EXPERIMENTAL INVESTIGATION OF SELF CURING CONCRETE USING RECYCLED AGGREGATE

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ABSTRACT

Use of recycled aggregate in concrete can be useful for environmental protection. Curing of concrete plays a major role in developing the concrete micro structure and pore structure and hence improves its durability and performance. Keeping importance to this, an attempt has been made to develop Self Curing Concrete by using Self curing agents. Recycled aggregate with various proportions are casted with PEG 400 admixture and cured for 28 days and the compressive strength, flexural strength and split tensile strength are obtained. M30 grade concrete is used.

KEYWORD : *Recycled aggregates, Virgin coarse aggregate, compressive strength test, split tensile test, flexural strength test*

1. INTRODUCTION

Concrete is everywhere. It is the second most consumed material after water. Construction and demolition waste is generated whenever any construction demolition activity takes place, such as, building roads, bridges, fly over, subway, remodelling etc. According to a study commissioned by Technology Information Forecasting and Assessment Council (TIFAC), 70% of the construction industry is not aware of recycling techniques. Recycling of concrete and masonry waste is, however, being done abroad in countries like U.K., USA, France, Denmark, Germany and Japan.The applications of recycled aggregate in the construction areas are wide. Replacing it for different percentages gives good results. Self curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation. PEG400 is a good admixture for self-curing.

1.1 LITERATURE REVIEW

Experimental study of Self curing concrete using Steel fibres by Agalya C (2018)

Experiment is carried out on M20 grade concrete by considering 2% of steel fibers and dosage of PEG 400 varied in the range of 1%, 1.5% and 2%. It is concluded that PEG 400 of 1.5% dose and steel fibers of 2% attains maximum flexural, split tensile and compressive strength.

A study on high strength RCA concrete by Arun Kumar. H (2017)

This paper aims to evaluate the physical properties of concrete using RCA with 0%, 25%, 50%, 75% and 100% by weight of NCA in M30 and M40concrete. The 25% and 50% replacement of RCA in M30 and M40 grade concrete respectively shows maximum strength and recommended for field applications.

Experimental study of recycled aggregate concrete by Gargi Kushwah (2016)

This paper is on the study of replacement of natural aggregate by 0%,25%, 50% and 75% and corresponding results of compressive strengths were noted. The compressive strengths were noted by crushing the cube at 7, 14 and 28days and it was found that performance of concretes with 0% and 25% replacement of natural aggregate by recycled aggregate were quite similar to concrete without replacement but with 50% and 75% replacement, the strength of concrete was decreased. Use of recycle concrete aggregate up to 33% in concrete does not affect the compressive strength of the concrete. Addition of more than 33% of recycled concrete aggregate reduces the compressive strength of the concrete. Moreover the workability of the concrete with RCA is of same order up to 25% addition of RCA. So it is advisable to use25-30% recycled concrete aggregate in low rise structure, pavement design, drainage structure, road construction.

2. PHYSICAL PROPERTIES

Table-1: Properties of NA & RA

PROPERTIES	NORMAL AGGREGATE	RECYCLED AGGREGATE
Shape and texture	Well rounded, smooth (gravels) to angular and rough (crushed rock)	Angular with rough surface
Specific gravity	2.48-2.75	2.25-2.53
Absorption (%)	0.2 – 0.4	2.6 – 3.3
Impact value (%)	8.57–13.80	25.07–30.26

3. EXPERIMENTAL AND TESTING

- Compressive strength test
- Split tensile strength test
- Flexural strength test

3.1 COMPRESSIVE STRENGTH ON CUBE TEST

There are four proportions used in the mixing of concrete. Compressive test is carried out on specimen cubical in shape. The cube specimen is of size 150mm *150mm*150mm is used.

3.1.1 Comparison b/w 7 days & 28 days & Graphical Representation

Table-2: Compressive strength of the specimen (7 day)

REPLACEMENT OF RCA	M30 GRADE CONCRETE (N/mm^2)
30%	6.19
40%	8.62
50%	8.80
60%	7.6

Table -3: Compressive strength of the specimen (28 days)

REPLACEMENT OF RCA	M30 GRADE CONCRETE (N/mm^2)
30%	30.5
40%	32.3
50%	33.7
60%	25.7

Maximum compressive strength @ 50% replacement (28 days)

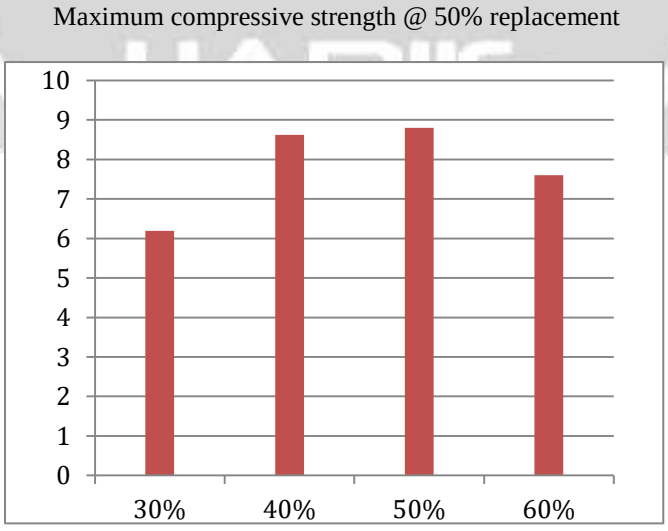

Chart-1 Compressive strength (N/mm^2) vs Replacement of RCA (%)

3.2 SPLIT TENSILE TEST

There are four proportions used in the mixing of concrete. Spilt tensile is carried out on specimen cylindrical in shape. The cylindrical specimen is of size 150mm *300mm is used

Table-4: Split Tensile strength of M30 specimen (40% of RAC)

S.NO.	SPECIMEN DETAILS	TEST RESULTS		
		SPLIT TENSILE STRENGTH (N/mm^2) (RAC)	ULTIMATE LOAD (kN)	SPLIT TENSILE STRENGTH (N/mm^2) (NA)
1	7 days	1.1	94	1.3
2	28 days	2.0	148	2.1

3.3 FLEXURAL STRENGTH TEST

Similarly it is found that the flexural strength is also in the phase of 40% replacement of Recycled coarse aggregate. The maximum strength has been achieved at 40% replacement whose flexural strength is nearly equal that of the conventional concrete.

Table-5: Flexural strength for different grade of concrete for 7days curing

Type of grade concrete	Strength of VCA N/mm^2	Replacement of RCA in %	Strength of RCA N/mm^2
M30 grade concrete	3.5	60%	2.47
M30 grade concrete	3.5	50%	3.29
M30 grade concrete	3.5	40%	3.13
M30 grade concrete	3.5	30%	3.08

Table-6: Flexural strength for different grade of concrete for 28days curing

Type of grade concrete	Strength of VCA N/mm^2	Replacement of RCA in %	Strength of RCA N/mm^2
M30 grade concrete	4.2	60%	3.61
M30 grade concrete	4.2	50%	4.15
M30 grade concrete	4.2	40%	3.93
M30 grade concrete	4.2	30%	3.75

4. CONCLUSIONS.

From the above test results it is concluded that the Compressive strength, Split tensile strength and Flexural strength of the Self curing concrete with normal aggregate is same as that of our Self curing concrete with Recycled aggregates. Hence in future it is advised to use 40% replacement of Recycled aggregates and 1% of PEG 400 for M30 grade concrete to get good results in the Structural member tests.

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