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DESIGN AND FABRICATION OF COMPOSITE BRICK USING WASTE PLASTIC AND GLASS MATERIALS

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Abstract

The article describes how municipal plastic waste (MPW) is used in the building industry. Plastic is a material that is not biodegradable and takes thousands of years to disintegrate, polluting both land and water. Municipal Solid garbage (MSW) contains an increasing amount of plastic garbage. Every ten years, the rate of utilization is thought to double. Polyethylene (PE), one of the most abundant plastic wastes, is consumed in vast quantities. The use of earth-based clay material led to the depletion of resources and the damage of the environment. The cost element decreases because plastic garbage is typically available in plenty. Since these brick blocks are good water absorbing and have greater compressive strength. Therefore, because they have a good water absorption limit and a higher compressive quality, these types of brick blocks are best used for underground pits and water tank construction, and building construction. We looked into and evaluated the characteristics of the composite bricks. Strength, water absorption, and other characteristics were comparable to those of traditional bricks. This waste-derived brick will be practical and offer an enduring solution.

KeyWords—Composite bricks, PVC, Glass, Hydrotons,Cement, M-Sand.**.**

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I. INTRODUCTION

Plastic is not a biodegradable substance. It is widely distributed around the world. We must therefore cut back on the use of plastics in order to restore balance. In order to replace the traditional bricks, we are introducing a new form of composite brick. Although flexible, durable, and stiff, plastic is a very useful material, it pollutes the environment after use and becomes waste. Recycling involves converting garbage into new products in order to avoid wasting materials that could be valuable. The needs of study into the how can to be an utilized the while benefiting the environment and using the material standards affirmed in the building industry's growing into the environmentally friendly, less expensive, and lightweight construction materials standards. Recycling is done both to make use of plastic and to preserve the environment. Recent research has replaced and added materials by directly including polyethylene or plastic fiber, polyethylene terephthalate (PET) bottles in the form of shredded fiber, chemically treated polyethylene fiber. The majority of replacements were done using volume calculations, which revealed that the compressive strength declined as the amount of plastic fiber grew.

II. MATERIALS USED

The new materials we used in our effort to create a composite brick substitute are

- M-sand
- Cement
- Waste PVC
- Hydrotons
- Waste glass

A. M-Sand

For concrete buildings, manufactured sand (M-Sand) is used in addition to river sand. Crushing stiff granite stone yields manufactured sand. The crushed sand has square, grounded boundaries, has been cleaned, and is categorized as a building material and the material shown as Fig. 1.

Fig. 1 M-Sand

B. Cement

Cement is a binding chemical that may bind other materials together and is used in building. Depending on the cement's capacity to set in the presence of water, types of cement used in building can be classified as hydraulic or non-hydraulic. The cement type designated by the 33 Grade has a compressive strength of 33 N/mm2. After 28 days of construction, the compressive strength is assessed. For creating mortar or concrete, cement, a fine grey powder, is mixed together to the water and components. It is a crucial component of residential and commercial construction projects. The cement good binding material and cement as shown in the Fig.2.

Fig. 2 Cement

C. Waste PVC

Plastics are widely utilized materials that are crucial to practically every area of our lives. End-of-life management must be done properly because plastic garbage is produced on a large scale. Containers, plastic tubing used for plumbing and drainage, and so many things made of plastic and waste plastic PVC are shown in Fig. 3.

Fig.3 Waste PVC

D. Hydrotons

Hydrotons are excellent water absorbers, and as was already said, they gather extra water and store it for later use. It stops the damage that too much water would otherwise do to roots. For plants to receive the right amount of water and air, clay pebbles are typically utilized as a base layer or alongside other planting materials. across it. Expanded clay from of the original Hydrotons are brand distinctive. The hydrotons powders are shown in the Fig. 4.

Fig. 4 Hydrotons

E. Waste Glass

The procedure is remarkably easy. Place the trash container in the canteen for garbage disposal. Choose water and cold beverages in disposable bottles from the canteens Glass can never biodegrade. It does not biodegrade despite being constructed of natural materials like limestone, ash, and sand. Biodegradable substances are often those that bacteria and other microbes can consume and break down into minute fragments for nature to repurpose. The waste glass powders are show in the Fig.5

Fig. 5 Waste Glass

III. MIX PROPORTION

The compressive testing machine [CTM] is used to test the plastic soil bricks in order to determine which ones have the highest compressive strength. The mix percentages ranged from 30% in out of 100%. The proportion table is mentioned in Table 1,2 and 3.

TABLE – 1

MIX PROPORTION OF BRICK 1

Materials	In %	In (gram)
m-sand	35	750
cement	30	875
waste pvc	15	375
hydrotons powder	05	125
waste glass	15	375

TABLE – 2

MIX PROPORTION OF BRICKS 2

Materials	In %	In (gram)
m-sand	35	750
cement	30	875
waste pvc	20	500
hydrotons powder	05	125
waste glass	10	250

TABLE – 3

MIX PROPORTION OF BRICKS 3

Materials	In %	In (gram)
m-sand	35	750
cement	30	875
waste pvc	10	250
hydrotons powder	05	125
waste glass	20	500

IV. MANUFACTURING OF BRICKS

This brick is made using wooden mold. Wooden mold is cheaper and easily available than iron. This mold is made to scale. And the wooden molds are easily we can remove. both constructed of wood and are produced in a carpentry store. For the brick to have a higher surface quality, all four sides wooden parts are even. Wooden molds are less expensive and will fit the function. The previously prepared mixtures are pour into the wooden mold. Mold dimensions used were 19 cm x 9 cm x 9 cm as shown in Fig. 6.

Fig. 6 Mold

V. TESTING OF BRICKS

There are a number of tests that are frequently used to determine different brick qualities. Nevertheless, in this investigation, only two bricks were tested. The two brick tests examined the bricks' compressive strength and their capacity to absorb water. The testing process was built around Indian Standards (IS) norms. Here, the composite bricks underwent the following tests.

- Compressive Strength Test
- Water Absorption Test
- Impact Test
- Hardness Test
- Soundness Test
- Color Test

Based on the results and observations made during the testing on the bricks, it was possible to draw a number of conclusions about the tests.

A. Compressive Strength Test

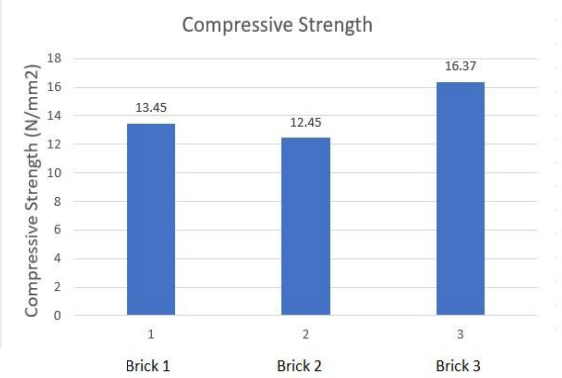
In This test was carried out to assess the brick's compressive strength. It is also referred to as brick crushing strength. Each of the three brick samples are analyzed properly in a laboratory. Usually, foundations, pillars, are constructed using bricks. These load-bearing masonry structures mostly encounter compressive loads. The test are shown as Fig. 7.

Fig**.** 7 Compression Strength Test

COMPRESSIVE STRENGTH = (Load in N / Surface Area in mm²)

Each brick's overall size was determined, and the area of the bed face of the samples was computed. The bricks' compression strength is determined by comparing the load at which a brick fails to its surface area are referred in the Chart 1

CHART – 1 COMPRESSION STRENGTH TEST



B. Water Absorption Test

Bricks are weighed in dry condition for this test before spending 24 hours submerged in fresh water. Those are removed from the water and clothed after 24 hours of immersion. The brick is then weighed while moist. The sample tests are shown in the table-4.

TABLE – 4

WATER ABSORPTION TEST

Sample	Water Absorption Test In %
Brick 1	14.15
Brick 2	10.17
Brick 3	15.12

WATER ABSOPRTION = ($W_2 – W_1 / W_1$) x 100

The water absorption test is conducted for various mix proportion. The values obtained from the three brick samples bricks. The water absorption are shown in the Chart-2.

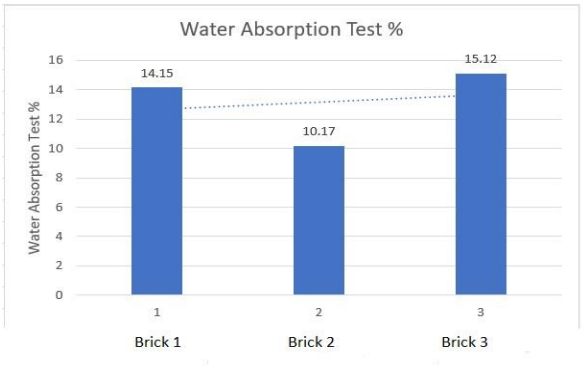


CHART – 2 WATER ABSORPTION TEST

C. Impact Test

Bricks are thrown from a height of one meter in this test. Bricks have a poor impact value if they shatter, making them unsuitable for use in construction. When dropped from the specified height, the brick remained intact. Consequently, it is a high-quality brick.

D. Hardness Test

In this experiment, surfaces made of brick were scratched. A very faint impression was left on the surface of the sand bricks after a scratch was created with a fingernail. In light of these findings, fibrous concrete bricks are suitably strong.

E. Soundness Test

Efflorescence In this test, the structures made by the broken bricks were checked to see if they contained any flaws, such as holes or lumps. Sand blocks can be divided into equal portions in this test. The sand brick construction was flawless, compact, and uniform.

F. COLOR TEST

Bright and consistent color should be present throughout a brick of good quality. The brick sample passed this test with flawless color.

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