

Papercrete Blocks: Lightweight Bricks Using Waste Paper Pulp and Cement

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Abstract—This research investigates the development and performance of *papercrete blocks*—lightweight, eco-friendly bricks produced using waste paper pulp and cement. The study aims to utilize discarded paper as a sustainable raw material for construction, reducing environmental waste and overall material cost. The prepared papercrete samples were tested for compressive strength, density, and water absorption. Results show that papercrete is significantly lighter than conventional bricks, cost-effective, and suitable for non-load-bearing walls, though improvements are required for strength and water resistance.

Index Terms—Papercrete, Lightweight bricks, Waste paper pulp, Sustainable construction, Cement composite

I. INTRODUCTION

Rapid urbanization and population growth have increased the demand for affordable and eco-friendly construction materials. Traditional clay bricks require large energy inputs and contribute to soil degradation. In contrast, *papercrete*, a mixture of waste paper pulp and cement, provides a sustainable alternative. Waste paper, being abundantly available, can be reused to produce construction materials that reduce landfill burden and carbon footprint. Papercrete offers low density, good thermal insulation, and reduced cost compared to traditional masonry units. However, its compressive strength is relatively lower, restricting its use to non-load-bearing applications.

II. OBJECTIVES

- To manufacture lightweight bricks using waste paper pulp and cement.

- To evaluate the mechanical and physical properties such as density, compressive strength, and water absorption.
- To promote sustainable construction using recyclable waste materials.
- To analyze the feasibility of papercrete as a partial replacement for conventional bricks.

III. LITERATURE REVIEW

- Tiwari & Singi (2023): Papercrete bricks made from waste paper pulp and cement are lightweight and eco-friendly, suitable for non-load-bearing walls but exhibit lower compressive strength.
- Riad, Hossain & Mamun (2023): Increasing paper content decreases compressive strength but enhances insulation, making papercrete ideal for partition walls.
- Niyomukiza et al. (2023): Mixes with less than 50% paper content achieve better strength and durability.
- Meshram et al. (2025): Achieved compressive strength of about 3 MPa, confirming suitability for lightweight construction but high-water absorption.
- Anusuya & Makesh (2025): Adding supplementary materials like GGBS or quarry dust improves mechanical performance. These studies highlight papercrete's potential as a sustainable material when optimized for strength and durability.

IV. METHODOLOGY

4.1 Materials



- Cement: Ordinary Portland Cement (OPC, 43 grade)
- Waste Paper: Sourced from newspapers and office waste
- Water: Used for pulping and mixing
- Sand (optional): Added to improve texture and density

4.2 Procedure



Preparation of Pulp: Waste paper was soaked in water for 24 hours, then blended into

1. fine pulp.
2. Mixing: The pulp was combined with cement in a ratio of 3:1 (paper pulp: cement) with water added for workability.
3. Molding: The mix was poured into standard brick molds (230 mm × 110 mm × 75 mm).
4. Curing: Bricks were first air-dried for 48 hours, then water-cured for 7–14 days.
5. Testing: Compressive strength, density, and water absorption tests were performed.

4.3 Experimental Setup

- Equipment Used:
 - Brick mold
 - Weighing machine
 - Compression testing machine (Smaran Enterprises)

V. RESULTS AND DISCUSSION

5.1 Physical Properties

Property	Papercrete Brick	Conventional Brick
Size (mm)	230 × 110 × 75	230 × 110 × 75
Weight (kg)	3.0	3.8–4.0
Density (kg/m ³)	1450	1900

Papercrete bricks are approximately 25–30% lighter than conventional bricks, reducing the overall structural load.

5.2 Compressive Strength Test

Sample No.	Load (kN)	Area (mm ²)	Compressive Strength (N/mm ²)
1	25	230 × 75	8.15
2	22	230 × 75	7.18
3	23	230 × 75	7.51
Average		7.61 N/mm ²	

The compressive strength of papercrete bricks is slightly lower than conventional clay bricks (10–12 N/mm²) but acceptable for non-load-bearing walls and partition structures.



5.3 Water Absorption Test

Sample No.	Dry Weight (g)	Wet Weight (g)	Water Absorption (%)
1	3000	3420	14.0
2	2980	3390	13.8
3	3010	3430	13.9
Average		13.9%	

Papercrete exhibits slightly higher water absorption, which can be minimized by adding fine aggregates or surface coatings.

VI. CONCLUSION

The experimental results confirm that papercrete bricks are a promising eco-friendly alternative to conventional clay bricks. They are lightweight, cost-effective, and promote waste recycling in construction. Although their compressive strength is lower, it meets the requirements for non-load-bearing applications such as partition walls. To improve performance, supplementary materials like sand, fly ash, or GGBS can be incorporated to enhance strength and reduce water absorption. Thus, papercrete contributes significantly to sustainable construction and resource conservation.

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