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EXPERIMENTAL INVESTIGATION ON CONCRETE BY PARTIAL REPLACEMENT OF FRESH COARSE AGGREGATE WITH RECYCLED COARSE AGGREGATE AND ADDITION OF CRIMPED FIBERS

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Abstract: - now a day's concrete is one of the most used material in this era because of their properties and life span and load carrying capacity or to transfer load from one member to other. Some of their drawbacks when compare to steel member is cost of construction. So in this thesis try to find the alternative to reduce the cost with the same strength. As we know concrete were invented around 1824. Nearly 196years ago concrete construction started. And life spans of concrete structures are nearly 100years we can find old structures. So Replacing the fresh aggregates with recycled ones by varying percentages(0%, 10%, 20%, 30%)and adding steel crimped fibers with constant percentage (1% of weight of cement). And checking the behavior of the specimens after curing 7days and 28days and testing by compressive strength and split tensile

Keywords: load, drawbacks, recycled aggregate, split tensile, compressive strength.

1. INTRODUCTION

In this era most important is to reduce the cost of construction. And aggregate is a natural resource if we can use recycled aggregate we can reduce the cost as well as not wasting naturally occurring material.

1.2 steel crimped fibers

Fibers as the additional ingredients in concrete , dispersed uniformly at random in small percentages, i.e. between 0.3% and 2.5% by volume in plain concrete.

Aspect ratio of steel fibers used is 43.95. Steel fibers are added to concrete to improve the structural properties, particularly tensile and flexural strength. The extent of improvement in the mechanical properties achieved with Steel fiber reinforced concrete over those of plain concrete depends on several factors, such as shape, size, volume, percentage and distribution of fibers. Such as shape, size, volume, percentage and distribution of fibers. Even though higher ratios of fibers gave increased flexural strength, workability of green SFRC was found to be adversely affected with increasing aspect ratios. Hence aspect ratio is generally limited to an optimum value to achieve good workability and strength.

2. Objectives

The main aim of this experimental investigation is to study the performance of Recycled coarse aggregate & steel crimped fibers in concrete under variable amplitude loading by varying the percentages of Recycled coarse aggregate by 0, 10, 20, 30%. Experimental investigation include the basic tests carried out to check the physical properties of material used and properties of concrete in fresh state like Compaction factor test, Slump test, Vee-Bee test .Testing on hardened concrete like compressive strength for cubes and split tensile for cylinders is carried out.

3. Properties of recycled coarse aggregate

SNO.	TEST	RESULT IN %
1	SPECIFIC GRAVITY	2.37
2	WATER ABSORPTION	0.7
3	IMPACT TEST VALUE	22

4. Result and discussion

This part classified into two types of hardened concrete testing. They are compression strength test and tensile strength test. All the points used was according to the Indian Standard Code. Experiments were conducted on normal concrete and modified concrete by replacing natural coarse aggregate with recycled coarse aggregate with varying percentages of 0%, 10%, 20%, 30%, 40% and addition of steel crimped fiber as percentage 1% of weight of cement.

4.1 compressive strength

Compression strength of concrete can be defined as the measured maximum resistance of a concrete to axial loading. Compression test is the most common test used to test the hardened concrete specimens because the testing is easy to make. The strength of the concrete specimens with different percentage of indicating through the destructive tests named as compression test. The specimens used in the compression test were 150mm x 150mm x150mm seized cubes and 150mm x 300mm cylinders. There are three specimens were used in the compression testing in every batches. Differences of the strength among the different percentage of RCA used in the age of 7 and 28days also indicated through the compression test.

RCA was added to concrete at varying proportions (0%, 10%, 20%, and 30%) and addition steel fibers 1% by weight of cement, at a water cement ratio of 0.5 the desired compressive strength was obtained for conventional concrete at this ratio the result of compressive strength of fiber reinforced concrete are shown.

Table-1: Age of 7 days compressive strength of cubes specimen values

Specimen	w/c ratio	% steel fibers	% of RCA	Compressive strength N/mm²
				7 days
1.	0.5	0%	0%	8.76
2.	0.5	1%	10%	14.89
3.	0.5	2%	20%	18.19
4.	0.5	3%	30%	10.67

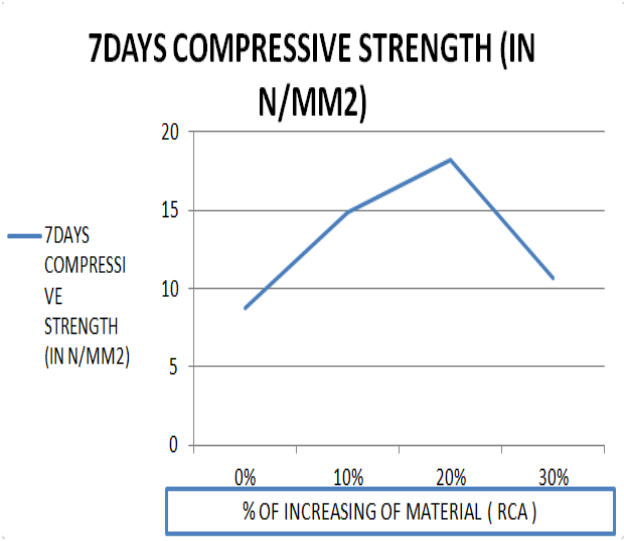

Chart -1 graphical representation of 7days compression test values

Table-2: Age of 7 days compressive strength of cubes specimen Values

Specimen	w/c ratio	% steel fiber	% of RCA	Compressive strength N/mm²
				28days
1.	0.5	0%	0%	6.69
2.	0.5	1%	10%	16.82
3.	0.5	2%	20%	18.75
4.	0.5	3%	30%	8.72

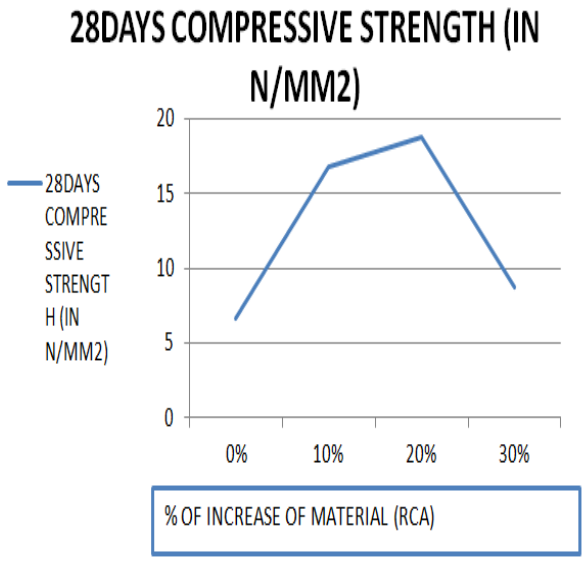

Chart -2 graphical representations of 28days compression test values

4.2 split tensile strength

Split tensile tests were conducted on standard cylinders of dimension 15cm diameter and 30cm depth, specimens each for plain concrete, Recycled coarse aggregate and steel crimped fibers concrete were casted at varying percentages of RCA+CG (0%, 10%, 20%,and 30%.). For each case 7 & 28days strength values were obtained by loading under a compression testing machine or universal testing machine

Table-3: Split tensile test of Cylinders age of 7Days values

Specimen	w/c ratio	% steel fiber	% of RCA	Tensile strength N/mm²
				7days
1.	0.5	0%	0%	2.131
2.	0.5	1%	10%	5.356
3.	0.5	2%	20%	5.97
4.	0.5	3%	30%	2.77

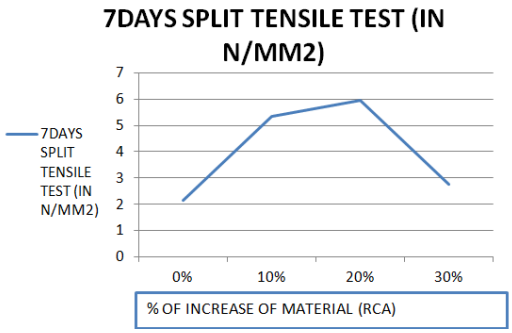

Chart -3 Graphical representations of 7days tensile test values

Table - 4: Split tensile test of Cylinders age of 28 Days

Specimen	w/c ratio	% steel fiber	% of RCA	Tensile strength N/mm²
				28days
1.	0.5	0%	0%	1.727
2.	0.5	1%	10%	1.622
3.	0.5	2%	20%	2.252
4.	0.5	3%	30%	2.062

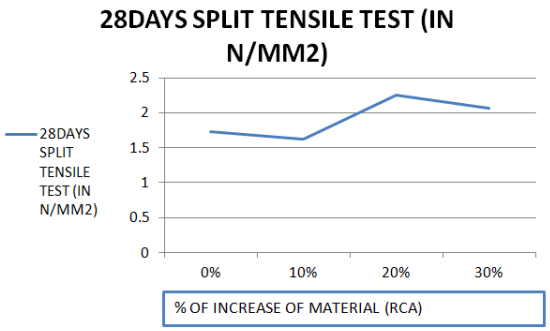

Chart - 4 Graphical representations of 28days tensile test values

5. CONCLUSIONS

Experimental works on the use of recycled aggregates and steel fibers have proven that good quality concrete could be produced with recycled aggregates and steel fibers. The use of construction waste and natural waste produced from demolition of buildings should be further promoted. Based on the experimental investigation reported in the work, the following conclusions are drawn:

- The workability of recycled aggregate and steel fiber concrete mix is satisfactory compare to natural aggregate, concrete mix with 2% steel fibers and 40% recycled aggregate has satisfied workable concrete.
- The recycled aggregate concrete has a convenient compressive strength and appreciable improvement in tensile strength, which means it, can be convenient for structural elements in concrete structures.
- Although recycled aggregate can be applied in the high strength concrete structure, but one issue must not be neglected as recycled aggregate with reduce water content would have low workability. Whenever recycled aggregate is used, water content in the concrete mix has to be monitored carefully, due to the water absorption capacity of recycled aggregate.
- At 20% RCA and 1% addition of steel crimped fibers with a water cement ratio of 0.5, compressive strength tests yielded best results.
- There is an optimum value of RCA, beyond which the compressive strength decreases. Hence 0.5 was taken as the optimum water cement ratio and optimum RCA and steel fibers content was taken as 20% and 1% respectively.
- These steel crimped fibers help in increasing the tensile property of concrete. The tensile properties and cracking pattern of concrete shows that it can be useful in construction activities.

- In this investigation the results has shown a significant increase in percentage of various strength parameters such as compressive and split tensile strength.
  Compressive strength up to 48%
  Split tensile strength up to 76.4%

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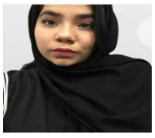

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