

Replacement of cement and sand in concrete with Waste Marble Product

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Abstract: marble is also a type of building material especially for the construction in palaces and monument, which will increase the strength with the age. Reported many studies in literature on the concrete performance, containing the waste marble dust powder or waste marble aggregate. It is observed in this study that the combination of marble dust and any other ingredient has higher modulus or higher compressive strength than the individual for 7day and 28 days of curing respectively. The combination of high proportion of marble dust increases the strength. This study was based on the experimental investigation on the cement and sand both is the partially replaced in concrete, and then observed that the compressive strength, flexure and split tensile strength is increase up to a certain percentage. But if cement and sand both are replaced at same time than it is get decreased.

Index Terms - Sand, Ordinary Portland cement 43 grade, Concrete, flexural strength, split tensile strength, Compressive Strength.

I. INTRODUCTION

The most abundant material in the world are one of the cement based material. Due to natural sources it is high demand of engineers and architects. The chooses of material for the development of the building as a green building which is very economy, eco-friendly and save the environment by using this marble dust powder or marble waste. If marble waste is dumped to the ground than it is directly effects to the ground as decrease the productivity of the ground .it also reduce the ground porosity thus the ground water table getting decreased. The marble is general used in the building construction due to its beauty, high fire resistance, high compressive strength and the main factor of using the marble dust in the building construction is the cementations properties of the marble dust powder.

A. MAIN INGREDIENTS

Ordinary Portland cement is used in this experimental work. fine aggregate or sand are used in this experimental work which is easily available. 20mm coarse aggregate has been used. A M25 mix design with 0.43w/c ratio is taken for the preparation of test sample. For the design of M25 mix design the IS: 10262:1982 are used, and for coarse aggregate and or fine aggregate The IS code IS: 383: 1970 are taken. Water is used as per requirement.

B. METHODOLOGY

The effects of waste marble in concrete are investigated by four different specimens who are tested after 7 days and 28 days curing respectively. After the test and calculation of result, the results were compared with control mix design.

1. 0% replacement of cement and sand or fine aggregate with marble dust powder or marble waste.
2. 10% replacement of sand with marble dust powder.
3. 10% replacement of cement with marble dust powder.
4. 10% sand and 10% cement both are replaced with marble dust powder..

TABLE I
MIX PRO POSITION

Sr. No	Cement %	Sand %	Marble powder %	Mix Designation
1	100	100	0	Mix0 (control)
2	100	90	10	Mix1 (Sand)
3	90	100	10	Mix2 (Cement)
4	90	90	20	Mix3 (Cement & Sand)

II. TEST ON CUBE

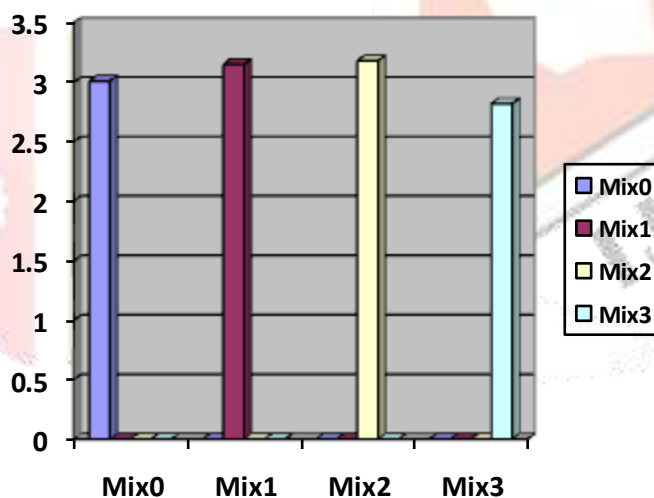
Cubes were casted in this study. Marble dust in different proportion as a partial replacement of sand, cement and both were used for the manufacturing of concrete mix of M-25 grade. After 7 days and 28 days curing period respectively. The cubes of flexural strength of 150 mm x 150 mm x 150 mm in size were flexural strength is determined in compression testing machine. Table 5 shows the test result on cube after 7 days curing period whereas Table 6 shows the test result after 28 days curing periods respectively. Fig 4 shows compression test machine used to determine flexural strength of concrete

III. RESULT AND DISCUSSION

The results is obtained were cement, sand and both cement & sand are replaced with marble dust powder or marble waste product or called as marble waste chips in concrete. And the flexural strength test is performed after 7 days and 28 days of curing respectively.

TABLE II
FLEXURAL STRENGTH TEST RESULT OF CONCRETE CUBES AFTER 7 DAYS CURING IN N/mm²
Flexural Strength Variation at 7 days

Sr. No	Mix Designation	Marble powder %	Average flexural strength (N/mm ²)
1	Mix0(control)	0	4.69
2	Mix1(Sand)	10	4.92
3	Mix2(Cement)	10	4.76
4	Mix3(Cement & Sand)	20	4.41

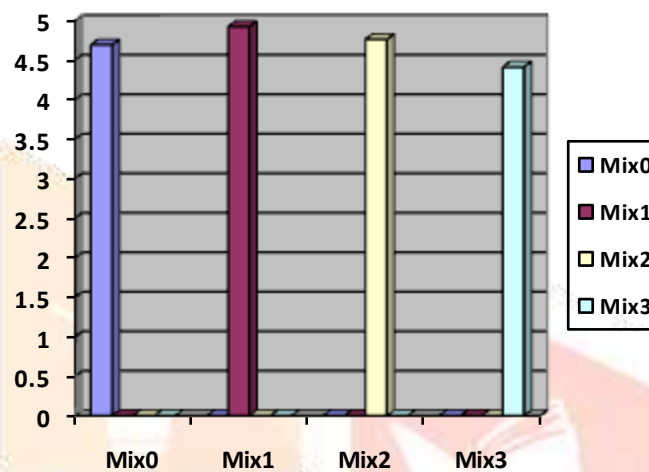


Graph 1: the flexural Strength of Cubes on 7 days in N/mm² of replacement of cement, sand and cement & sand both with marble dust powder or marble waste product in 0% and 10%.

According to this graph the highest flexural strength were achieved by replacement of 10% cement with marble dust powder as compared to 0% replacement of cement, sand and both replacement or 10% replacement of sand with marble waste product and then adding extra percentages of marble dust powder and marble waste product as fine aggregate then the flexural strength were starts to decreases

TABLE III
FLEXURAL STRENGTH TEST RESULT OF CONCRETE CUBES AFTER 28 DAYS CURING IN N/mm²

Sr. No	Mix Designation	Marble powder %	Average flexural strength (N/mm ²)
1	Mix0(control)	0	3.01
2	Mix1(Sand)	10	3.15
3	Mix2(Cement)	10	3.18
4	Mix3(Cement & Sand)	20	2.82



Flexural Strength Variation at 28 days

Graph 2: the flexural Strength of Cubes on 28 days in N/mm² of replacement of cement, sand and cement & sand both with marble dust powder or marble waste product in 0% and 10%.

According to this graph the highest flexural strength were achieved by replacement of 10% sand with marble waste product as compared to 0% replacement of cement, sand and both replacement or 10% replacement of cement with marble waste product of marble dust powder and then adding extra percentages of marble dust powder and marble waste product as fine aggregate then the flexural strength were starts to decreases

IV. CONCLUSION

- For improving strength characteristics of concrete, the cement and sand or fine aggregate is replaced with marble dust powder or marble waste products. But the combination of replacement of 10% of cement and 10% of sand with marble dust powder or marble waste product, the strength get start to decrease. So that the 20% of combination of cement and sand cannot be replaced by marble waste product or marble dust powder.
- In this study it was observed that the 10% replacement of sand with marble waste product gives maximum flexural strength at 28 days curing.
- the cement replaced 10% with marble dust powder in M-25 grade of cement concrete cube the flexural strength of the cubes at 7 days it is increased and then further increase the replacement of cement with marble dust powder there was decrease the strength.

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