

# Experimental Study in Strength of Concrete by Using Coconut Shell as Partial Replacement of Coarse Aggregate

Kendre A. K.<sup>1</sup>, Prof. Patwari V.G.<sup>2</sup> Prof. Hamne A. A.<sup>3</sup>

<sup>1</sup>M.TECH Student, Civil Engineering Department, M.S. Bidve Engineering College, Latur, Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Approved by AICTE, Accredited by NAAC, Maharashtra, India.

<sup>2,3</sup>Assistant Prof., Civil Engineering Department, M.S. Bidve Engineering College, Latur, Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Approved by AICTE, Accredited by NAAC, Maharashtra, India.

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**Abstract** - This Study fills in as execution markers strong handiness and quality be mixed using a waste Coconut Shell as fragmented replacement of Coarse Aggregate, Sand, Cement, Coarse Aggregate and Water. The hugeness of this then again stone replacement to diminish coconut shell waste that is hard to pass and to avoid abuse of waste that can be changed in accordance with something that can be used in the improvement of advancement later on. Besides the lessening the defilement of nature, it moreover saves cost and apply Reduce, Reuse and Recycle. Concrete is most comprehensively used advancement material on the planet. To appreciate regular issue like articulation of waste thing, reusing or reuse of waste thing, I am using waste thing coconut shell to make eco-obliging concrete. A standard proportionate mixing of container tops in concrete in replacement of all out gives best result. In light of creating normal care, the world is logically going to exploring properties of waste and finding game plan on using its critical portions parts so that those might be used as assistant rough material in various branches. Green structure is an inflexibly noteworthy overall concern and an essential technique to spare trademark resources and decrease the proportion of materials taking off to our landfills. Colossal measures of waste are delivered from coconut, for example, coir and shells. This is a biological issue as coconut shell waste is difficult to biodegrade and incorporates frames either to reuse. Today the improvement business needs finding amazing materials for growing the nature of strong structures with insignificant exertion, and with less characteristic damage. This investigation is made arrangements for watching out for such issues by exploring the opportunity of using waste coconut shell to some degree fill in for coarse all out in strong creation. The compressive quality and flexural quality properties at different rates replacing of coarse all out with waste container tops were investigated in research office. By supplanting coarse total with 0%, 5%, 10%, and 15% of the waste Coconut Shell in concrete is contemplated. To guarantee the accomplishment of this investigation, the materials to be utilized are as coarse total, concrete, sand, water and waste Coconut Shell measurement not more than 31mm., where will the new waste Coconut Shell Crush structure. Moreover there are two preliminary blends to be made for example 1) Ordinary Concrete, 2) Concrete with expansion of squashed structure Coconut Shell for M-30 evaluation of cement. These examples are contrasted and Ordinary Concrete with VSI Sand.

**Key Words:** Coconut Shell Concrete, Compressive Strength, Workability, Flexural Strength, Strengthening.

## 1. INTRODUCTION

Because of fast industrialization and urbanization in the Country, heaps of foundation improvements are occurring. This procedure has thusly driven inquiries to humanity to take care of the issues produced by this development. The issues de-coarse are intense deficiency of constructional materials expanded dumping of waste items. Subsequently so as to conquer the above said issues squander items ought to be utilized as development material. The danger of removal of coconut shell won't illuminate until the functional advances are not started at the ground level. It is conceivable to improve the presentation of bituminous blended utilized in the surfacing course of streets. Studies announced in the utilized of re-cycled coconut shell, in the assembling of mixed demonstrated decreased perpetual disfigurement through rutting and diminished low temperature splitting of asphalt surfacing. The field tests withstood the pressure and demonstrated that coconut shell squanders utilized after appropriate handling as an added substance would upgrade the life of the streets and furthermore take care of condition issues.

Coconut shell is a very versatile material. Due to the Food Industry revolution, and its large scale waste production of coconut shell seems to be problematic. Today, every vital sector of the economy starting from agriculture to food supply, market is evolving. Coconut shell is a moderate biodegradable material and analysts found that material can stay on earth for a long time without corruption. A few investigations have demonstrated the wellbeing peril brought about by inappropriate removal of coconut shell squander. The wellbeing peril remembers conceptive issues for human and creature, genital variations from the norm and so on., Looking forward the situation of present style a total restriction on the utilization of coconut shell can't be put, in spite of the fact that the waste coconut shell taking the face fiend for the present and group of people yet to come. We can't boycott utilization of however we can reuse the coconut shell squander. Amounts of coconut shell squander have expanded quickly during this time because of its useful properties of low thickness, light weight and

quality. Other significant factors, for example, ease and eco cordial bio item turns into an indistinguishable piece of our lives.

### 1.1 Objectives of the Project

1. Determine the reasonableness of coconut shell as incomplete substitution of coarse total in concrete.
2. Find the option of fundamental materials which are utilized in development from past numerous years.
3. Manage modern waste.
4. Compare the mechanical properties of coconut shell in concrete with control concrete.
5. Study the properties of new and solidified solid when coarse total are incompletely supplanted with Waste Coconut Shells.
6. Produce lightweight waste mix concrete for multi-reason use.
7. Develop reasonable blend structure.

### 1.2 Significant of the Study:

1. To lessen the space required for the landfill of coconut shell.
2. To reduce the weight on abusing the normal assets.
3. To present the capability of coconut shell as coarse total.

## 2. METHODOLOGY

### 2.1 MATERIAL USED

#### a) Cement:

Concrete is a notable structure material and has involved a crucial spot in development work. There is an assortment of concrete accessible in advertise and each type is utilized under certain condition because of its extraordinary properties, for example, shading and creation of concrete. The capacity of concrete is, first to tie the sand and coarse totals together, and second to fill the voids. In spite of the fact that concrete establishes just around 10 level of the volume of the solid blend, it is the dynamic segment of the coupling medium and the main logically controlled element of cement. Locally accessible concrete is utilized. Like PPC (Ultra Tech-Cement).

#### b) Fine Aggregate (V.S.I Sand):

Vertical Shaft Impactor (V.S.I.) Sand is otherwise called Artificial Sand or Crushed Sand. Just sand made by V.S.I. Smasher is cubical and precise fit as a fiddle. There is standard particular for Fine Aggregates (Sand). It is separated in four degrees Zone-I, Zone-II, Zone-III and Zone-IV. For the most part the size of the total lesser than 4.75 mm is considered as Fine Aggregate.

#### c) Coarse Aggregate:

The messed up stone is commonly utilized as a coarse total. Total possesses the vast majority of the volume of the solid. Locally accessible coarse total having size of in excess of 12 mm was utilized. The totals were washed to evacuate residue and soil and were dried to surface dry condition. Coarse Aggregate utilized of 20 mm and down size. Testing is done according to Indian Standard Specification May be: 383-1970. The size of the total greater than 4.75 mm is considered as Coarse Aggregate.

#### d) Water:

Water is utilized for blending, restoring reason ought to be tribe and convenient, new and liberated from any microbes and want matter affirming to IS 3025-1964 is utilized for blending. Water is a key fixing in the producer of cement.

#### e) Waste Coconut Shell:

Squander coconut shells acquired from Food Market. Squander Coconut Shell is a perfect material for reusing. The utilization of Waste Coconut Shell spares parcel of vitality and the expanding attention to Waste shells, reusing speeds up center around the utilization of Waste coconut shell material with various structures in different fields.

### 2.2 Casting of Specimen

Test examples of Cubes of size 150mm x 150mm x 150mm, bar with 700mm x 150mm x 150mm will arranged utilizing the standard molds. The examples are thrown. The examples are remolded after 24hrs of throwing and kept in a water tank for 7 and 28 days restoring. An aggregate of 54 examples cast for testing the properties, for example, compressive quality, and flexural quality.

36 3D shape tests of size 150mmx150mmx150mm for various rates of waste coconuts in incomplete substitution of coarse total will throw. The solid blends are 0%, 5%, 10%, 15% squashed waste with halfway substitution of coarse total. All 3D shapes will throw in one lift and combined utilizing machine vibrator. After definite setting of 3D shapes, the 3D square forms will be expelled and blocks will kept in water tank for relieving up to 7 and 28 days.

All example pillars size 700mm x 150mm x 150mm will throw with ideal compressive quality for the particular blend in single lift and united utilizing packing poles. In the wake of setting, the shafts will secured with wet gunny sacks. The burlap will be saved for 3days. Toward the finish of the third day, the structures will stripped and pillars will kept for restoring as long as 28 days.



**Fig-1** Crushed Coconut Shell added to Concrete

Specimens casted for investigation purpose are listed in Table-1.

**Table -1:** Number of Cubes and Beam casted for 7 days and 28 days

% of Crushed Coconut Shell	No. of Cube Cast		No. of Beam Cast for 28 days
	7-Days	28-Days	
0	3	3	3
5	3	3	3
7.5	3	3	3
10	3	3	3
12.5	3	3	3
15	3	3	3

### 2.3 Testing of Specimen

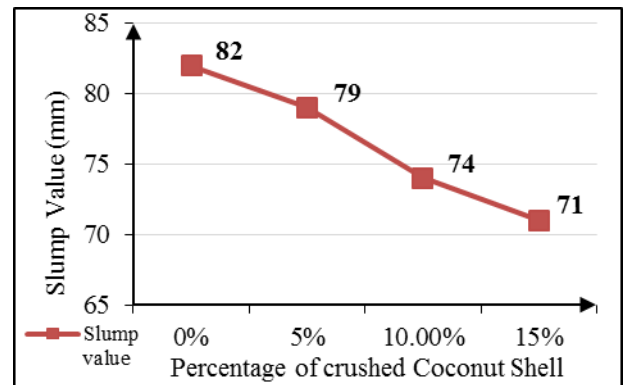
After 24 hours, the specimens were removed from the mould and subjected to water curing for 7 days and 28 days. After curing, the specimens were tested for compressive strength and flexural strength. Using a Compression Testing Machine of capacity 2000 KN in accordance with the provision of the Indian Standard specification IS:516-1959, strength of specimens were tested at 7 days and 28 days.

### 3. WORKABILITY

The workability of M30 grade of concrete is measured by widely used empirical test i.e. slump test with w/c ratio 0.40 for addition of different percentage waste coconut shell. Values obtain for different percentage mix is as show in following

**Table -2:** Slump values for different percentage of mix

% of coarse replaced by crushed waste Coconut Shell	Slump value (mm)
0	82
5	79
10	74
15	71



Graph 1: Slump Value

### 4. EXPERIMENTAL METHODOLOGY

#### 4.1 Compressive Strength Test

The result of compressive strength After 7 days and 28 days are recorded. Result indicate that as we increase percentage of waste coconut shells from 0% to 15% it's compressive strength increases after further increment in percentage of waste coconut shells there is loss in compressive strength. That means we can replace up to 15% natural coarse aggregate by waste coconut shells.

#### 4.2 Flexural Strength Test

Testing of all beam specimens with two points loading for flexural strength. The results of flexural strength were plotted in below table for 28 days. Result indicate that if we increase percentage of waste coconut shells from 0 to 15% will give us good results and help to increase flexural strength of concrete.

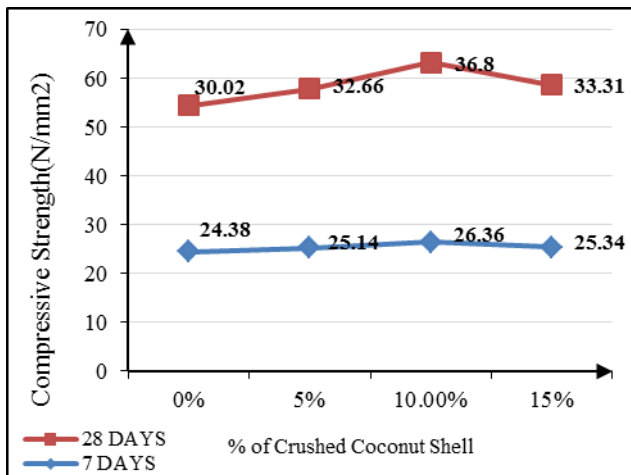
$$F_r = \frac{P \times L}{b \times d^2}$$

### 5. EXPERIMENTAL RESULTS

#### 5.1 Compressive Strength Test

**Table -3:** Results of Compressive Strength

% of Crushed Coconut Shell	Compressive Strength (N/mm <sup>2</sup> )	
	7-Days	28-Days
0	24.38	30.02
5	25.14	32.66
10	26.36	36.80
15	25.34	33.31

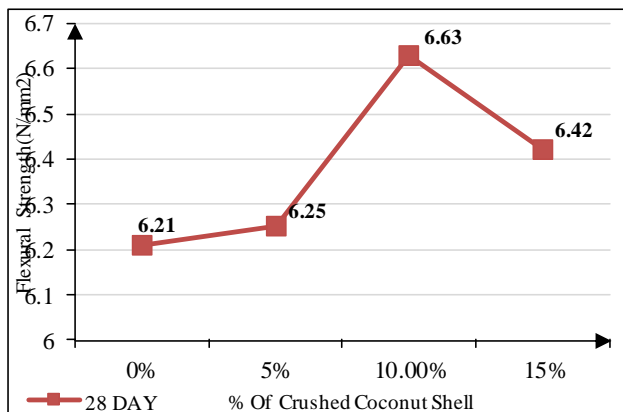


Graph 2: Compressive Strength at 7 and 28 days

### A. Flexural Strength Test:

Table -4: Results of Flexural Strength

% of Crushed Coconut Shell	Flexural Strength (N/mm <sup>2</sup> ) 28 days
0	6.21
5	6.25
10	6.63
15	6.42



Graph 3: Flexural Strength at 28 days

### CONCLUSION:

Based on results and observation made in experimental research study. The following conclusions are drawn.

- It is observe that with increase in percentage of waste crushed Coconut Shell workability increases upto at only specific percentage.
- Crushed coconut shell concrete is cheaper than conventional concrete.

- Current study concluded that waste crushed Coconut Shell can replace coarse aggregate up to 10%
- 22.5% increment in the compressive strength is found for 10% replacement of coarse aggregate by waste crushed Coconut Shell and the strength increases by 10.9% when the 15% of coarse aggregate is replaced by waste crushed Coconut Shell, by using aggregate cement ratio (A/C) is 4.2 and water cement ratio (W/C) is 0.40.
- 6.76% increment in the flexural strength is found for 10% replacement of coarse aggregate by waste crushed Coconut Shell and the strength increases by 3.38% when the 15% of coarse aggregate is replaced by waste crushed Coconut Shell, by using aggregate cement ratio (A/C) is 4.2 and water cement ratio (W/C) is 0.42

- The use of waste crushed Coconut Shell in concrete is possible to improve its compressive strength, and flexural strength.

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**BIOGRAPHIES:****KENDRE A. K.**

Student of M-TECH (M.S. Bidve College of Engineering, Latur).

**Prof. PATWARI V. G.**

Asst. Professor at M.S. Bidve Engineering College, Latur.

**Prof. Hamane A. A**

Asst. Professor at M.S. Bidve Engineering College, Latur.