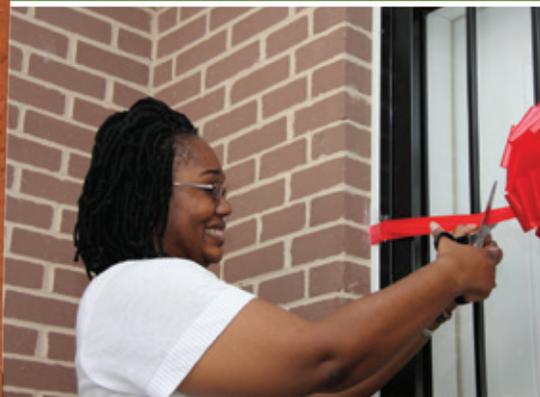


SMaRT[®] Environmental Product Declaration

In accordance with ISO 14025



CalStar Brick



**CALSTAR
PRODUCTS™**

Product Description:

Bricks have long been prized for their classic look, durability, and weather resistance. CalStar Products, Inc. has developed a proprietary new manufacturing process that reduces manufacturing energy requirements, while producing bricks that meet industry standards, without compromising project aesthetics or budgets. CalStar modular-sized brick (3 5/8 x 2 1/4 x 7 5/8 inches) were used for this analysis.

CalStar bricks are designed and intended to be used anywhere bricks are used. CalStar bricks meet the performance requirements discussed in ASTM C216 *Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)*, though CalStar bricks are not made of clay or shale. They are installed using the same materials (mortar) with the same labor (masons) on the same projects.

CalStar bricks contain 37.1% fly ash, which is a post-industrial (pre consumer) recycled material. Fly ash is a waste product of generating electricity from coal, which is generally disposed of in landfills. The CalStar process uses fly ash as the binder in bricks, eliminating the need for clay, kiln firing or Portland cement. The entire manufacturing time for a CalStar brick from raw material delivery to packaging is approximately 24 hours. The CalStar process requires very little energy during the life cycle—especially the manufacturing stage—and, as a result, has a small carbon footprint.

CalStar’s commitment to environmental performance includes carbon reduction, embodied energy reduction, recycling industrial waste, and waste diversion from landfills. CalStar purchases Renewable Energy Credits (RECs) from wind energy to offset half of the manufacturing energy usage. This renewable energy was deliberately not taken into account during the life cycle assessment (LCA). The LCA values shown in this document represent the complete life cycle of CalStar bricks, without accounting for the RECs purchased by CalStar.

Manufacturer:

CalStar Products, Inc. develops and manufactures sustainable building products that allow customers to dramatically reduce the embodied energy and carbon footprint of their projects and incorporate significant recycled materials, without compromising building performance or budgets. Founded in Silicon Valley and headquartered in Wisconsin, CalStar’s mission encompasses the national priorities of supporting energy independence, mitigating climate change, preserving natural resources, recycling industrial waste, and creating green jobs.

For more information, visit <http://www.calstarproducts.com>

Material Declaration:

CalStar modular bricks are composed of the materials listed in this table. (The table shows materials comprising 1% or more by weight.) A single modular brick weighs 4.2 lbs and contains 37.1% post-industrial recycled content (fly ash). Bricks are packaged in cubes, with 525 modular bricks in a cube. Cubes are strapped together using recyclable polyester plastic straps. Cubes are then stretch-wrapped, using recyclable low-density polyethylene.

material	weight/brick (lb)	amount of mixture
sand	2.34	55.8%
fly ash	1.56	37.1%
water	0.25	5.9%

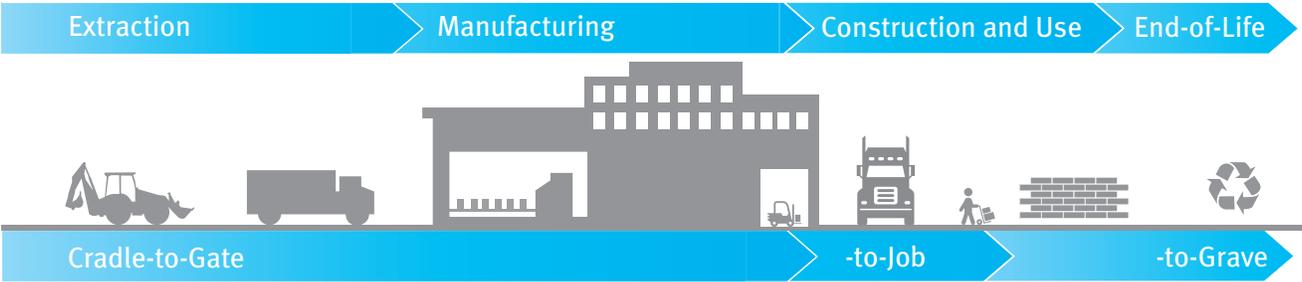
Environmental Product Declaration:

CalStar and its users, owners, employees, and stakeholders possess a shared interest in the environment with particular focus on mitigating climate change through the reduction of product-related embodied energy and associated greenhouse gas emissions. As such, CalStar commissioned an ISO-compliant life cycle assessment from leading architectural firm, Perkins+Will, to assess the environmental impacts of a CalStar brick throughout its entire life cycle—including raw materials extraction and transportation, brick production, transportation to job site, use, and end-of-life. The functional unit used in the LCA is one modular brick (3 5/8 x 2 1/4 x 7 5/8 inches) plus associated mortar (mortar joints assumed to be 3/8 inches wide, and run the full depth of the brick). The brick has an 80-year life expectancy, and the LCA accounts for tuckpointing the mortar once (at the 40-year mark) during the life cycle.

The LCA was performed by Perkins+Will, using Gabi 5.0 software, following the SMaRT[®] Product Criteria Rule (PCR). The SMaRT EPD Policy and PCR documents meet the requirements of the ISO Standards for LCAs and EPDs. It should be noted that the SMaRT PCR is more comprehensive than the standard ISO requirements for reporting of environmental impacts—SMaRT requires eight Life Cycle Impact categories, three more than ISO 21930, including Human Health, Criteria Air Pollutants and Ecological Toxicity.

Life Cycle Inventory Analysis:

The life cycle inventory analysis covers all the life cycle phases, as shown below:



Phase Descriptions:

Extraction Phase:

This phase includes raw material extraction and transportation to the CalStar manufacturing facility. The sand used is obtained from a local quarry. Fly ash is a waste product from coal combustion for electricity generation. Fly ash is typically disposed of in landfills. By recycling fly ash into bricks, CalStar diverts material from landfills. CalStar uses fly ash from a power plant located 6 miles from the CalStar plant. A CalStar brick contains 37.1% recycled post-industrial material (fly ash).

Over 98% of CalStar’s raw materials are sourced within 60 miles of the CalStar plant. As consistent with the SMaRT PCR, CalStar considers two-way transportation for this phase: trucks transport raw materials from their sources to the plant, and then return back to the raw material sources—no backhaul is considered.

Phase Descriptions: *(Continued)*

Manufacture Phase:

This phase includes the manufacturing process for CalStar brick. Raw materials are measured into a mixer; mixed for a fixed time; conveyed into a vibrocompaction press hopper; discharged into brick molds; vibrocompacted; ejected from the brick molds; conveyed into curing chambers; cured; conveyed to packaging stations; inspected to ensure conformance with CalStar’s strict quality requirements; and then packaged. Packaging uses recyclable plastic straps and recyclable LDPE stretch-wrap.

As specified by the SMaRT PCR and required by ISO, CalStar includes upstream (also called “primary” or “source”) energy required to produce the energy used in the manufacturing process (also called “delivered” or “site” energy).

This phase captures the bulk of CalStar’s innovation in reducing environmental impact, which is the result of two primary innovations: using an abundant waste material as a critical manufacturing resource, and reducing manufacturing energy needs. CalStar bricks perform and are used in virtually the same way as conventional brick, but do not require firing at high temperatures for long periods of time.

Construction and Use Phase:

This phase includes transportation of bricks and mortar to the jobsite; the mortar used to construct the wall; and the water required for the mortar. Though the CalStar brick itself is not comprised of mortar, mortar is required to build the brick into a functional element, such as a wall or building. As such, the mortar is considered part of the life cycle. CalStar brick uses the same types and amounts of mortar as conventional fired brick.

Brick and ingredients for mortar are generally transported on flat-bed trucks on as-needed basis by contract haulers. As such, one-way transportation is considered for this phase, as back-hauls on flat-bed trucks are common and expected.

The construction process itself is fairly low waste, as bricks are modular in nature, requiring that only the number of bricks needed on a job are actually used. Remaining bricks can be used on other jobs. Likewise, mortar is mixed in batches, allowing masons to mix only the amount of mortar that is needed for a specific job.

The life cycle of a CalStar brick wall or building is defined to be 80 years. Bricks generally need very little maintenance, as they are pest- and weather-resistant, and do not require painting or sealing. However, the front edge of mortar can deteriorate over time. Thus, the life cycle assessment includes tuckpointing the mortar once (removing and replacing the front edge of mortar in the joints), at about 40 years. Tuckpointing is included in the Construction and Use phase.

End-of-Life Phase:

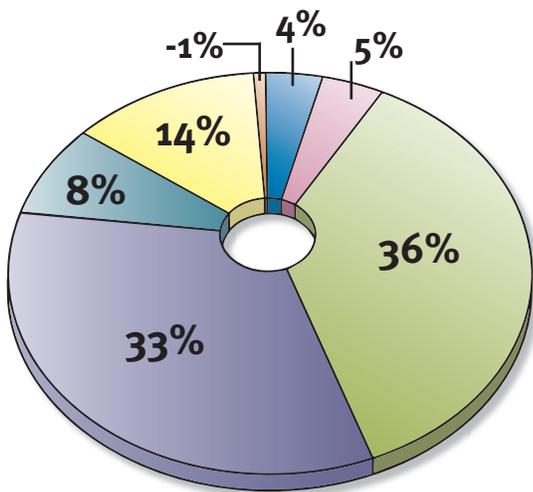
This phase includes demolition of the brick and mortar, as well as transportation to a recycling yard or landfill. Used CalStar brick and mortar can be readily recycled by crushing into an aggregate for road sub-base; the facilities for doing so are abundant. Therefore, the LCA anticipates that 80% of the material will be recycled and a portion of the environmental impacts for mining virgin aggregate, such as CO₂ emissions from diesel fuel use, are credited back to the CalStar brick during the end-of-life phase. The LCA anticipates the remaining 20% of the material is landfilled.

Environmental Impact Potential:

Impact	Unit	Extraction	Manufacturing	Construction + Use	End-Of-Life	Total
Global Warming Air (carbon footprint)	kg CO ₂	0.005	0.053	0.070	-0.001	0.127
Fossil Fuel Depletion (embodied energy)	kg Oil	0.005	0.026	0.030	0.003	0.063
Human Health Criteria Air	kg PM ₁₀	2.032	4.421	5.042	-1.161	10.334
Human Toxicity	kg 1,4-DB	0.185	0.288	1.763	-0.105	2.131
EcoToxicity - Water	PAF m ³	0.424	2.008	2.394	0.256	5.082
EcoToxicity - Soil	PAF m ³	1.203	1.055	1.794	-2.713	1.340
EcoToxicity - Air	PAF m ³	0.066	1.202	0.802	0.014	2.084
Water Depletion	m ³	0.004	0.021	0.024	-0.002	0.046
Metal Depletion	kg Fe	0.051	0.204	8.187	0.003	8.445
Smog Air	kg O ₃	0.573	2.161	3.184	-0.222	5.697
Ozone Depletion Air	kg CFC 11	0.831	3.075	4.805	-0.618	8.093
Eutrophication Air	kg N	0.207	0.549	2.429	0.010	3.195
Acidification Air	kg H+ moles	0.001	0.012	0.010	0.000	0.023

Extraction phase includes transportation of raw materials to manufacturing site.
 Construction phase includes transportation of finished goods and mortar to job site, as well as use of mortar.
 Use phase includes tuckpointing.
 End-of-life phase includes recycling and energy required to crush brick for recycled use.

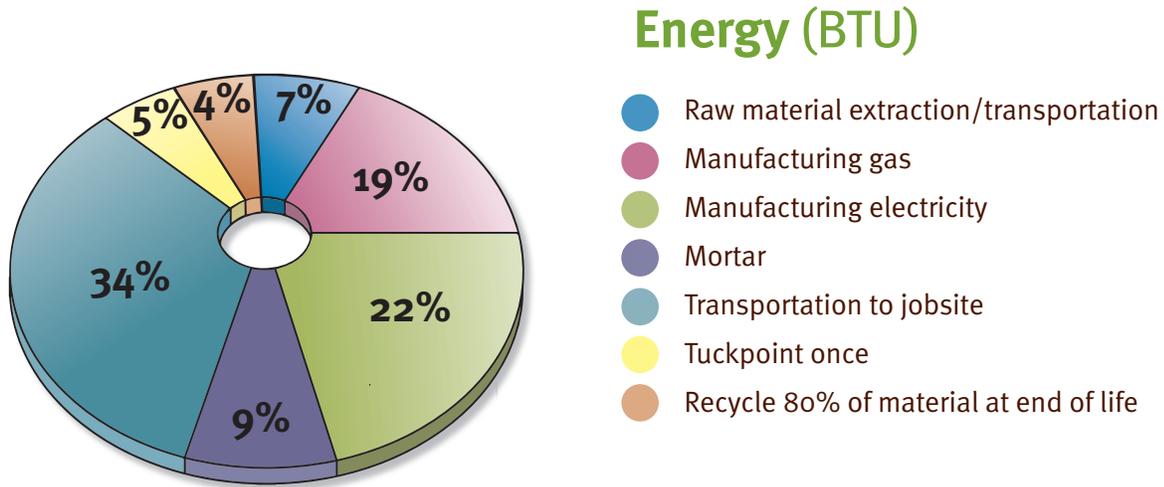
Life Cycle Carbon Footprint of CalStar Brick



CO₂ (lb)

- Raw material extraction/transportation
- Manufacturing gas
- Manufacturing electricity
- Mortar
- Transportation to jobsite
- Tuckpoint once
- Recycle 80% of material at the end of life

Life Cycle Embodied Energy of CalStar Brick



Note: CalStar’s revolutionary manufacturing process dramatically reduces the embodied energy and associated greenhouse gas emissions of brick. Nonetheless, the LCA shows that the manufacturing process is responsible for the largest portion of embodied energy within the life cycle. In keeping with CalStar’s continued commitment to the environment, CalStar purchases Renewable Energy Credits (RECs) from wind energy to offset half of the manufacturing energy usage. This renewable energy is deliberately not taken into account during the life cycle assessment. The LCA values shown in this document represent the complete life cycle of CalStar bricks, without accounting for the RECs purchased by CalStar.

Maintenance, Quality, Durability

Brick masonry is known for its durability and longevity. It is a low-maintenance cladding option that requires no painting and little maintenance. It is generally resistant to weather and pests. It is often considered a premium cladding option.

CalStar Brick and SMaRT[®]:

CalStar brick is rated Sustainable Platinum by the SMaRT[®] Sustainable Product Standard. SMaRT is a comprehensive, transparent, consensus-based sustainable product standard that measures a product's environmental, economic and social benefits over its life cycle and throughout its global supply chain, from raw materials extraction through reclamation or re-use. The SMaRT Scorecard results of different products can be accurately compared and include LCA results. The CalStar SMaRT Scorecard and SMaRT Certification Summary are available at this link:

http://mts.sustainableproducts.com/SMaRT_Certified.html

SMaRT & SMaRT EPD Significance

All SMaRT Product EPDs are Certified as Sustainable Products, Stockholm Treaty Toxic Chemicals/PVC and SF6 free, meet SMaRT's Carcinogen and Legal Operations Policies, use FSC Certified Wood for wood products, and are uniquely comparable and accurately based on life cycle assessment (LCA).

CalStar brick is a SMaRT **Sustainable Platinum** certified product achieving a total of 90 points:

- 23 points for Safe for Public Health & Environment
- 31 points for Renewable Energy & Energy Reduction
- 5 points for Biobased or Recycled Materials
- 12 points for Facility or Company Based Requirements
- 4 points for Reclamation, Sustainable Reuse & End of Life Management
- 15 points for Innovation in Manufacturing



Background on SMaRT & ISO Environmental Labels

SMaRT is a type 1 consensus, performance-based and quantified Ecolabel, an independently third-party verified, multi-criteria license to use the SMaRT Label indicating the overall environmental and sustainable preferability of a product on a life cycle basis. Type 2 labels are manufacturer self-claims on the environment without third-party verification. A type 3 label is an independent, qualified third-party verified environmental product declaration based on a quantified LCA with set parameters. To increase accuracy, SMaRT EPDs combine the requirements of a type 1 Ecolabel with a transparent type 3 label. LCAs are best used to obtain supplier environmental impact data and improve product design.

CalStar Brick and LEED®:

CalStar Brick contributes to a number of LEED credits:

- Materials and Resources Credit 4: Recycled Content, 2 points possible
- Materials and Resources Credit 5: Regional Materials within 500 miles of our manufacturing facility in Racine, WI, 2 points possible
- Innovation in Design Credits: Exemplary Performance in both Regional Materials and Recycled Content, 2 points possible
- Innovation in Design Credit: SmARt Certified Materials, 1 points possible

Interpretation:

CalStar's innovative process produces bricks with an extremely small global warming potential (carbon footprint) and very little fossil fuel depletion (embodied energy). In addition, CalStar bricks contain 37.1% post-industrial recycled content that has been diverted from a landfill.

Methodology and Certification:

The LCA was performed by Perkins+Will, using Gabi 5.0 software, following the SMaRT Product Criteria Rule (PCR). 

This SMaRT Environmental Product Declaration (EPD) was certified by Market Transformation to Sustainability (MTS) November 2012, and expires November 2015.

CalStar asserts that the SMaRT EPD Policy and PCR were adhered to in preparation of this Declaration with accurate information that is not misleading, and qualified professionals were used, consistent with the FTC Environmental Marketing Guides.

SMaRT PCR review consistent with ISO 21930 §§6.2 & 9.1 & ISO 14025 §8.1.2 was conducted by MTS. The SMaRT® Committee overseeing this EPD Policy and requirements can be contacted through MTS@sustainableproducts.com.

Independent verification of the declaration and data, according to ISO 14025:2006 was performed by an external expert reviewer, Michael Italiano, Founder USGBC. (ISO 14025 §8.1.1)

SMaRT EPD third-party verification was conducted by MTS, independent of first parties (suppliers/manufacturers) and second parties (purchasers). The verification is appropriate for business-to-business and business-to-consumer communications, and consumer and environmental representatives, per the SMaRT EPD Policy, which is consistent with ISO 14025 §9.3.

MTS was not involved in the development of the ISO-compliant LCA or the EPD, has no conflicts of interests, and is a nonprofit IRC §501(c)(3) (ISO 14025 §§8.1.1 & 9.4).

MTS is competent to conduct the third-party SMaRT® EPD verification pursuant to ISO 14025 §8.2 as documented in section 12 of the SMaRT® EPD Policy.

References:

SMaRT® Environmental Product Declaration (EPD) Policy & PCR: [http:// mts.sustainableproducts.com/SMaRT/CalStar](http://mts.sustainableproducts.com/SMaRT/CalStar)
ISO 14025 Environmental labels and declarations—Type III Environmental Declarations—Principal and Procedures
ISO 14040 Life Cycle Assessment—Principles and Framework
ISO 14044 Life Cycle Assessment— Requirements and Guidelines
ISO 21930 Sustainability in Building Construction—Environmental Declaration of Building Products
Federal Trade Commission (FTC) Environmental Guidelines
LCA Method and Characterization Factor

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