

RE-EXAMINE ON GREEN CONCRETE: PRODUCTIVE AND ECO-FRIENDLY CONSTRUCTION MATERIAL

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Abstract- Recycling and Reuse of waste material can reduce the consumption of fresh raw material. In today scenario it is very important to make a new product with the help of waste material because natural resources will decrease in a short time. Most important construction material used worldwide is concrete. Also in the parallel number of construction and buildings are pulverizing in present time. This concrete detritus have adverse results on the environment. The reuse of pulverizing debris gives us a good solution to overcome through an excess waste material problem. Construction industry invents an alternative of Portland cement concrete which known as "green concrete". Green concrete is a partial and complete replacement of cement and coarse aggregates. In this paper, we will study how alternative/waste material and green concrete elements affect the properties compared to normal cement concrete. Also, we will study about recycled coarse material in green concrete.

Keywords- Green Concrete, Construction, Waste material, Aggregates, Replacement

I. INTRODUCTION

As the human population is increasing there is a lot of load on the utilization of natural resources. This often causes over-exploitation of natural resources. So much consumption of natural resources can outstrip available natural resources in the future and wipe out for future generation. It is most important to use alternatives in place of natural resources. The construction industry is the second largest industry in worldwide and concrete is the most important material of construction. Aggregates are the main constituent of concrete. Due to continuously mining of aggregates availability is reduce and also emerged environmental problems. Also, demolition of construction buildings creates the problem in dumping sites, increase the cost of disposal and huge waste material to worry about environmental degradation. Normal concrete production is responsible for greenhouse gases like CO₂ and also production is highly energy intensive. The depletion of natural resource for aggregate encourages using demolished waste as new concrete.

To remember all the point in mind like durability, energy consumption, etc. construction industry finds an alternate technique to use waste material is known as green concrete. It is nothing to do with colour. This research work considers the comparison of properties between green concrete and Portland concrete cement like absorption, crushing value and specific gravity etc. green concrete a is composite of fine and coarse aggregates. At around 250 million tonnes of industrial waste is used to produced green cement. This paper summarizes the various efforts to make concrete suitable for "green building" material. Also, we will study advantages and disadvantages of green concrete.

II. OBJECTIVE

The goal to study green concrete is:

- ❖ To examine impact of maturing to writing effect on environment of green concrete and Portland cement concrete.
- ❖ To examine difference between property through maturing of coarse aggregates and recycled aggregates test.
- ❖ To examine the impact of maturing on rheology properties of coarse aggregates and recycled aggregate test with water.
- ❖ To examine the various test results like flexural test, absorption test etc.

III. METHODOLOGY

- a) Find out more and more research to know better about green concrete.
- b) To study about ingredients of green concrete.
- c) To conclude better various test performed on recycled coarse aggregates to check their strength, durability, flexural test etc.
- d) To investigate the need of concrete industry towards environment sustainability.
- e) An experimental project is used to understand phenomena of recycled coarse aggregates to used 30%, 50%, 80% and 100% in cement.
- f) To design a concrete mix for M45 grade as per Indian Standard Recommended method.

IV. MATERIALS

(A).Cement

In general cement is an adhesive substance of all kind but in narrower it is a binding material in civil engineering. Most commonly used cement is ordinary Portland cement. The ordinary Portland cement of grade 53 is collaterals to IS: 12269-2013 is being used.

TABLE -1
PROPERTY OF ORDINARY PORTABLE CEMENT OF 53 GRADE

S.NO	PHYSICAL PROPERTY	OBTAINED VALED	AS PER IS:8112-1989
1	Special gravity	3.13	3.10-3.15
3	Strength	549 N/mm ²	530N/mm2 minimum
2	Delicacy	6.5%	<.8%

(B). Aggregates

a) Fine Aggregates

The fraction from 4.75mm to 75 microns is considered as fine aggregates. The river and crushed sand is considered as a fine aggregate as per IS: 383 (2016).

TABLE-2
PROPERTIES OF FINE AGGREGATES

S.NO	PROPERTY	FINE AGGREGATE
1	Size	<4.75mm
2	Special gravity	2.41
3	Water Absorption	1.19



Figure.1: Fine Aggregates

b) Coarse Aggregates

The fraction from 20mm to 4.75mm is considered as coarse aggregates. Blast furnace slag and recycle concrete material is confirming to IS: 383(2016) in use.

TABLE-3
PROPERTIES OF COARSE AGGREGATES

S.NO.	PROPERTY	STANDARD VALUE
1	Specific gravity	2.50-3.00
2	Water absorption	0.5%-1.0%
3	Grading zone	1-4 zone



Figure.2: Coarse Aggregate

V. EXPERIMENTAL ANALYSIS

This experimental work includes research work on aggregate material to know slump test, chemical analysis test and compressive strength test. First of all, a mixture of fresh concrete is prepared to check out compressive strength before and after curing at different time. Mixture prepared was cast in mould in 150 x 150 x 150mm cubes to determine compressive strength after 7 and 28 days.

(A). Compressive Test:

Compressive Strength is performed by compressive testing machine (shown in fig.3) of 2000KN Capacity. This test is performed as per IS: 516-1959 in order to determine the compressive strength of the cubes casted. Compressive strength depends on many factors such as water cement ratio, quality of concrete material etc.

Compressive strength =load/cross-sectional area

Load should be applied gradually at the rate of 140kg/cm² per minute till the specimen fails.

Following results is come out after 7 to 28 days after casting.

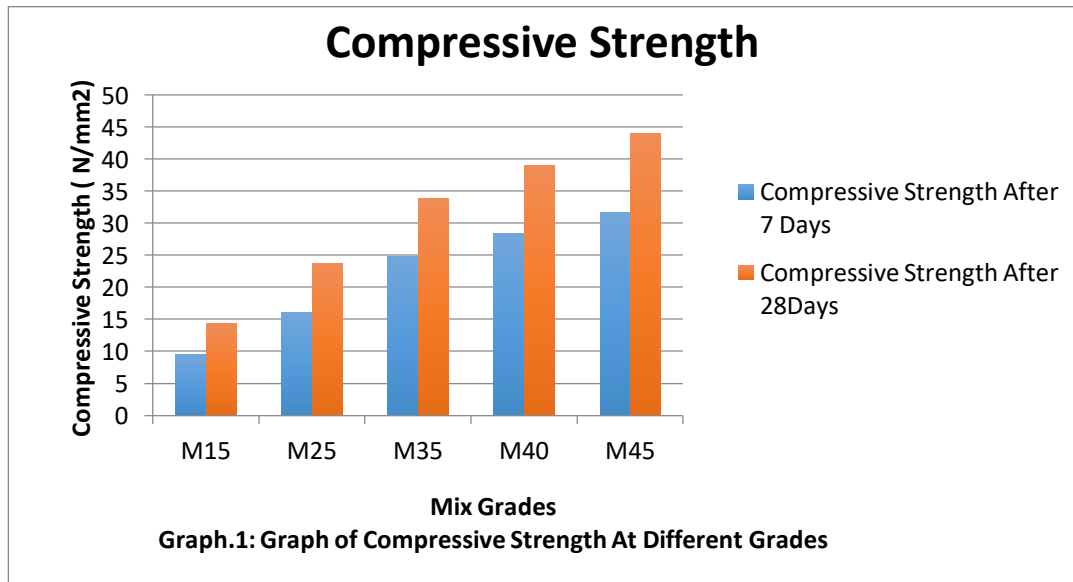


Figure.3: Cube under CTM

**TABLE-3
 COMPRESSIVE STRENGTH OF CONCRETE IN DAYS**

DAYS	STRENGTH
7 days	18%
14 day	65%
28 day	99%

The compressive strength test is performed on different grades of concrete and results are as show in graph 1. From the results



(B). Slump Test

This test is performed as per IS: 1199 (1959) in order to find out the workability of concrete. The test is designed mainly for use in the laboratory, but if conditions permit, it may also be used in the field. Slump test is carried out to know workability and consistency of concrete mix prepared for construction during work. It is used to checked uniform quality of concrete during construction. In slump test basically workability means water cement ratio. Air content, temperature of the concrete, amount of free water in concrete these some factors influence the concrete slump test. Slump test was carried out for fresh mixture of concrete in both conditions of cement and sand replacement and both results are compared with control mix. Result of mixture is presented in table 5.

**TABLE-5
SLUMP TEST RESULT**

CONCRETE MIX		SLUMP(CM)
CONTROL MIX	C M	5.0
Cement Replacement	SG C5	8.0
	SG C15	6.2
Sand Replacement	SG S10	9.8
	SG S25	5.3



Figure.4:- Slump Test

VI. ENVIRONMENTAL IMPACT OF GREEN CONCRETE

Every year about 0.9 tons of carbon dioxide is produced for every ton of cement. Carbon dioxide is responsible for global warming which is a green-house gas. Green concrete is new technology form all side to use as partial and alternate of Portland cement concrete. Green concrete reduced the carbon dioxide emission by 20%. This new technology includes all aspects i.e. disposal of wastage, maintenance of construction, manufacturing cost, concrete properties etc. Practical benefits come out from green concrete is not only give environmental and economical also provide construction industry to use own residual products. Use of fly Ash in green concrete in the ratio of 50% gives the high performance concrete. This high volume ash mixture reduces the environmental impacts and also save the money.

(A). Advantages of Green Concrete

The extensive use of green concrete in construction industry has a number of environmental benefits. We will discuss briefly below:

- ❖ Energy conversation: producing a tonne of Portland cement require approximately four to five giga-joule of energy. By using fine aggregates at replacement of cement will decrease energy consumption.
- ❖ By using green concrete green-house gases emission is reduced.
- ❖ Compressive and tensile split strength is good comparison to the conventional concrete.
- ❖ Instead of using 100 percent Portland cement mixture, green concrete use 25 to 30 percent fly ash.
- ❖ Green concrete has a lower rate shrinkage rate and also a better chance of surviving. Also it has a good resistance to corrosion.

(B). Disadvantages of Green Concrete

Disadvantages of green concrete are as follows:

- ❖ Buildings made through green concrete always depend on sun for energy. They located where sun exposure is good on their building.
- ❖ Structured made through green concrete have comparatively less life span to normal concrete.
- ❖ Water and cement ratio is high in green concrete.
- ❖ Bend strength is less in green concrete.

VII. CONCLUSION

It is most important to utilization of waste material to reuse as the population increasing and demolished debris is increasing. This research work carried out gives an idea that how much recycled coarse aggregates can be replaced by normal coarse aggregates. Partial replacement of waste material gives the best result compare to normal concrete in compressive strength, fire resistance and thermal resistance. Also some barrier is yet come out to use green concrete in academia and practical scenario. It is very much important to understand the life cycle of green concrete to obtain resultant concrete. At present this technology is not used in worldwide. Future research could expand in more countries then we will get more accurate and substitute of green concrete.

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