A REVIEW PAPER ON CUPOLA SLAG WASTE AS APARTIALLY REPLACEMENT IN COURSE AGGREGATE IN CONCRETE

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Abstract - Cupola Slag Waste As a Partially Replacement of Coarse Aggregate in Concreting is expected that in upcoming day, the community of civil engineering have to product structures with the concept of sustainable development by using high performance material and new concept with law environmental impact which per produced at a reasonable cost.

Now a days waste materials are utilized in the preparation of conventional concrete. In the present work the waste material considered is cupola slag which is by-product of cast iron manufacturing.

The design mix for M20 grade concretes were arrived and the target strength was found to be 23.41 N/mm^2 (7 Days) respectively. Cupola slag was used in concrete as partial replacements for fine and coarse aggregates (20%) to ascertain applicability in concrete.

Since the disposal of cupola slag in open area causes environment pollution, it can be recycled for use in construction industry without producing any harm to human and environment.

The concrete with cupola slag as partial replacement for coarse aggregates gives less strength when compared to fine aggregates.

Ordinary Portland cement of grade 53 will use in this project. Cubes of size 150mmX150mmX150mm is used. The specimens will be cure for the period of 3days, 7 days, 14 days & 28 days before crushing. The strength of Different concrete for 7 days & 28days check in compression testing machine.

Key Words: Increases Compressive Strength, Use Waste Material, Cupola Slag, Replacement In Course Aggregate furnace slag, sand

1. INTRODUCTION

At present, development in India is mainly by implementation of infrastructure projects. Due to that construction projects are executed at very rapid rate. In the developing country like India, availability of natural resources is also an influencing factor apart from funding due to this rapid infra- structural growth it requires large amount of construction material like cement, aggregate ,wood etc. R.C.C. structures are preferred over steel structures in India which requires larger quantity of concrete. Since availability of natural resources of concrete is limited as we get it from natural deposits at present, there is a need to develop a new material that can effectively replace with conventional without compromising with strength and durability properties of concrete.

History of Concrete

The word concrete comes from the Latin word "concretus" [meaning compact or condensed], the perfect passive participle of "concrescere", from "con-" [together] and "crescere" [to grow].Concrete was used for construction in many ancient structures. Concrete was a new and revolutionary material. Laid in the shape of arches, vaults and domes, it quickly hardened into a rigid mass, free from many of the internal thrusts and strains that troubled the builders of similar structures in stone or brick.

Some have stated that the secret of concrete was lost for 13 centuries until 1756, when the British engineer John Smeaton pioneered the use of hydraulic lime in concrete, using pebbles and powdered brick as aggregate. However, the Canal du

Midi was built using concrete in 1670, and there are concrete structures in Finland that date from the 16th century. Producing Portland cement method was patented by Joseph Asp din on 1894.

History of Cupola

Cupola furnaces were built in China as early as the Warring States period, although Donald Wagner writes that some iron ore melted in the blast furnace may have been cast directly into moulds' modern cupola furnace was made by French scientist and entomologist René-Antoine Ferchault de Reaumur around 1720.

2. LITERATURE REVIEW

Wang et.al (1972) [1] studied the response of rigid pavements subjected to wheel loadings using linear finite element model. The slab was modeled with medium thick plate elements assuming Kirchhoff plate theory. The foundation was considered to be as an elastic half space. Slab stresses and deflections were computed using finite element model with both a continuous foundation and Winkler foundation, and were compared to stresses computed using Westergaard's equation

M. Soliman (2013) [2] till date everyone has been using marble as a decorative building material. This research paper gives us other aspects of marble and its waste dust like its severe effect on environment, health and other economical uses. In the above study it has been found that the waste marble dust can be replaced by sand resulting the improvement, workability & performance of concrete. This waste marble dust is produced during the process of cutting,

Mohammed Nadeem and Arun D. Pofale et al. (2012) [3] replaced Coarse and fine aggregate by using industrial slag of partial replacement of 0, 30, 50, 70 and 100%. They Prepared M20, M30, and M40 grades were considers for a W/C ratio of 0.55, 0.45 and 0.40. They study in all the parameters compressive strength, split tensile strength and flexural strength, also they observed workability properties of concrete. They observed as 100% replacement there is 2 to 7% increase in compressive strength while in split tensile strength and flexural strength they observed increment is range of 5 to 8%.

Hebhoub et al. (2011) [4] investigated the use of waste marble aggregates in concrete. Today we are faced with an important consumption and a growing need for aggregates because of the growth in industrial production, this situation has led to a fast decrease of available resources. On the other hand, a high volume of marble production has generated a considerable amount of waste materials; almost 70 % of this mineral gets wasted in the mining, processing and polishing stages which have a serious impact on the environment

Joseph O. Afolayan, Stephan A. Alabi et al. (2013) [5] they replaced coarse aggregates fully with cupola slag in all mix and partial replaced of cement by slag cement. 0%, 2%, 4%, 6%, 8%, and 10% replacement of cement was taken. They conclude that higher strength is obtained for 2% cement replacement, while using 100% cupola slag aggregate. They only measure compressive strength, no study on about split tensile, flexure, and durability test.

R.Balaraman and S. Anne Ligoria et al. (2015) [6] they had partially replaced fine aggregate and coarse aggregate by Cupola Slag. They were taken 0, 5, 10, 15, 20, 25, 50, and 100 % replacement. They only measure Compressive strength and split tensile strength. Maximum Value of compressive strength is 31.555 N/mm2 for M20 grade when coarse aggregate is replaced by 5% of cupola slag

3. DESCRIPTION AND MATERIAL TESTING Portland cement

It is the most common type of cement in general use around the world as a basic ingredient of concrete, mortar, and non-specialty grout. It was developed from other types of hydraulic lime in England in the mid-19th century, and usually originates from limestone. It is a fine powder, produced by heating limestone and clay minerals in a kiln to form clinker, grinding the clinker, and adding 2 to 3 percent of gypsum. Several types of Portland cement are available. The most common, called ordinary Portland cement (OPC), is grey in color, but white Portland cement is also available

Coarse aggregates

Those particles that are predominantly retained on the 4.75 mm (No. 4) Sieve and will pass through 3-inch screen are called coarse aggregate. The coarser the aggregate, the more economical the mix. Larger pieces offer less surface area of the particles than an equivalent volume of small pieces. Use of the largest permissible maximum size of coarse aggregate permits a reduction in cement and water requirements. Using aggregates larger than the maximum size of coarse aggregates permitted can result in interlock and form arches or obstructions within a concrete form. That allows the area below to become a void, or at best, to become filled with finer particles of sand and cement only and results in a weakened area.

Fine Aggregate

Those particles passing the 9.5 mm (3/8 in.) sieve, almost entirely passing the 4.75 mm (No. 4) sieve, and predominantly retained on the 75 µm (No. 200) sieve are called fine aggregate. 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.

Blast Furnace Slag (Cupola Slag)

Blast furnace Slag is a non-metallic by product produced in the process of iron production by chemical reduction in a blast furnace. It consists primarily of calcium silicates, alumina silicates, and calcium-alumina-silicates.

4. SCOPES FOR FURTHER WORK

In the present study experimental program was devised to study the strength characteristics of mixes containing furnace slag. The work can be extended to study the durability characteristics as well.

The performance of the pavement quality concrete slabs containing furnace slag can be evaluated by constructing the trial stretches. The behavior of these PQC slabs can be analyzed under repetitive loading for the fatigue life consumed.

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