

Material Wastage Control and Site Management in Residential Building Construction

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Abstract—In any residential apartment building, basic materials like TMT steel, cement bags, ready-mix concrete, AAC blocks, sand, and tiles take up nearly 55% to 60% of the total construction cost. On many medium-size building sites in cities like Nashik, rough unloading, damp cement sheds, unplanned cutting of 12 m steel bars, mortar dropping on floors, and missing store records increase wastage two or three times above normal limits. In this paper, we studied ten published research papers on construction waste, ABC stock grouping, and First-In First-Out (FIFO) cement storage. We also checked real site work at an ongoing G+7 residential building at Carbon Naka, Shivaji Nagar, Nashik. When we compared uncontrolled work on Floors 1 to 3 with strict daily site supervision on Floors 4 to 7, average material wastage came down from 7.4% to 2.6%. This saved Rs. 5.81 Lakh directly on the upper four floors.

Index Terms—ABC Inventory Control, AAC Blocks, Bar Bending Schedule (BBS), Cement Storage, Construction Site Management, FIFO Method, Material Wastage Control.

II. INTRODUCTION

Residential apartment work is growing fast in Nashik areas like Carbon Naka, Shivaji Nagar, Satpur, and Gangapur Road. In all such G+5 to G+7 buildings, material bills are the biggest part of the budget. About 55% to 60% of total money goes into buying materials, and the remaining 40% goes into labour wages, centring rent, machines, and site office expenses. If 4% or 5% extra steel, cement, sand, or blocks get wasted on site, the contractor directly loses profit. At the same time, extra broken rubble piles up on small city plots and costs more tractor trips to throw out. Past site studies clearly show one simple point. Building materials rarely go bad due to factory faults.

Most wastage happens because of loose daily site habits. Helpers stack cement bags on damp floors without wooden planks. Bar-benders cut new 12 m steel bars without checking old cut pieces first. Dumpers unload sand on open ground where rainwater washes half the fine sand into road drains. Masons break full AAC blocks with a brick hammer instead of a proper hand saw. In this paper, we studied ten research papers and checked these exact practical points on our G+7 residential site at Carbon Naka, Shivaji Nagar, Nashik.

II. METHODOLOGY

2.1 Study Building Overview

To check real material saving on site, we tracked materials from the main gate up to each slab and masonry floor. Our case study building is an ongoing G+7 residential apartment at Carbon Naka, Shivaji Nagar, Nashik (3,600 sq.m built-up area, 28 flats of 2-BHK on a 25 m × 35 m plot).

Work was recorded in two clear stages:

1. Phase 1 (Floors 1 to 3): Normal site work recorded without strict store rules
2. Phase 2 (Floors 4 to 7): Controlled site work under daily supervisor checks

2.2. Inward Gate & Store Register System

Every lorry or tempo coming to the gate was checked for weight slip, bag count, and broken pieces before unloading:

Inward Check = Gate Entry Book + Store Ledger + Stack Card Floor Issue = Signed Indent Slip from Site Supervisor
Friday Check = Physical Stock Count vs. Drawing Quantity.

2.3. ABC Material Inventory Classification

Site materials were divided into three simple groups based on total bill value:

Class A (70% cost): TMT Steel, Cement Bags, and RMC Concrete (checked daily).

Class B (20% cost): AAC Blocks, Red Bricks, and Tiles (checked twice a week).

Class C (10% cost): Sand, 20 mm Metal, Binding Wire, and Pipes (controlled by brick bunds and farma boxes).

2.4. Cement & Concrete Control Rules

As per IS 4082 rules, 50 kg cement bags were kept inside a dry tin shed on 150 mm high wooden pallets. A 300 mm gap was left from all walls and stack height was kept up to 10 bags only. Old stock was issued first using FIFO boards. On working floors, masons used GI trays for mortar mixing. During slab concreting, remaining slab area was measured with a tape before calling the last RMC mixer.

2.5. Steel Bar-Bending Schedule (BBS) Control

Before cutting new 12 m Fe500D TMT bars, a Bar Bending Schedule (BBS) list was given to the fitter mistri as per IS 2502. Long beam bars and short stirrup or lintel pieces were planned from the same 12 m bar. Leftover cut pieces longer than 500 mm were kept by size (8, 10, 12, 16, and 20 mm) on a small rack and used in lintels, chajjas, chairs, and spacers.

2.6. Masonry Block, Sand & Tile Handling

Helpers unloaded AAC blocks (600 × 200 × 150 mm) by hand in pairs on level ground up to 1.5 m height. Masons used toothed hand saws instead of hammers to cut half-blocks.

Crushed sand was unloaded inside a 3-sided brick bund wall and measured with 1 ft × 1 ft × 1 ft wooden farma boxes. Room tiles were laid from a centre chalk line, and side cut pieces were used for 100 mm wall skirting.

2.7. On-Site Reuse of Residual Debris

Small broken pieces that could not be avoided were used back on the same site:

Broken AAC / Brick Bats = Filled inside sunken bathroom slabs
Leftover Pump Concrete = Poured into 20/25/40 mm cover block moulds

Coarse Sand Screening = Spread under compound paving bed.

2.8. Wastage Percentage Check

At the end of every floor, drawing quantity was compared with actual store issue:

Wastage Quantity = Store Issued Quantity – Drawing Quantity

Wastage Percentage = (Wastage Quantity / Drawing Quantity) × 100.

2.9. Supervisor Workflow Summary

1. Group site materials into Class A, Class B, and Class C
2. Build wooden cement dunnage, steel racks, and brick sand bunds
3. Check gate challans, FIFO boards, and signed floor indent slips
4. Give BBS cut sheets and keep an offcut rack near the cutter
5. Count closing stock every Friday and reuse clean bats on site

III. OBSERVATIONS AND REVIEW FINDINGS

1. Uncontrolled Baseline Losses (Floors 1 to 3)

Main Losses Seen on Lower Floors:

- Crushed and plaster sand had the highest loss at 11.5% due to open gate heaps and rain washout.
- AAC blocks had 9.2% breakage during lorry unloading and hammer cutting.
- Floor and wall tiles showed 7.8% breakage and odd edge cuts.

Costly Class A Losses:

- TMT steel reached 6.8% scrap loss because fitters cut new 12 m bars without checking old pieces.
- Cement bags had 6.5% loss from wall dampness and bare-slab mixing.
- M25 RMC concrete had 5.4% loss from ordering extra concrete on the last trip and shuttering leaks.

2. Main Mistakes Found on Site

- Bar cutting was started without a written BBS cutting list.
- Cement bags were stacked without wooden planks or FIFO date tags.
- Plaster mortar was mixed on bare floors and left extra at 5:30 PM.
- AAC blocks and tile boxes were shifted roughly without supervision.

3. Improvements Seen on Upper Floors (Floors 4 to 7)

- TMT steel wastage came down from 6.8% to 2.4% after using BBS sheets and the offcut rack.
- Cement wastage dropped from 6.5% to 2.2% with wooden pallets and GI mixing trays.
- RMC concrete loss came down from 5.4% to 1.9% by tape checking before the last transit mixer and casting cover blocks.

4. Masonry, Sand & Tile Improvements

- AAC block wastage dropped from 9.2% to 3.4% with toothed saws and sunken toilet filling.
- Sand wastage dropped from 11.5% to 4.2% inside the 3-sided brick bund bay.
- Tile wastage came down from 7.8% to 2.8% by using side cuts in 100 mm skirting.

5. Site Cleanliness & Worker Safety

- Keeping passages clear of bent steel scraps and broken blocks made wheelbarrow movement easy and stopped foot injuries to helpers.

IV. RESULT SUMMARY

Comparing Floors 1 to 3 with supervised Floors 4 to 7 at our 3,600 sq.m G+7 residential site at Carbon Naka, Shivaji Nagar, Nashik gave clear savings: Drop in Wastage:

- Overall average material wastage came down from 7.4% to 2.6% (4.8% net reduction).
- All six materials came close to standard CPWD and IS site limits of 2% to 4%.

Direct Money Saved (Floors 4 to 7):

- TMT steel saved: 3.40 MT (Rs. 1.97 Lakh); M25 RMC saved: 23 cu.m (Rs. 1.24 Lakh).
- Cement saved: 225 bags (Rs. 0.81 Lakh); Sand saved: 13 Brass (Rs. 0.68 Lakh).
- AAC blocks and tiles saved: Rs. 1.11 Lakh; Total money saved on Floors 4 to 7 = Rs. 5.81 Lakh, while spending only Rs. 0.48 Lakh on pallets, racks, bunds, trays, and saws.

V. CONCLUSION

Material wastage on residential building sites can be cut by more than half without costly machines or complex software. Regular site supervision, ABC

stock control, IS 4082 dry cement stacking, advance BBS cutting lists, brick sand bunds, toothed block saws, and Friday stock counting are enough to keep the site clean and save lakhs of rupees on multi-storey apartment projects.

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