Journal of Civil Engineering and Environmental Technology
Print ISSN: 2349-8404; Online ISSN: 2349-879X; Volume 2, Number 14; July-September, 2015 pp. 27-29

http://www.krishisanskriti.org/jceet.html

Behavior of Concrete Mix with Fly-Ash and Super-Plasticisers

Ritu Rai[1], Vishal Kumar Chaurasia[2] and Rohit Kumar[3]

[1]PG Student, BIET Jhansi
[2,3]Civil Engineering, Raffles University, Neemrana, Alwar, Rajasthan
E-mail: [1]ritsrai26@gmail.com, [2]vishal14290@gmail.com, [3]rohitsingh2260@gmail.com

Abstract—*In termed of concrete mix design, the process of selecting acceptable ingredients of concrete and determining their relative amounts with the objective of producing a concrete of the required durability, strength and workability as economically as possible. In this research topic, M20 grade concrete mix proportion (cement: fine aggregate: coarse aggregate) is 1: 1.5: 3 by volume with nominal mix as per IS 456-2000 was used. The fly ash is blended in cement at a rate of 10% to 50% by weight of cement. In Admixture, poly carboxylic was also used as a water reducing agent for better workability and strength. After that prepared a concrete block for a standard size 150mm × 150mm × 150mm for various content of fly ash from 10% to 50% in cement and 2% of water reducing admixture. Project was placed for 28days to check the strength of concrete cubes from 7days to 28days comparing with normal mix cubes. After that calculating the different test on concrete and find the suitable value of blended fly ash is 30% effective for replacement of cement in concrete.*

Keywords*: Fly ash, Super plasticisers, Strength of concrete.*

1. INTRODUCTION

Electricity is the key for the development of our country. Coal is a major source of fuel production of electricity generation. Large quantity of fly-ash get produced and become available as by product of coal based power stations. Karthik H. O., Ash products - any country's economic and industrial growth depends on the availability of power. In India coal is a major source of fuel for power generation. About 60% power is produced using coal as fuel. Indian coal is having low calorific value (30 - 45%) resulting in huge quantity of fly-ash generation in coal based thermal power stations. during 2005 - 2006 about 112 million tone of fly-ash is generated in 125 such power stations. with the present growth in power sector, it is expected that ash generation will reach to 175 million tone fly-ash per annum by 2017.

Karthik H. O., Over the past several decades, the use of fly ash in concrete has had a successful track record. The performance benefits fly ash provides to mechanical and durability properties of concrete have been well researched and documented in actual structures.

2. LITERATURE REVIEW

Namagga C (et.al) found that high lime fly-ash in concrete increases the strength of concrete. The test done by them indicated that replacing proportions of cement with high lime fly-ash would provide improved strength and a most effective solution.

Kayali O., concluded that

- The results were indicative of the satisfactory performance of the fly-ash brick as load bearing element.
- The mechanical properties of fly ash bricks have exceeded those of standard load bearing clay bricks.
- There is evidence that the micro structural feature of the surface of fly ash is rougher texture. This characteristic is responsible for increase bond strength.
- The density of fly ash brick is less.
- Using fly-ash provides much saving of money.

Faith T., (et.al) concluded that material for the production of building is not only a viable alternate but also a solution to a difficult and expansive disposable problem.

Elsageer M. A., (et.al) concluded that

- Fly-ash concrete was observed to be similar to that of an equivalent portland cement concrete at standard curing temperature (20 degree centigrade up to 32 days.
- At 40 degree centigrade and 50 degree centigrade, the strength development of concrete is similar to that of an equivalent portland cement concrete at early stages.
- Their work indicates that fly ash concrete could be used in projects when early strength is required (4)

3. MATERIAL USED

3.1 Cement

In this work, Ordinary Portland cement (OPC) of Ultra tech brand 0f 43 grade obtained from a single batches was used.

The physical properties of PPC as determined are given in Table 3.1. The cement satisfies the requirement of IS**:** 1489-1991, PART2. The specific gravity was 2.96 and fineness was 4 %.

Table: 3.1: Typical composition of Ordinary Portland cement.

Chemical	Weight
Tri-calcium silicate -C3S	55%
Di-calcium silicate -C2S	18%
Tri-calcium aluminate -C3A	10%
Tetra-calcium alumino ferrite -C4AF	8%
Calcium sulphate dehydrate -CSH2	6%

3.2 Fine Aggregate

Fine aggregate/sand is an accumulation of grains of mineral matter derived from the disintegration of rocks. The sand from natural river bed of Zone-II will be used. The specific gravity is about 2.6 and the sand should conform to IS: 383-1970.

3.3 Coarse Aggregate

Coarse aggregate are the crushed stone used for making concrete. The commercial stone is quarried, crushed and graded. Much of the crushed stone used is granite, limestone and trap rock. Crushed aggregate of 10 mm size from a local source will be used as coarse aggregate. The moisture in the stone should be avoided.

3.4 Water

Potable water will be used for mixing and curing. on addition of higher percentage of demolished waste the requirement of water increases for the same workability. The water cement ratio is between 0.4 to 0.5.

3.5 Super Plasticizer

A poly carboxylic type super plasticizer in a liquid form was used in all the concrete mixtures and this is high range of water reduction with good workability. The chemical composition of super plasticizer is given below table no-3.2

Table 3.2: Chemical Composition of Super Plasticizer

Items	Index
Appearance	Light brown
	liquid
Density (20) g/ml	1.09±0.02
Solid content %	20±1
Cement paste fluidity (cement	250(W/C=0.29)
base) (mm)	
Ph	6-8
Chloride % ≤	0.02
pH value(1% water solution)	1.5~2.0
Alkali (Na2O+0.658K2O)(%) ≤	0.2

3.6 Fly Ash

Fly ash (Type F) collected from Jai Durga Infracom Ltd. near Shajapur, Haryana, India. Investigations were carried for different percentage of fineness of fly ash 10 to 50% of cement replacement by mass of fly-ash.

4. RESULT

The test was conducted by varying the percentage of fly-ash with respect to weight of cement. The variation of fly-ash was 0%, 10%, 20%, 30%, 40%, and 50% by weight of cement. The data shows that there are non-linear decreasing in compressive strength of concrete at various percentage of fly-ash at 7 days, 14 days and 28 days. The respective test results are shown in table no-4.1 and fig. no-4.1.

Table No.4.1: Variation of Compressive Strength with Fly Ash

S. No	% of fly ash used	Compressive strength at 7 days (N/mm^2)	Compressive strength at 14 days (N/mm^2)	Compressive strength at 28 days (N/mm^2)
1	0	13	17.5	23
2	10	12.5	18	22.5
3	20	12	17	21
4	30	12	16.5	20.5
5	40	11	15	18
6	50	8	12	15

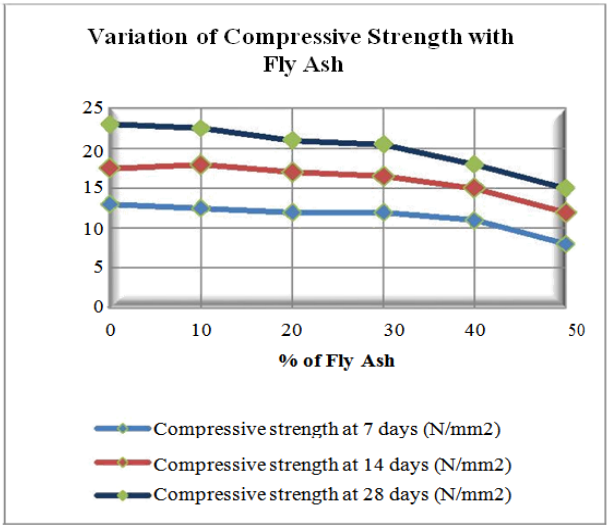

Fig.4.1. Variation of Compressive Strength with Fly Ash

5. CONCLUSION

The test result shows that upto 20% to 30% of flyash can be used in concrete without any major decrease in compressive strength of concrete.

REFERENCE

[1] Upadhyaya S., Chandak R. (2014), "Effects of Flyash on Compressive Strength of M20 Mix Design Concrete" International Journal of Advancements In Research & Technology, Volume 3, Issue 9, 19 ISSN 2278-7763

[2] Karthik H. O., (2008), "Specifying Fly Ash for Use in Concrete", Spring 2008

[3] Namagga C., Rebecca A., and Atadero, (2009) "Optimization Of Fly Ash In Concrete" World Coal Ash (W.O.C.A) May 4-7, 2009

[4] Kayali O., (2005) "High Performance Brick From Fly Ash" Published At 2005 World Coal Ash (W.O.C.A) April 11- 15, 2005 Faith T., and Umit A., (2001), "Utilization of Flyash In Manufacturing Of Building Bricks", International Ash Utilization Symponium, Center Of Applied Energy Research, University Of Kentucky, Paper #13

[5] Elsageer M. A., Gmillad S., (2009) "Strength Development of Concrete Containing Coal Fly Ash Under Different Curing Temperature Condition" World Coal Ash (W.O.C.A) conference May - 4-7, 2009 In Lenington, U.S.A