EXPERIMENTAL STUDY ON UTILIZATION OF WASTE MATERIAL IN BRICK MANUFACTURING

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ABSTRACT

Abstract - Bricks are the common building construction material previously the mud bricks ware made as the development is getting increasing day by day the demand increasing with variation of materials. The addition of waste material in brick manufacturing leads to increase the utilization of waste materials hence reduces the quantity of generation of waste disposal. This is the one of the attempt towards the controlling pollution from disposal of waste material and leachate problems. In this paper we experimentally describe the utilization of waste materials in brick manufacturing. The waste material shown the good results in performed experiment. And also bonding between the materials is perfect bond..

Keyword: - *Cement brick, PVC waste, fine aggregate, Compressive Strength Test, Flow value Analysis, Partial Replacement.*

1. INTRODUCTION

Due to the industrialization and growing countries increasing in pollution. The growing technologies demanding the environmentally free, reusable and recyclable materials with effective disposal of them .the ultimate disposal of waste materials can be done by using them into a civil engineering productive material. Before this the various attempts were made by using agricultural rise husk, baggas ash, fly ash with varying in the percentage in the manufacturing of bricks. In the present study the main aim is to reduce the use of naturally available materials as construction material

2. OBJECTIVES

1. To convert waste material into constriction material.
2. To check compressive strength and size, shape of brick which is made up of waste material with various suitable mix.
3. Achieving the properties of brick with partially replaced material.

3. SCOPE

1. It should encourage use of waste material instead of traditionally used materials in construction industry.
2. To solve the problem of waste disposal.
3. The properties of brick can be achieved by replacing the other waste materials such as, treatment sludge, glass powder, granite and marble waste etc**.**

4. MATERIAL USED

1. Cement: It is used in this experimental work is OPC. The Cement here binds material all the other Ingredients.
2. Crush Sand: crush sand used in this experimental work is crushed black stone locally available.
3. PVC waste Fine granular pieces of PVC materials residue from the pipe manufacturing factory.
4. Water: It helps to mix all raw materials and binds together to form a good proper mix.

TABLE 1: Properties of Materials

Sr. No	Name of test	Permissible Value	Results Obtained
1	Normal Consistency	25-33%	27%
2	Initial Setting Time	Min 30 Minutes	94 Minutes
3	Final Setting Time	Max 600 Minutes	360 Minutes
4	Soundness	Must not exceed 10mm	Expansion 6 mm

TABLE 2: Properties of Material Crush Sand

Sr. No	Name of test	Standard	Results Obtained
1	Fineness Modulus	2 to 4	6.23
2	Water Absorption	0.6%	0.94%
3	Specific gravity	2.36	3.28

5. METHODOLOGY

5.1 Manufacturing of Bricks

5.2 Development of Bricks:

Cement + crush sand + PVC waste material
Proportion of cement, crush sand, and waste water
Mortar proportion: 1:3, 1:5, 1:7
Addition of waste material is partial replacement to crush sand
5%, 10%, 15%

TABLE 3. Design Mix Proportion for Bricks

Mix proportion	**M1**	**M2**	**M3**
1:3	5%	10%	15%
1:5	5%	10%	15%
1:7	5%	10%	15%

6. TESTING OF BRICKS:

6.1. Impact Test

In this test we randomly selected any bricks and are dropped from 1M height on a surface and examined carefully for any kind of crack and breaking property.

6.2. Shape and Size Test

For this test we picked some bricks randomly and checked it along its three dimensions and results in the standard size and shape with truly rectangular and sharp edges.

6.3. Compressive Strength Test

Apparatus: UTM (Universal Testing Machine) plane thin plate to adjust surface.

Procedure –Place the specimen with flat surface face horizontal and carefully centered between plates. For compression test the specimen should be fixed in between the middle and bottom jaws of UTM. Then start applying load axially with a uniform rate of 14N/mm^2 till the failure of specimen occurs. The load ta which the specimen fails to produce any further increase in the indicator reading on the testing machine. The Compressive Strength of Brick can be calculated in (N/ mm^2)

Formula $= \frac{Maximum\ load\ at\ failure\ point}{Cross\ sectional\ atea\ of\ surface}$

6.4. Water Absorption Test

APPARATUS: - Balance and oven

PROCEDURE: -The specimen is dried in a ventilated oven at a temperature 105 to 115℃ till it attains substantially constant mass. The specimen is cooled to room temperature and its weight recoded (M1).The dried specimen is immersed completely in clean water at a room temperature for 24 hours. The specimen is then removed and any traces of water are wiped out with a damp cloth and the specimen is weighted. The weighing is completed 3min after the specimen has removed from water (M2)

FORMULA –Water absorption, percent by mass after 24-hour immersion in cold water is given by the following formula.

Water absorption = $\frac{(M2-M1)}{M1} \times 100$ (%)

7. ANALYSIS OF TEST RESULTS

7.1. Test Results of Compressive Strength

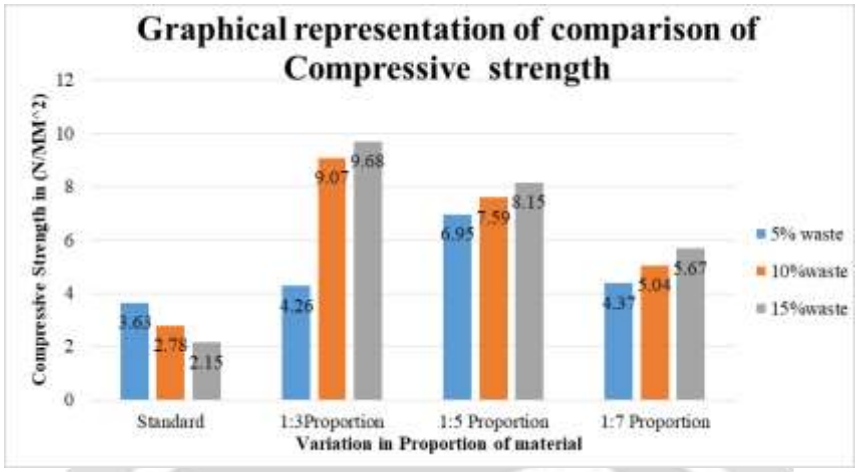
Table 4. Compressive strength of nominal bricks

Sr. No.	No. Of bricks	Proportion	Avg. Load KN	Area MM×MM	Avg. Stress N/MM^ 2
1	3	1:3	163.64	300×150	3.63
2	3	1:5	125.56	300×150	2.78
3	3	1:7	97.25	300×150	2.15

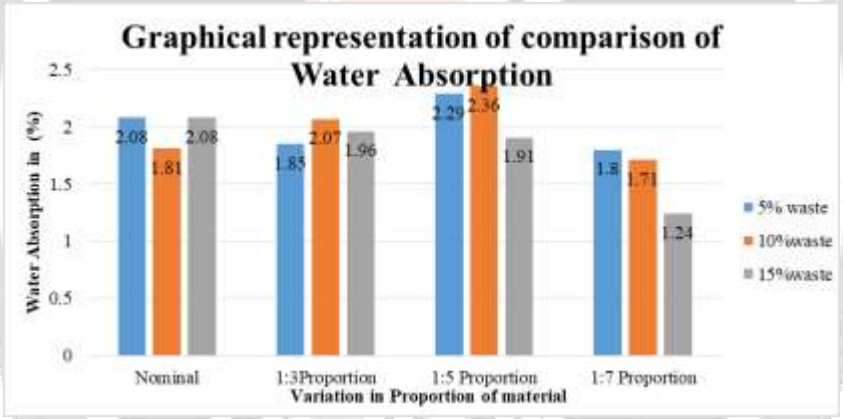
Table 5. Compressive strength of PVC material brick

Sr. No.	No.of bricks	Proportion	Waste %	Avg. Load KN	Area MM × MM	Avg. Stress N/MM^2
1	3	1:3	5%	192.05	300×150	4.96
2	3	1:3	10%	408.25	300×150	9.07
3	3	1:3	15%	436.04	300×150	9.68
1	3	1:5	5%	313.16	300×150	6.95
2	3	1:5	10%	341.99	300×150	7.59
3	3	1:5	15%	366.91	300×150	8.15
1	3	1:7	5%	196.85	300×150	4.37
2	3	1:7	10%	227.03	300×150	5.04
3	3	1:7	15%	255.56	300×150	5.67

7.1 Result & Graphical Representation of Compressive Strength Test



7.2. Result & Graphical Representation of Water Absorption Test



8. CONCLUSIONS

Based on the above experimental results and graphs we can conclude.
1) Use of PVC waste materials reduces the weight of brick and solves the problem of waste disposal.
2) The waste percent of 10 and 15 shows huge difference in bricks strength compared to the nominally mixed bricks.
3) The proportion of 1:3 and 1:5 of PVC brick showing similarities with increasing in strength.
4) Addition of PVC waste material in excess percent will reduces the strength of brick.
5) The water absorption test also showing the expected results.
6) The overall PVC waste material bricks shows good appearance with homogeneity in materials mixture.

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