

EXPERIMENT STUDY ON STRENGTH CHARACTERISTICS OF CONCRETE USING WASTEMARBLE POWDER

HARDIK LAD

UG Student, Civil Engineering Department, FETR Bardoli, Gujarat, India.
Ladhardik0696@gmail.com

DR. BHAVIN G. PATEL

Assistant professor, Civil Engineering Department, FETR Bardoli, Gujarat, India
bgp.fetr@gmail.com

PROF. PRATIK V. SHAH

Assistant professor, Civil Engineering Department, FETR Bardoli, Gujarat, India
pvs.fetr@gmail.com

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 swastemarle 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% and 15% 0.43 water 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

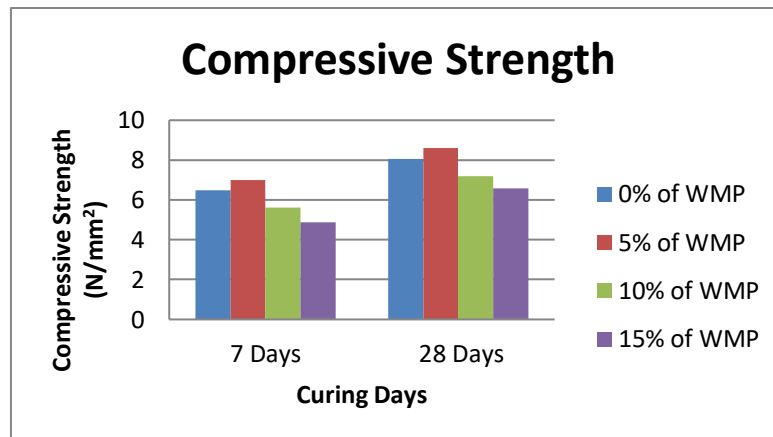


Figure – 1: Average compressive strength for various proportions

SPLIT TENSILE STRENGTH TESTS

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

Table - 5: Shows the average split tensile strength of concrete for 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

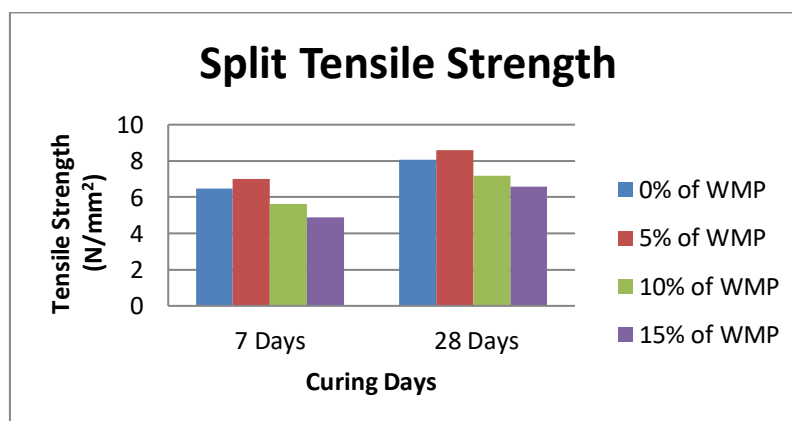


Figure – 2: Average split tensile strength for various proportions

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

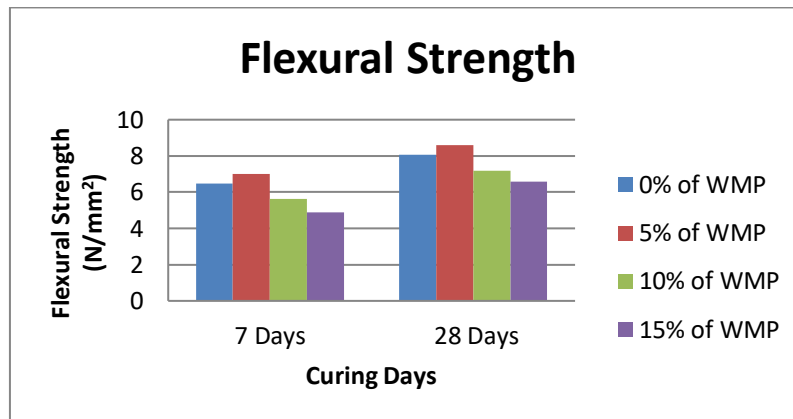


Figure – 3: Average Flexural strength for various proportions

RESULTS AND DISCUSSION

From the experimental analysis, it is 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.

REFERENCES

- I. Bhupendra Singh Kalchuri, Dr. Rajeev Chandak & R.K. Yadav (2015). "Concrete Using Marble Powder Waste As Partial Replacement Of Sand". International Journal of Engineering Research and Applications, 87 – 89.
- II. Mr. L. Satish Kumar, Mr. M. srinivasaRao (2017). "Partial replacement of fine aggregate with marble dust in concrete". Anveshana's International Journal Of Research In Engineering And Applied Sciences, 36 - 43.
- III. Mrs. Shalaka S. Utkar (2016). "Use of marble powder as a partial replacement of cement". International Journal of Advance Research in Science and Engineering, 228 – 232.
- IV. Prof. P.A. Shirule, AtaurRahman, Rakesh D. Gupta (2012). "Partial replacement of cement with marble dust powder". International Journal of Engineering Research and Applications, 106 – 114.
- V. Rishi, Dr. Vanita Aggarwal (2014). "Effect on partial replacement of fine aggregate and cement by waste marble powder/ granules on flexural and split tensile strength". IOSR Journal of Mechanical and Civil Engineering, 110 - 113
- VI. Raghvendra, Prof. M. K. Trivedi (2017). "Partial Replacement of Cement with Marble Dust Powder in Cement Concrete". International Journal for Research in Applied Science & Engineering Technology. 712 - 717
- VII. IS CODE 10262:2009 for Concrete Mix Proportion.
- VIII. IS CODE 516-2008 for testing of hardened concrete.