

Durability study of Conventional Alccofine Concrete with utilization of Pond ash as the Partial Replacement of Fine Aggregate

Ajay Sharma¹ Mukesh Kumar Gautam² Ayush Madan³

¹Department of Civil Engineering ^{2,3}School of Biological Engineering and Sciences
^{1,2,3}Shobhit University, Gangoh, Saharanpur, U.P., India

Abstract— The Thermal power plants discharge waste materials as by-products which altogether are threat to environment. Disposal of them is a huge problem now-a-days. It consumes large part of land and also has many environmental hazards. In this study, an experimental work has been done on the M-40 grade of concrete with pond ash as a replacement of fine aggregate using different percentages of Alccofine. Nine concrete mixes named as C1, C2, C3, G1, G2, G3, G4, G5 & G6 were prepared with different replacement ratios (10, 12.5 and 15 percent) of pond ash and adding 2.5 and 5 percent Alccofine was used instead of cement. It is concluded that optimum replacement of fine aggregate in M-40 grade of concrete is achieved at 12.5% pond ash using 5% Alccofine after 28 days of curing. This study will be helpful to make reasonable and inexpensive concrete using of pond ash.

Keywords: Concrete, Pond ash, Alccofine, Durability

I. INTRODUCTION

“Pond ash is a byproduct which consists of constituents that makes a bond with the concrete. Its production from thermal power plants, consider as waster material which effect the environments. In the history of concrete industry, green

Sr.No.	Characteristics	Tested values	Standard Values
1	Specific Gravity of cement	3.14	-
2	Normal Consistency of cement	32%	-
3	Initial Setting Time of cement	1 hour 50min	Not to be less than 30 minutes
4	Final Setting Time of cement	5 hour 15min	Not to be greater than 600 minutes

Table 1: Physical Properties of the cement

B. Fine Aggregate:

The fine aggregate was used in this investigational work was locally procured. The tested Physical properties as per IS 383-1970.

Characteristics	Type	Specific gravity	Fineness Modulus	Grading Zone	Water absorption
Value	Ganga Sand	2.8	2.52	II	0.98%

Table 2: Physical Properties of used Fine Aggregate in the study

C. Coarse Aggregate:

The Carse aggregate used in this experimental study was locally available crushed stones of maximum size of 4.75 to 20 mm as per IS 383-1970.

Characteristics	Shape	Maximum Size	Specific Gravity	Fineness Modulus	Water absorption
Value	Angular	20 mm	2.9	6.72	0.83%

Table3: Physical Properties of used Coarse Aggregate in the study

D. Pond Ash

The pond ash used in this experimental study the physical and chemical composition of pond ash is given in Table 3.8

Characteristics	Specific gravity	Absorption
Value	2.4	1.8%

Table 4: Physical properties of Pond ash

concrete is a revolutionary topic” [4]. “Due to increase in the growth of industrial sectors the power requirement of the country is rapidly increasing. India depends on Thermal Power as its prime source, thus increase in power requirement every year” [1]. “Use of other material in concrete such as by-products from Thermal Power plant like Coal Ash (Fly Ash and Pond Ash) is eco-friendly”. “This work reports the results of experimental studies carried out on the use of Pond ash as Fine Aggregate and hence there is a vast opportunities of utilizing in India”. [2] Thus the pond ash can reduce the cost of concrete and save the environment from pollutant. This study mainly focused on M-40 grade of concrete addition of different % of pond ash and alccofine to check the concrete compressive strength of concrete cubes after 7 and 28 days of curing.

II. MATERIAL USED:

A. Cement

The cement used in this study was Ordinary Portland Cement (OPC Birla Uttam) of 43 grade of uniform consistency, conforming to Indian standard code of IS 8112- 1989. The properties of cement and tested results has tabulated in Table 1.

E. Super Plasticizer

Super Plasticizers is a high range water reducer .To maintains the workability of concrete, use of super plasticizer is necessary because with the increase in pond ash content, workability of concrete decreased. In this study Sikka super plasticizer was used.

III. CONCRETE MIX DESIGN

The mix design of conventional concrete was used for the M-40 grade of concrete as per the IS: 456-2000 and IS: 10262-2009, as shown in Table 5. The water/cement ratio was 0.40 for all the mix proportions. Three cubes of each set of concrete are cast and take the average of three concrete cubes.

Used Cement	380 Kg/m ³
Used Water	152 Kg/m ³
Used Fine Aggregate	802.15Kg/m ³
Used Coarse Aggregate	1027.55 Kg/m ³
Used Admixture	3.8 Kg/m ³
Used w/c	0.40

Table 5: Concrete Mix Design of M-40 grade of Concrete

MIX NO.	C1	C2	C3	G1	G2	G3	G4	G5	G6
ALCCOFINE	0%	0%	0%	2.5%	2.5%	2.5%	5%	5%	5%
POND ASH	10%	12.5%	15%	10%	12.5%	15%	10%	12.5%	15%
NO. OF CUBES	6	6	6	6	6	6	6	6	6

Table 6: Proportions of various concrete mixes



Fig. 3.1: casting and check the compressive strength of cubes

IV. RESULT & DISCUSSION

A. Compressive Strength

The sand was replaced by pond ash using alccofine in proportion of 10%, 12.5%, 15% and also in proportion of 0%,

MIX NO.	C1	C2	C3	G1	G2	G3	G4	G5	G6
7 days Strength	26.12	23.34	22.15	28.47	29.45	31.09	30.08	31.48	28.78
28 days Strength	37.57	39.28	36.56	40.25	42.73	41.67	41.48	43.98	41.90

MIX NO.	7 days Strength (N/mm ²)	28 days Strength (N/mm ²)
C1	26.12	37.57
C2	23.34	39.28
C3	22.15	36.56
G1	28.47	40.25
G2	29.45	42.73
G3	31.09	41.67
G4	30.08	41.48
G5	31.48	43.98
G6	28.78	41.90

Table 7: Results of Compressive Strength after 7days & 28 days

A. Mix proportions

Nine batches of mix proportions were made in the concrete laboratory. So, a total no of 54 cubes had casted in this study. We had replaced the cement with alccofine and fine aggregates were partially replaced by pond ash. In mix F we had replaced only fine aggregate with pond ash. In mix G1, G2, G3 we have used alccofine 2.5% in place of cement and pond ash varies as 10%, 12.5%, and 15% as replacement of fine aggregate. Similarly, in mix G4, G5, G6 alccofine 5% and pond ash same as 10%, 12.5%, and 15% as shown in Table 6.

2.5% and 5% alccofine replaced the cement. The investigation was done on its effect on properties of concrete. The variation in ultrasonic pulse velocity and compressive strength on varying percentage of pond ash using alccofine is mentioned below

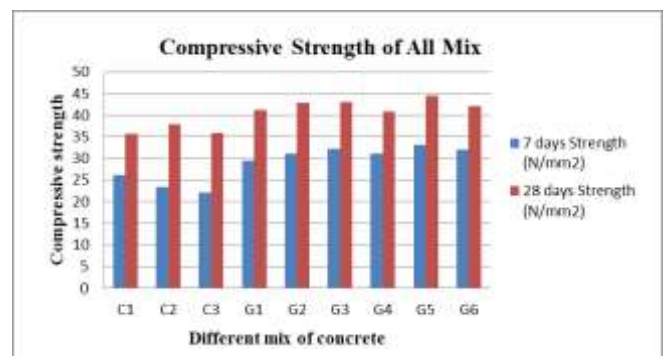


Fig. 4.1: Compressive strength of pond ash concrete of all mixes

V. CONCLUSION

- Concrete was replaced by the physical properties of the constituents of the pond ash and it satisfies the requirements as per respective codes.
- From the results it is clear that the maximum compressive strength is 44.46 (N/mm²) after 28 days of curing.
- From the results it clear that alccofine helps to increase the compressive strength of the concrete in G1 to G6 mixes.

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