To Analysis the Properties of Concrete with Adding Fly Ash

Abhash Kumar Prajapati[1] Dinesh Sen[2]
[1]Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]Vishwavidyalaya Engineering College Sarguja University, Surguja, India

Abstract— Aim of the study is to analysis the properties of concrete with adding fly ash. So using this waste in road construction can dispose this waste and also beneficial in minimize pollution in environment due to this waste. It saves the cement requirement for the same strength thus saving of raw material. In present study aims preparing concrete by replacement of Ordinary Portland Cement (OPC) with fly ash. A comparison is made between fly ash and cement properties which are used as sub-grade, base in Highway construction.

Key words: Concrete, Fly Ash

I. INTRODUCTION

Fly ash finely divided residue resulting from the combustion of powdered coal and transported by the flue gases and collected by electrostatic precipitator. Fly ash is the most widely used pozzolanic material all over the world. In India, fly ash was used in Rihand dam construction replacing cement upto about 15 percent. in the recent time, the importance and fly ash in concrete has improve so much that it has almost become a common ingredient in concrete, particularly for making high strength and high performance of concrete.

A. Objective and Scope of the Study

1) Objective of this study- To tests and analysis on fly ash concrete prepared by fly ash replacement with cement. 28 days compressive strength of fly ash concrete is to be checked.

2) Scope of Work- Following procedure to be done for this work:

- Experimental study is to be conducted on material to find out physical properties.
- Materials are to be mixed in proper proportion and molded in a cube.
- M25 cement concrete and fly ash with maximum replacement of cement - 0%,15%,25%, 35%,45%, 55% and 65%by fly ash.
- These various specimens of fly ash cement concrete are to be tested 7 days and normal 28 days compressive strength is to be checked.
- Analysis tests result.

II. METHOLOGY

A. Working Procedure

In this experimental study works are done as following:

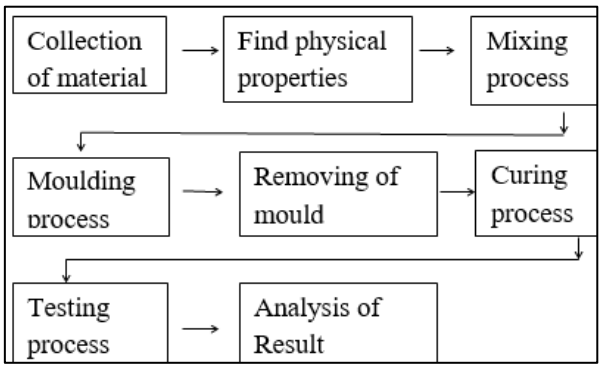

Fig. 1: Working Procedure of this Study

B. Collection of Material

1) Following materials are used for preparing of fly ash cement concrete –

- Cement- Ordinary Portland cement of conforming to Indian standard IS 12269(1987) was used for the present experiments.
- Fly ash- fly ash obtained from national thermal power plant uttar Pradesh, Ash collected from near the Mahamaya fly ash Ambikapur, sarguja district of chhattisgarh.
- Aggregates- 20 mm to 4.75 mm aggregates taken as coarse aggregates and below 4.75 mm aggregates taken as fine aggregates. Aggregates were taken from construction site.

III. MIX PROPORTIONS

A. Design Mix

Mix design for M25 cement concrete prepared by the nominal mix method with present study concrete was mixed of 1:1:2 and 0.35 w/c ratio.

B. Moulding Process

Concrete mixer moulded in cube sized 150*150*150 mm3. Totally, 12 cubes were moulded, in which 6 cubes tested after 7 days and rest 6 cubes tested after 28 days. Concrete is mixed by hand and thoroughly mixed and the concrete placed in cubes with the minimum delay. It was well compacted by rodding and temping to remove all air voids after placing.

C. Removing of Mould

After 24 hours moulds were removed. After de moulding, each cube was marked with a legible identification on the top or bottom using a waterproof marker.

D. Curing Process

Concrete cubes were cured normally in fresh water for 7 to 28 days at room temperature. Curing plays an important role in gaining of strength of concrete. If concrete cube not properly cured then it will not gain enough strength and on other hand if concrete cubes cured for more time then also its

strength decrease. Curing process in concrete increases strength and decrease permeability.

E. Testing process

After removing of mould, concrete cubes are tested in laboratory. Various tastes were done. For find physical property of material, specific gravity of cement, initial setting time, moisture content and standard consistency was determined, to check workability of concrete slump test was conducted, and for strength of concrete compressive strength was conducted by compressive strength testing machine.

IV. TEST AND RESULT

content	Wt. of fly ash (gm)	Wt. of cement (gm)	Consistency%
0%	0	300	33.0
15%	30	270	32.0
25%	60	240	32.0
35%	90	210	31.0
45%	120	180	31.0
55%	150	150	30.0
65%	180	120	30.0

Table 1: Standard consistency of fly ash and cement mix Result

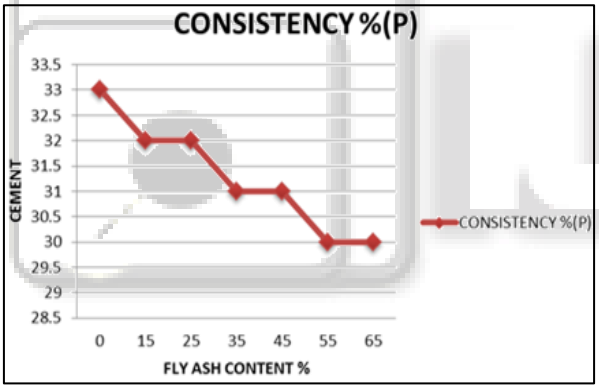

Chart 1: Standard consistency of fly ash and cement mix Result

Thus by results, we can see as amount of fly ash increased consistency decreased. As amount of fly ash increased in mix, it required less water as compare to cement.

Fly ash %	Flyash (gm)	Cement (gm)	Initial setting time
0	0	300	43 min
15	30	270	55min
25	60	240	60 min
35	90	210	67min
45	120	180	73 min
55	150	150	78 min
65	180	120	95min

Table 2: Initial setting time of cement concrete Result

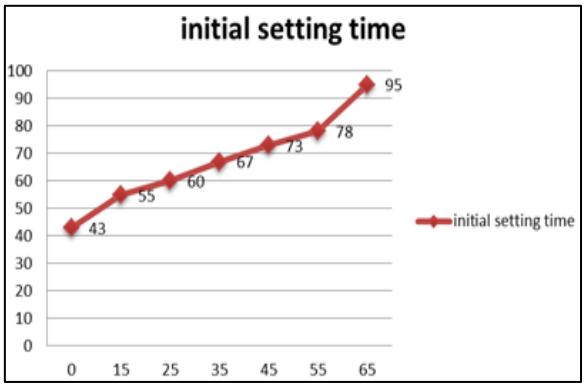

Chart 2: Initial setting time of fly ash and cement concrete Result

Thus by result it can see that as amount of fly ash increased in cement, initial setting time also increased and it take more time to settle.

Fly ash content	Slump value (mm)
0%	270
15%	290
25%	350
35%	380
45%	480
55%	620
65%	680

Table 3: Slump value of fly ash cement concrete Result

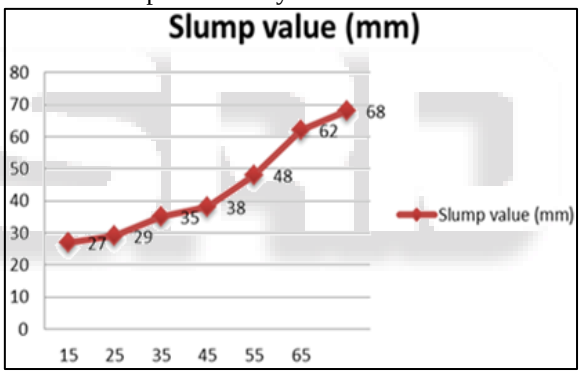

Chart -3: Slump value of fly ash concrete Result

As amount of fly ash increased slump values increased. Fly ash also has not more binding property so slump values increased. Water/cement ratio also plays an important role in preparing of concrete, amount of water for concrete mix is can be determined according standard consistency of cement. If water is added more it will wet concrete, which have less workability and strength. If water is added less it becomes stiff which is not useful.

Concrete Grade	Sample content	Compressive strength 7 days (N/mm2)	Compressive strength 28 days (N/mm2)
M25	0%	27	35
	15%	23	30
	25%	21	27
	35%	19	25
	45%	18	24
	55%	16	20
	65%	14	17

Table 4: compressive strength test Result

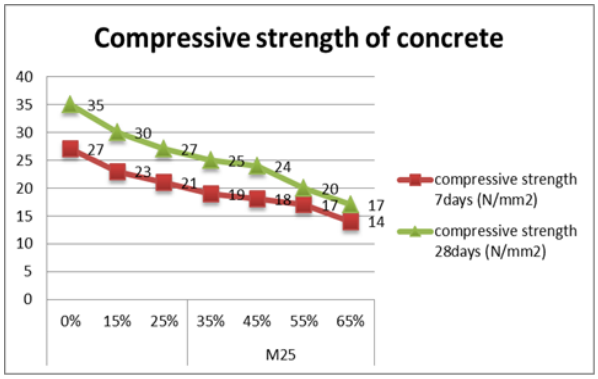

Chart 4: Compressive strength of concrete Result

Thus it can see that as amount of fly ash increased compressive strength decreased, up to 35%-45% is safe to use in concrete mix and 50% fly ash cement concrete has not enough compressive strength to use for construction.

V. CONCLUSION

In present study physical properties of cement, fly ash, and fine aggregates determined, and then slump test conducted to check concrete workability, and compressive strength test to check its quality and compressive strength. Results are following-

1) Standard consistency increased as amount of fly ash increased in cement fly ash mix
2) That means less water quantity need to make cement fly ash mix paste.
3) Fly ash takes longer time to settle down as compare to ordinary Portland cement. Cement paste settle down in 45 to 50 minute. On other hand as amount of fly ash increased its settling time also increased.
4) In slump test, Fly ash cement concrete has more workability as compare to normal cement concrete.
5) Fly ash-cement concrete cube absorbs more water.
6) Compressive strength is approximately same as normal cement concrete. As amount of fly ash increased, as compressive strength decreased. Replacement of fly ash with cement in concrete up to 35%-45% is safe to use in road construction.

REFERENCES

[1] Concrete technology M.S.Shetty, S Chand & company ltd. ISO 9001:2008 Company.
[2] High strength and durability of structure of lower cost , A.K.Mathur
[3] IS CODE 3812-1981, specification for fly ash use as pozzolana and admixture ,Bureau of indian standard New delhi 1981
[4] A study of high strength of fly ash cement concrete pavement, (Rakesh soni) Vol. 2 august 2015 p-ISSN: 2395-0072
[5] Anil Banchhor, S. Krishnan, "Advantages of using Fly Ash in Concrete PPC or site mixing of OPC and fly ash site"
[6] Mini Soman, Sobha.K, "Strength and Behaviour of High Volume Fly Ash Concrete" International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 5, May 2014.
[7] V.K. Mathur ,NTPC/CC Fly ash a resources material for construction.industries.http://siteresources.worldbank.org TRANSPORT/3562298117827263241 5/21322969/Fly_Ash_prsntn.pdf.
[8] Tomas U. GanironJr, Analysis of Fly Ash Cement Concrete for Road Construction, International Journal of Advanced Science and TechnologyVol.60, (2013).

