

Evaluation of FLY ASH and GGBS as Partially Replacement to Cement

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ABSTRACT: The objective of this research work is to reduce the cost of the construction. Now a days the industrial wastes are rapidly increasing. To utilize such materials and to reduce such type of waste in environment. The cement is replaced by the wood ash. FLY ASH and GGBS limited to the grain size of less than 90 micrometer is added to cement by weight percentage of 0%, 5%, 7.5%, 10%, 12.5% and 15% by the method of replacement by weight. The samples were hydrated at different time intervals ranging from one hour to 4 weeks. From this research the results are much better as compared to ordinary Portland cement. These tests were carried out to evaluate the strength properties for 7, 21 and 28 days.

KEYWORDS: Specific gravity test, workability test, compressive strength, FLY ASH and GGBS.

I. INTRODUCTION

Cement is the widely used material in the world for various construction purposes but during manufacturing of cement lot of dangerous gases are released such as carbon monoxide and carbon dioxide in the same way the hazardous waste such as highly alkalined materials and volatile organic compounds. Due to these hazardous waste the different types of diseases are caused and it also cause problem in eco-system which leads to environmental imbalance .in this way by using supplymentary cementious material we can reduce the environmental imbalance and maintain the eco-system in the good way.

II. MATERIALS USED

1. CEMENT:

Ordinary Portland Cement (43 Grade) with specific gravity of 2.9 was used for this experimental investigation. The testing of cement is done a per IS-4031-11-1998.

2. AGGREGATES:

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is a good gradation of aggregates. Good grading implies that a sample fraction of aggregates in required proportion such that the sample contains minimum voids. Samples of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregates.

3. FINE AGGREGATE (NATURAL RIVER FINE AGGREGATE):

The river sand is used in combination as fine aggregate conforming to the requirements of IS: 383. The river sand is washed and screens, to eliminate deleterious materials and oversize particles .Those fractions from 4.75mm to 150microns are termed as fine aggregate. Locally available river sand having density of 1550 kg/m³ and fineness Modulus (FM) of 5.02 was used. The specific gravity was found to be 2.62. The fine aggregate was found to be confirming to Zone III as per IS 383:1970. The specific gravity of fine aggregate is obtained by using the IS-2720-part 3 code.

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4. COARSE AGGREGATE:

The fractions from 20mm to 4.75mm are used as coarse aggregate. The Coarse Aggregates from crushed Basalt rock, conforming to IS: 383 is being used. The Flakiness and Elongation Index were maintained well below 15%. Natural granite aggregate having density of 1500 kg/m³ and fineness modules (FM) of 3.14 was used. The specific gravity was found to be 2.69 and maximum size of aggregate was 20mm. The specific gravity of coarse aggregate is obtained by using the IS-2386-part 3-1963 code.

5. FLY ASH:

Fly ash is the material which is formed during the pulverizing and combustion of coal which contains 80% of fly ash. It is a cementitious material which is used in the place of cement in measured quantity for higher strength.

6. GGBS:

Ground Granulated Blast Furnace Slag is the material which is formed from blast furnace used to make iron. It is a supplementary cementitious material which is used in constructions. The specific gravity of ground granulated blast furnace slag is 2.53.

7. WATER:

Generally, water that is suitable for drinking is satisfactory for use in concrete. Water from lakes and streams that contain marine life also usually is suitable. When water is obtained from sources mentioned above, no sampling is necessary. When it is suspected that water may contain sewage, mine water or wastes from industrial plants or canneries, it should not be used in concrete unless tests indicate that it is satisfactory. Water from such sources should be avoided since the quality of the water could change due to low water or by intermittent tap water is used for casting. The potable water is generally considered satisfactory for mixing and curing of concrete. Accordingly potable water was used for making concrete available in Material Testing laboratory. This was free from any detrimental contaminants and was good potable water.

8. Kerosene:

Kerosene (kerosene), also called paraffin or paraffin oil, is a flammable pale yellow or colorless oily liquid with a characteristic odor intermediate in volatility between gasoline and gas/diesel oil that distills between 125°C. Specific gravity of kerosene is 2.7. In this investigation we are using M30 grade mix design. And extra 10% of materials were added, because the mixing is not properly.

III. Tests

Compressive strength:

The compressive strength was investigated in the laboratory by using crushing machine. Three samples were tested for each set of blocks and were tested at the age of 7, 14 and 21 days. The average compressive strength was determined by averaging the corresponding compressive strength values. The strength characteristics of 0%, 5%, 10%, 15%, 20%, 25% and 30% blocks were compared with the conventional concrete block. The size of the cube is 150x150x150mm. The concrete mix design is carried out as per IS 10262-2009 of M30 mix grade. The cubes are tested on 2000KN capacity universal testing machine.

The table.1 says about the compressive strengths of cubes when the cement replaced practically with GGBS and fly ash for different age periods and it also shown in the bar chart also.

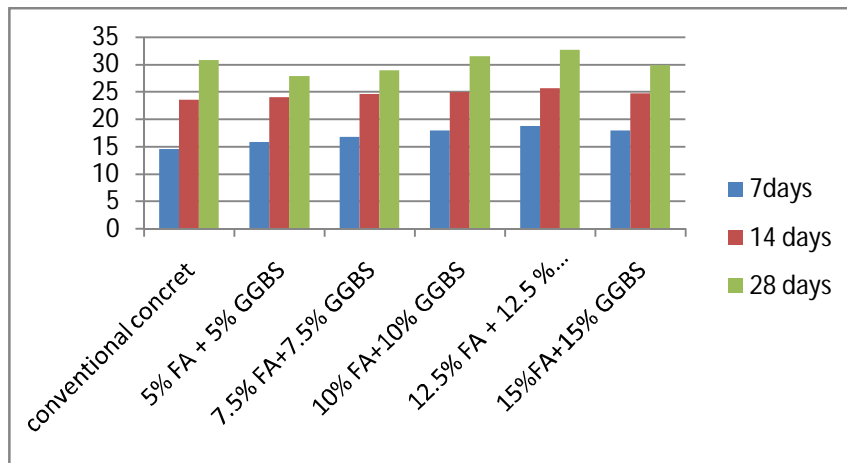
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Table: 1 Compressive Strength

Sl. No.	FLY ASH and GGBS	7 days N/mm ²	14 days N/mm ²	28 days N/mm ²
1	Normal Mix	14.53	23.56	30.77
2	5% replacement	15.81	23.98	27.81
3	7.5% replacement	16.73	24.62	28.88
4	10% replacement	17.93	24.98	31.44
5	12% replacement	18.71	25.67	32.64
6	15% replacement	17.93	24.73	29.86



Bar Chart :1 Compressive Strength Results

IV. CONCLUSION

The assumption of consideration of constant w/c ratio helps for understanding the effect of strength parameters due to the change of natural aggregates.

1. From the experiments conducted, replacement of FLY ASH and GGBS as cement can be optimized.
2. At 0%, 5%, 7.5%, 10%, 12.5%, 15% replacement of cement with FLY ASH and GGBS the strength properties were decreased linearly were compared with conventional concrete.
3. At 40%, 50%, 60% & 70% replacement of cement with FLY ASH and GGBS the strength properties were marginally decreased and at 80% to 100% replacement level strength properties were highly decreased when compared with conventional cement concrete.
4. And there is no highly difference of 7 days and 28 days strength properties of compressive strength.
5. So In the further investigation 20 % replacement of cement with FLY SH and GGBS by conventional aggregates content in concrete can be optimized.

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BIOGRAPHY

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