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EXPERIMENT STUDY ON STRENGTH CHARACTERISTICS OF CONCRETE USING WASTEMARBLE POWDER

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ABSTRACT
The present investigation centers on the use of waste marble powder as substitution material of cement for concrete. Around 6 million tons of marble waste is generated in India from cutting,handling,cleaning and crushing of marble. Conventional concrete was somewhat replaced by swastemarble powder in the proportion of 5%, 10%, and 15% by weight and the impact of waste marble powder (W. M. P.) as a replacement material has been examined on hardened concrete with tests for Compressive strength, Split tensile strength, Flexural strength for M25 grade of concrete. There was increase in the strength of the concrete when the W. M. P. content was 5%. Beyond that the strength of concrete begins to decrease drastically. The highest strength was obtained at 5%waste marble powder replacement.

KEY WORDS: waste marble powder, Compressive Strength.

INTRODUCTION
Conventional cement is most consumed major construction material all through the world. Researcher all through the world is trying to concentrating on methods for using industrial or agriculture waste as a raw material in construction. The utilization of this waste would help in environmental pollution control.Blast furnace slag, fly ash and waste marble powder are being used for as a replacement of main constituent of concrete i.e. cement. The marble waste powder results in the water logging and poor fertility of the soil.

AIM & OBJECTIVE
The aim of study is to evaluate the performance and suitability of W. M. P. in concrete with as alternative for cement. To find out the compressive strength, split tensile strength, and flexural strength of concrete with replacement of cement with W. M. P.
The objectives of experimental study are:

- Study on strength characteristics of M25 grade concrete with replacement of 0%, 5%, 10% and 15% of cement by W. M. P.
- To determine the %, strength of concrete at 7, 28 days

To find out the optimum percentage of W. M. P. that can effectively replaces the cement by weight without any adverse effect on properties of hardened concrete.

MATERIAL USED:
CEMENT
Locally available 53 grade of ordinary Portland cement (OPC) of ULTRATECH brand is being used in the present investigation for all concrete mixes. The cement used was fresh and not having any lumps.

FINE AGGREGATE

Locally available river sand is used in experiment which is passing through 4.75mm IS sieve and retained on 75 micron IS sieve.

Table-1: Properties of fine aggregates

Properties	Results
Specific Gravity	2.65
Water Absorption	1.34%
Maximum Size	4.75

COARSE AGGREGATE

70% to 80 % of volume of concrete is occupied by aggregate and therefore it have an important influence on its properties of concrete. Coarse aggregate was used of size 20mm conforming to IS 383 is used.

Table- 2: Properties of coarse aggregates

Properties	Results
Specific Gravity	2.69
Water Absorption	0.26%
Maximum Size	20 mm
Minimum Size	12.5 mm
Impact Value	18.62
Crushing Value	6.52

MARBLE POWDER

The waste marble powder is a result of sawing and shaping of parent marble rock.

MIX DESIGN

Concrete mix of M25 grade was designed by conforming to IS 10262-1982 method. The cement were replaced with bagasse ash by 0%, 5%, 10% and15% 0.43water cement ratio was kept constant.

Table -3: Mix proportion

	cement	Fine aggregate	Coarse aggregate	Water
Ratio	1	1.17	2.36	0.43
Mass Kg/m^3	445	523	1288	191.6

Mixes:

M1=100% of Cement+0% of WMP+100% FA+100% CA
M2=95% of Cement+5% of WMP +100% FA+100% CA
M3=90% of Cement+10% of WMP +100% FA+100% CA
M4=85% of Cement+15% of WMP +100% FA+100% CA
Where, WMP = Waste Marble Powder
FA = Fine Aggregate
CA = Coarse Aggregate

CASTING, CURING AND TESTING OF SPECIMEN

Cement, fine aggregate and coarse aggregate of mix proportion 1:1.17:2.37 were taken corresponding to M25 grade concrete. W. M. P. is added as partial replacement of cement. Concrete was made as per mix design with the help of weigh batching. All material were oven dried at required temperature and mixed with water in machine which provides the homogenous mix of concrete. Vibrating machine and trowel were used for compacting the concrete and leveling.

COMPRESSIVE STRENGTH TESTS

The test was done using IS code – 516 : 2008.

Table - 4: Shows the average compressive strength for various proportions

Mix Proportions	7days compressive strength in N/mm^2	28days compressive strength in N/mm^2
0%	17.48	24.67
5%	18.88	26.94
10%	16.67	23.71
15%	15.74	20.93

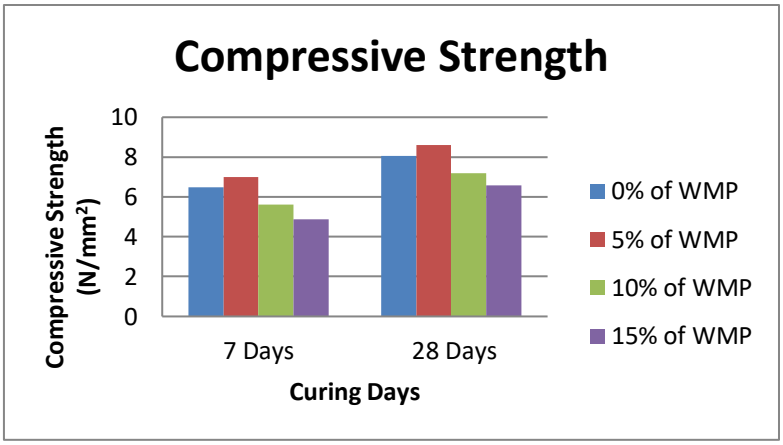

Figure – 1:Average compressive strength for various proportions

SPLIT TENSILE STRENGTH TESTS

The test was done using IS code – 516 : 2008.

Table - 5: Shows the average split tensile strength of concretefor various proportions

Mix Proportions	7days split tensile strength in N/mm^2	28days split tensile strength in N/mm^2
0%	2.53	6.49
5%	2.69	7.01
10%	2.42	5.63
15%	2.23	5.09

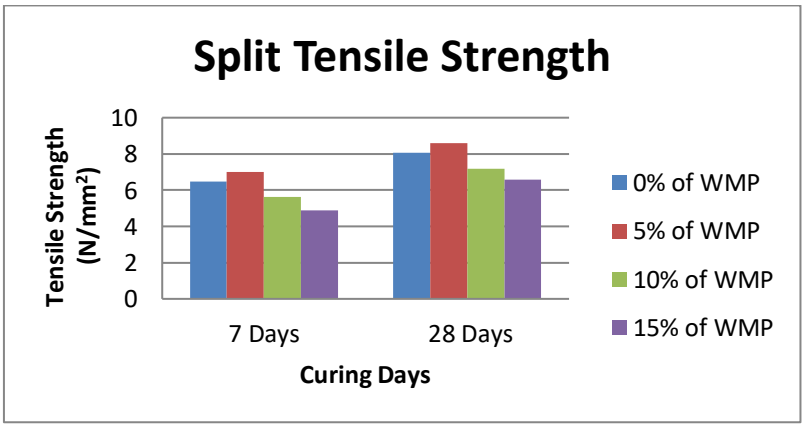

Figure – 2:Average split tensile strength for various proportions

FLEXURAL STRENGTH TESTS

The test was done using IS code – 516 : 2008.

Table - 6: Shows the average flexural strength for various proportions

Mix Proportions	7 days flexural strength in N/mm^2	28 days flexural strength in N/mm^2
0%	6.49	8.06
5%	7.01	8.59
10%	5.63	7.18
15%	4.89	6.58

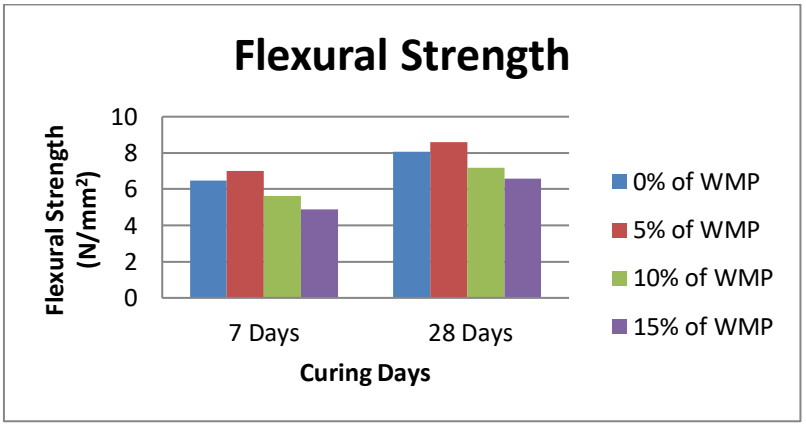

Figure – 3:Average Flexural strength for various proportions

RESULTS AND DISCUSSION

From the experimental analysis, it is an evident that at age of 7, 28 days fig 2,3,4 shows the compressive strength, split tensile strength and flexural strength increases at only 5% and further increase in the W. M. P. causes decrease in the strength. Optimum strength obtained at 5% replacement of W. M. P. as cement.

CONCLUSIONS

Waste Marble Powder can be used as partial replacement for cement up to percentage of 5. More than the 5% replacement decreases in strength is seen. For optimum result the 5% replacement of cement with waste marble powder is good.

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