

## ADDITION OF RICE HUSK ASH AND WASTE PAPER SLUDGE ASH AS PARTIAL REPLACEMENT OF CEMENT IN M30 CONCRETE

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**ABSTRACT:** In this 21 century concrete are widely used ,The main ingredient of the concrete is cement and during the manufacturing of cement large amount of CO is released into the environment and which causes global warming .Concrete engineers try to find some alternative materials which not only replaces the cement but also increases the strength of the concrete .

If we incorporate such materials that will reduce the cement content ,indirectly we are saving our environment .In this Research work Rice Husk Ash and Waste paper Sludge which we collected from the rice processing units and paper mills respectively .when these two materials are incorporated with concrete it not only improves the strength of concrete but also replaces the cement content .The cylinders of 150mm X 150mm & 150mm X 300mm were casted varying percentages of RHA & WPSA .The total number of Specimen which were casted was 78 and on which a series of tests were conducted like compressive ,Flexural & Split Tensile Strength .It was concluded that with the addition of these materials Rice Husk Ash and Waste Paper Sludge Ash under varying percentages of 1.5 %,3 % ,3.5 % & 4 % .Under the proper codal provisions .It was also concluded that the strength of concrete increased by incorporated the Rice Husk Ash & Waste Paper Sludge upto the optimum dosage beyond that the results show variations

### I. RICE HUSK ASH

Rice husk ash (RHA) is a by-product from the burning of rice husk. Rice husk is extremely prevalent in East and South-East Asia because of the rice production in this area. The rich land and tropical climate make for perfect conditions to cultivate rice and is taken advantage by these Asian countries. The husk of the rice is removed in the farming process before it is sold and consumed. It has been found beneficial to burn this rice husk in kilns to make various things. The rice husk ash is then used as a substitute or admixture in cement. Therefore the entire rice product is used in an efficient and environmentally friendly approach. Rice husk ash is produced in large quantities globally every year and due to the difficulty involved in its disposal, can lead to RHA becoming an environmental hazard in rice producing countries, potentially adding to air and water pollution. Rice husk ash is a natural pozzolan, which is a material that when used in conjunction with lime, has cementitious properties. Several studies have shown that due to its high content of amorphous silica, rice husk ash can be successfully used as a supplementary cementitious material in combination with cement to make concrete products.

Properties of RHA

The utilization of rice husk for use as a cementations material in cement and concrete depends on the pozzolanic property of its ash. The pozzolanic reactivity of the ash is closely related to the form of silica present and the carbon content. Since the physical and chemical properties of silica in RHA are strongly influenced by the temperature and the duration of thermal treatment, the yield of a highly reactive ash requires a burning method that can remain a low firing temperature and a short retention period in order to give ash with low carbon content and a high surface area.

### II. MATERIAL INVESTIGATION

#### ORDINARY PORTLAND CEMENT

Ordinary Portland Cement (OPC) of 53 Grade (Ambuja cement) was used throughout the course of the investigation. The physical properties of the cement as determined from various tests conforming to Indian Standard IS: 12269:1987 are listed in Table 4.1.

Table 1: Properties of OPC 53 Grade

Sr. No.	Characteristics	Values Obtained Experimentally	Values Specified By IS 12269:1987
1.	Specific Gravity	3.10	3.10-3.15
2.	Standard Consistency	31%	30-35
3.	Initial Setting Time	115 minutes	30min(minimum)
4.	Final Setting Time	283 minutes	600min(maximum)
5.	Compressive Strength(N/mm2)		
	7 days	38.49 N/mm2	37 N/mm2
	28 days	52.31 N/mm2	53 N/mm2

#### AGGREGATES

Aggregates constitute the bulk of a concrete mixture and give dimensional stability to concrete. The aggregates provide about 75% of the body of the concrete and hence its influence is extremely important.

#### Fine Aggregates

The sand used for the work was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The results are given below in Table 2 and 3. The fine aggregated belonged to grading zone III.

Table 2: Sieve Analysis of Fine Aggregate

Weight of sample taken =1000 gm					
Sr. No	IS-Sieve (mm)	Mass Retained (gm)	Cumulative mass Retained	Cumulative %age mass Retained	Cumulative %mass passing through
1	4.74	1	1	0.1	99.9
2	2.36	22	23	2.3	97.7
3	1.18	77	100	10	90

FM of fine aggregate =  $283.6/100=2.836$

Table 3 Physical Properties of fine aggregates

Characteristics	Value
Specific gravity	2.63
Bulk density	5%
Fineness modulus	2.83

#### Coarse Aggregates

Locally available coarse aggregate having the maximum size of 20 mm was used in this work. The aggregates were tested as per IS: 383-1970. The results are shown in Table 4

Table 4. Sieve Analysis of Coarse Aggregate (20 mm)

Weight of sample taken =2000 gm					
Sr. No	IS-Sieve (mm)	Mass Retained (gm)	Cumulative mass retained	Cumulative %age mass Retained	Cumulative % mass passing through
1	40	0	0	0	100
2	20	145	145	7.25	92.75
3	10	1829	1974	98.7	1.3
5	4.74	124	1998	99.9	0.1
6	2.36	0	1998	99.9	0.1
7	1.18	0	1998	99.9	0.1
8	600 $\mu$	0	1998	99.9	0.1
9	300 $\mu$	0	1998	99.9	0.1
10	150 $\mu$	0	1998	99.9	0.1
11	Below 150 $\mu$	2	2000	100	0
	<b>Total</b>			<b>Σ805.35</b>	

FM of Coarse aggregate =  $805.35/100=8.0535$

Table 5.Properties of Coarse Aggregates

Characteristics	Value
Type	Crushed
Colour	Grey
Shape	Angular
Nominal Size	20 mm
Specific Gravity	2.62
Total Water Absorption	0.89
Fineness Modulus	8.05

#### RHA

In this work, Rice Husk was taken from R. K. Enterprises, Bhangrotu, (Mandi), Himachal Pradesh, India. Rice husk firstly wash with portable water then dried in the sun. After then rice husk burnt in the open atmosphere so as to convert it into ash.

#### WASTE PAPER SLUDGE ASH

Waste paper sludge was taken from Haripur Paper Company Baddi. Waste paper was burnt in the open atmosphere so as to convert it into ash.

Appearance	Fine powder
Particle Size	Sieved through 90 micron sieve
Color	Dark grey
Specific gravity	2.09

Table 6: Physical properties of Waste Paper Ash

#### III. CONCLUSIONS

The objective of this experimentation has been to evaluate the possibility of successful replacement of cement with RHA, WPSA and MIX (RHA+WPSA) in concrete.

The conclusion drawn during the experimentations are as follows:

- The compressive strength and split tensile strength increased up to 10% with 3% replacement of WPSA. Further increase in WPSA decreases the strength gradually and up to 8% replacement it can be used as a supplementary material in M30 grade of Concrete.
- The above results shows that it is possible to design M30 grade of concrete incorporating with RHA content up to 10%.
- As test results shows the Mix (RHA+WPSA) can also be used as a replacement of cement.

#### FUTURE SCOPE

Study has shown that rice husk ash and waste paper sludge ash can be used in concrete. There are several areas in which further work can be extended:

- Some tests relating to durability aspects such as water permeability, resistance to penetration of chloride ions, corrosion of steel reinforcement, resistance to sulphate attack durability in marine environment etc. with Rice husk ash and Waste Paper Sludge Ash need investigation.
- The study may further be extended to know the behavior of concrete whether it is suitable for pumping purpose or not as present day technology is involved in RMC where pumping of concrete is being done to large heights.

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