

# Effect of Recycled Aggregate on Compressive Strength of Concrete

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**Abstract** – Concrete is most used material in construction. Concrete consumption is increasing every year. Recycled aggregate is used as a replacement for natural aggregate. Use of recycled aggregate in concrete is useful for environment protection also. Significant differences were observed between properties of fresh and recycled aggregates when tests are conducted. The results shows that replacement of 25-30 percent of recycled aggregate in place of fresh concrete does not have much effect on properties of concrete. Fresh properties were studied by slump test and compaction factor test. Mechanical properties studied are compressive strength and flexural strength and tensile strength.

**Keywords-** Recycled Aggregates; Consumption; Flexural Strength; Compressive Strength

## 1 INTRODUCTION

Recycling is the act of processing the used material to create a new product. The usage of natural aggregate is getting more and more importance with the advanced development in infrastructure. The applications of recycled aggregate in the construction areas are wide and they had been used since long time ago. Recycled aggregate are comprised of crushed, graded inorganic particles processed from the materials that have been used in the constructions and demolition. These materials are generally from buildings, roads, bridges, and sometimes even from areas such as wars and earthquakes. The need to develop and adopt performance requirements specifically for secondary and recycled. The use of recycled materials has become accepted throughout the ready mixed concrete industry in response to increasing environmental focus, including product stewardship, and the increasing cost of disposing of waste material products will not only promote secondary

and recycled materials specification, but will also ensure that externally verified quality certification and compliance systems covering both materials and recycling plants are adopted

## 2 OBJECTIVES OF THE STUDY

The present study involves laboratory observations on use of demolished concrete in construction. The main objectives of the study are:-

1. To highlight the importance of use of Recycled concrete.
2. To determine the compressive strength of recycled concrete at the age of 7,28,56 days.
3. To determine the difference in compressive strength of fresh and recycled concrete.
4. To demonstrate advantages of using recycled concrete.

## 3 METHODOLOGY

A concrete mix was designed as per the physical properties of the aggregates required. The physical properties are given below:-

Table 1: Physical properties of aggregates

S.No	Properties	Natural aggregates		Recycled aggregates
		Coarse	Fine	Coarse
1.	Shape and texture	100% crushed faces	100% crushed faces	100% crushed faces
2.	Specific gravity	2.69	2.66	2.6
3.	Water absorption	1.0	1.88	1.6
4.	Fineness modulus	7.6	3.3	6.9

Now we design a M40 mix as per the design requirements. Now we prepare five batches of mix with varying/different proportions of recycled coarse aggregates. Now we

#### 4 EXPERIMENTAL

Before moving on to the compressive strength of concrete, workability of concrete was also checked. Workability of concrete is decreased as higher proportion of recycled aggregates is added in concrete mix. Slump value and

increase 15% of proportion of recycled aggregate in every batch. Now they are termed as m0, m1, m2, m3 having recycled aggregates of 0%, 15%, 30%, 45% proportions respectively. All the indesignated are constant.

compaction factor value were also decreased due to higher water absorption of recycled coarse aggregates used in the mix. Now we will add super plasticizer to the recycled aggregates to limit the water absorbing power of recycled aggregates. The second table gives the details of comparison of slump value and compaction factor.

Table: 2 Compaction Factor and Slump Value

Mix	W/C	Super plasticizer (% of Cement)	Slump Value (Mm)	Compaction Factor
mo	0.38	0.7	41	0.830
m1	0.38	0.7	42	0.842
m2	0.38	0.7	40	0.843
m3	0.38	0.7	38	0.828

Compressive Strength: - the compressive strength of concrete was checked at the age of 9, 27, 54 days. Concrete cubes of 150\*150\*150m<sup>3</sup> were prepared and compressive

strength is determined after necessary observations. The strength of recycled aggregate used in concrete and virgin aggregates used in concrete was compared.

#### 5. RESULT: -

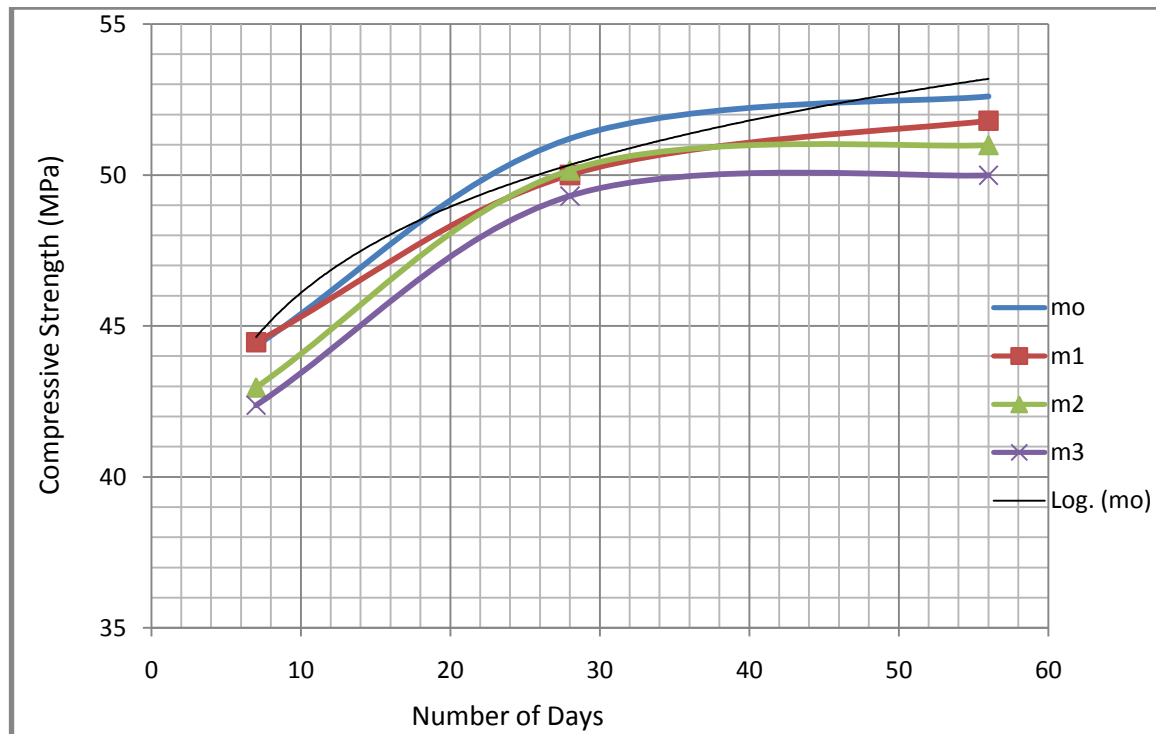
Compressive strength of concrete using recycled aggregates and virgin aggregates were compared using normal curing. The compressive strength of cubes was

determined with the help of compression testing machine (CTM). Table 3 gives the result of compressive strength of 0concrete of both fresh and recycled concrete at the age of 7, 28, 56 days

Table :- 3 Result of compressive strength of concrete

S.No	Mix	W/C	Compressive Strength (MPa)		
			7 Days	28 Days	56 Days
1.	Mo	0.38	44.34	51.2	52.6
2.	M1	0.38	44.46	50.0	51.8
3.	M2	0.38	42.96	50.15	50.99
4.	M3	0.38	42.37	49.3	49.99

Graph Shows Comparison of compressive strength of all the mixes



## 6. CONCLUSIONS

- This study examined that compressive and flexural strengths of recycled aggregate concrete at 7 and 28 days and compared the strength with control mix with natural aggregates.
- The strengths showed very minimum fluctuations between the mixes.
- The compressive strength of all mixes exceeded at the age of 28 days. Compressive strength of control mix i.e. of m0 is 51.2 MPa. Compressive strength of m1 is slightly decreased to 50. For m2, compressive strength is increased to 50.15 MPa, it also showed an increase in compressive strength. Compressive strength of m3 is decreased to 49.3 MPa that showed a decrease in compressive strength. So the results of test show that compressive strength does not follow a regular trend from m0 to m3. But from the results it is also concluded that compressive strength never went below the target strength for 28 days. This indicates that RCA can be used as replacement aggregates for compressive strength.
- From this study it was observed that the demolished concrete is a good source for concrete constructions. Economical and environmental pressures justifies the suitability of recycled aggregate concrete as alternative to the natural concrete. Where there is non-availability of natural/virgin aggregate from new rocks recycled aggregate concrete can be a good replacement for natural coarse aggregate in concrete constructions.

## 7. REFERENCES

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