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STUDY ON STRENGTH CHARACTERISTIC OF CONCRETE WITH PARTIAL REPLACEMENT OF CEMENT WITH RICE HUSK ASH

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Abstract— Concrete is no longer made of aggregates, Portland cement and water only. it is also not always incorporate so it requires at least one of the additional ingredients such as admixtures supplementary cementations material or fibers to increase the strength, durability and other properties. Rice husk ash is one of the pozzolanic materials that can be blended with Portland cement for the production of durable concrete. Supplementary cementations materials prove to be effective to meet most of the requirements of durable concrete. Rice husk as is found to be greater to other supplementary materials like silica fume and fly ash. In current study an attempt has been made to investigate strength parameters of M20 grade concrete. For control concrete mix IS method of mix design is adopted. Partial replacement of cement has been with different percentage of RHA namely, 5%, 10%, and 15%.Large range of curing period starting from 7, 14, and 28days are considered in the present study. And the compressive strength of concrete for above proportion and curing period is be carried out and the results revealed that the compressive strength of concrete is decreased with the increase in the percentage of RHA

Keywords—Rice husk ash (RHA), pozzolanic, Mix design, Compressive strength.

1. INTRODUCTION

The need to reduce the high cost of ordinary Portland cement in concrete has intensified research into use of some locally available materials that could be used as partial replacement of ordinary Portland cement (OPC) in civil engineering and building works.

- Extensive research has established, beyond a shadow of doubt that the most direct, technically sound and economical attractive solution to the problems of reinforced concrete durability lies in the incorporation of finely divided siliceous materials in concrete.
- Rice husk is an agricultural waste product which is produced in about millions of tons. Approximately for 100kg of rice 20kg of rice husk are obtained. Rice husk contain organic substance and 20% of inorganic material.
- Physical characteristics and chemical composition of mineral admixtures can be fulfilled by burning rice husk into ash. pozzolanic activity of rice husk ash (RHA) depends on (i)silica content (ii)silica crystallization phase (iii)size and surface area of ash particles. In addition small amount of carbon must be present in ash. Combustion of rice husk at controlled temperature produces RHA that has amorphous silica content and large surface area.
- Rice husk ash (RHA) has been reported to be a good pozzolan by numerous researchers. During mass concrete as compared to OPC concrete, RHA is very effective in reducing the temperature of mass concrete.
- This research work summarizes the use of RHA as partial replacement for ordinary Portland cement in concrete. Compressive strength of concrete at different level of partial replacement of RHA with OPC is determined.

2. MATERIAL

Cement:

Cement is a binder used for construction that sets, hardens and adheres to other materials binding them together.

Cement is a seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement is used with fine aggregate to produce mortar and with sand and aggregate to produce concrete. In this study ordinary Portland cement of 53grade is adopted for this work. The brand of cement used was Ultra Tech OPC with grade 53. The cement is was gray and free from lumps.

Fine Aggregates:

In this research work fine aggregates used was river sand zone-II and coarse aggregate used was crushed stones. These materials were easily available from local market.

Rice Husk Ash (rha):

RHA used in this work was obtained from the RHA burning mill near Katedan Hyderabad India. The rice husk was burned at controlled temperature at mill.

water

Clean tap water free from salt and visible impurities and it conformed to IS 456-2000 requirements.

3. METHODOLOGY

In this experiment the Mix design of M20 grade concrete as per Indian standard codebooks IS 10262-Concrete Mix proportioning-guidelines and IS 456 is followed.

Mix proportion for one concrete cube of(150cmx150cmx150cm):

W/C ratio	Cement in kg	Fine aggregate in kg	Coarse aggregate in kg	Water content in litres
0.5	1.3kg	1.95kg	4	0.64lit

CONCRETE MIX DESIGNATION

MIX DESIGNATION	DESCRIPTION
M0	Control concrete of grade M20
M1	5% of RHA+95% of OPC
M2	10% of RHA+90% of OPC
M3	15% 0f RHA+85% of OPC

Mix proportion for different % of RHA for 3 cubes 0f (150cmx150cmx150cm)

Mix designation	Rice husk ash	Cement in kg	Fine aggregate in kg	Coarse aggregate in kg	Water in Lit
M0	0%	3.96	5.9	12	1.95
M1	5%	3.76	5.9	12	2.2
M2	10%	3.564	5.9	12	2.53
M3	15%	3.366	5.9	12	2.75

4 CONCRETE PREPARATION :-

1) The cement fine aggregate and coarse aggregate is added and mixed with water accordance to the mix design of M20 grade concrete.

5 FILLING OF CUBES:

-i)first clean the moulds and apply waste oil to inner surface of the mould

ii) Fill the concrete in moulds in layers approximately 5cm thick

iii) Compact each layer with not less than 30-35 strokes per layer using a taming rod (steel bar of 16mm diameter and 60cm length).

iv) Level the top surface of mould after filling it with concrete with the help of trowel.

CURING OF CUBE SAMPLES

- After lefting the concrete cubes in mould in moist air for 24hrs the specimens are removed from the mould s and kept submerged in water for 7,14,and 28,days respectively.
- After curing the cubes should be covered with damp matting and stored in a place where the temperature can be kept 27+5°C for approximately 16 to 24 hours.

TESTING OF CUBES

Test is conducted following ASTM C 143-90a. Meanwhile, compressive test is conducted by following BS 1881: Part 108:1983 and three cubes of 150cmx150cmx150cmx were tested at 7,14, and 28 days.

COMPRESSION TEST:

- -The compressive strength test were conducted on cured cube specimens at 7,14, and 28, days age using a standard compression testing machine of 200KN Capacity. The cubes were fitted at center in the compression testing machine and fixed to keep the cube in position while applying the load. The load was applied slowly to the test specimen until failure occurs and reading is noted down for different cubes specimens. [COMPRESSION STRENGTH=APPLIED LOAD / C.S AREA]

COMPRESSIVE STRENGTH OF M20 GRAGE CONCRETE CUBE AT THE AGE OF 7,14 AND 28 DAYS REPECTIVELY

- For each concrete mix the compressive strength is determined on the three 15cmx15cmx15cmx size cubes at 7, 14, and 28 days of curing.
- Following table gives the compressive strength test results of control concrete and RHA concrete produced with 5%, 10%, and 15% of RHA.
- COMPRESSIVE STRENGTH TEST RESULTS:-

% of RHA (Mix designation)	Compressive strength in (mpa)			Average compressive strength in (mpa)		
	7 days	14 days	28 days	7 days	14 days	28 days
0%(M0)	30.00	31.11	53.11	29.25	33.85	42.88
	29.77	34.22	37.77			
	28.00	36.22	37.78			
5%(M1)	27.11	30.22	40.00	29.33	39.99	43.70
	30.22	50.22	42.22			
	30.66	39.55	48.88			
	2	2	3			

10%(M2)	8.00	8.44	5.11	29.03	35.55	40.29
	33.33	38.22	46.22			
	25.27	40.00	39.55			
15%(M3)	31.33	35.11	33.33	26.36	31.40	39.10
	24.44	33.55	46.66			
	23.33	23.55	37.33			

- NOTE:-From above results we can conclude that as the % of RHA is increased the strength of concrete cubes is decreased.

IV CONCLUSIONS

- Based on the limited experiment study carried out on the strength behavior of Rice husk Ash concrete, the following conclusions are drawn.
- According to the test results of the compressive strength on addition of 5% of RHA shows better results than the control concrete for M20 grade of concrete
- As the replacement of cement by RHA increases, the workability of concrete decreases
- The optimum strength is obtained at the level of 5% of OPC replaced by RHA for M20 grade concrete
- The replacement of cement with RHA results in reduction of density of concrete. This is due to the fact that the specific gravity of RHA is much lower than OPC
- As the RHA is a waste material, it reduces the cost of construction and mixing at minimum amount by replacement of OPC can provide better results.

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VI References

In this section we are going to present some research works that have been carried out by various scholars on RHA.

1. Deepa G Nair, K Sivaram and job Thomas, Mechanical properties of RHA-High strength concrete , AJER, vol-3, ISSN:2320-0847, pages 14-18
2. Makarand Suresh Kulkarni et.al.,Effect of Rice husk ash on properties of Concrete, Journal of Civil Engineering and Environment Technology, Print ISSN:2349-8404;Online ISSN:2349-879X;Volume-1,
3. Number-1, August, 2014 pp.26-29.
4. Manu Chaudhary et.al, Effect of Partial replacement of Cement by Rice husk ash in Concrete, International Journal of Science and Research.
5. Anil Kumarsuman, Anil Kumarsaxena, T R Arora, Assessment of Concrete Strength using partial replacement of Cement for RHA, Vol-4, ISSN 2331- 2307, Pages131-133.
6. Naveen rt.al, Effect of Rice husk ash on Compressive Strength of Concrete, International Journal of on emerging Technologies 6(1):144-150 (2015).
7. P. Chandan Kumar and P. Malleswara Rao Benefits of of RHA in Concrete, Jr. of Industrial Pollution Control 26 (2) (2010) pp 239-241.
8. Ms.Shetty, Concrete Technology, S .Chand and Company Ltd, 2008.

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