

Use of Marble Dust in Concrete

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Abstract -The main objective of this experimental work is to investigate the performance of concretes contained marble dust as a cement replacement, mix was prepared with cement and sand blended with marble dust with replacement from 0%, 10%, 20% and 30%. The experiment indicates that replacement of cement by marble waste powder at different ranges, in concrete production, results in Up to 10-20% replacement of cement with marble increases the compressive strength and tensile strength of concrete. Further increasing the percentage of marble decrease the compressive strength of concrete. Due to use of marble powder in concrete the water absorption became be less, the amount of permeability became reduce which make an important role to make concrete stable for a longer time

1. INTRODUCTION

Marble production is increasing with the increase in demand. Production of marble includes many steps from mining to finished product. While processing of marble stone, a huge quantity of waste generates in the various forms such as boulders, pebbles, grits, fines and slurry. In the absence of proper disposal plan, these wastes are dumped on forest land, roadsides etc. which results in deterioration of ecosystem of the nearby area. The marble slurry produced from the processing of marble has finer particle size which is airborne. It causes respiratory and eye infections to the human being. Also, Marble slurry is considered as waste by product generated from thermal power plants. The objective of this study was to investigate the feasibility of these industrial waste materials as replacement of conventional materials in concrete. Marble powder contains heavy metals which affect the human health and environment. The disposal of this waste is also a major problem faced in India and abroad also. So, to prevent these harmful alarms the waste marble dust is used as a replaced material incement concrete. The landfill which is used for disposal of waste marble dust is also minimized by this replacement.

The research consists the effects and benefits of waste marble dust used as a replacement material. To perform the laboratory test in better way is the main objective of this study. The objective of the research paper is to study comparison of compressive strength of marble dust concrete for 0%, 10%, 20% & 30% the Replacement of cement by marble dust for both water and water curing.

2. METHOD

Materials

Ordinary Portland (43 grade) cement was used. It was tested as Per the Indian Standard Specifications IS: 8112-1989 [7].its properties are shown in Table 1. Marble dust was obtained from local Industries. Fine aggregate was natural sand having a 4.75 mm nominal size. The coarse aggregate used in this investigation was 20 mm nominal size. Both aggregates were tested according to BIS: 383-1970

Physical	Test Results	BIS.8112-1989 Obtained Specifications
Normal Consistency (%)	26%	30%
Initial Setting Time (Min)	28	<30
Final Setting Time (Min)	608	>600
Fineness % (Residue Retained On 90 Micron Sieve)	5.88 %	<10
Specific Gravity	3.15	-

Table 2.1: Properties of Cement

Properties	Coarse aggregate	Fine aggregate
Maximum size (mm)	20mm	4.75mm
Specific gravity	2.80	2.60
Total Water Absorption (%)	1.82%	1.32%
Fineness Modulus		

Table 2.2 Properties of Aggregate

2.1 Specimen conditioning and testing

After casting, the specimens were stored for 24 h in the laboratory environment and then demoulded and stored in curing tank at room temperature till the time of testing. The compressive strength of the cubes was determined after 7, 14 and 28 days of casting.

2.2 Hardened concrete properties

After the required curing (i.e., 7, 14 & 28 days etc.), the specimens were tested under the compression testing machine. The load should be applied gradually at the rate of 24MPa per minute till the specimen fails. The testing shall be done on at least three specimens at each selected age. If the strength of any specimen varies by 15 % of the average strength, the results should be rejected.

3. RESULTS AND DISCUSSION

Concrete cubes confirming to IS: 516-1964 of size 150*150*150 mm was cast for assurance of compressive strength. After 24 hours the concrete cube became be placed for water curing for 7 days, 14 days and 28 days respectively. Before testing, the cubes were air dried for 2hours, breaking loads were noted for 7days, 14days and 28 days

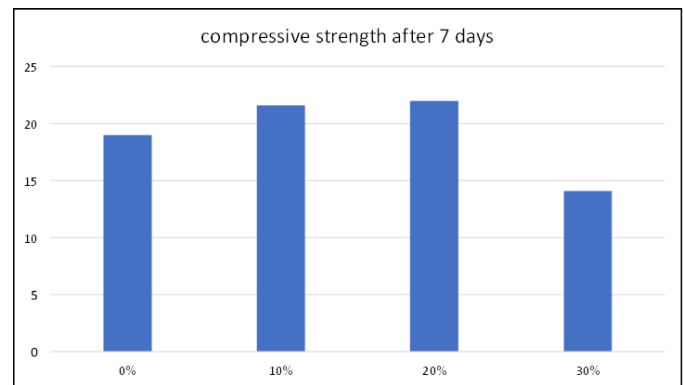


Fig No. 3.1 Compressive Test Carried Out on Universal Testing Machine

3.1. Compressive strength after 7 Days

Sr. No	% of marble powder	Water absorption	Compressive strength
1	0	0.38	18.97
2	10	0.38	21.58
3	20	0.38	21.98
4	30	0.28	14.07

Table 3.1 compressive strength after 7 days

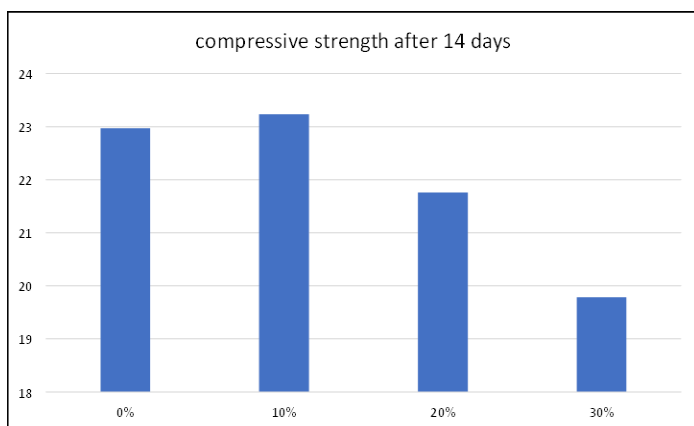


Graph 3.1 compressive strength after 7 days

3.2. Compressive strength after 14 Days

Sr. No	% of marble powder	Water absorption	Compressive strength
1	0	0.38	22.97
2	10	0.38	23.23
3	20	0.38	21.76
4	30	0.28	19.78

Table 3.2 Compressive strength after 14 days

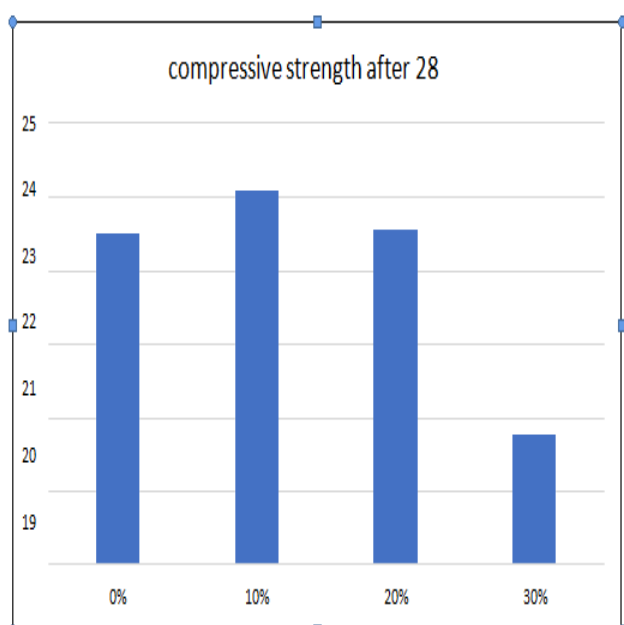


Graph 3.2 Compressive strength after 14 days

3.3. Compressive strength after 28 Days

Sr. No	% of marble powder	Water absorption	Compressive strength
1	0	0.38	23.52
2	10	0.38	24.10
3	20	0.38	23.56
4	30	0.28	20.78

Table 3.3 compressive strength after 28 days



Graph 3.3 compressive strength after 28 days

CONCLUSION

The aim of this research is to use useless material as marble in a useful way. After the practically perform the following conclusion come out –

1. Up to 10-20% replacement of cement with marble increases the compressive strength
2. Further increasing the percentage of marble decrease the compressive strength of concrete
3. Up to 10-20% replacement of cement with marble powder increases the tensile strength.
4. Further increasing the percentage of marble decrease the tensile strength of concrete
5. Using waste marble in concrete make a main role in cost-cutting.
6. Due to use of marble powder in concrete the water absorption became be less, the amount of permeability became reduce which make an important role to make concrete stable for a longer time.
7. Archiving economy by use of marble powder.

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