

Experimental Study of Passive Construction Material in Buildings

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Abstract – A Brick is a building material used to make walls, and other element in masonry construction. Traditionally the term brick refer to a unit composed of clay but it is now used to denote rectangular unit made of clay bearing soil {Red soil}, sand and lime or concrete material. Bricks are produced in numerous classes, type, material and size which vary with region and time period and are produced in bulk quantity. Brick are laid in in courses and numerous pattern known as bond collectively known as brickwork and may be laid in various kind of mortar to hold the brickwork together to make a durable structure. A fiber is added to the brick in order to provide strength ie; water hyacinth scientifically known as Eichhorniacrassipes is a free floating aquatic plant with broad, thick, glossy, ovate leaves which rises up to 1m in height . This can perform functions such as for bioenergy waste, water treatment, edibility. Medicinal use, temperature reduction etc. Water hyacinth are been dried and cut in to fiber form and mixes with the clay soil in 0, 1%,2%,3% . The mixture is been poured in mould in order to make brick. This is been dried under sunlight and the strength and other test is been calculated by comparing with normal brick. A lime is been coated at the face of brick.

Keywords – Brick, fiber, strength, water hyacinth.

I. INTRODUCTION

1. Overview

Temperature is one of the important factor that face by human. Temperature may be hot or cold. In a year 75% of the month be like summer season. We can't able to completely avoid this situation but we can reduce it mainly in construction using passive brick. Water hyacinth is a plant which helps to maintain temperature level thus we can reduce energy consumption .Thus we introduce this plant in a fiber form mixing with clay soil (Red soil) .This fiber also play a major role in providing strength.

2. Water Hyacinth

Water hyacinth is a free-floating perineal aquatic plant with broad, thick, glossy, ovate leaves, water hyacinth may rise above the surface of the water as much as 1 meter in height.

The leaves are 10–20 cm across on a stem which is floating by means of buoyant bulb like nodules at its base above the water surface. They have long, spongy and bulbous stalks. The feathery, freely hanging roots are purple-black.

An erect stalk supports a single spike of 8– 15 conspicuously attractive flowers, mostly lavender to pink in color with six petals. When not in bloom, water hyacinth may be mistaken for frog's-bit.. Each plant additionally can produce thousands of seeds each year, and these seeds can remain viable for more than 28 years.



Fig. 1. Water Hyacinth at Ukkadam Lake.

3. lime

Lime has many complex qualities as a building product including workability which includes cohesion, adhesion, air content, water content, crystal shape, board-life, spread ability, and flow ability; bond strength; compressivestrength; setting time; sandcarrying capacity; hydrolocity; free lime content; vapor permeability; flexibility; and resistance to sulfates.



Fig. 2. Lime.

4. Red Soil

Red soil is a type of soil that develops in a warm, temperate, moist climate under deciduous or mixed forest, having thin organic and organic-mineral layers overlying a yellowish-brown leached layer resting on an illuvium red layer. Red soils are generally derived from crystalline rock. They are usually poor growing soils, low in nutrients and humus and difficult to be cultivated because of its low water holding capacity.



Fig. 3. Red Soil.

5. Objective

The main objective of this project is:

- To reduce energy consumption without using electricity.
- To maintain thermal condition during summer season.
- To reduce the maintenance cost when compared to concrete structures.
- Most economical method without causing damage to environment and health.

II. TEST ON BRICK

In order to find out the strength and other characteristic of brick we need to carry out some test i.e., absorption test, compression test, shape and size test, hardness test and efflorescence test.

1. Absorption Test

Absorption test is conducted on brick to find out amount of moisture content absorbed by brick. Take a sample brick and weighted. (M1). After weighting these brick is immersed in water for 24 hours. The weight of wet brick is noted. (M2). The difference between the wet and dry brick is found out. For good quality brick water absorption should not exceed 15%.

$$\text{Water Absorption} = \frac{M2 - M1}{M1} * 100$$

Table -I: Water Absorption Test

SNO	DESCRIPTION	WATER ABSORPTION
1	NORMAL BRICK	13%
2	BRICK with 1% FIBER	10%
4	BRICK with 2% FIBER	9
5	BRICK with 3% FIBER	7

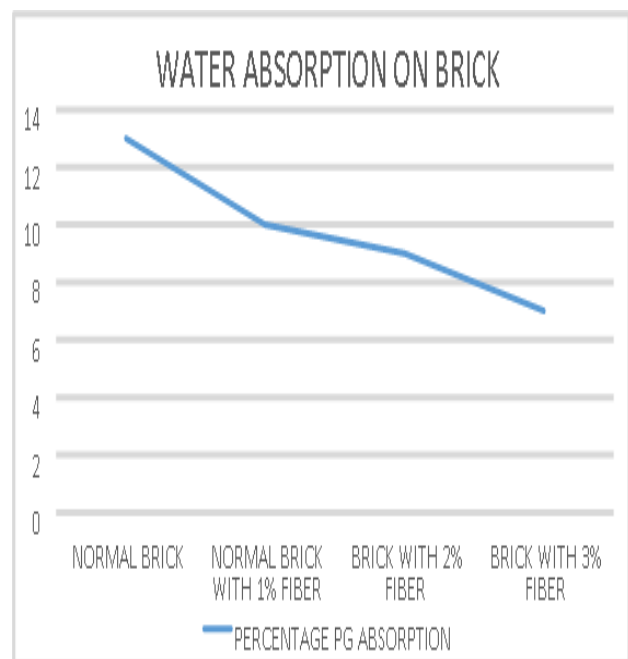


Chart-1. Water Absorption Test.

III. COMPRESSION TEST

It is used to determine the compressive strength of brick. The test is done on compressive testing machine. After placing the machine on CTM apply a load until it breaks. Note down the value of failure load and find out the crushing strength value. The minimum crushing strength value of brick is 3.50N/MM².

$$\text{Compression Strength} = \frac{\text{MAXIMUM LOAD AT FAILURE (N)}}{\text{AVERAGE AREA OF BED FACE (MM}^2\text{)}}$$

Table –II: Compression Strength Test

SNO	DESCRIPTION	COMPRESSION STRENGTH
1	NORMAL BRICK	11
2	BRICK HAVING 1% FIBER	13.5
4	BRICK HAVING 2% FIBER	15
5	BRICK HAVING 3% FIBER	17

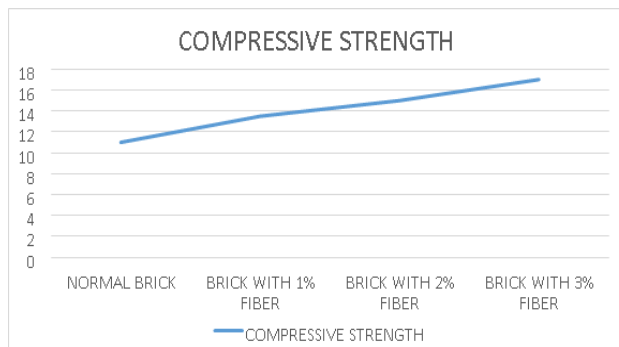


Chart-2. Compression Strength Test.

IV. CONCLUSION

1. In case of absorption test the value goes on decreasing when compared with normal brick because water hyacinth has good binding property and it had less void.
2. In case of compressive strength, it is inversely proportional to that of water absorption so the value goes on increasing when compared with normal brick.
3. It conclude that it can be used for construction purpose.

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