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# DEVELOPMENT AND EXPERIMENTAL STUDY OF COIR FIBER AND RICE HUSK ASH BASED SUSTAINABLE MATERIALS

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## ABSTRACT

Present investigation describes the behavioral aspect of coir fiber and rice husk based Concrete, Bricks, Insulation panel and Tiles. Various tests were performed for finding the performance of samples such as compressive, flexural and split tensile strength. The specimens were tested by using guarded heat flow meter. Before, the manufacture of the brick, the exact proportioning of the bricks have to be done in order to have a engineered quality of production and to maintain the quality and to know the quantity of the materials needed for an exact number of bricks. Totally, 6 count of bricks were moulded, the quantity of bricks is counted on the basis of that each proportion of brick has three days of compressive strength test, for each test three bricks are needed. So, totally single proportion will hold one bricks. Totally, five proportions were made, that each one proportion holds one bricks which lead to a count of 5 bricks for the test. After selecting suitable materials like cement, sand and coir fibers, material properties were determined. In order to replace cement with coir fiber, initial studies were conducted to finalize the % replacement of cement with fibers. After finalizing the same, tile specimens were prepared using specially prepared mould. Accelerated curing was given to the specimens using oven. Tests were conducted as per Indian Standard specification for tiles. Finally we can say that coir fiber and rice husk based Concrete, Bricks, Insulation panel and Tiles are suitable for sustainable construction.

**Keywords** Cement Concrete, flexural strength, Strength parameters, water absorption, Workability.

## 1. INTRODUCTION

Rice husks are the hard protective coverings of rice grains which are separated from the grains during milling process. Rice husk is an abundantly available waste material in all rice producing countries, and it contains about 30%–50% of organic carbon. Rice husk ash is a very fine material having average particle size of 3–10 μm. RHA is grayish-black in color due to unburned carbon. At burning temperatures of 550–800 °C, amorphous silica is formed, while crystalline silica is produced at higher temperatures. The specific gravity of RHA varies from 2.11 to 2.27

The properties of mature coir fibers are as follows: - 100% naturally originated fiber - Coir fibers are strong and light - Coir fibers easily withstand saline water - Coir fibers easily withstand heat exposure - Plastic shrinkage is delayed in coir-based materials by controlling the cracks developed at the initial stage - The usage of coir in composite materials enhances thermal conductivity - Biodegradability and renewability - Higher water retention - Rot-resistant - Moth-resistant - Heat insulator - Have acoustic properties Coir fibers can be of three types as shown in Fig., namely, curled, bristol, and mat fibers.

## 2. OBJECTIVES

Following are the objectives of this work

- To manufacture Coconut coir fiber and rice husk has based concrete.
- To manufacture brick using Coconut coir fiber and rice husk ash.
- To manufacture Insulation panel made from coir fiber reinforcement and rice husk.
- To manufacture Coir-fiber and rice husk based cement tiles.
- To compare the engineering properties of the above with traditional construction materials.
- To compare the above parameters for paver blocks prepared having different concrete mixes.
- To find out water absorption and abrasion values of paver blocks with geopolymer concrete.

## 3. METHODOLOGY ADOPTED

The present work focuses on bringing out the contribution of sustainable material for application in the building sector. The aim of this work is to spread awareness of energy-efficient materialsas a sustainable material in construction industry. Materials are as follows:

1. Coconut coir fiber and rice husk has based concrete

2. Coconut coir fiber and rice husk has based bricks

3. Insulation panel made from coir fiber reinforcement and rice husk

4. Coir-fiber and rice husk based cement tiles

## 4. CONCLUSION

On the basis of experimental investigation of the present research study, the following conclusions have been drawn.

- When the replacement of cement is increased up to RHA up to 10% with RHA in concrete mix, the compressive strength of based RHA concrete have been increased as compared to conventional concrete the strength increase gradually when we increase the percentage of fiber.
- It'sbeen clearly observed that by adding coir fibre and rice husk ash in a regular manner the split tensile strength of coir fiber reinforced based RHA concrete get increased as compared to conventional concrete.
- The maximum flexural strength of M30 grade of coir fibre and RHA based concrete is 5.25 N/mm2 . The Flexural strength of concrete increases gradually with the percentage of fiber and RHA adding in a regular interval basis.
- The addition of percentage level of coir fibre and RHA will increase the compressive strength of bricks.
- Water absorption increases with increase with coir fibre and rice husk ash content due to presence of pores. With the addition of RHA up to 20 %, the percentageof water absorption is up to 20% as specified in IS 1077-1976.
- Ringing sound of brick goes on decreasing with increase in the amount of RHA content. Ringing sound is excellent for conventional bricks with 0% coir fibre and RHA. Ringing sound for sample S5 found least.
- The result of thermal conductivity for various weight fraction of coir fiber and RHA indicates that Insulation panel made from coir fiber reinforcement and rice husk has thermal Insulation properties.
- Water absorption of coir-fibre and rice husk based tiles was 6.25%. IS specifications for MP tiles advocates that its water absorption should not be more than 18% (for class AA) and 20% (for class A) of its weight. Finally we can say that coir fiber and rice husk based Concrete, Bricks, Insulation panel and Tiles are suitable for sustainable construction.

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