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Reutilizing the Construction Waste and Industrial as a Partial Replacement in Concrete

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ABSTRACT

Reutilizing the industrial waste like flyash which is generated by coal fired electric and stream generating plants. Flyash is partially replaced with cement. It is a supplementary material to concrete which drops the CO2 emission of cement production and also it acts like natural Pozzolanic material. Pozzolanic reaction starts quickly after the hydration of cement and take on for a long time by increasing the strength. Concrete attain its strength from the Pozzolanic reaction between silica in flyash during the hydration. It is replaced with 0%, 10%, 20%, 30%, and 40%respectively by weight. Recycled coarse aggregate which is a partially replaced with coarse aggregate. The quality of recycled coarse aggregate procure from old concrete.RCA is acquire from after removing the adheres motor on aggregate. Rca is restored with coarse aggregate like 0%, 10%, 20%, 30%&40% respectively by weight. The w/c ratio for all the mixes kept permanent with 0.45.The test are conducted for Harden concrete and fresh concrete. Therefore, the merge of using both the materials attain the strength at 30%FA & 30% RCA.

KEYWORDS: Fly ash (FA) and Recycled coarse aggregate (RCA)

1. INTRODUCTION

Concrete is the foremost civil engineering construction material. Generally these materials are used in different types of civil engineering works like buildings, dams, bridges and defense structure. Concrete material consists of ingredients like cement, aggregate & water.

Feasible is turning out to be exceptionally normal around the world. Economical structure frameworks can have immediate ramifications on the advancement of job states of networks. The course towards this includes essentially limiting the natural effect of substantial creation by subbing virgin mineral materials by reused ones just as decreasing the worldwide CO2 discharges. Reusing is the demonstration of the handling the pre-owned material for making new item. The methodology embraced here incorporates a huge replacement of NCA by RCA acquired from squashed substantial trash, just as the utilization of FA as a halfway substitute of Portland concrete for FA substantial creation.

The popularity for concrete in the development utilizing typical weight totals, for example, rock and rock radically lessens the regular stone stores and this has harmed the climate accordingly causing natural irregularity. Likewise, separating virgin totals is making immense harm the climate and extensive energy is needed for both extractions just as squashing processes. Subsequently, there is a need to investigate and to discover appropriate substitution material to substitute the regular stone.

In urban area it is quite common of finding demolition of old building. After demolition lots of waste is produced. Most of the waste is disposed by

dumping in land. But the shortage of dumping ground and transportation cost become the major problem to minimize this problem recycling the demolition waste is a simple process which involves breaking, crushing and removing the adheres motors and making the crushing material into a specified size and quality. As a result it can be used as a partial replacement in coarse aggregate. Recycled coarse aggregate which have bonded mortar can lower the specific gravity and increases the water absorption compared to normal coarse aggregate (NCA)

Cement is the binding agent in concrete, normally the most active component, and usually the most costly. To reduce the cost of the material we have to replace with agricultural and industrial waste material. Industrial waste like flyash, Flyash is the finely divided mineral material which is produced from thermal or powdered coal in electric power generating plant. Generally the flyash are dumped in ground due to the disposal of fly ash it became the issues for the environment. So to reduce the landfill demands, concrete costs it is used in concrete. The advantage of using flying is it improves the concrete properties.

Countless research works have done to know the physical properties and mechanical properties of RCA and FA. Flyash decreases the drying shrinkage and also it yields better resistance to chloride ion penetration both at 28 days and 180 days was found by **P. Nath et al (2011**). It can be concluded that in lean concrete cement replacement by large amount of fly ash is highly beneficial. It significantly improves the workability and substantially reduces the water requirement to attain a given consistency in concrete mixtures is represented by **Dan ravina et al (1989)**. Use of RCA as a replacement material with coarse accumulated up to 30% doesn't disturb the functional requirements such as durability of them. Therefore, SCBA up to a maximum limit of 15% replacement with cement and RCA up to 30% replacement with coarse aggregate are feasible. The specific limits of % replacement level were concluded by **Dr Sunil et al (2013). R**ecycled concrete aggregate shows inferior physical properties than the natural coarse aggregate. However, the treatment of recycled coarse aggregate by acid, thermal and mechanical means improves the physical properties of RCA significantly concluded by **K pandurangan et al (2016).** The "Properties of Ternary and Quaternary Concrete Incorporating New Alternative Cementitious Material". The objective of their study was to investigate the compressive strengths, permeability, temperature of hydration and drying shrinkage of ternary and quaternary concretes incorporating other alternative materials to solve environmental materials thereby reducing wastes. One ternary and two quaternary blended cements were studied and compared with the control mix using Class F fly ash, slag, as well as silica fume. Glass frit, an alternative supplementary was used as partial replacement for cement. The authors reported that the incorporation of glass frit in a concrete system combining ternary and quaternary cements can contribute to enhancing the properties of fresh concrete and some aspects of hardened concrete. At 28 and 91 days, there was a clear improvement, in the strengths of ternary and quaternary concretes. The blended concretes of ternary and quaternary systems showed that they developed less shrinkage than the control concrete indicating they sell a bit more than the control mix was investigated by **Arezki Tagnit-Hamou.**

2. EXPERIMENTAL PROGRAM

MATERIALS:

The characteristics of the materials are explained in detailed below.

a) CEMENT

Ordinary Portland Cement (OPC) of 53grade conforming to Indian standard code IS: 12269 were used in concrete. The physical properties of cement are mentioned in table1.

TABLE 1: PHYSICAL PROPERTIES OF CEMENT

S.NO	PROPERTIES	RESULTS
1	Specific gravity	3.12
2	Fineness	94%
3	Standard consistency	31%
4	Initial setting time	38 min
5	Final setting time	272min

b) FLYASH:

Fly ashes from four different sources were used: fly ashes No. 1 and 2 correspond to ASTM Class F, and No. 3 and 4 to ASTM Class C. The properties of flyash were tabulated in table2.

FIG.FLY ASH

TABLE 2: PHYSICAL PROPERTIES OF FLYASH

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.15
2	Fineness	96%

c) FINE AGGREGATE:

The material used for this experimental program is the locally available river sand and it is conformed and conformed to Indian Standard Specifications IS: 383-1970 to Zone II. The fine aggregate belongs to zone II. The properties of fine aggregate were tabulated in table 3.

TABLE 3: PHYSICAL PROPERTIES OF CEMENT

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.68
2	Fineness	3.10
3	Water absorption (%)	0.45
4	Compacted Bulk density (gm/cc)	2.0
5	Loose Bulk density (gm/cc)	1.8

D) COARSE AGGREGATE (CA):

Crushed granite aggregate with a maximum size of 20mm, has been used and two fractions of CA 20mm&10mm are used and are tested as per IS 383-1970. The physical properties are mentioned in Table 4.

TABLE 5: PHYSICAL PROPERTIES OF CA

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.68
2	Fineness	7.89
3	Water absorption (%)	0.5
4	Compacted Bulk density (gm/cc)	27
5	Loose Bulk density (gm/cc)	10.3

E) RECYCLED COARSE AGGREGATE (RCA):

The RCA is from demolished building concrete consisting of crushed stone aggregate with old mortar adhering to it. Different methods of handling of processing the wastes and effects on the properties of concrete are to be explored. The properties of recycled concrete aggregate are investigated in Table 5.

(A) **(B)**

FIG. (A) RECYCLED COARSE AGGREGATE
(B) COARSE AGGREGATE

TABLE 5: PHYSICAL PROPERTIES OF RCA

S.NO	PROPERTIES	RESULTS
1	Specific gravity	2.72
2	Fineness	5.85
3	Water absorption (%)	1.20
4	Compacted Bulk density (gm/cc)	21
5	Loose Bulk density (gm/cc)	14.6

F) WATER:

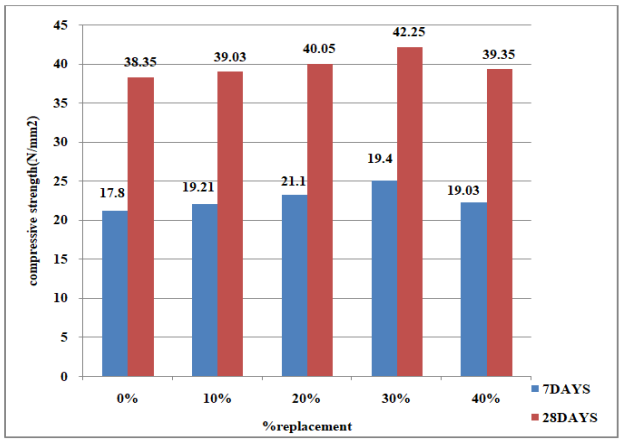
Required water is used from the college taps.

3. PREPARATION OF MIX

The material used in this project is flyash and recycled coarse aggregate. Flyash is used in place of cement as partial replacement and recycled coarse aggregate is used in place of coarse aggregate as partially. The w/c ratio for all the mix are kept constant as 0.45 for every mix three specimen have casted. Preparation of mix design has done as per IS 10262-2009.

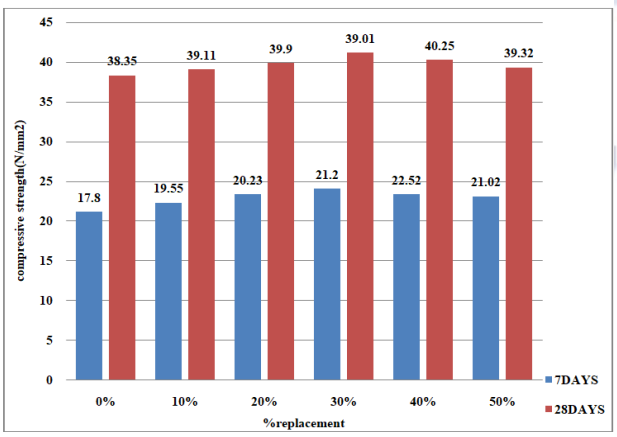
4. RESULTS & DISCUSSION

Concrete mould of size 150mmx150mmx150mm are casted for different durations, the outcome are shown below.



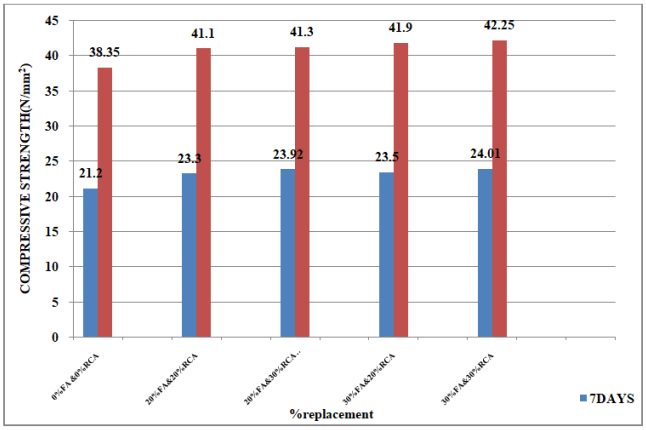
GRAPH.1.VARIATION OF COMPRESSIVE STRENGTH USING FLYASH (FS)

From the above graph it is clearly shown that the variation between the normal mix and the partially replacemed mix. Using FS as a partial replacement in place of cement as 0%, 10%, 20%, 30% & 40% by weight for 7days & 28days. We got the highest strength at 40% for 7days & 28days are 21.1 N/mm²&40.5N/mm² compared with normal mix for 7days & 28 days are 17.8 N/mm² &38.35 N/mm².



GRAPH.2.VARIATION OF COMPRESSIVE STRENGTH USING RCA FOR 7DAYS&28DAYS

From the above graph it is clearly shown that the variation between the normal mix and the partially replacemed mix. Using RCA as a partial replacement in place of coarse aggregate as 0%, 10%, 20%, 30%, 40% & 50% by weight for 7days & 28days. We got the highest strength at 40% for 7days & 28days are 21.1 N/mm²&40.5N/mm² compared with normal mix for 7days & 28 days are 17.8N/mm² &38.35 N/mm².



GRAPH.3.VARIATION OF COMPRESSIVE STRENGTH USING FS &RCA FOR 7DAYS&28DAYS

From the above graph it is clearly shown that the variation between the normal mix and the partially replacemed mix. Using FS & RCA as a partial replacement in place of cement & coarse aggregate for 7days & 28days. We got the highest strength at 30%FS & 30%RCA for 7days & 28days are 24.01 N/mm²&42.25N/mm² compared with normal mix for 7days & 28 days are 21.2N/mm² & 38.35 N/mm².

CONCLUSIONS:

From the experimental investigation the following results are concluded

- By replacing with fly ash the compressive strength values that are obtained are higher than the nominal mix. It is observed that there is increase in strength values with addition of fly ash at 10%, 20%, 30%, and 40%. The maximum value is obtained at 30% replacement with fly ash.

- The top most value obtained for 28days is 42.25N/mm² at 10% replacement with fly ash. The utmost value obtained for 7days is 25.03N/mm² at 10% replacement with fly ash.

- It is noted that by restoring coarse aggregates with RCA the compressive strength values are high when compared to nominal mix.

- The extreme value obtained for 28days is 41.2N/mm² at 30% replacement with RCA.The supreme value obtained for 7days is 24.1N/mm² at 40% replacement with RCA.

- By using both the blend mix it is observed that the highest compressive strength is 42.25N/mm² for 28 days and 24.01N/mm² for 7 days at 30% fly ash& 30% RCA.

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