JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

EXPERIMENTAL INVESTIGATION OF BRICK MANUFACTURING BY USING CRUSHED LATERITE STONE PIECES WITH USE OF RICE HUSK,FLY ASH,CEMENT AND PORTABLE WATER

[1]Prathamesh Sunil Jadhav,[2]Omkar Dattatray Thorat,[3]Rutwik Sunil Shinde,

[4]Mahesh Suresh Chavan,[5]Vishwajeet Narayan Naik,[6]Proff A N Kumbhar,[7]Proff P S Shinde

[1]B.Tech Civil Engineering Scholar,[2] B.Tech Civil Engineering Scholar,[3]B.Tech Civil Engineering Scholar,[4] B.Tech Civil Engineering Scholar,[5]B.Tech Civil Engineering Scholar,[6]HOD of Civil Engg Dept,[7]Assistant Professor in Civil Engg Dept
[1]Civil Engineering,
[1]Shree Santkrupa Insstitute of Enfineering And Technology, Ghogaon Tal – Karad Dist - Satara

Abstract : Developing countries facing challenges in provision of housing.Using low-cost housing material will be beneficial to provide affordable housing in order to meet society needs. This study investigates the sustainable use of laterite soil brick as a construction material. As far as country like India is concerned, low-cost materials and its availability is the main factor controlling the selection of material and mode of construction there are different materials with different composition and properties which are used to construct a wall.Water absorption in traditional brick is more and hence is dangerous for construction. But this bricks absorbs water less compared to traditional bricks.

Index Terms **– Laterite soil, Compressive strength, Fly ash, Rice husk, Cement, Water absorption .**

I. INTRODUCTION

The functions or duties of the wall, which are either load-bearing or framed structure, determine its construction materials types such as various types of bricks, blocks, partition boards etc. In olden days mud walled houses were used by poor people in rural areas. In ancient days natural stones is used as a walling material. The stones used for masonry construction must be hard, tough and free from cracks, sand holes, and cavities.Clay bricks available in certain region are poor in quality, which have forced engineers to look for better materials capable of reducing the cost of construction. The infrastructure such as buildings for housing and industry, and the facilities for handling water and sewage requires large amounts of construction materials.

Laterite is a soft rock composed of iron & aluminum oxides as the main ingredient. Due to the weathering actions, in hot & wet tropical areas, lateritic soil gradually gains strength to become a hard mass. These hard layers of laterite are cut into blocks of required sizes & transported for the building construction works. Laterites have recommended for the construction of roads and dams, as well as applications as fillers for soil reclamation. Laterite soils in India are found in the Eastern Ghats of Orissa, the Southern parts of Western Ghats, Malabar Coastal plains and Ratnagiri of Maharashtra and some part of Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Meghalaya, western part of West Bengal.

Clay bricks available in certain region are poor in quality, which have forced engineers to look for better materials capable of reducing the cost of construction. The infrastructure such as buildings for housing and industry, and the facilities for handling water and sewage requires large amounts of construction materials.

In this project we have given a thrust on the use of waste material such as fly ash, Rice husk with other raw materials to manufacture a masonry unit. And the results of experiments conducted for various percentages of laterite soil, cement and rice husk mixed with varying percentages of fly ash. Objective of this study is to obtain a best percentage of fly ash that can be added with soil and cement as stabilizing agent to manufacture bricks at a low cost which can fulfill the requirement of homeless people in the rural and urban parts of the country. Hence bricks in different percentages of fly ash, soil, cement and rice husk mix were added in this manufacturing process.

II. OBJECTIVE OF THE STUDY

To determine physical properties of soil.

To determine exact combination of brick materials which is used for brick making.

To qualitative analysis of brick.

Comparision of properties between red clay brick and rice husk brick.

III. PROBLEM STATEMNT

We are studying that self weight of brick is the most important part. Because the less the weight, the less the load on the structure. Similarly, the water absorption capacity of the brick is equally important. And this laterite soil also helps to reduce water absorption. Rice husk insulation has been studied for its thermal properties, and it has been found that the addition of rice husk fibers to thermal insulation wallboards can decrease their thermal conductivity and increase their insulation performance. Laterite stone is highly durable and can withstand extreme weather conditions. Its porous nature allows it to absorb and retain moisture, making it resistant to erosion and weathering. It also has excellent thermal properties, which make it a great insulator against heat and cold.

IV. MATERIALS

1. LATERITE SOIL

Laterite is a soil type rich in iron and aluminum and is commonly considered to have formed in hot and wet tropical areas. Nearly all laterites are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock, usually when there are conditions of high temperatures and heavy rainfall with alternate wet and dry periods. The process of formation is called lateriation. Tropical weathering is a prolonged process of chemical weathering which produces a wide variety in the thickness, grade, chemistry and ore mineralogy of the resulting soils. The majority of the land area containing laterites is between the tropics of Cancer and Capricorn.

One such material is Laterite which is found in hot and wet tropical regions in the form of soft rock composed of iron and aluminum oxides and due to weathering conditions, this rock hardens with time, and this hardened material is further cut and used as a stone or brick in the building construction by the name of laterite brick.

2. FLY ASH

Coal dust has historically been collected as a waste product from homes and industry. During the nineteenth century, coal ash was taken by 'scavengers' and delivered to local brick works, where the ash would be mixed with clay. The income from the sale of ash would normally pay for the collection of waste.

3. RICE HUSK

Rice husk has been used as insulating material for cold storage for many years in China, and it is available locally. Rice husk is usually used for wall and roof insulation. Occasionally it is used for floor insulation in small cold storages.

4. CEMENT

Cement is a binder, a chemical substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together.

5. WATER

Water is an inorganic compound with the chemical formula H_2O. It is a transparent, tasteless, odourless. Water expands roughly 9% as it is frozen, which, as a bargain for us, means we need that much less water. So, we would only need 0.969 Liters of water, and then we would have a solid brick of standard size.

V. RESEARCH METHODOLOGY

1. Research on project topic
2. Site selection for laterite soil
3. Soil test

4. Material collection
5. Preparation of brick with different proportion.
6. Brick test
7. Slection of best suitable proportion
8. Properties comparision

VI. TESTS ON SOIL

1. SIEVE ANALYSIS

   AIM: To determine the grain size distribution of the given soil by dry sieving.

   THEORY: Particle size classification of soils: IS system, MIT system, Differentiation: clay size fraction and clays; particle size distribution curves, characteristic sizes, well graded and poorly graded soils; gradation characteristics.

2. LIQUID LIMIT TEST

   The liquid limit is the moisture content at which the groove, formed by a standard tool into the sample of soil taken in the standard cup, closes for 10 mm on being given 25 blows in a standard manner. At this limit the soil possesses low shear strength.

3. PLASTIC LIMIT TEST

   Glass Plate, Palette knives, Air Tight Containers, Spatula, Brass Rod & Porcelain ,Hot Air Oven,Balance ,IS Sieve.

4. DETERMINATION OF SPECIFIC GRAVITY

   To determine specific gravity of a given sample of laterite soil. REFERENCE: IS: 2386 (Part III) – 1963.

VII. CASTING OF BRICKS

Collection of the materials like laterite soil, cement, sand etc. the lumps in the soil are converted in the powder test on laterite soil.

Dry mixing with proposed proportions and add the required water. Mixing is done with the help of the shovel.

To make edges of brick strong, bricks need to be heated for 24 hours.

During manufacturing of the bricks hydraulic pressure of 6 tonnes is applied on bricks two times. These casted bricks placed for 24 hours to dry after 24 hours the curing should be done by sprinkling method for 8 days. After 8 days, laboratory test compressive strength and water absorption test are conducted.

VIII. MIX PROPORTION

Sr No.	Soil	Cement (%)	Rice husk (%)	Fly ash (%)
1	Required	2	2.5	2
2	Required	2.5	3	3.5
3	Required	3	3.5	5

IX. TESTS ON BRCICKS

1. SHAPE AND SIZE

   In this test bricks are closely inspected for its shape. The bricks of good quality should be uniform in shape and should have truly rectangular shape with sharp edges.

2. HARDNESS

   In this test, a scratch is made on brick surface with the help of a finger nail. If no impression is left on the surface, brick is treated as to be sufficiently hard.

3. SOUNDNESS

   Two bricks are taken, one in each hand, and they are struck with each other lightly. A brick of good quality should not break and a clear ringing sound should be produced.

4. STRUCTURE

   A brick is broken and its structure is examined. It should be homogeneous, compact and free from any defects such as holes, lumps etc.

5. COMPRESSIVE STRENGTH OF BRICKS

   Bricks are the most commonly used building blocks used in construction works as masonry walls, paving bricks or in floorings where these are primarily subjected to compressive stresses. The strength of masonry wall is dependent upon the basic strength of bricks as well as mortar. Therefore, it is important to test the bricks for their compressive strength to assess the load carrying capacity of structural units constructed out of them. As per IS: 1077-1970, the minimum crushing strength of bricks is 3.5 N/mm2 (50 kg/ cm2) and bricks having compressive strength less than 5 N/mm2 (50 kg/cm2) are not used for structural works.

X. RESULTS

1. Physical properties of soil

Sr. No.	PARTICULARS	VALUES
1	Specific gravity	3.1
2	Liquid limit	45%
3	Plastic limit	27%
4	Shrinkage limit	15%
5	Plasticity index	18%
6	Optimum moisture content	21%
7	Maximum dry density	1660kg/m3

2. Compressive test of brick

No. of sample bricks	Average compressive strength
1	9.8
2	10.6
3	11.1

3. Water absorption test

No. of sample bricks	Average water absorption
1	5.6
2	6.1
3	6.4

4. Efflorescence test of brick

Clay brick is still a basic material in construction work in many countries, including Iraq. Bricks are considered to be important manufactured building materials and were known . . This is because of a number of factors, the most important of which is the availability of raw material almost everywhere, the cost of its small production, its strength, isolation of heat, its resistance to fire and atmospheric changes . There are many problems in the manufacture of clay brick. One of the most important of these problems is the Efflorescence that will be studied in this research . Efflorescence can be defined as a crystalline deposit of soluble salts, generally white in color that appears on the surfaces of clay brick . The salts of efflorescence are generally potassium, sodium, magnesium, iron and calcium; silicate; or carbonates of calcium and sodium; or sodium bicarbonate.

XI. CONCLUSION

1. We checked the physical properties of the laterite soil used for this project. All the physical properties of laterite soil come from its limitation or suitability. This test was done to prevent impact on the brick due to the deterioration of the soil.

2. In this project, the **3 % , 3.5 % 5 %** combination we used for mix design achieved more brick strength than the other two combinations.

3. Also, the strength and other properties of this brick have been achieved according to is code The highest compressive strength of brick is 11.1 . And lowest water absorption percentage is 6.4 that is comes from brick no 3 that is 3,3.5,5 % (cement , rice husk,fly ash) of laterite soil.

4. The strength of this brick is more in the comparison of traditional clay brick. Water absorption was also found to be reduced.

5. This laterite can be created in any ideal sizes as bricks and strong squares as building materials.The continuous use of natural resource-based building materials has led to many environmental problems. Therefore, it is essential to develop alternative materials that can give a comparable performance with respect to appearance, structural properties, and durability.

6. Bricks have the compressive strength which satisfies the IS code limits.

XII. REFERENCE

Nurul Ain Ibrahim, Thamendran Magindran (2020) Sustainable use of laterite soil as compressed cement stabilized earth block for low-cost house Suchanya Apithanyasaia Seksan Paponge (2020), The potential of industrial waste: using foundry sand with fly ash and electric arc furnace slag for geopolymer brick production

Ain Ibrahim, Nurul; Magindran, Thamendran (2020), Sustainable use of laterite soil as compressed cement stabilized earth block for low-cost housing construction

Priji E. Moses PhD-Scholar, Department of Civil Engineering, Bharath Institute of Higher Education and Research (BIHER), Chennai, India. (2020), Advantage of laterite over clay in the manufacture of compressed stabilized earth bricks

Gaurav Keshav M-tech in Structural Engineering (July 2015), Study on Fly ash Mixed Laterite-Cement Bricks:

R.Nithya (2016)" Experimental investigation on bricks by using various waste materials ", IJL-

TET ,volume:6.Issue:3 , page no:395

International Research Journal of Engineering and Technology (IRJET)

Investigation on strength parameters of lateritic interlocking block strengthened with fly ash and cement. Amit Rajendra Phadatare1, Aniket Sanjay