EVALUATION OF PROPERTIES OF USING HSC CONATINING RICE HUSK ASH AND M-SAND

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ABSTRACT: Concrete is a versatile material and can be extended to applications requiring to perform in aggressive environments. In these environments, concrete should be highly durable for longer service life. To achieve high Strength in the concrete, it is necessary to have better understanding of the behavior of constituent materials. A mix design method was suggested and a wide range of concretes varying from 78-86N/mm^2 with replacement levels varying from 5 to 15 Percentage were attempted. In particular, RHA concretes performed better than normal concrete.

Key words: Rice husk ash, M-Sand and Compressive strength and Durability properties

1. INTRODUCTION

Rice Husk Ash (RHA) is one of the pozzolanic material, which can be used as a cementitious ingredient in cement composites. RHA is obtained by the controlled combustion of the rice husk, which is an agricultural by-product. Research work to date suggest that this supplementary cementitious material improves many characteristics of the concrete such as strength, workability, permeability, and durability and it was suggested that it could be used in two ways, either as an additive or as a replacement material. Recent developments in concrete technology, like the use of materials such as super plasticizes and mineral admixtures, have given a new direction to the construction industry.

2. LITERATURE REVIEW

Samberg (1995) reported that the RHA concrete had a significant positive effect on the compressive strength after 28 days as compared to plain Portland cement concrete mixtures.

Ismail (1996) studied the strength development of concretes incorporating crystalline RHA at percentages varying from (10 to 30%) and with fineness 45 and 75µm. They reported that the 28-day compressive strength of concrete incorporating 10 and 20% RHA.

Zhang and Malhotra (1996) carried out tests on air entrained, and superplasticizer concrete is incorporating RHA in comparison with silica fume and control concrete at a replacement level of 10%.

Mehta and Pirtz (1978) studied the strength development of RHA concretes with 30% replacement level at 0.42 water-cementitious material ratio. They reported that the concrete containing rice hull ash showed about 5 percent higher strength at seven days and about 8 percent higher strength at 28 days compared to control concrete.

Nehdi et al. (2003) reported that to attain the same level of workability the concrete incorporating RHA at replacement levels of 7.5-12.5% which is produced using a new technology based on the stored reactor has reduced the water demand and superplasticizer required when compared to concrete incorporating silica fume at 7.5% replacement level and control concrete.

3. MATERIALS:

3.1 Cement: Ordinary Portland cement of C53 grade (Conforming to the requirements of IS: 12269) was used in all these investigations. Specific gravity of cement is 3.5 and Normal consistency 29%

3.2 Rice husk ash: The RHA used in this investigation was supplied by a local manufacturer. The RHA was found to be confirming to the requirements presented in the earlier literature. The Specific gravity of RHA is 3.6

3.3 Quarry dust: that is available in nearby locality has been used as fine aggregate. Other foreign matter present in the sand has been separated before use. The Quarry dust was sieved through 4.75mm

4. MIX PROPORTIONING

In the present investigation, a wide range of concrete strengths (78–86N/mm^2) were taken up with RHA replacement ranging from 0 to 15%, depending upon the maximum replacements possible at any strength. The normal concretes were designed as per recommendations of American Concrete Institute (ACI) method. This method was slightly modified by adopting ACI modified water cement ratio to strength relationship which can be used for both low and high strength concretes.

5. RESULTS AND DISCUSSION:

5.1 Compressive strength results of concrete for various replacements of cement with RHA and 100% M-Sand At 10% replacement of RHA and 100% M-Sand gives maximum 28 days compressive strength 87.03N/mm^2

5.2 Split tensile strength test results

Split tensile strength results of concrete for various replacements of cement with RHA and 100% M-Sand at controlled concrete and 100% M-Sand gives maximum 28 days split tensile strength 9.09N/mm^2

5.3 Flexural strength test results

Flexural strength results of concrete for various replacements of cement with RHA and 100 M-Sand at controlled concrete and 100% M-Sand gives maximum 28 days Flexural strength 9.35N/mm^2

5.4 Water absorption test results

At 10% replacement of RHA and 100% M-Sand gives low water absorption as 2.98%.at 72hour

5.5 Moisture migration test results

At 5% replacement of RHA and 100% M-Sand gives low moisture migration as 14mm at 72hours.

6. CONCLUSIONS

The maximum strength of about 90MPa can be obtained. Also, the NDT measurement through rebound number show that they are dependent on strength and the variation is similar to normal concrete.

The limitation on maximum replacement percentages possible for a particular strength was also established. The absorption and moisture migration values show that RHA concretes had higher durability compared to normal concretes at all replacement levels,

The RHA concretes showed higher resistance to chloride ion diffusion compared to normal concretes and the resistance increased with increasing strength and all levels of replacements.

The total charge passing, typically for the 10% replacement concretes, was in the range of 400 to 600 coulombs for RHA concretes compared to the range of 1000 to 3000 coulombs for normal concretes (78-86MPa).

Finally, it can be concluded that, by understanding the reactivity of RHA in concrete through efficiency concept and utilizing it through an effective mix proportioning methodology.

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