

# Evaluation of Wood Ash as Partially Replacement to Cement

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**ABSTRACT:** The objective of this research work is to reduce the cost of the construction. Now a days the industrial wastes are rapidly increasing. To utilize such materials and to reduce such type of waste in environment. The cement is replaced by the wood ash. Wood ash limited to the grain size of less than 90 micrometer is added to cement by weight percentage of 0%, 5%, 10%, 15%, 20%, 25% and 30% by the method of replacement by weight. The samples were hydrated at different time intervals ranging from one hour to 4 weeks. From this research the results are much better as compared to ordinary Portland cement.

**KEYWORDS:** Specific gravity test, compressive strength, cement and wood ash

## I. INTRODUCTION

The phenomenal pace of population growth and urbanization drives the cement requirement to many fold in the past three decades. The ordinary Portland cement is a very important material in the construction industry. The grading of cement is done by the compressive strength of the material for a specified time period. The grading of cement are 43 and 53. In this research 53 grade of cement is used.

The present paper is aiming to the study of compressive strength of a normal concrete using wood ash at a partial proportion. Also aim to reduce the cost of the construction.

## II. MATERIALS USED

### 1. CEMENT:

In this experiment 53 grade ordinary Portland cement is used. The testing of cement is done as per IS 4031-11-1988 code. The specific gravity of cement is 3.02.

### Aggregates:

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is a good gradation of aggregates. Good grading implies that a sample fraction of aggregates in required proportion such that the sample contains minimum voids. Samples of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregates.

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## 2. FINE AGGREGATE (NATURAL RIVER FINE AGGREGATE):

The river sand is used in combination as fine aggregate conforming to the requirements of IS: 383. The river sand is washed and screens, to eliminate deleterious materials and oversize particles. Those fractions from 4.75mm to 150microns are termed as fine aggregate. The specific gravity of fine aggregate is 2.6. The fine aggregate is used which passes through the 4.75mm sieve

## 3. COARSE AGGREGATE:

The fractions from 20mm to 4.75mm are used as coarse aggregate. The Coarse Aggregates from crushed Basalt rock, conforming to IS: 383 is being used. In this experiment also locally available aggregate is used and the specific gravity of coarse aggregate is to be obtained by using IS 2386 part 3:1963 code. The specific gravity of coarse aggregate is 2.7. The coarse aggregate is which passes through the 20mm sieve are.

## 4. WATER:

Generally, water that is suitable for drinking is satisfactory for use in concrete. Water from lakes and streams that contain marine life also usually is suitable. When water is obtained from sources mentioned above, no sampling is necessary. When it is suspected that water may contain sewage, mine water or wastes from industrial plants or canneries, it should not be used in concrete unless tests indicate that it is satisfactory. Water from such sources should be avoided since the quality of the water could change due to low water or by intermittent tap water is used for casting. The potable water is generally considered satisfactory for mixing and curing of concrete. Accordingly potable water was used for making concrete available in Material Testing laboratory. This was free from any detrimental contaminants and was good potable water.

## 5. PROPERTIES OF WOOD ASH:

Wood waste ash is generated as a by-product of combustion in wood-fired power plants, paper mills, and other wood burning factories. In the present research the wood waste ash used, is retained from 300 microns. The chemical composition of the ash was determined the elements such as Total Potassium, Phosphorous, Nitrogen, Magnesium, Calcium and Silicon were determined. The specific gravity of wood ash is 2.71.

## 6. KEROSENE:

Kerosene (kerosene), also called paraffin or paraffin oil, is a flammable pale yellow or colourless oily liquid with a characteristic odour intermediate in volatility between gasoline and gas/diesel oil that distills between 125°C. Specific gravity of kerosene is 2.7.

In this investigation we are using M30 grade mix design. And extra 10% of materials were added, because the mixing is not properly.

Mix proportions of mixes

Sl.no	Materials in Kg/m <sup>3</sup>	Percentages					
		0%	10%	15%	20%	25%	30%
1.	Cement	4.873	4.3857	4.142	3.8984	3.65475	3.411
2.	Coarse aggregate	10.8	10.8	10.8	10.8	10.8	10.8
3.	Fine aggregate	8.5	8.5	8.5	8.5	8.5	8.5
4.	Wood ash	0	.4873	0.730	0.9746	1.21825	1.462
5.	Water	2.2+5%	2.2+15%	2.2+15%	2.2+15%	2.2+15%	2.2+22.5%

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## TESTS

### Compressive strength:

The compressive strength was investigated in the laboratory by using crushing machine. Three samples were tested for each set of blocks and were tested at the age of 7, 14 and 21 days. The average compressive strength was determined by averaging the corresponding compressive strength values. The strength characteristics of 0%, 5%, 10%, 15%, 20%, 25% and 30% blocks were compared with the conventional concrete block. The size of the cube is 150x150x150mm. The concrete mix design is carried out as per IS 10262-2009 of M30 mix grade. The cubes are tested on 2000KN capacity universal testing machine.

## III. RESULT AND DISCUSSION

The compressive strength of cement increases significantly over hydration time. The compressive strength in between 10%-20% wood ash sample shows more strength at 4 week sample and 30% samples exhibits less compressive strength throughout the study. The strength gain of the 10%- 20% sample in 4 weeks hydration time may be due to pozzalonic reaction between SiO<sub>2</sub> from WA and CaOH from cement hydration. So for the current work 10%-20% Wood Ash sample is compared with ordinary Portland cement. The compressive strength test results of different age periods are shown in the below table.

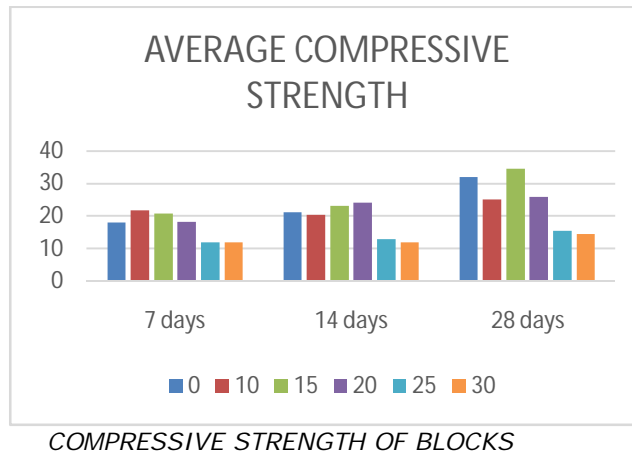
**Table:1 Compressive Strength**

Wood ash content	7 days	14 days	28 days
	Strength in N\mm <sup>2</sup>		
0%	18.12	21.26	33.14
5%	18.86	21.54	29.23
10%	21.89	20.47	25.141
15%	20.97	23.174	34.631
20%	18.36	24.32	26.084
25%	11.974	12.94	15.512
30%	11.954	11.974	14.513

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## IV. CONCLUSION

The wood ash exhibits an appreciable amount of pozzolanic properties. The water requirement increases with the increase with WA addition. In between 10%- 20% wood ash sample shows higher degree of hydration and compressive strength than conventional concrete. The optimum replacement percentage of wood ash is therefore in between 10%-20% for construction industry.

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