PERFORMANCE OF CONCRETE BY PARTIALLYREPLACEMENT OF CEMENT WITH FLY ASH AND SILICAFUME

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***Abstract*: High overall performance concrete seems to be higher preference for a robust and sturdy structure. A big quantity of spinoff or wastes consisting of fly-ash, copper slag, silica fume and so forth are generated via way of means of industries, which reasons environmental in addition to fitness troubles because of dumping and disposal. Silica Fume is maximum normally used supplementary cementitious substances which end result from the electrical furnace operation at some stage in the production. The Silica Fume and Fly Ash to the water permeability and power of concrete. Silica Fume and Fly Ash are excessive trails of concrete Proper advent of silica fume in concrete improve each the mechanical and sturdiness traits of the concrete. This kind of concrete is getting used in lots of huge initiatives as it's far in your price range in addition to long lasting and makes sure safety. This paper gift literature assessment on substitute of Cement via way of means of Silica Fume which incorporates modern-day and destiny tendencies of research. Fly ash and silica fume has taken the function of cement with inside the variety of 0%, 5%, 10%, 15% and 0%, 5%,7.5%, 12.5%. The compressive and cut up tensile power of the specimens are tested.**

***Keywords*: flyash, silica fume, compressive strength, split tensile strength.**

I. INTRODUCTION:

Concrete is the most generally used human-made product. In contrast to its internal complexity, versatility, durability, and economy it has been the most extensively used construction material with a production over six billion tons every year In India, Conventional concrete is regularly delivered with four fundamental parts to be specific Cement, Water (binder), the Crushed or uncrushed Stone and Natural Sand or Stone Dust. Not with standing the above fixings, maybe a couple extra chemicals are additionally added to the formula of concrete keeping in mind the end goal to upgrade a few properties. Certain materials of mineral root are additionally added to concrete to upgrade their strength and sturdiness properties of concrete materials, for example, fly ash, silica fume, which are for the most part fine, may be finer than cement, when added to cement in right extent can enhance the strength and durability of concrete enhanced and HPC is acquired in this way.

II. OBJECTIVES

The objectives of this study are as follows

a) To optimize the usage of cement with fly ash
b) To optimize the usage of cement with silica fume.
c) To evaluate the compressive and spilt tensile strength of concrete.

III. MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.15
2	Fineness	7.18%

3.1 Silica fume:-The production of silicon metal or ferrosilicon alloys produces silica fume as a byproduct. Concrete is one of the most beneficial applications for silica fume. It is a highly reactive pozzolan due to its chemical and physical characteristics. Concrete with silica fume can be extremely strong and long-lasting. Silicafume is available from concrete additive manufacturer sand, if specified, is simply added during the concrete manufacturing process. The concrete contractor must pay extra attention to the placement, finishing, and curing of silica-fume concrete Silica fume is available in both wet and dry forms for usage in concrete. Illustrated in the photo, it is commonly added during the manufacture of concrete at a concrete plant. Both central-mix and dry-batch operations have successfully manufactured silica fume-concrete. All aspects of handling silica fume and using it to generate consistent, high-quality concrete can be handled with ease.

3.2 Fly ash: Fly ash is a naturally cementitious substance produced as a by- product of coal combustion. Fly ash is retrieved from the precipitators installed in coal-burning power plants' smokestacks to reduce pollution. With the rising need for power and coal, it is projected that the number of thermal power plants would expand in the near future. Fly ash has a spherical shape and solidifies in the form of a suspension in exhaust gases. Fly ash is made of silica (SiO2), alumina (Al2O3), and iron oxide (Fe2O3) (Fe2O3). The physical and chemical requirement of fly ash varies depending on the need and use. Fly ash is divided into two categories, Class F and Class C are two different types of classes. The amount of calcium, silica, alumina, and iron in the two classes differs significantly. The chemical makeup of the fly ash is determined by the qualities of burned coal, such as anthracite and bituminous. When older, harder anthracite burns, Class F fly ash is produced, which is pozzolanic in nature and contains10% lime (Cao). Class F fly ash with glassy silica and alumina requires a cementing agent such as Portland cement, quicklime, or hydrated lime to have cementitious properties.

IV. EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 to4.

Table 2: Compressive strength of concrete with Silica fume as partial replacement of cement in concrete

Sl.no	SILICAFLUME	7days (N/mm^2)	28 days (N/mm^2)
1	0%	42.77	61.54
2	5%	46.40	66.67
3	7.5%	49.84	71.93
4	12.5%	46.19	66.10

Table 3: Compressive strength of concrete with Flyash as partial replacement of cement in concrete

Sl.no	FLYASH	7days (N/mm^2)	28 days (N/mm^2)
1	0%	42.77	61.54
2	5%	43.67	63.39
3	10%	45.52	65.50
4	15%	48.55	69.47

Table 4:- Compressive strength of concrete with Silica fume and Flyash as partial replacement of cement in concrete

Sl.no	FLYASH +SILICAFLUME	7days	28 days
	0%	42.77	61.54
1	15FH+7.5%SF	53.88	75.89

4.2Split Tensile strength results

At the age of 7 and 28days, the cylindrical specimens (150mm diameter x 300mm height) were tested for evaluating the split tensile strength. The experiment is performed by putting a cylindrical sample horizontally between a compression testing machine loading surface and the load is applied until the cylinder fails along the vertical diameter.

Table 5: Split Tensile strength of concrete with Silica fume as partial replacement of cement in concrete

Sl.no	SILICAFLUME	7days (N/mm^2)	28 days (N/mm^2)
1	0%	4.22	6.08
2	5%	4.51	6.49
3	7.5%	4.92	7.11
4	12.5%	4.60	6.67

Table 6: Split Tensile strength of concrete with Flyash as partial replacement of cement in concrete

Sl.no	FLYASH	7days(N/mm^2)	28 days (N/mm^2)
1	0%	4.22	6.08
2	5%	4.27	6.21
3	10%	4.46	6.43
4	15%	4.72	6.76

Table 7: Split Tensile strength of concrete with Silica fume and Flyash as partial replacement of cement in concrete

Sl.no	FLYASH+SILICAFLUME	7days (N/mm2)	28 days (N/mm2)
	0%	4.22	6.08
1	15FH+7.5%SF	5.28	7.44

V. CONCLUSION

In this study the concrete ingredient like cement is replaced by Fly ash and Silica fume with 0%, 5%, 10%, 15% and 0%, 5%, 7.5%. 12.5%.

- The Compressive strength of normal concrete at the age of 7days and 28days are N/mm^2 are 42.77 & 61.54N/mm^2.
- At 7.5% replacement of cement by Silica fume the achieved compressive strength of concrete is 49.48N/mm2 for 7 days and 71.93 N/mm2 for 28 days.
- At 15% replacement of cement by Fly ash the achieved compressive strength of concrete is 48.55 N/mm2 for 7 days and 69.47 N/mm2 for 28 days.
- At 7.5% replacement of cement by Silica fume the achieved Split tensile strength of concrete is 4.92 N/mm2 for 7 days and 7.11 N/mm2 for 28 days.
- At 15% replacement of cement by Fly ash the achieved Split tensile strength of concrete is 4.72 N/mm2 for 7 days and 6.76 N/mm2 for 28 days.
- At Combined replacement of cement by Silica fume and Fly ash the achieved compressive strength of concrete are 53.88 N/mm2 for 7 days and 75.89 N/mm2 for 28 days.
- At Combined replacement of cement by Silica fume and Fly ash the achieved Split tensile strength of concrete is 5.28 N/mm2 for 7 days and 7.44 N/mm2 for 28 days.

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