PARTIAL REPLACEMENT OF OPC BY RICE HUSK ASH WITH M30 GRADE CONCRETE

AlokKumar[1], Arjun Singh[2], Hardeep Kumar Pannu[3]
[1]*Assistant prof., Dept. of Civil Engineering, Poornima Group of Institutions, Jaipur*
[2], [3]*.B.Tech Student, Dept.of Civil Engineering, Poornima Group of Institutions, Jaipur.*
[1]*a.kumar@poornima.org,*

ABSTRACT

The aim of this study is to evaluate performance of concrete when mixed with mineral admixture such as rice husk ash as a partial replacement of ordinary Portland cement (OPC). The concrete with 43 grade cement is checked for strength, workability and durability in the present study. The percentage of rice husk as partial replacement of cement varies from 5% to 20% with 5% interval (i.e. 5%, 10%, 15% and 20%).Total thirty six mixes (trial mix, control mix and variation mix) were prepared for concrete mix of M30 grade. This study evaluates the compressive strength of concrete block deep cured in water under normal atmospheric temperature for 28 days.On the basis of the results obtained, it is found that concrete with rice ask ash as partial replacement was found to increase in Compressive strengthwith no adverse effects on durability.

Keywords:-*Concrete, Rice Husk Ash, OPC Cement (43 grade), Aggregate, Compressive Strength*.

1. INTRODUCTION

Concrete is a blend of bond, common sand,coarse total and water. Its prosperity lies in its extents as can be intended to withstand cruel condition while going up against the most helpful structures. Designers and researchers are further attempting to build its breaking points with the assistance of imaginative concoction admixtures as water reducer and mineral admixture different supplementary cementations' materials SCMs like rice husk cinder, fly fiery debris, silica seethe, GGBS.

Concrete is a composite materials which is set up with blend of bond, fine total, coarse total and water. It can be generally utilized for a structure according to decision and request and rate constituents of cement can be changed according to load and quality necessity by infrastructure.
Concrete is sparing when contrasted with steel structure and it has likewise minimal effort of support, simple instrument for work

Total is the part of a composite material that opposes compressive pressure and gives mass to the composite material. For effective filling, total ought to be significantly littler than the completed thing; however have a wide assortment of sizes.

2. MATERIAL REQUIRED

2.1 Cement

OPC -43 grade cement conforming to IS 8112:2013 was used.The various properties of cement are given in the table.

Fig:-1 Cement

Table 1: Test result on cement

Physical test	Value
Initial setting time(IST)	70 minutes
Final setting time(FST)	310 minutes
Consistency test(Vicat Consisitency)	32%
Fineness modulus(Sieve Analysis)	7%
Specific gravity(Pycnometer)	3.157

2.2 Fine aggregate

The fine aggregates used brought from Jaipur.Various test were conducted on fine aggreagates.The results are given in table no.2

Table 2: Test result on fine aggregates

Mass Properties	Fine aggregate(Natural)
Sp. Gravity (OD)	2.74
Sp. Gravity (SSD)	2.69
Density (OD)	1632 kg/m^3
Density (SSD)	1679 kg/m^3
Bulk Density (SSD)	1679 kg/m^3
Bulk Density (Dry)	1619 kg/m^3
Water Absorption	1.19 %

2.3 Coarse aggregate

The coarse aggregates used brought from Jaipur.Various test were conducted on fine aggreagates.The results are given in table no.3

Table 3: Test result on coarse aggregates

Mass Properties	Coarse Aggregate (Natural)	
	10MM	*20MM*
Bulk Density (Dry)	1520 kg/m^3	1475kg/m^3
Density (SSD)	1488 kg/m^3	1567 kg/m^3
Density (OD)	1342 kg/m^3	1456 kg/m^3
Water Absorption	0.45%	0.45%
Sp. Gravity (SSD)	2.657	2.653
Sp. Gravity (OD)	2.636	2.625

Fig:-2 Fine aggregate

Fig:-3Course aggregate

2.4 Rice Husk ash

The rice husk ash waste taken fromR. S. Rice Mills,Amritsar (143022), Punjab, India .

Fig. 4:- Rice Husk Ash

Table 4:- Physical Properties of Rice Husk Ash

Physical Properties	Range
Physical State	Solid
Appearance	Very Fine Powder
Color	Greyish
Odour	Odourless

2.5 Chemical Admixture

The super plasticizer which is used for the experimental performance is KavassuPlast SP-431/ ShaliplastSP-431.The various properties of the admixtures are given in table

Table 5 Properties of Chemical Admixture

Properties	SulphonatedNapthalene Formaldehyde
COLOR	Brown black liquid with faintness
DRY MATERIAL %	41- 45 %
CHLORIDE %	NIL
ASH CONTENT	10.00 - 14.00%
SP. GRAVITY at temperature 27ºC	1.20 +/- 0.04
PH	7-9
ALKALIES	NIL
Admixture properties	Chloride free, as per IS: 9103& ASTM C 494, Super plasticizer

3. RESULTS AND DISCUSSIONS

3.1 Compressive Test results

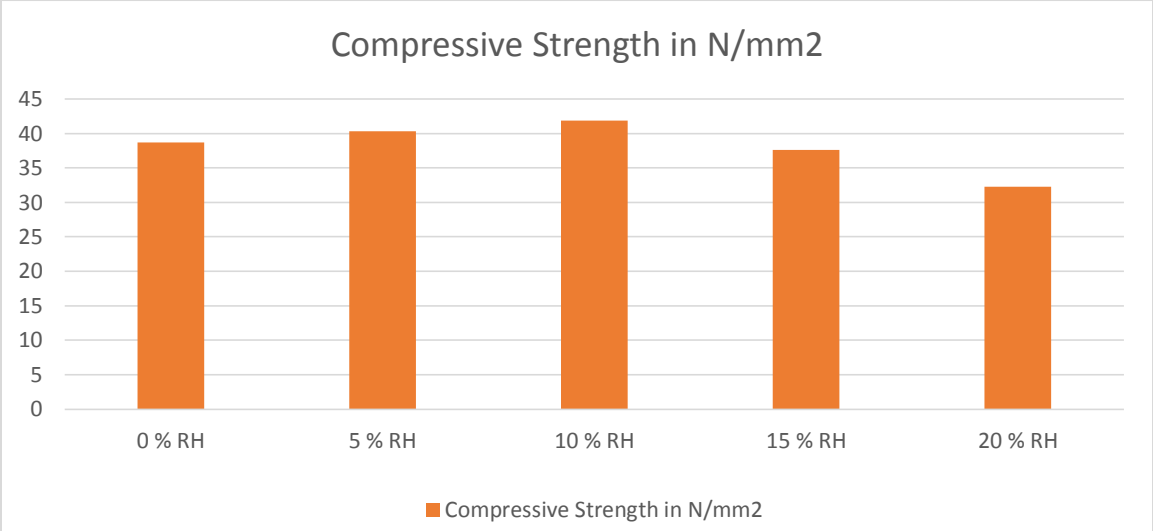
Calculation of material for cube of size 150mm x150mm x 150mm.Use different percentage of rice husk ashfor replacement with Ordinary Portland Cement by 0%,5%,10%,15%,20%.

Table 6 Different mixes of concrete

Replacement of OPC by RHA(%)	Cement (kg)	RHA (kg)	Fine aggregate(kg)	Course aggregate(kg)	Water (gm)	Plasticizer (1%) (gm)
0%	1.44	0.00	2.96	3.89	0.61	14.14
5%	1.37	0.072	2.96	3.89	0.61	14.14
10%	1.30	0.144	2.96	3.89	0.61	14.14
15%	1.22	0.216	2.96	3.89	0.61	14.14
20%	1.15	0.289	2.96	3.89	0.61	14.14

Table No.7 Compressive strength test result

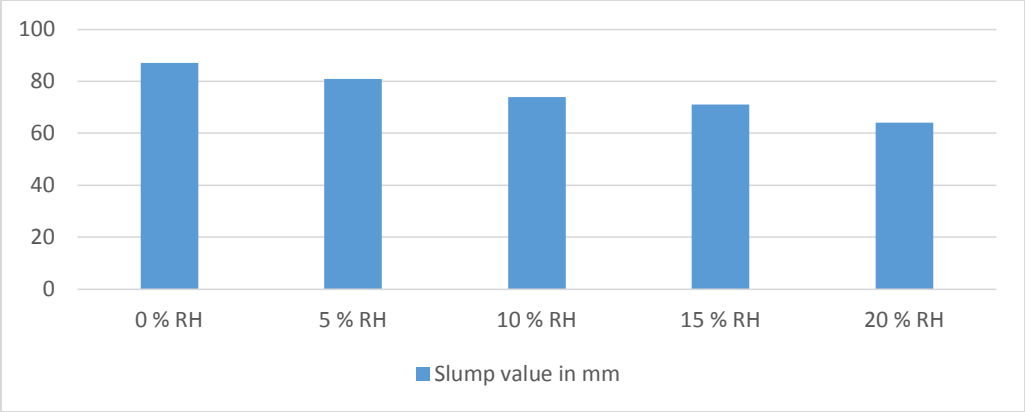
S. No.	Rice Husk Ash %	Compressive Strength N/mm^2 (28 days)
1	0	38.72
2	5	40.29
3	10	41.87
4	15	37.64
5	20	32.24



3.2 Slump Value Test: -

Slump value for various rice husk ash % replacement with OPC 43 grade.

S. No.	Rice Husk Ash %	Compressive Strength N/mm^2 (28 days)
1	0	87
2	5	81
3	10	74
4	15	71
5	20	64



4. Conclusion

Following conclusions can be drawn based on the present study:

1. At initial stages with replacement by RHA , compressive strength of concrete also increases.
2. Emission of green house gases can be prevented using RHA in concrete.
3. Cost of production of concrete reduces by 7% to 10% with use of RHA.
4. Use of RHA is environment friendly due to utilization of waste(RHA is basically waste obtained from Rice mill) and replacement of RHA because production of 1 million tones of cement emerges 1 million tones of Carbondioxide.

REFERENCES :-

1. IS: 10262-1982,"Guidelines for Concrete Mix Design", Bureau of Indian Standards, New Delhi, India..
2. IS: 8112-1989, "Specifications for 43-Grade Portland Cement", Bureau of Indian
3. IS: 383-1970, "Indian Standard Specification for coarse and fine aggregates from Natural Source for Concrete", Bureau of Indian Standards, New Delhi, India.
4. IS: 2386-1963 (Part I to Part III), "Indian Standards Method of Test for Aggregate for Concrete", Bureau of Indian Standards, New Delhi, India.
5. IS: 456-2000, "Plain and Reinforced Concrete - Code of Practice" Bureau of Indian Standards, New Delhi, India.
6. Ganesan, K, Rajagopal, K. Thangavel, K. Selvaraji, R Sara Swarthi, V. "Rice Husk Ash – As Versatile Supplementary Cementitious Material "India Concrete Institute Journal, March 2004 .
7. IS: 9103-1999, "Specification for Concrete Admixtures" Bureau of Indian Standards, New Delhi, India.
8. FChristopher, A Bolatito and S Ahmed ,"Structure and properties of mortar and concrete with rice husk ashas partial replacement of ordinary Portland cement",journal,(year),vol .,pp