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# Impact of Strength Parameter of Concrete by using GGBS, FLY-ASH & SILIKA - FUME

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**Abstract—**The Ordinary Portland Cement (OPC) is one of the main ingredients used for the production of concrete. Unfortunately, production of cement involves emission of large amounts of carbon-dioxide gas into the atmosphere, a major contributor for green house effect and the global warming, also construction industry, use of concrete is going on increasing rapidly. Cement is major constituent material of the concrete,which produced by natural raw material like lime and silica. Once situation may occurs there will be no lime on earth for productionof cement. This situation leads to think all people working in construction industry to do research work on cement replacingmaterial and use of it.hence it is inevitable either to search for another material or partially replace it by some other material. The search for any such material, which can be used as an alternative or as a supplementary for cementso we had taken a research for partial replacement of cement by combinaly mixing GGBS,FLY-ASH,AND SILIKA FUME in a varying percentage and cheking effect of special material on concrete.

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## I. INTRODUCTION

Concrete has basic naturally, cheaply and easily available ingredients as cement, sand, aggregate and water. After the water, cement is second most used material in the world. But this rapid production of cement creates two big environmental problems for which we have to find out civil engineering solutions. First environmental problem is emission of CO2 in the production process of the cement. We know thatCO2 emission is very harmful which creates lots of environmental changes whatsoever. Ground Granulated Blast furnace slag (GGBS) is a by-product for manufacture of pig iron and obtained through rapid cooling by water or quenching molten slag. Here the molten slag is produced which is instantaneously tapped and quenched by water. This rapid quenching of molten slag facilitates formation of "Granulated slag". Ground Granulated Blast furnace Slag (GGBS) is processed from Granulated slag. Fly ash is one of the residues created during the combustion of coal in coal-fired power plants. Fine particles rise with flue gasses and are collected with filter bags or electrostatic precipitators.Silica Fume is a finely-divided mineral admixture, available in both uncompact and compacted forms. This ultra-fine material will better fill voids between cement particles and result in a very dense concrete with higher compressive strengths and extremely low permeability.

## II. METHODOLOGY

The study work is to analyses strength properties of partially replaced by GGBS, FLY-ASH, and SILIKAFUME concrete. The tests of concretes are carried out as per IS code for this proposed investigation work.

Steps for Trial…
Introduction

Collection of Materials

Test conducted on Materials

Trail mix design

Casting of specimen

Testing of specimen

Results and observations

Conclusion

## III. PROPERTIES OF INGREDIENTS

### 3.1 Cement

The cements used in this experimental works are ordinary Portland cement. All properties of cement are tested by referring IS Specification for Ordinary Portland cement. Test results are presented in Table

Table 1. Physical Properties of Cement
(Confirming to IS 12269 – 1987)

| SR.NO. | DISCRIPTION OF TEST | RESULT |
|---|---|---|
| 01 | Finness of test | 1% |
| 02 | Specific gravity | 3.15 |
| 03 | Standered consistency of cement | 35% |
| 04 | Setting time of cement<br>a) Initial setting time<br>b) Final seting time | <br>90minute<br>360minute |
| 05 | Soundness test of cement (with le –chatlear apparatus) | 1.5mm |

### 3.2 Sand

The cement is used for experimental work are natural sand All properties of sand are tested by referring as per Specification for natural sand . Natural sand from river confirming to IS 383 -1970 used. Various tests such as specific gravity, waterabsorption, impact strength, crushing strength analysis etc. have been conducted on CA and FA toknow their quality and grading.

Sand used in this study conform to Zone-II .

The above said test results are shown in Tables.Table 2.

| Sr. no. | DISCRIPTION OF TEST | RESULT |
|---|---|---|
| 01 | Quality of sand | Natural sand |
| 02 | Bulking of sand | 11% |
| 03 | Surface moisture | nil |
| 04 | % OF sand passing .75 mm | 99% |
| 05 | Dry loose bulk density(DLBD) | 1.5265 kg/$m^3$ |
| 06 | Fineness modulus of sand | 2.031 |
| 05 | Passing through 600micron | 69.81% |
| 06 | Specific gravity of sand | 2.574 |
| 07 | Silt content in sand | 1.6% |
| 08 | Partical shape and size | Round 4.75mm above and dowen |

### 3.3 PROPERTY OF COURSE AGGRIGATE.

Crushed black trap basalt rock of aggregate size 20mm down was used confirming to IS 383-1970.The coarse aggregate used in this study have the maximum size of 20mm.

| Sr. no. | Description of test | Result |
|---|---|---|
| 01 | Type of aggregate | Crushed |
| 02 | Maximum aggregate size | 20mm |
| 03 | partical shape and size | Angular 20mm |
| 04 | Fineness modulus of 20mm aggrigate | 5.89 |
| 05 | Specific gravity of agg | 2.70 |
| 06 | Dry loose bulk density (DLBD) OF MEAL ONE(M1) | 1.364 kg/$m^3$ |
| 07 | Dry loose bulk density (DLBD) OF MEAL TWO(M2) | 1.38 kg/$m^3$ |
| 08 | % PASSING 4.75mm sieve | 2% |
| 09 | Water absorption | 5% |
| 10 | Surface moisture | nil |
| 11 | Size of metal two (M2) | 10mm |

(Table 3.)

### 3.4. Property of ground granulated blast furnanacesluge (GGBS) (Table 04.)

| Constituent | Percent |
|---|---|
| Sio2 | 34.4 |
| Al2O3 | 21.5 |
| Fe2O3 | 0.2 |
| Cao | 33.2 |
| MgO | 9.5 |
| P2O5 | 0.54 |
| SO3 | 0.66 |
| PASSING 90 MI-CRON | 80% |
| SPECIFIC GRAVITY | 3.15 |

### 3.5. Property of fly-ash.(Table 05.)

| Chemical Composition Of Fly Ash OXIDES | PERCENTAGE |
|---|---|
| SiO2/Al2O3 | 1.5 |
| Sio2 | 52.0 |
| Al2O3 | 33.9 |
| Fe2O3 | 4.0 |
| CaO | 1.2 |
| K2O | 0.83 |
| Na2O | 0.27 |
| MgO | 0.81 |
| SO3 | 0.28 |
| LOI | 6.23 |

**3.5.** Mix Design for M30 grade concrete With Bureau of Indianstandard (BIS) Method Then the mix proportion becomes10262:1985-
Prepare quantity for the nine(09) cube. (Table 06.)

| Cement | Sand( fine agg.) | Course agg. | Water (W/C) |
|---|---|---|---|
| 1 | 1.47 | 1.9 | 0.4 |
| 18.8kg | 27.636kg | 35.72kg | 7.52ltr |

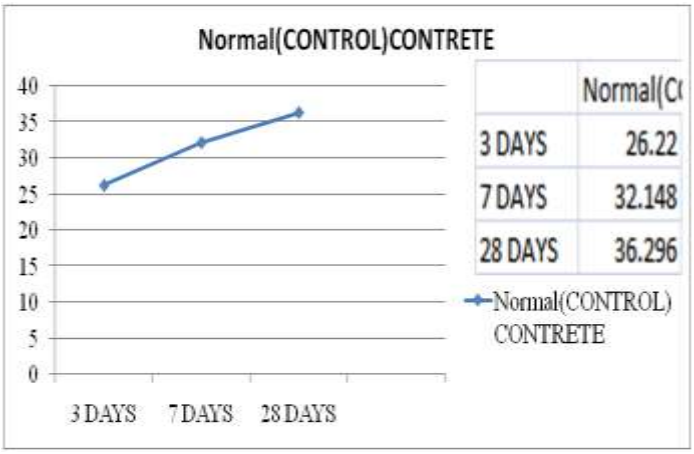
**3.6** TESTING OF SPECIMENS
Compressive strength of cubes are determined at 28days using compression testing machine (CTM) ofcapacity 3000 KN. Flexural testing setup of UTMmachine of capacity 40 tones was used to determine.

## IV. RESULT

**4.1** Compressive strength test on cube:A cube compression test was performed on standardcubes of plain size 150mm150 mm at 28 days of immersion in water for curing.

**CONTROL CONCRETE OF M30 GRADE** (Table 07.)

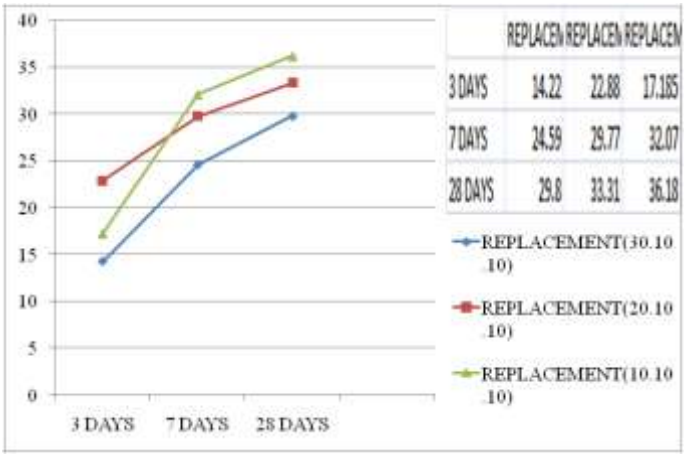
| DAYS / STRENGTH(Mpa) | 3 DAYS | 7 DAYS | 28 DAYS |
|---|---|---|---|
| NORMAL CONCRETE (CONTROL CONCRETE **(1:1.47:1.9)** | 26.22 Mpa | 32.148Mpa | 36.296Mpa |




X-AXIS =DAYS, Y AXIS= STRENGTH OF DAYS (N / $MM^2$)(Table 08.)

REPLACING CEMENT BY GGBS,FLY-ASH AND SILIKA FUME .
(GGBS**:** FLY-ASH**:** SILIKA-FUME)(Table 09.)

| **DAYS / STRENGTH(Mpa)** | **3 DAYS** | **7 DAYS** | **28 DAYS** |
|---|---|---|---|
| Cement replacement (30:10:10) | 14.22Mpa | 24.59Mpa | 29.8Mpa |
| Cement replacement (20:10:10) | 22.88Mpa | 29.77Mpa | 33.31Mpa |
| Cement replacement (10:10:10) | 17.185Mpa | 32.07Mpa | 36.18Mpa |




X-AXIS =DAYS ,Y AXIS= STRENGTH OF DAYS (N / $MM^2$)(Table 10.)

## V. CONCLUSION

Partial replacement of cementin presence of silika fume and fly-ash ,as quantity of ggbs decraeses strength of concrete will increeses.

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