

RESEARCH ARTICLE



ISSN: 2321-7758

VARIATION IN CONCRETE CHARACTERISTIC STRENGTH BY REPLACING CEMENT WITH MARBLE DUST POWDER

MD SULTAN

Department of Civil Engineering, Al-Falah University Dhauj Faridabad Haryana, India



ABSTRACT

In this research work we are using marble dust powder in a small quantity in the place of cement and analyzing the variation in compressive strength of concrete. The purpose of the investigation are to improving the properties of concrete, use of marble dust powder, reducing the quantity and cost of cement and hence reduce the cost of whole project, protect the environment by marble dust powder. In this project we are going to test the cubes with varying percentage of marble dust powder and then test them on Compression Testing Machine.

Keyword: Marble Dust Powder, Compression Testing Machine, 43 Grade Cement

INTRODUCTION

Marble is a metamorphic rock produced from lime stone from pressure and heat in the earth's crust due to geological process. Marble dust powder is an industrial waste produced from cutting of marble stone. In India the marble processing is one of the most flourishing industries. Marble industries in India grow more than 3500 metric tons of marble powder slurry per day. The cement industry release carbon dioxide, a major greenhouse gas 5-10%. Marble stone industry generate both solid waste and stone slurry whereas solid waste result from the rejects at the mine sites liquid substance consisting of particles originating from the sawing and the polishing process and water used to cool and lubricate the sawing and polishing machines. Marble stone slurry generated during processing corresponds to around 40% of the final product from the stone industry. This is relevant because the stone industry presents on annual output of 86 million tons of processed products hence the scientific and industrial community must commit towards more sustainable patterns. Marble dust is not only the economical material but also improves the properties of fresh and hardened concrete can be improved.

OBJECTIVE

- To study the variation in concrete characteristic strength by replacing cement with marble dust powder.
- The objective of this research is to find the scope for the use of marble dust powder to reduce the amount of cement in concrete for the construction work. This is done via material testing of concrete with various percentage of replacement of cement by marble dust powder.

METHODOLOGY

As partial replacement of cement by mineral admixture such as fly ash, silica fume, blast furnace slag or rice husk in cementing material would help to overcome these problems and lead to improvement in the workability, strength and durability of cementing material. This would also lead to additional benefits in terms of reduction in costs, energy saving, promoting ecological balance and conservation of natural resources.

EXPERIMENTAL PROCEDURE

All the specimen were tested in the compressive testing machine. The testing procedure for the entire specimen was same. After the curing period of 28 days was over, the cube was washed and its surface was cleaned for clear visibility of crack.

Compressive strength of concrete was undertaken on 15cm cube specimen. At 7 days, 14 days, 28 days. All specimens were remove 24 hour after casting and then transferred for curing.



Figure 1: Compressive testing of concrete block

MATERIAL USED

CEMENT---Ordinary Portland cement (opc) 43--grade was used for the investigation. It was tested for its physical properties in accordance with Indian Standard Specification.

FINE AGGREGATE--- The fine aggregate used crushed sand which is clear from all sorts of organic impurities was used in this experiment. The fine aggregate was passing through 4.75mm sieve.

COARSE AGGREGATE--- The fractions from 20mm to 4.75mm are used as coarse aggregate. The coarse aggregate from crushed basalt rock conforming to IS: 383 are used.

WATER--- Ordinary tap water used for concrete mix in all mix ratios.

MARBLE DUST POWDER--- Marble dust powder of 90 micron passing is used having specific gravity of 2.76. This waste marble powder is replaced in increasing percentage from 0%--30%.



Figure 2: Marble dust powder

RESULTS & DISCUSSION

The test are conducted on concrete cubes with increasing percentage of marble dust powder after curing 7, 14, 28 days. Following load and compressive strength are obtained.

Table 1: Compressive Strength of marble dust replaced after 7 Days curing

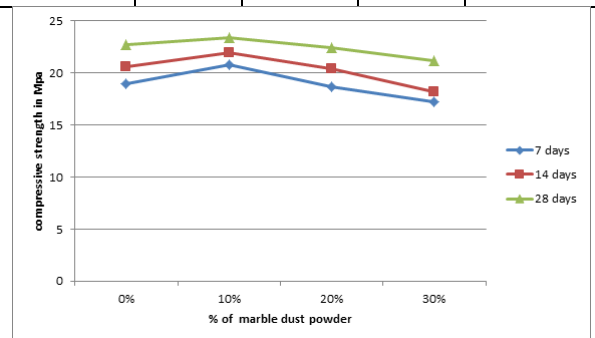
Percentage of Marble Replacement (%)	Load on specimen 1) KN	Load on specimen 2) KN	Mean load on specimen KN	Compressive strength in MPa
0%	412	440	426	18.93
10%	490	446	468	20.80
0%	402	438	420	18.66
30%	410	365	387	17.22

Table 2: Compressive Strength of marble dust replaced after 14 Days curing

Percentage of Marble Replacement (%)	Load on specimen (1) KN	Load on specimen (2) KN	Mean load on specimen KN	Compressive strength in MPa
0%	470	456	463	20.58
10%	504	485	494.5	21.98
20%	452	465	458.5	20.37
30%	422	395	408.5	18.15

Table 3: Compressive Strength of marble dust replaced after 28 Days curing

Percentage of Marble Replacement (%)	Load on specimen (1) KN	Load on specimen (2)KN	Mean load on specimen KN	Compressive strength in MPa
0%	527	495	511	22.71
10%	538	514	526	23.37
20%	485	524	504.5	22.42
30%	465	486	475.5	21.13



CONCLUSION

In this research work the cement was partially replaced by marble dust powder with increasing percentage 0% 10% 20% 30% by weight of M25 grade concrete. Concrete mixtures were developed tested and compared in terms of compressive strength to the conventional concrete. After testing following conclusion is made.

- From the above study, it is concluded that the replacement of marble dust powder the compressive strength of concrete gradually increases up to certain limit then decrease.
- From the above table and graphs it is concluded, the replacement of 10% and above, marble dust powder it gives higher compressive strength of concrete.
- By using marble dust powder, it minimize the cost of construction.

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