EMPIRICIAL EXPLORATION ON MECHANICAL PROPERTIES OF TREATED RECYCLED COARSE AGGREGATE

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ABSTRACT

In this investigation recycled coarse aggregates are collected by crushing the existing concrete specimens. These aggregates are engaged to cast cubes and cylinders to obtain the compressive and split tensile strength. The recycled aggregates collected are treated with fly ash to promote the properties of recycled coarse aggregate. Rather from conventional, other castings of cubes and cylinders are done by replacing coarse aggregate by recycled aggregate in proportions like 0, 25, 50, 75 and 100%. Each specimens are tested in regular interval of time at 7, 14 and 28 days. By casting and testing the specimens using treated aggregates has obtained acceptable strength when compared to normal recycled aggregates and sustainable.

KEYWORDS: *Compressive Strength, Fly Ash, Recycled Aggregate, Split Strength*

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INTRODUCTION

Recycled aggregate is alternative material for prevention of ecosystem. A significant numbers of many construction projects have started in European countries have initiated the implementation of recycled coarse aggregate. Though every countries have relaxed the infrastructural laws to increase the usage. Globalization has raised the standards of the world to fulfill the growing needs of construction in accordance to revolution of industrialization GDP of India has increased and its accounting about 9%. The demolished waste are left as filling material in order to reuse, recycle its further utilized for new construction with proper guidelines. The scarcity of construction material in present days which can be compensated by using these materials for building works. Hence utilization of these material can be an alternative to save the natural resources and this act as a powerful substitute without compromising the quality, quantity and standards of construction.

OBJECTIVE

- To analyze the treated recycled coarse aggregates with that of natural coarse aggregates.
- The different percentage of replacement treated coarse aggregate at 25, 50, 75 and 100% to that of conventional concrete and evaluate the mechanical properties of concrete.
- To optimize the percentage of replacement treated coarse aggregate.

MATERIALS AND METHODOLOGY

Ordinary Portland Cement

Cement of 53 grade utilized for the experimental investigation and its physical properties are tabulated in Table 1.

Table 1: Properties of Cement

S. No.	Properties	Values
1	Specific gravity test	2.905
2	Fineness modulus	9%
3	Standard consistency	33%
4	Initial setting time	38 minutes
5	Final setting time	632 minutes

Natural Fine Aggregate

River sand utilized for the experimental investigation which passed through the 4.75 mm IS sieve is used as natural fine aggregate in producing concrete are tabulated in Table 2.

Table 2: Properties of Fine Aggregate

S. No.	Properties	Values
1	Specific gravity test	2.5
2	Sieve analysis	4.04
3	Zone	III

Natural Coarse Aggregate

Naturally available material is adopted confirming to IS383-2016. Natural aggregate (NA) collected from single quarry.

Recycled Aggregate

Recycled aggregates (RA) are collected by crushing the 28 days tested conventional concrete cubes. The aggregates should pass through 20mm and retained in 12.5mm. Collected recycled aggregates are treated with fly ash.

Table 3: Properties of Coarse Aggregate

S. No.	Test Conducted	NA	RA	TRAC
1	Specific gravity	2.68	2.5	2.7
2	Aggregate crushing value	16.72	59.51	22.60
3	Impact value	18.43	32.8	21.68
4	Water absorption	1.2	5.7	2.06
5	Abrasion test	3.2	8.2	4.25

Fly Ash

Class F flyash used to treat recycled aggregate. Fly ash is mixed in the ratio of 1:2 and coated to recycled aggregate and it acts as protective layer which leads to protect from alkali aggregate reaction. Treated recycled aggregate concrete (TRAC) favours for sustainable environment.

RESEARCH SIGNIFICANCE

The mix ratio adopted for this work is 1:1.3:2.5:0.45 for M30 grade of concrete. The coarse aggregate is replaced with treated recycled coarse aggregates. The recycled coarse aggregate is treated by flyash treatment method. After this proper treatment process, the coarse aggregate is replaced with treated recycled coarse aggregates in different proportions. Conventional concrete of M30 grade with replacement of 25, 50, 75 and 100% of aggregates with recycled aggregates.

RESULTS AND DISCUSSION

The test result such as compressive, split tensile strength with flyash treatment process of RCA are displayed below.

Compression Test

The cast and cured specimens size of 150 mm are tested in compression testing machine and the results are furnished in figure 1.

Figure 1: Specimen under Test for Compression and Split Tensile Strength.

Split Tensile Test

The split tensile strength test was performed at 7, 14 and 28 days and presented in figure 3.

Figure 2: Compression Test.

Figure 3: Split Tensile Test.

CONCLUSIONS

From the results obtained after through experimental investigation it is concluded that,

- The properties of the treated recycled coarse aggregates revealed similar values to that of natural coarse aggregates.
- After treatment of recycled aggregate with fly ash the water absorption decreases whereas the compressive and split tensile strength increases gradually.
- Partial replacement of treated recycled aggregate is reasonable upto 50% whereas untreated recycled aggregate is reasonable up to 25%.

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