

Gypsum Drywall Reuse Pathways

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Introduction

Selected Material: Gypsum Dry Wall; Gypsum core sandwiched between two sheets of paper. [10]
Use: Used as a fireproofing agent that lies behind a finished surface in NYC vertical construction. [10]
Why Reuse?: Dry wall is sent to landfills, where its paper lining decomposes and its exposed gypsum core releases the greenhouse gas methane. [3]
Waste Stream Entry: Enters waste stream when previously installed boards are removed during building renovation or demolition. [12]
NYC Requirements: Gypsum dry wall must meet several fire resistance codes. ASTM C codes: 1629, 1047, and 557, declare drywall must resist fire regardless of deformation, accessories, and adhesives. [11]
Annual Quantity (NYC): US EPA estimates 13,000,000 tons of dry wall waste is yielded. It can be inferred that NYC makes up a significant portion. [12]

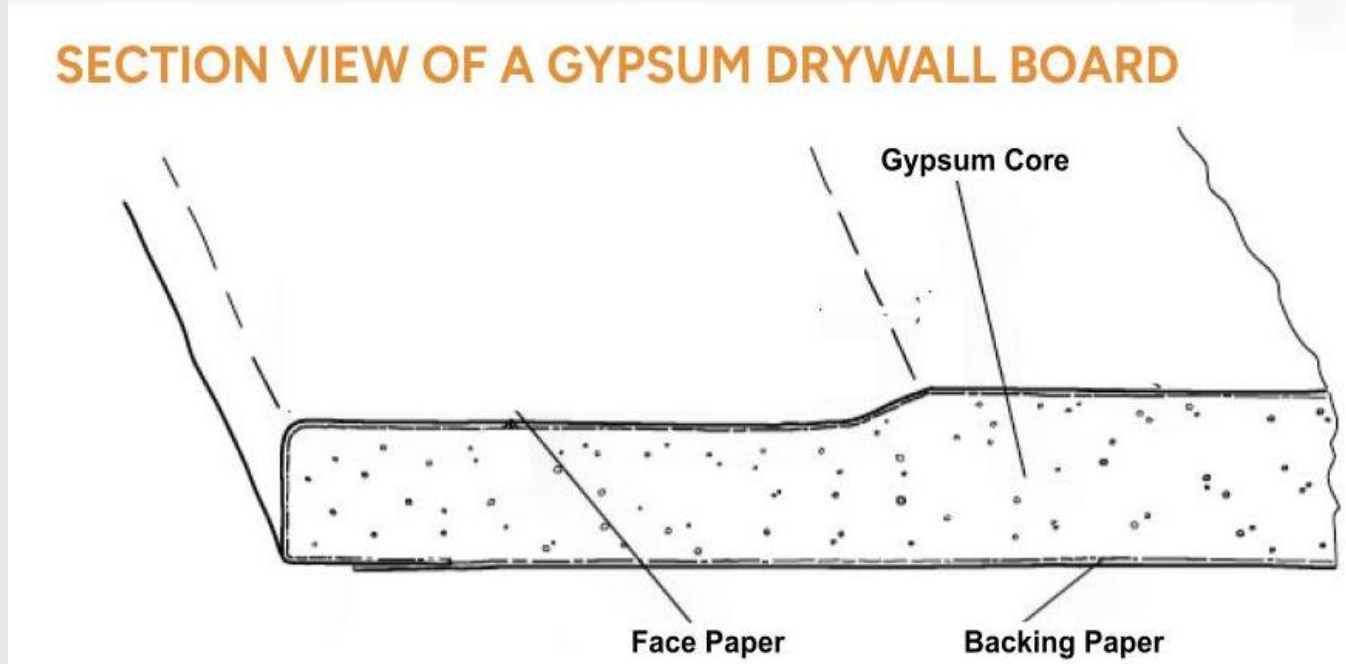


Figure 1. Section View of gypsum dry wall. [10]

Material Properties

Chemical Composition: Primarily calcium sulfate dihydrate (CaSO₄·2H₂O). [5] 21% chemically combined water by weight. [2]
Physical Properties: Low strength and mild porosity. Properties depend on additives like cellulose fibers which increase stiffness and permeability. [2]
Morphology: Composed of interlocking crystals that form a micro-porous structure susceptible to abrasion and moisture damage. [2]
Common Waste Forms: Recovered as whole sheets, broken pieces, or powder from demolition. [10]
Reuse Standards: ASTM C 1881 ensures recovered dry wall waste is not contaminated and suitable for recycling. [4]
Hazards: Under anaerobic landfill conditions, sulfate-reducing bacteria convert gypsum sulfate into hydrogen sulfide (H₂S), a toxic and odorous gas. [14]
Environmental Concerns: Moderate carbon footprint stemming from energy require to produce and transport dry wall boards. [14]

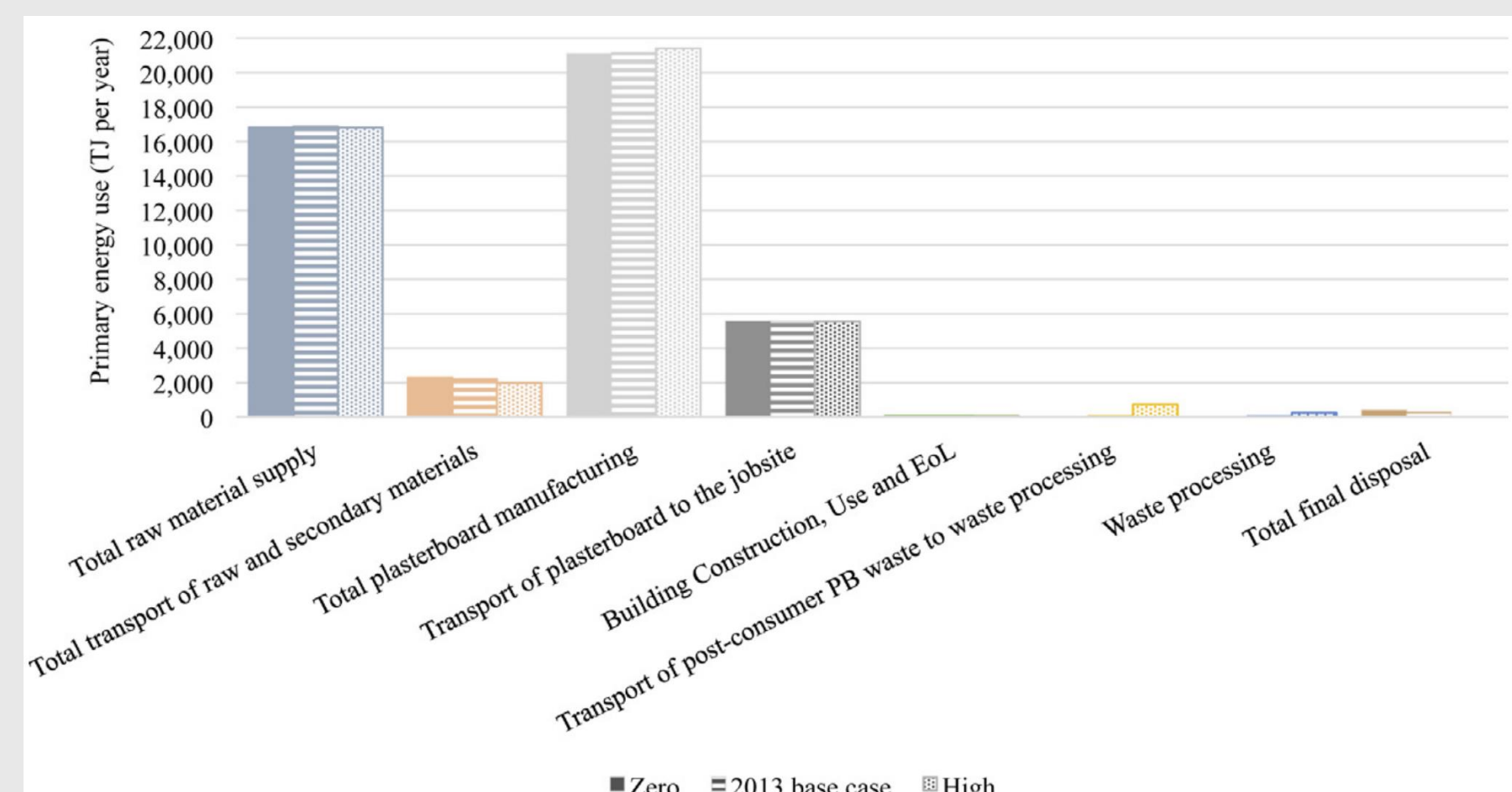


Figure 2. Primary energy use in TJ per year within a dry wall board's life cycle.

Beneficial Use Pathways

1. New Gypsum Products

Processing: Crushed, milled, and calcined to restore binding properties. [3]
Benefits: Enables closed-loop recycling, directly reducing landfill waste. [3]
Limitations: Requires intensive processing and strict contamination control. [3]

2. Cement & Concrete Production

Processing: Ground into a fine powder for use as a partial cement replacement or set regulator. [4]
Benefits: Reduces the carbon footprint of concrete and combines effectively with fly ash. [6]
Limitations: High gypsum content without fly ash significantly reduces early strength. [6]

3. Soil Stabilization & Amendment

Processing: Crushed and ground into a powder for direct application. [1]
Benefits: Improves soil structure and provides plant nutrients. [1]
Limitations: Highly soluble and requires cement additives to prevent erosion and ensure durability. [1]

4. Water Treatment Medium

Processing: Crushed and sieved to a fine powder. [4]
Benefits: Highly effective and low-cost adsorbent for removing fluoride from water. [4]
Limitations: Performance can be inhibited by competing anions like phosphate. [4]

5. Brick Manufacturing

Processing: Crushed and heated, then mixed with binders. [7]
Benefits: Enhances flexural strength in non-load-bearing bricks. [7]
Limitations: Limited to non-structural applications and requires uncontaminated gypsum. [7]

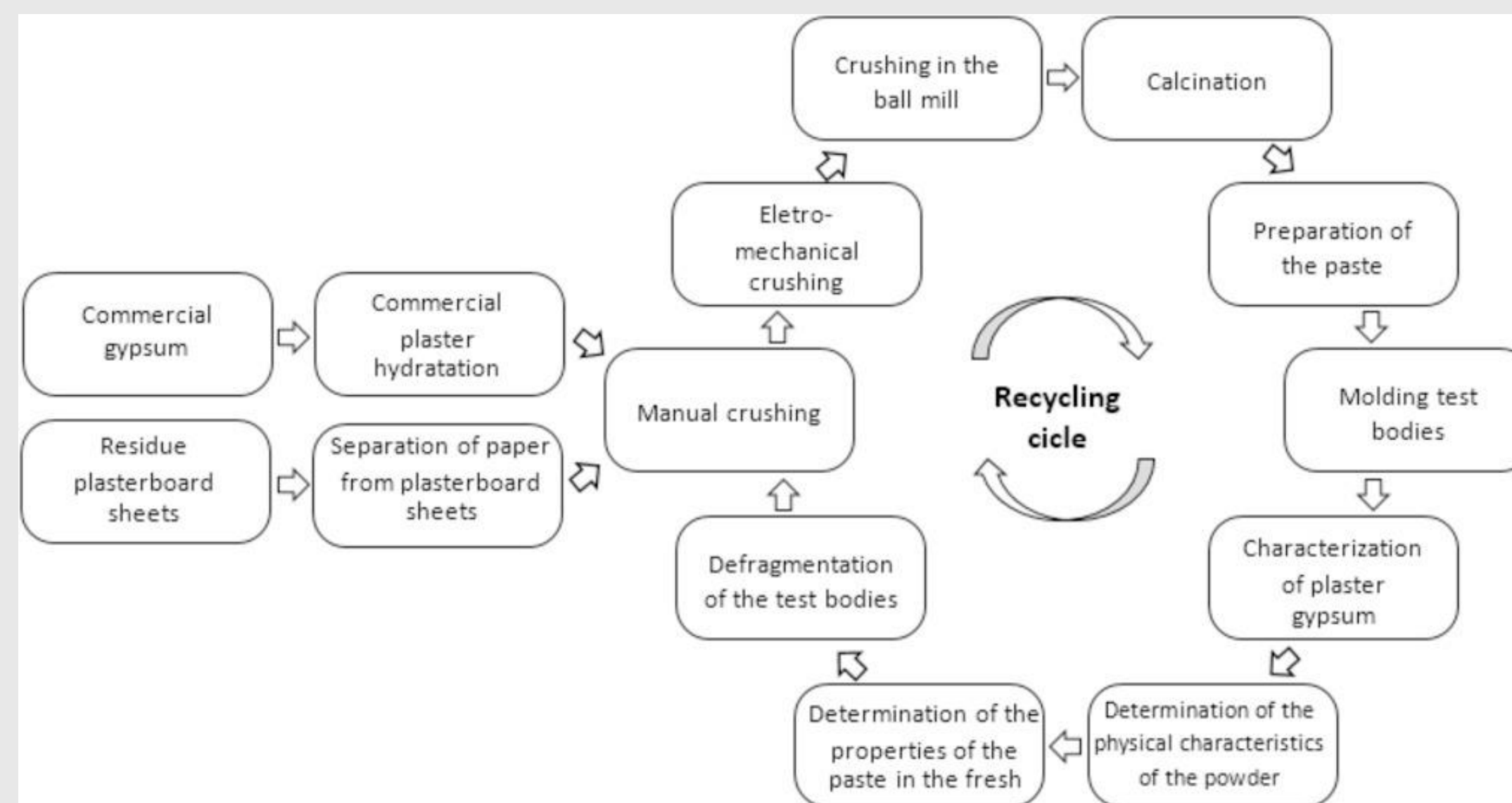


Figure 3. General Recycling Process of Gypsum Plasterboard [3]

Related Regulations

NYS and NYC policies promote the beneficial reuse of gypsum drywall to reduce environmental impacts. Under **6 NYCRR Section 360.12**, processed drywall used as a substitute in products like cement, bricks, or new panels can cease to be regulated as waste, while **Section 360.13** limits its use as fill due to odor and leaching risks. [10] **Section 361-5.3** strengthens source separation at job sites by requiring drywall to be clean when delivered to recycling facilities. [10] New York City climate policies, such as the **80x50 Roadmap (LL66-2014)** and **Executive Order 23 (2022)**, directly support gypsum recycling by encouraging the use of low-carbon recycled materials in construction. [8] **Local Law 118-121** reinforces this by mandating environmentally friendly purchasing, [8] and **LL13-2014** ensures that recycled drywall meets building code standards. [9] Overall, these regulations contribute to diverting gypsum from landfill disposal to high-value, circular use in manufacturing and construction.

Beneficial Use Pathway	Key Environmental & NYC Regulations
Soil Amendment	6 NYCRR Section 360.12 [11] 6 NYCRR Section 360.13 [11] 6 NYCRR Section 361-5.3 [11] Roadmap to 80x50 (LL66-2014) [8]
Manufacturing New Drywall Panels	6 NYCRR Section 360.12 [11] 6 NYCRR Section 361-5.3 [11] Executive Order 23 (2022) [8] NYC Building Code LL13-2014 [9]
Cement Component	6 NYCRR Section 361-5.3 [11] Executive Order 23 (2022) [8] Roadmap to 80x50 / LL66-2014 [8]
Water Treatment Medium	6 NYCRR Section 360.12 [11] BUD – Environmental Testing Required
Component in Bricks / Masonry	6 NYCRR Section 360.12 [11] Executive Order 23 (2022) [8]

Citations

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[12] NYC closes the loop on gypsum wallboard. *Wastetodaymagazine.com*. (2019, May 8). <https://www.wastetodaymagazine.com/news/building-product-ecosystems-closed-loop-gypsum-wallboard-nyc/>
[13] SECTION 9B GYPSUM DRYWALL AND TILE BACKER BOARD. New York City Department of Housing Preservation and Development. (2010, January). <https://www.nyc.gov/assets/hpd/downloads/pdfs/services/09b-gypsum-drywall-and-tile-backer-board.pdf>
[14] TABLE 2506.2 GYPSUM BOARD AND GYPSUM PANEL PRODUCTS MATERIALS AND ACCESSORIES. 2022 New York City Building Code. (n.d.). <https://codes.iccsafe.org/s/NYNYCBC2022P1/chapter-25-gypsum-board-gypsum-panel-products-and-plaster/NYNYCBC2022P1-Ch25-Sec2506.2>
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