

Review of Mechanical Properties of High Strength Concrete Incorporating with Copper Slag

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Abstract- *This paper deals with Mechanical Properties of High Strength Concrete Incorporating with Copper Slag. During cement, manufacturing process tremendous emission of airborne pollution in form of dust, gases, noise & vibrations takes place, which damages Environment and the excessive amount of CO₂ emissions during cement manufacturing directed in atmosphere causes the global warming. Therefore, there is, need to find the replacement of the Cement. Copper slag is an abrasive blasting grit (by-product) made of granulated slag from metal smelting process in which Sulphur dioxide is released. The objective of this study is to use copper slag mix as a new and innovative sustainable building material which is an alternative to conventional aggregate. So that, we decided that using the copper slag as a replacement to the cement. It is much needed for the environment and making the construction cost lesser by using it.*

Indexed Terms- *Mechanical Properties, High Strength Concrete, Copper Slag, cement, CO₂, environmental problems.*

I. INTRODUCTION

The construction of modern and complicated civil engineering structures has become a part of today's fast developing world. Concrete known for its high compressive strength, workability and durability plays a vital role in construction. In the recent times construction activity has increased many times in India.

Fast growth in construction industry in our country relies on the use of natural resources, for infrastructures development. Large-scale production of Portland cement and the rapid exploitation of the environment for aggregate in the last decade, have a dramatic impact on the environment. The available of

the natural resource is reducing in India, slowing down the growth in construction activity. The rapid depletion of the natural resources along with the substantial increase in waste generation poses a serious problem.

In day-to-day life, several types of by-product and waste materials are generated through commercial/industrial activities. These waste materials need to be effectively recycled or safely disposed. The utilization of such materials in concrete does not make it economical but also helps in decrease disposals. Hence appropriate technology is needed to know their use in concrete. Utilizing these waste materials for the manufacture of SSC, makes SSC economical, reduces disposal problems. A fine example of use of waste material in concrete would be copper slag, which can replace either cement or aggregate partially or completely.

II. LITERATURE REVIEW

2.1 G Murali Krishna, K. Nandini

This project reports on an experimental program to investigate the effect of using copper slag as a replacement of fine aggregate on the strength properties. Copper slag is the waste material of matte smelting and refining of copper such that each ton of copper generates approximately 2.5 tons of copper slag. Copper slag is one of the materials that is considered as a waste which could have a promising future in construction Industry as partial or full substitute of fine aggregates.

2.2 K.Ganesh Kumar, Sumathi Rajan

This study reports the potential use of granulated copper slag from Sterlite Industries as a replacement for sand in concrete mixes. In this project work, the concrete grade M25 was selected and IS method was used for mix design. The properties of the material for

cement, fine aggregate, coarse aggregate, and copper slag were studied for mix design. The effect of replacing fine aggregate by copper slag on the compressive strength and split tensile strength are attempted in this work.

2.3 Wei Wu, Weide Zhang

This study investigated the mechanical properties of high strength concrete incorporating copper slag as a fine aggregate and concluded that less than 40% copper slag as sand substitution can achieve a high strength concrete that comparable or better to the control mix, beyond which however its behaviours decreased significantly. The workability and strength characteristics were assessed through a series of tests on six different mixing proportions at 20% incremental copper slag by weight replacement of sand from 0% to 100%. The results indicated that the strength of the concrete with less than 40% copper slag replacement was higher than or equal to that of the control specimen and the workability even had a dramatic growth.

2.4 Khalifa S.Al-Jabri, Makoto Hisada, Abdullah H.Al-Saidy, S.K.Al-Oraimi

This research study was conducted to investigate the performance of high strength concrete (HSC) made with copper slag as a fine aggregate at constant workability and to study the effect of superplasticizer addition on the properties of HSC made with copper slag. Two series of concrete mixtures were prepared with different proportions of copper slag. The first series consisted of six concrete mixtures prepared with different proportions of copper slag at constant workability. The water content was adjusted in each mixture in order to achieve the same workability as that for the control mixture. Twelve concrete mixtures were prepared in the second series. Only the first mixture was prepared using superplasticizer whereas the other eleven mixtures were prepared without using superplasticizer and with different proportions of copper slag used as sand replacement.

2.5 K. S. Al Jabri

This paper presents results from an experimental investigation carried out to study the potential use of copper slag as fine aggregate on the strength of both and high strength concrete. Concrete mixtures were prepared using different proportions of copper slag as

partial and full replacement of fine aggregate. The percentage of copper slag added by weight ranged between 10-100% of sand used in concrete

2.6 Mr. Suhas S. Malkhare, Prof. Atul B. Pujari

This paper presents the experimental investigation of properties of concrete using copper slag as replacement material of fine aggregates to increase the hardened concrete properties such as compressive strength, split tensile strength, flexural strength and ultrasonic pulse velocity of concrete. The present study encouraged the use of industrial by-product or waste copper slag as replacement material of fine aggregates in concrete. Mix proportion has to be done for M25 grade of concrete with water cement ratio 0.50. The fine aggregate is replaced with copper slag in proportions of 0%, 20%, 30%, 40%, 50%, 60%, 80%, and 100%.

2.7 K. Mahesh Babu, K. Sudhakar Reddy

The present paper explains about the utilization of high-volume copper slag in concrete. The study leads towards cleaner production, by utilizing industrial by-product i.e., copper slag as a replacement to natural river sand as fine aggregate. In this literature several studies have highlighted the various aspects of copper slag in developing it as a valuable resource. However, there are very limited studies available about the performance of copper slag in high strength concrete. The main aim of the present research is to make the structural high strength concrete by using copper slag. This research work was carried out in two phases to find the strength of concrete.

CONCLUSION

So, we conclude that, the Copper slag can be used as a construction material as a partially replacement of the cement in construction of high Strength Concrete. The use of HSC for construction, especially for multi-story buildings, has become very common in industrialized and developing countries. As per the research papers we will further cast the concrete blocks 0%, 5%, 10%, 15% and 20% replacement of Cement by Copper slag as per the requirement and various tests as well as Mechanical Properties Test will be conducted after curing period of 7 days and 28 days.

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