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STUDY ON BREATHE BRICKS

Mr. B. Manibalu[1], Ms. C. Sakthipriya[2], Mr. R.K. Manikandan[3]

[1-3]*Assistant Professor & Department of Civil Engineering & Dhanalakshmi Srinivasan Engineering College, Perambalur, Tamilnadu, India*

Abstract - *A brick is major component for building work. Generally, Bricks are manufactured by grinding or crushing the clay in mills and mixing it with water to make it plastic state. This investigation presents a parametric experimental study, by utilization of lime and plastic coupler in brick manufacturing with the replacement of clay and sand to reduce the entry of pollutants to the wall and give a cooling temperature. Lime is the substitute of clay and the plastic coupler of size 3/4 inches with cover and spring and 10% of glycol and 10% of calcium nitrate to make the perfect breathe brick. The mechanical properties of bricks are investigated and compressive strength, bulk density and water absorption and efflorescence of the breathe bricks are determined. The test on brick is carried out according to IS 3495-1992. The key characteristics of these bricks are environmental savior and these brick has unique activity of breathing. The compressive strength of these brick is found to be same as the normal brick. The water absorption capacity of these brick is lower than the normal brick. There is nil efflorescence produce on these brick. These bricks are likely to add energy efficiency and help to create a economic value to the manufacturer. A mathematical model is developed to predict the compressive strength of the breathe brick. This investigation introduces the new strand of research and development of the construction materials.*

Keywords: Plastic coupler, water absorption, compressive strength, efflorescence test, breathe brick.

1. INTRODUCTION

The design is simple and logical. This design was developed because of understanding effects of temperature on different materials. Several materials have been used in the past to offset thermal conductivity through the construction material or even to store thermal energy. The worst medium for thermal conductivity that responds in the shortest timeframe to temperature is air. This is the basic principle. The design is based on double-wall configuration with 2-3 inches' gap between inner and outer walls. Standard bricks (or cement blocks) are used with mud and hay mortar for brick bonding and plastering. The configuration gives a comfortable living environment without any extra energy requirement for thermal comfort. During day, the outer walls get heated from the direct sun rays. Solar heat absorbed by the outer bricks warms and expands the air in the gap reducing the density of air and the ability to transfer heat to the inner wall. At night, the temperature falls outside thus cooling the air inside the walls as well. This temperature drop contracts the air and creates a partial vacuum in the gap; helping outer cold air to enter the walls through ports on the top layer of the walls. The gap between the walls helps contain the moisture and cold air during the day repeating the cycle. In addition, the wind catchers also help in developing limited cooling effect. In the morning, these wind catchers can be closed. Sketch 1 in figure 4 gives a schematic diagram of how breathing walls work and Increase in volume also reduces density of air voids. The direct sunlight is absorbed by the exposed brick wall. The conduction depending upon the density and the material absorbs the energy and conducts it through the medium. The air in the cavity receives this energy and begins to expand. The expansion increases the volume and reduces the density and associated thermal conductivity. This expansion pushes the warm air outside the wall through the openings left at the upper end of the wall. Increase in volume also reduces density of air and proportionately reduces thermal conductivity capability of air. At night, when the temperature falls, the cooling takes place and the inner air also cools resulting in contracting and creating a vacuum in the cavity. This vacuum helps the outside cold air to enter the wall cavity with the moisture content thus cooling the air inside the cavity. In addition, the wind catchers that are common in the southern Pakistan can help regulate the fresh air at night. In the morning, these wind catchers can be closed. Wind catchers can be embodied in the structure by using sun burnt bricks and they work on the reverse phenomenon of fire place exhaust/chimney.

2. PRESENT SCENARIO OF BREATHING WALL CONCEPT IN WORLD

The countries located closer to equator have inherited problem of hotter climates. They also receive comparatively lesser rainfall. Geographical context and rich or poor in the economic prosperity framework. Changing climate resulting in global warming arising from extensive and uncontrollable use of fossil fuel has considerably magnified the thermal comfort problem. In winters, it is intensely cold and summers are intense too making newer hottest. The records every year passing says that, oil producing countries may be able to provide cheaper fuel to their citizens but the countries that must import fuel for energy are

facing increasing energy cost thereby a difficulty to provide a comfortable living environment for their inhabitants. It is worth mentioning that extreme climates have resulted in many deaths all over the planet Earth. Many die due to lack of heating and many due to in sufficient cooling. Economic activity relationship is adversely affected by increasing fossil fuel prices. This aspect alone is forcing the poor communities to switch to alternate methods of making homes comfortable. Cost of energy and carbon footprint are increasing in the construction industry in manufacturing construction materials like steel, cement, glass, plastics and numerous supplementary and complementary building materials etc. A quick look in the supply chain will show that before the building materials reach the site, much of fossil fuel energy has been used and consequent carbon has been produced. From the workers who start their day to reach the quarry site, may it be in remote areas of barren mountains or agricultural plains, transporting labor to site has initiated the consumption of fossil fuel and subsequent greenhouse gases(GHG).Transportation of raw material to the manufacturing sites and then the manufacturing processes and associated labor all add to GHGs. Finally, the material is transported to the construction site. During all these process times, the cost is rising.

3. MIX DESIGN AND METHODOLOGY OF BREATHE BRICKS

In order to find the breathe bricks that they possess high compressive strength with various mix proportions are made and they are tested on compressive testing machine (CTM).The mix proportions of the breathe bricks are as follows:

Table no-1: Mix Proportion

S. No	LIME (Kg)	WHITE CEMENT%	CALCIUM NITRATE %	C2H6O2 %	WATER %
1	1	10	10	10	10
2	2	20	20	20	20
3	3	30	30	30	30
4	4	40	40	40	40

Collection of materials

The materials of these bricks are properly collected from the available areas and also shops.

Batching of materials

Measurement of materials for making brick is called batching. After collection of materials we separate and remove any other waste presented in the collected material and check that any water content in sample collected.

Mixing

Mixing of materials is essential for the production of uniform and strength for brick. The mixing has to be ensure that the mass becomes homogeneous, uniform in color and consistency. Generally, there are two types of mixing, Hand mixing and mechanical mixing. In this project, we adopted hand mixing. Until the entire lime content required for water added.

Moulding

After completion of proper mixing we place mix into required mould. In these projects we use the different brick sizes (15x15x4 cm). After 2 days remove the brick from the mould and then done curing.

Burning

The test specimens after moulding were allowed to dry for a period of 24 hours. The specimens were kept in burning at 120°C and a period of 8 hours.

Materials

Lime(CaCO3), Plastic coupler with cover ¾inches, Spring 150mm, Glycol 10 % by weight and calcium nitrate.

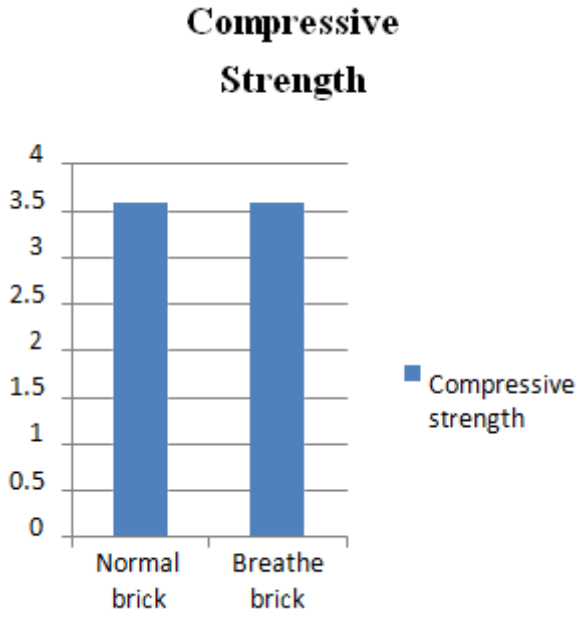
4. RESULTS

Table no-2: Compressive Strength Test

Sample No.	Normal Brick Strength	Breathe brick Compressive strength (N/mm^2)
1	3.6	3.4
2	3.6	3.5
3	3.6	3.5
4	3.6	3.5
5	3.6	3.5

Table no.3: Water Absorption test

Sample No.	Lime Percentage	Water Absorption %
1	0	0.23
2	5	0.14
3	10	0.11
4	15	0.09
5	20	0.075



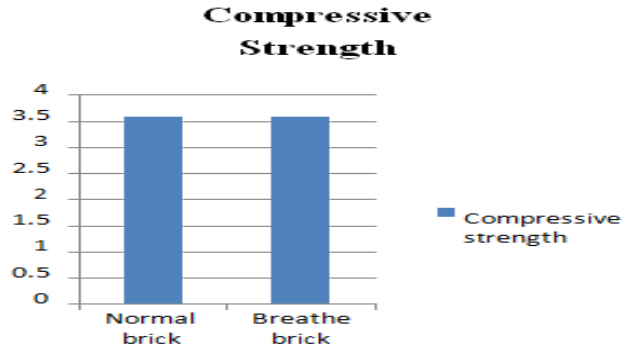


Chart -1: Compressive strength test

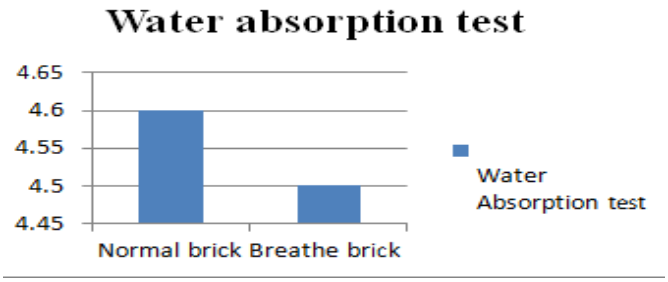


Chart – 2: Water absorption test

5. CONCLUSION

The experimental investigation on Breathe Bricks but lime as substitute of clay, White cement for binding purpose and glycol for cooling purpose of brick and calcium nitrate as corrosion inhibitors. And these brick reduces the pollutants (dust particles). Compared to ordinary bricks. And these bricks are energy efficient. The compressive strength of these brick is equal to ordinary brick. The water absorption is better than normal brick. And the other tests like efflorescence, Hardness, Soundness etc., gives the same result. Finally, we conduct that, our bricks are environmental savior for the environment.

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