

# STRENGTH COMPARISON OF VARIOUS PERCENTAGES OF SAWDUST ADDED CLAY BRICKS: A EXPERIMENTAL STUDY

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**Abstract:** Now a days the use of clay bricks in building construction is widely used. Such a time clay bricks to be used in better option of building construction as examining compared to the conventional clay bricks which is made by only on clay bricks in a cost view of point and better suitability. India is a developing country so here the construction of compound walls and building plays an important role. Nowadays most of the work related with building is done. Thus the clay bricks is light weighted and then to be used another option of prefabricated compound wall construction. This experimental investigation design bricks by using Indian standard code of dimension 230mm x 110mm x 75mm. In this project main mix design proportions is 2%, 3%, 6% and 9% of sawdust with jaggery water mixer. Ultimate aim of this study is to increase the compressive strength and weight to be reduction of clay bricks and to reduce the waste materials available in saw mills and timber industries. Then the water absorption to be noted and examine strength comparison in the specimen tests.

**Key words :** Compressive Strength, Water Absorption, Cost, Clay, Clay bricks, Sawdust, jaggery, Mix proportion

## 1. INTRODUCTION

Clay brick masonry is one of the oldest and most durable construction techniques used by mankind clay bricks. Masonry consists of manually built stable stacks of small elements, with or without mortar. This study bricks are produced different percentages of clay and sawdust using .There are two categories of bricks such as fired and unfired bricks. This Fired bricks having normal strength, light weight and long lasting and strongest building materials. Bricks are sometimes referred as natural stone. It gives high protection over the other wall cladding materials. It requires less maintenance than the other building materials.

## 2. CLAY BRICK

A brick is building material used to make walls, masonry construction. Used in the construction of residential, commercial and industrial structures. Although refinements have been made in the brick manufacturing process, it remains largely unchanged from the earliest bricks, estimated to be around 10,000 years in the middle east and south Asia. Clay bricks is made by mixing clay with water such as to prevent shrinkage and provide bulk.

## 3. DIMENSIONS TOLERANCE

As per IS 1077:1992 to be provided

- Modular sizes of Indian standards-Length=190mm, width=90mm, height=90mm.
- Non modular sizes of the Indian standard- Length=230, width=110mm, height=70mm

- Used modular sizes- Length =230mm, width=110mm, height=75mm.

#### 4. ADVANTAGES OF CLAY BRICKS

- Very economical when comparing to other bricks.
- Minimum repairing work will be enough.
- Good looking.
- Proper drainage can be maintained.
- Damage of bricks due to wear and temperature will be reduced.
- Laying of clay bricks can be easily taken.
- Duration to construct the bricks is reduced due to normal clay bricks.

#### 5. LITRATURE REVIEW

**R.R.Tharini, K.Panchavarnam, Jayalakshmi et al** presents the manufacturing of bricks emission is more and exploitation of clay soil is more. For this reason, they can reduce the clay content and replaced by waste by product. In this paper they used the ball clay, fly ash and jaggery and use ball clay as the replacement of clay and jiggery dissolved water. Jiggery used to increases the compressive strength of brick and ball clay contain high silica content. It is reduced the water absorption in brick and increases the workability of the brick. Here they find the fired strength of the bricks using ball clay, fly ash and jaggery. They use different proportions of materials. The brick specimen of size 230mm x 110mm x 75mm. Compressive strength was determined for different proportions.

**Ali Ahmed Mohammed et al** explains about the art work of manufacturing bricks in the past and the current trend in the bricks industry with respect to the raw materials, ways of manufacturing and the out- comings. Moreover, the hazardous impacts of the conventional brick manufacturing will be wholly covered as well as the attempts of the previous researches in treating the problem properly.

**Fernando, Devika Madushani, Praththana, Nanayakkara et al.**, deals about the Clay bricks have been made since ancient periods. The higher demand for this brick fails to support the needs. This is because clay is the non-renewable materials. Therefore, new artificial cement blocks have been introduced to satisfy the fast demand in the world. However, the clay bricks are the most eco-friendly and form green environment.

#### 6. SCOPE

- By using light weight clay bricks replacement of the prefabricated compound walls.
- This project is economical, so future scope is effectively.
- Used control heavy weight deformation. Because gravity pulls on light as well as matter.

#### 7. OBJECTIVES

- Comparison of compressive strength between clay bricks and sawdust added clay bricks.
- Make less the soil exploitation and use unwanted wooden poles using the materials in the manufacture of bricks.

- Analyze water absorption and compressive strength in the various percentages of clay and sawdust with jaggery by adding water.
- To Choose the optimum materials properties and ratios to produce brick from sawdust with jaggery by mixing water.
- Clay is performed by adding of 2%, 3%, 6% and 9% of sawdust with 100ml, 200ml, 300ml and 400ml of jaggery mixer water.
- Examine comparison of strength and water absorption in the various percentages of sawdust added clay bricks.

**8. QUANTITY OF MATERIAL**

**Table..1 Quantity of Material**

Materials	Total weight in kg
Clay	16.60
Sawdust	0.700
Jaggery mixer water	1 liter

**Table.2 Proportions of Raw Material**

SI.NO	Mixers	Clay (% of weight)	Jaggery mixer(ml)	Sawdust(% ofweight)	Total percentage
1	Mix 1	100	0	0	100
2	Mix 2	94	100	2	96
3	Mix 3	94	200	3	97
4	Mix 4	94	300	6	100
5	Mix 5	94	400	9	103



**Fig.1 Mixing of Sawdust with Jaggery Mixer**



**Fig.2 Mixing of Clay Sawdust with Jaggery Mixer**

### 9. COMPARISON OF WEIGHT OF CLAY BRICKS

Clay bricks has different weight depending on the quantity of clay and sawdust used in clay mixer proportions, type of material replaced and percentage of material replaced during mixer preparation.

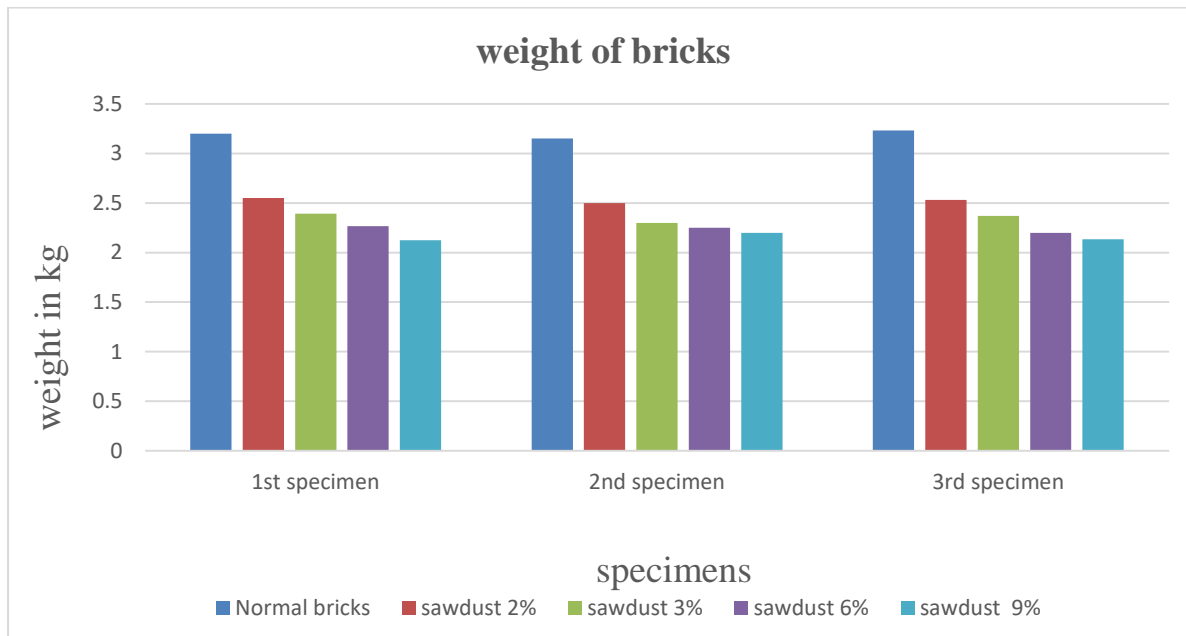
- Weight of clay bricks are calculated using normal conventional weighing machine used in laboratory in decimal values.
- Material added to the clay mixture will increase and decrease the weight of sawdust in bricks.
- Weight of clay brick which has 20% of replaced sawdust is greater than the normal conventional clay brick.

**Table.3 Weight of Specimens**

	1 <sup>st</sup> specimen	2 <sup>nd</sup> specimen	3 <sup>rd</sup> specimen
Normal bricks	3.2	3.15	3.23
Sawdust 2%	2.550	2.500	2.530
Sawdust 3%	2.394	2.300	2.370
Sawdust 6%	2.266	2.250	2.200
Sawdust 9%	2.125	2.200	2.134

- From the above table conventional sawdust clay bricks weight is slightly lesser than the normal clay bricks which has sawdust waste materials and it also has no larger weight than the bricks.
- Saw dust reduces the weight of clay bricks depending on its proportion and density of type of dust used in clay bricks.

Following stock diagram shows the average increment and decrement of weight of clay bricks with gradually replaced sustainable materials.



**Fig.3 Weight of Specimens**

From the above stock diagram weight of clay bricks which has lesser than the weight of normal conventional bricks.

**10.COMPARISON OF COMPRESSIVE STRENGTH**

Compressive strength of clay bricks is calculated using ultimate compressive load occurring when specimen gets failure and bearing area of specimen. Generally, load is applied in KN. A compression testing machine, the compression plate which shall have a ball seating or plywood in the form of portion of a sphere the centre which coincides with the centre of the plate, shall be used.

$$\begin{aligned} \text{Surface area of the specimen (rectangle)} &= 2lw + 2lh + 2wh \\ &= (2 \times 230 \times 110) + (2 \times 230 \times 75) + (2 \times 110 \times 75) \\ &= 101600 \text{ mm}^2. \end{aligned}$$

Following details are the compressive load on bricks in after burning compressive strength test.

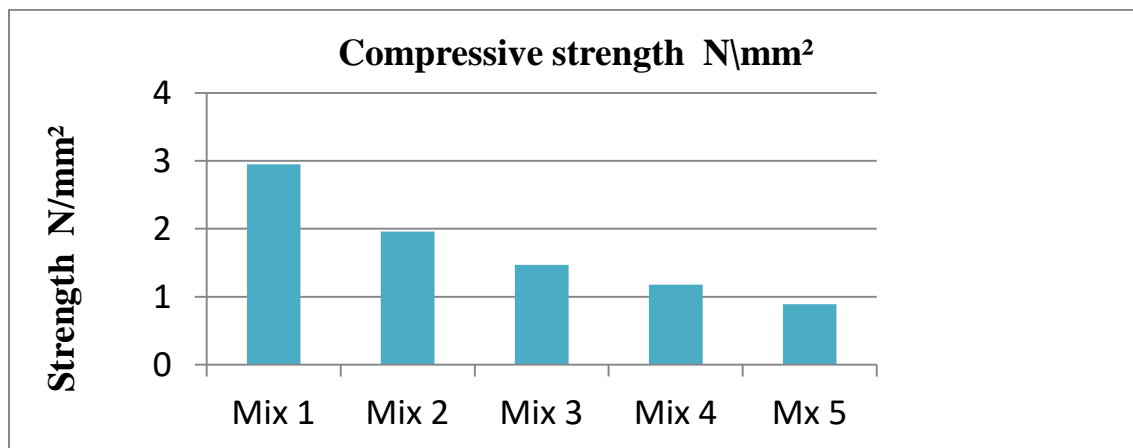
**Table.4 Compressive Loads on Specimen**

S.NO	Mixers	Compressive strength N/mm <sup>2</sup>
1	Mix 1	2.95
2	Mix 2	1.96
3	Mix 3	1.47
4	Mix 4	1.18
5	Mix 5	0.89

The above table shows the Compressive load applied on test specimen in kilo Newton (kN) which will be the primary factor to calculate the compression strength of bricks.



**Fig .4 Compressive Strength Testing**



**Fig.5 Compressive Loads on Specimen**

## 11. CONCLUSIONS

- By results of clay bricks testing the weight of bricks is differed depending on the sawdust material replaced. Conventional clay bricks gets 3.2 kg of average weight after hardened. But other bricks are light weighted.
- By adding the sawdust 2% at that time clay bricks weight is high when compared to other adding percentages respectively, Adding the jaggery water mixer to be increased soundness and hardness because its composition chemicals.
- Compressive strength of clay bricks has to be increased by adding of sawdust decreased and is high when 2% of sawdust and 100 ml of jaggery water mixer.
- Conventional bricks with standard material gives the compressive strength of 3.5 to above N/mm<sup>2</sup>.
- Water absorption test is calculated at various percentages of sawdust adding clay bricks to be 6% and 9% is to very low strength.
- Good future reception is great the weight is less and the strength of it is going to happen and it will be an example of such innovations. After doing various studies of different compounds

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