Experimental Study on Light Weight Concrete By Partial Replacement of Coarse Aggregate By Coconut Shell

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Abstract- *Concrete is a composite material, it is a mixture of cement, fine aggregate and coarse aggregate. Coarse aggregate is a main constitute for strength properties of concrete. Government are restricted for extraction of stones from quarry, due to less availability of material and reduction of self-weight of concrete selecting alternative material has coconut shell. In our project study on light weight concrete by partial replacement of coarse aggregate by using coconut shell.*

Keywords- light weight, compressive, tensile

I. MATERIALS

a. Cement
b. Fine aggregate
c. Coarse aggregate
d. Coconut Shell

II. OBJECTIVES

1. To find economical solution for high cost of construction material.
2. To prepare light weight concrete by using coconut shell as coarse aggregate.
3. The use of waste materials saves natural resources and dumping spaces, and helps to maintain a clean environment.
4. Coconut shell have been used as cheap and durable nonstructural elements
5. To study the Compressive & Tensile Strength of concrete with the varying Percentage of coconut shell as coarse aggregate.

III. METHODOLOGY

Experimental Approach

1. Test for Materials:-

Cement

1. Standard consistency
2. Setting time
3. Fineness Test
4. Sieve test

Fine aggregate

1. Sieve Analysis
2. Specific Gravity
3. Water absorption

Coarse Aggregate

1. Sieve Analysis
2. Specific Gravity
3. Water absorption

IV. EXPERIMENTAL RESULTS

1. Cement

The standard consistency of a cement paste is defined as that consistency which will permit the vicat plunger to penetrate to a point to 7 mm from the bottom of the Vicat mould, when the cement paste is tested in a standard manner as explained below.c

1. Type of cement: ACC CEMENT
2. Grade of cement: Ordinary Portland cements 43 grades.
3. Type of test: consistency test.

Table 1: Water requirement for cement Paste

Trial no	Weight of cement taken (gms)	Percentage Of Water Added	Quantity of water in (ml)	Penetration in (mm)
1	400	25%	100	40
2	400	26%	4	39
3	400	27%	4	38
4	400	28%	4	36
5	400	29%	4	33

Percentage of water required to make cement paste= **29%**

Table 2: Specific Gravity of Material

Sl NO	Material	Specific Gravity
1	Cement	3.08
2	Fine Aggregate	2.67
3	Coarse Aggregate	2.56

Tests on Fresh Concrete

Slump Test

Aim: To determine the slump for the given concrete mix

Apparatus Required: iron pan, weighing platform spatula, trowels, slump test apparatus, tamping rod, balance

Table 3 : Calculation and Observation

W/C Ratio	Initial reading (mm)	Final Reading (mm)	Types of slump	Slump value
0.45	300	267	True Slump	33
0.5	300	265	True Slump	31

Slump of a given concrete mix from top = 32mm

Interference

By this test we can determine the water content to give specified slump value. In this test water content is varied and in each slump value is measured till we arrive at water content giving the required slump value.

Moulds and Its Specifications

General

Cubical and cylindrical moulds are used in this project whose dimensions are given below.

Cubical Mould

Cubical mould is having the dimension of 150mm × 150mm × 150mm.Typical cubical mould used in this project work is as shown in the figure below.

Figure1: Cubical Mould

Cylindrical Mould

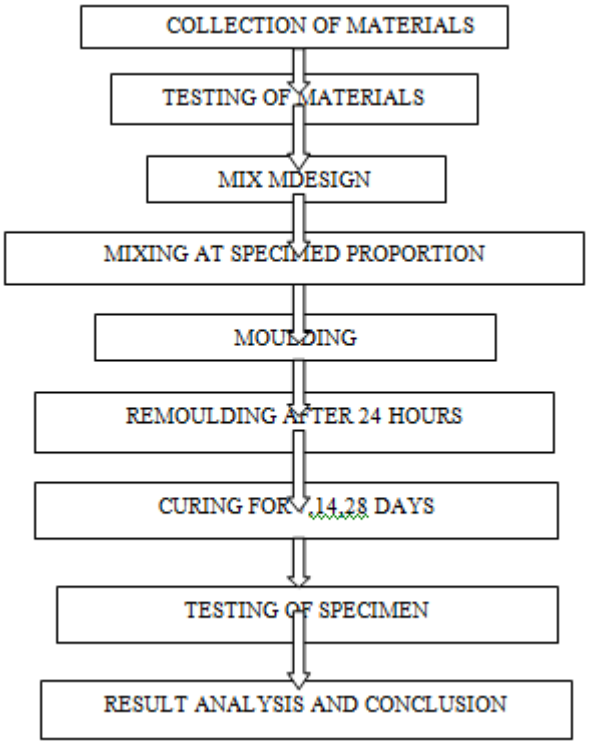
Cylindrical mould used in this project work is having the dimension of 100mm diameter and 200mm height as shown in the figure below.

Figure 2: Cylindrical Mould

Compression Testing Machine

Figure 3: Electronic compression testing machine.

Schematic Representation of Methodology



Method of Testing

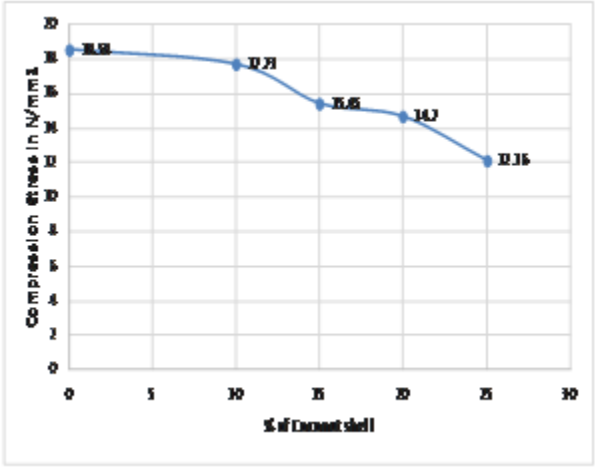
Specimens are tested at the ages of 7, 14 and 28 days. The specimens to be tested are taken out from water and wiped to remove excess water and grit present on the surface. 3 specimens are tested for each type of mix at specific age. Cubes are placed on the compression testing machine of 200 tons capacity such that the marked face faces the observer cylinders are placed on the compression testing machine such that the marked surface faces the observer and their side with their principal axis lying in the horizontal plane load is applied on the specimen and increased at the rate of 140kg/sq cm/min until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained.

V. RESULT AND DISCUSSION

Compressive Strength for Plain Concrete and Coconut Shell Concrete, As Follows:

TABLE 4: 7 DAYS OF COMPRESSIVE STRENGTH

Sl no	Specimen	Size of the cubes in cm	Age of cubes in days	Compressive stress in N/mm	Avg value in N/mm²
1	PLAIN 0%	15×15×15	7 Days	14.12	14.86
2				15.20	
3				15.28	
1	With COCONUT SHELL 10%	15×15×15	7Days	13.10	13.52
2				14.20	
3				13.28	
1	15%	15×15×15	7Days	10.22	11.41
2				11.21	
3				12.85	
1	20%	15×15×15	7Days	10.85	10.66
2				10.33	
3				10.81	
1	25%	15	11.85	9.46	9.72
2				9.82	
3				9.89	

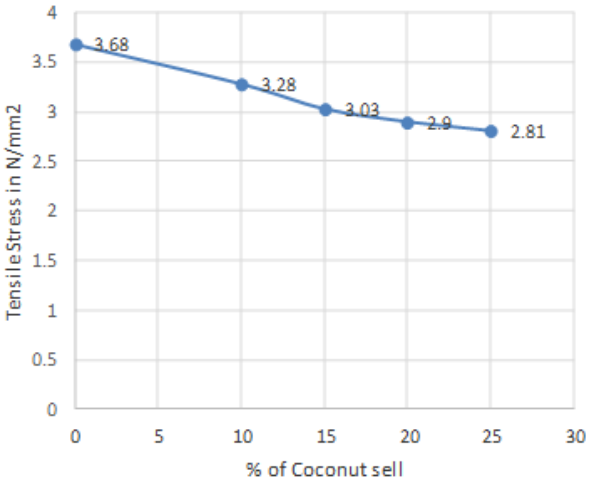


Graph 1: 7 Days Compression Strength Result

From the above graph we can recommend the use of 10% coconut shell in making light weight concrete.

TABLE 5: 28 DAYS SPLIT TENSILE STRENGTH

Sl no	Specimen	Size of the cylinders in cm	Age of cylinders in days	splitting tensile strength in N/mm²	Avg value in N/mm²
1	0%	30×15	28 Days	3.9	3.68
2				3.55	
3				3.35	
1	10%	30×15	28 Days	3.14	3.28
2				3.34	
3				3.5	
1	15%	30×15	28 Days	3.51	3.03
2				3.01	
3				3.29	
1	20%	30×15	28 Days	2.85	2.90
2				2.9	
3				2.8	
1	25%	30×15		2.6	2.81
2				2.3	
3				2.9	



Graph: 2 28 Day Split Tensile Strength Result

From the above graph we can recommend the use of 10% coconut shell in making light weight concrete.

VI. CONCLUSION

1. Reduce the density of concrete by replacing coarse aggregate by light weight material
2. It is observed from the result that, on the addition of coconut shell the compressive strength and tensile Strength of concrete of 0% &10% is almost similar.
3. Therefore we can recommend the use of 10% Coconut shell in making light weight concrete.

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