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The Effect of Flyash and Foaming Agent on Setting Time and Strength of OPC Cement- A Experimental Approach

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Abstract: concrete is veritable and relatively high cost material used in construction industry .concrete utilize cement as only binding material which harden with time and give strengthen to structure .the production pf opc cement produce large amount of heat ,co₂ and lot of expenditure involved .this, may degrade the environment and also increase the cost of construction .therefore ,now a days fly ash is used to as a replacements of cement in concrete .fly ash is waste generated by thermos plant is a such a big environments concern .in this paper a researches carried out to study the utilization of fly ash in opc cement with foaming agents as a partial replacements of cements as well as an additive so as to provide an environmentally consistency way of its disposal and reuse and also comparing the compressive strength with respect to different ratio of mixing .the main parameter investigated in this study is detailed experimental study on consistency percentage , setting time (initial setting time and final setting time)and compressive strength at age of 7 and 28 days of different mix proportion of fly ash , opc and ppc cement as 1:3,1:4,1:5and 1:6.

Keywords: fly ash, foaming agent, consistency percentage, setting time, compressive strength.

I. INTRODUCTION

In India, currently a large amount of fly ash is generated mainly in thermal power plants with an imperative blow on environment and living organism.

The use of fly ash in concrete can reduce the consumption of natural resources and also diminishes the effect of pollutant in environment or its reduces the unwanted materials from the environment. In recent studies, many researchers found that the use of additional cementitious materials likes fly ash in concrete is economical and reliable. This investigation is a part of experimental programme or approach carried out to study the utilization of non-conventional building material (fly ash) for development of new materials and technologies and replacement by the cement . the history of cementing material is as old as the history of engineering constructions .

A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement mixed with aggregate (fine and coarse) produces mortar for masonry, or with sand and gravel, produces concrete. Cement is the most widely used material in existence and is only behind water as the planet's most-consumed resource and also cheapest material and available in all kind of areas . A foaming agent is a material that facilitates formation of foam such as a surfactant or a blowing agent. A surfactant, when present in small amounts, reduces surface tension of a liquid (reduces the work needed to create the foam) or increases its colloidal stability by inhibiting coalescence of bubbles and smooth the mixture which is help in the hydration of cement and increase the setting time of cement.

II. RESEARCH SIGNIFICANCE

Durability of a reinforced concrete structure and plain concrete structure depends on the environment in which it is exposed, as also on the time and properties of concrete (types of cement and adding admixture). So it is required to investigate the effect of fly ash as used cement and using foaming agent as a admixture to improve consistency percentage , setting time (initial setting time and final setting time)and compressive strength properties of different types of concrete .

III. EXPERIMENTAL PROGRAMME

The experimental program was planned to investigate the effect of fly ash replace as cement and using foaming as a admixture on consistency percentage , setting time (initial setting time and final setting time)and compressive strength. This study includes determination of compressive strength (up to 28days) of mortar specimen made and cured by using normal water .

Variable Contents cement Portland cement conforming to IS 8112: 2013 was used as binding materials. Its physical properties are given in

Table: 1 Physical property of cement

s.no:	Characteristic	Obtained	Required
1.	Fineness m ² /kg	227.4	>225
2.	Soundness By Le Chateliers Method, mm	10	<10
3.	Setting time(minutes) (a) Initial (b) Final	35 177	>30 <600
4.	Compressive strength (a) 72 ± 1,h (b) 168 ± 2,h (c) 672 ± 4,h	28 39.2 49.9	>23 >33 >43
5.	Specific gravity	3.2	3.2

A. Test For Hardness

Compressive Strength of mortar :mortar specimen of 70mmX70mmX70mm were casted and tested in compression testing machine after 7, 28 and 90 days of curing in normal water temperature compression testing machine of 2,000 KN capacity as per IS: 5161959 (2004). Compressive strength $f_c = P/A$, where, P is load & A is area of cube The result of Compressive strength is shown in table.

IV. MORTAR QUALITY

Two different mortar mixed mixes, namely Ppc cement A , B is foaming agent and C fly ash were used. And ratio is C:A. Relevant information of the mortar mixes is given in Table.

s.no:	1:3	1:4	1:5	1:6
With out B				
(a)consistency percentage	28	28	29	30
(b) setting time (minutes)				
i.initialsetting time	30	32	35	35
ii.finalsetting time	540	557	577	585
(c)Compressive strength				
(a) 72 ± 1,h	100	100	100	100
(b) 168 ± 2,h	110	110	115	120
(c) 672 ± 4,h	120	120	125	130
With B				
(a)consistency percentage	26	26	26	26
(b) setting time				
i.initialsetting time	31	35	37	38
ii.finalsetting time	535	545	555	585
(C)Compressive strength				
(a) 72 ± 1,h	120	125	135	140
(b) 168 ± 2,h	125	130	140	140
(c) 672 ± 4,h	125	135	145	150



Fig1: consistency test



fig2: setting time test



Fig3: mixture of fly ash and cement



fig4: mixture of fly ash and cement with foaming agent



Fig5: cubes with ratio of 1:4 (fly ash: cement)



fig6: foaming agent



V. CONCLUSION

- A. Addition of foaming agent up to 20% with 26% of w/c ratio, slightly increase the initial setting time and hence can be used where early initial setting is required.
- B. Addition of foaming agent, w/c is reduced in between 5-7%.
- C. Addition of foaming agent, mortar become more workable.
- D. Addition of foaming agent up to 20% with 26% of w/c ratio, increase the compressive strength nearly twice time of original strength.
- E. Replaced the cement and utilization of wastage material like as form of fly ash.

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