

“MANUFACTURING OF BRICKS BY USING INDUSTRIAL AND AGRICULTURAL WASTE”.

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Abstract - In India, bricks are particularly composed up of clay, and are usually produced in conventional, unorganized small-scale industries. Bricks are crucial building material and approximately 250 billion bricks are yearly produced via manner of the industries. pink clay bricks making consumes larger amount of clay which results in top soil removal and land degradation. huge regions of lands are destroyed every year mainly in growing nations because of collection of soil from an intensity of about 1 to two m from agricultural land.

on this paper Fly ash, GGBS, Sugarcane Bagasse were used in production of Bricks. the prevailing contain offers an in-depth description on the experimental investigation at the compressive strength and physical properties of the Sugarcane Bagasse and GGBS. The brick residences together with compressive strength, water absorption, acid resistance and efflorescence take a look at had been accomplished on the check specimens.

Key Words (Fly Ash, Sugarcane Bagasse, Ground Granulated Blast Slag, Compressive Strength)

1. INTRODUCTION

The requirement of energy for the growing international locations mainly vicinity is fulfilled from the combustion of coal. The disposal of the growing quantities of thermal waste from coal-fired thermal electricity plant life is growing every day, this disposal of the thermal waste is named as fly ash, which consists of the non-flammable mineral a part of coal consumed in a coal fuelled strength plant and the powdery waste remained as residue from the diverse plant life and factories. Fly ash is powder substance received from the dust creditors inside the electric strength plant life that use coal as fuel. Fly ash is furnished free of value to entrepreneurs. GGBS changed into found inside the form of powder from iron wastes. this could motive environmental troubles and making disposal issues at the disposal net websites, this had been modified in to beneficial useful resource and used for making bricks. The charge and different residences of the bricks are

equalized to the ordinary bricks. The houses of the synthetic brick have compromised with the normal brick. This looks at involves the addition of GGBS with clay inside the fired bricks.

2. Literature Review -

[1] Vanreyk at el carried out a Comparative have a have a look at of Clay Bricks with GGBS and Laterite Soil. in this have a look at used a trade technique to decrease the quantity of clay is thru including the waste materials like GGBS and laterite soil. GGBS changed into introduced in four%, 8%, 12%, 16%. Laterite soil is a soil with excessive clay content material. It carries minerals like kaolinite and elite. to improve the houses and electricity of clay bricks, laterite soil is brought. Laterite soil added in 5%, 10%, 15% and 20%. The 15 % of laterite soil introduced to clay bricks have become located pinnacle of the road bring about complete electricity to the most fulfilling percent of Laterite soil GGBS had been brought in various percentage had been analysed. eight% GGBS, and 15% laterite soil have been one after the other delivered to clay bricks offers higher compressive power and higher result. Water absorption increases with addition of materials and thermal conductivity shows a lowering style with increase in fabric addition.

[2] Divahar at el carried out the experimental study on brick manufacturing with partially replacement of clay with GGBS. In this paper GGBS was partially replaced with clay into brick. Clay, lime and GGBS were the materials used to manufacture the bricks. There were different proportion of bricks were studied such as 0%, 5%,10%,15%,20%,25% and 30%. In the results strength and stability was increased and reduced the brick production cost. And also, good quality of bricks produced from proportion of slag, lime and sand mixture.

[3] Indrajith at el conducted a study on properties of brick made with fly ash and granulated blast furnace slag (GGBS). In this study brick contains fly ash as the source material of bricks. Also used fine aggregate (M-sand). M-

sand grading zone was 2 of IS 383-1970 was used. Also used alkaline activated solution for the activation of polymorphism reaction. Sodium hydroxide and sodium silicate as activator. In the results water absorption of bricks show absorption up to 6%. Compressive strength of brick ratio fly ash: GGBS is 75:25 shows highest strength in this paper.

[4] Kumutha at el finished experimental investigation fly ash Bricks incorporating M-sand and GGBS. Brick became made with the useful resource of using cloth like fly ash, granulated blast furnace slag (GGBS) and synthetic sand(M-sand). The motive of this check changed into to apply waste fabric efficiently thinking about that GGBS and fly ash is industrial waste. The test ends up done with the aid of using taken numerous percentages of material and houses of cloth and bricks are studied thru sporting out numerous tests like weight, comprehensive power and water absorption take a look at as steady with Indian popular.

[5] Jonathan at el Conducted the study on the Development of Unfired Clay Building Materials for Building Construction.

[6] Malhotra at el conducted an experimental study the development of bricks from GGBS, result obtained that the slag- lime sand bricks can be manufactured beneficially in the vicinity of iron and steel plants.

[7] Mathew at el experimentally analysed on the Development of Coal Ash GGBS based geopolymer bricks.

They concluded that the parameter which had the highest influence on strength of the mix was binder percentage.

3. Materials-



Fig - 1: Mixing of Material

- **Fly Ash** - after burning of coal or lignite inside the boilers. Fly Ash is that portion of ash that's accrued from the ash ponds. backside ash is that portion of

ash which may be amassed from the lowest part of the boilers. The traits of fly ash primarily based upon the quality of lignite or coal and the performance of boilers.

- **Sugarcane Bagasse** - Bagasse is a residue obtained from the burning of bagasse in sugar generating factories. Bagasse is the mobile fibrous waste derivative after the extraction of the sugar juice from cane turbines. it is currently used as a bio gas and within the manufacture of pulp and paper merchandise and building materials.
- **GGBS** - It changed into obtained by way of quenching molten iron slag from a blast furnace in water or stream. they're off-white in shade. specific gravity of GGBS changed into obtained as 2.89.
- **Clay** - Clays are plastic due to their water content material and become difficult, brittle and non-plastic upon drying or firing. Geologic clay deposits are in particular composed of phyllosilicate minerals containing variable quantities of water trapped within the mineral shape. depending on the content material of the soil, clay can seem in numerous hues, from white to stupid grey or brown to a deep orange purple.

4. Composition

Table 1: Composition of Brick 1 (B1)

Fly Ash	30%
Sugarcane Bagasse	15%
GGBS	20%
Clay	35%

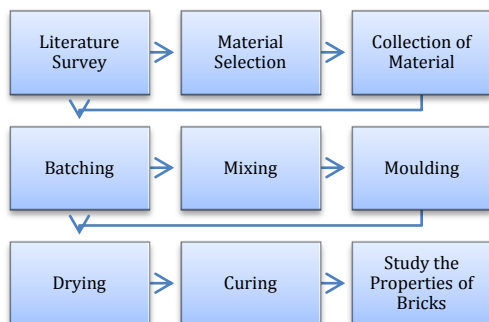
Table 2: Composition of Brick 2 (B2)

Fly Ash	35%
Sugarcane Bagasse	10%
GGBS	25%
Clay	30%

Table 3: Composition of Brick 3 (B3)

Fly Ash	25%
Sugarcane Bagasse	12%
GGBS	23%
Clay	40%

5. Methodology



Fly ash (20-30%), Sugarcane Bagasse (7-10%), GGBS (20-25%) and Clay (40-50%) every mix percentage is manually feed into a pan mixer where water is introduced to the desired share for homogeneous mixing. After mixing, the combination is brought

about belt conveyor to feed in to automatic brick making system where the bricks are pressed automatically. Then the bricks are positioned on wood pallets and set aside as it's far for two days, there once they are water cured for 10 -15 days. The bricks are looked after and examined at 7th and 14th from the day of manufacturing, every brick has been casted for nominal length of 190mm×190mm×90mm.



Fig – 2: Moulding

6. Test Setup -

To recognise the high-quality of bricks following 8 assessments has been executed. In those tests a few are performed in laboratory and the relaxation are on discipline.

1. length, shape and colour test
2. colour test
3. Soundness test
4. Water Absorption test
5. Hardness test
6. Compressive Strength test

1-2. Length, form and colour take a look at

in this take a look at randomly accumulated 18 bricks are staked along lengthwise, width wise and top clever after which the ones are measured to recognise the variation of sizes as in step with standard. Bricks are intently considered to test if its edges are sharp and straight and uniform in shape. an awesome pleasant brick must have brilliant and uniform shade all through.

3. **Soundness** take a look at two bricks are held via each palms and struck with one another. If the bricks give clean steel ringing sound and do not ruin then the ones are true quality bricks.

4. **Water Absorption** take a look a ton this take a look at bricks are weighed in dry situation and allow them to immersed in clean water for 24 hours. After 24 hours of immersion the ones are taken out from water and wipe out with fabric. Then brick is weighed in moist circumstance. The distinction between weights is the water absorbed by means of brick. the share of water absorption is then calculated. The less water absorbed by using brick the extra its first-class. properly fine brick would not take in more than 20% water of its personal weight.

5. In **Hardness check** a scratch is made on brick surface with a tough component. If that does not leave any effect on brick then that is good first-rate brick.

6. **Compressive energy check** is done to understand the compressive electricity of brick. it's also referred to as crushing energy of brick. generally, five specimens of bricks are taken to laboratory for testing and examined one after the other. in this test a brick specimen is placed on crushing system and implemented strain until it breaks. The ultimate strain at which brick is overwhelmed is taken into consideration. All 5 brick specimens are tested one at a time and common end result is taken as brick's compressive/crushing strength.

7. Test Result -

- **Size and Shape Test -**

Table 4

Brick	Length	Width	Height
B1	19cm	9cm	9cm
B2	19cm	9cm	9cm
B3	19cm	9cm	9cm



Water Absorption -

The water absorption of brick is calculated using formula (1)

$$W = (M2 - M1 / M1) \times 100 \dots\dots\dots (1).$$

Where,

M1= Dried specimen weight cooled at room temperature.

M2= Immersed specimen weight after 24 hours.

Table 5

Brick	Water Absorption %	Average
B1	17.31	17.31
	17.02	
	17.60	
B2	16.8	16.43
	16.05	
	16.4	
B3	18.5	18.13
	18.02	
	17.91	

Compressive Strength -

The Compressive strength has been calculated by using following formula (2) and using Compression Testing Machine.

$$\text{Compressive Strength of Bricks} = \text{Maximum Load at Failure (N)} / \text{Average area of bed face (mm}^2\text{)} \dots\dots\dots (2)$$

Table 6

Brick	Compressive Strength (P/A) in N/mm ²	Average
B1	4.4	4.2
	4	
	4.2	
B2	4.3	4.5
	4.7	
	4.5	
B3	4	4.03
	3.9	
	4.2	

8. Conclusion -

- I. A better measure through an innovative construction fabric is formed via these studies.
- II. Modified clay bricks show boom in compressive strength upto a selected percentage, past that point compressive strength decreases.
- III. This looks at allows in converting the non-treasured bagasse ash into bricks and makes it precious.
- IV. The water absorption of bricks shows water absorption 16% to 18% whereas the normal clay bricks it will be around 20% water absorption.
- V. The bricks can be used for framed structures and compound walls as compressive strength is 4N/mm² to 4.5 N/mm².

9. Reference -

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