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INVESTIGATION ON PROPERTIES OF RICE HUSK ASH AND ITS USES AS CEMENT REPLACEMENT MATERIAL

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Abstract- In this study, Husk Ash (RHA), which was used to replace some of the cement, is tested together with the mechanical and durability characteristics of interlocking concrete paving blocks. When RHA is replaced with cement in a percentage of up to 10%, the compressive strength of concrete increases by 13%, and its flexural strength increases by up to 19% compared to that of a controlled mix.

Keywords: Rice Husk Ash, Compressive strength, Paver Blocks, Flexural strength

I. INTRODUCTION

The husk of rice is utilized as building material which is waste material available in abundance in rice producing countries. A pozzolanic material called rice husk ash is combined with portland cement to strengthen and extend the life of concrete. The usage of grounded and ungrounded low carbon RHA as a partial replacement of 7.5% and 15% of cement by weight in mortar and concrete preparation was researched. RHA affects the mechanical characteristics of high strength concrete. The development of compressive strength of concrete incorporating RHA for 91 days, in which residual RHA from a rice mill and controlled incinerated RHA from USA were used. RHA has the higher compressive strength than control mix concrete and highest value was obtained at 20% replacement of RHA. RHA was utilised to replace 5%, 10%, 15%, and 20% of the cement by weight to increase the compressive strength of concrete when employing particle sizes of 5 microns and 95 microns.Concrete's maximum compressive strength was measured at a 10% weight-for-weight replacement of ultra-fine RHA for cement. According to IS Code 15658:2006 paving stones are robust unreinforced precast concrete products used for paving pavements, having a minimum horizontal cross-section of 50 mm in any direction from each edge and having an aspect ratio greater than 4. excluding those that do not exist for accessories. Paver blocks are a commonly used decoration method for creating pavers and permanent stands. The main advantage of using paver over other materials is that individual blocks can be lifted and replaced later.

2. MATERIALS

Rice Husk Ash (RHA) -The hard coating that protects rice grains, known as rice husk. When rice husk is burned in boilers, rice husk ash (RHA), which makes up roughly 25% of the weight of rice husk, is created. RHA is a pozzolanic material with a high silica content that can be used to build concrete when combined with Portland cement.. Two forms of RHA which are un-grounded form of RHA is the natural form of RHA obtained from the boiler after the burning of rice husk and grounded form of RHA is when the un-grounded form of RHA is grinded properly to get size equal to that of cement then that form is called grounded form of RHA

3. EXPERIMENT

RHA was used in the experiment as a partial replacement for cement to determine the compressive and flexural strength of the paver block. Several trials were conducted to determine the final constituent proportion for the standard cement mix design for M40 grade. I-shaped concrete paver blocks measuring 195 mm*165 mm*80 mm were casted and tested.
Compressive strength test: - Specimen was cast in the shape of an I, measuring 195 mm x 165 mm x 80 mm. the concrete into the mold and compacted on a vibrating machine and allowed to curing for one day after casting. Three Samples per mix proportion were subjected to compression testing at 28 days to find its average strength values. . The specimen was subjected to an unassisted load that increased at a rate of 15 3 N/mm2/min continuously until it was unable to withstand the maximum load.
Correct Compressive Strength = (apparent compressive Strength X Appropriate correction factor) / Maximum Load (in mm2)
Flexural Strength test: - After 28 days of curing the specimen is placed on support is positioned on roller supports with a center-to-center distance that can be adjusted to the specimen's total length minus 50 mm. A gentle steel pole is put in focus of specimen for

one point stacking. After Placing Specimen in Testing machine load is applied for top side without any shock and increased at a rate of 6 KN/m till the specimen fails and the maximum load is noted. Flexural strength i.e. $F_b = \frac{3Pl}{2bd^2}$

4. RESULTS AND DISCUSSION

Compressive Strength A total of 18 specimens with measurements of 195 mm X 165 mm X 80 mm were casted. Each specimen was evaluated after 28 days of curing and showed a significant rise.

Table 1: Compressive Strength Test Results of different mix at 28 Days

S no.	Mix	Compressive Strength (MPa)
1	R0 NA	48.6
2	R10 NA	54.5
3	R20 NA	43.9

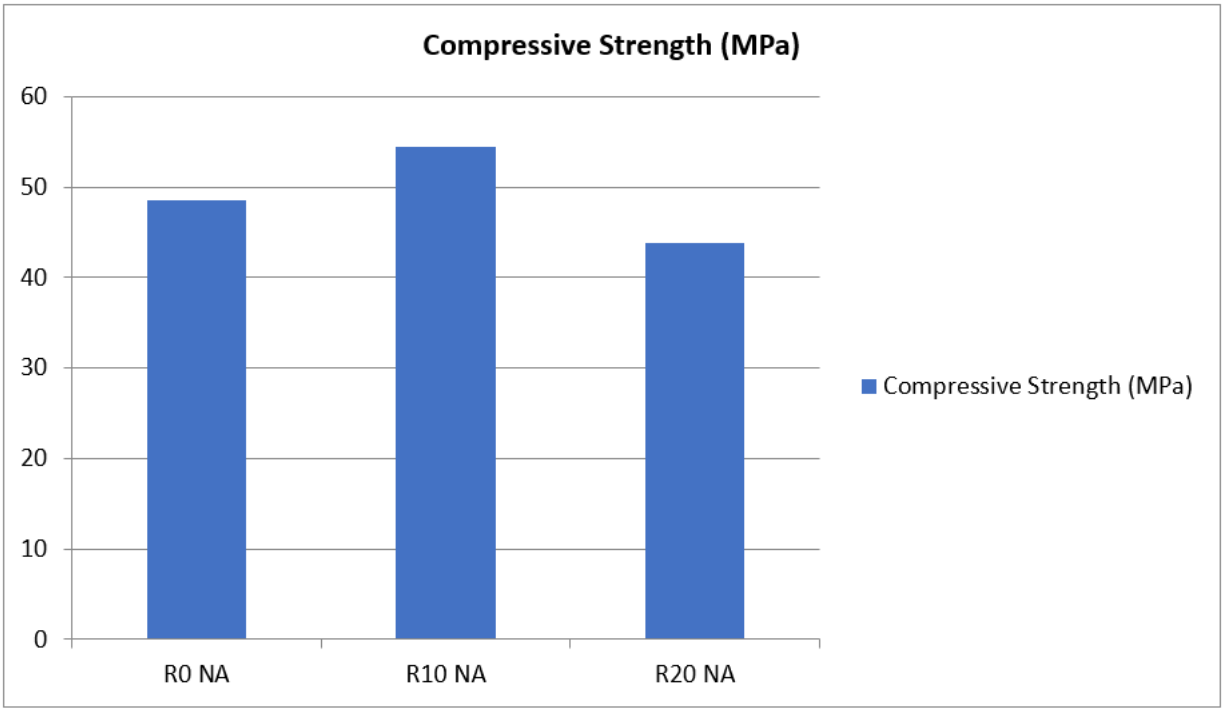

Figure1: Variation of Compressive Strength results at 28 days

From the above results the value of compressive strength increases by approximately 13% when the percentage of RHA in replacement cement is increased by up to 10%. However, compared to the controlled mix, the compressive value decreases as the percentage of RHA rises to 20 percent.

Flexural Strength:-
Table 2: Flexural Strength results at 28 days

S. No.	Mix	Area (mm2)	Flexural Strength (MPa)
1.	R0 NA	30000	4.13
2.	R10 NA	30000	4.91
3.	R20 NA	30000	4.57

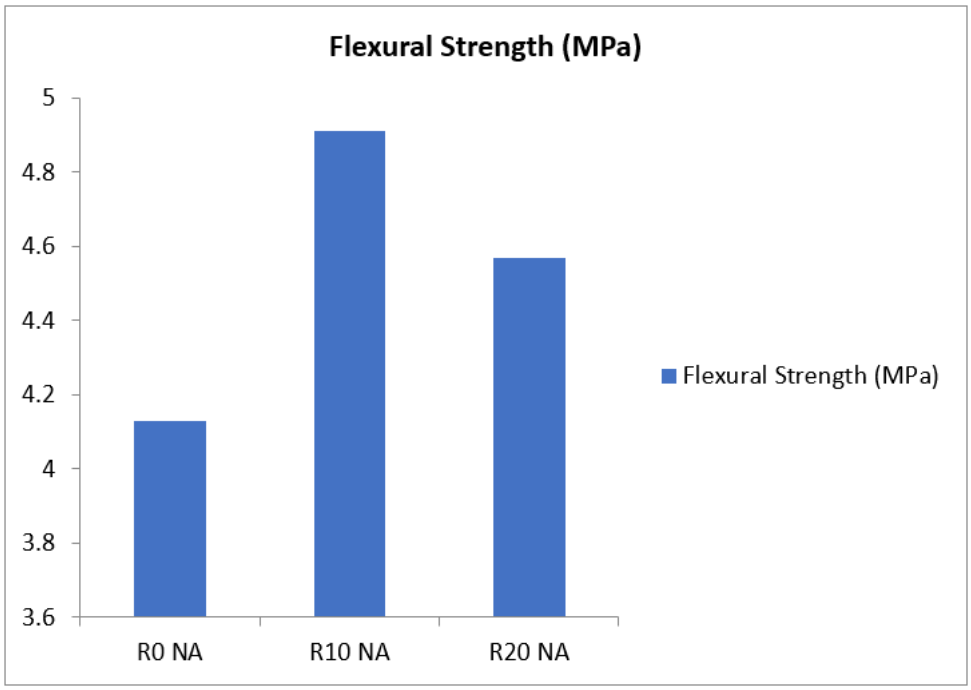

Figure 2: Variation of flexural Strength of concrete at 28 days

From the above results The value of flexural strength increases by approximately 19% & 11 %when the percentage of RHA in replacement cement is increased by up to 10% & 20%

5. CONCLUSION

The average compressive strength significantly increases after 28 days on addition of RHA As compared to controlled mix, compressive strength increases by upto 13% when RHA is increased by upto 10% during cement replacement. But with further increasing in percentage of RHA up to 20%, the value of compressive decreases about 10 % comparing with controlled mix. 10% is the ideal replacement for RHA in cement. The flexure strength of concrete made by using only RHA up to 10% and 20% in replacement with cement is near about 19% and 11% more as compared to controlled concrete. With addition of RHA up to 10% and 20%, the flexure strength of concrete decreases by 0% and 23%, respectively, as compared to controlled mix concrete.

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