



PARTIAL REPLACEMENT OF FINE AND COARSE AGGREGATE BY USING MARBLE POWDER AND DEMOLISHED WASTE

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ABSTRACT

Concrete is a versatile engineering composite material made with cement, sand, aggregates and admixtures in some cases. Due to the day by day innovations and developments in construction field, the global consumption of natural aggregates is very high and at the same time production of solid wastes from the demolitions and manufacturing units are also very high.

Extensive use of concrete leads to the scarcity of natural aggregates. Because of this reasons the reuse of demolished construction wastes and solid waste from manufacturing units came into the picture to reduce the solid wastes from demolition and manufacturing units and as well as to decrease the scarcity of natural basic aggregate.

Our aim is to study the suitability alternative to depletion of natural aggregates. Demolished building wastes are used to partial replacement of the coarse aggregate and marble powder is used to partial replacement of the fine aggregate.

M20of concrete mix has been taken and casted into cubes and conducted a strength tests. Also cast the replacement of sand and aggregate by marble powder and demolished waste respectively and the mix is casted into moulds and conduct a strength test on new specimens and compare the results.

Keywords: Aggregates, Concrete, Marble powder, Replacement of aggregates, Sand

I. INTRODUCTION

Concrete is a mixture of a cement, fine aggregate and coarse aggregates with water. Now a day the availability of natural aggregates is less and it is getting depleted. Even though it is available it is too costly to use it in the construction field. Hence we are thinking the alternatives to the natural aggregates. In India the extractive activity of decorative sedimentary carbonate rocks, commercially indicated as marbles and granites, is the most thriving industry. Due to the new emerging innovative ideas in construction field People are owing to renovate their buildings and also demolishing the old ones to reconstruct the buildings. Due to the demolition of buildings, the demolished waste is generated and it's a big challenge to dispose it off. So we are trying to solve this problem in the view of protecting environment by utilizing this waste by replacing the natural coarse aggregates with this waste.

Our main objective is to know the behaviour of concrete with replacement of fine aggregate with marble powder and coarse aggregate with demolished waste respectively. The main parameter is to study basic engineering properties of the cement aggregates and compressive strength Also to establish the effect of marble powder and demolished waste on the properties concrete mixes. To study the effect of varying percentage of demolition waste as a replacement to

natural aggregates on the performance. The collected construction and demolition waste were crushed, sieved and according to gradation it was separated with a required quantity for the analysis. Natural aggregates according to gradation with the percentages of 0%, 10%, 20%, 30% replacement was used, and casted moulds. From the results found the optimum percentage of demolished waste aggregate keeping that as constant. To study the influence of partial replacement of fine aggregate with waste marble powder, and to compare it with the compressive strength of ordinary M20 concrete.

To determine and find the percentage of marble powder replaced in concrete that makes it economical. As marble powder acts like a pollutant so by partially replacing fine aggregate with marble powder there will be reduction in pollution. In this project our main objective is to study the influence of partial replacement of fine aggregate with marble powder. The compressive strength of ordinary M20 grade of concrete are obtained. Similarly compressive strength were obtained for 0%, 10%, 20%, & 30% replacement of fine aggregate with marble powder by weight. The water cement ratio (0.50) kept constant throughout the investigation of this project work. To study the physical properties of Marble dust powder. To characterize the particle size of Marble dust powder also to study the effect of marble powder inclusion on the properties of concrete.

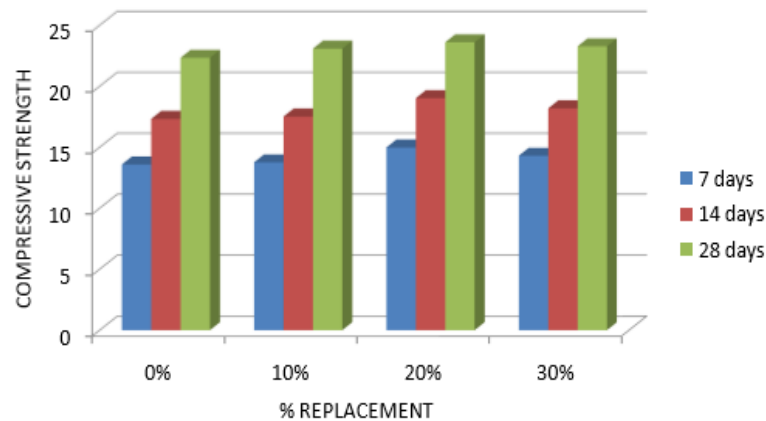
C. Corinaldesi V et al., (2010) has inscribed that Marble as a building material especially in palaces and monuments has been in use for ages. However the use is limited as stone bricks in wall or arches or as lining slabs in walls, roofs or floors, leaving its wastage at quarry or at the sizing industry generally unattended for use in the building industry itself as filler or plasticizer in mortar or concrete. The result is that the mass which is 40% of total marble quarried has reached as high as millions of tons. This huge unattended mass of marble waste consisting of very fine particles is today one of the environmental problems around the world.

B. V.M. Sounthararajan et.al (2013) has been conducted a study on Effect of the Lime Content in MDP for Producing High Strength Concrete. They found that the marble powder up to 10% by weight of cement was investigated for hardened concrete properties. Furthermore, the effect of different percentage replacement of marble powder on the compressive strength, was evaluated. It can be noted that the influence of fine to coarse aggregate ratio and cement-to-total aggregate ratio had a higher influence on the improvement in strength properties. A phenomenal increase in the compressive strength of 46.80 MPa at 7 days for 10% replacement of marble powder in fine aggregate content was noted and also showed an improved mechanical property compared to controlled concrete.

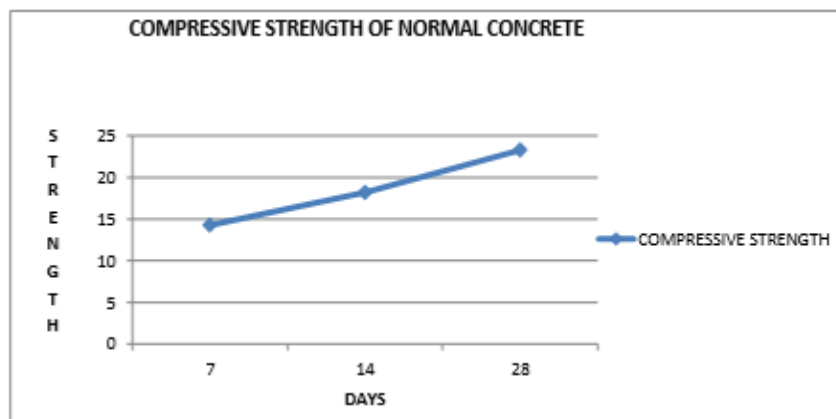
II. TESTS ON CONCRETE CUBES



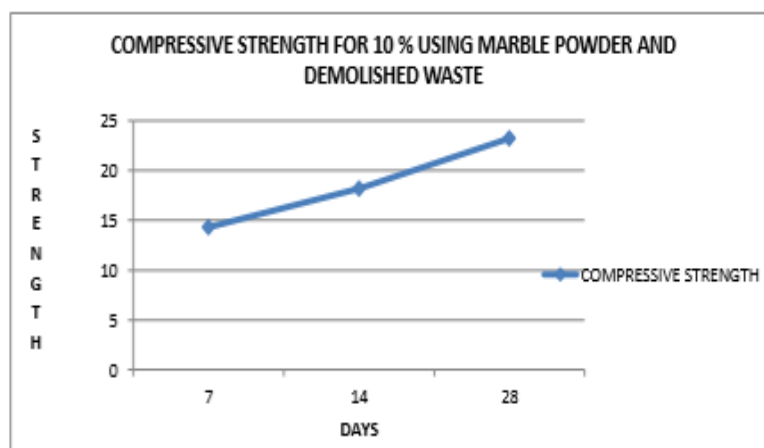
“Fig. 2”: Comparison of Compressive Strength between Normal Concrete and Concrete Using 10%, 20% And 30% Marble Powder and Demolished Waste.



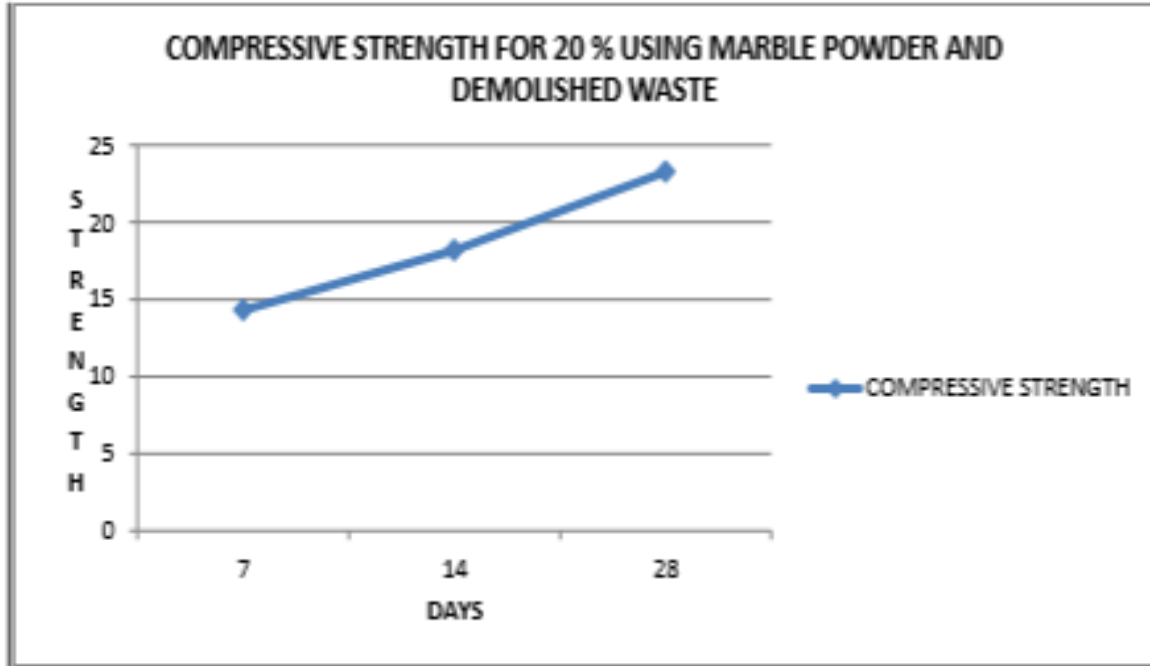
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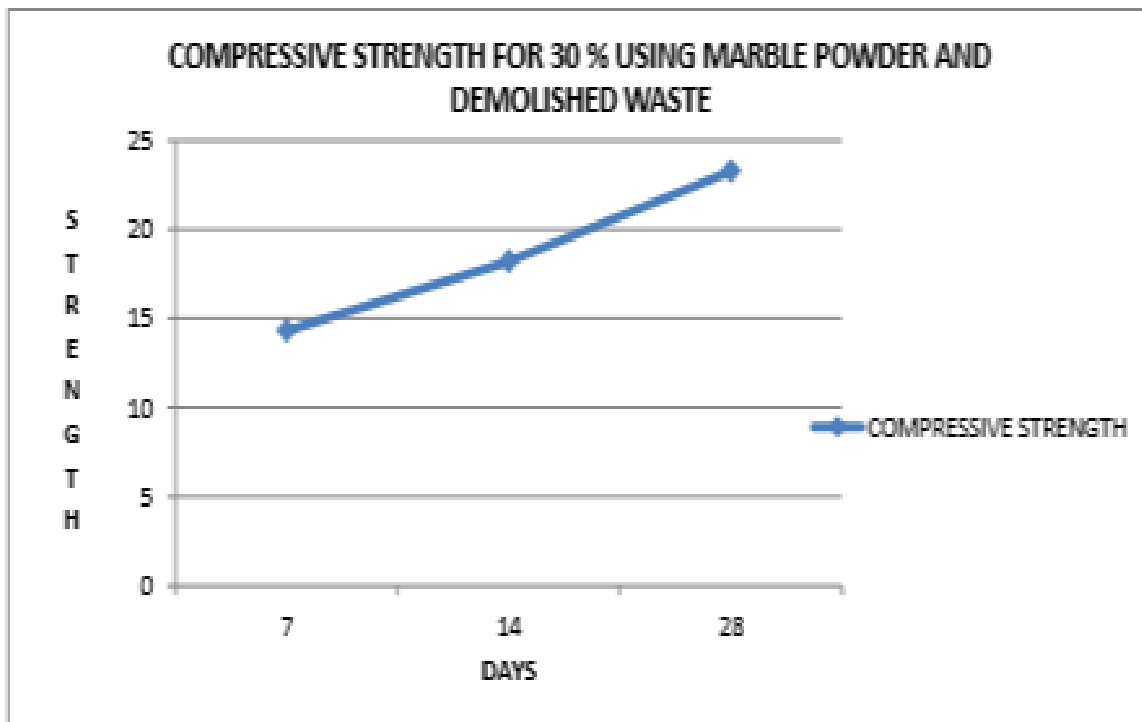
“Fig. 3”: Compressive Strength between Normal Concrete for 7,14and 28 days.



“Fig. 4”: Compressive Strength of concrete by 10% replacement of marble powder and demolished aggregate for 7,14and 28 days.



“Fig. 5”: Compressive Strength of concrete by 20% replacement of marble powder and demolished aggregate for 7,14and 28



“Fig. 6”: Compressive Strength of concrete by 20% replacement of marble powder and demolished aggregate for 7,14and 28

Percentage of marble powder and demolished waste added (%)	Compressive strength (N/mm ²)		
	7days	14days	28days
0%	13.75	17.02	22.64
	13.57	17.35	22.20
	13.44	17.60	22.15
10%	13.95	17.20	23.15
	13.70	17.45	23.00
	13.65	17.90	23.10
20%	14.80	19.00	23.47
	15.00	18.85	23.85
	15.15	19.20	23.50
30%	14.40	18.45	23.35
	14.20	18.00	23.28
	14.30	18.10	23.18

“Table 1”: Compressive Strength Test Results

IV. CONCLUSIONS

1. The replacement of fine aggregate with waste marble powder attains maximum compressive strength.
2. Up to 20% replacement of fine aggregate and coarse aggregate with waste marble powder and demolished waste there is an increase in all mechanical properties.
3. Sand has more water content than marble dust. So for preparing concrete mix marble dust require more water to add.
4. In compressive strength test on harden concrete cube, it was found as amount of marble dust increased compressive strength decrease but it has enough compressive strength up to 20% as require for construction. More than 20% fine and coarse aggregate cannot be replace with marble powder and demolished waste thus it decreases the compressive strength.
5. Demolished aggregate possess relatively lower bulk crushing, density and impact standards and higher water absorption as compared to natural aggregate.
6. Tests conducted on demolished aggregates and results compared with natural coarse aggregates are satisfactory as per IS 2386. The Compressive strength of Concrete increases up to 20% replacement of cement by marble powder and further increasing of percentage of marble powder leads to decrease in compressive strength of concrete. The obtained optimum percentage of marble powder and demolished waste is 20%

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BIOGRAPHICAL NOTES



Prof. Lakshmi H S is working as Assistant Professor in the Department of Civil Engineering in Shri Pillappa College of engineering, Bangalore from past two years. She completed M.Tech in Structural engineering from Visvesvaraya Technological University. Her research interest in the field of concrete technology.