

Experimental Investigation on Making of Plastic Brick

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Abstract— The plastic waste is the hazardous problem in today's world. This is most dangerous problem in front of humanity. The most hazardous type of wastes are LDPE and PTE and the plastic below 50micron is also causing a serious problem. These plastic mixed in the soil, it directly effects on fertility of the soil. Nowadays, the large amount of plastic is deposited into sea. This plastic wastes gives hazardous effect on the aquatic life and quality of seawater also polluted by this plastic. So, we try to finding efficient way to solve this problem of plastic waste. So, we added this plastic wastes into the bricks and create the bricks by using plastic wastes. It is most economical solution present in the construction industry and it is also economical and environment friendly solution of the plastic wastes. The bricks produced are light weight, have smooth surface and fine edges, do not have cracks and have high crushing strength and very low water absorption. The bricks are manufactured by heating waste plastic to temperature range of 150 to 200 degree centigrade and mixing sand to the molten plastic.

Keywords—LDPE, CTM, PTE, Water Absorption

I. INTRODUCTION

Low density polyethylene (LDPE) is the most common packaging material used worldwide and is used for packaging a variety of products. It is also used for making containers and bottles. However they pose great threat to the environment as their effective disposal is a herculean task. They are not easily degradable; it usually takes more than ten decades to decompose. As a result, they clog water ways, channels and drains. As they require many years to decompose, they fill up the landfills faster. Polythene bags and packaging sheets harm aquatic life and wildlife as they pose the threat of choking if ingested. Low density polythene can be reused for making bricks. Bricks are the basic components of a building and are required in bulk.

By using plastic in making the brick, the overall cost of the brick will get reduced as, waste polyethylene is being reused. Brick earth is costly, and digging of brick earth poses some damage to the environment. Hence using plastic to make bricks is not only cost effective and ecofriendly but also the plastic bricks have a smooth finish, devoid of cracks and have low water absorption value, and will not have problems like efflorescence & Dampness of wall in future.

A. PROCEDURE FOR MAKING PLASTIC BRICK

MATERIALS USED

- WASTE PLASTIC
- SAND

Methodology

- Collection of Materials.
- Batching.
- Melting.
- Mixing.
- Moulding.
- Curing.

Collection of Materials:

The plastic material should be collected from the factories waste and Canteen waste, Grocery Polythene bags & Stationary waste and also food packages and plastic bottles this will come under the LDPE plastic type

Batching.

Measurement of materials for making brick is called batching. After collection of materials, we separate the types of plastic and remove any other waste presented in the collected material and check that any water content in in sample collected ten proceed for remove the moisture content by atmosphere

Usually a common brick is made from clay & approximately 3kg of clay is used to make a clay brick. We are taking 70:30 ratio of plastic brick to plastic waste and sand respectively. i.e. 2.1Kg Plastic waste & 0.9kg per plastic brick



Melting of plastic waste:-

After completion batching the plastic waste was taken for burning in which the plastic bags are drop one by one into the container and allowed to melt. These would be done in closed vessel because to prevent the toxic gases released into atmosphere. These will be at the temperature of 150-200 degrees centigrade

Mixing:

As per Proportion (70 % Plastic bags & 30 %) River sand mixing of materials is essential for the production of uniform and strength for brick. The mixing has to be ensuring that the mass becomes homogeneous, uniform in color and consistency. Generally, there are two types of mixing, Hand mixing and mechanical mixing. In this project, we adopted hand mixing. Until the entire plastic content required for making plastic brick of one mix proportion is added into it. Then these plastic liquids thoroughly mixed by using trowel before it hardens. The mixture has very short setting bags are turned to molten state; the river sand is added to it. The sand added is mixed time. Hence mixing process should not consume more time.



Moulding & De-moulding

After completion of proper mixing, we place mix into required mould. In these projects we use the normal brick sizes (19x9x9 cm). After 1Hrs remove the brick from the mould and then done curing



Moulding of Plastic Brick
De-Moulding of Plastic Brick

Curing: -

The test specimens after moulding were allowed to dry for a period of 01hours. The specimens were kept in curing tank and allowed to cooling purpose for a period of 3hrs.

TESTING OF PLASTIC BRICKS

- WATER ABSORPTION
- COMPRESSIVE STRENGTH
- HARDNESS
- TOUGHNESS

Testing of Plastic Brick & Comparison of normal Clay Brick.

Water absorption test

Water absorption test on bricks is conducted to determine durability property of bricks such as degree of burning, quality and behavior of bricks in weathering. A brick with water absorption of less than 7% provides better resistance to damage by freezing. The degree of compactness of bricks can be obtained by water absorption test, as water is absorbed by pores in bricks. The water absorption by bricks increases with increase in pores. So, the bricks, which have water absorption less than 3 percent can be called as vitrified.



Plastic Brick Specimen (Frog fill-up 1:3 Mortar Proportion)



Plastic Brick immersion in Water for 24Hrs

Calculation of Water Absorption of Bricks

Water absorption, % by mass, after 24 hours immersion in cold water is given by the Formula

$$W = \frac{M_2 - M_1}{M_1} \times 100$$

M1= Weight of dry brick

M2= Weight of moist brick (After water Absorption)

W = Water Content %

Sample 1 $W = \frac{1682-1673}{1673} \times 100$
 W= 0.537 %

Sample 2 $W = \frac{1350-1323}{1323} \times 100$
 W= 2.04 %

Sample 3 $W = \frac{1370-1350}{1350} \times 100$
 W= 1.48 %

Water Absorption of Plastic Brick			
Sample 1	Sample 2	Sample 3	Avg. Water Absorption (%)
0.537	2.04	1.48	1.35

Result

Water absorption of the given bricks = 1.35 %

Compressive strength test

Compressive strength test on bricks is carried out to determine the load carrying capacity of bricks under compression with the help of compression testing machine. Bricks are generally used for construction of load bearing masonry walls, columns and footings. These load bearing masonry structures experiences mostly the compressive loads. Thus, it is important to know the compressive strength of bricks to check for its suitability for construction.

Apparatus:

Compression testing machine, the compression plate of which shall have ball seating in the form of portion of a sphere center of which coincides with the center of the plate



Compressive strength sample with fill-up frog

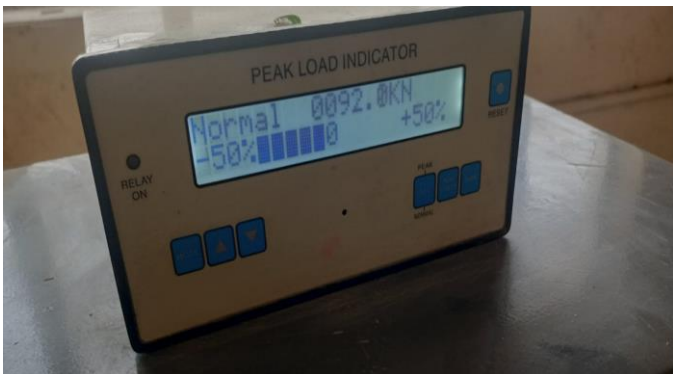


Dimension of plastic Brick

Length	Width	Depth
230	100	70
230	110	40
230	110	40



Compressive Strength of Plastic Brick



Compressive Load on Plastic Brick

Calculation

Compressive Strength of Bricks = Maximum Load at Failure (P)/ Area of brick (mm²)

- Sample No 01= Load=92KN=92000N
- Sample No 02= Load=102KN=132100N
- Sample No 03= Load=126KN=156800N

Sample 1 Stress= $\frac{P}{A}$

$$= \frac{92000}{(230*100)}$$

$$= 4.00N/mm^2$$

Sample 2 Stress= $\frac{P}{A}$

$$= \frac{132100}{(230*100)}$$

$$= 5.22N/mm^2$$

Sample 3 Stress= $\frac{P}{A}$

$$= \frac{156800}{(230*100)}$$

$$= 6.19N/mm^2$$

Compressive Strength of Plastic Brick			
Sample 1	Sample 2	Sample 3	Avg. Comp Strength (N/mm ²)
4.00	5.22	6.19	5.13

Result

Average compressive strength of plastic bricks = 5.13N/mm²

Hardness & Toughness test

Hardness test is done to check hardness of brick. This is an indirect test to know its compressive strength and to know how well the brick is kilned. This is tested by using a sharp tools or finger nail and scratching against the brick surface. If there is no impression of the scratch on the brick surface, the brick is sufficiently hard and fit for use

Procedure of hardness test

Make a scratch on the bricks with your finger or with anything with sharp edges like a nail. If there is Impression on brick then it is said to be hard brick.



(No Scratch of plastic brick so brick is hard)

Toughness test



No Break of Plastic Brick

CONCLUSION

- Plastic bricks can a very good alternative of traditional earthen bricks.
- Plastic bricks can be used for partition walls and exterior walls
- Cost of manufacturing per unit plastic brick is significantly lower than traditional earthen bricks, hence they are cheaper
- Re using plastic will reduce environmental pollution.
- Plastic sand bricks reduce the usage of clay in making of bricks
- Water absorption of plastic sand brick is 1-2 percent. Hence Dampness of wall problem prevented
- Consume less time compare to traditional brick
- Plastic brick available many different colors adding color pigment

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Comparison between Clay Brick & Plastic Brick

Sr.no	Properties	Clay brick	Plastic Brick
1	Material	Soil	<ul style="list-style-type: none"> • Plastic Waste • Sand
2	Water Absorption	22.80%	1.35%
3	Comp. Strength	6.11N/mm ²	5.13N/mm ²
4	Hardness	Low	High
5	Toughness	Low Toughness	High Toughness
6	Weight	2.1-2.3Kg	1.6-1.8Kg
7	Time	300-500/day	400-500 /Hr
8	Cost of Manufacturing	4-5rs/Brick	1.5-2rs /Brick