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STUDY OF CONCRETE BY PARTIAL REPLACEMENT OF CEMENT BY GGBS AND FINE AGGREGATE BY COPPER SLAG

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Abstract - *Concrete is one of the major constituents in construction work. Many Waste products are used as aggregate for concrete to improve the strength and durability. GGBS is a one of the supplementary material to replace with cement to reduce the consumption of cement and Copper Slag is the Byproduct material from the manufacturing of copper. A large quantity of copper slag disposed as a waste in landfills to make an affects to the environment. This study is to evaluate the possibility of usage of GGBS and Copper Slag. In this Study, the usage of GGBS for partial replacement of cement and Copper Slag for partial replacement of fine aggregate with the proportion of 10%, 20%, 30%, 40% and 50% with mix design of M30 Grade. Hardened concrete test such as compressive strength, tensile strength can be take. The resistance of sulphate attack determine with expose in sulphate solution which results less attack of acid.*

Key Words: **Ground Granulated Blast Surface (GGBS), Copper Slag, High Performance Concrete**

1. INTRODUCTION

Civil engineering practice and construction works in India depend to a very large extent on concrete. Concrete basic constituents are cement, fine aggregate (sand), coarse aggregate (granite chippings) and water. Hence, the overall cost of concrete production depends largely on the availability of the constituents (and selected additives). The continuously growing construction industry has posed the possibility on depletion of natural aggregates in the future that would increase the cost of concrete material. So the need for replacement of present aggregates is a growing concern to meet the demand for aggregates in the structures. Thus alternative options are adopted for non-load bearing walls and non structural floors in buildings. Different alternative materials such as recycled aggregate, foundry sand, Copper slag, GGBS etc. In this project, use copper slag as replacement of fine aggregate and GGBS as replacement of cement. The usage of GGBS is to make "High Performance Concrete" and the usage of Copper slag is to improve the strength and the results indicates that water demand reduced almost 20% by using copper slag compared to other mixtures.

1.1 OBJECTIVES

The objective of this study is to evaluate the possibility of usage of GGBS and Copper Slag which results "High Performance Concrete".

To study the strength and durability of the concrete. Copper slag reduces the cost of concrete.

1.2 SCOPE

The scope of this project is to make a use of copper slag and GGBS is to replace on concrete to gain the strength as "High Performance Concrete".

2. MATERIAL

2.1 GROUND GRANULATED BLAST SLAG

GGBS is a cementitious material and byproduct from the blast furnace. It is a mixture of iron ore, coke and limestone which heats at temperature about 1500C. GGBS is used in concrete as a partial replacement material to improve the performance as high. It may be to reduce the heat of hydration and to avoid retardation in cold weather. GGBS high in calcium silicate hydrates which improves the strength, durability and appearance of the concrete. GGBS is used to make durable concrete structures in combination with OPC.

Two major uses of GGBS are in the production of quality improved slag cement namely Portland Blast Furnace cement (PBFC) and High slag Blast Furnace cement (HSBFC). GGBS content ranging typically from 30 to 70% and in the production of ready mixed or site batched durable concrete. Concrete made with GGBS cement sets more slowly than conventional concrete, but also continuous to gain strength which gives results in lower heat of hydration and lower temperature rises and makes avoiding cold joints easier.

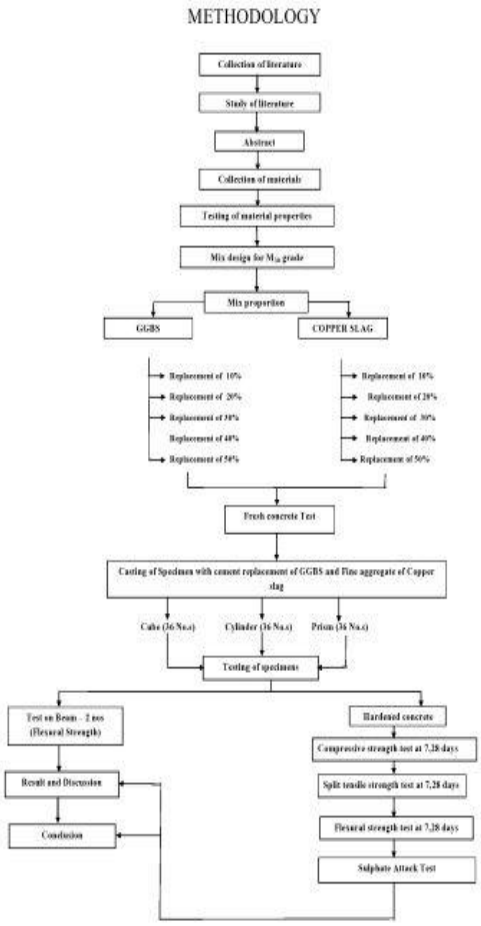
2.2 COPPER SLAG

The utilization of solid waste is the challenge for the civil and environmental to utilize the waste from different industry to the sustainable development with cost concern of the present materials. Copper Slag is a byproduct obtained during refining of copper. It can be used as a abrasive tools and construction. It contains iron oxides and silicon oxides.

In construction, copper slag used in concrete as a partial replacement for fine aggregate. The strength and durability were improved when copper slag used in concrete.

The use of copper slag in the production of cement, mortar and concrete as mixed with lime stone powder, dust, cement replacement use as partial replace of coarse and fine aggregates. The usage of this slag reduces the usage of primary materials as well as reduces the construction depth which in turn reduces energy demand in building.

3. METHODOLOGY



4. LITERATURE REVIEWS

GGBS is used to replace with cement on concrete to reduce the consumption of cement. A Study about the partial replacement of GGBS for cement on concrete.

The mix design as M20 Grade and the proportion is 0%, 20%, 30%, 40% and 50%. It is proved that GGBS can be used as an alternative material for cement, reducing cement consumption and reducing the cost of construction [1].

In this present work M20 grade concrete was considered. For the present investigation, mix design for M20 grade of concrete was carried out. The proportion of the materials by weight was 1:1.65:2.84 (cement: fine aggregate: coarse aggregate) with w/c ratio 0.53. The cement constituent was subsequently replaced with percentage of GGBS (by mass). The percentage of cement was 0%, 10%, 20%, 30% and 40% [2].

The partial replacement of Copper slag for fine aggregate on concrete. The mix design as M25 Grade and the proportion is 10%, 15% and 20%. In this report, the results indicates that water demand reduced almost 22% by using copper slag as a partial replacement material. The strength and durability were improved with increase of copper slag content [3].

The partial replacement of Copper slag for fine aggregate on concrete. The mix design as M40 Grade and the proportion is 20%, 40%, 60%, 80% and 100%. Concrete is tested by the test of ultrasonic pulse velocity test. . This report concluded that it increase the density of concrete and increase the self weight of concrete [4].

A paper studied about the partial replacement of GGBS for cement on concrete to determine the water binder ratios and GGBS level on activation energy. A number of mixtures with different water-binder ratios (ranging from 0.30 to 0.51 and tested at 0.5, 1, 2, 4, 8, 16, and 32 days. The activation energies were determined using the American society for testing and materials and the FHP method. Different grades of concrete (C45 and C75) used and this report concluded that values of activation energy for both grades of concrete determined by using this two methods to be similar [5].

A paper studied about the partial replacement of Copper slag for fine aggregate on concrete. The mix design was M40 Grade of concrete and the proportion 25%, 50%, 75% and 100%. The sulphate attack test indicates the results that depth of penetration is 8.5mm and after dipped in sulpahate solution, white patches were found on the surface of the concrete. The results of this study show that up to 40% fine aggregates in concrete can be safely replaced with copper slag [6].

This paper studied about the partial replacement of Copper slag for fine aggregate on concrete. The mix design was M20 Grade of concrete and he proportion 20%, 30%, 40%, 50%, 60% and 70%. The maximum compressive strength attained at 50% as 38.75N/mm2. In this case concluded that Copper slag behaves like river sand and when percentage of replacement of copper slag increases, the unit weight of concrete is increases [7].

5. CONCLUSION

From the above journals, it is concluded that GGBS and Copper Slag plays a vital role in concrete and performs highly in concrete to improve he durability and strength.

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