EFFECT OF WOOD ASH ON THE PROPERTIES OF HIGH STRENGTH CONCRETE

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ABSTRACT:-

The researchers have shown that for every 600 kg of cement, approximately 400 kg of CO2 is released into the atmosphere. The increasing demand of cement leads to higher rate of environmental degradation. Scarcity of land-filling space and because of its ever increasing cost, recycling and utilization of industrial by-products and waste materials has the only option. The utilization of such materials in concrete not only makes it economical, but also helps in reducing disposal concerns. Wood ash is the residue produced from the incineration of wood and its products. Wood ash has been used as a replacement of lime or cement kiln dust in the solidification of hazardous wastes. An experimental investigation is carried out to study behavior of M50 concrete using wood ash as a partial replacement for OPC 53 grade cement is partially replace with 0%, 5%, 10%, 15% and 20% and polycarboxylate based super plasticizer is added to concrete. Concrete cubes, cylinders and beams will be cast and test on it. Main aim is to determine the effect of wood ash as partial substitute of cement on the properties of concrete in fresh state and hardened state. Hardened concrete test like compressive strength at the age of 7 days, 14 days and 28 days will be obtain and also durability aspect of wood ash concrete for sulphates attack will test.

KEY WORDS:- Wood ash, Durability properties, Strength properties, Compressive Strength,

Introduction:-

Concrete is utilized in worldwide in all major and minor structural designing ventures. These ingredients are sand, cement, aggregates, water in definite water cement ratio for better performance of concrete. Use of waste material (wood ash) in place of cement up to a certain proportion with all other ingredients modifies the properties of concrete. However, by reducing content of cement and using waste material makes concrete light in weight. For the most part concrete is a composite blend of restricting material, filler material (coarse and fine total) and water; which joins the entire mass. The point of solid blend configuration is to accomplish most extreme sturdiness and compressive quality as conceivable as with no trade off with the quality. Specialists and researchers are further endeavoring to expand its breaking points with the assistance of imaginative substance admixtures and different advantageous restricting and filler materials alongside adjusted assembling systems. Presently multi day's bunches of innovation is utilized in the field of solid innovation that changes solid properties.

Wood ash is the buildup created because of ignition of wood and wood items (chips, saw dust, bark, and so forth.). It is the inorganic and natural buildup staying after the ignition of wood or unbleached wood fiber. Hardwoods usually produce more ash than softwoods and the bark and leaves generally produce more ash than the inner woody parts of the tree. On the normal, the consuming of wood results in about 6– 10% powder. Wood cinder creation can be exceptionally factor contingent upon geological area and mechanical procedures.

Experimental Investigation:-

[1]Material Used:

Cement- Ordinary Portland cement of 53 grade from a single batch was used for the entire work and care has been taken that it has to been stored in airtight containers to prevent it from being affected by the atmospheric and monsoon

moisture and humidity. The cement procured was tested for physical requirements in accordance with IS:12269-1987 and for chemical requirements in accordance with IS: 4032-1977.

Wood Ash- The Wood Ash (WA) was gotten from open field consuming with normal temperature being 700 _C. The material was dried and carefully homogenized. An adequate wood ash particle size was obtained by mixing wood ash and coarse aggregate together for a fixed amount of time. This mixing was done to facilitate easy pozzolanic reaction and reduced water content due to uniform size distribution. The physical properties evaluated were in perfect harmony with the findings of Naik et al. who reported specific gravity of wood ash ranged between 2.26 and 2.60 and unit weight ranged from 162 kg/m3 to a maximum of 1376 kg/m3. The chemical analysis results are corroborated by the findings of several researchers who reported the presence of significant silica in the ash specimens obtained from uncontrolled incineration of saw dust and gave a mean of 72.78% for the total composition of pozzolanic essential compounds namely silica, alumina and ferric.

Fine Aggregate- The river sand, passing through 4.75 mm sieve and retained on 600 µm sieve, conforming to Zone II as per IS 383-1970 was used as fine aggregate in the present study. The sand is free from clay, silt and organic impurities. The aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk modulus in accordance with IS: 2386-1963.

Coarse Aggregate- Throughout the investigations, crushed coarse aggregates of 20mm and 10 mm greet procured from the local crushing plants was used. The aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk density etc. in accordance with IS: 2386-1963 and IS: 383-1970.

Table-1: Physical properties of OPC and Baggase Ash

Physical Properties	Ordinary Portland Cement	Wood Ash
Initial Setting Time	37.5	-
Final Setting time	560	-
Specific Gravity	3.15	2.42

[2] Mixing Proportion:-s

Following table showing mix design of concrete with addition of different proportion of wood Ash. Wood Ash replacement ranges from 0% to 20% in the step of 5% by volume. Course aggregate and Fine aggregate volume remained constant.

Table-2: Mix Proportion

Cement (kg/m^3)	F.A (kg/m^3)	C.A (kg/m^3)	Water (Ltr/m^3)
597	682	997	197

Table-3: Partial Replacement of Bagasses Ash with Cement

Replacement of wood Ash with Cement	**Cement (Kg)**	**Wood Ash (Kg)**	**Sand (Kg)**	**Coarse aggregate (Kg)**
0%	**597**	**0**	**682**	**997**
5%	**567**	**30**	**677**	**990**
10%	**537**	**60**	**672**	**983**
15%	**507**	**90**	**667**	**976**
20%	**477**	**119**	**662**	**969**

[3] Preparation of Samples:-

In this study totally 45 cubes were casted by replacing cement with WA replaced by 0%, 5%, 10%, 15%, 20% for two different water cement ratios. For each water cement ratio and replacements 3 cubes were caste and its average compressive strength is tabulated for 7, 14 and 28 days. All the materials used were batched by weight proportions. Concrete were mixed in drum type mixer in the laboratory. Before starting mixer machine the mixer drum was fully washed using portable water and allowed to dry for 5 minutes. The coarse aggregate and river sand mixed for 2 minutes. Finally cement, WA and remaining water was added and mixing continued until the concrete gets homogeneous. The same procedure

was followed for various mixes. 150 mm cube moulds were used to cast the specimen and a vibrating table was employed to compact the concrete. Immediately after casting the specimens were covered with plastic sheets for 24Hrs to prevent the evaporation of water from the concrete. They were demolded after 24hrs and cured in water under ambient temperature until they were tested.

[4] Test on fresh state of concrete:-

Tests on fresh concrete is slump test.
Slump Test: - The maximum flow of concrete in absence of any obstructions was conducted by slump flow test in which the slump cone was filled mixed without any compaction. The value of Slump flow is the average of the two diameters cone in perpendicular directions of the concrete after lifting the cone and until concrete stops flowing.

Fig.1- Slump Test

Results and Discussion:-

[1]Compressive strength:-

Concrete cubes of size 150×150×150mm were casted and tested for compressive strength in normal water at ages of 7, 14, 28 days for 0%, 5%, 10%, 15% and 20% replacement of wood ash for M50 grade of concrete.

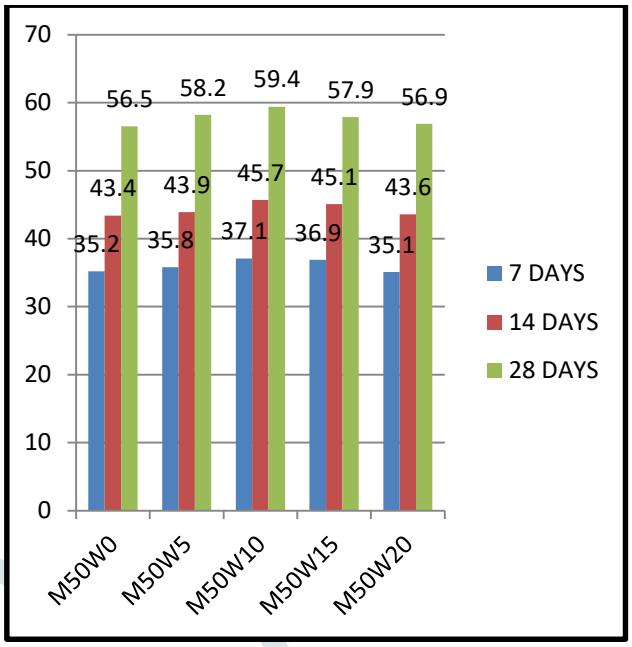

Fig.2- Compressive strength of concrete at ages of 7 days, 14 days and 28 days

[2]Flexural strength:-

Fig.3 shows flexural strength results for mix with different percentage of wood ash.

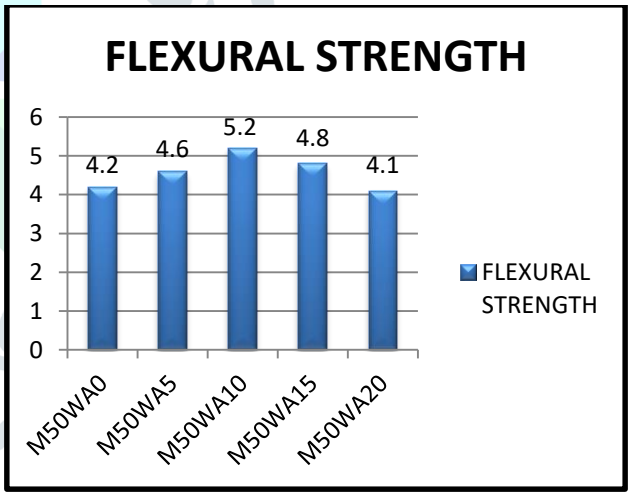

Fig.3- Flexural strength of concrete at ages of 28 days

CONCLUSION:-

1. Inclusion of wood ash partial replacement of cement adversely affects the slump of the concrete.
2. Water absorption capacity of the concrete increases with increase in wood ash content.
3. Strength properties of concrete mixtures decreases marginally with increase in

wood ash contents, but increases with age due to pozzolanic actions.

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