

Strength of the Partial Replacement of Cement by using Rice Husk Ash

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Abstract: *In these papers present we have replaced with cement by rice husk ash concrete which contains silica. Rice being the staple food of the Indian Subcontinent, huge quantities of paddy is grown, milled to yield rice and byproduct, rice husk, is going as waste material in the absence suitable recycling technology till recently. Rice husk when burnt yields ash with 80 to 90 percent of silica depending upon the temperature of burning. Extensive studies conducted have revealed that the concrete made of cements partially replaced by rice husk ash yielded good concrete with high early strengths. The replacement is 30 percent in 1:1.6:2.8 mix ratio with water cement Ratio 0.5. The study present with the strength properties of compressive strength for cube and cylinder split tensile strength, modulus of rupture. Rice husk ash considerable increased strength for partial replacement and disposal of Partial replacement of cement by rice husk ash considerable increase strength and disposal of rice husk is also considerably reduced.*

Keywords: - Mechanical properties, Rice husk

I. INTRODUCTION

A. GENERAL

Concrete is basically a mixture of three components as well as cement with water, coarse aggregates and fine aggregate. The cement is the binding materials and coarse aggregates contribute of strength and fine aggregates are filler materials. The materials composed of cement and water, and it binds together the fine aggregates and coarse aggregates. Some of the reports have been presented in these papers Mr. V. Seshagiri Rao and Mr. A. Prasada Rao have carried out research on “Durability of rice husk cement concrete”. The different grades of concretes made with replacement of cement by rice husk ash are comparable in strength with no ash concrete even at 30 – 40% of replacement of cement by ash. The rice husk ash concretes are less permeable than concretes with no ash for different grades. The rice husk ash concretes are more resistant to abrasion and it is found to be about twenty percent. The rice husk ash concrete offer more resistance to dilute acids, the resistance being very high for

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sulphuric acid, followed by acetic acid and hydrochloric acid. G. V. Rama Rao and M. V. Seshagiri Rao have carried out research on “Improvement in Durability Characteristics of Concrete Using Pozzolanic Material as Admixture”. There is an improvement for abrasion in RHA concretes upto 40% replacement. The resistance of RHA concretes is improved sufficiently more so in the case of H₂SO₄. According to Rice husk ash is to contribute to the concrete strength. The rice husk ash is lead to increase shrinkage problem but this has not been confirmed. To achieve adequate workability the use of super plasticizers may be necessary.[2]-[8]

II. MATERIALS AND MIX PROPORTIONS

A. Materials

The grade of concrete M20 mix is used as per IS 10262-2009.The mix ratio found to be 1:1.6:2.8:0.5 respectively. Plain cement concrete without Rice husk ash for the above proportion is prepared.

B. Mix Proportions

In the mix proportion Rice Husk Ash concrete six different mixes were prepared. In each stage the cement was replaced by RHA in proportion of 5%, 10%, 15%, 20%, 25%, and 30% by weight. All the mix was prepared and tested in the laboratory.

C. Scope and Objectives

i. Objectives

To study about mechanical properties of Rice Husk Ash concrete in compressive strength for cube and cylinder, modulus of rupture, split tensile strength compare the same with plain cement concrete for water cement ratio 0.5. The rice husk ask 5-10 percentages with replacement of cement and their properties are to be investigated and compared to the plain cement concrete.

III. METHODOLOGY

A. Test Methods and Preparation of Specimen

Workability of Concrete

Workability test were tested on fresh concrete during casting of specimens.

Slump cone Test and Factor of Compaction test were

conducted for all proportions of concrete mix to analysis the workability of concrete. Table1 Show slump values and compaction factor of fresh concrete. [10]-[15]

B. Compressive Strength Test

The Compression tests were carried out 3rd day, 7th day and 28th day strength of cubes for all mix proportion of concrete was found out, 3 nos of specimen each. Similarly 28th day compressive strength of cylinders for all the mix proportion of concrete, 3 nos of specimen each were found out.

Split tensile strength test

Split tensile strength tested for all the mix proportion of concrete at 28 days.

C. Test for modulus of rupture

Three numbers of beams of size 100mm100mm500mm were tested for modulus of rupture for all the mix proportion of concrete conducted on 28th day.[16]-[21]

D. Preparation of Test Specimen

Identification	Cement + RHA	Slump value in cm	Compaction Factor
RHA 00	100% + 00%	5	0.97
RHA 05	95% + 05%	4	0.95
RHA 10	90% + 10%	3	0.93
RHA 15	85% + 15%	2	0.90
RHA 20	80% + 20%	1	0.85
RHA 25	75% + 25%	0.5	0.82
RHA 30	70% + 30%	0.5	0.79

Casting of Cubes Nine concrete cubes of size 150mmx150mmx150mm of the above mix in each mix proportion were prepared. Casting of Cylinders Six concrete cylinders of size (150mmx300 mm)using the above mix in each mix proportion were prepared Casting of Flexure Beams Three concrete beams of size 100mmx100mmx500mm of the above mix in each mix proportion were prepared.[22]-[25]

IV. RESULTS & DISCUSSION

A. Workability test

The workability of fresh concrete reduced gradually increased Rice Husk Ash in the percentage. The Slump cone value is reduced up to 5cm to 0.5 cm compare with the plain cement concrete to 30% replacement of cement by Rice Husk Ash. The factor Compaction is reduced up to 0.98 to 0.79 compared to the plain cement concrete. Fig 8.1 and 8.2 shows the reduction in value of the slump and compaction factor.[26]-[30]

B. Compressive Strength concrete

The 3th and 7th day strength of Rice Husk Ash cement concretes is reduced compared to conventional cement concrete. The 28th day strength of concrete is increased 20% replacement of cement by Rice Husk Ash. For concrete with

5% replacement of cement by Rice Husk Ash increase strength of cube is 2.3%, increase in strength of cylinder is 23.4%. For concrete with 10% replacement of cement by Rice Husk Ash increase in strength of cube is 2.3%, increase strength of cylinder is 19.0%. For concrete with replacement 15% of cement by Rice Husk Ash increase in strength of cube is 1.7%, increase in strength of cylinder is 16.9%. For concrete with replacement 20% of cement by Rice Husk Ash strength of cube is equal and increase in strength of cylinder is 7.4%. For concrete with more than 20% replacement of cement by there is reduction in strength of cube and in strength of cylinder. The ratios strength of Rice Husk Ash cement concrete of all mixes is more than those of plain cement concrete.[22]-

C. Split Tensile Strength of concrete

The strength of the cubes and cylinder 5% replacement of cement by Rice Husk Ash to increased strength 10% and 6.5%.

D. Modulus of Rupture

The beam strength is increased for mixes with replacement 15% cement by Rice Husk Ash. For concrete with replacement 5% of cement by Rice Husk Ash increase in modulus of rupture of beam is 8.6%. For concrete with replacement 15% of cement by RHA increase in modulus of rupture of beam is 8.6%. For concrete with replacement 20% of cement by RHA increase in modulus of rupture of beam is 1.7%. For concrete with more than replacement 15% of cement by Rice Husk Ash these is reduction in modulus of rupture of beam.

Compressive Strength of Cubes				
Identification	Cement + RHA	3 days	7 days	28 days
RHA 00	100% + 00%	22.8	28.7	34.8
RHA 05	95% + 05%	20	26.8	35.6
RHA 10	90% + 10%	17.2	24.3	35.6
RHA 15	85% + 15%	15.4	23.8	35.4
RHA 20	80% + 20%	13	21.5	34.4
RHA 25	75% + 25%	11.7	17.0	26
RHA 30	70% + 30%	10.5	16.2	23.6

Table 3: The split Tensile Strength of Cylinders and modulus of rupture of beam



Split Tensile Strength of Cylinders and modulus of rupture of Beams				
Identification	Cement + RHA	Split Tensile Strength of Cylinders in N/mm ²	Modulus of Rupture of Beams in N/mm ²	Ratio of (1)/(2)
RHA 00	100% + 00%	3.1	5.8	0.53
RHA 05	95% + 05%	3.3	6.3	0.52
RHA 10	90% + 10%	3.3	6.3	0.52
RHA 15	85% + 15%	2.8	5.9	0.47
RHA 20	80% + 20%	2.6	5.8	0.45
RHA 25	75% + 25%	2.3	5.1	0.45
RHA 30	70% + 30%	1.9	5.0	0.38

V. CONCLUSIONS

Based on the experimental investigation on cement concrete and cement concrete with Rice Husk Ash, the following conclusions have been made.[31]-[34]

- The Rice Husk Ash replacement of cement is counteracting the initial strength of concrete that is 3rd day and 7th day. But the 28th day concrete strength is increasing as compared to the plain cement concrete.
- The Rice husk ash 10% replacement of cement by the characteristic strength of concrete increases, further increasing Rice Husk Ash content results in reducing strength.
- The Rice husk ash 20% replacement of cement, the characteristic strength of concrete almost equal compared to the plain cement concrete.
- The Rice husk ash 10% replacement of cement in concrete is selected as optimum mix proportion.
- The Rice husk ash 20% replacement of cement in concrete is selected as maximum mix proportion.
- The addition of Rice husk ash reduces the concrete workability and it requires more compaction, super plasticizers may be added to increase the concrete workability.
- Rice Husk Ash disposal is a serious problem; this may be rectified by using this as ingredient for concrete.

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