

(An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 11, November 2015

Behaviour of Rice Husk Ash Concrete Exposed to Nitrate Attack

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ABSTRACT: The principle objective of this study is to focus the conduct of Rice Husk Ash Concreteunder nitrate exposure. The replacements of RHA to cement is 0%, 5%, 7.5%, 10%, 12.5% & 15% and cured in normal water for 7,28,56 days and also cured in 0.5% and 1% Concentration of Potassium nitrate solution for 56days. Comparative study is conducted on compressive strengths between normal water curing and chemical curing. the results showed that, By comparing normal water curing with 0.5% nitrate exposure it was watched that, the compressive strength was hardly diminished with increase in RHA Percentage. By comparing normal water curing with 1% nitrate exposure it was observed that, the compressive strength was highly decreases with increase in RHA percentage.

KEYWORDS: Rice husk ash, Compressive strength, Flexural strength, Potassium Nitrate etc.....

I. INTRODUCTION

Rice husk fiery debris is one of the bounteous farming waste material present in India. On a normal it is assessed that for each 1000 Kg we will get 200 Kg of Rice Husk Ash is created. To diminish the increment in the rural waste materials, Rice Husk Ash is utilized as a side effect of concrete halfway on the grounds that it contains extensive measure of silica particles and which are fine in nature. Solid as is surely understood is a heterogeneous blend of bond, totals and water. The admixtures may be included solid so as to improve a properties' portion craved uniquely. The easiest structure cement is a blend of fine total coarse total and water. Rice husk material will be added and admixture to get same quality of fancied cement. The solid's nature was controlled by nature of the glue. Rice husk slag is the by result of blazed rice husk at high temperature. Impressive endeavors are being taken for to use normal waste and bye results of agrarian squanders as supplementary establishing materials to enhance the properties of bond cement. Rice husk fiery debris (RHA) with utilizing Steel fiber is such materials. RHA is bye-result of paddy industry. Rice husk fiery remains is one of the pozzolanic material created by controlled smoldering of rice husk. Paddy was changed over to rice by floor processing and creates a by item know as husk. The external layer of the paddy grain is called husk. Amid processing of paddy around 78 % of weight is gotten as rice, broken rice and wheat .Rest 22 % of the heaviness of paddy is known as husk. This husk is utilized as house hold fuel as a part of the rice plants to create steam and for cooking reason. This husk contains around 75 % natural unstable matter and the equalization 25 % of the heaviness of this husk is changed over into slag amid the smoldering if husk in high temperatures, is known as rice husk fiery debris (RHA). This RHA thusly contains around 90% shapeless silica.Pozolonaare materials containing receptive silica and/or. alumina which are having low tying property be that as it may, when blend RHA with lime in the vicinity of water, will set and solidify like concrete. Pozolnas are a critical fixing in the creation of option establishing materials to Portland bond (OPC). Option concretes give an incredible specialized alternative to OPC at a much lower cost and can possibly make a huge commitment towards the procurement of ease building materials and hence moderate sanctuary. Pozzolanas can be utilized as a part of mix with lime and/or OPC.

Potassium Nitrate:Nitrate is a boring, unscented, and weak aggravate that is available in Industrial effluents, groundwater and in soils . Nitrate can be communicated as either NO3 (nitrate) or NO3-N (nitrate-nitrogen). Nitrate



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levels over the EPA Maximum Contaminant Level of 10mg/l NO₃-N or 45 mg/l NO₃ may achieve methemoglobinemia in new conceived youngsters Fitting administration of composts, fertilizers, and other nitrogen sources can minimize tainting of drinking water supplies.

II. RELATED WORK

2.1. SCOPE OF WORK

The present investigation is to partial substitution of cement to rice husk ash. This investigation focuses to focus the optimum percentage (0%, 5%, 7.5%,10%, 12.5% and 15%) of Rise husk fiery debris was partial replacement of cement for M30 grade of concrete. The curing was done for normal water curing and chemical curing.

2.2 EXPERIMENT PROCEDURE

2.2.1CEMENT

An OPC 53 grade of Maha Gold cement is used in this investigation. The quantity required for this research work is estimated and the entire quantity is purchased and stored properly in casting store vard. The following tests are conducted as per IS codes respectively.

S. No	Particulars of tests	Test results	
1	standard consistency	33%	
2	Specific gravity	3.15	
3	Setting time		
	a) Initial	55 min	
4	b) Final	215 min	
5	Fineness	8.6%	
6	soundness	6mm	

Table 1-Cement Experiments

2.2.2. MIX DESIGEN OF CONCRETE

IS-Code method of mix design was used for mix design of M-30 grade of concrete. The quantities of ingredient materials &mix proportions as per design are as under.

Material	Proportion by weight	Weight in kg	
Cement	1	342	
F.A	2.58	884	
C.A	3.29	1126	
W/C ratio	0.45		



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III. EXPERIMENTAL RESULTS

Days of curing	Cement replacement(MPa) of rice husk ash percent compressive strength values					
	0%	5%	7.5%	10%	12.5%	15%
7 days	28	26.22	25.33	24.88	22.66	20.44
28 days	40.88	38.22	36.44	34.66	33.77	33.33
56 days	41.33	39.11	38.22	37.33	36.44	35.11

 Table 2-Compressive Strengthundernormal water

Graph 1- Effect of RHA on 7, 28 & 56 days compressive strength under normal water curing



The result shows that with increase in replacement of cement up to 7.5% attained target strength of the conventional concrete. After 7.5% replacement with RHA, there was a gradual decreases in compressive strength of concrete for all curing periods. The addition of RHA in concrete, at early age curing strength obtained with the addition of 5% & 7.5%



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RHA give marginally same strengthcompared with conventional concrete at 7 days. After 56 days curing, the rate of increasing in compressive strength is more compared to 28 days curing.

b) Chemical curing 56 days Compressive strength values

 Table 3- Compressive StrengthValues In Chemical Exposure

Cement replacement of rice husk ash percent	Percent of chemical curing and its compressive strength values		
	0.5%	1%	
0%	39.88	38.22	
5%	37.65	36.42	
7.5%	36.92	35.31	
10%	36.16	34.56	
12.5%	35.14	32.23	
15%	33	31.84	

C)Comparing of 56 days compressive strength normal water curing & chemical curing:



Graph 2- chemical curing percentages



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In chemical curing cubes were tested for 56 days. The cubes are exposed to both 0.5% & 1% concentrated Potassium Nitrate solution. The results obtained, shows that the compressive strength is high for 0.5% concentrated Potassium Nitrateexposure when compared to 1% concentrated Potassium Nitrateexposure.



Graph 3 Comparing normal water and chemical curing

The obtained results shows at 56days, for 5% & 7.5% replacements in concrete under curing of 0.5% concentrated sodium phosphate gives marginal equal compressive strength compared to normal water curing. In 1% concentrated Potassium Nitrateexposure compressive strength deterioration is high compared to normal curing & 0.5% concentrated Potassium Nitrateexposure.

IV. CONCLUSION

- 1. It has been concluded that the compressive strength of normal concrete were decreased upon increase in the concentration of nitrate solution after 56 days of exposure.
- 2. It was concluded that there was a decrease in compressive strength of 3.52% for 0.5% nitrate exposure and 7.5% for 1% nitrate exposure when compare to that of normal water exposure to 56 days.
- 3. The decrease in compressive strengths may be due to the formation of hydrated nitrates which are in acidic form. This is because of Nitrates present in the chemical reacts with concrete.
- 4. It was additionally reasoned that compressive quality in 5% RHA concrete were found to be decreased in strengths upon exposure to increase in the concentration of nitrate solution after 56 days of exposure.
- 5. It was concluded that there was a decrease in compressive strength for 15% RHA concrete about 5.99% for 0.5% nitrate exposure and 10.9% for 1% nitrate exposure with respect to normal water exposure for 15% RHA with respect to 15% RHA concrete exposed to normal water for 56 days.



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