

Partial Replacement of Fine and Coarse Aggregate by using Marble and Demolish Waste

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Abstract— Concrete is the widely used material in construction around the world and cement, a major constituent of concrete is being costly and only moderately available, researches or experiments are conducted to study the variations in the strength characteristics of concrete by replacement of cement partially or fully by cheaper or locally available materials. Ceramic waste powder is settled by alleviation and then dumped away which results in environmental pollution, in addition to forming dust in summer and menacing both agriculture and public health. Therefore, utilization of the ceramic waste powder in various industrial sectors especially the construction, agriculture, glass and paper industries would help to protect the environment. In this research study the cement has been replaced by ceramic waste powder accordingly in the range of 10% 15%, 20% b weight of M30 grade. Concrete mixtures were produced, tested and compared in terms of compressive strength, split tensile strength and flexural strength to the conventional concrete. These tests were carried out to evaluate the mechanical properties for 7, 14 and 28 days. This research work is concerned with the experimental investigation on strength of concrete and optimum percentage of the partial replacement by replacing cement via 10%, 15%, 20%, of ceramic waste. Keeping all this view, the aim of the analysis is to study the performance of concrete while replacing the ceramic waste with different proportions in concrete.

Key words: Ceramic Waste Powder, Compressive Strength, Mechanical Properties, Conventional Concrete

I. INTRODUCTION

In this project we use the ceramic waste materials by replacing partially with cement in the concrete. Ceramics is an inorganic, non-metallic, solid material comprising metal, non-metal or metalloid atoms primarily held in ionic and covalent bonds. In India ceramic production is 100 million tons per year. In this ceramic industry, about 15% - 30% production goes as waste. This waste is not recycled in any form at present. However, the ceramic waste is durable, hard and highly resistant of biological, chemical and physical degradation this leads to serious environmental and dust pollution, occupation of vast area of land. The advancement of concrete technology can reduce the consumption of natural resources. They have forced to focus on recovery, reuse of natural resources and find other alternatives. The use of the replacement materials offer cost reduction, energy savings, arguably superior products, and fewer hazards in the environment

II. MATERIALS

A. Cement

In this work the Ordinary Portland Cement 53 grade was used. Cement is affine, grey powder. It is mixed with water

and materials such as sand, pozzolanas to make mortar and concrete. The cement and water forms a paste that binds the other materials together.

B. Coarse Aggregate

Locally available crushed stones confirming to graded aggregate of nominal size of 20mmas per IS 383-1970 are adopted. The physical properties of coarse aggregate like specific gravity, gradation and fineness modulus are tested.

C. Fine Aggregate

Locally available river sand confirming to grading zone II of nominal size 1.18 mm as per IS 383-1970.

D. Water

The water, which is used for making concrete and for curing, should be clean and free from harmful impurities such as oil, alkali, acid, etc. In general, colorless, odorless portable fresh water was used for mixing the concrete

III. CERAMIC TILE POWDER

The ceramic powder is obtained from the industrial by – products or as the solid waste dumped in any major city. As the ceramic in landfill it takes thousands of years to degradable and cause land pollution. So some of not recycled ceramic can be converted into ceramic powder and used as cement replacement. The usage of ceramic in the form of r is better than using it as fine or coarse aggregate. The tile dust is obtained from RAK ceramics. The specific gravity of tile dust is found to be 2.62 and the fineness is found to be 7.5%.

IV. EXPERIMENTAL PROGRAM

The aim of the experimental program is to compare the properties of concrete made with and without ceramic powder, used as partial cement replacement. The basic tests cared out on materials used for casting concrete samples are discussed in this chapter, followed by a brief description about mix design and curing procedure adopted. In this research work the Ordinary Portland Cement 53 grade, coarse aggregate with nominal size of 20mm are adopted. Various tests were conducted to check the properties of the coarse aggregate and some of the tests include the specific gravity, water absorption, fineness modulus, crushing strength tests etc. the natural sand is used as the fine aggregate in this study. Varioustests were conducted for fine aggregate also to find out the finest of sand, specific gravity of sand etc. Colorless, odorless potable fresh water was used for mixing the concrete. Here ceramic powder is used as partial cement replacement for making the concrete specimens. The test for cement was carried out to find the specific gravity, fineness, water absorption, Setting time and consistency. Initial and final setting time is founded with and without the replacement of ceramic tile powder in cement by Vicat apparatus. The percentage replacement for cement by tile powder was done

in the proportion of 0, 10, 15 and 20. After the various tests done on the materials the concrete is prepared through batching. The selected materials are properly weighed and mixed as per the design mix proportion of 1:1.57:2.57 for M30 grade concrete, the water cement ratio used in the work is 0.45, which is obtained from the IS 10262. The concrete was cast in the form of cubes and cylinders with 0%, 10%, 15% and 20% replacement of cement by Ceramic tile powder. To find out the workability of concrete the slump test was carried out in the fresh concrete mix. After 24 hours, the specimen is removed from the cube and cylinder mould and cured. The compression and split tensile test was carried out in 7, 14 and 28 days using compression testing machine. Compressive strength = Load in (N) / Area in (sqm) Split Tensile strength = $2P / \pi LD$

V. RESULTS AND FINDINGS.

The specific gravity test conducted for cement, coarse aggregates, fine aggregates and tile powder are carried out as per IS2386 using a parameter. Fineness test for fine and coarse aggregate is found out by I.S.SIEVES. The results obtained are mentioned below.

The above chart represents the strength of the cube in 7 days, 14 days, and 28 days for both conventional concrete and replacement of cement in concrete by different ratios of ceramic tile powder. It is observed that if the curing time increases then the strength of concrete is also increases. From the observation the 15% replacement of the Ceramic Tile powder gains strength more than the conventional concrete

VI. CONCLUSION

- This study was carried to obtain the results, test conducted on the tile powder modified cement concrete mix, in order to ascertain the influence of tile powder on the characteristic strength of concrete
- The most optimal dosage for the partial alternative of cement by ceramic tile powder is 15 %.
- The compressive strength of concrete decreases, when the addition of dosage is more than 15%.The results show if 20% replacement of cement by ceramic tile powder will affect the strength of concrete.
- By doing this project we could give a contribution to the society by making the environment more eco-friendly by utilizing the ceramic waste scientifically
- Thus by adopting replacement method we can overcome problems such as waste disposal crisis. Utilization of tile powder and its application for the sustainable development of the construction industry is the most efficient solution and also address the high value application of such waste
- By using the replacement materials offers cost reduction and can overcome few environmental hazards

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