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Etiquettes of Ground Granulated Blast Furnace Slag Infilled Concrete Column With Several End Conditions

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Abstract

The manufacturing of cement provides emission of many green house gases in atmosphere, which create global warming. Hence, the researches are currently research on cementing waste materials which without compromising on its strength and durability,. In this project compressive strength of concrete prepared with Ordinary Portland Cement (Ultratech) 53 grade, replaced by ground granulated blast furnace slag (GGBS).In this study, GGBS partially replaced at varying percentage of 11 to 75 %, at an interval of 25% and tested for its Compressive strength up to 28 days and those results were compared with conventional concrete. The overall test results shows that GGBS could be utilized in concrete as a partial replacement of cement which improves the mechanical properties of concrete.

Keywords– *GGBS, Portland cement,Green house gases*

I. INTRODUCTION

Concrete is one of the world's most used construction material due to its availability, durability and economyGreenhouse gas like CO2 causes global warming and it leads to about 65% of global warming. The global cement industry emits about 7% of greenhouse gas to the earth's atmosphere. To minimize this environmental impact alternative binding material are introduced to make concrete.GGBS, a by-product of iron manufacture, is a glassy, non-metallic granular material acts as pozzolana and is therefore combined with Portland cement.Moreover, it contains less free lime, which in its presence forms efflorescence and makes the resulting hardened cement more chemically stable. In addition, GGBS has a lower content of C3A than normal cement, thus decreasing the reactivity with sulphate.

II. OBJECTIVES

Experiment was conducted on concrete prepared by partial replacement of cement by GGBS ranging from 0 to 75% with an increment of 25%. Following are the main objectives of the investigation:

1) To investigate suitable substitute for ordinary Portland cement.

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2) To determine the percentage of GGBS which gives maximum strength when it was compared to the control mix concrete at different end conditions

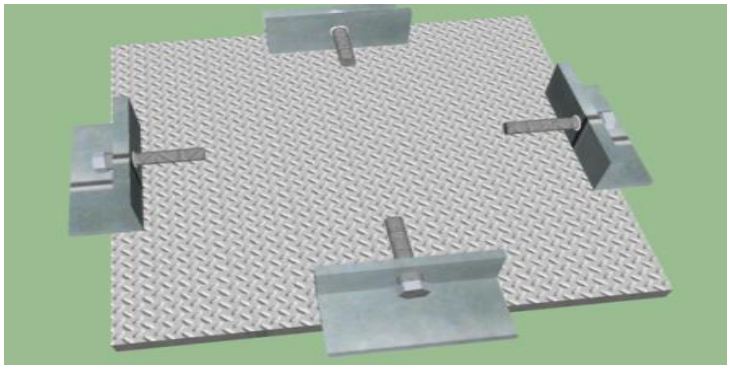

Fig. 1 Assembly for testing

III. MIX MATERIALS

TABLE I - PHYSICAL PROPERTIESOF GGBS

Sr.no	**Physical Properties of GGBS**	**Value**
1	Colour	off white
2	Specific gravity	2.9
3	Bulk density	1200 Kg/m^3
4	Fineness	350 m^2/kg

TABLE II- CHEMICAL COMPOSITION OF GGBS

IV. EXPERIMENTAL SET UP

Compressive Strength of Cubes:

Three cubes of size 150x150x150mm were casted to work out the 7thand 28th day's compressive strength of all the proportions.

TABLE III- COMPRESSIVE STRENGTH OF CUBES FOR 7 DAYS AND 28 DAYS

Mix Notation	**% replacement of cement by GGBS**	**Avg. Compressive Strength Mpa (7 Days)**	**Avg. Compressive Strength Mpa (28 Days)**

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C1	0%	19.71	31.86
C2	25%	20.97	33.10
C3	50%	21.65	34.92
C4	75%	20.12	32.31

A. Compressive Strength of Columns

Columns of size were tested for Compressive strength under universal testing machine with different end conditions. The compressive strength of concrete column with diff percentage of GGBS is found out.

TABLE V. COMPRESSIVE STRENGTH OF COLUMNS FOR DIFFERENT END CONDITION

Mix Notation	% replacement of cement by GGBS	Average Compressive Strength In Mpa (7 Days)				
		Both ends are fixed	One end fixed and one end pinned	Both ends are pinned	Both ends are fixed	One end fixed and one end pinned
C1	0%	10.76	10.45	9.92	16.19	15.68
C1	0%					
C1	0%					
C2	25%	11.076	10.76	10.36	16.73	16.30
C2	25%					
C2	25%					
C3	50%	11.37	11.03	10.83	17.18	16.66
C3	50%					
C3	50%					
C4	75%	11.03	10.53	10.28	16.65	15.95
C4	75%					
C4	75%					

The influence of GGBS on the Properties of concrete such as the compressive strength studied. An appreciable increase in the compressive strength is observed with the increase in the percentage replacement of cement by GGBS from 0 % to 75 %. With 25% replacement.

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Considering the strength criteria, the replacement of cement by GGBS is feasible up to 50%. Usage of GGBS in concrete can prove to be economical as it is having less cost than cement.

V. CONCLUSION

Based on experimental observations, following conclusions can be established:

1) GGBS concrete increases the compressive strength as compared with the conventional concrete.
2) Use of GGBS in concrete will minimize the disposal problem of GGBS and prove to be eco-friendly.

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