MANTECH Publications

Journal of Ceramics and Concrete Technology
Volume 6 Issue 1
ISSN: 2457-0826 (Online)

Experimental Study on Compressive Strength Properties of Recycled Aggregate Concrete

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Abstract

Concrete is one of the foremost prominent construction materials utilized within the field of gracious building. As a gracious Build the common evaluated life time of the building is 50 a long time. After 50 a long time life time the structure ended up out dated and the scrap esteem is substantial as it were for the wooden and basic steel components. Among basic components concrete have exceptionally destitute scrap value so that it cannot be utilized anywhere. This paper deals almost the possibility of utilizing the structural wastes as substitution for the fixings utilized in concrete. The material properties have been considered to find the substitution can be made for fine aggregate or coarse aggregate. Sieve analysis was performed to compare the possibility of utilizing for fine aggregate. Total impact test and water absorption test were carried out to find the possibility of utilizing it as coarse aggregate. The test comes about of material properties revealed the destroyed aggregate may well be a much better substitute for fine aggregate in structural concrete Cubes of size 100 mm x 100 mm x 100 mm were cast with the help of 10 mm coarse aggregates. The substitution proportion was made from 0 to 100 with the incremental value of 25%. The test comes about of the compressive strength revealed 100% utilization appears best among the other substitution proportions. The conceivable regions of applications moreover clarified.

Keywords*: - Scrap value, Recycled aggregate*

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INTRODUCTION

The reusing of Construction and Demolition Wastes such as recycled concrete has long been recognized to have the potential to moderate natural assets and to decrease vitality utilized in generation. In a few nations it could be a standard elective for both construction and support, especially where there's a deficiency of construction aggregate. The benefits and shortcomings of utilizing recycled aggregate in concrete have been broadly considered. The utilize of recycled aggregate for the most part diminishes the drying shrinkage and creep and increments the compressive strength and modulus of elasticity of concrete compared to those of natural aggregate concrete. The undesirable impacts of recycled aggregate on concrete quality limit the utilize of this material in basic concrete.

MATERIALS USED

Cement

Cement utilized for this study is conventional Portland cement of grade 53 has been utilized. Cement is utilized as a binder material.

Fine Aggregate

Fine aggregate utilized in this study could be normally accessible river sand the specific gravity of the material is 2.37. It is utilized as filler material.

Coarse Aggregate

Coarse aggregate utilized in this study is normally accessible coarse aggregate. The particular gravity of the coarse aggregate is 2.67.

Recycled aggregate

Recycled aggregate have been collected from different demolished wastes by hand demolition. It is replaced from 0% to 100% by substitution proportion of 25% for both fine and coarse aggregate. The fundamental material properties have been considered for the reason of finding which one is way better substitution for actually accessible aggregate.

LITERATURE REVIEW

Gagan and Sumit Arora (2015) proposed their thoughts in IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) generation of concrete aggregate from demolished waste, concrete reusing strategy, benefits of reusing of development and demolished waste, basic rules to be taken after in reusing of demolition waste. To begin with commercial scale pilot extend for C&D waste administration in India, Government and Ulb activities and few rules for fruitful

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C&D waste administration are a few other recommendations given by them. Normal resources are constrained in nature and will be exhausted with time. In arrange to moderate the common assets, pointless wasting of common resources ought to be limited and directed. Definition and execution of appropriate waste administration arrange all through the life cycle of the ventures can minimize C&D waste. With a coordinates resource administration conspire, most of the construction and demolition material can be recycled or reuse and more natural resources can be moderated for our following eras. The victory of reusing requires advancement by implies of instruction and data, in expansion to legal rules from the concerned administering body. The normal composition of Indian waste is appeared underneath. (**Figure 1)**

Katrina McNeil and Thomas H.-K. Kang (2013) in International Journal of Concrete Structures and Materials examined the properties of RCA, the impacts of RCA utilize on concrete material properties, and the expansive scale effect of RCA on structural members. The review study yielded the taking after discoveries in respects to concrete fabric properties: (1) replacing NA in concrete with RCA diminishes the compressive strength, but yields comparable splitting tensile strength; (2) the modulus of rupture for RCA concrete was somewhat less than that of ordinary concrete, likely due to the debilitated the interfacial move zone from remaining mortar; and (3) the modulus of elasticity is additionally lower than anticipated, caused by the more ductile aggregate.

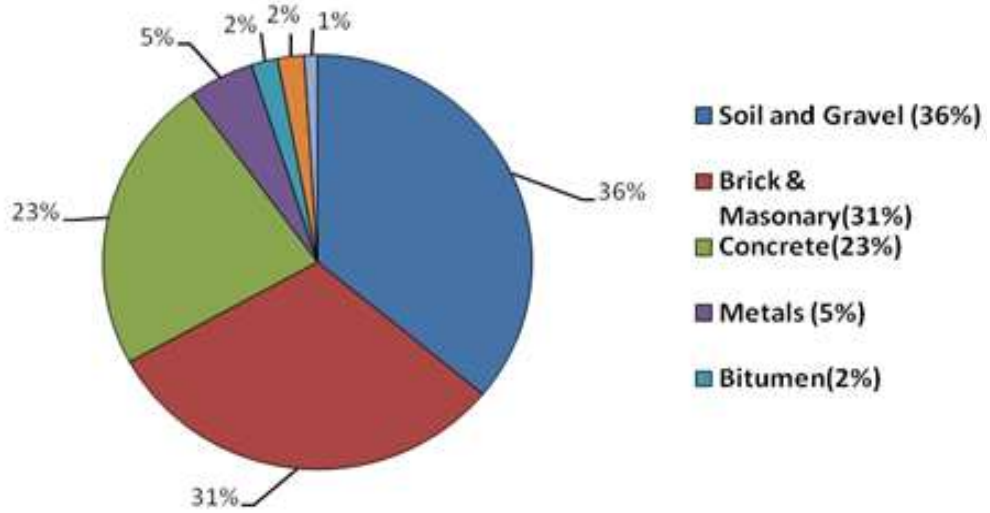


Figure 1: Replacement materials

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As distant as the auxiliary execution is concerned, beams with RCA did encounter more prominent midspan deflections under a service load and littler breaking minutes. Be that as it may, structural beams did not appear to be as influenced by RCA substance as materials tests. Most of all, the extreme minute was modestly influenced by RCA substance. All in all, it is affirmed that the utilize of RCA is likely a practical alternative for structural utilize. It managed with the total properties like density, porosity and water absorption, crushing and abrasion, shape, gradation and RCA concrete material properties like compressive strength, Splitting Tensile Strength, Modulus of Rupture and Elasticity etc.

MATERIAL PROPERTIES

Sieve analysis

Sieve analysis has been carried out for the materials of common accessible and recycled aggregate have been examined.

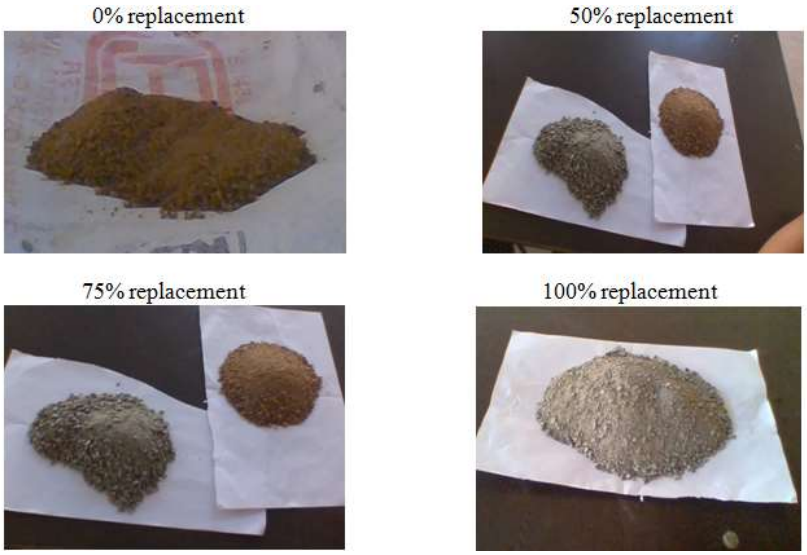


Figure 2: Materials used

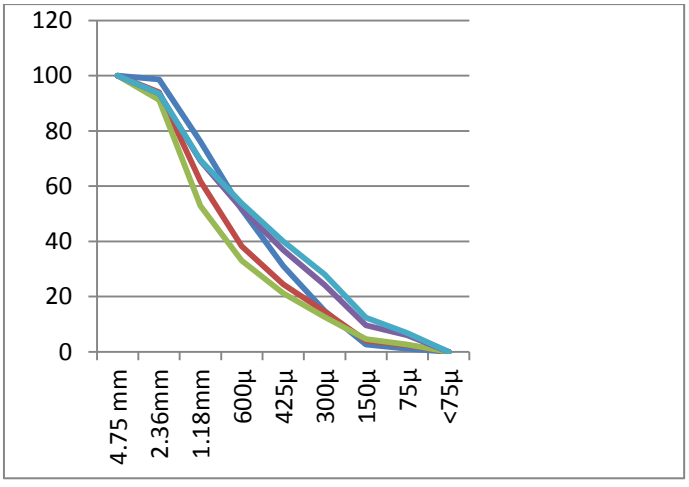


Figure 3: Particle Size distribution

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Table 1: Fineness modulus of materials

Replacement of Sand by Concrete debris	Fineness modulus
0%	5.24
25%	5.606
50%	5.82
75%	5.088
100%	4.96

From the fineness modulus comes about it can be possible to replace recycled aggregate for fine aggregate.

EXPERIMENTAL PROGRAM

It is the method of selecting appropriate ingredients of concrete and deciding their relative amounts with the reason of creating conservative concrete. The mix proportion of 1: 1.5: 3 [W/C = 0.50] Concrete of M20 were arrived as per the determinations and utilized all through the study.

Equipment

Standard Cube mould (100 mm x 100 mm x 100 mm), confirming to IS516-1959

Preparation of moulds

Before gathering the form, the faces fog be meagerly coated with form oil to avoid spillage amid filling, and a comparable oil film ought to be given between the contact surfaces of the foot of the shape and the base. The interior of the form must moreover be oiled to avoid the concrete from staying to it. The two segments must be blasted immovably together, and the moulds held down immovably on the base plates.

Sample preparation

For making 6 Sample cubes material quantity were arrived.

Grade of concrete - M20

Cube size 10 cm ×10 cm × 10 cm

Volume of the cube = $0.10m^3$

Unit weight = Weight / Volume

Unit weight of Concrete = $24 kN/m^3$

Weight of Concrete = 2400× 0.153 kg = 8.1 kg

Weight of Cement = (1/5.5×8.1) = 1.47 kg

Weight of Fine Aggregate = (1.5/5.5×8.1) = 2.20 kg

Weight of Coarse Aggregate= (3/5.5×8.1) = 4.41 kg

Two Test examples were arranged for standard grade of concrete (M20).Two Test Examples were arranged by replacing Fine aggregate (sand) with Concrete debris. Two Test Examples were prepared by replacing Coarse aggregate with Concrete debris. The amounts of materials were appeared in table.

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Table 2: Weight of samples

Sample No.	Cement (kg)	Sand (kg)	Concrete Waste (kg)	Coarse Aggregate (kg)
1	1.50	2.25	-	4.50
2	1.50	2.25	-	4.50
3	1.50	-	2.25	4.50
4	1.50	-	2.25	4.50

Mixing, Casting and Curing

- As per the mix ratio (1:1.5:3) we arranged the 6 concrete examples by hand mixing.

- Cast the arranged new concrete into the cube form which is greased up on its internal surface, by setting the concrete in three layer and along these lines compacting each layer with the tamping bar and trowel the best to be plane.

- Any discuss caught within the concrete will decrease the quality of the cube. Thus, the cubes must be completely compacted. Be that as it may, care must moreover be taken not to over compact the concrete as this may cause segregation of the aggregates and cement paste within the mix.

RESULTS AND DISCUSSIONS

From the experimental program the following results have been made.

Table 3: Compressive strength results

Replacement of concrete debris	Sample Name	Average Compressive Strength (N/mm^2)
0% Replacement	S 1	22.50
	S 2	
	S 3	
25% Replacement	S 1	25.60
	S 2	
	S 3	
50% Replacement	S 1	27.80
	S 2	
	S 3	
75% Replacement	S 1	29.30
	S 2	
	S 3	
100% Replacement	S 1	32.85
	S 2	
	S 3	

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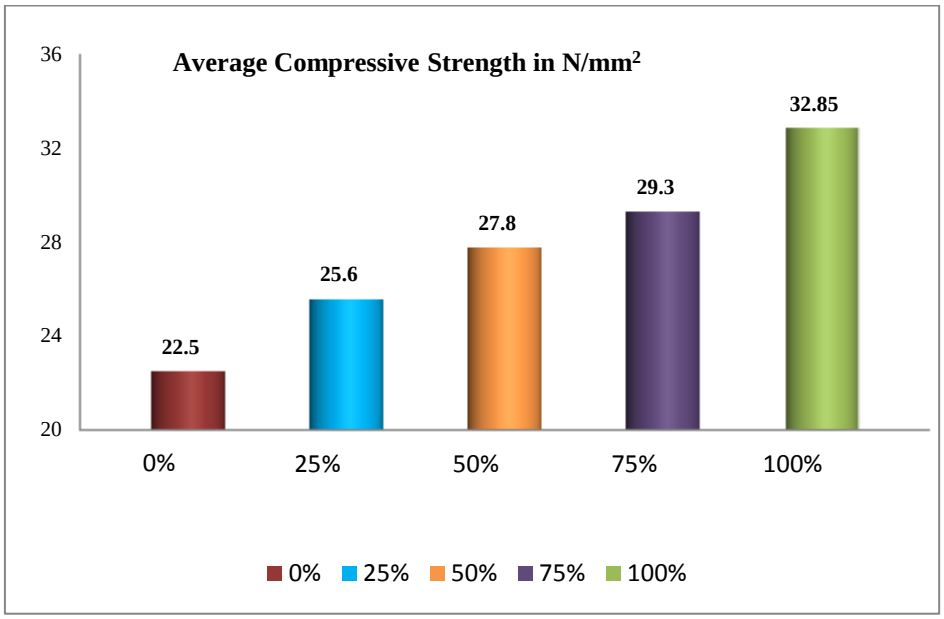


Figure 4

CONCLUSION

From the test comes about able to conclude that 100% of substitution of aggregate will appears better results.

FUNDING - Not applicable

CONFLICTS OF INTEREST/ COMPETING INTERESTS

There is no conflict of interest.

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