Effectiveness of waste plastic in the building of bricks

Use of P.P.E Plastic in Fly Ash Bricks

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Abstract: Plastics are critical resources in the overall economics, and recycling the product after the end of its useful life with meaningful and specific economic value creation minimizes environmental damage. This is the key to achieving sustainable and balanced management of our lifestyle. A substantial proportion of research has examined indoctrinating waste plastics in concrete and reported encouraging results with added benefits. The present study critically reviews some of these findings and gleans some valuable common trends in the properties reported in these studies. The theories also present innovative work on bricks made of non-recyclable waste thermoplastic granules composed of 0 to 20% by weight, 4kg of fly ash, cement, and sand making up the remainder. The bricks were cured underwater for 28 days and baked at temperatures ranging from 90 C to 110 C for 2 hours. These bricks' key characteristics are lightweight, porous, low thermal conductivity, and commendable construction intensity. Even Though such bricks hold promise, no related theories have appeared to have been effective so far. Unlike any other processes of making permeable bricks, which usually involve the incineration to burn combustible materials to form pores with the implications of high carbon emission matter, the planned procedure is non-destructive in a way that the bricks are merely baked at flat temperature, sufficient to meet the waste plastic that gets diffused within the body of the bricks. The compressive strength after the addition of waste plastic is the same as normal brick strength.

Furthermore, reducing the water absorption capacity of brick is diminished compared with little brick. As a result, efflorescence values were low than the typical block. The bricks are more likely to add energy efficiency in buildings and help create economic value for manufacturers and consumers, thereby encouraging the ecosystem of plastic waste management involving all leads in the purpose concatenation.

Keywords: Plastic, Bricks, Compressive strength, water absorption.

I. INTRODUCTION

Plastics is the name coined to describe a wide range of synthetic or semi-synthetic elements that are used in a vast and currently snowballing in a range of applications. Materials ideal Plastics are highly versatile bodies and are supreme for their applications in the consumer and manufacturing industries. Additionally, the relatively low density of most plastics gives plastic products the advantage of being lightweight. Although experiments have showcased that plastics have excellent thermal and electrical insulation properties, some plastics can conduct electricity when required. The significant problem with plastics is their decomposition process; as plastic is made from polymer chemicals, they are non-biodegradable and cannot be recycled soon. Meaning the plastic waste will not decompose when it is placed inside the earth.

The increasing use and popularity of using eco-friendly, lightweight, and low-cost building materials in the construction domain have brought the need to investigate how this phenomenon can better the environment. In recent research, the replacement and addition have been done by directly incorporating polyethylene, polyethylene terephthalate (P.E.T.) bottles in shredded form, chemically treated polyethylene fiber, and P.E.T. in small particles replacing natural coarse aggregate. Most of the replacements have been done by volume calculation and showed decreased compressive strength as the increased plastic waste. In this study, recycled plastic waste has been introduced in the form of crushed.

II. Use of plastic in different aspects of the construction Industry

- **Flooring**

Plastic objects like polyvinyl chloride (PVC) and polyethylene are applicable to make the flooring a little less inclined to weathering. The plastic also reduces the sound pollution level by absorption and can also be wiped easily.
Layer

- **Roofing**

In order to protect the outer surface from wear and tear, initially, two strata of various plastic materials are required. The topmost portion is built of thermoplastic olefin or vinyl colored, while the bottom part consists purely of polyurethane foam which consumes minimal energy and keeps the interior of a house cooler.

- **Wall**

A structural insulated panel (SIP) combines inflated polystyrene amidst two slim layers of oriented strand board. This type of pre-fab, composite wallboard can easily be transferred to the workplace for a particular task and allow good columns and other associated structural members during remodeling.

- **Pipes**

Typically made up of polyvinyl chloride (PVC), CPVC, acrylonitrile butadiene styrene (ABS), or polyethylene, plastic pipes are flexible and light in weight, making them easy to install. These materials are also highly chemical and water-resistant, making them adaptable even for harsh atmospheres.
Quiet.

- **Windows**

Polycarbonate is used to manufacture commercial and residential windows. This plastic material is robust, transparent, and very low in mass. Polycarbonate-induced windows are acknowledged more robber-proof than everyday conventional windows of glass. Other two plastics materials, vinyl, and fiberglass are used commonly in the production of window frames. Fiberglass is solid, while vinyl is wholly sturdy and also cheap.

III. OBJECTIVES

1) To develop and an efficient way to effectively utilize waste plastics.

2) To reduce the consumption of natural resources such as clay for the manufacturing of bricks.

3) To reuse and minimize the generation of waste plastics on the water and land to avoid degradation and consequent pollution hazard.

4) To produce cost-effective materials which an ordinary person can afford easily.

5) To reduce the plastic in streams and saving the precious non-renewable resources

Methodology

1. We collected P.P.E. raw material from a local supplier, which is to be used in the brick.
2. We then started to work on the fly ash Brick in which we were supposed to add P.P.E. plastic
3. Then, with the help of a mix ratio that we calculated and designed; we used the right amount of raw materials to manufacture the brick of our design.
4. In making the brick, while mixing the raw material in the batching plant to replace a little quantity of crushed sand.
5. After the proper mix and practical observations, we pored the mixture in the mold to give the brick a definite shape and size.
6. The bricks were then taken out of the mold and were kept in the laboratory for time-to-time curing.
7. After 14 days of complete curing, the bricks were taken out and subjected to the Compressive and Crushing tests.
8. We tested and compared the bricks simultaneously with the help of a Universal Testing Machine equipped by our construction department at Symbiosis University.
9. We achieved a 15% increase in the bricks' strength compared to their conventional method

Various Test that was Conducted

We conducted the following tests on the various brick samples to test their strength and durability. After conducting the test on the sample bricks, we were then able to compare the conventional bricks we currently use.

1.Compression test

Compression testing is a widespread testing method used to establish the compressive force or crush resistance of a material and the ability of the material to recover after a specified compressive force is applied and even held over a defined period. These tests are done to understand the compressive strength of brick samples. It is also called the crushing strength of brick. Generally, three examples of bricks are taken to the laboratory for testing and tested simultaneously. In this test, a brick specimen is kept on the crushing machine, and then pressure is applied till it breaks. The ultimate pressure at which brick is crushed is taken into account.

2. Water absorption test

The water absorption test involves soaking a brick specimen in a water bath for about a day. We need to verify that the weight of the brick should not increase more than 20% of its original weight. This test helps understand the level of absorbed moisture content in extreme conditions.

3. Crushing test.

This is the preliminary test conducted to test the suitability of the brick for construction work. This test is to be executed with the help of a compression testing machine. A brick is then placed in the CTM. It is pressed until a deformation occurs. Later on, the compression strength of the brick is reported from the meter of the compression testing machine. A brick after undergoing compression test, this test is carried out for both fly ash bricks and as well as burnt clay bricks.

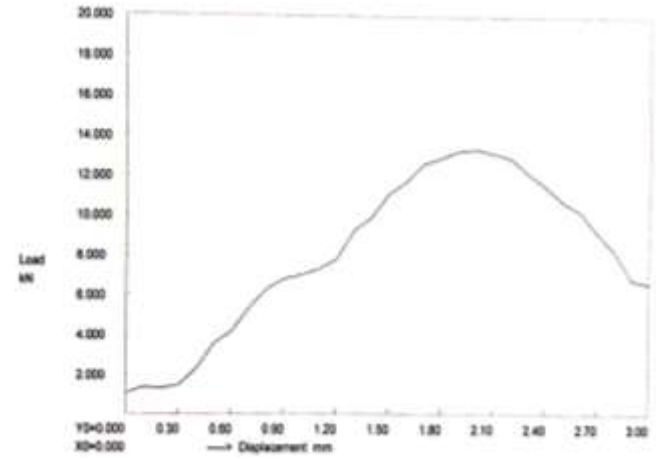
3.1 COMPARISON OF NORMAL FLY ASH BRICKS AND PLASTIC FLY ASH BRICK

Mix Ratio of Bricks

Brick Type	Cement (kg)	Crush sand(kg)	Fly Ash(kg)	Plastic (Kg)
Fly Ash Brick	0.2	4.5	0.5	0
Plastic Fly Ash Brick	0.2	2	0.7	0.130

Test Reports for Fly Ash Bricks

Samples	Weight(kg)	Force (KN)	Compressive strength (MPa)
Brick 1	3.37	13.350	1.669
Brick 2	3.38	18.950	2.707



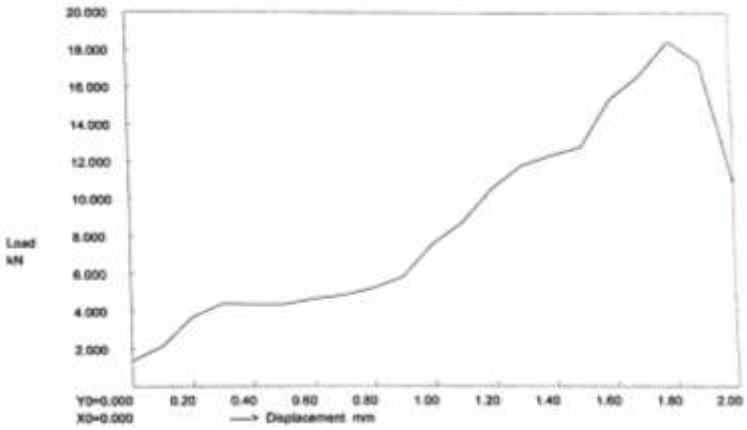
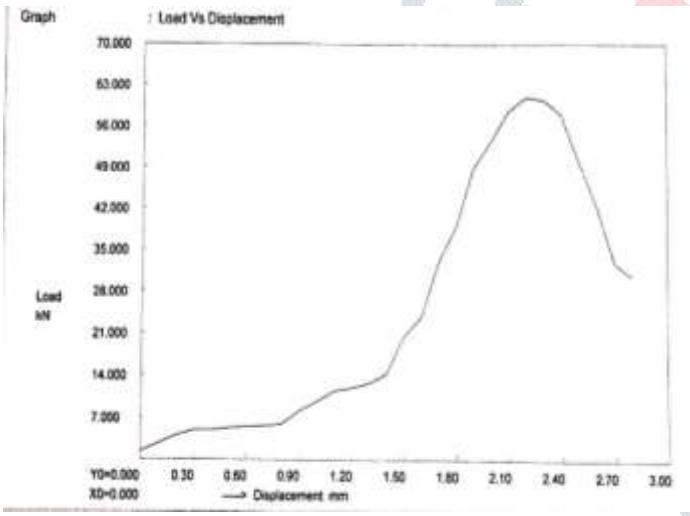
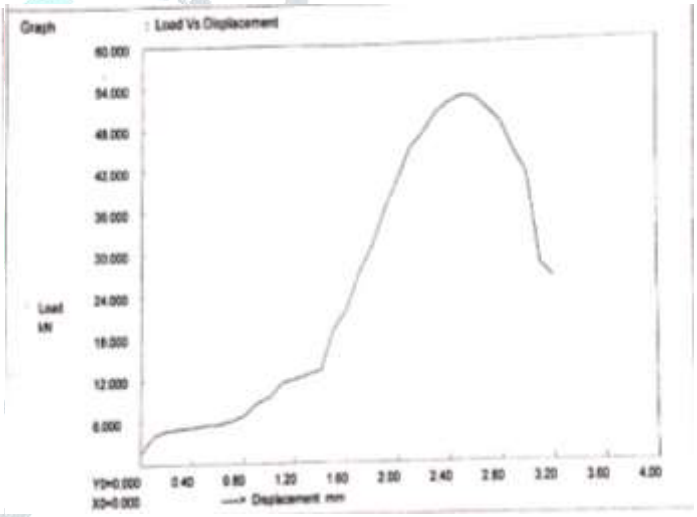


Table for Plastic Fly Ash Brick

Samples	Weight(kg)	Force (KN)	Compressive strength (MPa)
Brick 1	3.34	61.450	7.661
Brick 2	3.33	52.35	6.960





Conclusion: -

A study on the effect of addition of waste plastics to bricks production in several percentages subjected to water curing is conducted to seek out the characteristic compressive strength and water absorption value of bricks. The test results show that the partial replacement of natural sand by crushed waste plastics at the levels of 5 to 10 percentages has good effects on compressive strength of the bricks. However, 20 percentage of replacement of waste plastics reduces the compressive strength compared thereupon of the control sample. Water absorption has attained desirable value for all the sort of mix proportions. Overall, the plastic which makes environmental issues are often utilized in brick mixtures as an honest substitute for natural sand

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