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Comparison between Black Cotton Soil Brick and Normal Brick by Using Admixture

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ABSTRACT

Over a past few decades, there are wide ranges of alternatives available in the field of construction with the changing in the raw material for the particulars. As concern with the brick there are some invention like fly ash brick, concrete blocks and brick. Here we are using black cotton soil as a raw material for the bricks and also using some admixture to alter the properties of the black cotton soil. This research study describes the feasibility of using black cotton soil as a raw material with some additional stabilizer in the brick production as partial replacement of clay in Indian context.
Keywords: Adhesive Material; Brick; Black Cotton Soil;Rice Husk; Salt.

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INTRODUCTION

1. A Brick is a block or a single unit of a ceramic material used in a masonry construction. Typically bricks are stacked together or laid as brick work using various kind of mortar to hold the bricks together and make a permanent structure. In the world Asia produces 87% of the total production of the bricks. Moreover, the India and china are the major consumer countries of the bricks. Bricks are typically produced in common or standard sizes in bulk quantities. They have been regarded as one of the longest lasting and strongest building material used in 20th century. Manufacturing of bricks produces harmful gases which results in substantial air pollution. As per in India produces over 60 billion clay bricks annually resulting in strong impact on soil erosion and unprocessed emissions. Use of traditional technologies in firing the brick resulted in significant local air pollution. The standard size of brick provided by IS: 2212 (1991) is (19cm × 9cm × 9cm). Bricks are laid in horizontal courses, sometimes dry and sometimes wet mortar. In some instances, such as adobe the brick is merely dried. More usually it is fired in a kiln of some sort to make a true ceramic. Clay bricks are used in a wide range of buildings from housing to factories, and in a construction of a tunnels, waterways, bridges, etc.

LITERATURE: The first patent for a clay working machine was granted in the year 1619. 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. Shakir Alaa A., Naganathan S. and Mustapha K. N. (2013) found from their research work that, the various wastes that are currently recycled in bricks manufacturing have been reviewed. The effects of hose wastes on the bricks properties are reviewed. Enhance performance in terms of making more environmental and an economical bricks neither consumes energy resources nor emits pollutant gases gives an economical option to design the green building. Certain bricks are produced without firing which is in term of low embodied energy material. The study in turn is useful for

various resources persons involved in using industrial or agriculture waste material to develop sustainable construction material. Subir Shri Singh (2012) found that, the use of environment- friendly technologies. Minimize transportation of material. Maximize the use of local material and resources. Utilization of industrial and mine waste for production of building material. Dr. Smt B. K. Shah, Patel A., Salla S., and Prof. Pitroda J. research that, as the percentage of the jute fibre in brick increase, the compressive strength of the brick increase. In this experimental work 0.5% fibre addition in the brick gives the maximum strength 8,051 N/mm2 after 21 days. As the compressive strength of the brick increase, the water absorption of the brick decrease. In this experimental work maximum compressive strength after 21 days is 8,061 N/ , where minimum water absorption is 10.236% after 21 days in jute fibre fly ash brick. He also recommend that use of fly ash and natural fibre help in fibre to prevention of environmental degradation and use of agriculture land utilized in clay brick productionz

III. OBJECTIVES

(1) To make an economical brick

(2) To make an eco-friendly brick

(3) To provide the better employment in local areas.

IV. PROBLEM It possesses a volumetric change with the change in the moisture content. Ordinary clay is very expensive in the areas where the black cotton soil is in locality.

V. METHODOLOGY The brick making process is done by the using traditional method with the help of mould. The procedure of brick production was divided in various stages like Clay preparation, Mixing, Moulding, Firing and Curing

A. Clay preparation

For the preparation of ordinary black cotton soil was taken from local area of the black cotton soil region. The debris and un necessary particles removed from the soil by sieve, and make it passing from 0.75µ sieve by crushing. Tempering is adding water to the soil in order to make it more workable which takes 2 to 3 days in the case of black cotton soil. An alternative to tempering is disintegration or weathering, which involves allowing clay to dry in the sun and accept moisture from rain and dew. The repeated drying and moistening of clay will bring clay to a plasticity and workability appropriate for brick making. Crushing will make the mixture more homogeneous. It is noted that at the time of making brick the soil was prepared totally dry by oven drying or sun drying.

B. 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:

(1) Reduce cracking during drying. (2) 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.

C. Moulding

The size of a mould for brick making was selected such that considered shrinkage effect of soil take in mind. Bricks will shrink when drying, so the mould size chose larger than the intended finished brick. The slop moulding technique was adopted for the preparation of the mould. In slop moulding, a wet clay mixture is used- the mix is put into a rectangular form without a top or bottom. The mould was selected in size of 190mm x 90mm x 70mm height with a frog 10 to 20 mm deep on one of its flat side. The limitation with this technique is that because the mix is so wet, the brick may deform under its own weight and the surface can be marked easily. Often this method produces poor quality bricks because of the excess water used both in the mixing of the clay and the wetting of the mould. The clay mixture becomes so wet and soft that the newly made brick begins to deform under its own weight. Once placed on the ground, it cannot be moved because it is so soft. Often the brick is marked or deformed if accidentally touched or moved before the brick dries properly. The excess water can also cause the brick to crack and break during drying. Slop moulded bricks can be imprinted with the brick makers name, called a "frog," on the flat side of the brick. This helps the brick dry and fire better, and is a good form of advertising.

D. 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

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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).

E. Firing

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

F. Curing

The stabilized bricks after moulding are further hardened by curing. The chemical changes occur in the bricks mix contents after moulding and heat of hydration are evolved. The rate of the effect of heat of hydration is mitigated and lowered with sufficient water and alkali solution is provided to accelerate pozzolanic reaction. There are different processes of curing option. Steam curing under high pressure Steam curing under normal pressure Hot water dip curing Hot water air curing Water tank curing Water curing in the open air We carried out curing up to 24 hrs by using the technique of water curing in the open air. the design life of the road. The mixed common vehicles with different axle loads are to be converted in terms of the cumulative number of standard axle load , Ns to cater for the design, using the equation:

Compressive Strength Test Result

Table no.1

3.73	**6.02**	**2.72**	**14.2**	**6.52**	**9.37**	**5.7**	**7.17**
Normal brick	Black cotton soil brick	Black cotton soil + lime	Black cotton soil brick +adhesive material	Black cotton soil brick + rice husk	Black cotton soil brick + salt	Black cotton soil+ salt+rice husk	Black cotton soil + lime+ salt+ adhesive materi …

Types of bricks

Water Absorption Test Result

Table no. 2

16.62	**12.84**	**17.94**	**11.18**	**16.9**	**14.71**	**14.75**	**15.71**
Normal brick	Black cotton soil brick	Black cotton soil + lime	Black cotton soil brick + adhesive material	Black cotton soil brick + rice husk	Black cotton soil brick + salt	BLACK COTTON SOIL + SALT +RICE HUSK	BLACK COTTON SOIL + LIME + SALT + ADHESIVE MATERI …
16.62	**12.84**	**17.94**	**11.18**	**16.9**	**14.71**		

Types of bricks

Table no.2

shows the % of water absorption of total weight of brick made from different compositions. The brick made from black cotton soil are showing better performance against water absorption ratio in compare to normal brick. After performing the entire test, the results shows that, a unit brick sample are hard as it does not show any impression on surface, a uniform colour throughout, giving clear metallic

ringing sound and does not show the cracks or holes on broken faces; so, we can say that our bricks are good quality

SUMMARY

From the results of compressive strength we found that the black cotton soil brick is having 60% more compressive strength of the normal brick and from the water absorption test, we found that the average water absorption of the brick made from the black cotton soil with the various admixture is about 20% less than the water absorption of the normal brick. The volumetric change occurs in the black cotton soil bricks is in the range of 3 mm to 6 mm. This type of brick may be proved one of the economical solutions for the construction where soil locality is basically black cotton. The use of black cotton soil in making of brick production can generate better employments in local areas and play a important role for the development of nation.

Conclusion:

Based on the experimental investigation carried out in this work, the following conclusions can be drawn:

It is possible to manufacture good quality bricks from locally available black cotton soil using admixture, such as lime, salt, Rice husk, coal etc.

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