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Experimental Study on Blended Concrete in R.C.C column and its Behaviour

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Abstract - - *In the recent past, hence to get high strength concrete with good rheology, fly ash is progressively used to the concrete during mixing stage. In this study, the influence of natural admixture Kadukkkai (Terminalia Chebula) on the engineering properties of high strength concrete has been investigated. Compressive strength, workability pore size and porosity distribution were assessed in order to enumerate the effect of Herbocrete (Kadukkkai) on the concrete. The results show that it has considerable effect on the workability of concrete. Pore size and porosity were decreased with the addition of the Herbocrete. The strength of the concrete has been increased with addition of plant extract at constant slump and hence hardened concrete properties are improved by the use of kadukkai extract.*

Key Words: Fly ash aggregates, Control concrete, Artificial aggregates, Herbocrete…

1. INTRODUCTION

Concrete is the most widely used construction material around the world. The constituents of concrete are coarse aggregate, fine aggregate, cement and water. Among these constituents' aggregates occupies more than two-third of the total volume of the concrete. Hence there are many researches going on to replace the aggregates with any suitable alternative source. One such alternative way is the replacement of fine aggregate and coarse aggregate with fly ash. Fly ash is generally a waste material that is produced as a byproduct of coal combustion process in thermal power station. So, the use of fly ash as aggregates in concrete is an effective way of utilization of the waste. Also Fly ash-based aggregate are light in weight. It can be seen that fly ash also reduces the dead weight of the concrete without any change in the strength of the concrete. The Fly ash aggregate to be produced are formed by palletization. Fly ash and cement are mixed together in different proportions to obtain the fly ash aggregate. Along with that to increase the strength of the aggregate, natural admixture is added at different percentages with the fly ash and cement. The natural admixture to be used is Terminalia chebula powder which is commonly called as kadukkai powder. This admixture is supposed to be increase the strength when added with cement. Hence it is added to the fly ash aggregate mix to check the strength characteristics. Also, the use of fly ash for aggregate preparation reduces the land requirement for the landfills.

2. EXPERIMENTL DETAIL

2.1 Fly Ash

Fly ash to be used is of class F shown in Fig. which is collected from the Mettur thermal power plant, Tamil nadu Class F fly ash originates from anthracite and bituminous coals. It consists mainly of alumina and silica and has a higher LOI than Class C fly ash. Class F fly ash also has a lower calcium content than Class C fly ash. The physical properties of fly ash.

Table -1: Chemical constituents present in the class F fly ash

s. No	Parameter	Percentage in sample	Standard values
1	Loss of ignition (LOI)	1.51%	06% (max)
2.	Silica (SiO_2)	68.44%	60%(max)
3	Calcium oxide (CaO)	1.61%	10% (max)
4	Magnesium oxide (MgO)	0.5%	3.82% (max)
5	Iron oxide (Fe_2O_3)	1.62%	25% (max)
6	Aluminium oxide (Al_2O_3)	17.63%	30% (max)

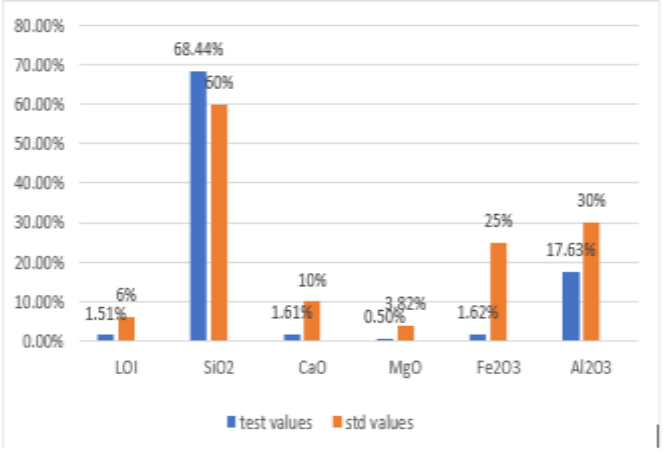

Chart -1: Bar chart for comparison of chemical constituents of fly ash with standard values

Table -2: The test values of physical properties of fly ash

N. o	PROPERTY	VALUES
1	Fineness	8%
2	Specific gravity	3.66
3	Consistncy	45%
4	Initial setting time	50 minutes

Table -3: Test Results for chemical composition of fly ash from sonastarch

PARAMETER	EXPERIMENTAL VALUE
Loss of ignition	2.51%
Silica	78.55%
Magnesium	0.90%
Iron oxide	1.43%
Aluminum oxide	19.63%

2.2 Fly Ash Aggregate Preparation

The cement and fly ash proportion used for the trial mix of fly ash aggregate preparation is 30:70. Along with these the water cement ratio adopted is about 0.30. And the percentage of admixture used is about 2 % by weight of cement fly ash proportion. The Conplast SP 430 to be added is at a rate of 10 ml for every 1 kg. The rotation of the mixer forms smooth surfaced round pellets of varying diameter. Depending upon the water cement ratio the size of the Fly Ash aggregate formed varies. The procedure for fly ash aggregate is also similar to the priorone.

2.3 Fly Ash Fine Aggregate

Fly ash aggregates passing 4.75 mm were collected as fine aggregate and some of the fly ash coarse aggregate were crushed to form fine aggregate. Thus, fly ash fine aggregate would have the same chemical property as the fly ash coarse aggregate. The same procedure is followed for obtaining the fly ash fine aggregate.

2.4 Fly Ash Coarse aggregate

Both fly as coarse aggregate and the coarse aggregate will be directly obtained from the mixer machine. And those which were retained on the 4.75 mm sieve were designated as coarse aggregate.

2.5 Test on Aggregate

The aggregates were successfully obtained from the crushed coarse aggregate by using the proportion of 30:70 with 2 % admixture. The test for fine aggregate includes the specific gravity, fineness modulus. The fly ash coarse aggregate was obtained directly from the mixer drum. The test for coarse aggregate includes specific gravity, fineness modulus, bulk density, impact test and crushing test.

2.6 Specific Gravity

At first, the empty dry pycnometer was weighed and taken as M1. Then the bottle was filled with fine aggregate and it was weighed as M2. The pycnometer was dried and then it was filled with part of fine aggregate and water and it was weighed as M3. The pycnometer was filled up to the top of the bottle with water and it was weighed as M4.

Specific gravity of fine aggregate (G) = (M2 – M1) / [(M2 – M1) – (M3 –M4)]

M1 = Mass of empty pycnometer (g)

M2 = Mass of the pycnometer filled with fine aggregate(g)

M3 = Mass of the pycnometer filled with fine aggregate & water (g) M4 = Mass of the pycnometer filled with water (g)

2.7 Fineness Modulus

The sample was brought to an air – dry condition by drying at room temperature. The required quantity of the sample was taken (kg). The sieves were placed in the order of size. Sieving was done for 10 minutes. The material retained on the each sieve after shaking, represents the fraction of the aggregate coarser than the sieve considered and finer than the sieve above. The weight of aggregate retained in each sieve was measured to a total sample.

Fineness modulus = sum of cumulative percentage of material on each sieve/100

3. TEST ON COARSEAGGREGATE

3.1 Physical Properties

The Fly ash is tested for its physical properties such as specific gravity, consistency with the help of respective apparatus. The results obtained are as follows.

Table -4: Physical properties of fly ash

S.NO	PHYSICAL PROPERTIES	VALUES
1	Fineness	8%
2	Specific gravity	33.54
3	Consistency	49%
4	Initial setting time	50 minutes

3.2 Physical Properties of OPC 53grade

The Cement is tested for its physical properties such as specific gravity, consistency with the help of respective apparatus. The results obtained are as follows.

Table -5: Physical properties of OPC 53 grade

S.NO	PHYSICAL PROPERTIES	VALUES
1	Fineness	9%
2	Specific gravity	4.14
3	Consistency	40%
4	Initial setting time	29 minutes

3.3 Result of Aggregate Test

The test for fine aggregate includes the specific gravity, fineness modulus. The results were listed in the Table.6The comparison of the test values of both fly ash fine aggregate.

Table -6: Results of fine aggregate test

NO	PROPERTY	FLY ASH AGGREGATE
1	Specific gravity	2.72
2	Fineness modulus	5.2

3.4 Results of Coarse Aggregate Test

From the results it can be seen that both the specific gravity and the fineness modulus of fly ash aggregate greater than the fly ash fine aggregate. The test for coarse aggregate includes specific gravity, fineness modulus, bulk density, impact test and crushing test. And the results were listed in the Table 7 The comparison of the test values for specific gravity and fineness modulus of both fly ash coarse aggregate.

Table -7: Results of coarse aggregate test

NO	PROPERTY	FLY ASH AGGREGATE
1	Specific gravity	2.96
2	Fineness modulus	9.11
3	Impact value	19.87 %
4	Bulk density (kg/ m^3)	1087
5	Crushing value	29.23 %

4. TEST OF CONCRETE SPECIMEN

Table -8: Results of concrete specimen

S.NO	MORTAR	STRENGTH FOR 7DAYS (N/MM2)	STRENGTH FOR 14 DAYS (N/MM2)
1	1:3	4.66	5.11
2	1:5	1.404	1.7
3	1:6	1.7	1.7

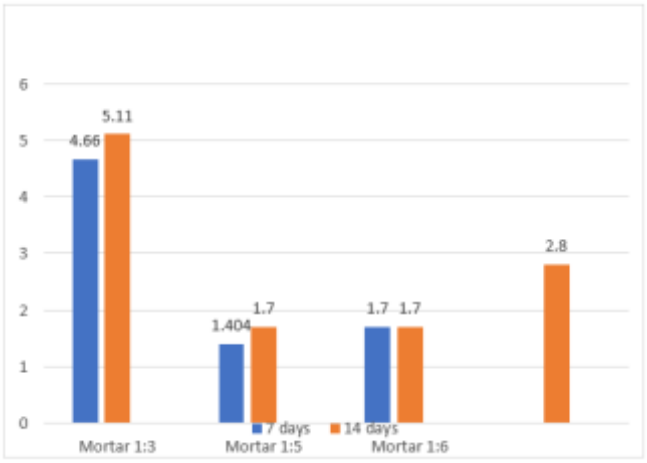

Chart -2: Bar chart for concrete specimen

Chart -3: Strength Properties of Concrete Specimen

5. CONCLUSIONS

The conclusions made from the above experimental investigation are as follows.

- The Fly ash and cement proportion of 70:30 with 2% Terminalia chebula is enough to form fly ash aggregate successfully.
- He Impact value results shows that the Fly ash aggregate can be used for both concrete works and in wearing surfaces.

- The failure of concrete in split tensile test shows that the failure is caused due to the failure of aggregate.
- Thus, the strength of aggregate can be increased either by increasing the cement content or the percentage of Terminalia chebula powder added.
- High strength of fly ash aggregate can be increased by increasing the curing period from 7 days to 28 days.

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