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*Original Article*

# Strength Study On No – Fine Concrete Using Marble Sludge Powder

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***Abstract:*** *Leaving the waste materials to the environment directly can cause environmental problems. Hence the reuse of waste material has been emphasized. Waste can be used to produce new products or can be used as admixtures so that natural resources are used more efficiently and the environment is protected from waste deposits. Marble industry generates both solid waste and stone slurry. These industrial wastes are dumped in the nearby land, and the natural fertility of the soil is spoiled. Therefore, the scientific and industrial community must commit towards more sustainable practices. In this project our main objective is to study the influence of partial replacement of cement with marble powder, and to compare it with the compressive and tensile strength of ordinary concrete. We are also trying to find the percentage of marble powder replaced in concrete that makes the strength of the concrete maximum. Nowadays marble powder has become a pollutant. So, by partially replacing cement with marble powder, we are proposing a method that can be of great use in reducing pollution to a great extent*

***Keywords****: No-fine concrete, Marble sludge powder, Compressive strength, Sustainable construction, Waste material utilization, Eco-friendly concrete, Lightweight concrete, Mechanical properties, Porosity, Permeability.*

## I. INTRODUCTION

Environmentally, when industrial waste is recycled not only are CO2 emissions reduced but residual products from other industries are reused and therefore less material is dumped as landfills and more natural resources are saved. Fly ash, blast furnace slag and silica fume are most widely used industrial wastes in place of cement for concrete production attributed to their reactivity nature called pozzolanic behavior. In addition to pozzolanas, other inert byproducts and waste materials have been used in concrete and mortar production as inert fillers for similar reasons. The waste is approximately in the range of 20% of the total marble handled. The waste generated every year is in tons, which is dumped in open space. This leads to serious environmental and dust pollution. This may also lead to contamination of underground water reserves. The environmental problems attributed by waste marble powder impose threat to ecosystem, physical, chemical and biological components of environment. It is therefore very important to reuse the waste marble powder which shall solve most of the problem. This report describes the feasibility of using the waste marble powder as a partial replacement of cement.

## II. LITERATURE REVIEW

Conducted an experimental study on concrete by partial replacement of fly ash and marble powder for the cement to find out mechanical properties of concrete. The fly ash and marble powder were replaced within the percentage of 0%, 5%, 10%, and 15% and 20%. The strength of concrete has been found for both M20 and M25 mixes. The compressive and split tensile strength of concrete was evaluated after 28 days curing periods. The replacement 0%, 5%, 10%, 15%and 20%cement by fly ash and marble powder showed 24.5, 26.7, 27.3, 25.6and24.4 N/mm2 increase in compressive strength at 28 days of curing for M25. The replacement 5%, 10%, 15%and 20%cement by fly ash and marble powder showed 1.52, 1.78, 1.98, 1.89and1.76 N/mm2 respectively increase split tensile strength at 28 days of curing for M25. Finally, it was observed that the compressive and split tensile strength of M25 will be high at 10% replacement of marble powder and fly ash by the weight of cement

## III. METHODOLOGY

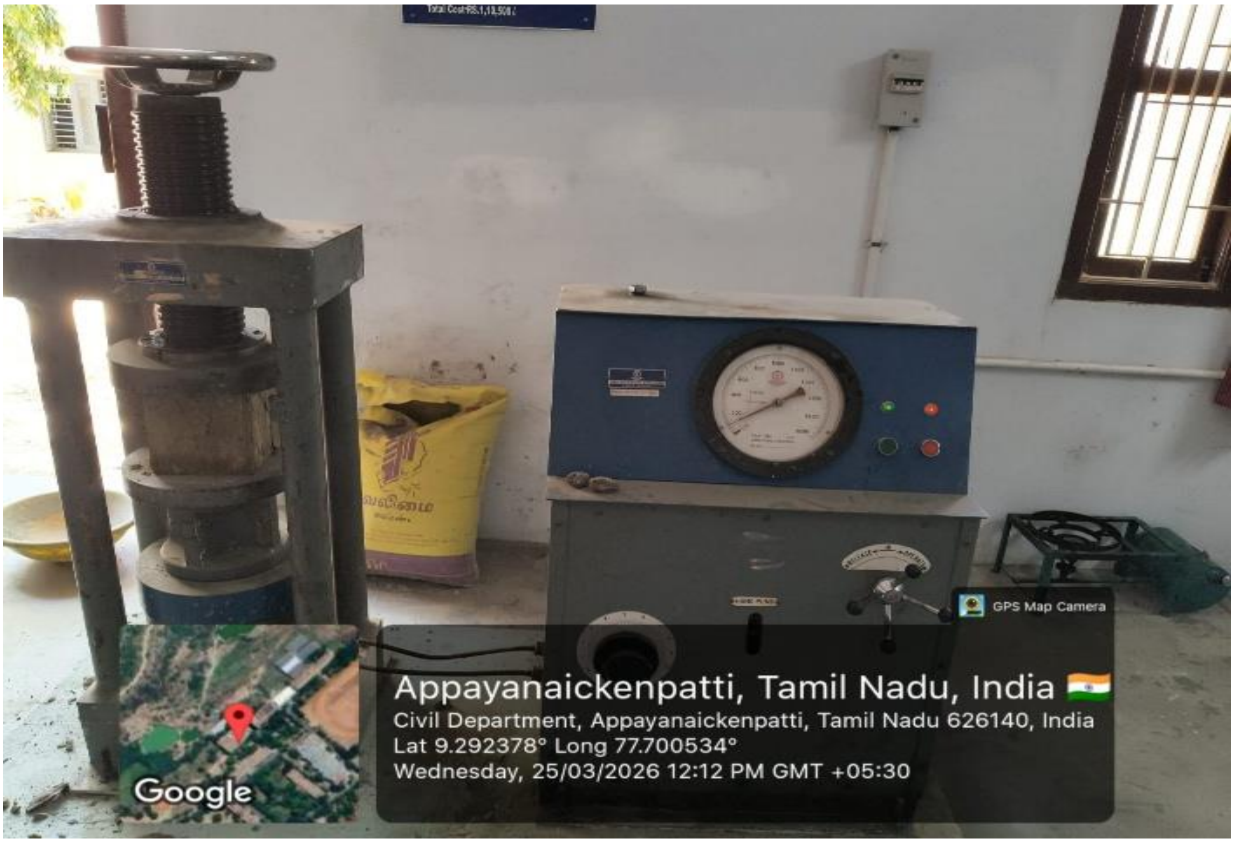
The methodology for the strength study on no-fines concrete using marble sludge powder involves the selection of suitable materials such as Ordinary Portland Cement, coarse aggregates, marble sludge powder, and potable water. The marble sludge powder is collected, dried, and sieved before being used as a partial replacement for cement. No-fines concrete is prepared without fine aggregates, using a cement-to-aggregate ratio of about 1:6 to 1:8 and a water-cement ratio of 0.35 to 0.45. Different mixes are prepared by replacing cement with marble sludge powder at varying percentages such as 5%, 10%, 15%, and 20%. The concrete is then placed into standard cube moulds and compacted lightly. After 24 hours, the specimens are de-moulded and cured in water for 7, 14, and 28 days. Compressive strength tests are conducted using a compression testing machine. Additional tests such as density and water absorption are also performed The results are analyzed to determine the effect of marble sludge powder on strength. Finally, the optimum replacement level is identified based on performance.

## IV. RESULTS AND DISCUSSION

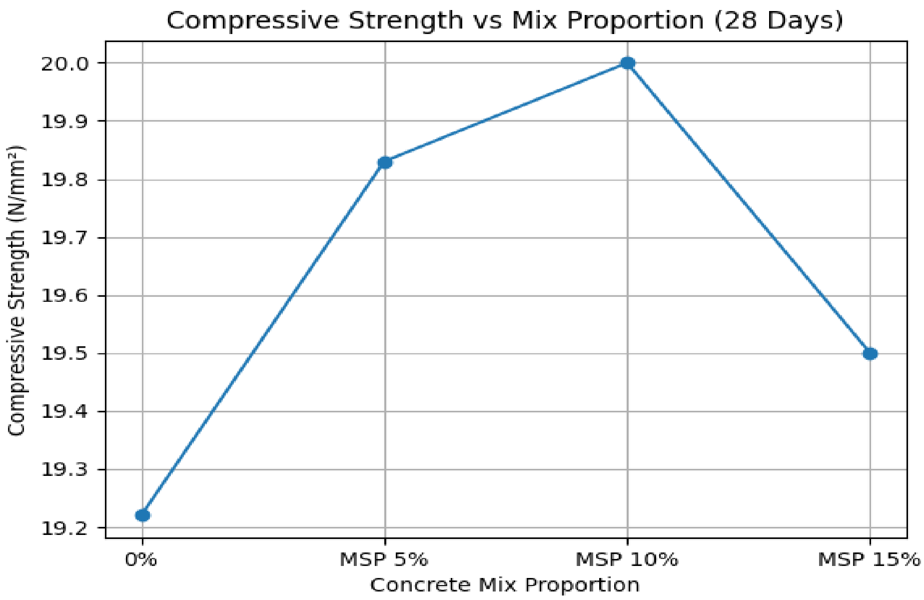
The results show that the addition of marble sludge powder influences the strength of no-fines concrete. Compressive strength increased gradually with replacement levels up to about 10–15% due to improved bonding and particle packing. Beyond this level, strength decreased because of reduced cement content. The density slightly increased, while the void ratio decreased with the addition of marble sludge powder. Water absorption was also reduced at lower replacement levels, indicating better durability. Overall, an optimum replacement of 10–15% marble sludge powder provides improved performance.

## V. WORKABILITY & COMPRESSIVE STRENGTH TESTS

In this study, the compression testing machine CTM having capacity of 3000 KN are used for compressive strength of the concrete cubes. Compressive test was carried out on cubes of dimensions 150*150*150mm after 3 days, 7 days and 28 days for each test and for each mix three specimens were tested.




| S.no | Concrete mix proportion | Sample -1 (N/mm²) | Sample -2 (N/mm²) | Average (N/mm²) |
|---|---|---|---|---|
| 1 | 0% | 19.22 | 19.22 | 19.22 |
| 2 | MSP 5% | 20.11 | 19.56 | 19.83 |
| 3 | MSP 10% | 19.78 | 20.22 | 20 |
| 4 | MSP 15% | 19.56 | 19.44 | 19.5 |




## V. CONCLUSION

The compressive strength of no-fines concrete is calculated by dividing the maximum load by the cross-sectional area of the specimen. For a 150 mm cube, the area is 22500 $mm^2$. For example, if the applied load is 150 KN, the compressive strength is 7.50 $N/mm^2$. Water absorption is calculated using the difference between wet and dry weights divided by dry weight. Density is obtained by dividing the mass of the specimen by its volume.

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