Scientific Journal of Impact Factor(SJIF): 3.134
e-ISSN(O): 2348-4470
p-ISSN(P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 1,Issue 12, December -2014

A REVIEW ON COMPRESSIVE STRENGTH OF PLAIN OPC CEMENT CONCRETE WITH FLYASH USING DIFFERENT WATER CEMENT RATIO

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Abstract—*Flyash is investigated for its used as a replacement for cement and different water cement ratio. this paper represent the result of compressive strength of cement concrete using different proportion of fly ash(0%,30%, ,40%,50%,60%,70%)as per weight of cement and with 0.4%,0.45% and 0.50% water cement ratio. Test results indicate that the laterally improvement in the strength property of cement concrete as a partial replacement of flyash in cement concrete for different proportion of water cement ratio.*

Keywords- *flyash, cement concrete, compressive strength,*

I. INTRODUCTION

Fly ash is a great cementations industrial waste which can be used with Portland cement to achieve economy in concrete. The production of fly ash in India is likely to be more than 175 million tons from about more than 80 thermal power plants by the year 2012. The utilization of fly ash in India has gone beyond 50%; still a lot has to be done for full utilization of this precious wealth from waste. The fly ash produced is effectively utilized in production of Portland pozzolona cement, making bricks, in construction of road pavement, Ready mix concrete(RMC) etc. The purpose of this program is to study the suitability of fly ash available at G.I.P.C.L Surat with respect to compressive strength requirement and workability. These studies will explore the use of fly ash in OPC. Their results will be compared with controlled specimens of cement concrete. The replacement of cement by GIPCL Lignite based fly ash (class F) will be carried up to 60%. The test will be performed for workability and compressive strength at the age of 28 days and attempts will be made to achieve maximum strength at maximum fly ash/cement ratio at lowest possible economy.

Class F: Fly ash normally produced by burning anthracite or bituminous coal, usually has a less than 5% Cao class F has a pozzolonic property only.

Class C: Fly ash normally produced by burning lignite or sub-bituminous coal, some class C fly ash has a Cao content excess of 10%.

II. LITERATURE REVIEW:

A. Kamal Rahmani, Department of Civil Engineering, Mahabad Branch, Islamic Azad University, Mahabad, Iran "EFFECT OF WATER AND CEMENT RATIO ON COMPRESSIVE STRENGTH OF FLYASH CONCRETE"

The Compressive Strength curve changes with respect to water-cement ratio for curing time of 7, 28 and 91 days are shown in Figure 1. Improvements of compressive strength of concrete samples for 7, 28 and 91 days are shown in Figures 2-4, respectively. Also Tables 1 - 5 summarized obtained data for Compressive Strength Test for samples with defined water and cement ratio of 0.33 to 0.5. Table 6 presents the improvement made for concrete aged for duration of 7, 28 and 91 days. Compressive Strength (%) with water sand cement ratio of 0.05.

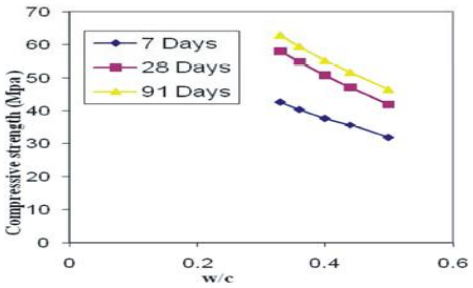


Fig. 1: Compressive Strength curve changes with respect to water-cement ratio at 7, 28 and 91 days

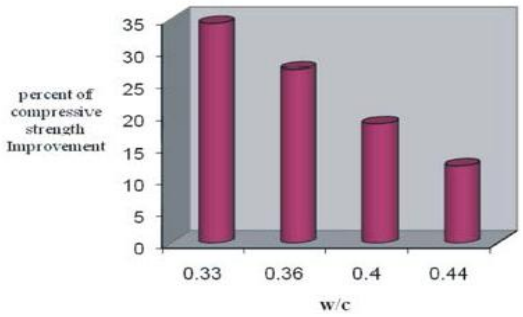


Fig. 2: Compressive strength improvement after 7 days

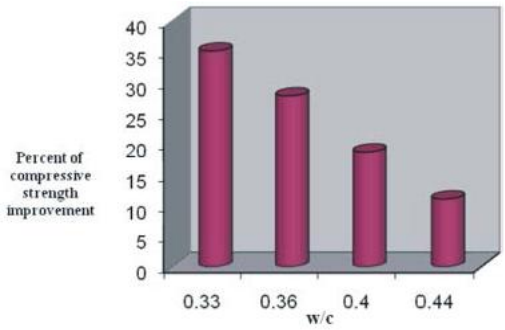


Fig. 3: Compressive strength improvement after 28 days

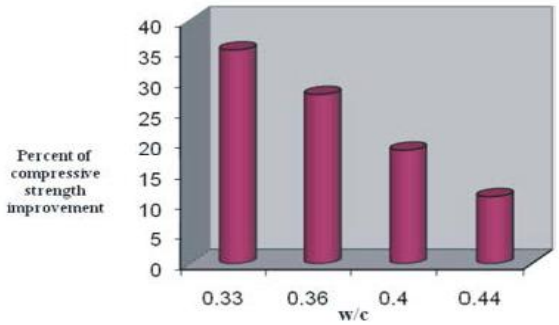


Fig. 4: Compressive strength improvement after 91 days

Table 1: Compressive Strength Test for samples with water and cement ratio of 0.33

Average Compressive Strength (Mpa)	Age of samples (days)	Water and cement ratio (w/c)
39.08	7	0.33
51.66	28	
60.24	91	

Table 2: Compressive Strength Test for samples with water and cement ratio of 0.36

Average Compressive Strength (Mpa)	Age of samples (days)	Water and cement ratio (w/c)
36.88	7	0.36
50.56	28	
55.63	91	

Table 3: Compressive Strength Test for samples with water and cement ratio of 0.4

Average Compressive Strength (Mpa)	Age of samples (days)	Water and cement ratio (w/c)
33.69	7	0.4
47.17	28	
51.87	91	

Table 4: Compressive Strength Test for samples with 0.44 water-cement ratio

Average Compressive Strength (Mpa)	Age of samples (days)	Water and cement ratio (w/c)
39.08	7	0.33
51.66	28	
60.24	91	

Table 5: Compressive Strength Test for samples with water and cement ratio of 0.5

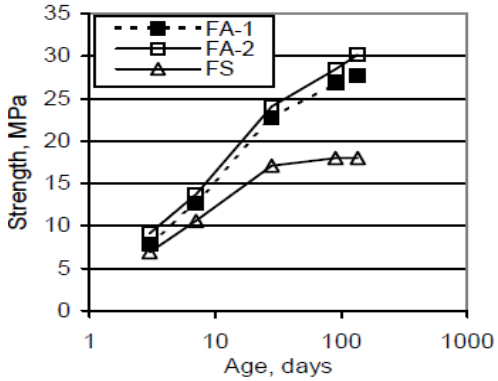
Average Compressive Strength (Mpa)	Age of samples (days)	Water and cement ratio (w/c)
32.20	7	0.44
45.17	28	
48.94	91	

Table 6: Improvement of concrete aged for 7, 28 and 91 days. Compressive Strength (%) with water sand cement ratio of 0.05

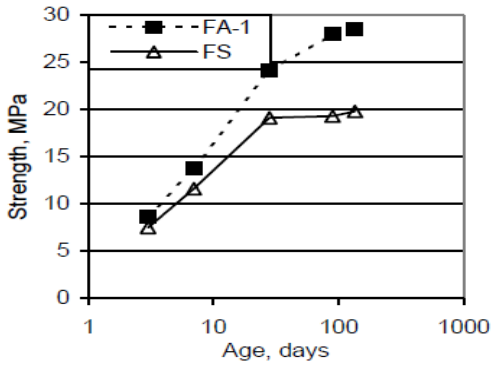
Improvement of 91 days Compressive Strength (%)	Improvement of 28 days Compressive Strength (%)	Improvement of 7 days Compressive Strength (%)	Water and cement ratio (w/c)
37.44	33.21	35.79	0.33
26.92	30.38	28.14	0.36
18.34	21.63	17.06	0.40
11.66	16.48	11.88	0.44

B. M. Akram Tahir*, UET, Lahore, Pakistan, Essa Bin Moeen, WAPDA, Pakistan, "STRENGTH DEVELOPMENT OF CONCRETE DUE TO CHEMICAL COMPOSITION OF INCORPORATED FLY ASH"

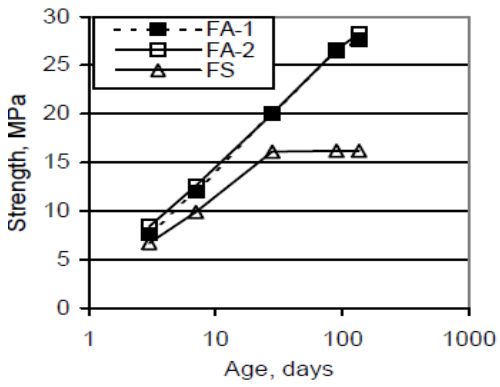
An experimental study was conducted to evaluate the influence of chemical composition of fly ash alone on the strength development of concrete In the first series of the test program, 6 concretes were cast by varying fly ash-binder ratios and water-binder ratios. The fly ash-binder ratios used were 0.20, 0.35 and 0.50 and water-binder ratios were 0.40 and 0.50. In second series 6 concretes of similar composition were cast, the only difference being that fine sand was used in place of fly ash in order to compensate the effect of fineness of fly ash on strength development of concrete. The fine sand was ground to approximately obtain the same specific surface area as that of fly ash. In third series of tests another fly ash of different chemical composition was used to repeat the strength tests. The compressive strengths were obtained after 3, 7, 28, 90 and 180 days of standard moist curing. It was found that contribution of chemical composition to strength increased with age and with increase in fly ash-binder ratio and it ranged from 12% to 46% of total strength.

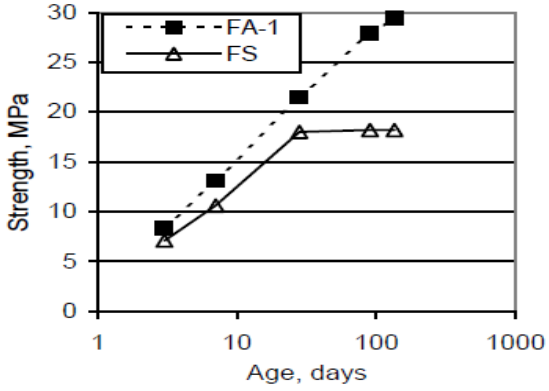


W/(C+F)=0.50: F/(C+F)=0.20

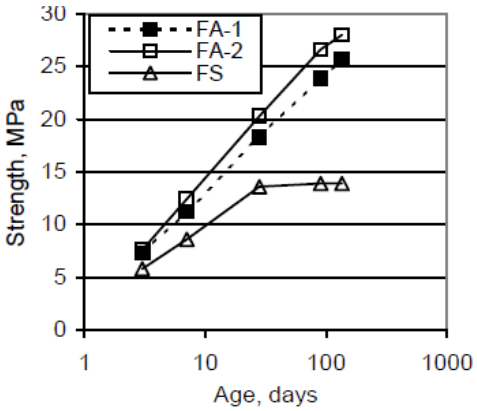


W/(C+F)=0.40: F/(C+F)=0.20

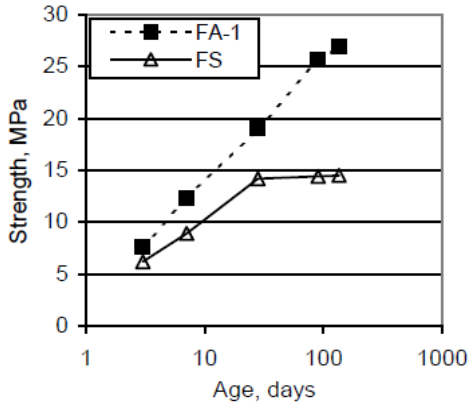




W/(C+F)=0.50: F/(C+F)=0.35



Fly W/(C+F)=0.40: F/(C+F)=0.35



W/(C+F)=0.50: F/(C+F)=0.50

W/(C+F)=0.40: F/(C+F)=0.50

Fig. 5. Strength development of two fly ash-concretes in comparison with fine sand-concretes.

F/(C+F)	W/(C+F)	% of strength of fly ash-concrete				
		3-day	7-day	28-day	90-day	135-day
0.20	0.40	12.79	15.94	20.75	31.07	30.53
	0.50	12.66	16.54	25.00	32.84	35.02
0.35	0.40	15.48	19.08	16.28	34.77	38.10
	0.50	11.84	17.50	19.90	38.64	41.30
0.50	0.40	18.42	27.64	25.26	43.75	46.10
	0.50	20.55	23.21	25.68	41.84	45.70

Table.7 Percentage of strength of concrete due to chemical composition of fly ash alone.

It may be noted from Table 2 that the contribution of chemical composition to the strength development of fly ash-concretes increases with time for all water-binder ratios and all fly ash-binder ratios. At fly ash-binder ratio equal to 0.20 this contribution is more in case of the water-binder ratio 0.50 as compared to the water-binder ratio of 0.40 at all ages except 3 day. Almost same trend is observed for fly ash-binder ratio of 0.35 for 28 day and later ages. However, this trend is reversed for fly ash-binder ratio of 0.50, for which the contribution of chemical composition with water-binder ratio equal to 0.40 is almost equal to that at the water-binder ratio of 0.50.

C. Rafat Siddique, Department of Civil Engineering, Thapar Institute of Engineering and Technology,Deemed University, Patiala, Punjab 147 004, India Received 18 March 2003; accepted 4 September 2003"PERFORMANCE CHARACTERISTICS OF HIGH-VOLUME CLASS F FLY ASH CONCRETE"

Ravina and Mehta reported that by replacing 35– 50% of cement with fly ash, there was 5–7% reduction in the water requirement for obtaining the designated slump, and the rate and volume of the bleeding water was either higher or about the same compared with the control mixture.

Compressive strength of concrete mixtures was determined at the ages of 7, 28, 91, and 365 days. Results are given in Table 6 and shown in Fig. 1. At 28 days, control mixture M-1 (0% fly ash) achieved compressive strength of37.2 MPa, whereas mixtures M-2 (40% fly ash), M-3 (45% fly ash), M-4 (50% fly ash) achieved compressive strength of 26.7, 24.7, and 23.1 MPa, respectively; a reduction of 28%, 34%, and 38%, respectively, in comparison with the strength of the control mixture M-1 (0% fly ash). The results at 91 and 365 days indicated that there was continuous and significant improvement in strength beyond the age of 28 days. The increase in strength from 28 to 91 days was
between 20% and 26%, whereas increase in strength from 28 to 365 days was between 39% and 45%. The increase in strength is, of course, due to the cement that continued to hydrate. The significant increase in strength of high volume fly ash concrete is due to pozzolanic reaction of fly ash. Although at 28 days, the replacement of cement with fly ash decreased the compressive strength of concrete, but, even then, compressive strength result indicated that even mixture M-4 (50% fly ash) could be used for general concrete construction, and other mixtures M-2 (40% fly ash) and M-3 (45% fly ash) could very well be used for structural concrete.

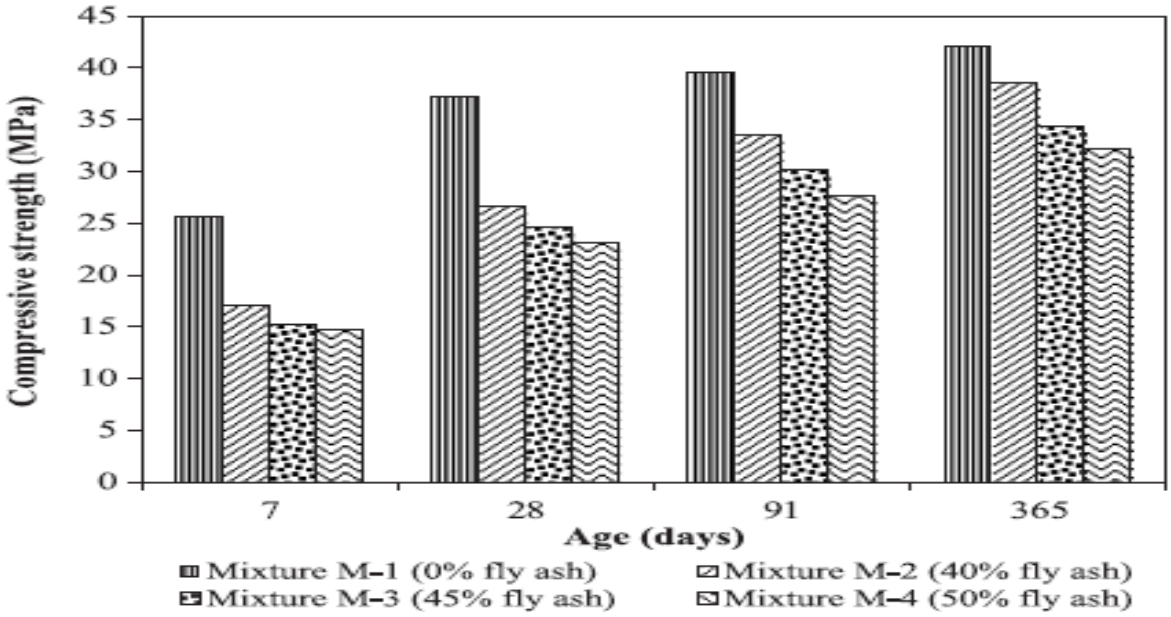


Fig. 8. Compressive strength versus age.

Mixture number	Compressive strength (MPa)			
	7 days	28 days	91 days	365 days
M-1 (0% fly ash)	25.7	37.2	39.5	42.1
M-2 (40% fly ash)	17.0	26.7	33.5	38.6
M-3 (45% fly ash)	15.3	24.7	30.1	34.4
M-4 (50% fly ash)	14.7	23.1	27.7	32.1

Table. 8 Compressive strength results

III. CONCLUSION

In first paper included that;
To increase in water-cement ratio from 0.5 to 0.33, 7-days compressive strength increases 35.8%.
To the increase in water-cement ratio from 0.5 to 0.33, 28-days compressive strength increases 33.2%.
To the increase in water-cement ratio from 0.5 to 0.33, 91-days compressive strength increases 37.44%.
In second paper included that
The results of this study have shown that filler effect of fine particles of fly ash or fine sand cause increase in the early strengths of concrete and this effect contributes significantly up to the age of 28 day.
The results of this study have shown that at the age of 3 to 7 day the part of chemical composition of ash in pozzolanic reaction varies from 12 percent to 28 percent.
In third paper included that;
The replacement of cement with three percentages of fly ash content reduced the compressive strength of concrete at the age of 28 days, but there was a continuous and significant improvement of strength properties beyond 28 days. The strength of concrete with 40%, 45%, and 50% fly ash content, even at 28 days is sufficient enough for use in reinforced cement concrete construction.

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