International Journal of Research in Engineering, Science and Management
Volume-2, Issue-3, March-2019
www.ijresm.com | ISSN (Online): 2581-5792

A Review on the Use of Construction and Demolition Waste in Concrete

Abdul Gaffar[1], Tejaswini S. Ganvir[2], Vishwajit Lohkare[3]
[1]*Professor, Dept. of Civil Engineering, J. D. College of Engineering and Management, Nagpur, India*
[2,3]*Student, Dept. of Civil Engineering, J. D. College of Engineering and Management, Nagpur, India*

***Abstract*: India is presently generating construction and demolition (C & D) waste to the tune of 23.75million tonnes annually and these figures are likely to double fold in the next 7 years. C & D waste and specifically concrete has been seen as a resource in developed countries. Works on recycling have emphasized that if old concrete has to be used in second generation concrete, the product should adhere to the required compressive strength. This paper deals with the review of the existing literature work for the use of recycled concrete as aggregates in concrete in respect of mainly the compressive strength and proposes and approach for use of recycled concrete aggregate without compromising the strength. The need for demolition, repairs and renewal of concrete and masonry structures is rising all over the world, more so in the developing countries. It is highly desirable that the waste materials of concrete and bricks of further reutilized after the demolition of old structures in an effective manner especially realizing that it will help in reducing the environmental damages caused by excessive reckless quarrying for earth materials and stones. Secondly, this will reduce pressure on finding new dumping ground for these wastes, thus further saving the natural environment and ecosystem. This paper critically examines such properties in reused concrete and brick masonry waste materials and suggests suitable recommendations for further enhancing life of such structures thereby resulting in sufficient economy to the cost of buildings.**

***Keywords*: Concrete waste, concrete waste reuse, construction waste, new concrete.**

1. Introduction

Concrete has been around for many centuries, the first known use of a material resembling concrete was found by the Minoan civilization around 2000 BC. During the earlier stages of the Roman Empire around 300 BC, the Romans discovered that mixing a sandy volcanic ash with lime mortar created a hard Water resistance substance which we know as concrete, a huge amount of solid waste is generated annually from construction and demolition activities. This has led to the promotion of waste recycling as a major measure to reduce waste and to mitigate the harmful effects of construction activities on the environment. Among these waste, concrete apportions more than half of the total. The construction industry conspicuous consumer of raw material of many types and thus large material inventories are required to sustain the growth. Among the various raw materials used in construction, aggregates are important components for all the construction activities and the demand in 2007 has seen increase by 5%, to over 21 billion tones the largest being in developing countries like china, India etc. The use of swine manure, animal fat, silica fume, empty palm fruit bunch, citrus peels, fly ash, foundry sand, glass, plastic, carpet, and concrete aggregate in construction is becoming increasingly popular due to the shortage and increasing cost of raw materials. This study present an initial understanding of the current strengths and weaknesses of the practices intended to support construction industry in developing effect policies. It has been established that materials and components recovered from demolished buildings are being reused for new construction works as well as renovation projects, especially by low-income communities in developing countries. It has also been noted that material, which was not considered worthy of re-use a few years ago, has appeared in the market after the recent global economic crisis. For example, steel reinforcement from demolished buildings used to be recycled back into steel; however, it is now considered worthwhile to adopt measures to facilitate its reuse as a building material. Meanwhile, demolition contractors have also become increasingly aware of the feasibility of recovering as much material as possible, for new construction works. Consequently, they are giving considerable importance to the proper sorting, storing and display of their wares. Rapid industrial development causes serious problems all over the world such as depletion of natural aggregates and creates enormous amount of waste materials from construction and demolition activities. One of the ways to reduce these problems is to utilize recycled aggregate in the new construction concrete components.

2. Materials

A. 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.

B. Fine aggregate

In the present investigation, fine aggregate is natural sand from local market is used. And also used the crushing sand as a fine aggregate

C. Coarse aggregate

In the present study, coarse aggregate is taken from the demolition waste i.e. recycled aggregate.

Table 1
Tests on Recycled aggregate

S. No.	properties	value
1	Impact value	32.14%
2	Flakiness index	8.69%
3	Elongation index	5.29%

3. Methodology

Concrete grade = M30
Design – IS 10262:2009

Three types of concrete mixtures were tested: first concrete made by without adding any construction waste and second concrete is made by adding recycled aggregate, crushing sand and cement and third concrete made by adding cement, recycled aggregate and river sand. Twenty-one specimens were made for the testing of the basic properties of hardened concrete.

4. Mix design

The demolished concrete material is collected from 15 years old residential demolished building located in Nagpur. The Demolished waste is crushed in concrete lab by hammer after crushing the material sizes are taken from sieve analysis. After checking all physical properties making mix design M30 and getting proportion C: S: A=1:0.75:1.5 according to IS 10262:2009.W/C ratio is considered 0.50. Mix proportion of M30 mix design without adding any admixtures is showing in following table for 0.02025 m^3

Table 2
M30 mix design for 02025 m^3

Cement	42 Kg
Water	25 L/Kg
Fine Aggregate	28 Kg
Coarse aggregate	22 Kg
Recycled aggregate	44 Kg
Crushed Sand	14 Kg

5. Result & conclusion

In the present study, the result is comparison between the mixture of nominal material concrete and demolition waste material concrete.

Fig. 1. Compressive Strength of Concrete Cube

Table 3
Compressive Strength Result

Material	Compressive strength (1) N/mm^2	Compressive strength (2) N/mm^2	Compressive strength (3) N/mm^2	Average Compressive Strength N/mm^2
Fresh concrete	22	22.48	17.02	20.5
Recycled aggregate + River sand	28.53	32.31	27.37	29.40
Recycled aggregate + Crushing sand	35.31	32.53	36.53	34.85

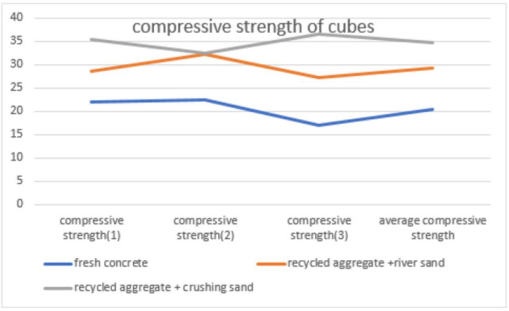

Fig. 2. Comprehensive strength of tubes

Hence the above results are discussed by the compressive Strength of the cubes under the 7, 28 days curing from the Above graph, 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.

6. Conclusion

From the present study the following conclusions were drawn: The idea of reusing the waste material very exciting and encouraging especially when it will be helpful in minimizing destruction to earth's crust and green forest cover by virtue of reduced mining. Protection of environment from the demolition concrete waste Compressive strength of the demolished concrete is getting greater than normal concrete. The tensile and flexural strength is also high. This method in the construction filled is very effective.

References

[1] Asif Husain, and Majid Matouq Assas, "Utilization of Demolished Concrete Waste for New Construction," in International Journal of Civil and Environmental Engineering, Vol. 7, No. 1, pp. 38-42, 2013
[2] R. Praba Rajathi, and J. Jai kanth, Utilization of Recycled Demolition Concrete," in International Journal of Engineering and Computer Science, Vol. 3, no. 12, pp. 9602-9605, December 2014.
[3] Al-Bared, Mohammed, Ayub, Azimah, Mohd yunus, Nor Zurairahetty, Harahap, Indra, and Marto, Aminaton, Application of demolished concrete material (DCM) in civil engineering structures - A review," in

International Journal of Civil Engineering and Technology, vol. 9, pp. 2345-2352, 2018.
[4] Nikita Patel and Piyush Patel, Use of Demolished Concrete Materials in
[5] Concrete and Comparative Study of its Mechanical Properties: NDT Comparison," in International Journal of Innovative Research in Science,
[6] Engineering and Technology, vol. 5, no. 4, pp. 4712-4721, April 2016.
[7] G. Yadhu and S. Aiswarya Devi, An Innovative Study on Reuse of Demolished Concrete Waste," in Civil & Environmental Engineering, vol. 5, no. 5, 2015.
[8] Firman Masudi, Ahmad, Hassan, Che, Mahmood, Noor, Mokhtar, Siti Nik Sulaiman, and Nik Meriam, "Waste quantification models for estimation of construction and demolition waste generation: A review," in Int. J. of Global Environmental Issues. vol. 12. pp. 269 – 281, 2012.
[9] Airy Vimal, Amrutha Mary, Vasudev R, and Anju Paul, "Review on Construction and Demolition Waste for Potential Research Trends Reuse of demolition waste for construction - A state of technology review."
[10] Jainisha K. Patel, Neeraj Sharma, and Rushabh Shah, "A Review On Construction and Demolition Waste Quantification Models."
[11] Kotulkar Poonam Jalandar, G. N. Kanade, and Swapnil S. Kulkarni, "Demolition of Structure Using Implosion Technology and Reuse Waste - A Case Study."