CONCRETE MASONRY & HARDSCAPES ASSOCIATION

HOW TO TALK ABOUT CARBON AND CMU

Q: Is concrete block a high-carbon material?

A: Compared to other wet-cast concrete products, concrete masonry units (CMU) typically use significantly less cement per square foot of wall than poured concrete. With webs, faceshells and open cores, CMU minimizes material use and accelerates natural carbon sequestration over time—making it a more sustainable, lower-carbon option among the concrete family.

- **Carbon sequestration:** CMHA commissioned the first-ever peer-reviewed study on carbon sequestration in dry-cast concrete masonry, giving members credible data to share with the design community. The ASTM (2022) and CMDC (2025) peer-reviewed study found that CMU absorbs CO_2 much faster than other concrete products—over 20% of cement-related emissions within 28 days, and more than 40% after two years. This natural "carbon sponge" effect aligns with findings from the IPCC, which confirms that concrete can reclaim a significant portion of its manufacturing emissions over time.
  Source: Concrete Masonry & Hardscapes Association. Canada Masonry Design Centre: Modeling Natural Carbon Sequestration Rates of Dry-Cast Manufactured Concrete Products. IPCC (2022) Climate Change Mitigation: Industry Chapter

- **Material efficiency:** CMU's hollow cells and optimized geometry use less raw material—particularly cement—per unit of wall area compared to solid concrete. A wall system that requires less material translates into lower embodied.

Q: How does the carbon footprint of CMU compare to other materials?

A: When considering the full life cycle—manufacturing, use, and end-of-life—CMU provides significant advantages. Unlike materials that degrade or require frequent replacement, concrete block structures have long service lives, reducing the need for new material production. Additionally, advances in mix designs to optimize material utilization continue to reduce the embodied carbon of CMU.

- **CMU lifespan:** Well-maintained CMU structures regularly last 100 years or more, significantly reducing embodied carbon over time compared to materials with shorter life cycles.
  Source: U.S. Department of Energy

- **Recyclability:** CMU can be crushed into recycled concrete aggregate (RCA) for road base, fill, or reuse in new concrete, cutting virgin resource use by up to 50%.
  Source: EPA Sustainable Materials Management Report

- **CMU's Sequestration Advantage:** A key benefit of dry-cast CMU is its ability to sequester significant amounts of CO_2 early in its service life—enabling project teams to meet low embodied carbon targets sooner. Unlike poured or wet-cast concrete, which relies more heavily on end-of-life applications for carbon uptake, CMU continuously absorbs carbon thanks to its porous structure. An ASTM (2022) and CMDC (2025) peer-reviewed study confirms this ongoing sequestration effect over time.

Q: What's new or innovative about CMU?

A: CMU has evolved significantly with advancements in mix designs, alternative cement materials, and carbon sequestration techniques. Modern manufacturing processes allow for lower-carbon production, and new developments in high-performance masonry improve energy efficiency and sustainability.

- **Supplementary Cementitious Materials (SCM) reduce carbon footprint:** Incorporating fly ash, slag, or limestone fines can reduce embodied carbon by up to 40% compared to traditional mixes.
  Source: Financial Times, 2025

- Some manufacturers are exploring ways to further reduce emissions by infusing CO_2 into CMU during the curing process. While many of these solutions are still in early stages of validation and not yet widely adopted, they demonstrate the potential to permanently trap carbon within the block and enhance material performance—offering a promising path to lower-carbon construction.

Q: How does CMU contribute to net-zero building goals?

A: Net-zero construction isn't just about reducing embodied carbon—it's about operational energy efficiency and longevity. CMU provides exceptional thermal mass, reducing heating and cooling loads. When combined with proper insulation and passive design strategies, CMU helps achieve net-zero energy targets by lowering lifetime energy consumption.

- **Energy savings:** Thermal mass properties of CMU reduce HVAC energy demand by up to 50%, contributing to net-zero goals.
  Source: Southeast Concrete Masonry Association

- **Passive design impact:** CMU-based designs help maintain stable indoor temperatures and can significantly reduce peak energy demand on the grid. Modeling studies have found that high-mass wall systems in commercial buildings can lower peak heating/cooling loads by as much as 15% versus lightweight walls under typical conditions, and in some climates the total annual energy use reduction from heavy exterior walls (with optimized thickness) reached nearly 40% compared to light-frame construction.
  Source: ResearchGate, 2019. ASHRAE 2013

- **Lower lifecycle carbon:** Analyses by the Athena Sustainable Materials Institute note that maintenance-related GHG emissions for a masonry structure are only a fraction (approx. 1/4) of those for an equivalent wood-framed structure over a 60- or 100-year period. The inherent durability and inertia of CMU means 75% less carbon emitted in upkeep and refurbishments compared to light-frame construction.
  Source: Department of Energy: Embodied Carbon Reduction in New Construction, 2024

Q: How does CMU help to reduce construction waste?

A: CMU generates minimal waste compared to other materials. CMU is highly recyclable and reusable, contributing to sustainable construction. They can be crushed into recycled concrete aggregate (RCA) for road base, fill, or new concrete production, reducing the demand for virgin materials.

Whole blocks can be salvaged and reused in new construction, landscaping, retaining walls, or temporary structures. Additionally, crushed CMU can be used in carbon-sequestering concrete, permeable pavement systems, and erosion control applications. Their durability also allows for modular reuse in acoustic barriers, thermal mass applications, and deconstructable masonry designs, minimizing waste and supporting a circular economy.

- **CMU waste is <5%** of total material volume on job sites, significantly lower than wood (20-30%) or gypsum board (12-15%).
  Source: EPA Construction Waste Report

- **Circular economy impact:** CMU reuse and recycling reduces demand for virgin materials by 50% in road base and secondary applications.
  Source: Frontiersin.org 2023

- **Recycled CMU use:** Crushed CMU can be used in carbon-sequestering concrete, permeable pavement systems, and erosion control applications.
  Source: Washington State Department of Ecology, 2022

Q: How does concrete masonry affect indoor air quality?

A: Unlike some alternative materials that rely on adhesives, sealants, or composite resins that emit volatile organic compounds (VOCs), CMU is inert and does not off-gas harmful chemicals. This makes them a preferred material for improving indoor air quality in schools, hospitals, and other high-occupancy buildings.

- **Moisture Resistance:** CMU doesn't rot, warp, or serve as a food source for mold, helping reduce allergens and improve long-term air quality.
- **Thermal Mass & Humidity Control:** The dense mass of CMU helps moderate indoor temperatures and humidity by absorbing and slowly releasing heat and moisture, promoting a stable, comfortable environment.

  Source: NJ Green Building Manual. CMACN Report on Green Building, Sustainable Design and Concrete Masonry, 2013
- **Acoustic Separation:** CMU's density significantly reduces sound transmission, supporting quieter, more private spaces—especially valuable in schools, multifamily housing, and healthcare settings.
- **Fire & Smoke Safety:** Unlike combustible materials, concrete masonry won't ignite, burn, or release toxic smoke—a leading cause of death in fire events. Its inherent fire resistance helps buy valuable time for evacuation without adding to smoke-related hazards.

Q: How do locally sourced materials impact sustainability?

A: Local sourcing plays a significant role in lowering a building material's overall carbon footprint. Concrete masonry units (CMUs) are typically manufactured close to where they're used—often within 50–100 miles—minimizing transportation-related emissions and supporting more resilient, regionally self-sufficient supply chains.

- **Shorter shipping distances:** Most CMU plants operate regionally, and projects using CMU often benefit from 15–30% lower transportation emissions compared to materials shipped cross-country.
  Source: Concrete Masonry & Hardscapes Association (CMHA), TEK 0 6-9
- **Reduced Supply Chain Vulnerability:** The U.S. Department of Transportation promotes local procurement as a resilience strategy, noting that sourcing materials locally can strengthen infrastructure by reducing reliance on long, fragile supply chains and mitigating disruption risks.
- **Lower lifecycle carbon:** CMU production relies on abundant, regionally available ingredients, which lowers the need for long-haul freight and limits the embodied carbon associated with complex supply logistics.
  Source: ARUP Buildings & Infrastructure Priority Actions for Sustainability Embodied Carbon, 2023

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