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A REVIEW PAPER BASED ON PARTIAL REPLACEMENT OF CEMENT WITH MARBLE POWDER AND FLY ASH FOR M25 GRADE CONCRETE

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ABSTRACT: Marble powder and fly ash both are the byproducts of marble cutting industries and coal based thermal power plants respectively. To fulfill the objective of dissertation work many kinds of researchers have studied. After that, it has found that there is feasibility in replacing the concrete ingredients with marble powder and fly ash. In the present dissertation work, we are replacing cement with marble powder and fly ash in the percentages of 0%, 4%, 8%, 12%, 16%and 20% respectively. By this replacement of cement with byproducts, we want to find out the effects of marble powder and fly ash on the strength properties of concrete mix M25. In this dissertation work, three strength characteristics are compared with ordinary M25 grade concrete namely compressive strength, split tensile strength and flexural strength.

Key Words: Marble powder, Fly ash, Compressive strength, Split tensile strength and Flexural strength.

I. INTRODUCTION

Concrete is the best construction material with high compressive strength and long life. On our earth, the natural resources are consumed day by day due to the construction-related demand of human beings. In thermal power plants, coal has widely used as a raw material for generating steam. After the use of this raw material, the residue left known as fly ash. We can also say that fly ash is a byproduct of thermal power plants. If this byproduct directly through on to the ground then it can harm the groundwater properties as well as it can also affect the human health. Marble is most commonly use worldwide for ornamental works. In marble cutting industries a huge quantity of marble chips or small pieces of marbles is left per day. These marble chips are also known as byproduct or residue of marble industries. If this byproduct directly falls on to the ground that it covers a large number of area and also affects the soil fertility. The reuse of both kinds of byproduct is the best way to save the environmental pollution, soil pollution, and water pollution as well as to control the harmful effects of these byproducts on human health. From the past researches, it has been found out that we can use these byproducts as concrete ingredients to improve the properties of ordinary concrete. So, the making of concrete by the help these byproducts is the best way to utilize these byproducts as a construction material.

II. LITERATURE REVIEW

S Suthandra Devi, R.Ramya and R.Keerthika (2018) conducted an experimental study on concrete by partial replacement of fly ash and marble powder for the cement to find out mechanical properties of concrete. The fly ash and marble powder were replaced within the percentage of 0%, 5%, 10%, and 15% and20%. The strength of concrete has been found for both M20 and M25 mixes. The compressive and split tensile strength of concrete was evaluated after 28 days curing periods. The replacement 0%, 5%, 10%, 15%and 20%cement by fly ash and marble powder showed 24.5, 26.7, 27.3, 25.6and24.4 N/mm2 increase in compressive strength at 28 days of curing for M25. The replacement 5%, 10%, 15%and 20%cement by fly ash and marble powder showed 1.52, 1.78, 1.98, 1.89and1.76 N/mm2 respectively increase split tensile strength at 28 days of curing for M25. Finally, it was observed that the compressive and split tensile strength of M25 will be high at 10% replacement of marble powder and fly ash by the weight of cement.

Neha Yadav, Navinderdeep Singh (2018) presents a review on the concrete mix by adding marble waste powder and fly ash. The aim of the study was to check the compressive strength, spilt tensile strength and flexural strength of concrete by replacing cement and fine aggregates by Fly Ash and waste marble powder with constant water cement ratio 0.38. It was observed that increase in water cement ratio decreases the strength of concrete. Up to 20%, compressive strength is increased in Marble Waste Powder as a partial replacement of fine aggregates. With the addition of Fly Ash initial and final setting time gets decreased.

Virendra Singh, Pratik Gajjar, P.N. Nimodiya (2017) carried out an experimental study to enhance the strength properties of self-compacting concrete using waste marble dust and fly ash. The experimental work was carried out for M30 grade of self-compacting concrete mix with the replacement of cement with different proportions of marble dust (10%, 15%, 20% and 25%) and 30% of fly ash. The main aim of the study was to identify the best proportion of marble dust with fly ash, which can be replaced with cement to get the desired strength. In the study work process of the development of the concrete for strength aspects in various proportions varying from 0%, 10%, 15%, 20% and 25% marble dust as a replacement of cement along with fly ash. Final results from the compressive test represent that for replacement of cement by marble dust up to 10% and fly ash up to 30% gives comparatively higher results than Control mix. It was observed that the splitting tensile strength of the SCC for the replacement of cement by 30% and 10% marble dust gives almost same results as control mix at both 28th day and 56th day. The further addition of the marble dust content reduces the splitting tensile strength of the concrete. At finally by experimental results of compressive strength test and

splitting tensile strength test, it can be concluded that the best proportion of marble dust and fly ash are 10% and 30% respectively with 28 days of curing.

A. Sathesh Kanna, G.Sangara Pitchai Raj, Ms.Nivethitha(2017) carried out a study on partial replacement of cement with marble dust and fly ash. In the study work, the cement has been replaced by marble dust and fly ash accordingly in the range of 0%, 5%, 10%, 15% & 20% by weight of cement for M-25 mix. These tests were carried out to evaluate the mechanical properties of the concrete at 28 days curing period. The compressive strength test has been conducted by the universal compressive testing machine of capacity 200 KN at a loading rate of 2.5 kn /sec. The test result shows that Compressive strength at 28 days had achieved in 15% mix were high. The split tensile strength had achieved in the M15 mix was also high.

Professor Mallesh M and Abhilash K (2017) conducted an experimental investigation on strengths properties of concrete by partial replacement of cement with mineral admixture. By this investigation, it was observed that the ideal trade proportion for M20 review solid blend is the substitution of Cement by 10% of Fly Ash and 10% of Marble Powder, which gives about 20% more Compressive strength than the consequences of customary cement of M20 blend.

Darzi Musaib ,Bhumre Shivkumar (2016) provide a review paper on "effective partial replacement of cement and sand with fly-ash and marble powder to make green concrete".In the experimental investigation, cement was replaced with fly ash in percentages of 5, 10 and 15 % and sand with marble powder in percentages of 20, 40 and 60 %. The objective of the study was to assess compressive and split tensile strength of concrete and find the optimum percentage of replacement to gain the maximum strength and compare it with the strength of ordinary M20 concrete. After studying of review papers it was expected that optimum proportion of replacement of cement with fly ash will be 10 %, and that of sand with marble powder will be between 40 to 50 %.

Krishna P Pala, Krunal J Dhandha (2015) presents an experimental study on use of marble powder and fly ash on self compacting concrete. The main objective of the study was to determine the behavior of SCC with marble powder and fly ash and understand the effect on fresh property, Harden property, and Durability of concrete. The slump and V- Funnel test was carried out on the fresh self compacting concrete. The compressive strength of concrete was also determined at 7days, 14 days and 28 days time intervals. The final results show that self compacting concrete with 10% of marble powder and 25% of fly ash gives a higher value of compressive strength at 7days,14 days and 28 days time intervals for the M30 grade concrete mix.

Md Mahboob Ali, Professor S.M. Hashmi (2014) investigated the strength characteristics of concrete using marble dust powder as a partial replacement of cement and sand by stone dust. The research work was carried out with the M30 grade of concrete. In the research work, the marble powder was replaced by weight of cement in the percentages of 5%, 10%, 15%and 20%. For all the mixes split tensile strength, compressive strength and flexural strength are determined at different intervals of curing. Final results of tests indicated that up to 10% replacement of marble dust by weight of cement and 20 percent replacement of stone dust by weight of sand improved the compressive, flexural and split tensile strength of concrete.

S. Flrat, G. Yllmaz, A. T. Cömert, and M. Sümer (2012) provide an idea about utilization of marble dust, fly ash and waste sand (silt-quartz) in road sub-base filling materials. In the study work, three different types of wastes namely fly ash; marble dust and waste sand are used. Two types of natural soils were replaced with 0%, 5%, 10%, 15%, and 20% of fly ash, marble dust, and waste sand. Different tests like Standard compaction, permeability, and California Bearing Ratio tests, X-Ray Diffraction and Scanning Electron Microscopy were performed on two types of natural soils, containing three industrial waste types in different ratios. Final results of the thesis were shows that for all of these by-products optimum replacement level was 15% for medium and low plasticity type of soils.

Baboo Rai, Khan Naushad (2011) conducted an experimental program to find out the influence of Marble powder/granules in a Concrete mix. The effect of marble powder and granules as ingredients of fines in concrete by partially reducing quantities of cement as well as other conventional fines has been studied in the study work. The experimental work was carried out to find out the relative workability & flexural strength as well as compressive strength of concrete. To fulfill the requirements of experimental work total 30 cubes and 8 beams specimens of M30 grade concrete have been tested in a laboratory. 6 specimens for each percentage of marble granules i.e. 0%, 5%, 10%, 15% and 20% were prepared for testing. Finally, compressive strength test results show that by increasing the waste marble granules up to 15% by weight of cement the compressive strength values of concrete tends to increase at each curing age. A slight decrease in compressive strength of concrete was observed when 20% marble granule was used as compared to the 15% marble granule mix strength. The flexural strength of waste marble mix concrete increases with the increase of the waste marble ratio up to 15% in these mixtures by weight of cement.

Demirel and Yazicioglu (2006) found, in addition to marble powder, silica fume, fly ash, pumice powder, and ground granulated blast furnace slag can be widely used in the construction sector as a mineral admixture instead of Cement, Marble powder can be used either to produce new products or as an admixture so that the natural resources are used more efficiently and the environment is saved from marble waste.

III. CONCLUSION

In today life the natural resources of our earth depleted at a rapid rate. During the manufacturing of cement lot of

environmental problems creates like origination of co2 in the environment which can harm the human health as well as surrounding conditions. Due to this the use of byproducts likes' marble powder and fly ash at the place of cement in required proportion seems to be a good alternative. By the past researches, it has found that a required quantity of fly ash and marble powder can enhance the properties of concrete.

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