

# INFLUENCE OF MINERAL AND CHEMICAL ADMIXTURES ON THE PROPERTIES OF CONCRETE

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**Abstract**— This paper presents a review of the properties of fresh concrete including workability, heat of hydration, setting time, curing, and reactivity by using chemical admixtures (super plasticizers) and mineral admixtures (fly ash and gypsum) and harden concrete including compressive strength . Cement is replaced by fly ash of 10%, 20% & 30% and fine aggregate by gypsum of 10% & 20%. This project presents a detailed experimental study on Compressive strength at age of 14 and 28 days. The tests indicate the use of Fly ash and gypsum in concrete, the performance in Compressive strength test. Comparison of normal and high performance concrete in which cement is partially supplemented by mineral admixture has been considered. High performance concrete (HPC) is a concrete mixture, which possess high durability and high strength when compared to conventional concrete. They cause low workability and demand more water which may be offset by adding effective super plasticizer.

**Keywords** — Fly ash, Gypsum, Super plasticizer, M40.

## I. INTRODUCTION

Concrete is strong in compression but weak in tension. In order to make changes in properties of concrete various studies have been carried out with the use of admixtures. Admixtures are the ingredients other than the key ones that are being added during the process of mixing. They made concrete to adjust to different atmospheres and at different steps

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of construction to make the process convenient. Adequate precaution during the use of admixtures should be taken as they should not affect the strength of concrete. They should be environment friendly and easily degradable. Some of them are available in natural state and few are being obtained through scientific processes.

Cement is generally replaced partially by mineral admixtures, and the specific effects of admixtures generally vary with the mix proportion, ambient conditions and the dosage that is added. In particular, two types of admixtures – mineral and chemical – in mineral admixture fly ash and gypsum, chemical admixture superplastizer are used in our experimental investigation.

## II. OBJECTIVE

1. To determine the mix proportion for M<sub>40</sub> mixes using fine aggregate, coarse aggregate, fly ash, and gypsum.
2. To carry out strength test (compression) on concrete replaced with various proportions of fly ash and gypsum for various curing period of 14 and 28days.
3. To study the effect of introduction of admixture in to concrete mixes by doses in Fly ash (10%, 20% & 30%) and Gypsum (10% & 20%).
4. To evaluate the cost reduction and management of materials without compensating the strength properties of concrete.
5. The main objective is to test the concrete in fresh and harden state of various admixture.

## III. EXPERIMENTAL PROGRAMME

Thirty six specimens were casted and tested in laboratory. Fly ash is used in concrete by various proportions such as 10%, 20%, 30% to the weight of

cement and for gypsum proportion were 10%, 20% to the weight of fine aggregate and studied the 14, 28 days compressive strength.

Test materials are given below:

### 1) Cement

Ordinary Portland cement (53 grade) whose specific gravity is 3.1, initial setting time is 35 minutes, final setting time is 450 minutes as per IS 8142 is used.

### 2) Fine aggregate

In this study zone sand is used whose specific gravity is 2.70, water absorption is 0.45% is used.

### 3) Coarse aggregate

Coarse aggregate of size 20mm is used which has specific gravity 2.72 as per IS 383.

### 4) Water

Portable water free from harmful oils, alkalis, sugar, organic impurities is used for proportioning and curing of concrete.

### 5) Super plasticizer

VARAPLAST SP 123 ether complies with IS:9103 1999. This Super Plasticizer show extremely high water reduction in concrete with improved workability.

### 6) Gypsum

Gypsum is a soft sulphate mineral composed of calcium sulphate dehydrate, it is used to decrease the void ratio. Gypsum is added to control the “setting of cement”.

### 7) Mix design

The following mix design is arrived:

**Table 1 Mix Proportions Of conventional Concrete**

Samples	Conventional
S1	0%

**Table 2 Mix Proportions Of Fly ash Concrete**

Samples	Fly ash%
S2	10%
S3	20%
S4	30%

**Table 3 Mix Proportions Of Gypsum Concrete**

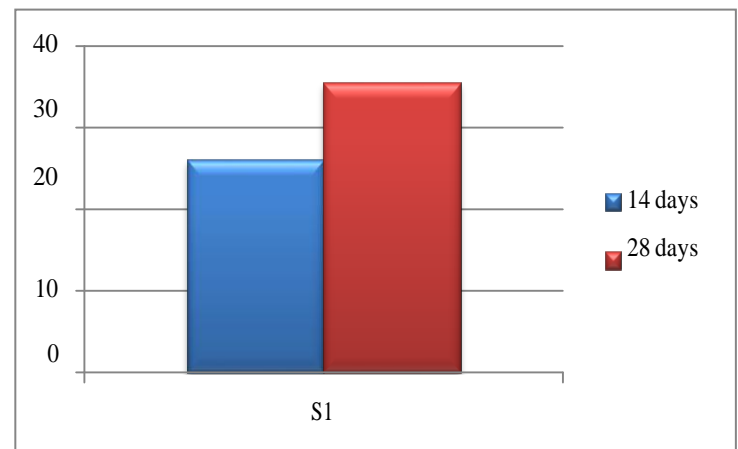
Samples	Gypsum%
S5	10%
S6	20%

### 8) Compressive strength

1) The test was carried out for compressive strength of  $M_{40}$  grade of concrete. The compressive strength of high performance concrete with gypsum, fly ash and super plasticizer is given below:

**Table 4 Compressive Strength Of Conventional Concrete**

Samples	Compressive strength(N/mm <sup>2</sup> )	
	14 days	28 days
S1	25.99	35.53



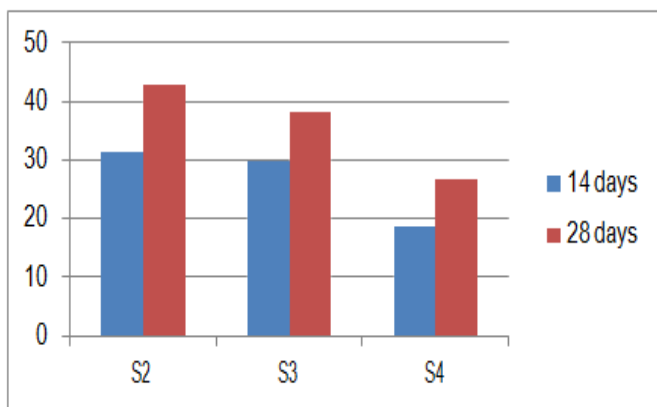
Graph 1 Compressive Strength Of Concrete

2) The test was carried out for Fly ash concrete strength of  $M_{40}$  concrete the test results were

given in the table 5.

**Table 5 Compressive Strength Of Fly ash Concrete**

Samples	Compressive strength(N/mm <sup>2</sup> )	
	14 days	28 days
S2	31.47	42.93
S3	29.71	38.30
S4	18.49	26.56

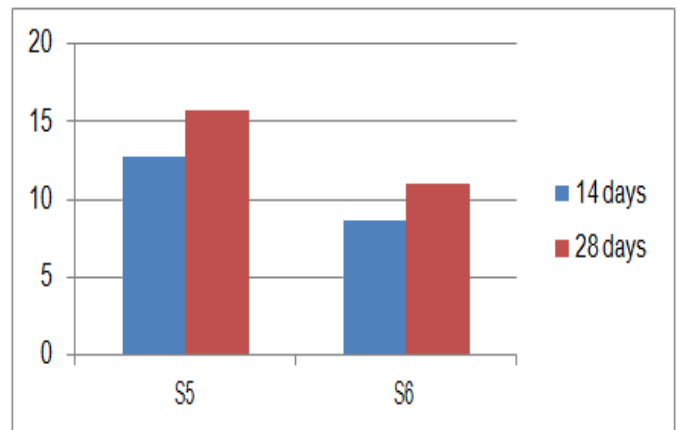


Graph 2 Compressive Strength Of Fly ash Concrete

3) The test was carried out for Gypsum concrete strength of M<sub>40</sub> concrete the test results were given in the table 6.

**Table 6 Compressive Strength Of Fly ash Concrete**

Samples	Compressive strength(N/mm <sup>2</sup> )	
	14 days	28 days
S5	12.76	15.69
S6	8.71	11.03



Graph 3 Compressive Strength Of Gypsum Concrete

#### IV. RESULTS AND DISCUSSION

Workability of fresh concrete is determined by using slump test given below

**Table 7 Workability Of Concrete**

S.No	Concrete Specimen	Proportion	Slump Value(mm)
1	Conventional Concrete	-	50
2	Fly Ash	10%	87
		20%	90
		30%	95
3	Gypsum	10%	35
		20%	14.5

#### V. CONCLUSION

Based on the experiments done the following result is achieved:

1. Compressive strength test were conducted and results are found to be high for S2 proportion of concrete. i.e. 10% fly ash.
2. Based on the experimental investigation on the project, when comparing with the conventional concrete compressive strength, fly ash has the highest compressive strength.
3. In conventional concrete M<sub>40</sub> grade concrete and only superplactizer is used in that situation concrete gives low strength. By adding fly ash as mineral admixture 10% gives more compressive strength.

4. For the further construction cement can be partially replaced by fly ash.
5. By economical wise, cost is decreasing and strength is increasing by 15%
6. Whereas in partial replacement of fine aggregate by gypsum, gypsum need more water content based on our experimental project.
7. By this study fly ash were found to be an effective construction material.

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