Usage of Unburnt Bricksas Construction Material in Major Structures

Praveen Savanth [1], V.Srilaxmi [2]
[1, 2] Asst.Prof, Dept of CIVIL
[1, 2] Holy Mary Institute of Technology & Science/ Keesara - Bogaram – Ghatkesar Rd, Kondapur, Telangana 501301

Abstract- *Worldwide, technology is facing the great challenge which is "environmental destruction" through various factors among which high consumption of some natural resources contributes significantly. TBrick material that has not been exposed to very high temperatures for a prolonged period during the manufacturing process. ...*

Bricks can broadly be categorized into two types as follows on the basis of how its manufactured:

1. *Unburnt or sun-dried bricks*
2. *Burnt bricks*

Unburnt bricks or sun-dried bricks are the types which are dried with the help of heat received from sun after the process of moulding. These bricks can only be used in the construction of temporary and cheap structures. Such bricks should not be used at places exposed to heavy rains.

I. INTRODUCTION

A brick is a block of ceramic material used in masonry construction, usually laid using various kinds of mortar. Bricks were often used for reasons of speed and economy, even in areas where stone was available. Bricks may be made from clay, shale, soft slate, calcium silicate, concrete, or shaped from quarried stone. Clay is the most common material, with modern clay bricks formed in one of three processes - soft mud, dry press, or extruded. Clay is highly needed for its merely properties of plasticity which contributes in resisting against cracking during the process of firing the bricks. Normally, brick contains the following ingredients 1. Silica (sand) - 50% to 60% by weight 2. Alumina (clay) - 20% to 30% by weight 3. Lime - 2 to 5% by weight 4. Iron oxide - 5 to 6% (not greater than 7%) by weight 5. Magnesia - less than 1% by weight The clay brick has been used as a construction and architectural materials for several millennia. And as the time went on, various improvements have been made on clay bricks, whereby some additives such as shale and broken brick fragments have been used to improve both strength and durability, additives of chopped straw to the wet clay to improve structural strength of the product. And to reduce the energy demand for firing of raw bricks, the calorific value of several organic substances, generally regarded as waste products e.g. sawdust, coal dust and waste oil, has been utilized by adding them to clay. Many other solutions have been adopted to improve the quality of clay brick for instance by utilization of sewage sludge in the manufacture of clay bricks. As the technology was stepped forwarding, clay bricks won the ground worldwide and become successful over other construction materials.

II. METHODOLOGY

The following methodology was used: i. Sampling with various types of the soil from some areas in Rwanda ii. Field test, Visual test, Touch test and LABORATORY TEST to determine the name of the soil for the proposed new material iii. Burning of different types of bricks iv. Laboratory tests for compressive strength. v. Comparative Analysis of compressive strength characteristics of earth bricks with other types of bricks for which these characteristics are already known Soil sampling The two samples were taken arbitrarily from Kabarondo region in eastern province, where the type of soil concerned in this study, is found in abundance. The two samples (A and B) were taken at approximately one meter deep from the top soil to avoid the presence of organic portions in the study sample; and the distance of approximately 100 meters between the two samples was considered. The soil is, by naked eye, blown red in color (Figure 1). This region is at 1°C57″ 33′S latitude and at 30° C36″ 53′E longitude, the temperature of the region is at approximately 21°C. By eyes, the great area of this region is made of this type of soil. This type of soil can also be found in different places in Rwanda.

III. MATERIALS TESTING

3.1 SIEVE ANALYSIS:

The grain size characteristics of soils that are predominantly coarse grained are evaluated by a sieve analysis. A nest of sieves is prepared by stacking test sieves one above the other with the largest opening at the top followed by sieves of successively smaller openings and a catch pan at the bottom.

3.2 compressive /Crushing Strength of Bricks

Compressive /Crushing strength of bricks (Indian Made) are very variable, and may vary from 30 kg/sq. cm to 150 kg/sq. cm for hand-made burnt bricks, while Crushing strength of heavy duty bricks machine pressed (also called engineering bricks) may have compressive strength as high as *450* kg/sq. cm, and even 500 kg/sq. cm. The minimum crushing / compressive strengths of burnt bricks tested flat-wise prescribed are:

(i) Common building bricks—35 kg/sq. cm,
(ii) Second class bricks—70 kg/sq. cm,
(iii) First class bricks— 105 kg/sq. cm.
(iv) Crushing strength of bricks not less than 140 kg/sq. cm are graded as AA class.

The strength of bricks decreases by about *25* per cent when soaked in water.

Strength of sun-dried (unburnt) bricks is from 15 to 25 kg/sq. cm.

Water absorption of bricks after 24 hours immersion,
First class bricks—20%,
Second class bricks—22 %,
Third class bricks—25%.
Heavy duty machine made bricks should not absorb more than 5% of their weight.

IV. HOW TO CHECK QUALITY OF BRICKS ON SITE?

Bricks are the building blocks of a building. If the quality of brick used in a structure is not good then it can lead to serious damages of building. Therefore it is necessary to check the quality of brick before using it in any construction activities. There are some field tests that we can conduct in the field in order to check the quality of bricks. These tests are as follows.

1. Water Absorption
2. Visual inspection
3. Efflorescence
4. Dimension
5. Hardness
6. Soundness
7. Structure

FIELD TESTS ON BRICK TO CHECK QUALITY

1. WATER ABSORPTION

5 bricks are taken and the bricks are weighed dry and the average dry weight of 5 bricks is calculated. Bricks are then immersed in water for a period of 24 hours. After 24 hours of immersion, bricks are weighed again and average of 5 bricks is calculated. The difference of the final average weight and initial average weight indicates the amount of water absorbed by the bricks. It should not in any case exceed 20percent of average weight of dry bricks.

2. VISUAL INSPECTION

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.

3. EFFLORESCENCE

This test should be conducted in a well ventilated room. The brick is placed vertically in a dish 30 cm x 20 cm approximately in size with 2.5 cm immersed in distilled water. The whole water is allowed to be absorbed by the brick and evaporated through it. After the bricks appear dry, a similar quantity of water is placed in the dish, and the water is allowed to evaporate as before. The brick is to be examined after the second evaporation and reported as follows:

- Nil: When there is no perceptible deposit of salt
- Slight: When not more than 10% of the area of brick is covered with salt

- Moderate: When there is heavy deposit covering 50% of the area of the brick but unaccompanied by powdering or flaking of the surface.
- Heavy: When there is heavy deposit covering more than 50% of the area of the brick accompanied by powdering or flaking of the surface.
- Serious: When there is heavy deposit of salts accompanied by powdering and/or flaking of the surface and this deposition tends to increase in the repeated wetting of the specimen.

Bricks for general construction should not have more than slight to moderate efflorescence.

4. DIMENSIONAL TOLERANCE

Twenty bricks are selected at random to check measurement of length, width and height. These dimensions are to be measured in one or two lots of ten each as shown in figure. Variation in dimensions are allowed only within narrow limits, ±3% for class one and ±8% for other classes.

5. 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.

6. 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.

7. 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.

V. CONCLUSIONS

Based on the afore results it is important to recommend the following: i. The use of earth unburnt bricks, as it had been the case in Rwandan rural areas is not advised. ii. Earth burnt bricks can still be used in construction of simple buildings, iii. The research should continue with other types of soils to see if still some soils can offer the needed strength characteristics. iv. It is recommended to consider the application of the burnt clay-silt bricks for instance in the case of construction of agglomerations or settlements (IMIDUGUDU) and other similar houses which do not carry a heavy load during their service live. v. While research continues, for more important building, it is advised to apply hydraform bricks as an only good alternative for burnt clay brick to keep the safe environment.

REFERENCES

[1] http://www.theconstructioncivil.org/compressive-crushing-strength-of-bricks/
[2] http://www.ijsrp.org/research_paper_jul2012/ijsrp-july-2012-80.pdf
[3] http://www.theconstructioncivil.org/classification-of-bricks/
[4] file:///C:/Documents%20and%20Settings/BOSSTEC/My%20Documents/Downloads/sustainability-02-03639.pdf
[5] http://apexjournal.org/irje/archive/2014/Jan/fulltext/Leopold%20et%20al.pdf