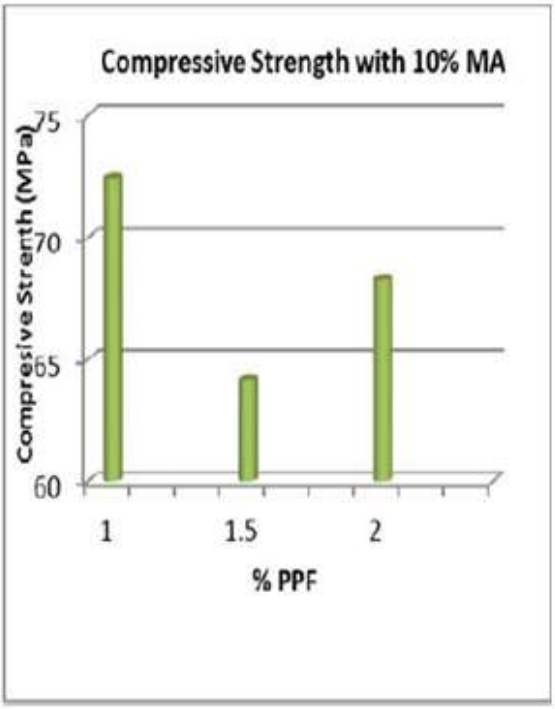
Fig.4. Flexural test

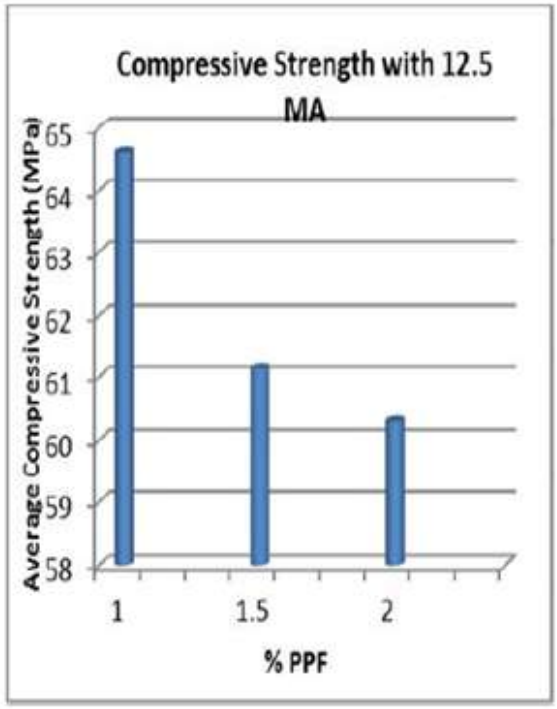
III RESULT OBTAINED

Compressive strength test Result-

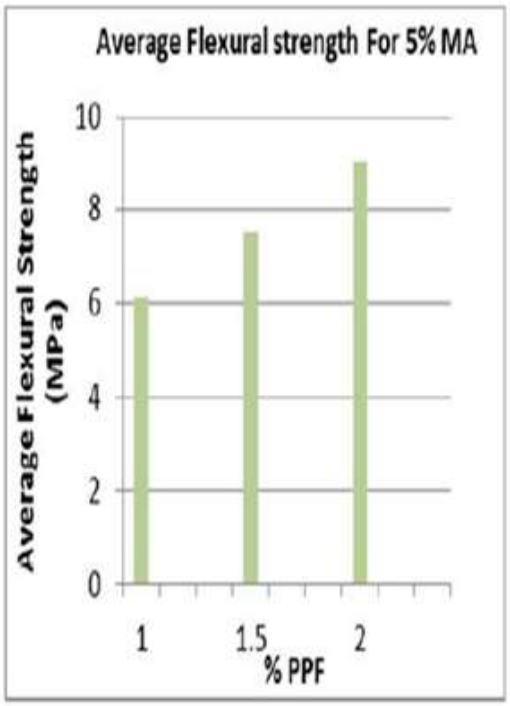


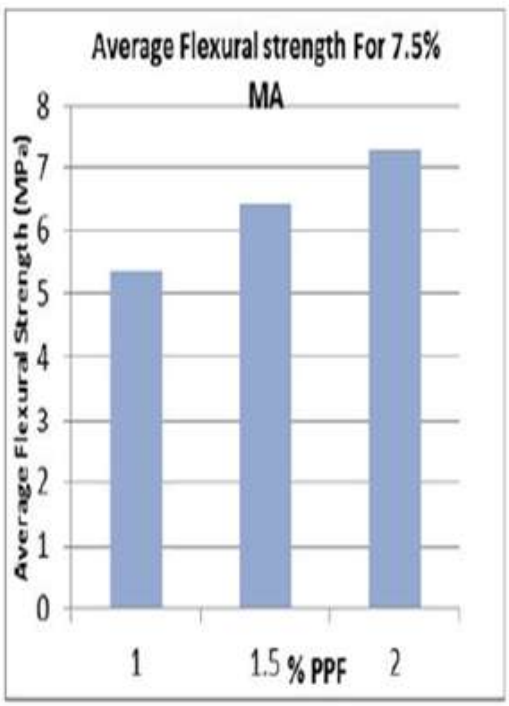


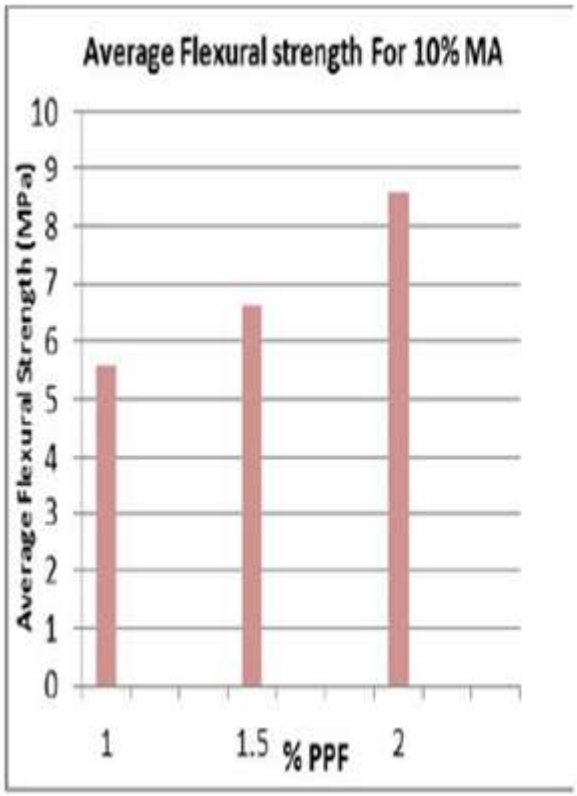


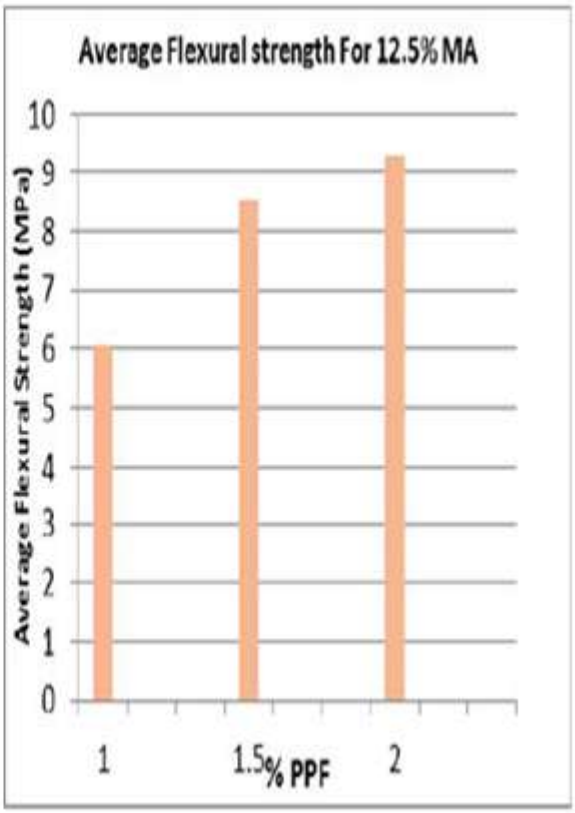


Flexural strength test on Beam Result-









IV. CONCLUSIONS

From the results of beams we found that

1) flexural strength of concrete was found maximum when we used 2% of fiber volume fraction by weight of cement.Flexural strength of beams was found to be more for 5%, 7.5%, 10% and 12.5 % Mineral Admixture. Among all the results the value was found to be maximum at 12.5% MA with 2% PPF.

From the results of cubes we found that

- For compressive strength of cubes it was found to be maximum corresponding to 10% of Mineral Admixture
- The minimum value was found at 1.5% of fibers corresponding to 7.5% of alccofine by weight of cement.
- The test carried our at 7 till 28 days shows that strength gain is rapid. As per literature review the strength gain will go on till 56^{th} day but in slower rate.

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