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EXPERIMENTAL STYUDY ON LOW COST FIBER REINFORCED CONCRETE

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ABSTRACT: *Concrete is one of the most important and widely used material in India in construction field. There are many developments going on in concrete by utilizing locally accessible material. The main aim of the study is the effect of synthetic fiber in concrete. FRC has high tensile strength and fire resistance property which reduces the loss of damage during fire accidents. In this thesis the strength property were studied by comparing size and proportions of fiber. The polypropylene fiber is used size is 6mm with the proportions of 0%, 0.1% and 0.15% of cement by weight. The study of making the concrete of low cost was also done by utilizing locally available aggregates from scrap buildings in replacement of natural aggregate. The replacement of natural aggregate is done in various proportions like 0%, 5% and 10%, according to previous research papers the proportions are taken. The workability, compression strength and tensile strength were obtained at 7th day, 14th day and 28th day of curing. The result are compared for the best conclusion.*

UNIT I INTODUCTION

The increase in population day-by day there is a steep rise in the demand of infrastructure in the last few decades which in turn increased the demand of building materials. Among all the building material concrete aggregates alone constitute up to 75% of the concrete. The steep rise in the demand with the limited availability of material and low cost construction. Polypropylene fiber is the fiber which is used commonly in market. It has the property of improving tensile strength as well as the reduces micro cracks. To make the construction of low cost building the aggregates can be replaced by demonized building. The cost of aggregate will be reduced.

The use concrete has been traced some thousands year back. In earlier concrete, the constituents of concrete were different. It was made up of fine aggregates, coarse aggregates and lime. Later on lime has been replaced with the cement. Now a day, concrete is used with steel structure to give additional strength to the structure. Type of concrete depends upon its constituents therefore required quality of concrete for any application can be obtained by substituting the constituents. Based on properties, concrete can be used for different purpose. It is used in high rise and low rise building, R.C.C, P.C.C, bridges, foundation work etc.

The performance of fiber reinforced is good as compared to normal concrete. To reduced the cost of construction waste aggregate can be used which will reduces the cost of aggregate. To use Aggregate from the demoralized building structure, its properties has been compared with those of Natural Aggregate concrete (NAC). Before starting the work on our project we have thoroughly studied the properties of natural aggregates and also have gone through the literature available around the world mentioning the research work already done in this field. We have referred the literature work done by Indian as well as some foreign scholars in the field of using Recycled Aggregates obtained from the demolition of old structures and construction wastes along with Natural Aggregates in the concrete mixture.

UNIT II LITERATURE REVIEW

1. A. M. Shende and A. M. Pande.: Critical investigation for M-40 grade of concrete having mix proportion 1:1.43:3.04 with water cement ratio 0.35 to study the compressive strength, flexural strength, Split tensile strength of steel fiber reinforced concrete (SFRC) containing fibers of 0%, 1%, 2% and 3% volume fraction of hook tain. Steel fibers of 50, 60 and 67 aspect ratio were used. A result data obtained has been analyzed and compared with a control specimen (0% fiber). .

2. A. P. Sathe and A. V. Patil: The paper presents research work of experimental investigation on polypropylene fiber reinforced concrete by replacing river sand to artificial sand with and without admixture. Fiber (0%, 0.5%, 1.0%, 1.5%). The result of this present investigation indicates that by adding of 0.5% of polypropylene fiber shows maximum compressive and tensile strength.

From the above research work we got to know that the increase in cost of construction is becoming a big issue thus alternate material are required to make less use of concrete ingredients. The aggregate is the main ingredient

which strengthen the concrete. Many researchers have found that the demoralized building the aggregate can be reused by cleaning the used aggregate. The strength of concrete will be reduced due to use of used aggregate but it can be improved by using polypropylene fiber concrete. Thus in this thesis the strength is improved by using fibers of size 6mm with proportion of 0%, 0.1% and 0.15% of cement by weight. To reduce the cost of construction aggregates are replaced by waste aggregate.

UNIT III MATERIAL AND METHODOLOGY

Concrete consists of three major components, viz. water, Portland cement, and aggregates. Properties of the final product i.e. cement changes according to the change in the ratio of its components and hence consequentially help the engineer in deciding the proper use of the same according to his need. To get a certain specific property in cement, Admixtures are added and hence enhance its required characteristic.

WATER: The water in the concrete mix should be clean and free of impurities. The change in water content with respect of cement decides the properties of the cement like how easily the concrete flows, but also affects the final strength of the concrete. Excess water implies to easier flow of concrete, but decreases its strength.

PORTLAND CEMENT: On mixing the water, cement hardens and hence all the ingredients are bounded together. Portland cement is the most common cement used and is composed of alumina, silica, lime, iron, and gypsum. Small amounts of other ingredients are also included.

AGGREGATES: Most of the concrete mixtures consist of both coarse and fine aggregates, and help in increasing the strength of concrete with respect to what cement can provide alone. Nowadays, sand, gravel, crushed stone, recycled materials, including blast furnace slag, glass (mostly for decorative purposes), and ground-up concrete are used as aggregates.

POLYPROPYLENE FIBER

Polypropylene fibers for utilizing in textiles, carpet, and tire cord are produced by extruding molten polymer through spinnerets and stretching to their final thickness and weight. The polymer melt must be homogeneous, gel free, and without oversize additive agglomerates to achieve high quality fiber and yields. Filtration of the procedure feedstreams, additive slurries, and polymer melt itself are important to help eliminate fiber breaks and enhance fiber strength and uniformity. Not only is fiber worth improved, but manufacturing rates can be higher with less procedure downtime.

METHODOLOGY: The testing is done for all the ingredients like cement, sand, aggregate, fibers and recycled aggregate ash as per Indian standard. The fiber is used of 6mm with various proportions like 0%, 01% and 1.5% of cement by weight. To reduces the cost of construction the aggregate are replaced by waste aggregate from demoralized by 0%, 5% and 10% and tested at the age of 7th day, 14th day and 28th day for Compressive and tensile strength test.

UNIT IV RESULT AND ANALYSIS

TEST RESULT OF CEMENT

4.3.1 FINENESS TEST:
It is the ratio of the weight of cement which passes through the IS sieve no.9 by gentle sieving to the total weight of sample cement.

Fineness of Cement (%) = (R2 / R1) x 100
R1 = Weight of sample taken
R2 = Weight of residue after sieving
= (0.5/10) X 100 = 5%

4.3.2 CONSISTENCY TEST:

It is the water content required to produce a cement paste of standard consistency.

Standard consistency (%) = (Weight of water added / weight of cement) x 100
= (135 / 500) X 100 = 27

IMPACT TEST FOR NATURAL AGGREGATE:

Impact test for Natural Aggregate:

S. no.	Total wt. of dry sample (A) in gm	Wt. of aggregate retained 2.36 mm sieve in gm	Wt. of aggregate passing 2.36 mm sieve in gm (C)	Aggregate impact value= (C/A)x100
1.	398	276	67	16.83
2.	356	287	76	21.34

Aggregate impact value (%) = 19.1

4.4.3 CRUSHING TEST FOR NATURAL AGGREGATE:

Crushing test for Natural Aggregate:

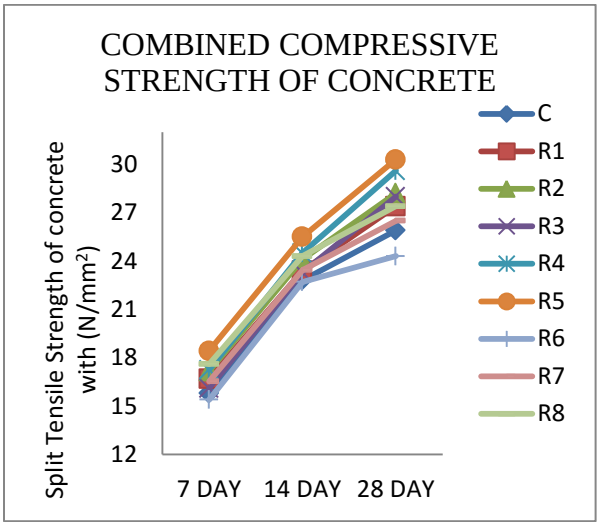
S. No.	Total wt. of dry sample in gm	Wt. of aggregate retained on 2.36 mm sieve in gm	Wt. of aggregate passing 2.36 mm sieve in gm	Aggregate crushing value
1.	3000	2590	410	13.67
2.	3456	2780	676	19.56

CA crushing value (%) = 19.61

COMPRESSIVE STRENGTH TEST

Concrete mix	Quantity of fiber used	7-days Average (MPA)	14-days Average (MPA)	28-days Average (MPA)
0%	0	16.1	23.3	28
	0.1	17.26	24.5	29.6
	0.15	18.43	25.5	30.3
5%	0	15.8	22.8	25.9
	0.1	16.7	23.4	27.4
	0.15	17.16	24.1	28.2
10%	0	13.4	16.7	18.6
	0.1	14.53	18.4	20.5
	0.15	15.6	19.3	21.4

COMPRESSIVE STRENGTH OF 6MM LENGTH PP FIBER



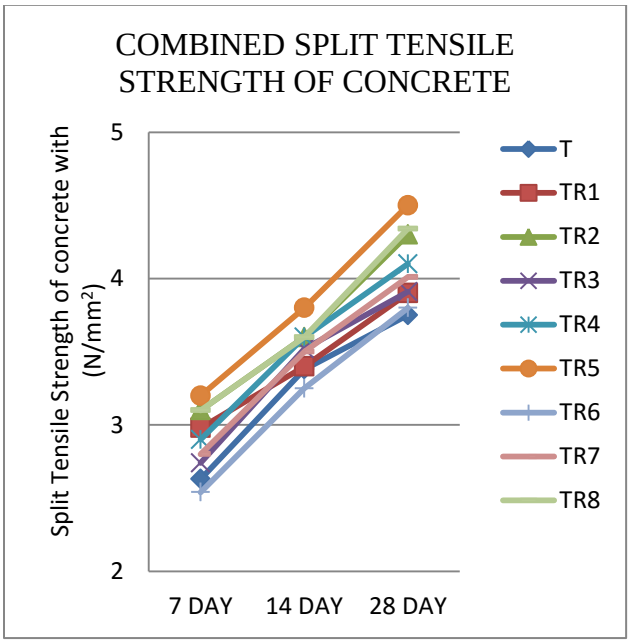
From Graph, the recycled aggregate replacing partially in the place of natural aggregate. The amount of natural aggregate left in India is very less now due to high construction rate thus one of the alternate material should be found. Old buildings are getting demoralized to construct new building, the disposal of scrap is an environmental thus the aggregate can be cleaned and washed to reuse. It is replaced in many proportions such as 0%, 5% and 10% with the PP fiber of length 6mm with three proportions 0%, 0.1% and 0.15% of cement by weight. The naming shows the ratios. The standard compressive strength were found at 28th day of curing i.e 28 N/mm², 29.6 N/mm², 30.3 N/mm², 25.9 N/mm², 27.4 N/mm², 28.2 N/mm², 18.6 N/mm², 20.5 N/mm² and 21.4 N/mm² for C, R1, R2, R3, R4, R5, R6, R7 and R8 respectively. The maximum compressive strength is which maximum amount of fiber i.e 0.15% is added in natural aggregate concrete. But when aggregate is replaced with waste aggregate by 5% gives result for M20 Grade of concrete, the result is 17.16 N/mm², 24.1 N/mm² and 28.2 N/mm² at the age of 7th, 14th and 28th day of curing respectively. From the above result we got that the use of fiber with recycled aggregate increases the strength.

TENSILE STRENGTH TEST

Concrete mix	Quantity of fiber used	7-days Average tensile Strength (MPA)	14 days Average tensile Strength (MPA)	28 days Average tensile Strength (MPA)
0%	0.00	2.74	3.52	3.91

	0.10	2.9	3.6	4.1
	0.15	3.2	4.1	4.5
5%	0.00	2.63	3.38	3.75
	0.10	2.8	3.4	3.95
	0.15	3.1	3.6	4.3
10%	0.00	2.01	2.58	2.87
	0.10	2.4	2.9	3.1
	0.15	2.6	3.1	3.5

SPLIT TENSILE STRENGTH OF 6MM LENGTH PP FIBER



From Graph, the recycled aggregate replacing partially in the place of natural aggregate. The amount of natural aggregate left in India is very less now due to high construction rate thus one of the alternate material should be found. Old buildings are getting demoralized to construct new building, the disposal of scrap is an environmental thus the aggregate can be cleaned and washed to reuse. It is replaced in many proportions such as 0%, 5% and 10% with the PP fiber of length 6mm with three proportions 0%, 0.1% and 0.15% of cement by weight. The naming shows the ratios. The standard Split Tensile Strength were found at 28th day of curing i.e 3.91 N/mm², 4.1 N/mm², 4.5 N/mm² 3.75 N/mm², 3.95 N/mm², 4.3 N/mm², 2.87 N/mm², 3.1 N/mm² and 3.5 N/mm² for T, TR1, TR2, TR3, TR4, TR5,TR6, TR7 and TR8 respectively. The maximum compressive strength is which maximum amount of fiber i.e 0.15% is added in natural aggregate concrete. But when aggregate is replaced with waste aggregate by 5% gives result for M20 Grade of concrete, the result is 3.1 N/mm², 3.6 N/mm² and 4.3 N/mm² at the age of 7th, 14th and 28th day of curing respectively. From the above result we got that the use of fiber with recycled aggregate increases the strength.

UNIT V CONCLUSION

1. The ingredients of is having strength as per IS standards.
2. The Compressive Strength of low cost fiber reinforced concrete of 6mm size in proportion of 0%, 0.1% and 0.15% at 28th day is: For 0% replacement of aggregate 28 MPa, 29.6 MPa and 30.3 MPa, for 5% replacement of waste aggregate by natural aggregate is 25.9 MPa, 27.4 MPa, 28.2 MPa, for 10% replacement of waste aggregate by natural aggregate is 18.6 MPa, 20.5 MPa and 21.4 MPa respectively.
3. The Tensile Strength of low cost fiber reinforced concrete of 6mm size in proportion of 0%, 0.1% and 0.15% at 28th day is: For 0% replacement of aggregate 3.91 MPa, 4.1 MPa and 4.5 MPa, for 5% replacement of waste aggregate by natural aggregate is 3.75 MPa, 3.95 MPa, 4.3 MPa, for 10% replacement of waste aggregate by natural aggregate is 2.87MPa, 3.1 MPa and 3.5 MPa respectively.
4. Both results of compressive and tensile strength is decreasing as natural aggregate is replaced by waste aggregate from demoralizes structure. But the strength is above M20 grade of concrete.
5. Polypropylene fiber of 6mm size with proportion of 0.15% of cement by weight gives better result when replaced with re used aggregate by natural aggregate by 5%. The strength is above M25 grade of concrete.

UNIT IV REFERENCE

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UNIT V BIOGRAPHIES

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