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Review on Low Cos Roofing Tiles By Using Agricultural And Industrial Waste (Manufacturing & Testing)

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The scenario of living in huts in slum areas is becoming very difficult day by day due to vast change in climate. Replacing the ordinary huts and conventional poor class roofs with much efficient alternate roof cover is being the most required. On the other side, proper and efficient disposal of agricultural wastes is being the key factor in solid waste management in most of the Indian States.Having both the problems in a single line, in this project we have prepared and evaluated the performance of low cost roofing tiles using agricultural wastes as raw material. Based on the results, it is suggested that we can efficiently replace significant quantity of river sand in making roofing tiles with the corn cob powder and rice husk powder in appropriate propositions which gave compressive strength as similar as before replacement. By replacing the river sand in making roofing tiles would reduce its manufacturing cost as well as selling price and makes it more affordable. Thus preparation of such sand replaced roof tiles will significantly reflect healthy environmental and economic benefits.

1. INTRODUCTION

Roof tiles are designed mainly to keep out rain, and are traditionally made from locally available materials such as terracotta or slate. Modern materials such as concrete and plastic are also used and some clay tiles have a water proof glaze. Roof tiles are „hung" from the framework of a roof by fixing them with nails. The tiles are usually hung in parallel rows, with each row overlapping the row below it to exclude rain water and to cover the nails that hold the row below. There are also roof tiles for special positions, particularly where the planes of the several pitches meet. They include ridge, hip and valley tiles. Slate roof tiles were traditional in some areas near sources of supply, and give thin and light tiles when the slate was split in to its natural layers. It is no longer a cheap material, however and is now less common.

LITERATURE REVIEW

Muthyalu P. V. and Ramu K. (2012)research that, the Expansive soils, such as black cotton soils are basically susceptible to detrimental volumetric changes, with changes in moisture. This behaviour of soil is attributed to the presence of mineral montmorillonite, which has an expanding lattice. Understanding the behaviour of expansive soil and adopting the appropriate control measures have been great task for the geotechnical engineers. Extensive research is going on to find the solutions to black cotton soils. There have been many methods available to controlling the expansive nature of the soils. Treating the expansive soil with electrolytes is one of the techniques to improve the behaviour of the expansive ground.

2. METHODOLOGY

2.1 Materials

The following materials were used in our research:

Whiteclay
Red Soil
Black
cotton soil
Water

2.1.2 Clay

Clay has the smallest particle size of any soil type, with individual particles being so small that they can only be viewed by an electron microscope.This feature plays a large part in clay's smooth texture, because the individual particles are too small to create a rough surface in the clay.Because of the small particle size of clay soils, the structure of clay-heavy soil tends to be very dense.Clay contains very little organic material; you often need to add amendments if you wish to grow plants in clay-heavy soil.

2.1.2Red Soil

Red soils are highly leached soils of the humid tropics having a high content of sesquioxides.Low natural fertility is the main limiting factor for good crop production on these soils and they are frequently acidic and deficient in all essential nutrients, especially N, P, K, Ca, Mg, S, Zn, B, and Cu. Adequate applications of lime and fertilizers are

important strategies for replenishing soil fertility and improving crop yields on these soils. Adequate applications of lime and fertilizers are important strategies for replenishing soil fertility and improving crop yields on these soil

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Mixing

Mixing is done to make the clay soil homogeneous and smooth. There are different techniques that can be used for mixing, including using animal power or letting humans mix the clay with their feet. Different admixtures such as coal or sawdust were added to the clay for two beneficial reasons:

Reduce cracking during drying.
Reduce fuel usage during firing.

In addition the rice husk, salt and lime was also added separately as well as combination of any rice husk-lime, salt-lime and salt-rice husk up to 5% of total weight of the soil.

Molding

the clay is extruded or moulded to obtain the shape required and then cut to size. In roof tile making, the clay can undergo a two-stage process, the second of which may occur after extrusion, depending on the roof tile being manufactured. For example, for interlocking tiles, the extruded clay is pressed between two moulds.

Drying

Water was added during clay preparation to increase workability of the mixture, but in drying it is removed for several reasons. First, there will be less cracking in fired bricks with less water content. Second, additional fuel is needed, beyond what is used for firing, to dry the bricks in the kiln. Proper drying of bricks will involve rotating the bricks for different exposures to ensure even drying rates. For best results, drying should be done slowly. This will help with more even drying. Also, the best drying technique may change from location to location, so the brick makers must gain experience to determine the best way to dry bricks for each production process. We dry the bricks under the normal atmospheric temperature (25˚C).

Firing

A clamp is a field kiln built from the green bricks that will be fired. Clamps vary with

2.1.3 Black cotton soil

A large fraction of india's population lives in black cotton (BC) soil areas. Production of tiles using black cotton soil is not possible either by the traditional tiles making process or by the pressed soil block process with stabilizers. The black cotton soil blocks crack on drying. Mixing stabilizers with BC soil to press soil blocks crack on drying. Mixing stabilizers with BC soil to press soil blocks proves difficult because the clay tends to form lumps. To overcome these obstacles a project was initiated.

A successful process of black cotton soil block making was evolved. Lime was used as a stabilizer because of its abundance in block cotton soil areas and its low cost. It has a reactive aspect which alters the soil properties to meet the specific engineering qualities viz., volume, stability, wet strength etc. The soil and the stabilizer with a high moisture content (20-25%) were kneaded together and the molded. The block was then cured.

2.1.4Water

Potable tap water was used for mixing and curing of specimens. The water reacts with the clay and sand, which bonds the other components together, creating a solid like material.

2.2 Methods

The default mixing ratios followed in the plant was:

White Clay	Red soil	Black cotton soil
55%	20%	20%

In the above normal mixing ratio, we have altered the River sand ingredient initially with Corncob powder to find out the optimum replacement ratio and then with Rice Husk as partial replacements. All theRoof tiles are made as per the recommendations provided in IS 3978-1967. The mixing ratios were adopted from

size and shape and must be oriented with respect to wind direction. Once a clamp is laid out and constructed, it must be insulated. Finally, the process of firing the clamp will take place in several steps. First, pre-heating, or water-smoking, will remove the water leftover from the drying process. This process is still physical. The second stage is firing, where the clay :

bricks will vitrify through a chemical process. The temperature must remain constant at this stage for complete verifications. Finally, for the cooling stage, the temperature must be slow and steady. A clamp may take two weeks to cool.

2.3Testing of Specimen for Failure Load

Since the compressive strength of typical roof tiles lies between 200 to 700 N/mm^2, we need to have the least count of CTM (Compression testing Machine) as 10

RESULTS AND DISCUSSIONS

The failure loads of the tiles of various mixing ratios will be determined.

The water absorption of control tiles should be 25% to 30%

Fig. CTM Machine

Water Absorption test on tiles

The tiles were dipped in a tray of water for 24 hours for determining the water absorption capacity.After that dries it in oven for 24hr.compare the weight before and after drying.

Fig. Water Absorption Test

CONCLUSION

The roofing tiles process can be used for the manufacturing of roofing tiles for replacement with various material. Testing for the samples can be done as above Load test and Water Absorption test with standard procedure.

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