

# International Journal of Innovative Research in Science, Engineering and Technology

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## Experimental Investigation on Replacement of Fine Aggregate with Demolished Construction Materials

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**ABSTRACT:** Demolition of old structures to make way for new and modern ones is common features in metropolitan areas due to rapid urbanization. Very little demolished concrete is recycled or reused. Due to strict environmental laws and lack of dumping sites in urban areas, demolished waste disposal is a great problem. This study is a part of comprehensive program wherein experimental investigations have been carried out to assess the effect of various percentage of replacement of fine aggregate by demolished waste on workability and compressive strength of recycled concrete for the study, at a period of 28 days. From test results, on replacing with demolished material (20%, 40% & 60%) in comparison with nominal mix and we obtained the optimized strength value 40% demolished material.

**KEYWORDS:** Fine aggregate, Coarse aggregate, demolished material.

### I. INTRODUCTION

As we know that the present world is heavily feeding on concrete at a huge extend that's the reason the demand for the construction aggregates has also increased .So in order to catch up with demand natural resources are reducing at very fast rate so to substitute the resources some recycled resources are used such as demolished concrete Demolished concrete is produced when structure made up of concrete is demolished and then the amount of the waste concrete left after demolition named as demolished concrete. We can use this productive waste in a very beneficial way by doing recycling. As we know recycling and reusing of waste product always proved to be eco-friendly and economic .Waste product can add advantage in the construction work if used according to their potential. Demolished concrete are available at various construction sites in huge quantity which are now posing serious problem of disposal. Firstly these materials are only used for the land filling works but now to eradicate the problems such as decreasing natural resources and disposal which poses a serious threat to environment. Now a day these material are being used in the construction work in order to meet the resource requirement. Volume of demolished concrete is increasing because of the following factors:

- Demolishing of structure for construction of new ones.
- Destruction of structures due to natural calamities.

These are some factors due to which billion tons of waste got produced every year. So the investigation we have conducted is about to evaluate the compatibility of productive waste (DEMOLISHED CONCRETE) in concrete production.

### II. MATERIALS AND METHODS

The material used for this experimental work are cement, sand, water and demolished material.

#### Cement:

Cement is a binder that sets and hardens and can bind other materials together. Ordinary Portland Cement (OPC) 53 grade is used.

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## Fine aggregate:

The specific gravity of fine aggregate was 2.67.

## Coarse aggregate:

Angular shape aggregate which passes through 20 mm sieve and retain on 10mm are used as coarse aggregate in this project work. The specific gravity of coarse aggregate was 2.74.

## Demolished Material

The demolished concrete is taken and brought to the lab and hammered with 10kg of weight and then it is sieved through 4.75mm size and used in the replacement in the fine aggregates. Demolished waste was collected from IIT Building near Jhalwa Allahabad, India. Demolished waste on being tested in laboratory showed pozzolanic properties. Demolished waste as a pozzolanic material was used to partially replace cement and similarly fine aggregate. Properties of recycled aggregates are given below.

## Mix design:

The mix design of M35 grade concrete is calculated using IS 456-2000 and IS 10262-2009. The material required as per design are given in Table: 1

Materials	W/C ratio	Cement	Fine aggregate	Coarse aggregate
Ratio	0.45	1	1.4	1.96

TABLE: 1 Material required as per is method of design

## III. TESTING METHODS

### FLEXURAL STRENGTH FOR RCC BEAM

All beams (100mm x 150mm in cross section and 1600mm in length) were tested as simply supported beams under three point loading over an effective span of 1400mm. The load shall be applied at a rate of loading of 400kg/min for the 15 cm specimens and at a rate of 180kg/min for the 10cm specimens. The loads were applied at a distance of 533mm on either side of the mid span of the beams of 1600mm length. The loads were monitored through a high accuracy load cell with a load sensitive of 0.1 tonnes. For this case, mid span deflection was measured using dial gauges of least count 0.01mm. The parameters such as initial cracking load, ultimate load and the deflected shape of the specimens were noted.

Determine the modulus of rupture ( $F_b$ ) =  $3Pl / 2bd^2$

Where

p = maximum load

L = length of the specimen in mm

b = breath of the specimen

d = depth of the specimen

## IV. EXPERIMENTAL RESULTS

### FLEXURAL STRENGTH OF COMPOSITE BEAM:

The following table shows the details of the flexural strength of composite beams of different specimens of different thickness.

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**TABLE2: FLEXURAL STRENGTH OF BEAM**

S.NO	SPECIMENS	LOAD		FLEXURAL STRENGTH(N/mm <sup>2</sup> )
		(kN)	(N)	
1	CONTROL BEAM 12mm	76	76000	47.29
		72	72000	44.80
2	20% DEMOLISHED MATERIAL	69	69000	40.50
		66	66000	38.60
3	40% DEMOLISHED MATERIAL	82	82000	55.64
		78	78000	51.48
4	60% DEMOLISHED MATERIAL	63	63000	34.25
		60	60000	31.20

**TABLE3: AVRAGE FLEXURAL STRENGTH OF BEAM**

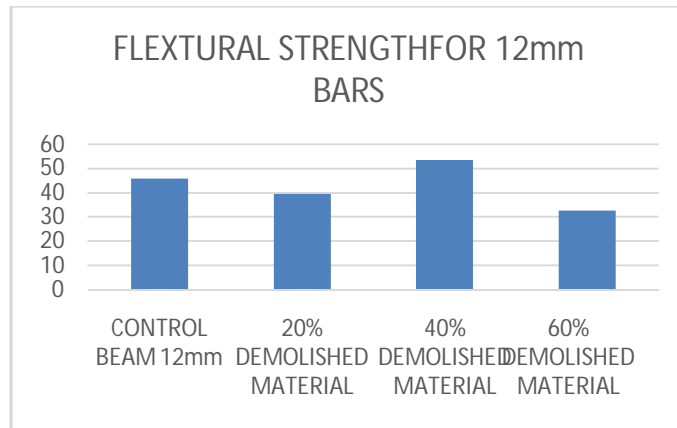
S.NO	SPECIMENS	FLEXURAL STRENGTH(N/mm <sup>2</sup> )	AVRAGE FLEXURAL STRENGTH(N/mm <sup>2</sup> )
1	CONTROL BEAM 12mm	47.29	46.045
		44.80	
2	20% DEMOLISHED MATERIAL	40.50	39.55
		38.60	
3	40% DEMOLISHED MATERIAL	55.64	53.56
		51.48	
4	60% DEMOLISHED MATERIAL	34.25	32.72
		31.20	

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**Fig:1 AVERAGE FLEXURAL STRENGTH**



FIG:2 casting of the beam

Fig.2. Preparation of specimen after mixing of the concrete and filled the mould



FIG:3 casting specimen

Fig.3. 20%,40%,60% casting specimen

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FIG:4 testing of specimen

Fig. 4 .after curing the specimen ready to test

## V. CONCLUSION

Recycled aggregate concrete is used in order to avoid the wastage of material from the demolished construction site hence by replacing the river sand with the conventional concrete tends to decrease both the compressive and tensile strength in that case the partial replacement is done. Recycled aggregate concrete can be partially replaced therefore we can get the result as better while comparative with full replacement. Also the main reason for decrease in strength is due to high water absorption. By the replacement of demolish material from 0% to 60% which tends to slightly increase in both the compressive and tensile strength. Hence using demolished material which help increase the recycling process and also it one the best method to avoid wastage from demolished construction sites.

1. We conclude that a detailed study was carried out on flexural strength of concrete.
2. The compressive strength increases when the replacement of fine aggregate with demolished waste aggregate up to 40% replaces by the weight of fine aggregate further replacement of fine aggregate with demolished waste aggregate increase the compressive strength.
3. The split tensile strength are increases when the replacement of fine aggregate with demolished waste aggregate upto 40% replaces by the weight of fine aggregate.
4. From test results, on replacing with demolished material (20%, 40%&60%)in comparison with nominal mix and we obtained the optimized strength value 40% demolished material.
5. Finally we conclude that the waste materials have been utilized in an effective manner and plays an efficient role in construction field.

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