BEHAVIOR OF LIGHT WEIGHT FOAM CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH GGBS

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Abstract: This study has been undertaken to investigate the behavior of Foam Concrete when it is partially replaced by Ground Granulated Blast Furnace Slag (GGBS) with cement. The changes in the regular foam concrete are obtained by casting concrete cubes of various mix proportion. The aim of study is to obtain Economical foam concrete with High strength values.

Index Terms **– Foam Concrete, GGBS**

I. INTRODUCTION

Foam concrete also known as Cellular Light Weight Concrete (C.L.C) is made up of mainly cement, fly ash, foaming agent and water. Due to its light weight property it has a very good sound and thermal insulation as well as the dead load on structure is reduced resulting into great structural stability and economy in reinforcement can also be achieved. In this Experiment some amount of cement is replaced by Ground Granulated Blast Furnace Slag (GGBS), so as to obtain more economical product of Foam Concrete as well as GGBS which is a By-product of Steel industry but contains cementitious property can also be used up.

II. METHODOLOGY

After collecting the material, the mix design was formulated according to which the experiment was carried out. The cubes were casted for various ratios and the results were obtained for 7 days, 14 days and 28 days of moist water curing.

III. MATERIALS USED

1. Cement
   53 Grade OPC Cement.
2. Fly Ash
   Type C Fly Ash was obtained from the Thermal Power Plant.
3. Foaming Agent
   Synthetic based Foaming Agent was made available.
4. GGBS
   It is obtained from Iron slag which is quenched to obtain fine glassy granulated powder.
5. Water
   Potable water having a pH 7 was used during performing experiment.

IV. MIXING PROCEDURE

The Procedure of preparation of Foam Concrete is different from regular concrete. Here Fly Ash, Cement, GGBS and Water are mixed to form consistent slurry. Mean while Foaming Agent is added to water in specified proportion and then Foam is been obtained by using Foam Generator which is then added to the mixer to get the mix. This mix is then stirred about 10-15 minutes to obtain homogenous consistency. In this manner the Foam Concrete is been Prepared.

V. MIX PROPORTION

Table 5.1: The mix proportions used to make sample foam concrete.

Identification	GGBS Content in %	Fly Ash in Kgs	Cement in Kgs	GGBS in Kgs
M1	10	30	9.022	1.002
M2	20	30	8.020	2.005
M3	30	30	7.017	3.007

VI. CASTING

After mixing slurry and foam, it is placed in moulds as soon as possible. Before casting, the moulds should be cleaned properly. Then oil has to be applied to the moulds to prevent the sticking of concrete with the mould. As foam concrete has self-compacting property vibration is not required.

The size of the cube taken for the sampling: 0.15m x 0.15m x 0.15m

VII. CURING

The samples were moist cured for 7 days, 14 days and 28 days respectively with normal potable water.

VIII. RESULT

Table 8.1: Test results after 7 days of moist curing.

Identification	GGBS Content in %	Avg. Density in Kg/m^3	Mean Stress in N/mm^2
M1	10	1837.63	8.09
M2	20	1824.49	8.53
M3	30	1844.84	7.11

Table 8.2: Test results after 14 days of moist curing

Identification	GGBS Content in %	Avg. Density in Kg/m^3	Mean Stress in N/mm^2
M1	10	1837.63	10.76
M2	20	1824.49	11.11
M3	30	1844.84	9.33

Table 8.3: Test results after 28 days of moist curing

Identification	GGBS Content in %	Avg. Density in Kg/m^3	Mean Stress in N/mm^2
M1	10	1837.63	14.18
M2	20	1824.49	18.89
M3	30	1844.84	14

IX. CONCLUSION

From the above test results it is clear that when GGBS is replaced by 20% with cement it gives a higher compressive strength in comparison to other replacement. On 7th day it was 8.53N/mm ^{2}, on 14th day it was 11.11 N/mm^2 and on 28th day it was 18.89 N/mm^2 of curing, which was higher than 10% and 30%. Use of lightweight concrete as an alternative in construction can decrease the building's dead load as well as the force exerted on the structure due to earthquake excitations and the resultant collapse weight of the building if it falls down.

As there is increase in material cost, there is need to find cost saving alternatives. By using GGBS, we can construct it economically which will be environment friendly and sustainable material.

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