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EXPERIMENTAL INVESTIGATION ON CONCRETE WITHCOARSE AGGREGATE REPLACED WITH WASTE CONCRETEAGGREGATE

[1]MAHIDHAR, [2]P.GOPIKRISHNA

[1] P.G. Student, Siddartha educational academy group of institutions, Tirupati
[2] Asst. Professor ,Siddartha educational academy group of institutions, Tirupati

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Abstract: Today ecological investigations are talking about the reusing and reuse of waste materials and giving awesome significance. Solid waste, fly ash, rice husk and other distinctive sorts of waste material create a lot of waste. Catastrophic event, for example, earth tremors create extensive measure of waste concrete. Removing the waste materials far from the calamity site causes money related and condition issues. Keeping in mind the end goal to keep these issues squander material ought to be reused and reused. As indicated by an examination appointed by Technology Information Forecasting and Assessment Council (TIFAC), 70% of the development business doesn't know about reusing procedures. Focal Pollution Board has assessed current quantum of strong waste era in India to the tune of 48 million tons per annum out of which squander from development industry represents over 25%. The aggregate quantum of waste from industry in India is assessed to be 12 to 14.7 million tons for each annum out of which 7-8 million tons are concrete and block squander (Naguchi, 2012). In Present examination the potential use of waste solid total for making new cement was looked into. The properties of reused totals were tried for use in concrete. M-60 review solid blend was composed and new cements were made with 10%, 20%,30% and 40% coarse reused totals supplanting the characteristic total. Different tests were performed on crisp and solidified cement for it toughness properties. The outcomes show that the properties of the cements made with characteristic total and waste solid total up to 40% have just slight contrasts.

***KEY WORDS*: CEMENT, AGGREGATES, WASTE CONCRETE, COMPRESSIVE STRENGTH,FLEXURE STRENGTH etc..**

1. INTRODUCTION

Concrete is a champion among the most by and large used improvement material expediting an interest for it. As an outcome of this, there is an extension in the enthusiasm for its constituents like the coarse aggregates, sand, cement and water. This addition looked for after is making wide quarrying of ordinary sums as it is required as coarse aggregates in strong era besides it outlines the critical constituent by mass in bond. Remembering the true objective to have property being developed there has been store of substitution for different constituents of bond by discretionary building materials. as a choice, waste aggregates like assembling plant influenced sand to chamber scoria, fly ash, extended earth, broken pieces and steel may be used wherever fittingly. it's few preferences like low esteem, general settlement of material, limit, low essentialness intrigue and use underneath exceptionally amazing environmental conditions.

The purpose of any property improvement is to decrease the impact on setting of any advancement over its life expectancy. Cement is that the essential material used being developed everywhere the globe. Because of extension in Construction and Demolition practices far and wide, the strong misuses made because of pounding conjointly will increase. Regardless this waste isn't used for any reason that is absolutely setback inside the economy of the country as a delayed consequence of general resources square measure depleting at a speedy pace. continuously the created strong misuses cause bona fide move issues in light of the way that the regions don't give off an impression of being set up to comprehend the best reaction for it while not capable the setting. we in general understand that the chief normal watch everywhere the globe just in case of most of the materials (paper, plastic, versatile, wood, cement, et cetera.) is use to save heaps of the trademark resources and setting. Concrete is such a chic and essentialness overwhelming material at any rate it's amazing that strong waste is at times utilized by utilize the strong as a reused strong blend (RCA) to use for the change limits. Or maybe it's essentially disposed of in landfills.

2. MATERILAS

2.1.1 Cement

In this experimental study, Ordinary Portland Cement 53 grades, conforming to IS: 8112-1989 was used. The

different laboratory tests were conducted on cement to determine the physical and mechanical properties of the cement used are shown in

Table 1

Properties	Values
water absorption	**0.2 to 0.4 %**
Fineness modulus	**3.43**
Specific gravity	**4.05**
bulk density (gm/cc)	**2.20**

2.1.2 Aggregates

Locally available natural sand with 4.75 mm maximum size confirming to class II- IS 383 was used as fine aggregate, having specific gravity, fineness modulus and unit weight as given in Table 3 and crushed stone with 16mm maximum size having specific gravity, fineness modulus and unit weight as given in Table 3 was used as coarse aggregate. Table 2 gives the physical properties of the coarse and fine aggregates

Table 2: Physical Properties of coarse aggregate and fine aggregate

property	Fine aggregate	Coarse aggregate
Specific gravity	2.66	2.95
Fineness modulus	3.1	7.96
Surface texture	Smooth	--
Practical shape	rounded	angular

Table 2.3 Physical properties of Coarse Aggregate

Physical properties	Results
Fineness	8%
Normal consistency	31.5%
Vicat initial setting time(minutes)	43mins
Vicat final setting time (minutes)	256min
Specific gravity	3.15
7-days compressive strength	39.65
28-days compressive strength	54.86

2.1.3 Water

Ordinary potable water available in the laboratory has been used.

3. Testing Procedures

This paper entailed subjecting the designed concrete mixes to a series of tests to evaluate the strength, and other properties. For this experiment, it was important to monitor the strength development with time to adequately evaluate the strength of each concrete mix. For each test, 3 samples from each mix were tested at each curing age, ad the average values were used for analysis. The following sections present the procedures used for the various tests.

3.1Compression Strength Test

One of the most important properties of concrete is the measurement of its ability to withstand compressive loads. This is referred to as a compressive strength and is expressed as load per unit area. One method for determining the compressive strength of concrete is to apply a load at a constant rate on a cube (150×150×150 mm), until the sample fails. The compression tests performed in this project were completed in accordance with IS standard 516 "Methods of Tests for Strength of Concrete". The apparatus used to determine the compressive strength of concretes in this experimental work was a universal testing machine (UTM). For this study samples were tested for compression testing at 7, 28, 56 days of curing. The compressive strength of the concrete in terms of pressure was then calculated using the Equation

$$fc=P/A$$

Where,
fc = Compressive Strength of Concrete, (Kpa or psi)
P = Maximum load applied (KN or lb), and
A = The cross-sectional area of sample (mm2 or in2)

4.3.1 FLEXURE TEST ON CONCRETE:

Flexure in general is nothing but bending. In reinforced concrete members, little dependence is on the tensile strength of concrete since steel bars are provided to resist all the tensile force. However, tensile stresses are likely to develop in concrete due to shrinkage, temperature variation and many other reasons.

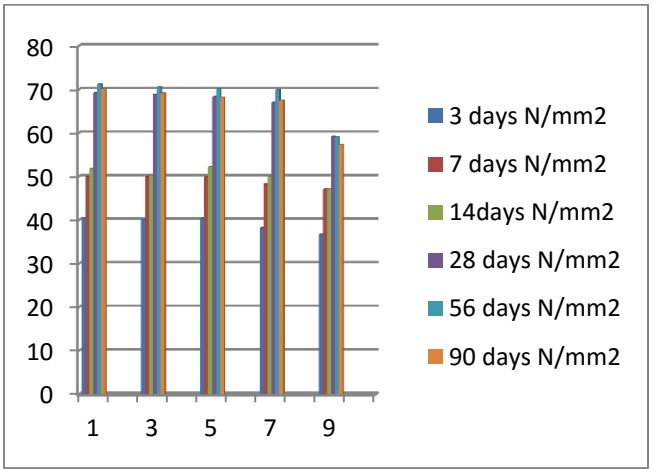
TEST PROCEDURE:

At the time of testing the cured cylindrical specimens are surface dried. It is then placed along its length over the lower plate of the universal testing machine (UTM) for flexure. The top plate is lowered till it touches the top surface of the specimen. The specimen is subjected to a 2 point load by operating the flexure testing machine at increasing rate. The dial gauge reading is noted when the specimen yields. From the number of divisions obtained from the dial gauge reading, we see the chart provided by the manufacturer to get the force applied in kgf. –'P'
Flexure strength: ($P \times l/bd^2$).

4. RESULTS AND DISCUSSION

Compression test results of concrete

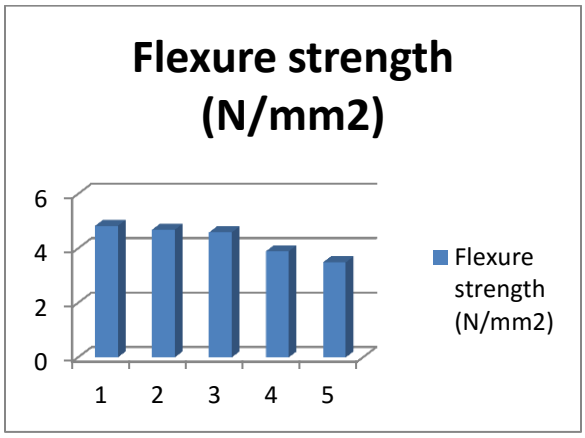
% replacement	3 days N/mm²	7 days N/mm²	14days N/mm²	28 days N/mm²	56 days N/mm²	90 days N/mm²
0%	40.52	49.99	51.88	69.3	71.23	70.12
10%	40.08	49.95	50.32	68.9	70.60	69.16
20%	40.45	49.93	52.32	68.3	70.13	68.14
30%	38.23	48.35	50.0	67.02	69.96	67.47
40%	36.78	47.10	47.22	59.21	59.12	57.39



Compressive strength vs age of concrete

Flexural strength

Sl no	% replacement	Flexure strength (N/mm²)
1	0	4.83
2	10	4.69
3	20	4.59
4	30	3.90
5	40	3.49



5. CONCLUSIONS

- From the compressive strength results of the concrete it can be concluded that both the natural and recycled aggregate concrete gain strength with age.
- But at any instant the strength of recycled aggregate concrete is lower than the strength of natural aggregate concrete.
- The greater the replacement ratio, the lesser is the strength developed in the concrete.
- The compressive strength of 40% recycled aggregate concrete is 14.36% lower than that of natural aggregate concrete while that of 10% recycled aggregate concrete is just 0.55% lower than that of natural aggregate concrete
- From the compression test results it can be concluded that up to 30% replacement of natural aggregates with recycled aggregates there is no considerable reduction in strength of concrete and hence can be considered as optimum replacement without compromise on strength.

The flexural strength of 40% RAC is 27.45% lower than that of NAC while that of 10% RAC is 3.48% lower than that of NAC

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BIOGRAPHY:

Mahidar
P.G. Student
Siddartha educational academy group of institutions
Tirupati
Andhra Pradesh.