AN EXPERIMENTAL INVESTIGATION OF TYRE BEAD WIRES REINFORCED WITH M20 CONCRETE

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Abstract: The aim of this work is to study the properties of concrete, when it is incorporated with steel strips obtained from waste damaged rubber tyres. As we know in this developing era these kinds of wastes (rubber tyres) are generated in large amount if we will properly manage these wastes, it can lead us towards green environmental concept. When these steel strips are added with concrete it increases the properties of concrete like workability, split tensile strength and Flexural strength. Thus in general, we can say it increases the mechanical properties of concrete. When this type of material is added to the concrete the concrete comes under the category of Steel Fiber Reinforced Concrete. As for the research work is concerned, various researches has taken on this type of concrete. In this experimental work, steel strips of o.5 mm and length of 45 mm was taken. The aspect ratio of 90 and the fiber was used in concrete in varying percentages (0%, 0.5%, 1%, 1.5% and 2%). These percentages were used by weight of concrete on grade M20. From the experimental investigation it has been found that at the optimum dosage of 1% the compressive strength is increased by 10% while as split tensile strength 20% and flexural strength 25%.

I. INTRODUCTION

The poor performance of conventional concrete made the researchers to think about the way by which the performance of the concrete can be increased. Plain concrete has deficiencies like low tensile strength and allow strain at fracture. In order to improve the properties of concrete we incorporated the steel strips of rubber tyres with concrete it increases the flexural, compressive and split tensile strength. This type of concrete can be used where the ordinary plain concrete fails to work; it increases the impact, abrasion and resistance in the concrete. It reduces the permeability of concrete. This type of concrete can be used in building, bridges, dams etc. The fibers obtained from tyre strips reduce the bleeding in fresh concrete.

II. LITERATURE REVIEW

As for as investigations are concerned there have been various experiments done on tyre strips reinforced with concrete and the number of papers have been published till now. various researchers have worked on the fiber reinforced concrete and they conclude that the compressive, Flexural and Split tensile strength of concrete increases as compared to plain concrete. Nasir B. Siraj etal [1] The author worked on pyrolised recycled steel fiber reinforced with concrete and concluded that it increases the strength of concrete. By providing these fibers we can replace the stirrups provided for shear in load carrying beams. It also improves the flexural strength, compressive strength. Vasudev R and Dr. B G Vishnuram [2] They use M30 concrete with varying fiber percentages (0, 0.25, 0.75 &1%) and concluded that the split tensile strength of concrete increases from 20-22%. Prof Ram Meghe et al [3] worked on the SFRC. The results on the addition of steel fiber showed that the split tensile strength and optimum fiber content for increasing the split tensile strength was found to be 1.75%. Pooja Shrivasta and Dr Y.P Joshi [4] They worked on the concrete reinforced with waste steel. They used the percentage of 0%,0.5%,1%,1.5% & 2% and found that the average strength (split tensile strength 3.4,3.63,3.9+1,4.06,3.892.) They concluded that concrete reinforced with such materials improves its strength as compared to plain concrete. Manawini C & Vasu deva [5] They concluded that the fiber added to the concrete acts as a crack bridging mechanism and increases the flexural strength up to 25.88%

III. MATERIAL USED IN THE EXPERIMENTAL WORK

The various materials used in experimental are enlisted as:-
Cement:- Ordinary Portland cement of 43 grade of Ambuja has been used in this experimental work .The properties are as under in the table

Sr. No.	Properties	Calculated Experimental values	Specified value as per IS :8112-1989
1	Consistency of cement (%)	33	33
2	Specific gravity	2.99	3.15
3	Initial setting time (minutes)	35	30
4	Final setting time (minutes)	270	<600 as per IS 4031-1968
5	Compressive strength (N/mm^2) After 3 days After 7 days After 28 days	 25.51 39.42 46.51	 23 33 43
6	Soundness test	9	10
7	Fineness of cement	5%	10% IS :269-1976

Fine aggregate:- The material selected as a fine aggregate was locally available sand passed through 4.75 mm IS sieve. The physical properties of sand like Fineness modulus,

specific gravity and water absorption are 3.49, 2.67 and 1.98% respectively.

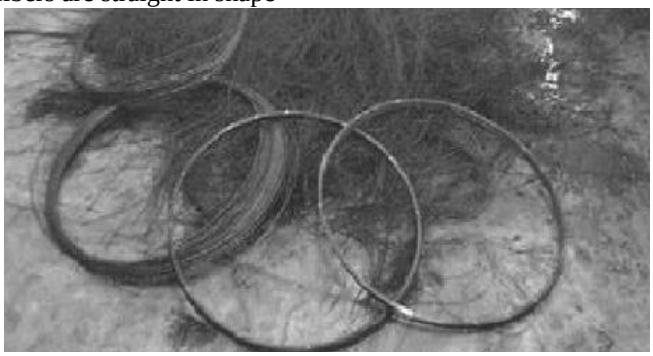
Coarse aggregate:- The coarse aggregates are obtained from the locally available quarry site having the maximum size of 20 mm with specific gravity of 2.84 and fineness modulus of 2.3

Sr. No.	IS Sieve Designation	Mass Retained on Sieve (gm)	%age retained (gm)	Cumulative %age retained
1	80 mm	0	0	0
2	40 mm	0	0	0
3	20 mm	0	0	0
4	10 mm	3600	36	36
5	4.75 mm	5800	58	94
6	Pan	600	6	100
∑C				230

CALCULATIONS :-

Fineness Modulus of coarse Aggregates = 230 / 100 =2.3

Fibers:- Steel fibers from waste tyres was used of diameter 0.5 and of length 45 mm with aspect ratio 90. These steel fibers are straight in shape



Water:- The water which was utilized in this experimental work was taken from tap, which was clean and free from oils, acids, salts and other impurities as per IS code 456-2000.

IV. EXPERIMENTAL WORK

As for the experimental work is concerned the tests like flexural, compressive and split tensile strength tests was performed

Flexural Strength Test:- The flexural strength test was conducted on beams as per IS code 516-1959. The flexural strength test was performed at the interval of 7 days and 28 days. The results are shown in table no.3

Mix designation	% of fiber used	Flexural strength after 7 days	Flexural strength after 28 days
MX 0	0	1.43	2.28
MX 1	0.5	1.71	2.75
MX 2	1	2.1	3.25
MX 3	1.5	1.8	2.62
MX 4	2	1.83	3.05

Table No.-3 Flexural strength test

COMPRESSIVE STRENGTH:- The compressive strength test was conducted was conducted on specimen as per IS: 516-1959.The compressive strength test was performed at the interval of 7 days & 28 days and are enlisted in table no.4

Mix designation	% of fiber used	Compressive strength after 7 days	Compressive strength after 28 days
MX 0	0	15.18	28.96
MX 1	0.5	18.92	31.69
MX 2	1	21.78	33.30
MX 3	1.5	17.08	32.27
MX 4	2	18.99	31.1

Table No.-4

Compressive strength test

SPLIT TENSILE STRENGTH:- The specimen were casted in cylinders and proper curing was done. The split tensile strength results are enlisted in table no. 5

Mix designation	% of fiber used	Split tensile strength after 7 days (N/mm^2)	Split tensile strength after 28 days (N/mm^2)
MX 0	0	1.41	2.33
MX 1	0.5	1.62	2.54
MX 2	1	1.75	2.89
MX 3	1.5	1.52	2.61
MX 4	2	1.66	2.51

Table No.-5

Split tensile test

As we look towards the results the flexural, compressive and split tensile strength increases at the dosage of 1%. Beyond this fiber content dosage the compressive, flexural and split

tensile strength decreases. It needs further investigation & even as per ACI they also cleared that beyond 2% of fiber content their needs further investigation.

V. CONCLUSION

The conclusion of this experimental investigation showed that the properties of M20 concrete increases with the addition of tyre steel strips. The fibers were used in this experimental work in varying percentages (0%, 0.5%, 1%, 1.5%, 2%) but the strength increases up to 1% of dosage of fiber content beyond that strength decreases. Flexural strength increases 25% as compared to plain concrete. Compressive strength increases 10% as compared to plain concrete. Split tensile strength increases 20% as compared to plain concrete.

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