

Partial Replacement of Coarse aggregate with Coconut Shell

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Abstract:— In the present era energy saving and sustainable development, several researches and projects have been conducted on how to create low cost and eco-friendly constructional materials. One such natural material is coconut. The selection of coconut is done due to its several important properties. These properties includes water resistance, durability against acids, alkalines and salts. It contains low cellulose content which helps to absorb less water which reduces its weight. The coconut shells are also non-bio degradable. It does not require pre-treatment. In the coming future the demand of crushed coarse aggregate may increase and it's a urgent need to find an alternative to it. The use of crushed coconut as coarse aggregate will create a light weight concrete reducing the self weight of the concrete. The coconut shell may present itself as a economical and potential material for creating a proper mix design. The test for partial replacement of coarse aggregate are obtained by using split tensile strength and compressive strength test. For these test cubes of dimensions 0.15m x 0.15m x 0.15m and cylinder of dimension 0.15m x 0.3m. The test results obtained are compared with nominal mix cube and cylinder. Hence our aim is to empower the issues related to the reduction of conventional material and proper usage of increasing waste material and its disposal by making the coconut shell concrete as light weight, durable CIVIL ENGINEERING MATERIAL.

Index Terms— Coconut shells, Light weight Concrete, Economical, Eco-friendly .

I. INTRODUCTION

The continuously increase in the demand for the infrastructural development leads to the rise in the production for the main civil engineering component termed as CONCRETE. Concrete is capable for satisfying the requirement for a stable, strong and durable structure. The concrete is composed of such natural ingredient which are considered to be on the verge of depletion. These ingredient include cement sand, coarse aggregate and water. The coarse aggregate plays a crucial role in designing of concrete. Aggregate, being a natural resource should be adequately utilized. The Global Market for constructional aggregate is expected to increase 5.2% per year. Hence there is an urgent need to find an alternative to coarse aggregate. Many researches have been conducted to find a replacement to coarse aggregate. One such Natural material is coconut. Coconut is that natural material which can be considered as a light weight, economical and environment friendly material. India is a religious country where several devotional practices are performed related to coconut. There is a mass production of waste related to coconut. Therefore coconut is found to be appropriate alternative to coarse aggregate. The coconut consists of fibers and shells. In this project, the coconut shell has been used as partial replacement of coarse aggregate. The properties of coconuts are as follows:-

PROPERTIES	COMPOSITION
PHYSICAL	1.) Density : 500-600kg/m ³ 2.) Maximum size : 20 mm 3.) Shell thickness : 3-6 mm 4.) Its rough surface helps to create a great bond with concrete. 5.) It does not require Pre-Treatment.
CHEMICAL	1.) Cellulose : 33.61% 2.) Lignin : 36.51%

Objectives: -

- To create a sustainable, light weight and environment friendly concrete.
- To conserve natural resources.(i.e. Aggregates)
- To reduce cost of construction.

Standard limits of properties of Material used (IS-383-1970):-

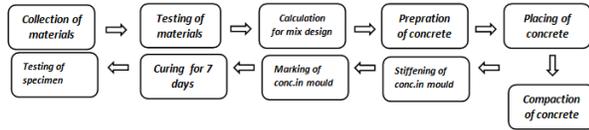
1) Coarse Aggregate

PROPERTIES	COARSE AGGREGATE
Specific gravity	2.60-2.10
Water absorption	0.50-1 %
Flakiness Index (IS 2386 part I 1963)	Less than 30%
Elongation index (Is 2386 part I 1963)	Less than 15%

2) Fine Aggregate

PROPERTIES	FINE AGGREGATE
Specific gravity	2.5-2.7
Water absorption	0.7-1%
Flakiness Index (IS 2386 part I 1963)
Elongation index (Is 2386 part I 1963)

Methodology:-



1. Collection of materials.

The required raw material i.e. Coconut shell was collected from temple. The coconuts were found in semi-crushed condition and were containing fibers and the fibers were separated and only coconut shells were used. The coconut shells were crushed and sieved through 20mm IS sieve. The crushed coconuts were air dried and then cured for 24 hours.

2. Testing of materials.

The materials were collected which are cement, sand, aggregate and coconut shells. The coconut shells do not require pre-treatment.

3. Calculations for mix design.

The Grade of concrete was selected using IS 456:2000. The condition was selected which was found to be severe condition. The further calculations were carried out by referring IS 456:2000.

4. Preparation of Concrete.

The Quantity of each material was selected by referring the calculation for mix design.

5. Placing of concrete.

The prepared concrete was placed in cylindrical mould and cubical mould. These moulds were oiled before use.

6. Compaction of concrete.

After placing the concrete in the moulds, they were placed on the table vibrater. The Compaction was further carried out.

7. Stiffening of concrete into moulds.

After compaction of concrete into the mould, they were left for 24 hours so that the concrete may satisfy its stiffening time.

8. Marking of Cubes and cylinder.

After the Cubes and cylinder were obtained after stiffening, they were marked by using oil paint.

9. Curing for 7 days :

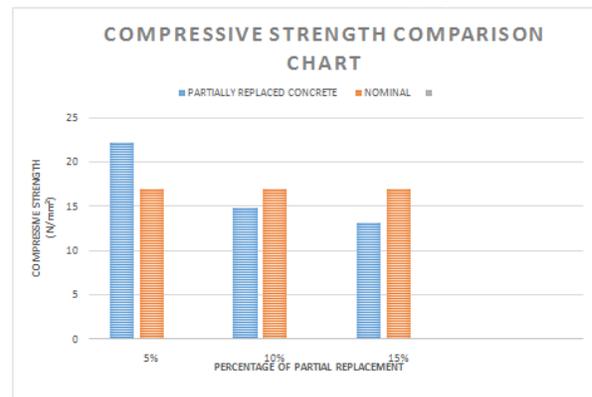
The marked cubes were placed in the curing tank for curing.

10. Testing of specimen.

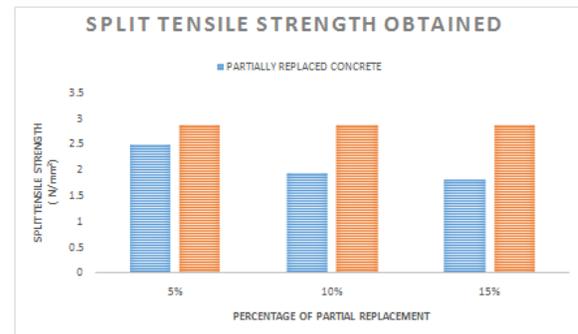
The specimens were tested. The test performed were Compressive Strength Test and Split tensile strength test.

Results obtained:-

The partial replacement has been conducted by replacing coarse aggregate with coconut shell by 5%, 10% and 15%. The compressive strength and tensile strength has been checked. The results obtained are graphed as follows:-



Graph-1



Graph-2

Graph 1 :

The graph shows that for 5% the strength of concrete is greater than the nominal mix strength. As the percentage replacement increases the strength of the concrete reduces.

Graph 2:

The graph shows that partial replacement is weaker in tension as compared to nominal mixes. As the concrete is weak in tension and stronger in compression.

CONCLUSION:-

This research paper of “Partial replacement of coarse aggregate” is been concluded. Our research paper portrays that coconut shell is compatible with concrete and does not require any pre-treatment except for water absorption. In this present era there is a need to create a light weight concrete

and thus replacement of coarse aggregate can be a better option for eco-friendly concrete. If a boom is provided to such eco-friendly concepts the world would be a better place to live.

REFERENCE

1. M.S. Shetty, "Concrete technology theory and practice" revised edition
2. IS 456:2000
3. IS 5816:(1999) Method of testing splitting tensile strength of concrete
4. Quality control Dept., Nagpur.

