A Research on Recycling of Demolished Concrete Waste

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Abstract

The report in this paper shows the various properties of recycled aggregate as compared with natural aggregate. The change in properties of natural and recycled aggregate is also noted along with their effect on construction component. It can be used for formation of cubes, cylinders, beams, etc. Also the properties of concrete such as compressive strength, workability, etc. are compared. The concrete is made of mixture of natural aggregate and recycled aggregate. Now-a-days, recycled aggregate have future scope in construction work in India. The members cast and test for compressive strength, split tensile for curing period of 7, 14, 21 and 28 days. This shows 60 to 80 % result without disturbing the design strength and gives effective result.
Keywords: Concrete, Recycle, Material

I. Introduction

The waste from construction or demolition is generated whenever any construction/demolition activity takes place such as building roads, bridges, and fly over, subway, remodeling etc. Mostly it comprises of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. A part of this waste comes to the municipal stream.

These wastes are heavy, having high density, often bulky and occupy considerable storage space either on the road or communal waste bin/container. It is not uncommon to see huge piles of such waste which is heavy and piled on roads especially in large projects which causes traffic congestion and disruption. Waste from small generators like individual house construction or demolition, find its way into the nearby municipal bin/vat/waste storage depots, making the municipal waste heavy and degrading its quality for further treatment like composting or energy recovery. Often it finds its way into surface drains resulting in choking of drains. It constitutes about 10-20 % of the municipal solid waste (excluding large construction projects).

II. Material & Methodology

Indian Standard Recommended Method of Concrete Mix Design (IS 10262-1982) Was first introduced during the year 1982. In the revision of IS 456:2000, A Number of changes were introduced in IS 456 which necessitated the revision of IS 10262 of 1982. A committee was set up to review the method of mix design in conformity with IS 456:2000. The committee took long time and came up with a new guideline for concrete mix proportioning. The information given below is based on guidelines given in Indian standard IS 10262:2009 for concrete mix proportioning.

III. Data required for mix design

- Grade of concrete
- Maximum size of aggregate
- Minimum cement content
- Maximum w/c ratio
- Workability in terms of slump
- Exposure conditions
- Maximum temperature at pouring point
- Early age strength
- Grading zone of fine aggregate
- Type of aggregate
- Maximum cement content
- What kind 0f admixture is used
- Specific gravity of all materials used and dosage

IV. RESULT & DISCUSSION

A. Results of Normal Concrete

1) Slump Cone Test Results

Slump test is most commonly used method of measuring consistency of concrete which can be employed either in laboratory or at site work. Workability of its result is calculated fromIS 456:2000even in IS 10262:1982

Table – 1
Slump Cone Test Results

Sr. no.	Result of normal concrete (M20)	Different ratio of recycled aggregate	Results of Concrete replaced by recycled aggregate
1.	28 Days	80:20	28 cm

Performance of Concrete with Recycled Aggregate

2) In Slump Cone Test

Table – 2
Performance of Concrete with Recycled Aggregate in Slump Cone Test

Sr. no.	Ratio	Cone Length	Cone length for normal concrete	%increase /decrease	Type of concrete
1.	0.80:0.20	28cm	28cm	0.00%	High category of workability
2.	0.90:0.10	27cm		3.57%	High category of workability
3.	0.10:0.00	28cm		0.00%	High category of workability

3) Compressive Strength Results

Compression test is most common test conducted on hardened concrete because it is easy to perform and most of the desirable properties of concrete are qualitatively related to its Compressive Strength. Different Combination of the aggregate replacement are followed to get the maximum strength of concrete after replacement

Table – 2
Compressive Strength of Conventional Concrete Cubes in N/mm^2

	Cube 1	Cube 2	Cube 3	Cube 4	Cube 5
7 Days	15.66	15.18	15.76	15.85	15.25
14 Days	17.38	16.74	17.01	17.9	16.84
21 Days	19.24	19.07	19.84	19.03	18.97
28 Days	23.08	22.41	22.1	21.54	21.07

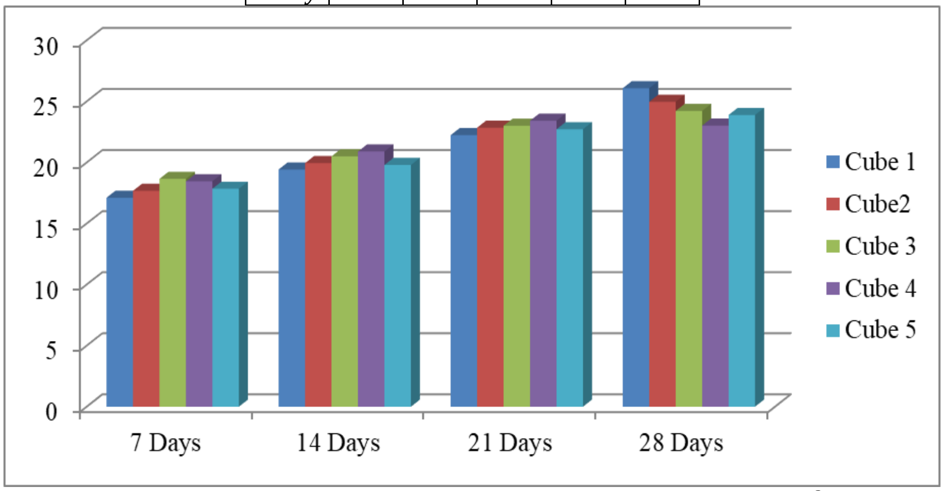

Fig. 1: Compressive Strength of Conventional Concrete Cubes in N/mm^2

Table – 3
Compressive Strength of Non- Conventional Concrete Cubes in N/mm^2

	Conventional	Non-conventional
7 Days	17.925	15.528
14 Days	20.114	17.174
21 Days	22.848	19.23
28 Days	24.436	22.04

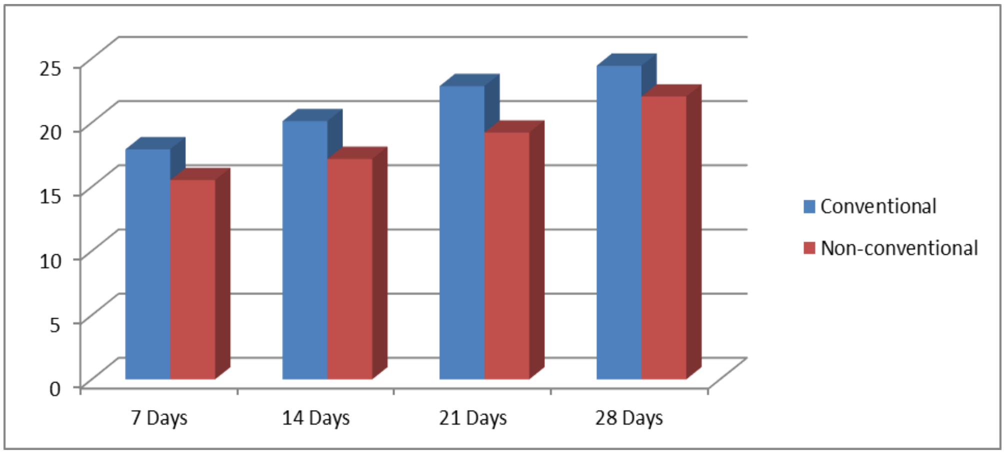

Fig. 2: Compressive Strength of Non- Conventional Concrete Cubes in N/Mm2

Comparison of the Compressive Strength of the Concrete with the Recycled Aggregate
Comparison of conventional and non-conventional concrete.

Table – 4
Comparison of Conventional & Non-Conventional Cube

	7 days	*14 days*	*21 days*	*28 days*
0%	*13%*	*18%*	*18.90%*	*19.85%*
80%	*10%*	*15.30%*	*15.80%*	*16.56%*

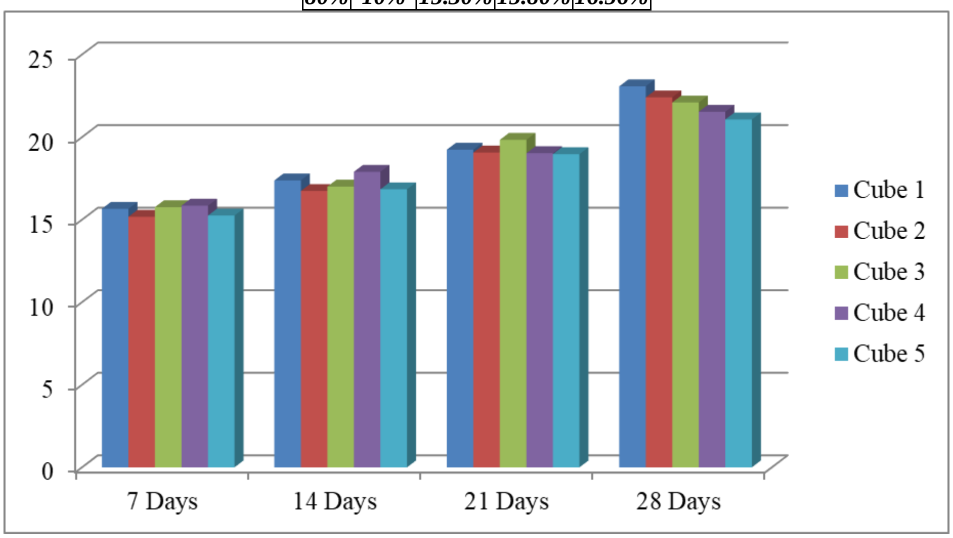

Fig. 7: Comparison of Conventional & Non-Conventional Cube

V. CONCLUSION

- The Study is conducted on the partial replacement of Recycled Coarse Aggregate in making high strength concrete M20 and the following conclusions are drawn on the limited study carried out:
- From Compressive strength test results, it is observed that 80% replacement of 20 mm aggregates in RCA mixing attains more than the conventional concrete and attains more strength when compared to conventional mix at 28 days. It is also found that, Compressive strength of 80% Replacement of 20 mm aggregates in RCA mix cubes were attain strength closer to the compressive strength results of conventional concrete at 7 days,14 days, 21days, 28 days. Finally, overall results are equal to the conventional concrete results at all ages.
- Construction and demolition waste can be used as recycled aggregate in construction. The more thoroughly the waste is treated, the higher the quality of the aggregate. However, high-quality aggregate is expensive, and thus, economically unavailable in countries where natural aggregate is cheaply obtained. Recycled concrete aggregates are different from natural aggregates and concrete made from these materials has specific properties.

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