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Review Paper On "Effective Partial Replacement Of Cement And Sand With Fly-Ash And Marble Powder To Make Green Concrete"

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Abstract - *Leaving the waste products directly into our environment can degrade the quality of our environment. We must find ways to reuse these products for making new products or as admixture in some products. Marble industry is the most thriving industry in our country. About 20 % of the final product is marble dust generated from marble processing industry. This waste is dumped in the natural soils which reduces the fertility of the soil. Fly ash is the waste generated from the coal combustion. Marble has properties like durability and also has good aesthetics whereas flyash has good binding properties. Cement upto a certain extent causes degradation of the environment as it releases major green house gas i.e. carbon dioxide. Also the prices of cement are rising day-by-day. The resources of natural sand are decreasing and its price is increasing tremendously. In this experimental investigation we are partially replacing cement with flyash in percentages of 5,10 and 15 % and partially replacing sand with marble powder in percentages of 20, 40 and 60 %. We are going to assess its impact on compressive and split tensile strength and find the optimum percentage of replacement to gain the* maximum strength and compare it with the strength of ordinary M20 concrete.

***Key words*:** Cement, Fly Ash, Sand, Marble powder, Green concrete, Compressive strength, Spilt Tensile Strength.

1. INTRODUCTION

In today's era major emphasis is given on making green and sustainable development. Marble is a metamorphic rock resulting from the transformation of a pure limestone. The purity of the marble is responsible for its colour and appearance: it is white if the limestone is composed solely of calcite (100% CaCO3). Marble is used for construction and decoration; marble is durable, has a noble appearance, and is consequently in great demand. Chemically, marbles are crystalline rocks composed predominantly of calcite, dolomite or serpentine minerals. The other mineral constituents vary from origin to origin. Quartz, muscovite, tremolite, actinolite, micro line, talc, garnet, osterite and biotite are the major mineral impurities whereas SiO2, limonite, Fe2O3, manganese, 3H2O and FeS2 (pyrite) are the major chemical impurities associated with marble

Fly-Ash is a pozzolanic material which is a waste generated from industries. Fly-ash does not have cementitious property by itself which is responsible for strength generation. But in presence of water it reacts with free lime obtained from cement and form hydrated products (C2S and C3S) which helps in attaining the strength and also improving the durability. As the flyash is very fine in structure, it fills more voids and provides superior pore structure and thereby improves its strength at later stages due to reduced permeability. River sand has been the most popular choice for use as fine aggregrate in concrete. But its excessive use has resulted in reduction or depletion of the sources of river sand. Due to shortages of river sand its price has increased tremendously. Therefore there is a need for obtaining cheap and eco-friendly substitutes for replacement of cement and sand. Therefore marble powder and fly-ash can be used as partial replacement of sand and cement and they can provide best substitutes for cement and sand without reduction in strength of concrete.

2. LITERATURE REVIEW

1. Jashandeep singh, Er. R S Bansal, "Partial replacement of cement with waste marble powder with M25 grade" concluded that the optimum percentage of cement was found out to be 12% and with this it also resulted in increase in both compressive strength and tensile strength.

2. V. M. Sounthararajan and A. Sivakumar "Effect of the lime content in marble powder for producing high strength concrete" concluded that high strength concrete was achieved when replacement of cement with marble powder was 10%.

3. Baboo Rai, Khan Naushad H., Abhishek Kr., Tabin Rushad S., Duggal S.K., "Study on influence of Marbel powder/granules in concrete mix" concluded that compressive strength of concrete reduces with increase in marble powder as replacement of cement as compared to normal concrete. But when they replaced sand with marble powder a consider increment in compressive strength was found at an optimum percentage of 20%.

4. Prof. Veena G. Pathan, Prof. Md. Gulfam Pathan ,

"Feasibility and need of use of Waste marble powder in concrete production" concluded that the combined use of quarry rock dust and marble sludge powder exhibited excellent performance due to efficient micro filling ability.

5. Prof. P.A. Shirule, Ataur Rehman, Rakesh D. Gupta, "

Partial replacement of Cement with Marble dust powder" concluded that the compressive strength of cubes increased upto 27.4% with addition of the marble powder upto 10% and further addition resulted in decrease in its compressive strength. Also the split tensile strength of cylinders increased upto 11.5% 10 % replacement of cement with marble powder. The initial strength gradually decreases from 15 % addition of marble powder.

6. Er. Amritpal Kaur Er. Rajwinder SinghBansal, "Strength and Duriabilty Properties of Concrete with Partial Replacement of Cement with Metakaolin and Marble Dust" concluded that optimum percentage for replacement of cement with Metakaolin and Marble powder was 9% and 10 % respectively for both cubes and cylinders. After 9%MK and 10% MP, compressive strength as well as split tensile strength starts decreasing. 5. There is decrease in strength after 9% replacement of MK and 10% replacements of MP but durability properties go on increase with increase in percentage of MK-MP.

7. Noha M. Soliman, "Effect of using Marble Powder in Concrete Mixes on the Behavior and Strength of R.C. Slabs" concluded that Increasing the marble powder ratio replacement of cement led to the increasing as the compressive strength by about (25% and 8%) for the marble powder replacement ratios (5% and 7.5%) compared to the control mix. 4. Increasing the marble powder ratios higher than 5% decreased the compressive strength of concrete mixes.

8. Er. Tanpreet Singh and Er. Anil Kumar Nanda,"Influence of marble powder on mechanical properties of mortar and concrete mix" concluded that there is a marked reduction in compressive strength values of mortar mix with increasing marble powder content when compared with control sample at each curing age.

3. PROPERTIES OF MATERIALS:

Table-1: Test of Aggregates

Sr.No.	Test	Result
1.	Aggregate Impact Value	4.76%
2.	Aggregate shape test	
	A. Flakiness Index	29%
	B. Elongation Index	16.7%
3.	Aggregate Crushing Test	7.85%
4.	Fineness Modulus	4.71
5.	Specific Gravity	2.4
6.	Water Absorption	1.01

Table-2: Tests on Sand

Sr.No.	Test	Result
1.	Fineness Modulus	2.9
2.	Specific gravity	2.76
3.	Bulking of sand	15.6%

Table-3: Tests on Cement

Sr.No	Test	Result
1.	Fineness of cement	2.61
2.	Standard Consistency of cement	32%
3.	Initial Setting Time	35 Minutes
4.	Final setting time	240 Minutes

4. CONCLUSION

After studying of review papers we are expecting that optimum proportion of replacement of cement with flyash will be 10 %, and that of sand with marble powder will be between 40 to 50 %. The cost of flyash and marble powder in less as compared to the price of cement and natural sand. Therefore it will help to reduce the cost of concrete and help us in making green and eco-friendly concrete.

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