Experimental Investigation on Concrete with Replacement of Coarse Aggregate by Demolished Building Waste with Crushed Concrete

By
Vijayvenkatesh Chandrasekaran
Student, Department of Civil Engineering, St. Josephs College of Engineering & Technology, India

Abstract:
Large quantities of construction and demolition wastes are continuing being generated which are just being dumped in the landfills. This requires large areas of land which is becoming difficult to find. The best solution would be to recycle and reuse the demolished waste which would not only help in protecting the environment but also help in dealing with construction wastes. Consequently, it have a grave difficulty to produce ecological toxic waste and in addition, obligatory a huge sum of liberty. That says about the project reuse waste crushed concrete maters (WCC) from the lath wastage of crushed concrete replacing from coarse aggregate 20%, 30%, 40% (WCC), 3% of crushed coarse aggregate (lathe waste) to reduce the generation of demolition wastes. (The analysis of demolished crushed concrete aggregate (DCCA) concrete in regular mold cast is to be ready in (7, 14, 28) days hydration and examination to be conduct lying on concrete. Such as compressive strength, split tensile strength, & flextural strength.) The replacing of coarse aggregate uses of waste mater and required strength attain in the conventional M20 grade concrete.

Keywords – Demolished Crushed Concrete Aggregate (DCCA), OPC (53 grade) cement, Lathe waste, Fine aggregate, coarse aggregate.

I INTRODUCTION

Since urban area is rising in excess of a moment in time, the stipulate used for innovative buildings and communications has stridently risen. With the vertical augment during the new-fangled structure the insist of usual aggregates have as well risen [1]. The usage of natural aggregate is getting more and more intense with the advanced development in the infrastructure area. In order to reduce the usage of natural aggregate, recycled aggregate can be used as replacement materials. Many old buildings and structures have overcome their age and limit of use. Structures not the portion the vents inside their scenario [1] [2].

New construction for better economic growth and job opportunities. Creation of building waste resulting from natural as well as man-made disasters. Demolished concrete fritter away obtain following the destruction of the arrangement is a life form correctly process

previous to the coarse aggregates of it be able to exist used in concrete production. Consequently, these process coarse aggregates utilize in the concrete in cast-off aggregate and concrete [4].

Advertisements

The discarding of building waste is 5000 tons per day in Overall analyzation in India and South Asia. According to Hindu also 23.75 million ton waste. In generated yearly inside India in 2007. It grave harm to contaminate surroundings, huge and too inhabit an outsized quantity of space [5]. Inside concrete engineering at in attendance internationally consume 8 to 12 billion tons of innate aggregate annually. Owing to incessant employ of expected sources similar to stone and sand is an additional main problem to alter climatic state and humiliating the Earth and to meet by means of insist in the future [7]. Through the use again of demolished concrete waste in the appearance of cast- off aggregate concrete is viewable because an effort in the direction of preserving the natural resource and protect the environment and not wastefully equilibrium [8] [9].

II MATERIALS AND METHODS

Materials

Cement: Available Ordinary Portland Cement of 53grade former used. Grade cement is required to conform to BIS specification IS: 12269-1987 with a designed strength for 28 days being a minimum of 53 MPa or 530 kg/sqcm.

Table 1 Physical Properties of Cement

Sr. No.	Physical Properties Of OPC 53 Grade Cement	Result
1.	Specific gravity	3.15
2.	Standard consistency	33.65
3.	Finess test	1.70
4.	Initial setting time	30 mins
5.	Final setting time	8 hrs. 20 mins

Fine aggregate:

Manufacture sand was used as fine aggregate. The exact gravity and fineness modulus be 2.55 and 2.93 respectively.

Coarse aggregate:

Nearby obtainable compressed stone be used as a coarse aggregate. Which contain the dimension of 20mm sizes used for the project.

Table 2 Physical Properties of Demolished Crushed Concrete and Normal Aggregate

Sr. No.	Physical properties	DCCA	Normal coarse aggregate
1.	Specific gravity	2.45	2.70
2.	Impact value	28.30	13.45
3.	Water absorption	5.62	0.95
4.	Bulk density	2.59	0.72
5.	Crushing test	29	17.50
6.	Abrasion test	16.5	14
7.	Size	20mm	20mm

Water:
Mixing and hydration process is used as potable water resources. Preparing of concrete and for this purpose used in the water cement ratio is W/C of 0.35.

Test specimens:
Test specimens consisting of 150×150×150 mm cubes casting for Compressive strength, 150mm Ø* 300mm length cylinders for split tensile strength. And 150×150×700 mm beam for flexural strength. Using different percentage demolished crushed coarsed 20mm size aggregate for M20 grade of concrete mix were cast and tested as per IS: 516 and 1199.

Curing of concrete:
Casting of concrete subsequent to the completion of 24 hours mold resolve be detached then hydrated through using potable water. The cast concrete cube, cylinder and beams is completely engrossed in potable water for exact age of 7, 14, 28 days. After the completion of curing it will be taken provided the room temperature in 24 hours after tested. Testing of hardened concrete:

1. Compressive strength.
2. Flextural strength.
3. Split tensile strength

III RESULT AND DISCUSSION

The Compressive Strength:
This concrete is poured into the mold and temper correctly, consequently because not to contain any void. The outside of these specimens be supposed toward existing complete even and smooth. This is complete by putting cement paste and dispersal easily resting on the entire area of the specimen. These specimens are tested by compression testing machine subsequent to 7 days curing, 14 days curing, 28 days after curing.

Table 3 Compressive Strength of concrete cubes

Grade	No. of days Curing	Comp- Strength of concrete	20% (DCC)	30% (DCC)	40% (DCC)
M20	7 days	20 N/mm^2	25.5 N/mm^2	23 N/mm^2	22.65 N/mm^2
	14 days	24 N/mm^2	39.5 N/mm^2	37.65 N/mm2	31 N/mm^2
	28 days	30 N/mm^2	42.45 N/mm^2	37.80 N/mm^2	35 N/mm^2

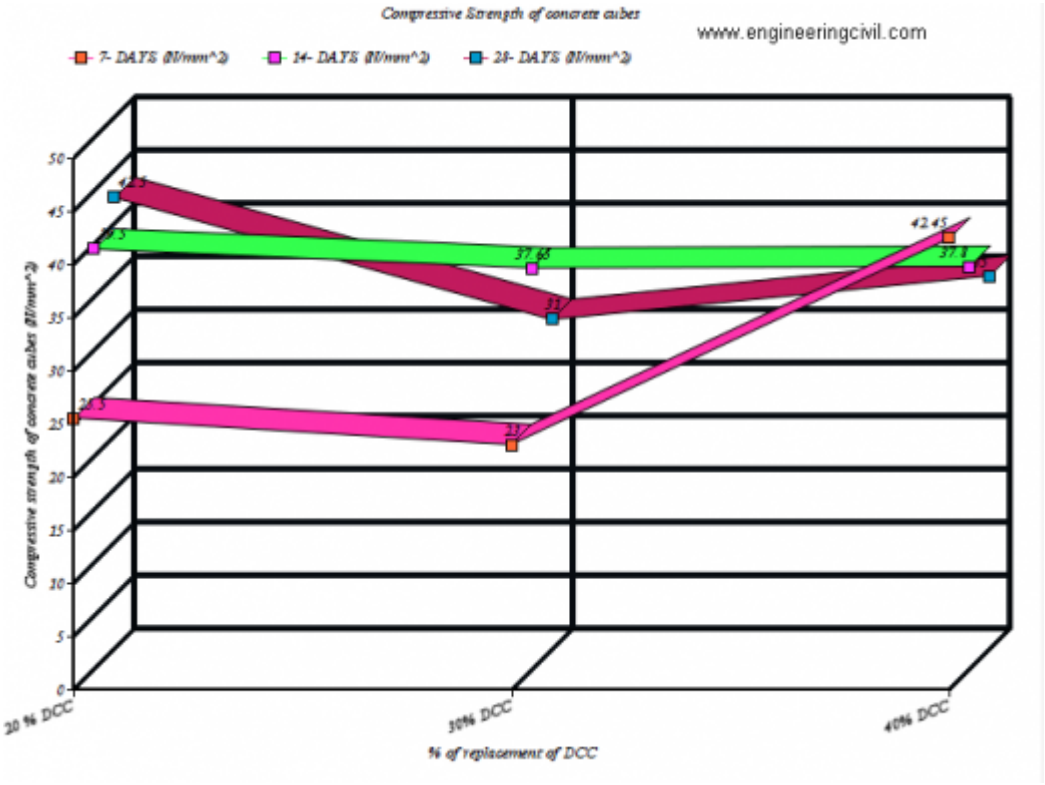

Figure 1 Strength analyses for Computer Assisted Qualitative Data Analysis Software

Figure 1 is represented by a 3-D view of the graph. It indicates the compressive strength of concrete cubes comparative for partial replacement of 20, 30, 40 % DCC hardened cubes in numbers of curing (hydrations) days status. Its maximum range of strength is analyzed the analytical reports.

Flexural Strength on Beam:

Flextural strength, also recognized as modulus of break or bends strength, or slanting crack is a fabric property,defined as the stress in a material immediately previous to it yields flexure test. The modulus of crack is resolute by testing standard test in testing machines specimens of size 100 X 100 X 500 mm.

Table 4 Flextural Strength of concrete beams

Grade	No. of days Curing	Flextural Strength of concrete	20% (DCC)	30% (DCC)	40% (DCC)
M20	7 days	3.82 N/mm^2	4.79 N/mm^2	4.65 N/mm^2	4.25 N/mm^2
	14 days	4.78 N/mm^2	8.52 N/mm^2	7.59 N/mm^2	7.18 N/mm^2
	28 days	6.97 N/mm^2	9.62 N/mm^2	8.79 N/mm^2	8.10 N/mm^2

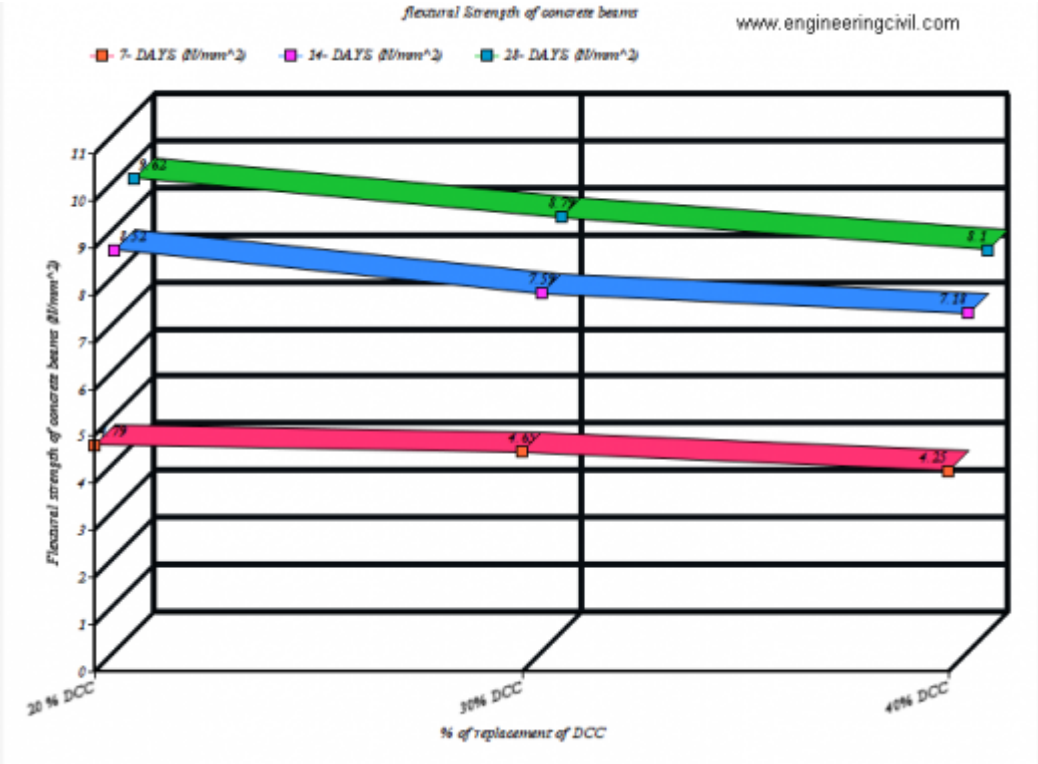

Figure 2 Strength analyses for Computer Assisted Qualitative Data Analysis Software

Figure 2 is represented by a 3-D view of the graph. It indicates the flextural strength of concrete beams comparative for partial replacement of 20, 30, 40 % DCC hardened beams in numbers of curing (hydrations) 7, 14, 28- days status. Its maximum range of strength is analyzed the analytical reports.

Split Tensile Strength:

The split tensile examination was conducted because for each IS 5816:1999. The size of the cylinder is 300mm length with 150mm diameter. The specimen was reserved in water for hydration for 7 days, 14 days and 28 days and for taking away were tested in wet condition through wipe water and gravel there on the surface. The experiment is

approved absent by placing a cylindrical specimen horizontally between the loading surfaces of a compression testing machine (CTM) and the load is practical to breakdown of the cylinder along the vertical diameter.

Table 5 Split Strength of concrete cylinders

Grade	No. of days Curing	Split Tensile strength of concrete	20% (DCC)	30% (DCC)	40% (DCC)
M20	7 days	2.02 N/mm^2	2.56 N/mm^2	2.25 N/mm^2	2.5 N/mm^2
	14 days	2.58 N/mm^2	2.78 N/mm^2	2.45 N/mm^2	2.59 N/mm^2
	28-days	3.20 N/mm^2	3.54 N/mm^2	3.23 N/mm^2	3 N/mm^2

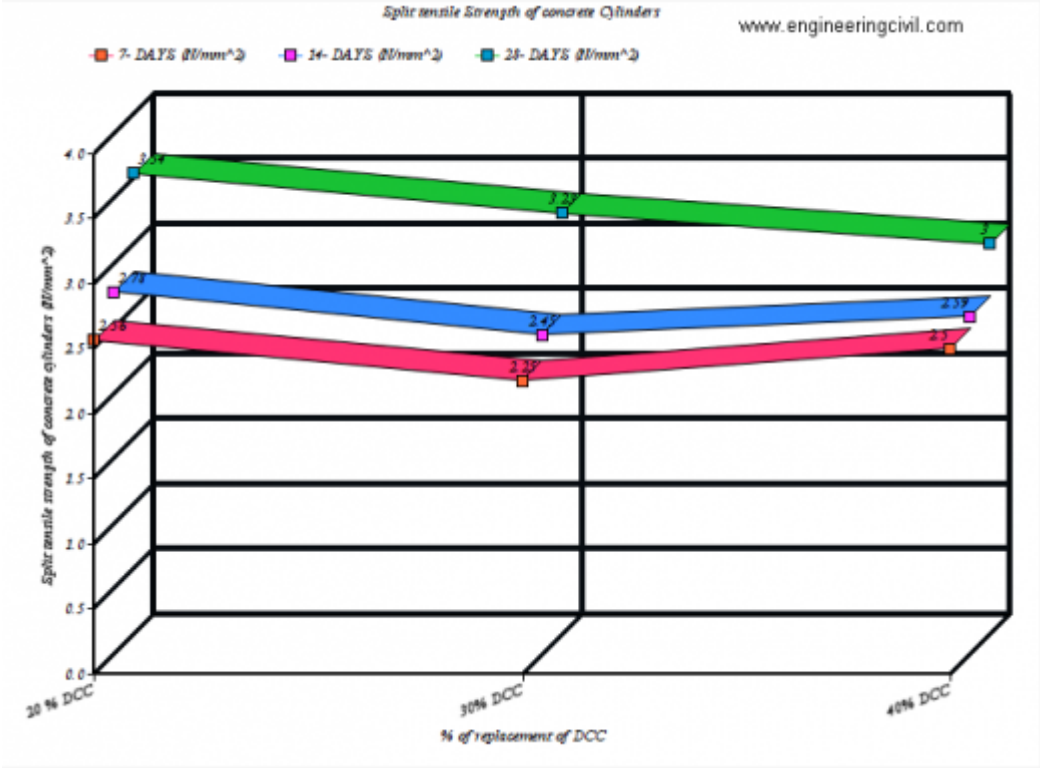

Figure 3 Strength analyses for Computer Assisted Qualitative Data Analysis Software

Figure 3 is represented by a 3-D view of the graph. It indicates the split tensile strength of concrete cylinders comparative for partial replacement of 20, 30, 40 % DCC hardened cylinders in numbers of curing (hydrations) 7, 14, 28-days status. Its maximum range of strength is analyzed the analytical reports.

Recommendation:
The result of the test, it is recommended that 40% DCC.

CONCLUSION

The use of recycled aggregates from construction and demolition wastes is showing prospective application in construction as an alternative to primary (natural) aggregates. Recycled aggregates are found to possess a relatively lower bulk density, higher crushing and impact values and higher water absorption as compared to natural aggregate. The compressive strength of recycled aggregate concrete is relatively lower than natural aggregate concrete. However, these variations are dependent on the original concrete from which the aggregates have been obtained.

REFERENCE

[1] Mohd Monish, Vikas Srivastava, V.C. Agarwal, P.K. Mehta and Rakesh Kumar (2013) "Demolished waste as coarse aggregate in concrete" ISSN: 2278- 5213 Feb-2013.
[2] Vaishali G. Ghorpade "effect of recycled coarse aggregate on the workability and shear strength of fiber reinforced high strength concrete" ISSN: 2319-8753 Vol. 2, Issue 8, August 2013.
[3] Tammi Sai Krishna "An Experimental Investigation on Flexural Behavior of Recycle Aggregate Fiber Reinforcement Concrete" e-ISSN: 2395-0056 Volumes 02 Issue 04 July 2015.
[4] Shaman Preet Singh, Rajwinder Singh Bansal "Strength evaluation of steel fiber reinforced concrete with recycled aggregates" e-ISSN: 2320-8163 Volume 4, Issue 1 (January- February, 2016).
[5] Abhishek Mandloi, Dr. K. K. Pathak Utilization of Waste Steel Scrap for Increase in Strength of Concrete Waste Management ISSN (online): 2321-0613 Vol. 3, Issue 09, 2015.
[6] Aiyewalehinmi E. O. and Adeoye T. E. "Recycling of Concrete Waste Material from Construction Demolition waste" Volume 2 Issue 10 (2016) pp10-19 ISSN (Online): 2321-8193 April, 2016.
[7] Prakash Somani, Brahmtosh Dubey, Lavkesh Yadav, Jitendra Kumar, Abhishek kumar, Mahipal Singh "Use of demolished concrete waste in partial replacement of coarse aggregate in concrete" (SSRGIJCE) Volume 3 Issue 5 May 2016.
[8] Jitender Sharma, Sandeep Singla "Study of Recycled Concrete Aggregates" (IJETT) Volume 13 Number 3 July 2014.
[9] Mirjana Malesev, Vlastimir Radonjanin and Snezana Marinkovic, "Recycled Concrete as Aggregate for Structural Concrete Production" ISSN2071-1050 March 2010.

*We at engineeringcivil.com thankful to **Er Vijayvenkatesh Chandrasekaran** for submitting this very useful paper to us. We hope this will be of great use to the engineering fraternity seeking more information on this topic.*

More Entries :
Comments

- *ktk123* November 10, 2017 at 5:15 am

  good

  Reply Link Quote
- Post a comment