

EXPERIMENTAL STUDIES ON COMPRESSIVE STRENGTH OF CONCRETE BY REPLACING FINE AGGREGATE WITH BLAST FURNACE SLAGS

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ABSTRACT— In our world today, concrete has become ubiquitous. It is hard to imagine modern life without it. Approximately five billion tonnes of concrete are used around the world each year. The increasing popularity of concrete as a construction material is placing a huge burden on the natural sand reserves of all countries. In view of the environmental problems faced today considering the fast reduction of natural resources like sand and crushed granite aggregate, engineers have become aware to extend the practice of partially replacing fine aggregate with waste materials. In this present study blast furnace slag from two sources were replaced with fine aggregate in proportion of 20%, 30%, 40%, 50% and 60%, the compressive strength of concrete were studied at 3rd, 7th and 28th day. The optimum percentages of replacement of these materials were found out. The result obtained encourages the use of these materials as a replacement material for fine aggregate.

Keywords— Blast Furnace Slag, Ground Granulated Blast Furnace Slag, Fine aggregate replacement, light weight, Cement, Sand, Aggregate. etc.

1. INTRODUCTION

The government of India has targeted the year 2010 for providing housing for all the people. Such large scale construction projects require huge amount of money which contributes to about 70 percent cost in developing countries like India. The present need is to replace the scarce and costly conventional building materials by innovative, cost effective and environment friendly alternate building materials. For many years by-products such as fly ash, silica fume and slag were considered as waste materials which have been used in the construction for partially or fully replacing fine and coarse aggregates. Following a normal growth in population, the type and amount of waste materials have increased rapidly. Many of the non-decaying waste materials will remain in the environment for thousands of years. This is known as the Waste Hierarchy and its aim is to reduce, reuse, or recycle waste, being the preferred option of waste disposal. The microstructure of the concrete was also studied. The aim

of this research is to study the physical and mechanical properties of concrete, replacing fine aggregate with blast furnace slag and ground granulated blast furnace slag.

2. LITERATURE REVIEW

Arellano et al: studied the properties of lightweight concretes of activated metakaolin fly ash binders, with blast furnace slag aggregates. This work investigated geopolymeric lightweight concretes with density 1200, 900 and 600 kg/m³ by adding aluminium powder in some formulation. The microstructure of the concrete was also studied.

Yun Wang Choi et al: studied the characteristics of mortar and concrete containing fine aggregate manufactured from recycled waste polyethylene terephthalate bottles. The results obtained from the research are the sorptivity coefficient was reduced by 25% and the slump value was found to increase with the increase in percentage of polyethylene terephthalate bottle aggregates.

3. MATERIALS USED

The key materials used in this study were cement, sand, crushed stone, GGBFS and BFS. The cement used was an ordinary portland cement of grade 43 with a specific gravity of 3.14. The fine aggregate conforms to grading zone III as per IS 383-1970 was used in the present research. The specific gravity of the fine aggregate was 2.65. The coarse aggregate used was crushed stone with a maximum size of 20mm. GGBFS was collected from Jindal Steel Works (JSW), Meycheri, Salem. The specific gravity of GGBFS was 2.14. The molten BFS was crushed manually and was used in concrete. The potable water from the college was used for mixing and curing the concrete. Blast furnace slag from two sources were replaced with fine aggregate in proportion of 20%, 30%, 40%, 50% and 60%, the compressive strength of concrete were studied at 3rd, 7th and 28th day.

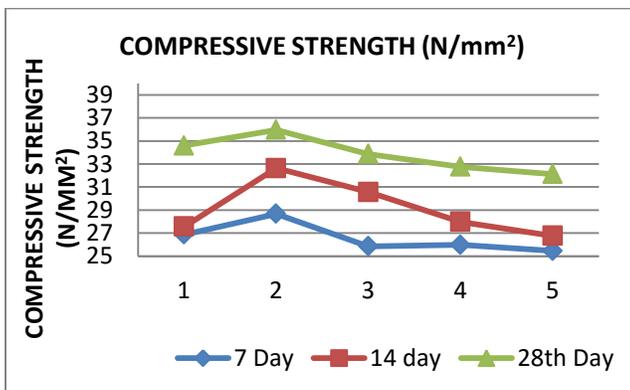
4. RESULT AND ANALYSIS

Concrete replacing fine aggregate with blast furnace slags has attained a good result in various proportions such as 20%, 30%, 40%, 50% and 60% at 7th day, 14th day and 28th day. Out of these proportions 30% replacing fine aggregate with slag gives better result.

Table -1: Compressive Strength of Concrete by Replacing Fine Aggregate With Blast Furnace Slags

Name	Sand replaced with Blast Furnace Slag.	Compressive Strength (N/mm ²)		
		3rd Day	7th Day	28th Day
1.	20%	26.87	27.56	34.60
2.	30%	28.67	32.64	35.97
3.	40%	25.86	30.56	33.87
4.	50%	25.98	27.98	32.76
5.	60%	25.45	26.77	32.12

The compressive strength increases from 28.67 N/mm², 32.64 N/mm² and 35.97 N/mm² at 7th day, 14th day and 28th day respectively.



The graph shows that 30% replacing fine aggregate with slag can be used in real time projects with can reduce the use of use of natural sand.

5. CONCLUSION

Concrete replacing fine aggregate with blast furnace slag has attained a good result in various proportions such as 20%, 30%, 40%, 50% and 60% at 7th day, 14th day and 28th day. The fine aggregate replaced with 30% of blast furnace slag increases the strength of concrete upto 35.97 N/mm² at 28th day. The use of blast furnace slag will reduce the cost of construction and as well as it is a very good alternative of natural sand.

6. REFERENCE

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7. BIOGRAPHIES



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