Eco-Friendly Construction: Plastic Brick Innovation Authors:

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Abstract

Plastic waste management has become a major environmental concern worldwide. This research focuses on the development of eco-friendly construction materials using waste plastic combined with fine aggregate (sand) to produce plastic bricks. The study evaluates the manufacturing process, material properties, compressive strength, and water absorption characteristics of plastic bricks.
Experimental results show that plastic bricks exhibit acceptable performance for non-structural applications while significantly reducing environmental pollution. The research highlights the potential of plastic bricks as a sustainable alternative in construction.

Keywords

Plastic Bricks, Eco-friendly Construction, Waste Management, Recycling, Sustainable Materials

1. Introduction

Plastic pollution is one of the most pressing environmental issues. Large quantities of non- biodegradable plastic waste accumulate in landfills, rivers, and oceans.

Eco-bricks or plastic bricks are an innovative solution where plastic waste is reused by packing or melting it into usable construction materials.

This method:

Reduces environmental pollution Reuses plastic waste effectively Provides low-cost construction material

However, challenges such as UV degradation and emission concerns must be addressed.

2. Materials Used

The main materials used in this study are:

2.1 Sand

Specific Gravity: 2.62
Density: 1620 kg/m³

Tested as per IS 2386 (Part 1)

2.2 Waste Plastic

Collected from domestic and industrial sources Cleaned and shredded

Used as a binding material

3. Methodology

3.1 Batching

Accurate measurement of materials (plastic and sand) based on mix ratio.

3.2 Mixing

Plastic is melted and mixed with sand to form a homogeneous mixture.

3.3 Moulding

The mixture is poured into moulds and compacted.

3.4 Burning

Plastic is heated to 150–180°C to achieve proper melting.

4. Mix Design

Different mix ratios were tested: 1:3

1:4

1:5

Example Calculation (1:3 Ratio): Brick Size: 19 × 9 × 9 cm

Volume: 0.00153 m³ Plastic required ≈ 0.53 kg Sand required ≈ 1.85 kg

5. Construction Process Step-by-step process:

Collection & Cleaning of Plastic Shredding (5–10 mm size) Melting (150–180°C)

Adding Sand
Mixing thoroughly Moulding

Cooling Finishing

6. Experimental Tests

6.1 Water Absorption Test Sample

Dry Weight (kg) Wet Weight (kg) Absorption (%) 1

2.834

3.119

10.5

2

2.962

3.385

14.28

3

2.836

3.16

11.42

Average Water Absorption = 11.92%

Within permissible limit (<20% as per IS 3495)

6.2 Compressive Strength Test Sample

Load (kN)

Strength (kg/cm²) 1

172

102.54
2

168

100.15

3

170

101.34

Average Strength = 101.34 kg/cm²

Suitable for non-structural applications

7. Applications Footpaths

Park walkways Parking areas Flooring

8. Comparison with Normal Bricks Plastic Brick

Normal Brick

Faster construction Slower

Lightweight Heavy

Cost-effective Expensive Eco-friendly

High pollution

9. Advantages

Reduces plastic pollution Low-cost construction

Lightweight material Local material usage Energy efficient

10. Disadvantages
Lower strength than first-class bricks UV sensitivity

Possible pollution during melting Still under research

11. Conclusion

Plastic bricks provide an innovative and sustainable solution to plastic waste management. Although they may not fully replace traditional bricks in structural applications, they are highly suitable for non-load-bearing structures. Their use reduces environmental pollution and promotes sustainable construction practices.

12. Future Scope

Development of stronger plastic composites Large-scale industrial production

Use in affordable housing

Reduction in greenhouse gas emissions Acknowledgement

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IS 2386 (Part 1) – Aggregate Testing

IS 3495 (Part 2): Water Absorption Test

Research on Plastic Wast Utilization in Construction Environmental Sustainability Journals