7th National Conference on
"Role of Engineers in Nation Building" organized by VIVA Institute of Technology, Mumbai
(1st and 2nd March 2019)
International Journal of Engineering Research & Science (IJOER)
ISBN: [978-93-5321-411-1] ISSN: [2395-6992] [Vol-5, Issue-3, March- 2019]

# Made brick by using black cotton soil by using various admixtures

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***Abstract-*** *Over a past few years, there are widely ranges of alternatives bricks available in the field of construction with the changing in the raw material for the product. Now we are using black cotton soil as a raw material in bricks & also using some admixture to change the properties of the black cotton soil. Expansive soils in India are popularly known as Black cotton soils, which are nearly 20% of the land area. These soils exhibit volume change characteristics under moisture variations. The brick specimens were then air dried, baked in kiln and tested for Compressive Strength, Water Absorption, Efflorescence and hardness test ,structure test, soundness test, shape and size. Test results obtained in the present investigation indicate that it is possible to manufacture good quality bricks using locally available black soil by suitably adding either Fly ash, lime, rice husk can be used in the black cotton soil in use for various construction activities across the country. The bricks has been regarded as long lasting and strong building blocks are made of a mixture of clay, which is subjected to various processes according to the nature of the material, after it is properly prepared the clay is done in moulds to the desired shape, and then air dried and burnt. The main objective of this investigation had been focused on the improvement of the compressive strength of the Black Cotton soil bricks with different constituent.*

***Keywords- admixtures, black cotton soil bricks, fly ash, lime, rice husk***

## I. INTRODUCTION

A brick is a construction material used in the construction of structure. The bricks and mortar are stacked tighter and make the wall and any type of the structure. The standard size of bricks is (19cm *9 cm*9cm).the nominal size of bricks is (20 cm*10 cm* 10 *cm). The standard size of bricks and specification of bricks are given. The bricks various material are used like clay, silica, alumina, etc. normally bricks are made from the clay material in which area there is shortage of the clay soil and only black cotton soil is available . The cost of the bricks is high and the transportation of clay cost become very high .So by the research and test we decided that the black cotton soil is used instead of the clay. But there are the different properties of the black cotton soil like shrinkage and have highly expansive nature when large amount of water content in the soil strata .so we decided that uses of various admixture and the adhesive material mixed with the black cotton soil and made a bricks and measures the different properties of the bricks like compressive strength and water absorption test. Using the black cotton soil instead of clay in brick may directly affect in the compressive strength and water absorption test.to utilize the various admixture in the black soil brick increase the compressive strength and decrease the water absorption ratio. There are various admixture used in the black cotton soil bricks are fly ash , rice husk ,lime and salt. Expansive soils in India are popularly known as Black cotton soils, which are nearly 20% of the land area. These soils exhibit volume change characteristics under moisture variations. Soil stabilization is the procedure of expanding the building properties of the soil and to make it suitable.

### 1.1 Objectives-

1. To make an eco-friendly brick.
2. To make an economical bricks.
3. To provide the better employment in local areas.
4. To increase compressive strength of bricks.

### 1.2 Scope of study

This paper gives the one out of many ways to stabilize the black cotton soil. Fly ash, lime, rick husk, salt can be used as an admixtures for black cotton soil. Admixture used for stabilization increases the strengthening of brick. It also decreases liquid limit, plastic limit and balance the shrinkage limit and make it suitable for construction work. In this project we study how, all of

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this admixtures may be effectively utilized in combination with expensive soil to get an improved quality of composite material which may be used in black cotton soil structure.

## II. METHODOLOGY

### 2.1 Clay preparation

For the preparation of ordinary black cotton soil was taken from local area of the black cotton soil region. The debris and unnecessary particles removed from the soil by sieve, and make it passing from 0.75µ sieve by crushing. 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 prepared totally dry by oven drying or sun drying.

### 2.2 Mixing

Mixing is done to make the soil homogeneous and smooth. There are different techniques that can be used for mixing, including using lime,ricehusk,salt,fly ash. 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.

### 2.3 Moulding

In the molding process, prepared clay is mold into brick shape (generally rectangular). This process can be done in two ways according to scale of project.

Hand molding ( for small scale)

Machine molding ( for large scale)

### 2.4 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. 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).

### 2.5 Firing

A clamp is a field kiln built from the 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.

### 2.6 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.

Types of Tests On Bricks for Construction Purpose

Following tests are conducted on bricks to determine its suitability for construction work.

1.Absorption test

2.Crushing strength test

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3.Hardness test

4.Shape and size

5.Color test

6.Soundness test

7.Structure of brick

8.Presence of soluble salts (Efflorescence Test)

**1. Absorption Test on Bricks**

Absorption test is conducted on brick to find out the amount of moisture content absorbed by brick under extreme conditions. In this test, sample dry bricks are taken and weighed. After weighing these bricks are placed in water with full immersing for a period of 24 hours. Then weigh the wet brick and note down its value. The difference between dry and wet brick weights will give the amount of water absorption. For a good quality brick the amount of water absorption should not exceed 20% of weight of dry brick.

**2. Crushing Strength or Compressive Strength Test on Bricks**

Crushing strength of bricks is determined by placing brick in compression testing machine. After placing the brick in compression testing machine, apply load on it until brick breaks. Note down the value of failure load and find out the crushing strength value of brick. Minimum crushing strength of brick is 3.50N/mm2.if it is less than 3.50 N/mm2, then it is not useful for construction purpose.

**3. Hardness Test on Bricks**

A good brick should resist scratches against sharp things. So, for this test a sharp tool or finger nail is used to make scratch on brick. If there is no scratch impression on brick then it is said to be hard brick.

**4. Shape and Size Test on Bricks**

Shape and size of bricks are very important consideration. All bricks used for construction should be of same size. The shape of bricks should be purely rectangular with sharp edges. Standard brick size consists length x breadth x height as 19cm x 9cm x 9cm.To perform this test, select 20 bricks randomly from brick group and stack them along its length , breadth and height and compare. So, if all bricks similar size then they are qualified for construction work.

**5. Color Test of Bricks**

A good brick should possess bright and uniform color throughout its body.

**6. Soundness Test of Bricks**

Soundness test of bricks shows the nature of bricks against sudden impact. In this test, 2 bricks are chosen randomly and struck with one another. Then sound produced should be clear bell ringing sound and brick should not break. Then it is said to be good brick.

**7. Structure of Bricks**

To know the structure of brick, pick one brick randomly from the group and break it. Observe the inner portion of brick clearly. It should be free from lumps and homogeneous.

**8. Efflorescence Test on Bricks**

A good quality brick should not contain any soluble salts in it. If soluble salts are there, then it will cause efflorescence on brick surfaces. To know the presence of soluble salts in a brick,

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placed it in a water bath for 24 hours and dry it in shade. After drying, observe the brick surface thoroughly. If there is any white or grey color deposits, then it contains soluble salts and not useful for construction.

Overview of project-A brick is a construction material used in the construction of structure .The cost of the bricks is high and the transportation of clay cost become very high .So by the research and test we decided that the black cotton soil is used instead of the clay. But there are the different properties of the black cotton soil like shrinkage and have highly expansive nature when large amount of water content in the soil strata .so we decided that uses of various admixture and the adhesive material mixed with the black cotton soil and made a bricks and measures the different properties of the bricks like compressive strength and water absorption test. In the contains of 6 research papers black cotton soil brick by using different additive material. The materials used for black cotton soil brick are fly ash, lime and rice husk, salt. Minimize transportation of material. Maximize the use of local material and resources. In the research papers using risk husk, lime and fly ash the black cotton soil brick can be gives most satisfactory result for strengthening. 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. In further studies we have checked conventional brick and perform various test on this bricks like compressive strength test, soundness test, hardness test, shape and size test, structure test and efflorescence test. On the basis of this the results are obtain on conventional bricks compressive strength test 3.14 N/mm2 ,Water absorption test 21.71%,soundness test normal metallic sound ,hardness test normal impression, efflorescence test some white patches of salts, structure of brick some cracks and lumps presents.

## III. RESULTS

**Table No. 1**

| Sr .no | Test | Results |
|---|---|---|
| 1. | Compressive strength test on bricks | 3.14 $N/MM^2$ |
| 2. | Water absorption test on brick | 21.71% |
| 3. | Soundness test on brick | Normal metallic sound |
| 4. | Hardness test on brick | Normal impression |
| 5. | Shape and size test on brick | 19cmx9cmx9cm |
| 6. | Efflorescence test on brick | Some white patches of salt |
| 7. | Structure of brick | Some cracks, lumps presents |

## IV. CONCLUSION

1. The Physical & Geotechnical properties of Black Cotton Soil, Red Soil & water are within the permissible limits.

2. The Physical Properties of manufactured bricks is better and are suitable for construction of common buildings.

3. Easy availability and low price of rice husk in rice producing countries in an extra benefit towards the use of this material.

4. By use of black cotton soil instead of clay in brick we can reduce cost of bricks.

5. The use of black cotton soil in making of brick production can generate better employments in local areas and play an important role for the development of local areas.

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