

EXPERIMENTAL STUDY ON GLASS FIBERED CONCRETE WITH GGBS

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Abstract: Concrete is the most widely used man-made construction material in the world. It is obtained by mixing cementitious materials, water, aggregate and sometimes admixtures in required proportions. In the present day construction industry needs of finding effective materials for increasing the strength of concrete structures. Hence an attempt has been made in the present experimental investigation to study the effect of addition of glass fiber at a dosage of 0.5% of the total volume of concrete and cement was replaced by 5%, 10% and 15% with GGBS. Cubes were casted of size 150×150×150mm and testing done for 7 and 28 days. Investigation was done for M30 grade concrete. Compressive strength was compared for normal concrete and GGBS glass fiber concrete. The strength was increased with 10% when compared with normal concrete.

Indexterms: GGBS, glass fibers, Cement, Aggregates.

1.INTRODUCTION 1

The main problem facing now a days is the environment problem. The ordinary Portland cement is an very important material in the construction industry. However, the cement contains the pollutants the utilization of the cement will cause the pollution to the environment. The grading of cement is done by the compressive strength of the material in the time period. The grading of cement are 43 and 53. In this research 53 grade of cement is taken.

2. MATERIALS USED 2

2.1 Cement 1

In this experiment 43 grade ordinary Portland cement is used. The testing of cement is done as per IS Code the specific gravity of cement found is 3.10.

Properties of cement

Property	value
Specific gravity	3.15
Fineness of Cement by Sieve	4%
Initial setting time	55min
Final setting time	9 hour 30 min
Standard consistency	30%
Compressive strength	54.2 N/mm 2

2.2 Fine Aggregates 2

“Fine aggregate” is defined as material that will pass a No. 4 sieve and will, for the most part, be retained on a No. 200 sieve. For increased workability and for economy as reflected by use of less cement, the fine aggregate should have a rounded shape. The purpose of the fine aggregate is to fill the voids in the coarse aggregate and to act as a workability agent.

Properties of fine aggregates

Description	Result
Sand zone	Zone 3
Specific gravity	2.59
Free moisture	1%
Bulk density of fine aggregates	1385 kg/m ³

2.3 Course Aggregates 3

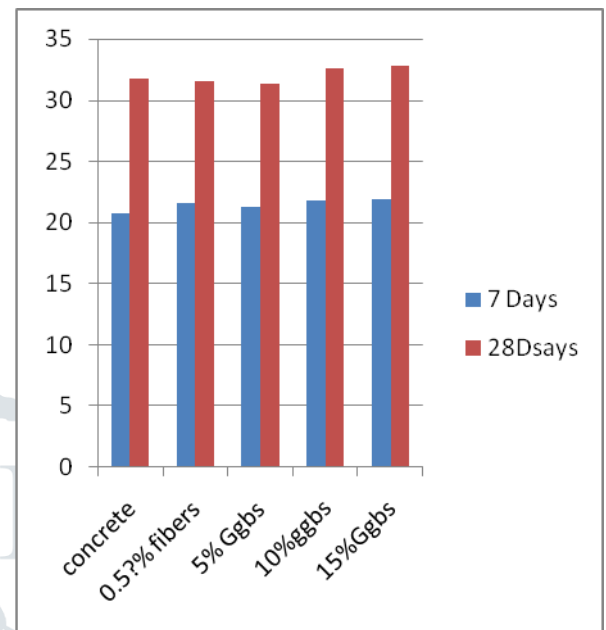
In this experiment the locally available aggregates are used and the specific gravity of course aggregate is done by using the IS2386 part 3 1963 code. The specific gravity is found 2.84. The course aggregates which are used of 20mm size.

Properties of coarse aggregates

Description	Test results
Normal size	20mm
Specific gravity	2.9
Impact value	10.5
Water absorption	0.15%
Sieve analysis	20mm
Aggregate crushing value	20.19%

composites(PMC).The principal advantages of glass fibers are low cost, high tensile strength, high chemical resistance and excellent insulating the porosity of concrete.(Al-otaibi,2008).

RESULTS



2.4 Water 4

The least expensive but the most important ingredient of concrete is water. The water which is used for mixing concrete should be clean and free from harmful impurities such as oil, alkali, acid etc. portable water was used for mixing and curing work.

2.5 Properties of GGBS 5

GGBS(Ground-granulated blast-furnace slag(GGBS or GGBFS)is obtained by quenching molten iron slag(a by-product of iron and steel making)from a blast furnace in water or stream, to produce a glassy, granular product that is then dried and ground into a fine powder.

Addition of slag in cement increases the durability properties of concrete and it also reduce Concrete is mostly used man-made construction material in the world. It is obtained by mixing of two components i.e aggregate and paste. usually the paste mix of Portland cement and water, binds the aggregate(usually sand and gravel or crushed stone)into a rocklike mass known as concrete.

2.6Glass fibers 6

Glass fiber also called fiberglass. It is material made from extremely fine fibers of glass fiber is a light weight, extremely strong, and robust material. Although Strength properties are somewhat lower than carbon fiber and it is less stiff, the material is typically far less brittle, and the raw materials are much less expensive. Its bulk strength and weight properties are also very favorable when compared to metals, and it can be easily formed using molding processes. It has remarkable physical and mechanical assets. GFRC properties are dependent on the quality of materials and accuracy of production method. In the most of glass fibers the content of glass fibers differ from 3 to7 percent by weight however, when the fiber ratio goes up density declines. Glass is the oldest, and most familiar, performance fiber. Fibers have been manufactured from glass since the 1930s. The Glass fibers are the most common of all reinforcing fibers for polymeric matrix

5. CONCLUSIONS 5

- It is obligatory to design the mix for high strength concrete.
- Design mix for a site/construction results in economy.
- By designing a mix, we can achieve the required compressive strength and workability by consuming minimum quantity of concrete materials.
- There is the relationship between aggregate size and quantity to the final strength of concrete .The study revealed a decrease in strength with increase in aggregate quantity and decrease in strength with decrease in aggregate sizes.
- It is therefore recommended that contractors of civil works appreciate and also take advantage of integrity and quintessence of concrete mix designs .Further work is also required in order to investigate the integrity of the other existing mix design methods and to recommend a particular mix design for particular project.
- It is suggested that all the contractors/builders should get the design mix done for bringing quality control
- The scope of present investigation deals with strength properties of concrete, on the effect of partial replacement of cement by using GGBS(I.E5%,10%and 15%) was used in concrete mix containing composite glass fibre are taken as 0.5%.

- It is found that by partial replacement of cement with GGBS and glass fiber helps to improve the strength properties of concrete substantially when compared to normal mix concrete.
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conventional concrete at 25% of roof tile aggregate replacement. The workability of roof tile waste concrete is in the range of medium. Overall, the replacement of tiles in concrete is satisfactory for small constructions.

REFERENCES

1. Being the major component of structure, many researchers have been done on concrete to improve its properties in every possible manner to develop a sustainable concrete mass. The concrete can be strengthened only by the replacement of its ingredients by better ones. Not only replacing by some material but using an waste material makes the environment friendly at the same time more suitable to construction. In this aspect lot of researches have been done on using the tile aggregate in concrete which is a waste material directly from industry or indirectly from demolition of a structure. The present study is focused only on the literature related to usage of tile aggregate in concrete as a replacement to coarse aggregate. The details of literature review are given below.
2. **E. MADHAVI , RAHUL NAYAK (2016)** :The objective of this research work is to reduce the cost of the construction. Now a days the industrial wastes are rapidly increasing more. To utilize such materials and reduce such type of waste in environment. The cement is replaced by the GGBS and fly ash with bacteria of 106 bacillus pasteurii in M40 mix. the GGBS and fly ash as taken in the proportions of 10% by weight of cement. From this research the results are much more better as compare to the convention concrete.
3. **G.SAI CHAND (2017)** : The tile waste based concrete, coarse aggregates were replaced by 20mm down size, tile wastes by 0% , 5%, 10%, 15%, 20% and 25% and also the fine aggregates are partially replaced by granite powder. The average maximum compressive strength of roof tile aggregate concrete is obtained at a replacement of 25%. A reduction of 10-15% of strength is observed compared to conventional concrete at 25% of roof tile aggregate replacement. The workability of roof tile waste concrete is in the range of medium. Overall, the replacement of tiles in concrete is satisfactory for small constructions.
4. **Aruna D (2015)** : For tile waste based concrete, coarse aggregates were replaced by 20mm down size, tile wastes by 0% , 5%, 10%, 15%, 20% and 25% and also the cement is partially replaced by fly-ash. The average maximum compressive strength of roof tile aggregate concrete is obtained at a replacement of 25%. A reduction of 10-15% of strength is observed compared to
5. **ETAVENI MADHAVI, T. DIVYA BHAVANA (2016)**: The present paper is aiming to the study of strength characteristics of a bacterial concrete using GGBS and fly ash at a partial proportions. Also aims to reduce the cost of the construction.
6. **B. TOPÇU AND M. CANBAZ (2010)**: The amount of tile waste generation is enough to use in concrete as a replacement to coarse aggregate. The use of ceramic tile waste has a positive effect on environment and in the cost aspects too. By the use of tile aggregate, the self weight of concrete is reduced about 4% which makes the structure economical. Coming to the strength aspect, the tile aggregate replacement has a negative effect on both the compressive and split tensile strength of concrete. But this paper studied maximum replacements of tile waste which can be further divided into smaller percentages and can be utilized in concrete with desirable properties.
7. **PROF. PANKAJ B. AUTADE, ANIL B WAKANKAR (2016)**:“A study on use of in ground granulated blast furnace slag in concrete”. In present paper focuses on using GGBFS as replacement material to cement in different 0%,020,30% and 40% by weight of cement and glass fiber is also added to concrete in different proportion 0%,0.03% and 0.06% by total volume.
8. **Md Daniyal and Shakeel Ahmad(2015)**: A large quantity of ceramic materials goes into wastage during processing, transporting and fixing due to its brittle nature. The crushed waste ceramic tiles were used in concrete as a replacement for natural coarse aggregates with 10%, 20%, 30%, 40% and 50% of substitution in concrete. The study states that the use of ceramic tile aggregate in concrete enhances its properties and it has been observed an increase in both compression and flexural strength.



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