International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 02 | Feb - 2025 SJIF Rating: 8.448 ISSN: 2582-3930

BricksterSelf-Plastered Bricks - Future of wall construction

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Abstract

Traditional bricklaying and plastering methods involve significant material wastage, labor-intensive processes, and increased construction time. This paper introduces **Brickster**, an innovative building material that integrates **brick and plaster as a single component**, eliminating the need for separate plastering. The study highlights **the environmental benefits, material efficiency, cost reduction, and labor optimization** associated with this new approach. The concept is particularly relevant for India and other regions where **red bricks are the primary construction material**. By reducing plaster wastage and simplifying construction techniques, Brickster offers a **sustainable and time-efficient alternative** for modern construction.

1. Introduction

Brick masonry is a fundamental component of construction, widely used across the world, particularly in India. Among the various types of bricks, **red bricks** are considered superior due to their **durability, strength, and**

thermal insulation properties. The traditional **bricklaying and plastering** process involves multiple steps, including the application of a **cement-sand plaster layer** between bricks, leading to considerable **material wastage and labor effort**.

This paper introduces **Brickster**, a **pre-plastered brick** with a **built-in binding layer**, designed to eliminate **excessive plaster use** and improve **construction efficiency**. By integrating **plaster onto the brick's surface**, this innovative solution ensures **faster assembly, lower costs, and enhanced sustainability**.

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2. Traditional Bricklaying Process and Its Challenges

The conventional bricklaying process follows these key steps:

1. **Application of Plaster Layer:** A **12mm cement-sand mortar** layer is applied to the base, serving as a binding medium for brick placement.
    - Standard cement-to-sand ratio:
        - **1:4** (Internal Walls & Ceilings)
        - **1:6** (External Walls)
    - The mix ratio is dictated by the **Bureau of Indian Standards (BIS)** and varies based on climate, wall positioning, and load factors.
2. **Brick Placement:** Bricks are positioned onto the mortar layer to form a stable wall structure.
3. **Side Plastering:** Each brick requires an additional **layer of mortar on its sides** to bond with adjacent bricks.
4. **Curing and Drying:** The constructed wall undergoes a curing process to **harden the mortar**, ensuring structural integrity.

Challenges in Traditional Methods:

- **Material Wastage:** Excess plaster often **spills over or dries out**, leading to **significant resource loss**.
- **High Labor Dependency:** Requires skilled **masons** for proper alignment and application.
- **Time-Consuming:** Repetitive **plastering and curing cycles** increase overall **construction time**.
- **Inconsistent Strength:** Variability in **plaster thickness and application** affects **structural uniformity**.

3. The Brickster Solution

Brickster is a **pre-plastered brick** that **integrates plaster onto the brick's surfaces**, addressing the inefficiencies of traditional bricklaying. This **all-in-one** solution consists of:

- **Plastered Side Ends:** Built-in **binding material** on **left and right sides** to act as an adhesive when stacked.
- **Pre-Plastered Front & Back Faces:** Eliminates the need for **external and internal wall plastering** after construction.

3.1 Working Model

Brickster can be applied to different brick types, including **red clay bricks, cement concrete (CC) blocks, and fly ash bricks**. The implementation follows these steps:

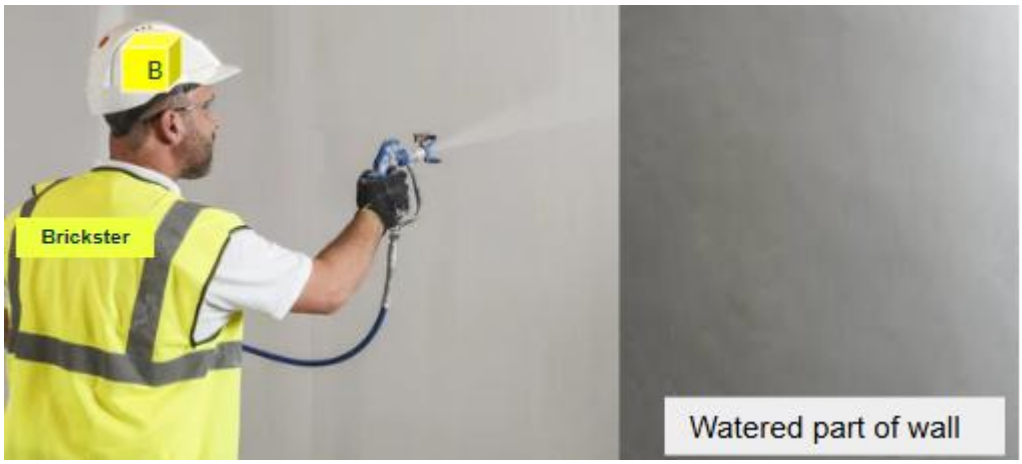
1. **Placement:** Position the pre-plastered Brickster bricks with plaster layers on all four sides, adhering to the required thickness specifications.
2. **Water Activation:** After placing bricks covering **3 square feet**, spray water using a **special spraying technique** that activates the bonding property of the plaster without damaging the pre-coated layer.
3. **Repeat Process:** Continue the process to complete the wall as per the **design drawing**.
4. **Spraying Rounds:** Water spraying should follow **standard rounds of 3 square feet at a time**, ensuring controlled activation of the plastered material.
5. **Alignment Check:** Upon wall completion, check vertical alignment and surface evenness using established **plastering quality control techniques**.

Regular ‘Red Brick’ without ‘Brickster’ Plaster

Redbrick inside covered with self plaster agent that activates to bind with adjoining bricks once it comes in contact with water - Recommended water spray for every 3 cubic feet of laying.

3.2 Water Spray Application

a. Brickster bricks being placed



b. Water sprayed on 'Brickster' bricks - Self plastered wall

c. Check surface straightness

Benefits - Avoid wastages, save time, easy to clean, less human effort, value for money, environmental friendly

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4. Checking Wall Evenness and Straightness

Ensuring a uniform and level plastered surface is critical. The most common techniques include:

1. **Straightedge and Spirit Level Method:**
   - Place a **straightedge** horizontally or vertically against the surface to detect irregularities.
   - Use a **spirit level** to check horizontal and vertical alignment.
2. **String Line Method:**
   - Stretch a **string line** along the surface to compare the alignment of multiple bricks.
3. **Plumb Bob and Laser Level:**
   - Use a **plumb bob** for vertical alignment.
   - A **laser level** can provide precise surface alignment.
4. **Tolerance Levels:**
   - Standard construction tolerances allow deviations of **±3mm over a 2-meter straightedge**.

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5. Case Study: Cost and Time Savings with Brickster

A comparative analysis of a **residential building project (1200 sq. ft.)** was conducted to measure the efficiency of Brickster versus traditional bricklaying methods.

Parameter	Traditional Method	Brickster Method
Material Wastage	15% Plaster Waste	<1% Waste
Labor Requirement	10 Masons	1 Mason and a helper
Construction Time	30 Days	18 Days
Cost Savings	-	20% Reduction

Results indicate significant reductions in cost, time, and labor, making Brickster a highly efficient alternative.

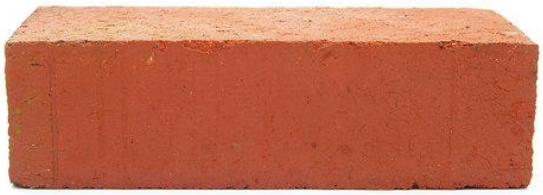

Figure a: Traditional brick plastering technique, manual method.

Leads to wastages, takes a lot of human effort, time and money.

6. Implementation and Future Scope

6.1 Manufacturing Process

- **Brick Firing & Processing:** Traditional red bricks are prepared using high-quality red soil, fired at optimal temperatures.
- **Plaster Integration:** A factory-applied plaster coating is added to ensure uniformity and durability.
- **Quality Testing:** Ensuring adhesion strength, impact resistance, and moisture control.

6.2 Potential Applications

- **Residential & Commercial Buildings:** Rapid deployment for high-rise structures and housing projects.

- **Government Infrastructure Projects:** Large-scale implementation in affordable housing initiatives.
- **Prefabricated Construction Industry:** Enhancing modular construction techniques.

6.3 Future Research and Innovations

- **Exploration of Advanced Binding Materials** for enhanced brick adhesion.
- **Integration of Fireproof and Waterproof Layers** for multi-climatic adaptability.
- **Automation in Brick Manufacturing** for mass production and affordability.

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7. Conclusion

Brickster presents a **transformative approach** to traditional construction by combining **brick and plaster into a single component**. This **pre-plastered, ready-to-use solution** addresses the inefficiencies of **manual plastering**, minimizes **material wastage**, and accelerates **construction timelines**.

References:

1. Bureau of Indian Standards (BIS) - Cement and Plastering Guidelines.
2. Sustainable Construction Practices, Journal of Green Building, 2023.
3. Advances in Prefabrication Technology, Construction Engineering Review, 2022.

Illustrations:

1. **Brick Types:** Red Clay Brick, Cement Concrete Block, Fly Ash Brick.
2. **Plaster Coating Process:** Standard thickness variations as per Indian codes.
3. **Water Spraying Technique:** Applied over a 3 square feet area.
4. **Completed Brickster Wall:** Demonstrating efficiency and uniformity.

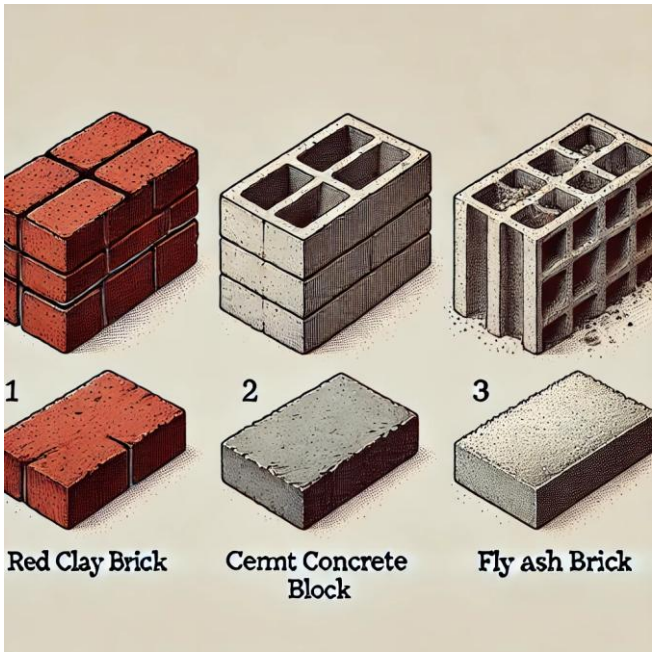

Fig: 1: Showing different types of bricks currently being used in the construction market.

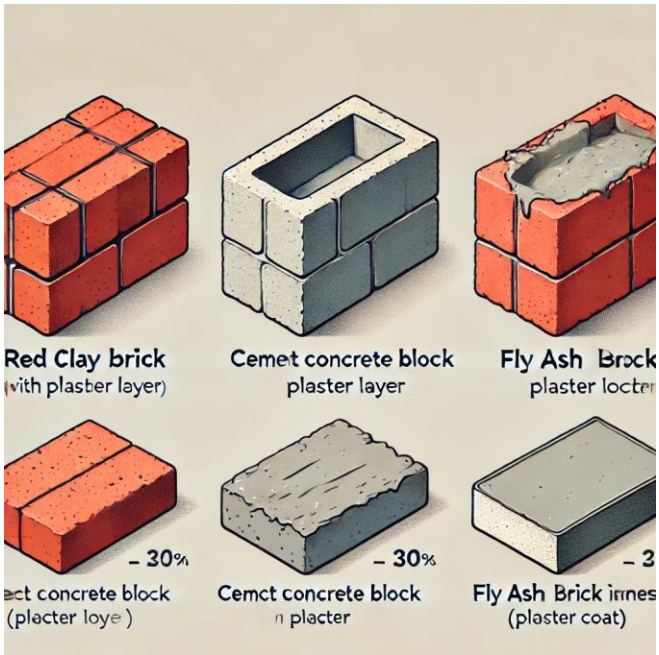

Fig: 2: Showing different types of bricks with plaster - Brickster

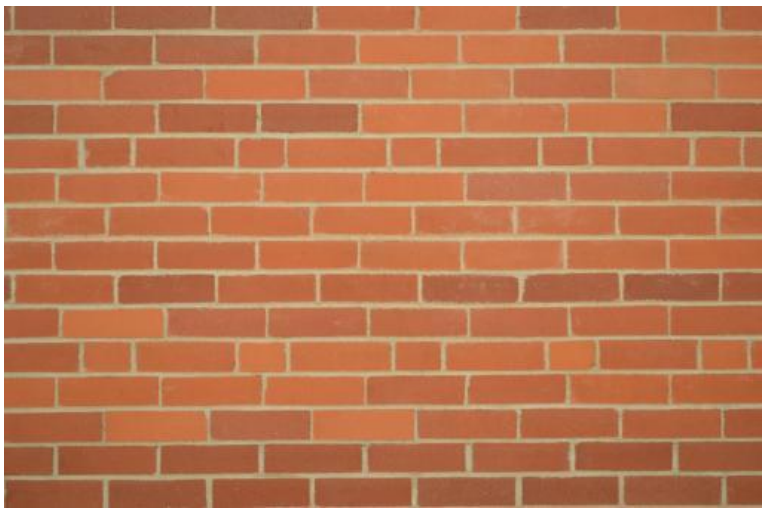

Fig: 3: Showing different types of bricks with plaster on the left and right side only - Brickster

Brickster Wall

Fig: 4: Showing plaster on the all sides - Brickster

Assessing the planar uniformity and vertical alignment of the brick wall construction