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COMPARATIVE STUDY ON CONVENTIONAL BRICK & ECONOMICAL BRICK

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Abstract: This report outlines the utilization of municipal plastic waste (MPW) in construction industries.Plastic is a non-bio-degradable substance which takes thousands of years to decompose that creates land as well as water pollution to the environment. The quantity of plastic waste in Municipal Solid Waste (MSW) is expanding rapidly. It is estimated that the rate of usage is double for every 10 years. The Plastic usage is large in consumption and one of the largest plastic wastes is polyethylene (PE). The utilization of earthbased clay material resulted in resource depletion and environmental degradationOne such effort is the efficient use of waste plastic and laterite quarry waste with a small quantity of bitumen, to develop an alternative building material such as bricks with negligible water absorption and satisfactory strength in comparison with Laterite stone to satisfy the increasing demand of conventional building materials.Utilizing MPW as construction materials especially in production of bricks is one of a promising step towards a sustainable resources and waste management. Plastic waste can substitute either partially or completely one or more of the materials in brick production. Further research based on recent research and a better understanding in utilization of plastic waste in brick is needed to produce a high durability and quality of bricks as well as to achieve the optimum balance in all aspects especially in terms of cost and functionality.

I. INTRODUCTION

Plastics are a wide range of synthetic or semi-synthetic materials that use polymers as a main ingredient. Their plasticity makes it possible for plastics to be moulded, extruded or pressed into solid objects of various shapes. This adaptability, plus a wide range of other properties, such as being lightweight, durable, flexible, and inexpensive to produce, has led to its widespread use. Plastics typically are made through human industrial systems. Most modern plastics are derived from fossil fuel-based chemicals like natural gas or petroleum; however, recent industrial methods use variants made from renewable materials, such as corn or cotton derivatives.

Plastics are made up of synthetic organic polymers which are widely used in different applications ranging from water bottles, clothing, food packaging, medical supplies, electronic goods, construction materials, etc. In the last six decades, plastics became an indispensable and versatile product with a wide range of properties, chemical composition and applications. Although, plastic was initially assumed to be harmless and inert, however, many years of plastic disposal into the environment has led to diverse associated problems. Environmental pollution by plastic wastes is now recognized widely to be a major environmental burden, especially in the aquatic environment where there is prolong biophysical breakdown of plastics, detrimental negative effects on wildlife, and limited plastic removal options.

Global Production of Plastic and Generation of Waste Plastic: As of 2008, the annual plastic production was estimated to be 245 million tons globally. At present, single-use packaging is the largest sector, accounting for almost 40% of the overall plastic usage in Europe, this is followed by consumer goods, materials for construction, automotive, electrical and agriculture applications at 22%, 20%, 9%, 6% and 3%, respectively. It was estimated in 2015, that the highest rate of production is in Asia (with 49% of total global output, with China as the largest world producer (28%), followed by North America and Europe at 19% each. In terms of production, the rest regions are of lesser importance although not necessarily in terms of plastic consumption. The increase in the popularity of using environmentally friendly, low cost. and lightweight construction materials in building industry has brought about the need to investigate how this can be achieved by benefiting the environment as well as maintaining the material requirements affirmed in of waste generated from industrial and agricultural activities as building material appears to be viable solution to such pollution problem but also to the problem but also to the problem of economic design of the building.

Plastic bricks are the types of bricks that are manufactured using plastic waste. These bricks are not only costeffective and eco-friendly but also have low water absorption value and high compressive strength and will not have problems like efflorescence in future. Plastic waste is increasing due to an increase in pollution, organization, and development. Since the rate of plastic production is projected to double the value every ten years Plastic brick gives better temperature resistance than conventional brick even after 30 minutes of heating in the corners and the centre of the modal brick .

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SCOPE OF PROJECT

1. To give new knowledge, replace the binding material of ordinary brick with plastic.
2. To enhance the knowledge of how to minimize the cost of bricks compared to ordinary bricks.
3. To find efficient ways of managing the non-degradable plastic waste
4. To compare the properties of bricks with other construction materials.
5. Further research and development is needed to promote wide production and application of bricks from waste materials
6. Appropriate research should be conducted to define relevant standards for the development of bricks from waste materials.

- **OBJECTIVE :**

1. To utilise plastic waste in conventional brick
2. To the strength of conventional brick and economical bricks
3. To compare the cost of conventional brick and economical bricks
4. To compare the water absorption test of conventional brick and economical bricks.

- **Advantages:**

1. The main advantage of eco-bricks is that they take something that would have had a detrimental effect on the environment and turn it into something that helps local communities, like fly ash.
.2. It can be moulded into many shapes.
3.These are cheaper to manufacture.
4.It has very less water absorption and hence provides better resistance to damage by freezing. These are cheaper to manufacture.

- **Disadvantages:**

1. Lesser fire-resisting qualities as compared to conventional bricks/stones.
2. Requires extra inclusion of detail when extra decorative additions are required.

II. COMPONENTS AND SPECIFICATIONS

A. SAND

Natural river sand was used as a fine aggregate. The properties of sand were determined by conducting tests as per IS: 2386 (Part-1). The results are shown in test data of materials. The results obtained from sieve analysis are furnished. The results indicate that the sand conforms to zone 11 of IS: 383-1970.

Properties of sand

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Sr No.	TESTS	RESULTS
1.	Specific Gravity	2.62
2.	BULK Density	1690 kg/m^3
3.	Fineness Modulas	2.92

B. WATER

Water used for mixing and curing of concrete shall be clean and free from oils, acids, alkalies, salts and organic materials or other substances they may be deleterious to concrete or steel. Portable water shall be used for mixing of concrete. Suspended solid matter in the water shall not exceed more than 200mg/l. The pH value of the water shall not be less than 6.

Waste Plastic	Available as
Poly-ethylene terephthalate [PTE]	Drinking Water Bottles etc .

C. WASTE PLASTIC

Plastics are commonly used substances that play an important role in almost every aspect of our lives. The widespread generation of plastic waste needs proper end-of-life management. The highest amount of plastics are found in containers and packaging (i.e. bottles, packaging, cups, etc.), but they also are found in durables (e.g. tires, building materials, furniture, etc.) and disposable goods (e.g. medical devices). The diversity of plastics applications is related to their specific properties, low density, easy processing, good mechanical properties, good chemical resistance, excellent thermal and electrical insulating properties, and low cost (in comparison to other materials). Post-production and post-consumer plastics are utilized in a wide range of applications.

- Process of Casting Plastic Sand Brick
- First, we need to collect the plastic waste and separate it from other wastes.
- Second, we should dry the plastic waste if it is wet and has a content of moisture. We have to use dry plastic waste.
- Then, we crush the plastic waste into small particles by crushing the machine.
- Then, the small particles crush into fine-sized particles.
- The ratio of plastic and stone dust that we use is 3:7.
- The stone dust that we use in manufacturing bricks/tiles is sieved for a size less than 4.75mm using sieve analysis.
- Then, we heated the stone dust in a furnace (Bhatti).

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- The fine particles of plastic waste are also heated in a furnace (Bhatti) till it is in a liquid form.
- Then, we add the stone dust to the melted plastic.
- Then, we can mix it properly and make a mix.
- Then, we poured the mix into molds.
- Then keep it in the mold to dry and de-mold it on the next day.
- The weight of the brick is 2.5Kg

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- **Field Tests for Bricks :**

1. Compression Strength test:

Compression Strength test (BS 5628: Part 1: 1992) In this test, the cubical brick specimen is placed in the compression strength testing machine. After placing it we will apply the load on the brick without any shock. The load will be increased at a rate of 140kg/cm2 min continuously till the specimen's resistance to increasing load breaks down and it cannot withstand any greater load further. Recording the maximum load applied to the brick specimen and the appearance and type of failure is also noted along with any unusual features.

2. Water Absorption test { IS1077-1970}

In this test at first the bricks are weighed in total dry conditions. Then they will be allowed to be dipped in fresh water for about 24 hours in a container. The bricks are taken out of the water after 24 hours and are wiped with a cloth. The wet brick is weighed using a weighing machine. For the calculation of water absorption, the difference between wet brick and dry brick is done. The difference is the amount of water absorbed by the brick.

After that the percentage of water absorption is calculated using the data. Water absorption of bricks tells about the bonding of bricks with mortar. Although other factors such as grooves and design on bricks also improve the bonding. For sand bricks which have less water absorptivity leaner mortar layer is used for bonding bricks and mortar. Greater quality bricks absorb less amount of water. For a good quality brick, the water absorption should be less than 20% of its own weight.

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3. Effloresecence test

The standard used for the test is ISS 1077-1970. It is done to detect the presence of alkalis in PET bricks which is harmful. The alkalis form a grey or white patch on the surface of the brick. A flat bottom container is used in which sufficient distilled water is poured. The depth of immersion is 25mm.The brick is immersed into the distilled water and left for 24 hours. The container is covered with a glass sheet to prevent excessive evaporation. After that the brick is removed from the container and left to dry for the same amount of time wherein the same amount of water must have evaporated from the open container without the brick or the sheet.

4. Fire Resistance

The standard used for the test is BIS 3809 1979. The plastic alone is readily susceptible if not flammable to elevated temperatures and in case of fire, the sand and plastic mixture may withstand temperatures that plastics alone usually cannot.It has been observed that the structural integrity of the bricks holds very well up to 180oC. In this test we will first heat and maintain the brick at the standard testing temperature in the furnace and then we will do the compressive strength test to check whether the properties change or not.

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