RECYCLED AGGREGATE USED AS RAW MATERIAL IN CONSTRUCTION

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Abstract

The execution of reused total from C & D squander can affect the quality of concrete materials that incorporate high volumes of reused total. The ongoing research focuses on evaluating the advantages of using reused total materials sourced from various construction and demolition waste sites. The study aims to analyze the performance of concrete materials that contain reused total as a replacement for traditional aggregate materials, considering different substitution rates for both coarse and fine aggregate materials.

1.Introduction

The execution of reused total from C & D squander can affect the quality of concrete materials that incorporate high volumes of reused total. The ongoing research focuses on evaluating the advantages of using reused total materials sourced from various construction and demolition waste sites. The study aims to analyze the performance of concrete materials that contain reused total as a replacement for traditional aggregate materials, considering different substitution rates for both coarse and fine aggregate materials.

2. LITERATURE REVIEW

George Dimitriou

The main difference between Recycled Concrete Aggregate (RCA) and Natural Aggregate (NA) is the mortar adhered on RCA. This paper presents the effect of RCA to concrete and a treatment method utilized to improve the properties of RCA, by reducing the amount of the adhered mortar, and therefore the properties of the Recycled Aggregate Concrete (RAC). Mineral admixtures were used as partial replacement of cement. Three types of coarse RCA and two types of mineral admixtures were used (fly ash and silica fume). In addition, the RCA were employed as internal curing (IC) agents in concrete mixtures to assess their effectiveness in enhancing the properties of concrete. The mechanical properties and durability of RAC were improved using the proposed methodologies. Cost analysis showed that RAC mixtures could be less expensive than NA mixtures.

A. Akhtar *et al. (2018)*

In developing countries, especially in East African countries, most construction and demolition waste generation is from construction renovation. This results in environmental impacts and various natural resource pollution due to dust emissions from C & C&D wastes and scarcity of lands due to C&D debris massive accumulation to the environment “Ashraf et al. [1]”. Composite construction and demolition trash contained a lot of waste types and categories. Most of it includes the soil, aggregate, and sand lest overs. These waste materials can be completely recyclable and reusable in many cases. Next to these categories, wood waste materials have significant parts in C&D debris groupings “Vijayalakshmi et al. [2].

3. Methodology

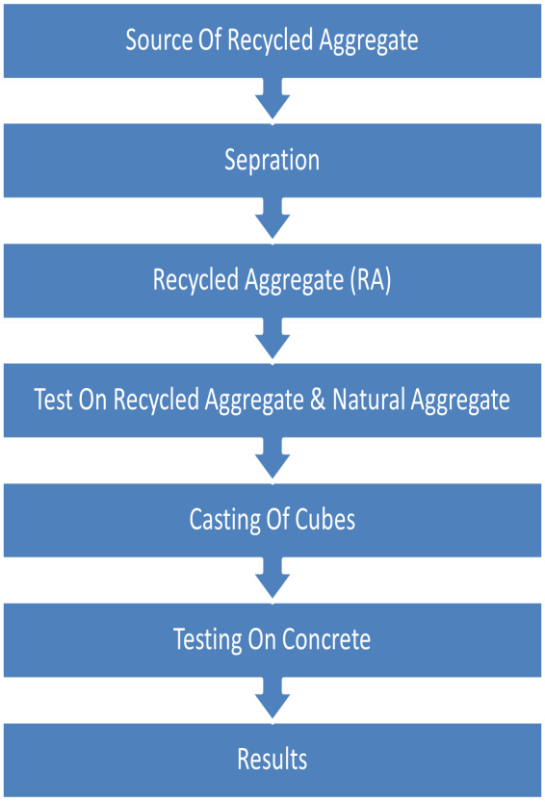
Throughout this section, we have explored a range of physical and chemical characteristics of Aggregate and other substances. The concrete mixture was formulated using M30 grade and consisted entirely of Aggregate. Subsequently, curing was carried out for durations of 7, 14, and 28 days, respectively.

3.1 General:

3.2 Materials Used -

i. Recycle Aggregate
ii. Cement
iii. Fine Aggregate

3.3 Flow Chart



Type of cement: opc 43 grade (ambuja cemet) according to IS – 8112 (**43 –grade).** .

Size of aggregates used: 18 to 20mm

Grade of concrete: M30 (1:0.75:1.5)

No. Of blocks casted: 9

(Table no.1 Table showing casting and testing schedule)

Proportion of RAC	100%		
Testing done on	7	14	28
Dates of Casting	6th March		
Dates of Testing	13th March	20th March	3rd April

Weight of cement for each batch of 9 cubes- 15kg

4. Experimental Analysis

4.1 General - This chapter shows the different tests which are performed on the Aggregate And cubes of concrete of the size 150 X 150 X 150mm with the 100% of RA. In this chapter the detail procedure are given for the following tests.

4.2 list of tests conducted on Aggregate –

i. Aggregate Impact Test
ii. Aggregate Crushing Value
iii. Aggregate Abrasion Test
iv. Elongation Index Test
v. Flakiness index
vi. Compression test

Test conducted on Concrete-

i. **Compression test**

4.3 Procedure of Tests -

1. The compressive backbone test requires three samples of cubes or cylinders, although sometimes only two are taken depending on the specifications. If one sample is added, it is activated only if the two initial samples fail and the actual sample passes. The additional sample is tested within 60 days if the adviser wishes to do so.

2. For cube analysis, specimens of either 15cm X 15cm X 15cm or 10cm X 10cm X 10cm are used, depending on the size of the aggregate. Typically, cubical moulds of 15cm X 15cm X 15cm are preferred for most works. The concrete is poured into the mould, compacted properly, and cured to avoid any voids.

3. After 24 hours, the moulds are removed, and the specimens are placed in water for curing. The top surface of the specimen should be made even and smooth by applying plaster and spreading it evenly. These

specimens are then tested using a compression testing machine after 7 or 28 days of curing, with the load applied gradually until failure. The compressive strength of concrete is calculated by dividing the load at failure by the cross-sectional area of the specimen.

Table 2: Strength gain pattern of concrete with respect to days

Fig 2: Compression Testing Machine

5.Result

1. Compression Test

% of RAC	Number of cubes casted	7 days (load in KN)	14 days (load in KN)	28 days (load in KN)	Average in N/mm^2
100%	3	450 448 456	638 643 650	680 688 679	7days-20.05 14days-28.60 28days-30.32

6. Conclusion

1. Based on the findings of the experiment, it can be deduced that the 28-day target compressive strength of all mixes was successfully achieved at 30 MPa, despite the fact that the recycled aggregate concrete (RAC) had lower strength compared to the natural aggregate concrete (NAC).
2. The compressive strength of the RAC falls within the same range as the NAC, reaching up to 30 MPa after 28 days of curing.
3. The size of the recycled aggregate (RA) had an impact on the compressive strength, with the results indicating that the 10mm and 14mm sizes of RA performed better than the 20mm size.
4. The workability of the RAC, as determined by the slump test, was lower than that of the NAC due to the higher rate of absorption of the RA compared to the natural aggregate (NA).
5. The general properties of the RA, including Aggregate Impact Value (AIV), Aggregate Crushing Value (ACV), and specific gravity, showed minimal differences compared to the NA. This confirms that the size of the RA affects the workability and strength of the concrete, particularly in terms of water absorption.
6. Recycling and reusing construction waste not only solves the problem of large quantities of debris but also addresses the issue of natural aggregate scarcity.
7. Recycled aggregate concrete has proven to be reliable in various applications. However, countries like India need to urgently implement measures to fully utilize the potential of RAC. By doing so, concrete recycling can become a crucial element in promoting construction sustainability.

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