



## Experimental Study on Utilization of Recycled Demolished Coarsed Aggregate By Replacing Natural Sand With Artificial M. Sand in Concrete

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**ABSTRACT**

India is presently generating construction and demolition waste to the tune of 23.76 million tones annually and these figures are likely to double fold in the next few years. Demolition waste and specifically concrete has been seen as a resource in developed countries. Use of recycled aggregate in concrete can be useful for environment protection; artificial sands are one of the most used among such materials to replace natural sand. River bedded sand which is one of the basic ingredients in the manufacture of concrete has become highly scares and expensive. Therefore looking for an alternative to river sand has become a necessity. Hence the artificial sand which is also known as Robo sand can be used as an alternative material for the natural sand. In this experimental work the basic materials of concrete were tested as per Indian standard codes and the specimens were cast using recycled coarse aggregate in which constantly 100% replacement of natural sand by artificial sand is done. Concrete M20 Grade was used for our study. In total 18 sets (3 cubes in each set) each were cast and tested.

**KEYWORDS**

Recycled coarse aggregate RCA, M-sand, compressive strength, slump.

**1.Introduction**

Concrete is the primary material which is used for construction purpose in every construction industries in India and around the globe. Due to rapid increase in infrastructural development and construction activities in India and around the globe, simultaneously the demand of concrete is also increasing which leads to excessive extraction natural aggregates, excessive extraction of virgin aggregates for the manufacturing of concrete, results in depletion of natural resources and hence damaging the ecological balance. For the accommodation of new structures, the old structures which is constructed in past years and those structures whose lifespan is successfully completed are being demolished and destroyed, and sometimes. M-sand is a type of fine aggregate which is obtained by crushing the sedimentary rock. damages happens due to the occurrence of natural disaster generates a huge amount of construction and demolition Waste, the handling, transporting and dumping of this waste is again creates a big problem. Dumping of this waste is polluting the environment and damaging the ecological balance. And due to scarcity of dumping land there is urgent need to find some alternatives. Construction and demolition waste contains some amount of useful aggregates which can be recycled and reuse for making of new concrete. Similarly due to various environmental issues government has banned the extraction of natural sand from river bed, which leads to scarcity of natural sand and significantly the cost of natural sand is also increasing. Therefore we are using RCA and artificial sand in my project work. RCA absorbs more water hence it retains more water content in it<sup>3</sup> Compressive strength of Concrete.

specimens cast with cent percent replacement of river bedded sand by M-Sand gives similar strength as that of Normal concrete<sup>2</sup>

**OBJECTIVES**

The main objective of the present study is to systematically study the workability, compressive strength of concrete made with RCA in fully replacement of natural river bedded sand by M-sand for M20 grade of concrete, in comparison with normal concrete.

**Table No.2 Test on Fine Aggregate ( M.Sand)**

SL No.	Properties	Value
1	Specific Gravity	2.63
2	Fineness Modulus	3.160%
3	Water absorption	1.8%
4	Surface Texture	smooth
5	Bulk Density	1616kg/m <sup>3</sup>
6	Zone	I

**b) Natural Sand:**

Locally available river sand is used for this experimental work, and the physical properties of natural sand obtained by conducting laboratory tests are given in table 2.1

**Table No.2.1 Test on Fine Aggregate ( River Sand)**

SL No.	Properties	Value
1	Specific Gravity	2.46
2	Water absorption	3.50%
3	Moisture content	1.6%
4	Zone	II

**4 Coarse aggregate**

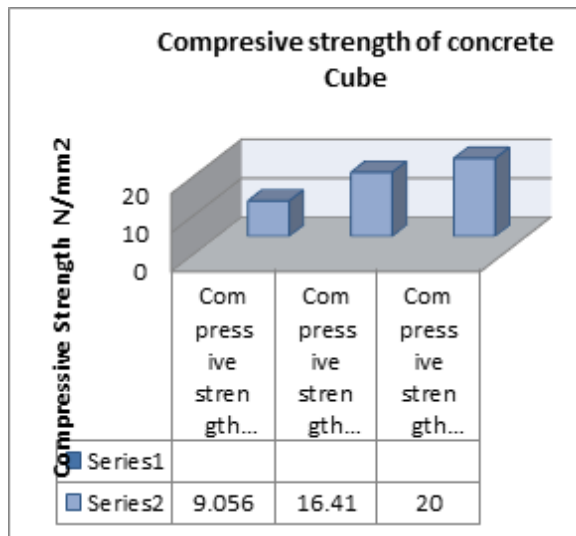
The recycle coarse aggregate of 20 mm down size rounded

Obtained from demolished building recycled coarse aggregate from our local city used in the present study. The properties of coarse aggregate are tested shown table no 5

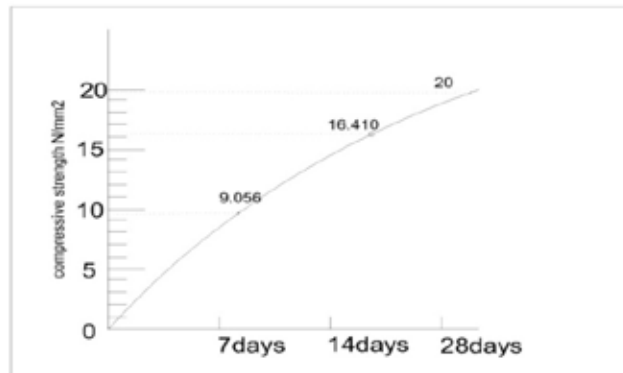
**Table No.3 Test on Demolished RCA**

SN	Properties	Value
1	Specific Gravity	3
2	Fineness Modulus	0.372%
3	Water absorption	25%
4	Particle Shape	Angular
5	Impact Value	8.5%
6	Crushing Value	20.1
7	Bulk Density	1658.28kg/m <sup>3</sup>

**Compressive Strength Test Results on Cubes by graph (IS: 5816 – 1959)**



**Compressive strength Test result on cubes (IS-5816-1959)**



Hence the above results are discussed by the compressive strength of the cubes under the 7, 14, 28 days curing. From the above graph (Fig.1.), the normal concrete attains the strength in general and the replaced material attains more strength than normal concrete. It shows that the recycled demolished concrete increased the strength than the normal concrete

**5. Conclusion**

From the present study the following conclusions were drawn

\*The idea of reusing waste material is very encouraging in concrete technology specially when it will be helpful in minimizing destruction to earth's crust and green forest.

**II. Materials and Methodology**

**2.1 Methodology**

Concrete grade = M20, Design – IS 10262:1980. Specimen moulds: Cube of size 150x150x150mm 18 No's Concrete made entirely with recycle coarse aggregates as a control concrete and river bedded natural sand. Other concrete made with M-sand and recycled coarse aggregate (in 100% replacement of coarse recycled aggregate or demolished waste coarse aggregate and M-sand fine aggregate). Cent percent specimens were made for the testing of the basic properties of hardened concrete. The basic test on fine aggregate and Recycled coarse aggregates 0.45M- sand can be used and (R.C.A) and compressive strength of concrete test carried out as per I.S Code recommendation concrete mix of M20 grade is used for our study and all basic test and compressive strength test tested in our K.C.T Engineering college laboratory material testing laboratory and concrete laboratory

**2.2 Cement**

Ordinary Portland cement of 53 grade from the local market was used and tested for physical and chemical properties as per IS: 4031 – 1988 and found to be confirming to various Specifications as per IS: 12269 – 1987. Table 1 shows the properties of cement.

**Table No.1 Test on Cement**

SN	Properties	Value
1	Normal consistency	30%
2	Initial Setting time	35 Min
3	Compressive Strength (7 days)	38 N/mm <sup>2</sup>
4	Compressive Strength (14 days)	48 N/mm <sup>2</sup>
5	Compressive Strength (28 days)	53 N/mm <sup>2</sup>
6	Specific Gravity	2.98

**2.3 Fine aggregate**

**a) Artificial sand**

In the present investigation, fine aggregate is artificial sand from local market is used. The properties of fine aggregate are tested and shown in table 2.

**3. Mix Design**

The process of selecting suitable ingredients of concrete and determining with their relative amount with the objective of producing a concrete of the required strength, durability and workability as economically as possible is termed concrete mix design. Table 4 shows the mix proportion of concrete

**Table No.4 Mix Proportion**

Mould	Volume (m <sup>3</sup> )	Cement (kg)	FA (Kg)	CA (Kg)
Cube	0.003375	2.10	1.20	2.40

**Table No 4.1 Slump and compaction factor tests result of m20grade concrete**

Sl.No	100% Replacement of R.C.A	Slump (mm)	Compaction Factor
1	C.C	92	0.89
2	100%	96	0.90

**4. Result & Discussion**

**Test on Concrete Cubes:**



**Table No.5**  
**Compressive Strength Test Results on Cubes (IS: 5816 – 1959)**

sl	100% recycled coarse aggregate With 100% A-Sand	Compressive strength for 7days curing (N/mm <sup>2</sup> )	Compressive strength for 14days curing (N/mm <sup>2</sup> )	Compressive strength for 28days curing (N/mm <sup>2</sup> )
1	100%	9.056	16.410	20

\* Protection of environment from the demolition Concrete waste.

\*Compressive strength of the demolished concrete made with recycled coarse aggregates and cent percent replacing fine aggregates with M-sand is getting greater than normal concrete.

\* This method of making concrete is very attractive in construction field.

\*Experimental study on recycled coarsed aggregate by replacing natural sand with artificial sand. ( M.sand).

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