

# Research study on Performance based plastic waste sustainable bricks

Mr. Pomane Pratik Sharad<sup>1</sup>, Mr. Yenpure Akash Nandkumar<sup>1</sup>, Mr. Adagale Pranav Ashok<sup>1</sup>, Mr. Raskar Nikhil Namdev<sup>1</sup>, Prof. Pratiksha. L. Sanas<sup>2</sup>

*Student, Diploma, Dept. of Civil Engineering, Trinity Polytechnic, Kondhwa (Bk.), Pune<sup>1</sup>*  
*Professor, HOD, Dept. of Civil Engineering, Trinity Polytechnic, Kondhwa (Bk.), Pune<sup>2</sup>*

**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 HDPE 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 waste 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 these 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.**

**Keyword: HDPE, PTE, Plastic Wastes**

## I. INTRODUCTION

Plastic is a very common material that is now widely used by everybody in the world. Plastic is made of polymer chemicals and they are non- biodegradable. Plastic is very useful material that is flexible, robust and rigid they become waste after their use and they pollute the air and land. Plastic waste is a serious problem as India have generated 4,126,997 tonnes per annum till 2020- 2021 according to Central Pollution Control Board (CPCB) and thus, it is difficult to recycle or utilize the waste at larger quantity. Disposal of plastic waste is also a serious problem globally, since they are non- biodegradable. The quantity of plastic in municipal solid waste collection is expanding rapidly. The rate of expansion is double for every 10 years. 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. The Plastic usage is large in consumption and one of the largest plastic wastes is polyethylene (PE). The utilization of earth-based clay

material resulted in resource depletion and environmental degradation. As amount of clay required for brick is huge, in this project these waste plastics are effectively utilized in order to reduce the land space required to dump these wastes. This creates the prevention from various harmful diseases. Polyethylene (PE) bags are cleaned and added with fine aggregate at various ratios to obtain high strength bricks that possess thermal and sound insulation properties. This is one of the best ways to avoid the accumulation of plastic waste.

But plastic is an effective raw material because of its large-scale production witnessed after the industrial revolution. Today, it is impossible for any vital sector of the economy to work efficiently without usage of plastic starting from agriculture to packaging. Automobile, electronics, electrical, communication sectors building has construction, been virtually revolutionized by the applications of plastics. Thus, we cannot ban the use of plastic but the reuse of plastic waste in building construction industry is considered to be the most feasible applications. Plastic has many good characteristics which include versatility, lightness, hardness, and resistant to chemicals, water. About 5%plastics can be found in municipal solid waste, which is hazardous in nature.

Since brick is used extensively for wide numbers of construction materials such as for the development of outer and inner walls in buildings. These plastic bricks can be helpful in reducing plastic waste. Therefore, utilization of these bricks of plastics can promote eco-conservation and sustainable development both at simultaneously. With the increasing concern of using construction materials which are eco-friendly, economic, and lightweight construction materials in building material can benefit us in providing materials requirement without compromising with nature. In this

work an attempt has been made to manufacture the bricks by using plastic waste and sand mixture

A. Necessity

- As plastic take hundreds of years to decompose, it leads to environmental degradation and ocean pollution. Using plastic waste to make bricks helps reduce the plastic burden in the environment.
- By recycling plastic into construction materials, the amount of waste going to landfills is reduced

B. Limitations

- As plastic bricks have lower heat resistance than traditional bricks, hence limits the suitability in areas requiring high fire safety standards.
- As the color of brick is dark or black it limits the use of brick for exterior construction.
- These bricks often limit the aesthetical aspect of the building.

II. METHODOLOGY AND ANALYSIS

A. Material

Plastic

Generally, there are seven types of plastics available on our earth name as, PET - Polyethylene Terephthalate, HDPE - High Density Polyethylene, LDPE - Low Density Polythene, PVC - Polyvinyl Chloride, PS – Polystyrene, PP – Polypropylene, and other remaining plastics.



Fig 1: Plastic

B. Process of Making Plastic Bricks:

1. Collection of Materials:

The plastic wastes used in making sustainable bricks is collected from our day-to-day uses of plastic such as milk pouches, plastic bottles, biscuits and chips wrappers and other multi-layered plastic (MLP). River sand is also used for making sustainable bricks.

2. Preparation of Mould:

The mould which is going to be used is made up of wooden and is prepared in carpentry shop. All sides of

the mould should be even for the brick to have better surface finish. Wooden mould will be cost effective than iron moulds. The size of mould would be 190X90X90 mm.

3. Batching:

Measurement of materials is called batching. After collection of plastic waste check that the water content in the plastic waste should not be present and if it is present then, it should be dried. Medium sand is used for making a brick and it can be achieved by sieving. Sieve the sand through 600-micron sieve, which will be used for making plastic and sand bricks.

4. Melting of plastic waste:

After the completion of batching process, the plastic waste was taken for burning in which the plastic waste is dropped one by one into the container and allowed to melt.

5. Mixing:

After the melting process is completed, the sand is added instantly into the melted plastic and is stirred continuously, so that both the materials get mixed properly and bonded. This process should not consume more time.

6. Moulding:

Apply the oil on the inner surface of mould so that the bricks can be removed easily. If the oil is not applied on the mould, after solidification of brick, the brick will not come out easily. So proper oiling is needed before filling the mixture in the mould. Prepared mixture is filled into the wooden mould and tamping is done by rod to achieve proper compaction and the wooden mould is filled properly, and left for 24 hours for drying.

7. Demoulding:

After the brick is dried after 24 hours, the brick is removed from the mould and taken for curing process.

III. RESULT AND DISCUSSION

A. Mixing Proportion

1. Mix- 1: (1:1.5) 40% Plastic waste+ 60% Sand

| Sr. No. | Samples   | Plastic Waste Weight in (gm) | Sand Weight in (gm) | No. of Specimens |
|---------|-----------|------------------------------|---------------------|------------------|
| 1       | Sample- 1 | 800                          | 1200                | 6                |
| 2       | Sample- 2 | 1000                         | 1500                | 6                |
| 3       | Sample- 3 | 1200                         | 1800                | 6                |

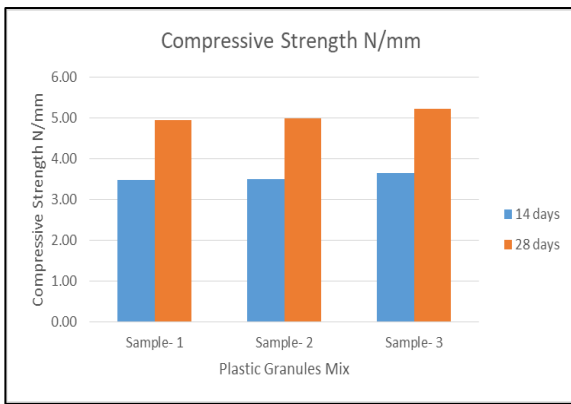
2. Mix- 2: (1:3) 25% Plastic Waste+ 75% Sand

| Sr. No. | Samples   | Plastic Waste Weight in (gm) | Sand Weightin (gm) | No. of Specimens |
|---------|-----------|------------------------------|--------------------|------------------|
| 1       | Sample- 1 | 500                          | 1500               | 6                |
| 2       | Sample- 2 | 750                          | 1750               | 6                |
| 3       | Sample- 3 | 1000                         | 2000               | 6                |

B. Compressive Strength

1. Mix- 1: (1:1.5) 40% Plastic waste+ 60% Sand

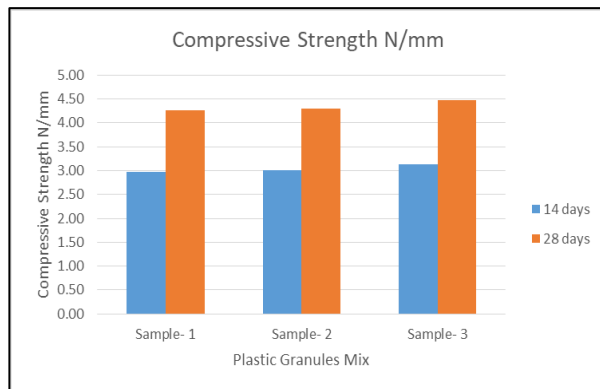
| Mix No | Plastic granules Mix % | 14 days | 28 days |
|--------|------------------------|---------|---------|
| 1      | Sample- 1              | 3.47    | 4.95    |
| 2      | Sample- 2              | 3.49    | 4.99    |
| 3      | Sample- 3              | 3.65    | 5.21    |



Graph 1 Compressive Strength – Mix 1

2. Mix- 2: (1:3) 25% Plastic Waste+ 75% Sand

| Mix No | Plastic granules Mix % | 14 days | 28 days |
|--------|------------------------|---------|---------|
| 1      | Sample- 1              | 2.98    | 4.26    |
| 2      | Sample- 2              | 3.00    | 4.29    |
| 3      | Sample- 3              | 3.14    | 4.48    |



Graph 2 Compressive Strength – Mix 2

IV. CONCLUSION

Based on the findings of the study, it is evident that waste plastics can be effectively utilized in the production of bricks and paver blocks, offering a solution to mitigate environmental pollution caused by plastic waste. The slow degradation rate of plastic waste further emphasizes the importance of this project in reducing plastic accumulation in an environmentally friendly manner. In addition, the use of waste plastic in brick and paver block manufacturing holds the potential for cost savings in construction compared to concrete paver blocks and mud bricks. The heat resistance of plastic bricks and paver blocks, as confirmed through oven testing, adds to their suitability for various applications. Further research will involve comparing the compressive strength of normal bricks with plastic bricks, as well as plastic paver blocks with concrete paver blocks, providing valuable insights for a major project continuation of this study.

REFERENCES

- [1] Anubhav Verma, Abhay Srivastava, Brijesh Kumar Ray, Deepak Yadav, “Manufacturing of Brick by Plastic Waste”, International Journal of Engineering Research in Mechanical and Civil Engineering, Vol 9, Issue 6.
- [2] Rishabh Kumar, Mohit Kumar, Inder Kumar, Deepa Srivastava, “A review on utilization of plastic waste materials in bricks manufacturing process”, Elsevier.
- [3] Aman Kumar, Mainak Biswas, Debarshi Nath, “A study of Manufacturing Bricks Using Plastic Wastes”, Journal of Emerging Technologies and Innovative Research, Volume 7, Issue 8, pp. 1838-1843.
- [4] Manish Kumar Sahu, Lokesh Singh, “Critical Review on Types of Bricks Type 14: Plastic Sand Bricks”, International Journal of Mechanical and Production Engineering, Volume- 5, Issue-11, pp. 84- 88.
- [5] Dinesh S, Dinesh A, Kirubakaran K, “Utilisation of Waste Plastic in Manufacturing of Bricks and Paver Blocks”, International Journal of Applied Engineering Research, Vol. 11 No.3, pp. 364-368.
- [6] Mohammad sultan, Rahul Jaiswal, Roshan Jaiswal, Falgunee Ram Sahu, Devannand, Megha

- Sahu, "Utilization of Waste Plastic in Manufacturing of Plastic Sand Bricks", International Journal of Innovations in Engineering and Science, Vol 5, No.1.
- [7] R. S. Kognole, Kiran Shipkule, Manish Patil, Lokesh Patil, Udaysinh Survase, "Utilization of Plastic waste for Making Plastic Bricks", International Journal of Trend in Scientific Research and Development, Volume: 3, Issue: 4, pp. 878- 880.
- [8] S S Chauhan, Bhushan Kumar, Prem Shankar Singh, Abuzaid Khan, Hritik Goyal, Shivank Goyal, "Fabrication and Testing of Plastic Sand Bricks", IOP Conference Series: Materials Science and Engineering.
- [9] Rajarapu Bhushaiah, Shaik Mohammad, D. Srinivasa Rao, "Study of Plastic Bricks Made from Waste Plastic", International Research Journal of Engineering and Technology, Volume: 06, Issue: 04, pp. 1122- 1127.
- [10] Dr. A.M. Arun Mohan, Ms. S. Bharathi, N. Sakthiram, Mr. M. Suganeswaran, Mr. P. Vigneswaran5, Mr. S. Vigneswaran, "Environmentally Friendly Bricks in Building Construction", International Journal of Engineering Technology and Management Sciences, Volume No. 8, Issue: 2, pp. 121- 126.