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# Comparative Study of Conventional Bricks, Fly Ash Bricks and Bagasse Ash Bricks

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***Abstract*:** *A brick is building material used to make walls, pavements, and other elements in masonry construction. In this report, we present the concept of the use of agricultural waste i.e. bagasse ash in the manufacturing of bricks as per IS specification. Sugarcane is largely produced in India. And after effective use of sugarcane the remaining product that is bagasse is used in boilers as a fuel and then bagasse is converted into ash. That ash is called Sugarcane bagasse ash. The amount of sugarcane bagasse ash accumulated in the 21st century has created big challenges for their disposal. In India, approximately 250-300 million tons of industrial wastes are being produced every year by chemical and agricultural processes and from that industrial wastes 10-12 million tons of wastes is bagasse ash. It is very essential to dispose of these wastes safely without affecting the health of human beings, environment, fertile land, sources of water bodies, etc. This bagasse ash can be qualitatively reused for the manufacturing of bricks. Using bagasse ash in bricks as a replacement of fly ash, solve the disposal problem and it also helps in making construction material. We used, bagasse ash in brick and made brick and made brick by using suitable material, size, shape, etc. And by accepting specific casting methodology. These bricks are then compared with fly ash bricks and conventional red bricks by using a particular test i.e. Compressive test, Hardness test, Water absorption test, Shape and size test, Soundness test.*

***Keywords***: ***Bagasse ash, Environmental Hazards, Manufacturing Processes, Casting Of Bricks, Comparisons, Conclusion.***

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## I. Introduction

Population scenario comes towards India utilizing increasing industries. The fruitful efforts of industries lead to develop India. As the industries increase also the waste coming from them at the end of the product increases. At the end of the survey result coming that the amount of the approximately 250 to 300 million tons of industrial wastes are being produced every year by chemical and agricultura l process in India. It is very essential to dispose of these wastes safely without affecting the health of human beings, environment, fertile land, sources of water bodies; etc. India, as we all know is the second biggest sugarcane growing country in the world, only behind Brazil. Every year, 4 million hectares had been planted with sugarcane. Sugar plant can process 40 million tones' sugarcane every year. For each tone of sugar cane crushed, about 200kg of bagasse is retrieved. Sugar cane bagasse, the fibrous residue after crushing and juice extraction of sugar cane, is a major industrial waste product from the sugar industry. Nowadays, it is commonplace to reutilize sugar cane bagasse as a biomass fuel in boilers for vapor and power generation in sugar factories. Depending on the incinerating conditions, the resulting sugarcane bagasse ash (SCBA) may contain high levels of SiO2 and Al2O3, enabling its use as a supplementary cementitious material (SCM) in blended cement systems. Uses of Sugarcane bagasse ash waste in brick can save the sugarcane industry disposal costs and produce a 'greener' brick for construction. The major sugarcane producing states in India are Uttar Pradesh, Karnataka, Maharashtra, Tamil Nadu, Gujarat, and Andhra Pradesh. These states contribute more than 85% of the total sugarcane production in India. Uttar Pradesh alone accounts for 41% of the total production. The total production in India was about 340 metric tons in the year 2010-11, which was about 27 % of the total sugarcane

production in the world during the same period. Uttar Pradesh tops the list of sugarcane producing states with 76.85 metric tonnes production (2011-12). Maharashtra is the second leading producer with 54.5 metric tonnes of production. We formed bricks by using bagasse ash by using different percentages of bagasse

ash (i.e. 15%;35%,50%). We also formed fly ash brick and conventional brick. And then compare fly ash brick and conventional brick with sugarcane bagasse ash brick.

## II. Objectives

- To utilize the waste material available in the agro-industries.
- To reduce the impact of bagasse ash on the environment.
- To study the result of bagasse ash in brick and concentrate on future use.
- To compare the test parameters as per standard IS code.
- To study the compressive strength of the brick by adding different percentages of bagasse ash.

## III. Methodology

### 3.1 General

A brick is building material used to make walls, pavements, and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote rectangular units made of clay-bearing soil, sand, and lime, or concrete materials. Bricks can be joined together using mortar, adhesives, or by interlocking them. Bricks are produced in numerous classes, types, materials, and sizes which vary with region and period, and are produced in bulk quantities. Two basic categories of bricks are fired and non-fired bricks. In the early age of mankind as the less knowledge of clay modifications and shapes unfired bricks were used and built mud houses also known as mud bricks, are made from wet, clay-containing soil mixed with straw or similar binders. They are air-dried until ready for use. Fired bricks are burned in a kiln which makes them durable. Modern, fired, clay bricks are formed in one of three processes – soft mud, dry press, or extruded. Depending on the country, either the extruded or soft mud method is the most common, since they are the most economical. Chemically set bricks are not fired but may have the curing process accelerated by the application of heat and pressure in an autoclave. Firstly, the literature surveyed was being accomplished to study the availability of agro-waste in India. It had been observed that an enormous quantity of agro waste was present in our country. So we could have carried out our research in this field. Then the materials which we had to use were chosen and the properties of those materials were examined and studied.

The following steps are involved:
Collection of raw material
Casting of bricks
Testing And Comparison

### 3.2 Material Used In Bricks

1. Water
2. Sugarcane Bagasse
3. Sugarcane Bagasse Ash
4. Fly Ash
5. Quarry Dust
6. Cement
7. Clay
8. Rice Husk.

### 3.3 Casting of Bricks

Size of bricks: - 9” x 6” x 4”. No of Bricks: -No. of Bricks :-
Conventional bricks: - 12nos.
Fly ash bricks: - 12nos.
Bagasse ash bricks: - 15%: 12nos, 35%: 12nos, 50%: 12nos.

**Table 3.3** Mix proportion

| TYPE OF BRICKS | RICE HUSK | CLAY | FLY ASH | BAGASSE ASH | CEMENT | QUARRY DUST |
|---|---|---|---|---|---|---|
| CB | 40% | 60% | - | - | - | - |
| FAB | - | - | 40% | - | 15% | 45% |
| SCBAB1 | - | - | - | 15% | 15% | 70% |
| SCBAB2 | - | - | - | 35% | 15% | 50% |
| SCBAB3 | - | - | - | 50% | 15% | 35% |

### 3.3.1. Manufacturing process of fly ash/bagasse ash brick

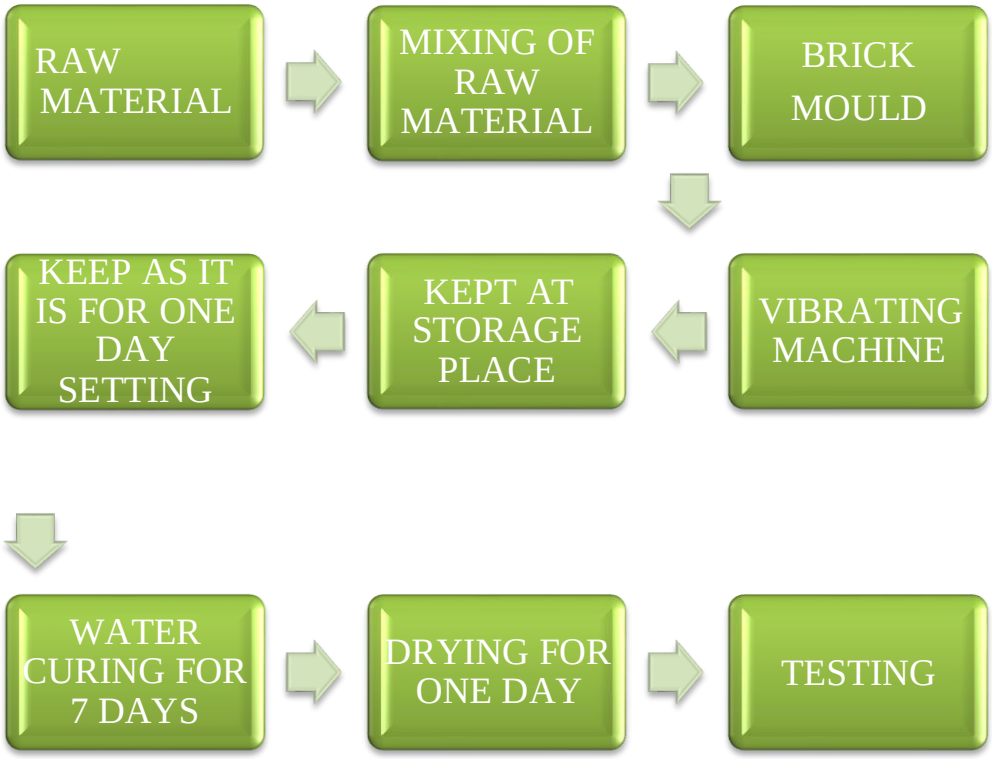


**Fig. 3.5**. Manufacturing process of fly ash/bagasse ash brick

- Mix all the raw materials quarry dust, cement, and fly ash/bagasse ash with water.
- Then this mixture is transferred into the brick mold.
- Place this brick mold on the vibrator to fill the voids and for proper compaction.
- Then these bricks are then kept at storage place for about 2days for setting and then for 7days for water curing.
- These bricks are then dried for 2 days and tested.

### 3.3.2. Manufacturing process of conventional brick

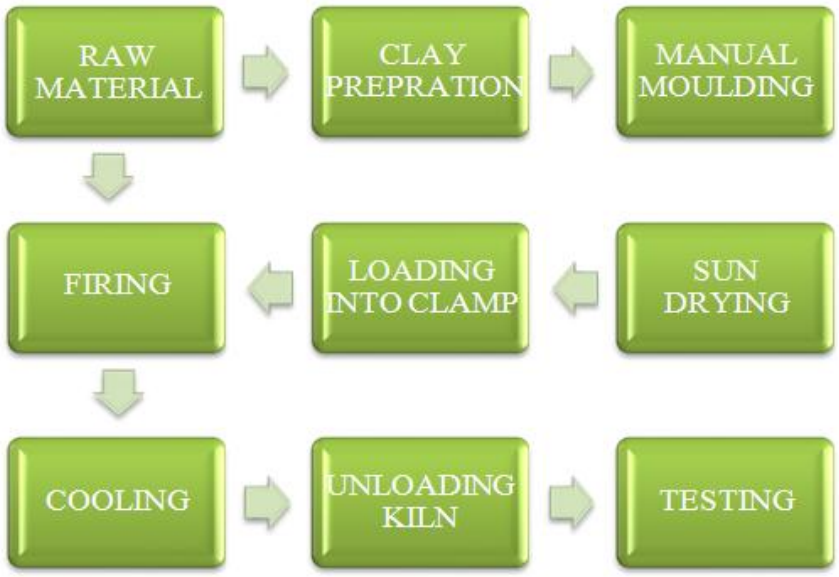


**Fig. 3.7** Manufacturing process of conventional brick.

- The raw material clay, rice husk are mixed with water. This mixture is introduced in the mold firmly.
- Then mould is lifted with jerk and inverted on ground.
- Then molded bricks are arranged in rows called hacks with space between bricks for Circulation of air.
- The bricks are burn-in clamp burning. Then cooling is done at room temperature.

### 3.3. Testing On Bricks

To know the quality of bricks following tests can be performed. In these tests some will be performed in the laboratory and the rest on the field. To determine the hardened properties of bricks standard tests like compression test on bricks for compressive strength of brick and water absorption test will be carried out at 14days and 28days of curing.

The following types of test are conducted on conventional bricks, fly ash bricks and bagasse ash bricks

1. Size, Shape and Colour Test
2. Soundness Test
3. Water Absorption
4. Hardness Test
5. Compressive strength Test

### 3.4. Comparison Of Bricks

This comparison of conventional bricks vs fly ash bricks vs bagasse ash bricks will help in making precise selection for construction. Conventional Bricks are made from the natural soil. If this natural soil is used continuously for construction, time will come when natural resources will be scare. Due to this reason various alternatives such as fly ash bricks and bagasse ash bricks should be used for constructing a wall. And as the bagasse is also a waste product it can be replaced with fly ash. From the comparison of conventional bricks vs fly ash bricks vs bagasse ash bricks based on these above we can make a rational choice

Descriptive comparison of conventional bricks, fly ash bricks and bagasse ash bricks concerning the following:

- Density
- Compressive strength
- Absorption
- Hardness
- Cost
- Uses
- Environmental impact

### 4.1 Comparison

The Conventional bricks, Fly ash bricks, Bagasse ash bricks are compared based on Density, Compressive strength, Water absorption, Hardness, Uses, and Environmental impact. It is shown in the following table below

**Table 4.12** Comparison of bricks

| Description | CB | FAB | SCBAB 15% | SCBAB 35% | SCBAB 50% |
|---|---|---|---|---|---|
| Density ($kg/m^3$) | 1100 to 1420 | 2300 to 2600 | 2250 to 2400 | 2150 to 2300 | 2000 to 2100 |
| Compressive Strength($N/mm^2$) | 8 to 9 | 16 to 17 | 15 to 16 | 13.5 to 14 | 12 to 13 |
| Water Absorption (%) | 9 to 12 | 10 to 12 | 6 to 7 | 7 to 7.5 | 8 to 8.5 |
| Hardness | Left mark | Dose not left mark | Dose not left mark | Slightly left mark | Slightly left mark |
| Cost (Rs.) | 5 to 8 | 4 to 6 | | | |
| Uses | Structural material in different structure | An alternative to conventional brick | And alternative to conventional red brick and fly ash brick | | |
| Environmental Impact | Not a green product and Reduced the top fertile soil cover | Utilizes fly ash waste | Utilizes bagasse ash waste and Help in solve disposal problem | | |

## IV. Conclusions

- A more appreciable use of sugarcane bagasse ash is found through this research.
- To make bricks which are only viable solutions to environmental concerns and natural resource conservation for future generations.
- This study helps in converting the non-valuable bagasse ash into bricks and make it valuable.
- An innovative supplementary construction material is formed through this study.
- The compressive strength of bagasse ash bricks is more than conventional bricks and nearby the fly ash bricks.
- The bricks with 35% bagasse ash shows good results.

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