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Mechanical Properties Of Plastic Fibre Reinforced Concrete

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***Abstract*—**These instructions give you guidelines for preparing papers for conferences or journals. Use this document as a template if you are using Microsoft Word. Otherwise, use this document as an instruction set. The electronic file of your paper will be formatted further at AETS. Define all symbols used in the abstract. Do not cite references in the abstract. Do not delete the blank line immediately above the abstract; it sets the footnote at the bottom of this column. Page margins are 1,78 cm top and down; 1,65 cm left and right. Each column width is 8,89 cm and the separation between the columns is 0,51 cm.

***Keywords*—**About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

The concrete is one of the most widely used construction material in developed and developing countries. The performance of concrete depends on its ingredients. It is well known that plain concrete is brittle and weak in tension. The major advantage of fiber reinforcement concrete is to transform a brittle concrete into a pseudo ductile material.

The low tensile strength of concrete is being compensated in several ways, and this has been achieved by the use of reinforcing bars and also by applying pre-stressing force. Though these methods provide tensile strength to concrete, they do not increase the inherent tensile strength of concrete itself.

Fibres in the cement based matrix acts as cracks arrester, which restricts the growth of flaws in the matrix, preventing these from enlarging under load, into cracks, which eventually cause failure. Prevention of propagation of cracks originating from internal flaws can result in improvements in static and dynamic properties of the matrix.

Adding fibers in concrete can arrest micro cracks which causes gradual failure. The fibers from cheap or waste materials may be used for manufacture of structural units with cement mortar composites have great potential for developing countries like India.

But still it is ongoing process to improve properties of concrete. The present paper reports on effect of the addition of various volume fractions of plastic fibers on behavior of concrete. Effect of plastic fibers in concrete under compression, flexural and split tension strength are discussed. Mathematical equations for compressive and split tensile strengths verses % fibres in composite are established.

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II. MATERIALS AND MIX PROPORTION

2.1 Material

The Materials used are cement, fine aggregate, sand, coarse aggregate, water, metakaolin.

Cement

Cement is a binding material which possess very good adhesion and cohesive properties which make it possible to bond with other material to form a compact mass. Ordinary Portland cement is the most commonly used cement for general engineering works. The specific gravity of all grades namely 33, 43 and 53 grades. In this project Ordinary Portland Cement of 53 grades is used is used for experimental work. Initial and final setting time of the cement was 30mins and 360mins.

Fine Aggregate

Sand is either round or angular in grains and is often found mixed in various gradation of fineness

A concrete can be made from sand consisting of rounded grains as good as form that in which the grains are granular. River or pit sand should be used and not sea sand as it contains salt and other impurities which will affect the structure. In this project river sand has been used as fine aggregate. The specific gravity of sand is found to be 2.67 by experiment.

Coarse Aggregates

Hard granite broken stones of less than 20mm size were used as coarse aggregate. The Specific Gravity, Fineness modulus, Water absorption and impact value of the coarse aggregate were tested.

Water

Potable water available in laboratory with pH value of of not less than 6 and conforming t the requirement of IS 456-2000 was used for mixing concrete and curing the specimen as well.

Polyethylene Terephthalate Fibre

The reinforcing material for this research was obtained from different waste bottles (refreshing drinks, water, tea and juices). Bottles were collected from house hold waste and were only treated by water-based washing. Were fibres obtained from PET bottles by manual cutting around the bottle walls.

Properties

- Excellent wear resistance.

- ❖ Low co-efficient of friction.
- ❖ High flexural modulus.
- ❖ Good chemical resistance.

2.2 Mix Proportion

CEMENT (Kg/m³)	F.A (Kg/m³)	C.A (Kg/m³)	WATER (lit/m³)
450	585.53	1064.25	197
1	1.3	2.4	0.45

M20=1:1.3:2.4

III. EXPRIMENTAL PROCEDURE

Preparation of the mould

The compressive strength of the concrete was determined by cubes of size 150mmx150mmx150mm. Split tensile strength of the concrete was determined by the cylinder of size 150mm diameter and 300mm height were prepared. Flexural strength of concrete was determined by Prism size 10mmx10mmx50mm.

Mixing of concrete

Thorough mixing of materials is essential for the production of uniform course.

The mixing should ensure that the mass becomes homogeneous, uniform in colour and consistency. As the mixing cannot be thorough, it is desirable to add 10% more materials. The mixing was done by hand mixing of coarse aggregate and cement. Add remaining water inside.

Placing of concrete

After mixing, the moulds are filled immediately by pouring the concrete inside. Concrete is filled in three layers, each layer is compacted well by using tamping rod, so as to avoid entrapped air inside the concrete cubes and honey combing effects on the sides. During pouring of concrete, is better to avoid wasting of concrete for effective and economical usage.

Compaction of concrete

Compaction of concrete is process adopted for expelling the entrapped air from the concrete. In the process of mixing, transporting and placing of concrete air is likely to get entrapped. Concrete is filled in layers of 15 to 20mm, and each layer is compacted using tamping rod. During compaction the strokes should be distributed in a surface of concrete, and should not forcibly strike the bottom of the mould.After the top layer has been compacted, a strike off bar is used to strike out the excess concrete.

Demoulding

The cube specimens are demoulded after 24 hours from the process of moulding. If the concrete has not achieved sufficient strength to enable demoulding the beam specimens, then the process must be delayed for another 24 hours care should be taken not to damage the specimen during the process because, if any damage is caused, the strength of the concrete may get reduced. After demoulding, specimen is marked with a legible identification, on any of the faces by using paint.

Curing

The demould specimen immediately cured in water at room temperature. . The curing is spilt into 2 batches. (7 days, 28 days).

Test On Conventionalconcrete

Tests on fresh concrete

Slump test results

S. No	Water / cement ratio	Slump value (mm)
1	0.4	65

Compaction factor test

Compaction factor = 0.875

Inference:

Poor workability value = 0.85
Medium workability value = 0.92
Good workability value = 0.95

Tests on hardened concrete

The following tests done in the concrete specimen.

A. Compressive strength Test
B. Split tensile strength Test
C. Flexural strength test

A.Compressive strength test result of cube

Weight of fine aggregate (kg)	Weight of cement (kg)	Weight of coarse aggregate (Kg)	w/c ratio	Specimen No.	Load (kN)		Compressive Strength (N/mm²)	
					7 days	28 days	7 days	28 days
7.1	5.5	12.1	0.4	1	565	830	25.1	36.88
				2	675	850	30	37.8
				3	655	800	29.1	35.55

B. Split Tensile Strength of cylinder

Weight of fine aggregate (Kg)	Weight of cement (kg)	Weight of coarse aggregate (Kg)	w/c ratio	Specimen No.	Load (kN)		Split Tensile Strength (N/mm²)	
					7 days	28 days	7 days	28 days
11.2	8.6	20.3	0.4	1	125	220	1.76	3.1
				2	120	200	1.69	2.82
				3	130	150	1.83	2.1

C. Flexural strength of Prism

Weight of fine aggregate (Kg)	Weight of cement (kg)	Weight of coarse aggregate (Kg)	w/c ratio	Specimen No.	Load (kN)		Flexural strength (N/mm²)	
					7 days	28 days	7 days	28 days
12	8.1	19	0.4	1	6	10	3	5
				2	8	9	4	4.5
				3	6	12	3	6

TEST ON PLASTIC FIBRE REINFORCED CONCRETE

Compressive strength test result of cube

Weight of fine aggregate (Kg)	Weight of cement (Kg)	Weight of coarse aggregate (Kg)	w/c ratio	Weight of Polyethylene Terephthalate Fibre(PET) (g)		
				0.3%	0.6%	0.9%
7.1	5.5	12.1	0.4	23	47	70

Specimen No.	Load (kN)						Compressive Strength (N/mm²)					
	7 Days			28 Days			7 Days			28 Days		
	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%
1	555	690	790	830	865	870	24.7	30.6	35.11	36.8	38.4	38.66
2	630	745	730	750	830	865	28	33.1	32.44	33.3	36.8	38.44
3	580	720	760	810	880	890	25.8	32	33.77	36	39.1	39.55

Split Tensile Strength of cylinder

Weight of fine aggregate (Kg)	Weight of cement(kg)	Weight of coarse aggregate(Kg)	w/c ratio	Weight of Polyethylene Terephthalate Fibre(PET) (g)		
				0.3%	0.6%	0.9%
11.2	8.6	20.3	0.4	37	74	110

Specimen No.	Load (kN)						Split Tensile Strength (N/mm^2)					
	7 Days			28 Days			7 Days			28 Days		
	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%
1	120	160	175	210	250	270	1.69	2.26	2.47	2.97	3.53	3.81
2	140	170	200	230	280	290	1.98	2.40	2.82	3.23	3.96	4.10
3	127	155	180	225	235	290	1.77	2.19	2.54	3.18	3.32	4.10

Flexural strength of Prism

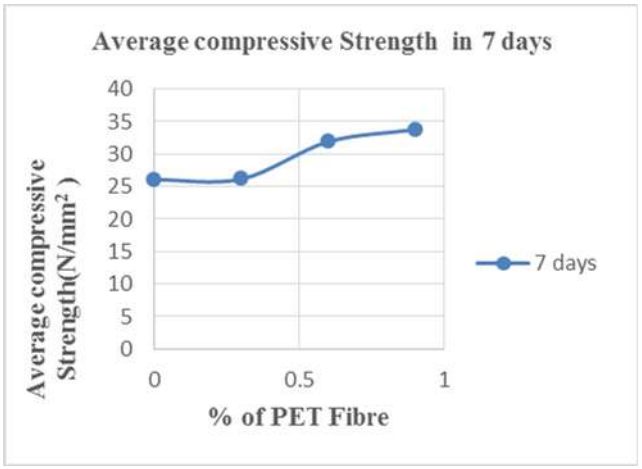
Weight of fine aggregate (Kg)	Weight of cement(kg)	Weight of coarse aggregate(Kg)	w/c ratio	Weight of Polyethylene Terephthalate Fibre(PET) (g)		
				0.3%	0.6%	0.9%
10	8	18	0.4	35	70	104

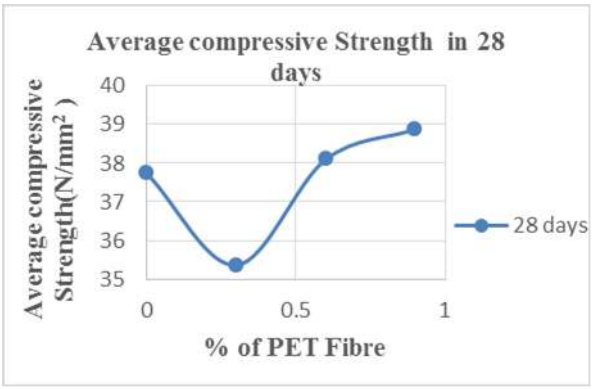
Specimen No.	Load (kN)						Flexural Strength (N/mm^2)					
	7 Days			28 Days			7 Days			28 Days		
	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%	0.3%	0.6%	0.9%
1	4	6	6.5	5	8	8	2	3	3.25	2.5	4	4
2	4	5	5.5	6	7	7.5	2	2.5	2.75	3	3.5	3.75
3	5	6.5	7	5	8	8.5	2.5	3.25	3.5	2.5	4	4.25

IV. DISCUSSION

Comparison of average compressive strength

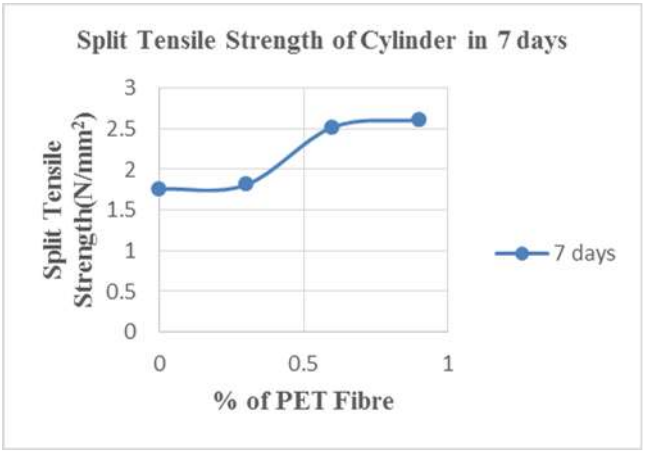
PET Fibre %	Average Compressive Strength (N/mm^2)	
	7 days	28 days
0	26.067	37.74
0.3	26.167	35.36
0.6	31.9	38.1
0.9	33.77	38.88



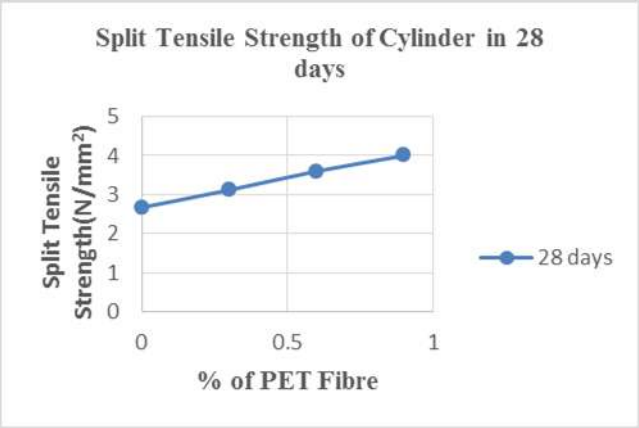


Comparison of average split tensile strength

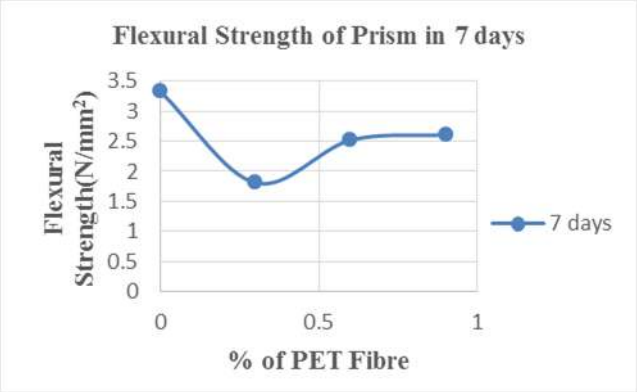
PET Fibre %	Average split tensile Strength (N/mm^2)	
	7 days	28 days
0	1.76	2.67
0.3	1.81	3.12
0.6	2.52	3.6
0.9	2.61	4



PET Fibre %	Average flexural Strength (N/mm^2)	
	7 days	28 days
0	3.33	5.167
0.3	1.81	3.12
0.6	2.52	3.6
0.9	2.61	4



Comparison of average flexural strength



V.CONCLUSION

❖ An experimental work has been carried out on the specimens like cubes, prism and cylinders which were casted in the laboratory and their behavior under the test was observed.

❖ While comparing the results, the compressive strength of concrete is increased from 37 to 39 N/mm^2, Split tensile strength of concrete is increased from 2.67 to 4 N/mm^2 in 28 days of curing period.

❖ From the above results, Optimum fibre percentage is 0.9% for M20 grade of concrete as per IS method of design.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments. Avoid expressions such as “One of us (S.B.A.) would like to thank ... .” Instead, write “F. A. Author thanks ... .” Sponsor and financial support acknowledgments are placed in the unnumbered footnote on the first page.

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