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Performance on Concrete with Banana Fibers And Partial Replacement of Fine Aggregate with White marble Dust

Dr. K. Chandramouli[1], J. Sree Naga Chaitanya[2], Dr. D. Vijaya Kumar[3], Y. Prem Nikhil[4]
[1]*Professor & HOD,* [2]*Assistant Professor,* [3]*Principal ,* [4]*UG Student*
[1.2.4]*Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru (M), Guntur, Andhra Pradesh, India*
[3]*Department of Civil Engineering, kodada institute of technology and sciences for women, Telangana, India*

Abstract: ***Currently, there is a significant demand for residential and commercial structures due to the population's fast increase. Concrete is essential for the construction of every building. To prepare concrete, several components are required. Owing to the ongoing development activity, these natural resources running out in an effort to preserve these assets, found marble dust here when researching for a substitute, why due to the fact that it is a byproduct of the marble industry .It has an impact on both the environment and people's health, therefore to reduce these damages and preserve our natural resources, intended to use this marble dust in place of fine aggregate .We intended to use banana fibre in order to improve the strength to the pavement. The percentages of substitution for marble dust are 0%, 5%, 10%, 15%, 20%, and 25%. Additionally, a proportion of 0%, 1.1%, 2.1%, 3.1%, 4.1%, and 5.1% of banana fibre is added. By using these percentages, we cast various cubes, and after evaluating them, we came to the conclusion that a 15% replacement provided the greatest results overall. And the tests we ran were the Compressive strength and Split Tensile Test. We utilised M20 concrete, which is a grade.***
Keywords: Marble dust, Banana fibre, compressive strength, split tensile strength.

I. INTRODUCTION

There is a shortage of suitable housing in cities due to rapid urbanization in emerging nations like India. A logical first step in addressing this issue is the use of artificial aggregates in high-quality concrete.

In order to fulfill the escalating demands of infrastructure development in recent years, some developing nations have overcome challenges in meeting the supply of natural fine aggregate. This is due to the extremely high global use of fine aggregate in the manufacturing of concrete.

Research sand practitioners in the building sectors have developed certain substitute resources, including as fly ash, slag, limestone powder, and siliceous stone powder, to combat the pressure and demand for fine aggregate. In India, attempts have been made to use marble dust in place of sand. Marble dust might be successfully used as fine aggregate to transform this disposal-problem-causing waste item into a useful resource. Utilizing this material has advantages for the environment in terms of waste disposal and lowering carbon dioxide emissions, as well as better strength and durability attributes. Energy and money are both significantly saved when these admixtures are added.

II. OBJECTIVES

1) To investigate the compressive strength of concrete when marble dust powder is used to replace some of the fine aggregate.
2) To determine the destructive and non-destructive test to determine the viability of the partial replacement of higher-than-material in concrete.
3) To suggest an estimated level of adding banana fibre and replacing marble dust based on the results of the examination.
4) By using banana fibre, we may prevent wall fractures.

A. Scope of the Study

The purpose of the research is to determine how to meet the goals, and it will mostly focus on experimental work. In order to explore the behavior of concrete, experiments on compression strength, split tensile strength, and the partial replacement of marble dust and addition of banana fibre will be conducted. All testing procedures and methodologies are laid out in accordance with Indian Standards.

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III. MATERIALS

A. *Marble Dust*

The marble processing business in Alwar, Rajasthan, India, provided the marble dust. The XRD method is used to determine the mineralogical composition of marble dust, and it presents the chemical composition of marble powder. The principal crystalline minerals found in marble dust, according to the XRD spectrum, are magnesium calcium bis (carbonate) (MgCa(CO3)2) and calcium magnesium aluminium catena- alum silicate.

Advantages of Using Marble Dust:

1) Marble dust may often increase compressive strength.
2) Marble dust can be added to concrete as a mixture enhancer.
3) Marble dust is a byproduct of the manufacturing of marble and can be utilised as either a filler or as a fine aggregate for making concrete.
4) The CO2 and powdered form of dust are reduced by using marble dust.
5) Marble dust usage in concrete lessens subsurface contamination issues and disposal issues.

B. *Banana Fibers*

The fibre has an embossed surface that gives it a "sticky" appearance. Mechanical anchoring-producing deformations. The banana fibres were cut from full-length fibres and ranged in length from 50 mm to 25 mm.Since CEB is an alkaline material compound with a pH value greater than 7 and banana fibre is an acidic fruit material with a pH value less than 7, chemical pretreatment is required to raise the pH level of the banana fibres. Previous research has demonstrated that the right surface treatments can promote mechanical bonding and hence enhance the interaction between the matrix and the reinforcement.

Advantages of Banana fibers

1) Compressive strength has increased, as has resistance to wall cracking.
2) Reduced shrinkage, increased ductility, and improved concrete post-cracking behaviour

IV. EXPERIMENTAL RESULTS

A. *Compressive Strength Results*

Table 1: Compressive strength results of marble dust and addition of banana fibre

% of marble dust	%of banana fiber	Compressive strength results,N/mm^2		
		28 days	56 days	90 days
0%	0%	31.50	34.31	36.78
5%	1.1%	33.15	36.11	38.77
10%	2.1%	35.04	38.10	40.98
15%	3.1%	36.93	40.22	43.12
20%	4.1%	35.25	38.39	41.14
25%	5.1%	33.98	36.93	39.64

B. *Split Tensile Strength Result*

Table 2: Split tensile strength results of marble dust and addition of banana fibre

% of marble dust	%of banana fiber	Split tensile strength results,N/mm^2		
		28 days	56 days	90 days
0%	0%	3.10	3.26	3.51
5%	1.1%	3.16	3.44	3.69
10%	2.1%	3.39	3.71	3.97
15%	3.1%	3.57	3.85	4.16
20%	4.1%	2.99	3.24	3.48
25%	5.1%	2.19	2.37	2.56

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V. CONCLUSIONS

A. The compressive strength of normal concrete at 28, 56 and 90 days is 31.50, 34.31 and 36.78 N/mm^2.

B. The split tensile strength of normal concrete at 28, 56 and 90 days is 3.10, 3.26 and 3.51 N/mm^2.

C. At combination of 15% of marble dust and 3.1% of banana fiber the compressive strength results for 28, 56 and 90 days is 36.93, 40.22 and 43.12 N/mm^2.

D. At combination of 15% of marble dust and 3.1% of banana fiber the split tensile strength results for 28, 56 and 90 days is 3.57, 3.85 and 4.16 N/mm^2.

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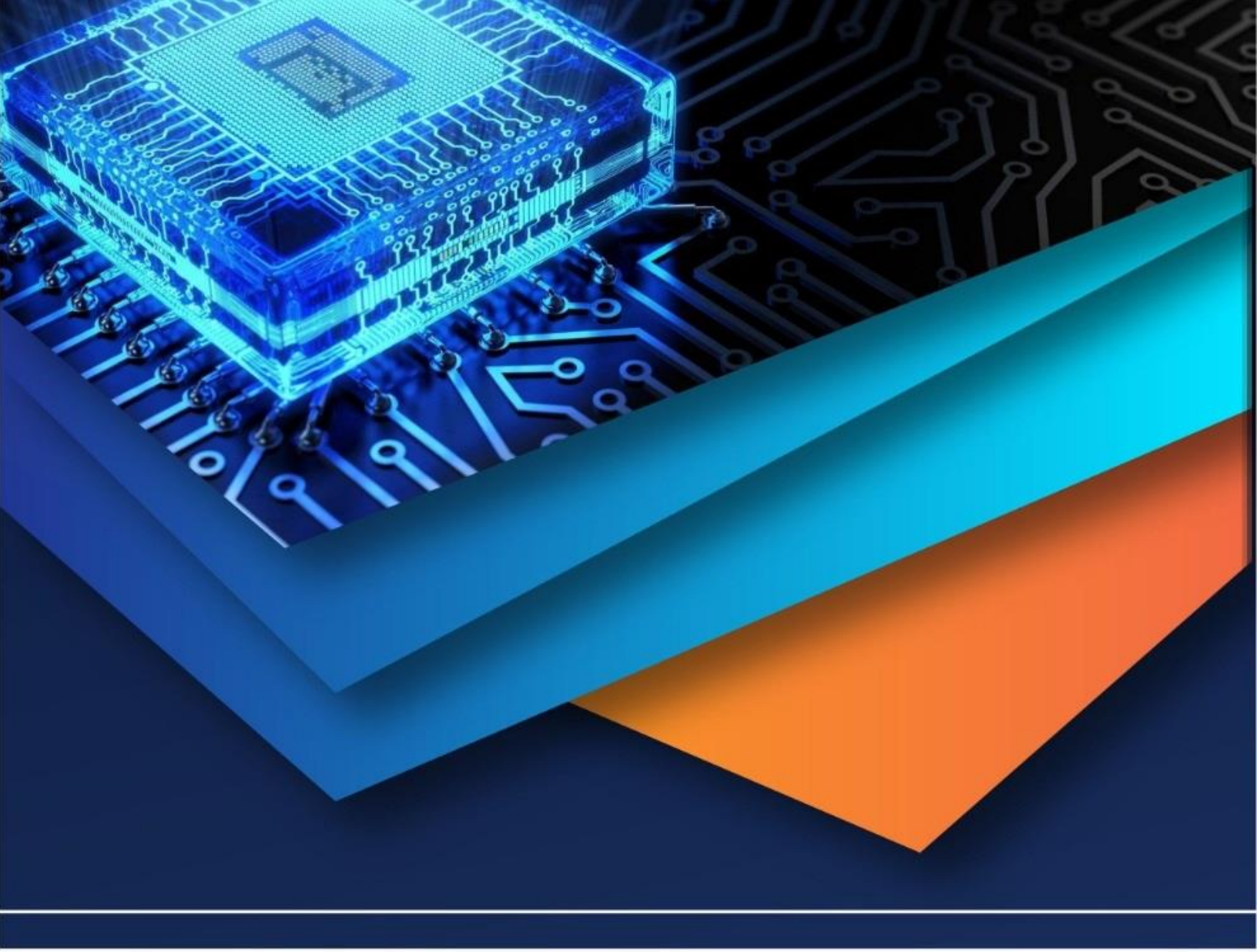
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