

# PARTIAL REPLACEMENT OF FINE AGGREGATE BY MARBLE POWDER

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**Abstract**— Concrete is the most widely used construction material in civil engineering industry because of its high structural strength and stability. Concrete is a heterogeneous mix of cement, aggregate (coarse and fine aggregate) with suitable amount of water. In this thesis here we are using marble powder as a supplement to fine aggregate as marble powder is a by-product of metamorphic rocks industries which is generally dumped near the marble processing industries which lead to environmental problems as it easily contaminates air and water. The main objective of our project work is to investigate the usage of the marble powder as partial replacement of fine aggregate (instead of sand). The concrete is prepared with marble powder as a partial replacement of fine aggregate in various proportions and laboratory tests like compressive strength test and workability test etc will be carried out. Later the compressive strength is compared with conventional concrete. From our research activity we are going to use marble powder as a supplement with different proportion.

**Index Terms**— Durability, Marble powder, compressive strength, tensile strength, workability.

## 1 INTRODUCTION

Now a day's marble powder is the source that causes of environmental troubles in the world. Therefore, maximum utilization of marble waste in various sectors, especially the construction, agriculture, glass and paper industries would help to protect the environment. Concrete generally used in construction projects in the civil construction work because of its large structural strength and constancy. The over use of river sand for construction has various undesirable social and ecological consequences, fine aggregate is one of the important constituents of concrete and mortar in construction industry as there is a huge demand of sand it is becoming a scarce material. As natural sand deposits are depleting it is necessary to replace partially or fully of fine aggregate with alternative. As a solution for this various alternative are explored.

Before this study, different investigations are found the solutions on concrete composite materials. Natural resources are decreasing from the earth and increasing wastes from industries generated simultaneously. The eco friendly and consistent enhancement for construction includes the utilization of non conventional and unusual waste materials, and use of waste material for reducing emissions in environments and decreasing the utilization of environmental resources. Sand is ordinary form of fine aggregate used in concrete production. Marble powder is the waste which is generated from Marble finishing industries in construction which has similar physical and chemical actions of sand.

## 2 . LITERATURE REVIEW

### 2.1 History of Literature.

This report portrays the idea using marble powder in concrete, its synthesis and properties and how it could be indicated for use in structural building works. Since the properties of concrete were improved by using marble. For further information on both submission guidelines, authors are strongly encour-

aged to refer to <http://www.ijser.org>.

powder in the published literatures, they assessed us to utilise in concrete and it can be utilised as a part of a wide assortment of uses, it is imperative to characterize execution prerequisites for each case. Most of the literatures available indicate that many researchers have studied the compressive strength, flexural strength etc. Cement and fine aggregate were replaced by marble powder in different concrete mixtures. This literature helps us to find the compressive strength of ordinary mix proportions of the testing specimen. Hence by observing the literatures, this work was carried out by replacing fine aggregate with marble powder and specimen's compressive strength was found.

## 3 METHODOLOGY

The material used in preparation of concrete mix is as follows. Cement of 53 grade, Fine aggregate (sand and marble powder), coarse aggregate and chemical admixture. The experimental program consisted of casting and testing specimens for arriving at the maximum size of aggregate. M20 grade of concrete is considered in this study. In the first stage the effective maximum size of aggregate for M20 grade of concrete was arrived. The mix proportion was arrived taking the different sizes of aggregate into consideration. This effective size of aggregate was arrived for M20 grade of concrete. A total of 63 cubes of standard size 150×150×150mm were prepared and compression testing machine is used to determine the compressive strength of concrete. Cement is by far the primary element of the concrete. In that it presents the binding material for the discrete elements. Cement naturally generating from raw supplies and sometimes blended with powder waste. The cement is used in this experiment was 53 grade cement. Before cement is used for experiment the following tests were carried out namely

- a) Fineness test
- b) Specific gravity of cement

c) Normal consistency of cement.

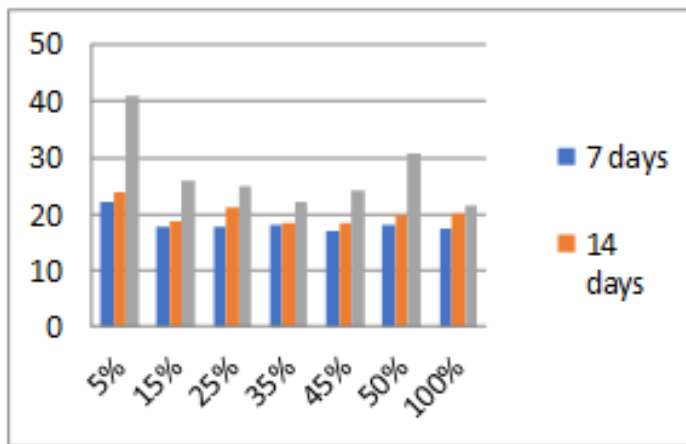
Mixing of all the ingredients like cement, fine aggregate like sand and marble powder, coarse aggregate and water for some specified proportions is nothing but casting. In the project our main aim is to compare the compressive strength for concrete cubes made with fine aggregates and its replacement as marble powder. As we are aware of the casting of concrete cubes in the below process. Firstly we need to test the samples of cement, aggregates so as if needs to reach the minimum required measures. Now my particular proportion of concrete is taken according so that proportions, we need to cast the concrete cubes. Proportion of concrete: Mix proportion adopted by nominal mix as per IS 456:2000 M20: 1:1.5:3 (Cement: Fine aggregate: coarse aggregate) Proportions with fine aggregate: To prepare the concrete cubes, the general ingredients used are cement, fine aggregates and coarse aggregate with suitable proportion of water. As in this project we are preparing the concrete cubes for 7, 14, and 28 days for M20 proportion of concrete. The casting (mixing of ingredients for concrete) process should be done within 5 minutes, as the cement concrete should not loss its plasticity. And main requirement is percentage of water for concrete as per water-cement ratio. In this project we are replacing fine aggregate (sand) with marble powder with different percentages such as 5%, 15%, 25%, 35%, 45%, 50% and 100%.

**4 RESULT AND DISCUSSION**

This chapter deals with the various test results conducted on constituents of concrete such as test on cement, fine aggregate (sand and marble powder) and coarse aggregate, and tests on fresh concrete and compression test.

S.NO	% of marble powder	Compressive strength of concrete (N/mm <sup>2</sup> )		
		7 days	14 days	28 days
1.	5%	22.07	23.85	40.88
2.	15%	17.77	18.67	25.78
3.	25%	17.78	21.04	25.04
4.	35%	17.92	18.37	22.22
5.	45%	16.89	18.37	24.30
6.	50%	18.07	19.70	30.67
7.	100%	17.33	20	21.63

compressive strength of concrete mixes with various percentages of marble powder



Graph: compressive strength of concrete mixes with various percentages of marble powder

**5 CONCLUSIONS**

From the test result the following conclusion can be drawn:

- a) The compressive strength of concrete is increased when the 5% of fine aggregate (sand) is partially replaced with marble powder and by further increasing the percentage of marble powder the compressive strength gradually decreases.
- b) Compressive strength of 5% marble powder partially replaced with fine aggregate at 28 days water curing is found to be 40.88 N/mm<sup>2</sup>.
- c) Partial replacement of fine aggregate with marble powder in a concrete mix boosts the compressive strength of concrete.
- d) Test also indicates that the waste marble powder can be successively utilized as partial replacement of fine aggregate in concrete production.
- e) As marble powder easily contaminates air and water and pollutes the environment their use in concrete will alleviate the problem of their disposal and environmental pollution.
- f) Cost of concrete production reduces when marble powder is used, as marble powder is a low cost material, hence it is economical.

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