

Comparative Study of Light Weight Floating Bricks with Clay Brick

***S. Hemanth Sai **C. Mounika**

*Assistant Professor, Department of Civil Engineering, Nalla Narasimha Reddy Group of Institutions
,Telangana, India.

** Assistant Professor, Department of Civil Engineering, Vignana Bharathi Institute of Technology,
Telangana, India

ABSTRACT

The bricks seem to have been produced since the dawn of the civilization. The brick is a building material used to make walls, pavements and other elements in masonry construction. Generally, the term block alluded to a unit made out of mud however it is currently used to indicate any rectangular units laid in mortar. A block can be made out of earth bearing soil, sand, and lime, or solid materials. Blocks are delivered in various classes, types, materials, and sizes which change with timespan, and are created in mass amounts. Two basic categories of bricks are fired and non-fired bricks. A Block is a similar term referred to a rectangular building unit composed of similar materials, but is usually larger than a brick. Lightweight bricks which are also called as lightweight blocks are made from expanded clay aggregate. In this thesis, fly ash and protein foam agent based light weight floating block is prepared with different proportions and the results were compared with the traditional clay brick.

Key Words: *Fly ash, Protein Foam, Mud Brick, Clay Brick, Lime, Sand*

Introduction

The bricks have been utilized everywhere throughout the world in each class and sort of structure. It is comprehended that around 65 percent of the bricks in world goes into homes and the parity into business, mechanical and institutional structures. The bricks have built up as a well established material appropriate from the covered house to the multi-storeyed structures. They were at first carefully assembled and utilized as burden bearing material for different structures. With the progression of time and coming of concrete and steel, the casings just are topped off with the consumed earth bricks. The production of burnt clay bricks on a scientific and modern basis including proper mining of clays can lead to availability of quality bricks.

A brick is building material used to make walls, pavements and other elements in masonry construction whereas a block is a similar term referring to a rectangular building unit composed of the similar ingredients, but is generally larger in size than a brick. Lightweight bricks (also called lightweight blocks) are made from expanded clay aggregate

Composition of good brick material:-

The following are the constituents of good brick material:

Alumina: It is the chief constituent of every kind of clay. A good brick should contain 20% to 30% of alumina. This constituent imparts plasticity to the clay so that it can be moulded. If alumina is present in excess, with inadequate quantity of sand, the raw

bricks shrink and warp during drying /burning and become too hard when burnt.

Silica: It exists in clay either as free or combined. As free sand, it is mechanically mixed with clay. In combine form, it exists in chemical composition with alumina. A good brick material should contain about 50% to 60% of silica. The presence of this constituent prevents cracking, shrinking and warping of raw bricks. It thus imparts uniform shape to the bricks. The durability of bricks depends on the proper proportion of silica in brick material. The excess of silica destroys the cohesion between particles and the bricks become brittle.

Lime: A small quantity of lime not exceeding 5 percent is desirable in good brick material. It should be present in a very finely powdered state because even small particles of the size of a pin-head cause flaking of the bricks. The lime prevents shrinkage of raw bricks.

Iron Oxide: A small quantity of oxide of iron to the extent of about 5 to 6 percent is desirable in good brick material. It helps as lime to fuse sand. It also imparts red colour to the bricks. The excess of oxide of iron makes the bricks dark blue or blackish. If, on the other hand, the quantity of iron oxide is comparatively less, the bricks will be yellowish in colour.

Magnesia: A small quantity of magnesia in brick material imparts yellow tint to the bricks and decreases shrinkage. However, excess of magnesia leads to the decay of bricks.

Harmful Ingredients in a brick:

1. Excess Lime
2. Iron Pyrites
3. Alkalies
4. Pebbles
5. Vegetation and Organic Matter

Factors affecting the Strength of bricks:-

1. Composition of brick making material
2. Mixing of Ingredients
3. Nature of moulding adopted
4. Care taken in drying and stacking of raw or green bricks
5. Type of kiln used including type of fuel and its feeding
6. Burning and cooling processes
7. Care taken in unloading

It is obvious that not only the bricks of different brick fields will have different strengths, but also in the same brick field, the bricks of the same batch may have different strengths.

The average crushing strength and tensile strength of hand moulded bricks are 60,000 kN/m² and 2000 kN/m² respectively. The shearing strength of bricks is about one-tenth of the crushing strength. It may be noted that the strength of brickwork mainly depends on the type of mortar used and not so much on the individual strength of the bricks.

LIGHT WEIGHT FLOATING BRICK:

Light weight bricks are made of fly ash, rice husk ash, foaming agent and cement. These can be extensively used in all building constructional activities similar to that of common burnt clay bricks. The light weight bricks are comparatively lighter in weight and stronger than common clay bricks. Since fly ash is being accumulated as waste material in large quantity near thermal power plants and creating serious environmental pollution problems, its utilization as main raw material in the manufacture of bricks will not only create ample opportunities for its proper and useful disposal but also help in environmental pollution control to a greater extent in the surrounding areas of power plants. Manufacturing of commercial brick produce

a lot of air pollution. The technology adopted for making. The light weight bricks are eco –friendly. It is no need fire operation in production unlike the conventional bricks. Among the traditional fossil fuel sources, coal exists in quantities capable of supplying a large portion of nation's energy need. That's why the power sector in India is a major consumer of coal in India and will continue to remain so far many years to come.

Composition of light weight floating brick:

- 1) Fly ash
- 2) Rice husk Ash
- 3) Cement
- 4) Foam agent

Fly ash:

Fly ash is a fine powder that is a by product of burning pulverized coal in electric generation power plants. It is a pozzolan, a substance containing aluminous and siliceous material that forms cement in the presence of water. When it is mixed with lime and water, fly ash forms a compound similar to Portland cement. This makes fly ash suitable as a prime material in blended cement, mosaic tiles, and hollow blocks, among other building materials. When used in concrete mixes, fly ash improves the strength and segregation of the concrete and makes it easier to pump.

Rice Husk Ash:

The rice paddy milling industries give the by-product rice husk. Due to the increasing rate of environmental pollution and the consideration of sustainability factor have made the idea of utilizing rice husk. They have a very low bulk density of 90 to 150kg/m³. This results in a greater value of dry volume. The rice husk itself has a very

rough surface which is abrasive in nature. These are hence resistant to natural degradation. This would result in improper disposal problems. The rice husk ash is a green supplementary material that has applications in small to large scale. It can be used for waterproofing. It is also used as the admixture to make the concrete resistant against chemical penetration.

Cement:

A Cement is a binder, a substance used for construction that sets, hardens and adheres to other materials, binding them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement is used with fine aggregate to produce mortar for masonry, or with sand and gravel aggregates to produce concrete. Cements used in construction are usually inorganic, often lime or calcium silicate based, and can be characterized as being either hydraulic or non-hydraulic, depending upon the ability of the cement to set in the presence of water.

Portland cement is by far the most common type of cement in general use around the world. This cement is made by heating limestone (calcium carbonate) with other materials (such as clay) to 1450 °C in a kiln, in a process known as calcinations, whereby a molecule of carbon di oxide is liberated from the calcium carbonate to form calcium oxide, or quicklime, which then chemically combines with the other materials that have been included in the mix to form calcium silicates and other cementitious compounds.

Foaming Agent:

A foaming agent is a material that facilitates formation of foam such as a surfactant or a blowing. These are used in air drilling applications to reduce air volume requirements and enhance the removal of drilled. The foaming agent used in the thesis is Akshar Chem Foaming Agent.



Fig 1 shows the Foaming Agent powder used in this thesis

MIX PROPORTIONS OF LIGHT WEIGHT FLOATING BRICK:

Grade A:

Cement : 1 Kg
 Rice Husk Ash : 3 Kg
 Fly Ash : 1 Kg
 Foam : 15 Gm (Mixed In 400 ml of Water)
 Water : 2000 ml

Grade B:

Cement : 1.5 Kg
 Rice Husk Ash : 3 Kg
 Fly Ash : 1.5 Kg
 Foam : 20 Gm (Mixed In 3000 ml of Water)
 Water : 3000 ml

Grade C:

Cement : 1 Kg
 Rice Husk Ash : 0.5 Kg
 Fly Ash : 1 Kg
 Foam : 10 Gm (Mixed In 400 ml of Water)
 Water : 2000 ml

MOULDING PROCESS:

Samples of each grade are prepared by means of hand moulding. Before that a mould of conventional clay brick size is prepared.

The ingredients are mixed in a proportionate manner and the mixing is done in a proper way such that there are no lumps in that. Foam powder when mixed with water and rinsed properly. The foam is generated and the same is mixed along with the cement, fly

ash and Rice Husk Ash. The bricks are prepared in this manner.

CURING:

Curing can be described as keeping the concrete moist and warm enough so that the hydration of cement can continue. More elaborately, it can be described as the process of maintaining satisfactory moisture content and a favourable temperature in concrete during the period immediately following placement, so that hydration of cement may continue until the desired properties are developed to a sufficient degree to meet the requirement of service. If curing is neglected in the early period of hydration, the quality of concrete will experience a sort of irreparable loss. An efficient curing in the early period of hydration can be compared to a good and wholesome feeding given to a new born baby. Membrane Curing is adopted in this thesis.



Fig 2 Shows Light Weight Floating Brick Floating in water

RESULTS AND DISCUSSIONS:

The density of the three grades of bricks was found and the results are tabulated:

Grades of Floating Bricks	Density of The Brick
Grade A	799 Kg/m ³
Grade B	820 Kg/m ³
Grade C	1200 Kg/m ³

Table 1 shows the density of the brick

The Compressive Strengths of the three grades of bricks are tabulated:

Grades of Floating Bricks	Compressive Strength Of The Brick For 7 Days
Grade A	9.3 N/mm ²
Grade B	9 N/mm ²
Grade C	22 N/mm ²

Table 2 shows the compressive strength of the brick for 7 days

Grades of Floating Bricks	Compressive Strength Of The Brick For 14 Days
Grade A	9.3 N/mm ²
Grade B	9 N/mm ²
Grade C	22 N/mm ²

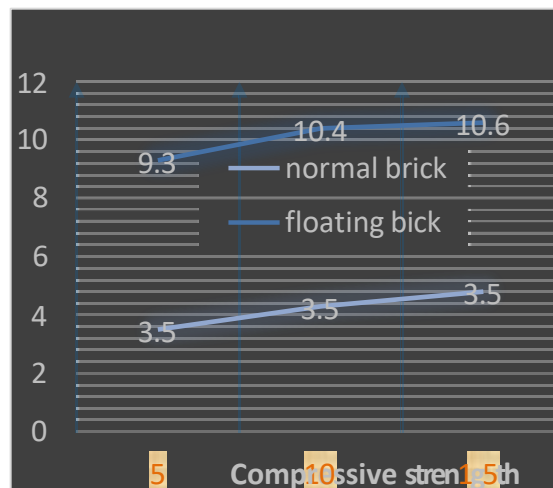
Table 3 shows the compressive strength of the brick for 14 days

Grades of Floating Bricks	Compressive Strength Of The Brick For 21 Days
Grade A	10.6 N/mm ²
Grade B	10.1 N/mm ²
Grade C	28.4 N/mm ²

Table 4 shows the compressive strength of the brick for 21 days

Cost Comparison: The normal brick costs Rs 8.00 per brick whereas the light weight floating brick costs only Rs 5.00 per brick.

Strength Comparison of Normal Brick with Light weight floating brick:



Graph shows the compressive strength comparison of both bricks

CONCLUSION:

1. It is found that fly ash added brick has shown reasonably good properties and may become good competitive brick with the conventional building brick.
2. Using light weight aggregate in concrete mixture reduces dead load.
3. Manufacture of brick with different type of waste has shown positive effect on property of fired clay.
4. By using this light weight bricks we can build small marine structures in the oceans.

REFERENCES:

- [1] N. Narayanan and K. Ramamurthy, "Microstructural investigations on aerated concrete," Cement and Concrete Research, Vol. 30, No. 3, pp. 457–464, 2000.
- [2] K. Ramamurthy, E. K. K. Nambiar, and G. I. S. Ranjani, "A classification of studies on properties of foam concrete," Cement

and Concrete Composites, Vol. 31, No. 6, pp. 388–396, 2009.

[3] Dhawal Desai, “Development of Light Weight Concrete”, Civil Engineering Portal, 2014.

[4] Lakshmi Kumar Minapu¹, M K M V Ratnam², Dr. U Rangaraju, “ (Experimental Study on Light Weight Aggregate Concrete with Pumice Stone, Silica Fume and Fly Ash as a Partial Replacement of Coarse Aggregate)”, International Journal of Innovative Research in Science, Engineering and Technology Vol. 3, Issue 12

[5] N. Sivalinga Rao, Y.Radha Ratna Kumari, V. Bhaskar Desai, B.L.P. Swami, “Fibre Reinforced Light Weight Aggregate Concrete” International Journal of Scientific & Engineering Research Volume 4, Issue 5, May-2013 ISSN 2229- 5518.