

Experimental Study on Assessment of Strength of Hollow Concrete Blocks with Holes Reinforced with Half Portion of Coconut Shells

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ABSTRACT: Natural building materials are a diminishing day by day. Hence it is economical alternatives of a natural building materials are necessary for the sustainable development. Hollow concrete block was a developed to reduce the use of a natural building materials. Agricultural waste products like as a coconut shells from the coconut industry have a disposal problems causing the environmental concerns. Various studies are done in the past, the portion of the natural aggregates with a broken coconut shells are replacing for a manufacturing the hollow concrete blocks. In this paper, we have developing the new method of forming the holes of a hollow concrete blocks by placing stacks of a half portion of a coconut shells at the bottom with convex surface upwards to a reinforce the holes by arch action. The results show that the coconut shell reinforced hollow concrete blocks have been better strength as a compared to a open graded hollow concrete blocks are available in the market.

Keywords - Building construction, Hollow concrete blocks, Coconut shells, Sustainable development, Environmental protection.

I. INTRODUCTION

In this paper Bricks and stones are the conventional building blocks for the load-bearing structures. These conventional building materials and its raw materials are the depleting quickly. Hence for sustainable development, alternative effective-cost building blocks were developed. Harmon S. Palmer developed the first hollow concrete block in the year of 1890 and patented the design in 1900. Hollow concrete blocks are may have one or more hollow cavities. Palmer's blocks

were of size 8-inch (20.3cm) x 10-inch (25.4 cm) x 30 inch (76.2 cm), and they were so heavy to lift. By 1905, about 1,500 companies were the manufacturing concrete blocks in a United States. Hollow building blocks, are a famous in the construction industry because of its economy.

II. AIM & OBJECTIVE

Aim: - In this paper the contents are tries to compare the strength of the hollow concrete blocks reinforced with coconut shells as compared to the commercially available hollow concrete blocks. This experiment covers a design and development of the hollow concrete block with the coconut shells and finding out the compressive strength, cost and water absorption.

Objectives: -

1. In this paper to study and analyse the engineering properties of a Coconut shell to use it as an alternate eco-friendly material in the producing cost effective building blocks or concrete.
2. In this paper to study the properties of a coconut shells, compatibility of a coconut shells with cement and to produce coconut shell aggregate concrete with 28-day compressive strength.
3. To study the behaviour of a compressive and the split tensile strengths.

III. RELATED WORK

1. DAMRE SHRADDHA1, FIRAKE HITALI1 (2014)

In this paper we studied that among the

useful agricultural waste materials the family of palm shells namely palm shell and coconut shell are highly available in torrid zones of the world. According to research coconut shell aggregates are in ratio of 1:5 used in normal concrete when compared with the compressive strength results that are obtained.

2. Ajay Lone, Aniket Deshmukh (2016)

The coarse aggregate are the main materials of concrete. In authors of this paper discussed about replacing coconut shell for coarse aggregate. 25% and 50% of coarse aggregate replacement prepared by binding constantly along with water in the ratio of 0.45 per all mixes, density, workability and water adsorption. One week, two weeks and four weeks were determined compressive strength, tensile strength and flexural strength.

IV. METHODOLOGY

Materials used:

1. Cement - 43 grade Ordinary Portland
2. Stacks of half coconut – 2 stacks of 4 shells
3. Sand
4. Aggregates – Coarse & Fine

Experimental procedure:

We placed a coconut shells in the two stacks of a four shells each. This study tries to compare the strength of the hollow concrete blocks

reinforced with the coconut shells as compared to the commercially available hollow concrete blocks. This experiment covers a design and a development of a hollow concrete block with the coconut shells and finding out the compressive strength, cost and water absorption. Open graded hollow concrete blocks are having 40 cm length, 20 cm breadth and 20 cm height are available in a market with a mix proportion of a 1:3:6 (1 cement: 3 sand: 6 aggregates of 6mm nominal size) with the water-cement ratio of 0.5. Hence, the made hollow concrete blocks of the same of size and mix, but forming the holes by placing the stacks of the half portion of a coconut shells the bottom with convex surface upwards to the reinforce the holes. The diameter of the coconut shells used for the experiment was a 8 cm and the cement used in this study is a 43 grade ordinary Portland cement.

ACTUAL PROCEDURE TO BE FOLLOWED:

1. Fresh concrete is a poured on a top of the coconut shells in the mould in three layers so that the holes are a formed under the coconut shells.
2. Each layer was the tamped 25 times using tamping a rod without affecting the position of a coconut shells.
3. We removed the mould after 24 hours, cured a blocks by immersing in water for a 7, 14 and 28 days and found the compressive strength with the UTM (Universal testing machined).



Fig.3.1. (a) UTM (universal testing machine)

4. The photograph of the bottom portion of a hollow concrete block is shown in the Fig. (b).



Fig.3.1. (b) Placing the coconut shells in the mould Fig.3.1. (c) The photograph of the bottom portion of the moulded open graded hollow concrete block

V. RESULTS

The Compressive strength at 07 days = **6.70 N/mm²**

The Compressive strength at 14 days = **9.55 N/mm²**

The Compressive strength at 28 days = **9.9 N/mm²**

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