ISSN No:-2456 –2165

Comparative Study on Replacement of Cement by Rice Husk Ash in Conventional Concrete and M-Sand Concrete

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Abstract:-Concrete is one of the most important and basic material used in all construction work. It is a largely consumed product next to water in the world. It is the strongest material composed of cement, coarse aggregate and fine aggregate. By replacing cement by rice husk ash(RHA) we can make the concrete economic meanwhile the quantity of waste also be reduced. Nowadays there arise a huge scarcity of fine aggregate by which people are shifting to M-sand. The core idea of this paper is to find the result of replacing cement by rice husk ash in M-sand concrete and make a comparative study with rice husk ash in conventional concrete. We have replaced cement by rice husk ash by 5% in both conventional concrete and M-sand concrete. All the basic tests such as compression test, split-tensile test and flexural test were performed. It is found that strength of M-sand concrete is higher than the strength of conventional concrete.

Keywords:-Concrete, M-Sand, RHA, Replacement, Strength.

I. INTRODUCTION

Concrete is heterogeneous mixture of paste and aggregates in its simplest form. The character of concrete is determined by the strength which is enhanced by quality of paste. The key to achieve a strong, durable concrete rests on careful proportioning, mixing and compacting of ingredients. Various materials such as rise husk ash,fly ash,etc.., are used to obtain the above desired properties. It is estimated that about 70 million tons of RHA is produced on average all over the world. This is a huge threatening to the environment in its disposal process. By replacing cement with RHA this kind of problems can be minimized. Since there is raising demand for naturally available river sand, there came many alternate solutions for it among which M-sand is commonly preferred one. M-sand is nothing but a manufactured sand that is commonly used as substitute for river sand. M-sand is produced from hard granites by crushing. The size of M-sand is always less than 4.75mm. It does not have impurities such as clay, dust, silt, etc. In M20 concrete 5% of cement is replaced by RHA and conventional concrete and M-sand concrete were made.

II. LITERATURE SURVEY

[1]. Pusuluri Siva Shankar & Mujahid Ahmed, here the authors described about the strength and performance of conventional concrete with the replacement of rice husk ash. As a part of the composite, rice husk ash acts in part as fine aggregate and impart as a cementitious component. This study verified the strength and performance adequacy of the alternate of using rice husk ash as a partial replacement of cement in M20 grade of concrete and with the cement replacement levels of 0%,5%,10% and 20% by rice husk ash.

[2]. Harshit Varshney**,** here the author explained the strength of concrete with the partial replacement of cement as rice husk ash with different percentages. In this work different tests such as Slump test, Compaction factor test, Compression and Split tensile test. Compression and Split tensile tests are performed for 7days and 28days of curing and result shows variations in every proportions.

[3]. Nimitha Vijayaraghavan & A.S Wayal, here the authors quoted the effects of using M-Sand on concrete by performing Compressive strength and Workability tests. Now-a-days due to constant sand mining the natural sand is depleting at an alarming rate with the environmental issues, so M-sand came into existence. The results shows that 100% replacement of it shows increase in strength by 7.03%, which is greater than the conventional concrete.

[4]. Prof.B.V.Venkatarama Reddy, here the author investigated the characteristics of mortars and concrete using

ISSN No:-2456 –2165

M-Sand as fine aggregate. The results pertain to the most commonly used grading zone-II sand. M-Sand also falls with the Zone-II.M-Sand concrete possess better bond strength between rebar and concrete. All the tests are significantly having increasing strength than the conventional concrete.

III. RICE HUSK ASH (RHA) PROPERTIES

A. Specific gravity

Weight of empty pycnometer (w1) = 323.4g

Weight of pycnometer + RHA (w2) = 353.9g

Weight of pycnometer+ RHA + water (w3) = 854.1g

Weight of pycnometer + water (w4) = 869.5g

Specific gravity of RHA, (w2-w1)/ (w2-w1)-(w4-w3)

=2.019

B. Bulk Density

Empty weight of calibrated container = 47g

Weight of container + RHA = 95.5g

Volume of container = 100cm^3

Bulk density of RHA = (95.5-47)/ 100

= 0.485g/cm^3

C. Fineness of RHA

Mass of RHA = 100g

Mass passing 90 micron sieve = 40g

Fineness of RHA = 60%

IV. GRADE M20 PROPORTION

Quantity of cement = 70kg

Quantity of RHA = 3.5kg

Quantity of CA = 205 kg

Quantity of sand = 50.5kg

Quantity of M-sand =50.5kg

V. CONVENTIONAL CONCRETE

A. Compressive Strength of M20 Conventional Concrete with 5% RHA:

S.no	Days	Load (KN)	Area(mm^2)	Strength (KN/mm^2)
1	3	278	22500	12.35
2	7	418	22500	18.57
3	14	580	22500	25.77
4	28	650	22500	28.88

B. Split Tensile Strength of M20 Conventional Concrete with 5% RHA:

S.no	Days	Strength N/mm^2
1	7	1.85
2	14	2.26
3	28	2.87

C. Flexural Strength of M20 Conventional Concrete with 5% RHA:

S.no	Days	Strength N/mm^2
1	7	1.23
2	28	1.86

VI. M-SAND CONCRETE

A. Compressive Strength of M20 M-sand Concrete with 5% RHA:

S.no	Days	Load (KN)	Area (mm^2)	Strength (KN/mm^2)
1	3	322	22500	14.35
2	7	440	22500	19.57
3	14	624	22500	27.77
4	28	672	22500	29.88

B. Split Tensile Strength of M20 M-sand Concrete with 5% RHA:

S.no	Days	Strength N/mm^2
1	7	1.89
2	14	2.31
3	28	3.04

C. Flexural Strength of M20 M-sand Concrete with 5% RHA:

S.no	Days	Strength N/mm^2
1	7	1.25
2	28	1.88

VII. CONCLUSION

As a result of all the experiments that are carried in both the conventional concrete and M-sand concrete, it is found that M-sand concrete with 5% replacement of cement by RHA shows higher strength than the conventional concrete with 5% replacement of cement by RHA. It is estimated that approximately there is increase in strength by 2% in M-sand concrete.

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