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Using Coconut Shells to Replace Some of the Coarse Aggregate

Vishwanath M. Kumbhar[1], Vishwajit R. Waghmare[2], Vikram T. Kale[3], Vishwajit S. Raut[4]
[1]*HOD, Civil Department, New Satara College of Engineering and Management (Polytechnic) Korti, Pandharpur, India*
[2, 3, 4]*Student, Civil Department, New Satara College of Engineering and Management (Polytechnic) Korti, Pandharpur, India*

***Abstract:** Massive buildings are being made as part of the urbanization and development process as it grows daily. In terms of stress, steel is superior to concrete because it is lighter. Even yet, using steel alone to build a structure is not recommended. Concrete is less expensive than steel. Thus, concrete is the material of choice for construction. Cement, fine aggregate, coarse aggregate, and water are the ingredients required to build concrete. More coarse aggregate is used than other ingredients in the creation of the concrete mix. Better and stronger aggregates are obtained by deeper excavation. Because the parent rock from which coarse aggregates are extracted determines their strength. Thus, the price of coarse aggregate is rising quickly. Coconut shells are used as a partial substitute for coarse aggregates in order to lower the expense and deeper excavation required. Using coconut shells as aggregates minimizes the agricultural waste that is generated from the shells. Because these materials are lightweight, light weight concrete is produced. The cost of building materials is increasing daily these days due to the rising use of concrete. One of the most crucial components of concrete is coarse aggregate. Because coarse aggregate requires deeper excavations, their cost rises. Thus, coconut shells from agricultural waste are chosen to replace some of the coarse aggregate. The amount of waste material made from coconut shells grows daily. When these are used as aggregates, they become less waste. Concrete made from coconut shell is lightweight since it is a lightweight material. In place of coconut shells, coarse aggregate makes up 0%, 5%, 10%, 15%, 20%, and 25% of the mixture. The coconut shells that are utilized in this measure less than 20 mm. Cubes are created in different sizes. After seven, fourteen, and twenty-eight days, specimens are tested*

I. INTRODUCTION

Mankind has three basic needs: food, clothes, and shelter. All of humanity's basic necessities are relevant to civil engineers, either directly or indirectly. Humanity has made great strides in the development of shelter construction techniques. People used to live in huts at first, but as time went on, they evolved into load-bearing houses. The growing expense of building materials is a major worry in this created environment.

Building materials are becoming more and more expensive every day. The majority of studies these days are concentrating on using waste elements in concrete based on their specific qualities.

Concrete can benefit from using fly ash, rice husk, slag, and sludge from the treatment of household and commercial wastewater as partial cement replacements. Another substance that can be substituted for other materials in concrete is coconut shell. In this project, coconut shells are used to partially replace the coarse aggregate. As a result, there are less land filings brought about by waste material deposits on barren areas. When compared to regular concrete, coconut shells have a very high resilience to impact load.

II. PROBLEM DEFINITION AND GOAL

The primary goal of this replacement project is to create lightweight concrete and make use of agricultural waste. Additionally, the strength parameters of standard concrete grade M25 are compared. To replace it, progressively increase the proportion of coconut shells added to the coarse aggregate.

III. MATERIALS USED

A. Cement Test

- Fines test
- Consistency test
- Soundness test
- Initial and final setting time

B. Fine Aggregate

Medium-sized fine aggregate, or less than 1.18 mm in size, is utilized in the concrete mix. based on BIS:383:1970, an Indian standard. This mixture was made with river sand. Tests fundamental to fine aggregate were conducted.

Fine aggregate tests

- Specific Gravity

Specific gravity= 2.50

- water absorption

water absorption= 1%

- Fineness modulus/Sieve analysis

Fineness modulus of fine aggregate= 2.75

- Bulking index

Percentage of bulking=26.47

C. Coarse Aggregates

The coarse aggregates used range in size from 16 to 20 mm, which corresponds to the available sieve size in the surrounding areas. The coarse aggregate is put to the test.

Coarse Aggregate Tests

- Specific Gravity
- water absorption
- Fineness modulus/Sieve analysis
- Fineness modulus of coarse aggregate= 6.45
- Impact test

D. Coconut shells

The adjacent hotels and homes provide the coconut shells for this project. These are dust-free and sun-dried for a full day. The particles utilized range in size from 16 to 20 mm.Coconut shells are used in the coarse aggregate test.

Test on coconut shells

- Specific gravity=1.13
- Water absorption= 155
- Impact test= 6.25%

Test on concrete

- Slump cone test
- Compaction factor test

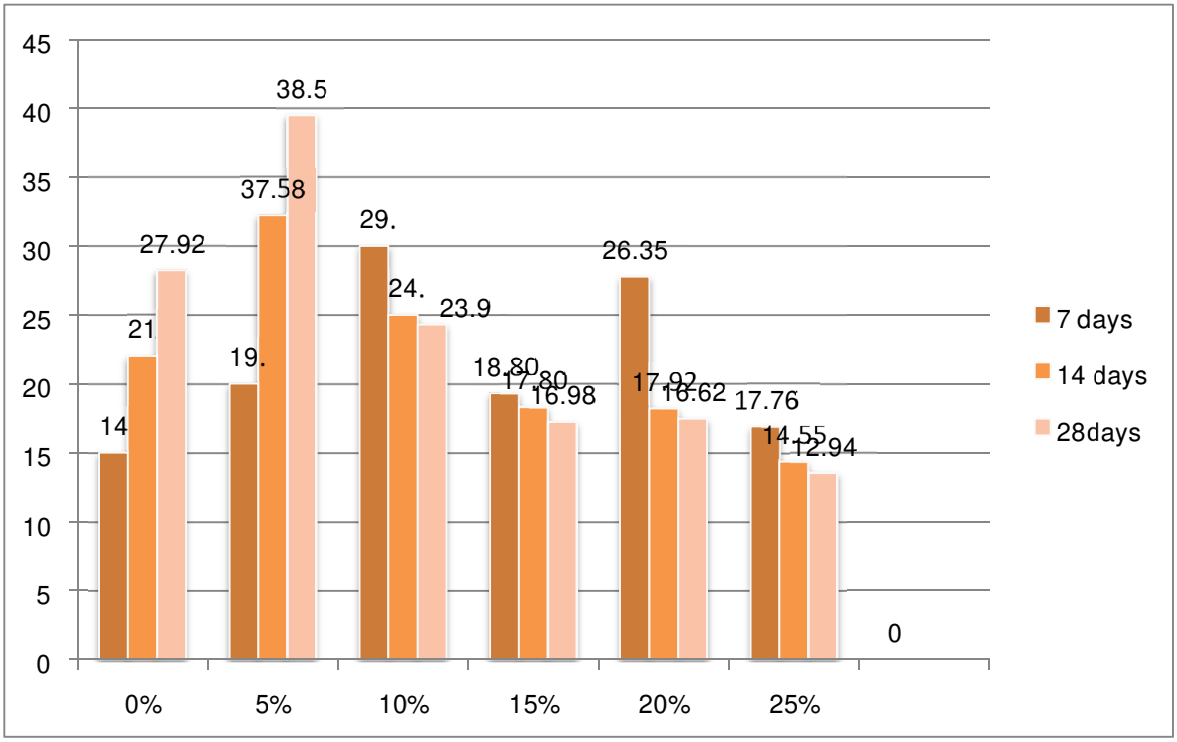
IV. EXPERIMENTAL WORK

For M25 grade concrete, the mix proportion is 1:1.3:1.9 with a water cement ratio of 0.4. The mix design was completed in accordance with IS 1026:2009 and IS 456:2000. Coarse aggregates (5%, 10%, 15%, 20%, and 25%) are used in place of coconut shells. Three layers of concrete were poured into the mold, then a tampering rod was used to compact each layer twenty-five times. After a day, they were removed from the molds. A total of twelve 150mm*300mm cylinders and thirty-six 150mm*150mm cubes were cast and subjected to split tensile and compressive strength tests.

Compressive strength by replacing coconut shells

Replacement	7 days Stress(n/mm2)	14 days Stress(n/mm2)	28days Stress(n/mm2)
0%	14	21	27.92
5%	19.5	37.58	38.58
10%	29.60	24	23.90
15%	18.80	17.80	16.98
20%	26.35	17.92	16.62
25%	17.76	13.55	12.94

Graph between stress and replacement



V. CONCLUSION

The compressive and split tensile strengths of replacement cubes and cylinders can be determined with the use of this experiment. When 5% or 10% of the coconut shells are replaced with coarse aggregate, the strength of the original material increases, while the strength of the other replacement material drops. When the replacement percentage rises to 15% or more, split tensile strength increases and drops simultaneously. This kind of concrete yields low-strength, lightweight concrete. This can be done in villages and other settings with little stress.

VI. RESULTS

The overall cost of building will go down. After 28 days, the control mix's greatest compressive strength is 38.50 N/mm2, whereas its lowest strength is 12.94 N/mm2. As the percentage of coconut shell increases, the compressive strength decreases. Coconut shell can therefore be used in situations where lightweight concrete is needed. The surface area of the aggregate made of coconut shell prevents proper cement-shell bonding. In the future, we can add admixtures to coconut shell concrete to boost its strength.

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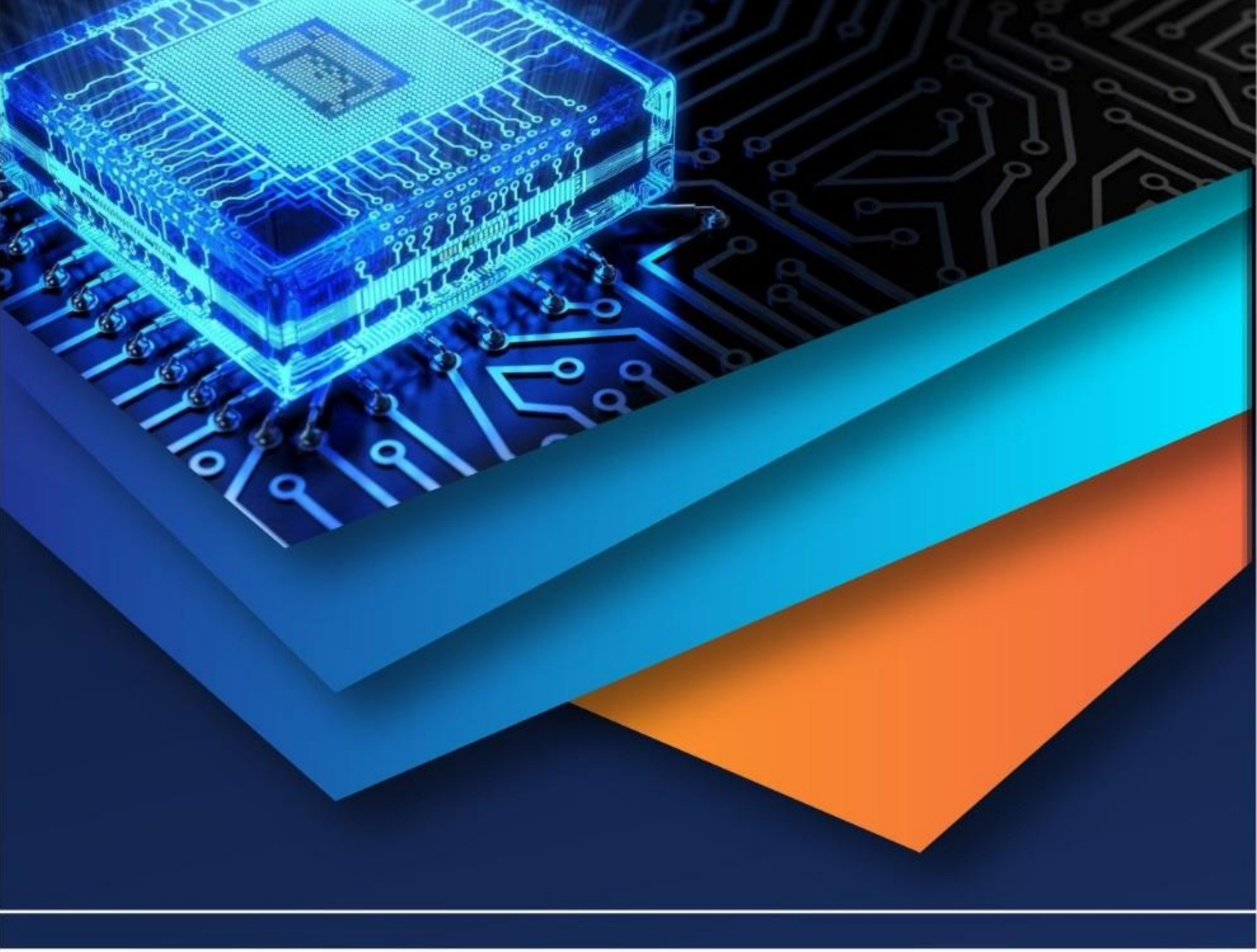

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