

# Demolished Construction Recycled Aggregate as a Construction Material

Pranay R. Dukare<sup>1</sup>, Aditya P. Harshe<sup>2</sup>, Sagar B. Raut<sup>3</sup>

<sup>1</sup>Under Graduate Student, Depart. Of Civil Engineering, Bajaj Institute of Technology, Wardha, Maharashtra, India.

<sup>2</sup>Under Graduate Student, Depart. Of Civil Engineering, Bajaj Institute of Technology, Wardha, Maharashtra, India.

<sup>3</sup>Under Graduate Student, Depart. Of Civil Engineering, Bajaj Institute of Technology, Wardha, Maharashtra, India.

\*\*\*

**Abstract:** The use of recycled aggregates in any concrete opens a whole new Scope of possibilities in the reuse of materials in the construction industry. The utilization of recycled aggregates is a one of the good solution to the challenge of an excess of waste in construction material, provided that the desired final product quality is reached. The studies on the used of recycled aggregates have been going on since from last 50 years. Infact, none of the outcome showed that recycled aggregates are unsuitable for structural use. The use of recycled concrete aggregate in concrete as partial and fully replacements of natural coarse aggregate is expanding stipulation interest in the construction Industry, as it reduces the demand for virgin aggregate. In addition, the use of RCA leads to a best possible solution to the environmental problem overcome caused by concrete waste, and reduces the negative harmful environmental impact of the aggregate extraction from natural resources. This paper presents a strength review on the use of RCA in concrete based on the experiment.

**Key words:-** Concrete, RMC, Demolition, Aggregates, Impact Test, Crushing Value Test.

## 1. INTRODUCTION

Due to development in any sector of all over the world amount of construction and demolition waste has increased considerably over the previous few years. Sustainable development has began to implemented to preserve the natural resources. To promote the construction and to fulfil the needs of resources nowadays waste product such as recycled aggregate are used to carried out whole construction. The recycling and the reuse of this material is necessary, considering the impact that the use of natural resources and non use of construction waste is causing. This would not happen if the use of recycled material were possible.

The largest Construction demolished wasted obtained because of increasing demand of the development and aggregate is most used construction material now a days. The studies reference to the applicability of recycled concrete aggregates are extended around the globe. Most research has focused basically on the mechanical and

physical properties of recycled aggregate concrete as a test element. So as to attenuate the usage of naturally available aggregate, recycled aggregate may be used because the replacement/ substitution materials. Recycled aggregate are comprised of crushed, graded inorganic particles processed from the materials that are employed in the constructions and demolition debris of the any construction structure . These materials are generally from buildings, roads, and sometimes even from catastrophes.

## 2. IMPACT VALUE TEST ON RECYCLED AGGREGATE

It gives relative measure of the resistance of recycled aggregates to sudden shock or impact or compressive forces. Aggregates impact value is a measure of toughness property of recycled aggregates, lower the impact value through the recycled against impact therefore for good quality concrete recycled aggregates with lower impact value is preferred.

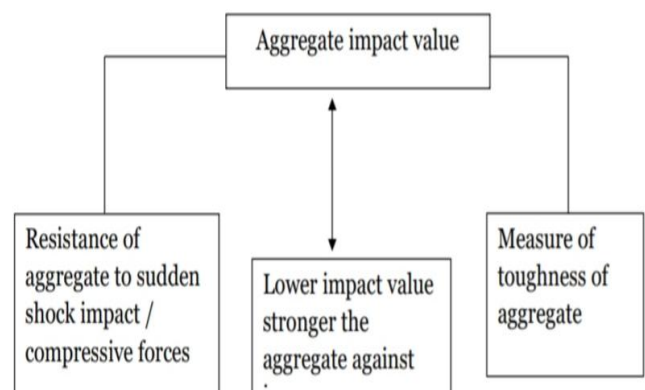


Fig -1 : Impact Test for Recycled Aggregate



Fig 2 :- Recycled Aggregate By Demolished Construction



Fig 3 :- Aggregate Impact Machine

Aggregate Impact Value, %	Toughness property
Less than 10	Exceptionally strong
10 to 20	Very tough / strong
20 to 30	Good for pavement surface course
Above 30	Weak for pavement surface

Table 1 :- Property index of aggregate

### 3. METHODOLOGY

Recycled aggregates passing 12.5 mm sieve and retained on 10 mm sieve are collected and dried in an oven for four hours at a temperature 100°C to 110°C and cooled to room temperature. They are then filled up to about one-third full in the cylindrical measure and tamped 25 times with rounded end of the tamping rod. Recycled Aggregate are then added till the cylindrical measure is two-third full and tamped 25 times. The measure is now full and over flow and 25 strokes of the tamping rod are given. The surplus aggregate are struck off using tamping rod as a straight edge. The weight of the cylindrical measure with the aggregate is noted, accurate to the nearest gram. The impact test machine is placed with the bottom plate flat on the floor so that the hammer guide columns are vertical. The cup is fixed firmly on the base of machine and whole

of the test sample from the cylindrical measure is transferred to the cup and tamped 25 times with the rounded end of the tamping rod. The hammer is raised using the lifting handle, until the lower face of the hammer is 38 cm over the upper surface of the aggregates in the cup and allowed to down freely on the recycled aggregates, The sample is subjected to a total 15 such blows, each being delivered at an interval of not less than one second. The cup is then taken out and the whole of the crushed recycled aggregates are transferred to the 2.36 mm sieve. Sieving is done until no further significant amount of crushed aggregate passes. The fraction passing the sieve is weighted accurate 0.1 g. The fraction retained on the sieve is also weighted and it should not be less then original weight of the specimen by more than one gram. If the total weight is less than the original by over one gram, the result is to be discarded and fresh test carried out.

### 4. RESULT AND DISCUSSION

The recycled aggregate impact value is found to be 22.28% As it is less than 30% hence can be used for concrete work. Hence we can used material for the construction. It satisfied the guidelines of Indian Standard.

### 5. OBSERVATION AND RECORD

Sr. No.	Item	Test
1	Weight of oven dried sample (W1)	350 gm
2	Weight of fraction passing 2.36mm IS sieve (W2) gm	78 gm
3	Weight of fraction retained an 2.36mm IS sieve (W3) gm	262 gm
4	Recycled aggregate impact value = $W2 / W1 \times 100$	$78 \times 100 / 350 = 22.28\%$

Table 2 :- Observation and Calculation for Recycled aggregate

### 6. CRUSHING STRENGTH VALUE TEST ON RECYCLED AGGREGATE

#### 6.1 Recycled Aggregate Crushing value:-

It gives relative measures of resistance of an aggregate to crushing under compressive load applied gradually, lower the crushing value, strength is the aggregate crushing. The test gives relative measure of resistance of aggregate to compressive stress.

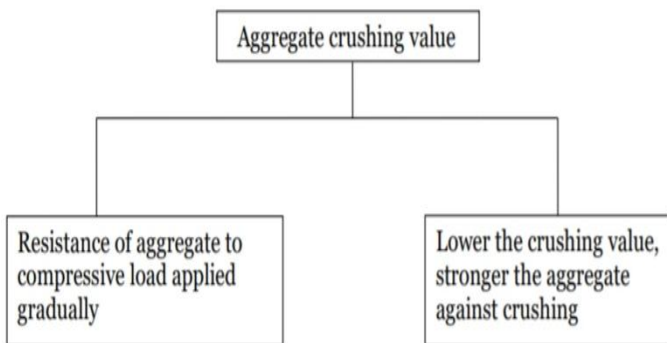


Fig 4:- Recycled Aggregate Crushing Value Test

6.2 Methodology :-

About 10 kg of recycled aggregate passing the 12.5 sieves and retained 10 mm sieve are collected. they're dried in an oven by heating for 4 hours at a temperature 100° C to 110° C and so cooled to temperature. Weight of empty cylinder is noted. it's then filled by the simplest sample of aggregate in three layers of roughly equal thickness, each layer being tamped 25 times by the rounded end of tamping rod. After the third layer is tamped, the recycled aggregate at the highest of cylindrical measure is leveled off using the tamping rod as a straight edge. The cylindrical measure with the recycled aggregate is then weighed.

The cylindrical test apparatus is placed on the bottom plate and therefore the contents from the cylindrical measure are transferred thereto by placing in three layers each being tamped 25 times with the rounded end of tamping rod, such the entire depth of fabric in cylinder is 10 cm. The surface of aggregate is leveled and therefore the plunger is inserted in order that it rests on this surface in leveled position. The cylinder with the test sample and therefore the plunger in position is placed within the compression testing machine. Load is then applied through the plunger at an uniform rate of 4 tonnes/min until the entire load is 40 tonnes. Aggregates including the crushed portion are off from cylinder and sieved on a 2.36 mm sieve. the fabric which passes this sieve is collected and weighed.

7. RESULT AND DISCUSSION

$$\text{Recycled aggregate crushing value} = (0.822/2.85) \times 100$$

As Result < 45%, hence suitable for any concrete work. By applying the compressive load on the sample we can get the value of the crushing.

8. OBSERVATION AND RECORD

Table No. 3 :- Observation Of Crushing Value Test

Sr. No	Items	Symbol	Test
1	Weight of surface Dry aggregate	W	2.85 kg
2	Weight of fraction passing 2.36mm IS sieve	W1	822 gm
3	Recycled Aggregate Crushing value	W1/W x 100%	34.979

9. CONCLUSION

By the above research we conclude that if the recycled aggregate satisfied in the range of the given Indian standard we can use instead of natural course aggregate. It preserves the natural resources. And the rate of construction waste it get reduced. Due to conduction of this test in recycled aggregate we get the assurance to used in the construction. It helps in Sustainable development. Which is nowadays primary concern of the world. Recycled aggregate has a enough strength which allows to used in the new developing construction. Waste gets reduced and proper management of waste can be done by these recycling construction project.

ACKNOWLEDGEMENT

We would like to express a deep sense of gratitude and whole hearted thanks to our HOD Dr. Sanjay Mahajan Sir whose supervision this research work has been carried out. It was his keep interest encouraging disposition and full co-operation that has made it possible for us to complete this work.

Lastly, we are Thankful to all those person, who have contributed directly or indirectly in the completion of this work.

REFERENCES

[1] Roberto dos Santos J, Branco F, de Brito J (2004) Mechanical properties of concrete with recycled aggregates. Structural Engineering International 3/2004,213-215.

[2] Hendriks ChF, Pietersen HS, Fraay AFA (2000) Recycling of building and demolition waste. An Integrated approach, Proceedings of the International Symposiumon 'Sustainable development Construction: Use of Recycled Concrete Aggregate', London, UK, pp 419-431.

- [3] Relevant Publications by Bureau of Indian Standards, New Delhi.
- [4] Katz, A. (2003). Properties of concrete made with recycled aggregate from partially hydrated old concrete. *Cement and Concrete Research*, 33(5), 703–711.
- [5] Knaack, A. M., & Kurama, Y. C. (2013). Design of concrete mixtures with recycled concrete aggregates. *ACI Materials Journal*, 110(5), 483–493
- [6] Symonds (1999) European Commission. Construction and demolition waste management practices, and their economics impacts. Report to DGXI, European Commission.

## BIOGRAPHIES



Pranay R. Dukare,  
Bajaj Institute of Technology,  
Wardha. Affiliated to DBATU,  
Lonere, Raigad.



Aditya P. Harshe,  
Bajaj Institute of Technology,  
Wardha. Affiliated to DBATU,  
Lonere, Raigad.



Sagar B. Raut,  
Bajaj Institute of Technology,  
Wardha. Affiliated to DBATU,  
Lonere, Raigad.