

Design of Compressive Strength of Concrete by Using Fly Ash for M30 and M50 Grade

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Abstract- Fly ash is finely divided residue resulting from the combustion of powdered coal and transported flue gases and collected by electrostatic precipitator. Fly ash is the most widely used pozzolanic materials all over the world. Fly ash was first used in large scale in the construction of Hungry Horse dam in America in the approximate amount of 30 percent by weight of cement. In recent time, the importance and use of fly ash in concrete has grown so much that it has almost become a common ingredient in concrete, particularly for making high strength and high performance concrete. Extensive research has been done all over the world on the benefits that could be occurred in the utilization of fly ash as a supplementary cementitious material, High volume fly ash concrete is a subject of current interest all over the world. The use of fly ash as concrete admixture not only extends technical advantages to the properties of concrete but also contributes to the environmental pollution control.

The present experimental investigation examines the effect of fly ash, as partial replacement to cement various properties of concrete block. Investigation is done on M30, M50 and M60 mix using fly ash as partial replacement by weight of cement. Experimentation is carried out to find the compressive strength, flexural strength of the concrete blocks. Experimentation is also carried out analysis the production cost of concrete paving blocks by using Waste Material.

Keywords- Fly Ash Compressive Strength, Flexure strength.

I. INTRODUCTION

In the last millennium concrete has demanding requirements both in terms of technical performance and economy while greatly varying from architectural masterpiece to the simplest of utilities. Concrete is a material with which any shape can be cast and with equal strength or rather more strength than the conventional building stones. Cement concrete is one of the seemingly simple but actually complex materials. the country. The properties of concrete mainly depend on the constituents used in concrete making. The main important material used in making concrete is cement, sand, crushed stone and water. The properties of sand, crushed stone and water, if not used as specified, cause considerable trouble in concrete. In addition to this workmanship, quality control

and methods of placing also plays the leading role on the properties of concrete. Concrete is considered as durable and strong material. Reinforced concrete is one of the most popular materials used for construction around the world. Reinforced concrete is exposed to deterioration in some regions especially in coastal regions.

II. OBJECTIVES

The following are the objectives of the research:

- 1) To find the Compressive strength and flexural strength of M30 grade concrete with and without Fly Ash.
- 2) To observe the durability of the concrete.
- 3) The main objective of this project is to study the properties of fresh and hardened high performance concrete.
- 4) To reduce the cost of concrete by finding out the optimum dosage of fly ash.
- 5) To find out compressive strength, flexural strength and split tensile strength of concrete.
- 6) To perform the non-destructive test on concrete specimen.

III. PROPERTIES OF FLY ASH

Table 1: Chemical properties of fly ash

S.No.	Chemical composition	% by weight	Requirements as per IS 3812:2000 (part I) 1
1	SiO ₂ +Al ₂ O ₃ +Fe ₂ O ₃	90.5	70.00(min)
2	CaO	3.60	5.00(max)
3	MgO	1.91	5.00(max)
4	SO ₃	1.80	2.75(max)
5	5 Na ₂ O	1.50	2.00(max)
6	Loss on Ignition	2.00	5.00(max)

Table 2: Physical properties of fly ash

S.No	Physical composition	Properties
1	Color	Whitish Grey
2	Bulk Density	0.994
3	Specific gravity	2.288
4	Moisture	3.14
5	Average Particle size (µm)	6.92

IV. RESULTS

Table 3. Compressive Strength of Concrete Cube for 0%, 5%, 10%, 15% & 20% Fly Ash.

Compressive Strength of Concrete Cube (size-150x150x150mm)				
%Fly Ash	Mixed Design	7 th Day (N/mm ²)	28 th Day (N/mm ²)	56 th Day (N/mm ²)
0	M30	20.05	24.50	29.93
5	M30	21.05	30.65	45.65
10	M30	21.14	35.16	57.10
15	M30	20.25	32.85	52.55
20	M30	20.85	31.35	48.35

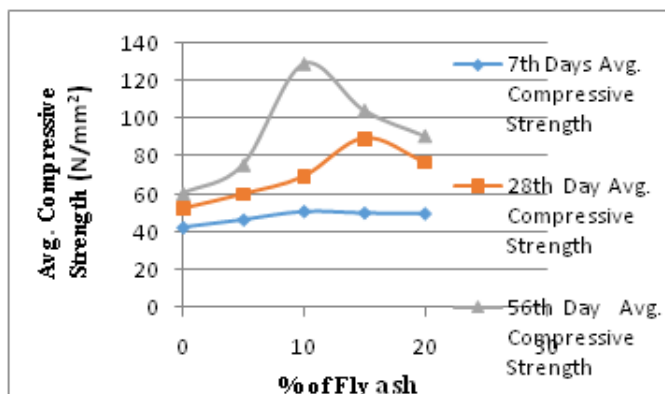


Figure 1. Shows the variations of average compressive strength of concrete cube for various % of fly ash

Table 4. Compressive Strength of Concrete Cube for M50 grade with 0%, 5%, 10%, 15% & 20% Fly Ash.

Compressive Strength of Concrete Cube (size-150x150x150mm)				
%Fly Ash	Mixed Design	7 th Day (N/mm ²)	28 th Day (N/mm ²)	56 th Day (N/mm ²)
0	M50	30.25	41.45	50.05
5	M50	38.78	49.15	57.35
10	M50	35.25	51.44	69.65
15	M50	34.79	54.03	82.17
20	M50	38.18	58.25	72.74

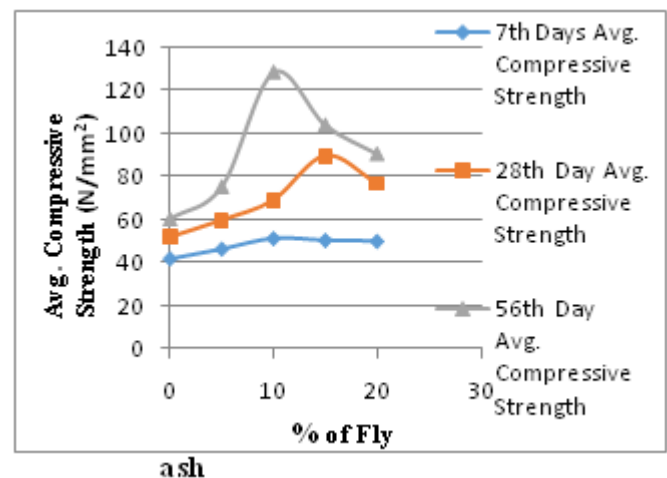


Figure 2. Shows the variations of average compressive strength of concrete cube for various % of fly

IV. CONCLUSIONS

1. The percentage increase in compressive strength of concrete cubes is 29.10% at 0% to 10 % of Fly Ash for M 30 grade.
2. Fly ash as a replacement to the cement will solve two problems with one effort, namely, elimination of solid waste problem on one hand and provision of a needed construction material on other hand. The fly ash reduces the cost production of concrete.
3. The percentage increase in compressive strength of concrete cubes is 32.12% at 0% to 10 % of Fly Ash for M 50 grade.

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