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ENVIRONMENTAL PRODUCT DECLARATION

U.S.–Canada Industrywide Clay Brick



**Certified
Environmental
Product Declaration**
www.nsf.org

Date of Issue: Oct. 7, 2020

Valid Until: Oct. 7, 2025

Declaration No.: EPD10447

PARTICIPATING BRICK PRODUCERS

The following brick producers participated in the data collection process that informed the development of the LCIs presented in this report.

Acme Brick Company

3024 Acme Brick Plaza
Fort Worth, TX 76109
brick.com

Belden Brick Company

700 W. Tuscarawas St.
Canton, OH 44701
beldenbrick.com

Bowerston Shale Company

515 Main St.
Bowerston, OH 44695
bowerstonshale.com

Brampton Brick, Inc.

1256 E. County Road 950 N.
Farmersburg, IN 47850
bramptonbrick.com

Endicott Clay Products Co.

57120 707th Road
Endicott, NE 68350
endicott.com

General Shale, Inc.

3015 Bristol Highway
Johnson City, TN 37601
generalshale.com

Glen-Gery Corporation

1166 Spring St.
Wyomissing, PA 19610
glengery.com

Hebron Brick Company

3280 Veterans Blvd. S.
Suite 320
Fargo, ND 58104
hebronbrick.com

Lee Brick & Tile Company

3704 Hawkins Ave.
Sanford, NC 27330
leebrick.com

Meridian Brick LLC

6455 Shiloh Road, Suite D
Alpharetta, GA 30005
meridianbrick.com

Meridian Brick Canada Ltd.

5155 Dundas St. W.
Burlington, ON L7R 3Y2
Canada
meridianbrick.com

Pine Hall Brick, Inc.

2701 Shorefair Drive
Winston Salem, NC 27105
pinehallbrick.com

Statesville Brick Company

391 Brick Yard Road
Statesville, NC 28677
statesvillebrick.com

1. Demonstration of verification

This document is a Type III industry-average Environmental Product Declaration (EPD) describing clay brick produced in the United States (U.S.) and Canada. A list of clay brick production companies that participated in the development of this EPD is included on the cover (previous) page.

This EPD is certified by NSF to conform to the Product Category Rule (PCR) referenced below, which is based on ISO 21930 (ISO 2007) as well as to the requirements of ISO 14025 (ISO 2006c). NSF also verifies that the life cycle assessment (LCA) upon which it is based conforms to the requirements of ISO 14044 (ISO 2006b).

Since EPDs developed under this PCR only cover the cradle-to-gate impacts of clay brick, clay brick pavers and structural clay tiles using a declared unit, the results cannot be used to compare between products.

Table 1. Information on EPD holder, reference standards and program operator

Declaration holder	Brick Industry Association 12007 Sunrise Valley Drive, Suite 430 Reston, VA 20191 USA www.gobrick.com
Declaration number	EPD10447
Declared product	Clay brick
Type of EPD	Cradle-to-gate
Declared unit	1 m ³
Core PCR	ISO 21930:2007, Sustainability in building construction — Environmental declaration of building products
Category PCR	ASTM Product Category Rule for Clay Brick, Clay Brick Pavers and Structural Clay Tile
PCR review	PCR review was conducted by: • Christoph Koffler, Ph.D., chairperson, thinkstep, Inc. • John P. Sanders, Ph.D., PE, The National Brick Research Center • Christine A. Subasic, PE, consulting architectural engineer For further information, please contact cert@astm.org
Period of validity	Five (5) years from date of issue

Independent verification of the declaration and data, according to ISO 21930:2007 and ISO 14025:2006, has been carried out by an external verifier.

Third-party verifier	Terrie Boguski, Harmony Environmental 913-780-3328 tboguski@harmonyenviro.com
Program operator	NSF Certification, LLC 789 N. Dixboro Road Ann Arbor, MI 48105 USA www.nsf.org
Date of issue	10/7/2020

2. Description of the product

Clay brick products are primarily composed of clays, shales and small amounts of additives to achieve a desired profile of properties (e.g., strength, color). The product under study is clay brick produced in the U.S. and Canada, meeting one or more of the specifications described in Table 2:

Table 2. Specifications of clay brick products under study

Facing Brick	ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
	CSA A82 Fired masonry brick made from clay or shale
Hollow Brick	ASTM C652 Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
	CSA A82 Fired masonry brick made from clay or shale
Thin Veneer Brick	ASTM C1088 Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
Building Brick	ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
	CSA A82 Fired masonry brick made from clay or shale
Chemical-Resistant Brick	ASTM C279 Specification for Chemical-Resistant Masonry Units
Firebox Brick	ASTM C1261 Specification for Firebox Brick for Residential Fireplaces
Glazed Brick (Single Fired)	ASTM C1405 Specification for Glazed Brick (Single Fired, Brick Units)
Glazed Brick (Double Fired)	ASTM C126 Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
Industrial Chimney Lining Brick	ASTM C980 Standard Specification for Industrial Chimney Lining Brick
Industrial Floor Brick	ASTM C410 Specification for Industrial Floor Brick
Sewer Brick	ASTM C32 Specification for Sewer and Manhole Brick (Made From Clay or Shale)
Pedestrian and Light Traffic Paving Brick	ASTM C902 Standard Specification for Pedestrian and Light Traffic Paving Brick
Heavy Vehicular Paving Brick	ASTM C1272 Specification for Heavy Vehicular Paving Brick

Table 3 describes typical product composition, and packaging is described in Table 4.

Table 3. Material composition of clay brick produced in the U.S. and Canada

Material ¹	Mass in final product (kg/m ³)	Share in the final product ²
Clay and Shale	2,010	94.9%
Secondary material (ash, grog, others)	78.7	3.71%
Pigments	19.1	0.901%
Additives	10.6	0.499%
Average clay brick density	2,120	Not Applicable

1. No hazardous substances are used in the production of clay brick.

2. While all clay brick products contain the ingredients listed above, the average clay brick production data computed for this EPD represents the production-weighted average use of all materials by all participating plants. The data should not be interpreted to mean that the ratios presented in this table are the formulation for all clay brick products.

Table 4. Packaging used for clay brick produced in the U.S. and Canada

Material	Amount per declared unit	Unit
Strap (plastic and steel)	35.4	m/m ³
Dividers (paper and wood)	0.00499	m ³ /m ³
Wooden pallet	0.0278	Unit/m ³
Other packaging	0.905	kg/m ³

Clay brick are produced in a wide variety of sizes. The clay brick represented by the data used in this study are described by the dimensions shown in Figures 1 and 2.

Figure 1. Modular brick sizes (nominal dimensions)

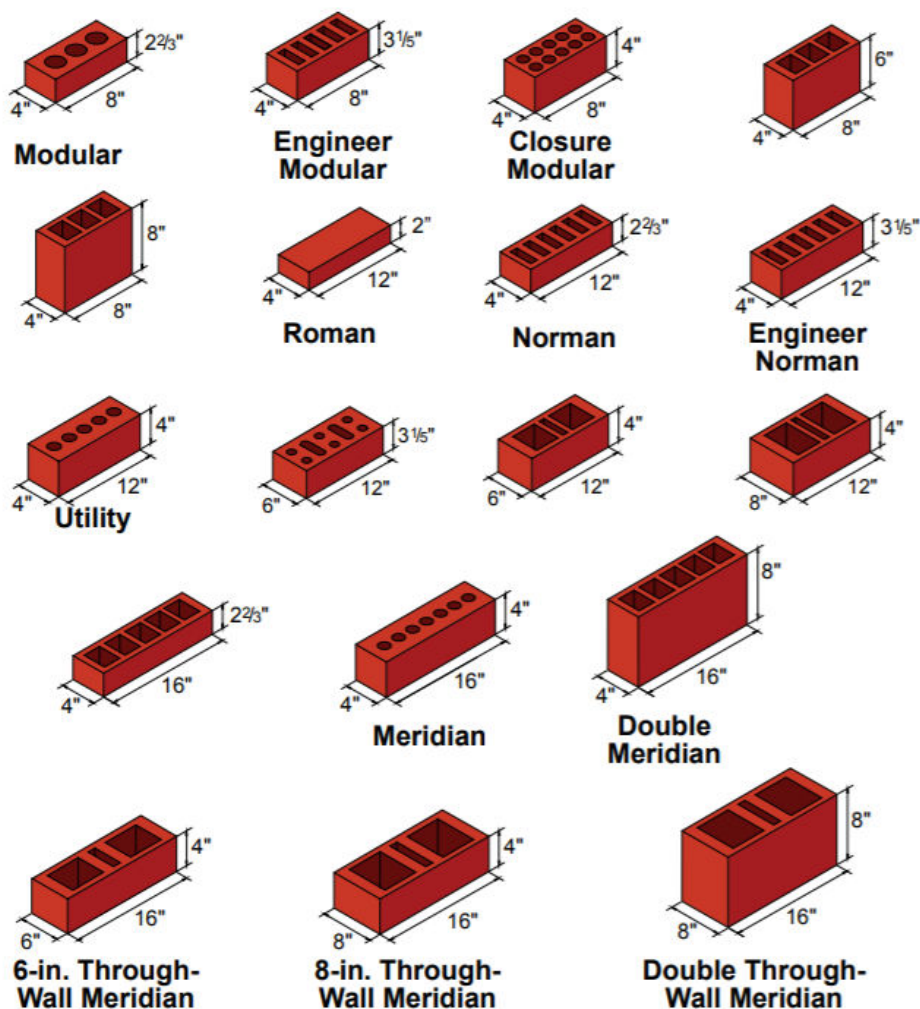
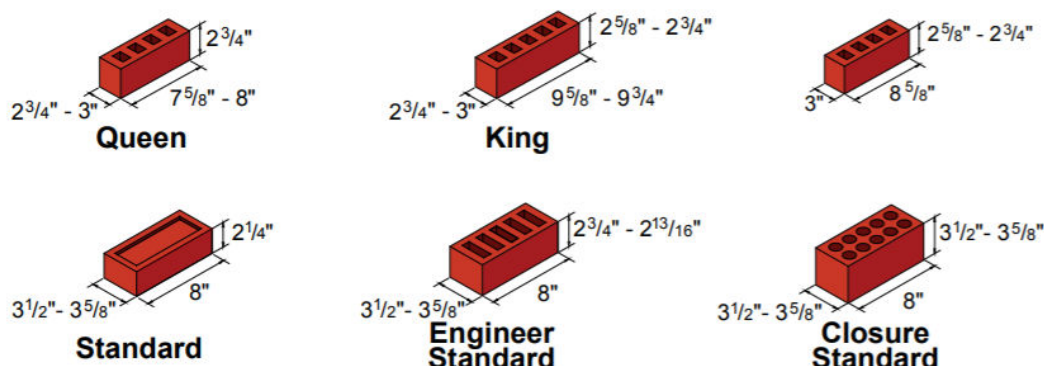


Figure 2. Non-modular brick sizes (specified dimensions)



3. Declared unit

The declared unit for this study is the production of one cubic meter (1 m^3) of clay brick awaiting delivery to a customer. The brick are either packaged in banded cubic formations or on wooden pallets and are stored typically in open air.

4. System boundary

4.1 Life cycle stages

This EPD describes clay brick production from cradle to gate, as depicted in Figures 3 and 4. This includes all modules (A1–A3) of the product stage as defined by the PCR. Specifically, product stage modules capture the following aspects of the life cycle:

- Extraction and processing of raw materials and packaging used to produce the clay brick
- Transportation¹ of raw materials and packaging from source to the clay brick production site
- Consumption of energy and water required to produce the clay brick
- Emissions and wastes generated from producing the clay brick
- Transportation of wastes from the clay brick production site to end of life
- End of life of wastes generated during clay brick production

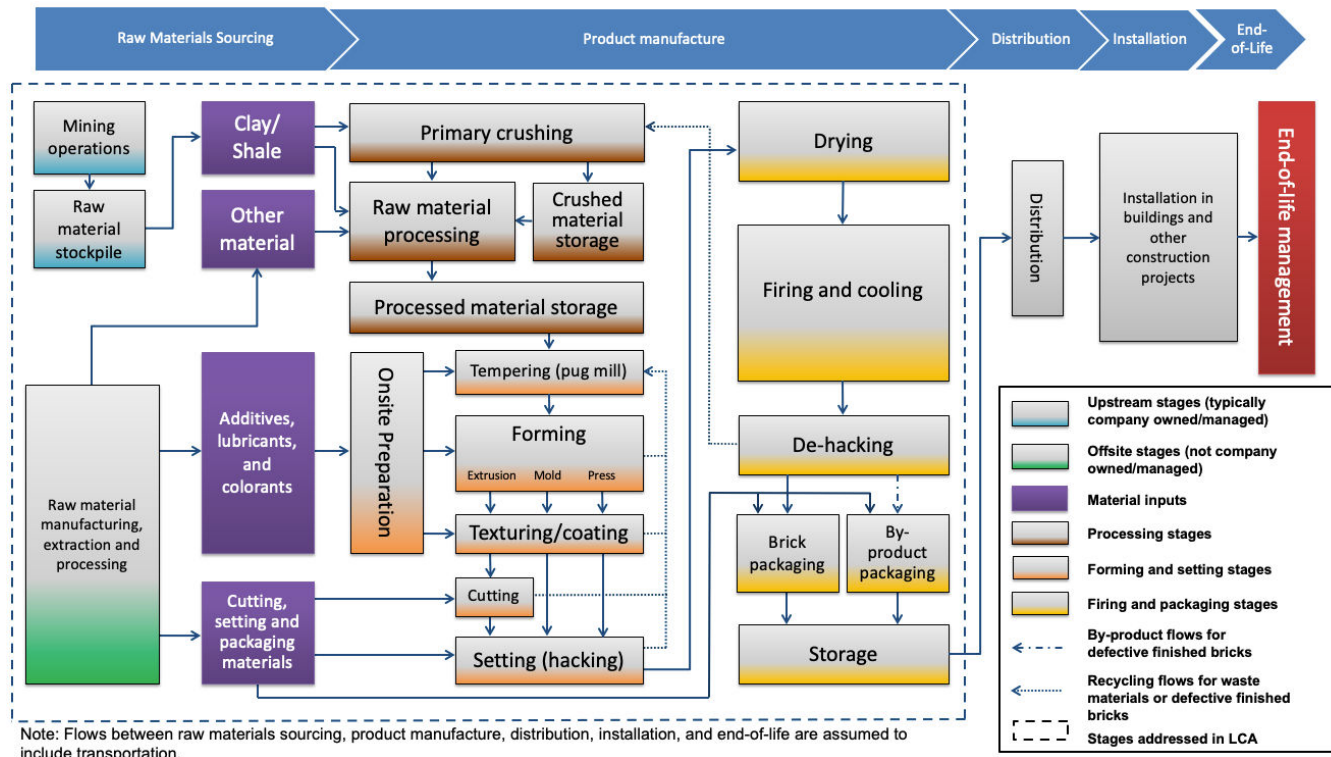
1. Empty backhaul is included as provided in the Ecoinvent datasets used in the analysis.

The Construction, Use and End-of-Life stages are excluded from the scope of the PCR and therefore from this EPD.

Figure 3. Life cycle stages considered in the EPD, as prescribed in the reference PCR.
Only A1, A2 and A3 are taken into account in a cradle-to-gate perspective.

Product stage			Construction process stage		Use stage							End-of-life stage			
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4

Figure 4. Typical production process for clay brick in the U.S. and Canada



4.2 Temporal and geographic boundaries

The clay brick production impacts estimated by the LCA represent production in the U.S. and in Canada in 2018. Data are still representative for the clay brick industry in 2020 as no major changes in manufacturing processes have occurred in the past years. Data and assumptions reflect equipment, processes and market conditions for this year. Background processes, such as quarry operations and electricity generation, are characterized by data that represent processes specific to the U.S. and Canada where information is available. In cases where this information is not available, the best available alternative information is used. Additional details describing the background data are provided in the report *Life cycle assessment of clay brick produced in the U.S. and Canada* developed for the Brick Industry Association (BIA). For further information on the report, please contact BIA via brickinfo@bia.org.

4.3 Exclusion and cut-off criteria

As per the PCR, the following items are not considered within the System Boundaries.

- Production, manufacture and construction of manufacturing capital goods and infrastructure
- Production and manufacture of production equipment, delivery vehicles and laboratory equipment
- Personnel-related activities (travel, furniture and office supplies)
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location

As described in the PCR, if a flow is less than 1% of the cumulative mass of the system model, then it may be excluded, provided that its environmental relevance is minor. All product components and production processes are included when the necessary information is readily available or a reasonable estimate can be made. The processes listed in Table 5 are excluded from the study due to lack of reliable data and expected low contribution to impact.

**Table 5. Flows excluded from the LCA
and their contribution to total mass input**

Flow	Contribution to total input, by mass
Secondary pigments	0.040%
Grog	0.116%
Furnace bottom ash	0.387%
Other secondary materials	0.357%
Total	0.900%
CUT-OFF RULE	<1%

4.4 Allocation approach

Allocation of inventory flows and subsequently environmental impact is relevant when assets are shared between product systems. For co-products, no credit is considered, and no allocation is applied due to the negligible amounts of co-products produced. Including co-products would not alter the results of the study.

5. Representation of the U.S. and Canada clay brick production

The life cycle impact assessment (LCIA) results presented by this EPD are calculated using an industry average LCI of U.S. and Canada clay brick production. The LCI is assembled with data shared by 13 brick producers through a survey of 2018 operations.

The study represents 31% of 2018 U.S. brick production and 48% of 2018 Canadian brick production. Overall, the study captures 32% of 2018 brick production across the U.S. and Canada.

The average electricity mixes for the U.S. and Canada are used to calculate impacts of electricity generation. The production share taking place in each country is applied to split the average electricity consumption value between the two mixes.

5.1 Production technology

Clay brick can be produced using different technologies. The clay brick described by this EPD are produced under the profile of production technologies shown in Table 6.

Table 6. Clay brick production technologies applied in the making of the product described by this EPD

Production technology	Percent of clay brick produced per production technology
Stiff mud	83%
Soft mud	5%
Stiff and soft mud	13%

About 90% of brick in the U.S. and 100% in Canada are produced by the stiff-mud process (BIA 2006, Meridian 2020), thus making this EPD representative of the technologies used in these countries.

5.2 Limitations

This EPD represents average environmental performance of clay brick production in the U.S. and Canada. It considers only plants located in the U.S. and Canada, although some participating producers may operate elsewhere in the world.

The information provided in this EPD may not adequately represent brick production systems that differ greatly from those captured by the data used in the underlying LCA. Additionally, EPDs from different programs (using a different PCR) may not be comparable.

Life cycle impact assessment results present potential and not actual environmental impacts. They are relative expressions that are not intended to predict the final impact or risk on the natural media or whether standards or safety margins are exceeded. Additionally, these categories do not cover all the environmental impacts associated with human activities. Impacts such as noise, odors, electromagnetic fields and others are not included in the present assessment.

5.3 Additional information regarding LCA methodology

Additional information regarding databases and impact methodologies used for conducting the LCA for this EPD can be found in the 2020 report *Life cycle assessment of clay brick produced in the U.S. and Canada*, developed for the Brick Industry Association.

6. Life cycle assessment results

Computation of the cradle-to-gate impacts of producing clay bricks have been carried out with Simapro (v. 9.0.0.49 developed by PRé Consultants, www.pre.nl), using as database Ecoinvent 3.4 allocation, cut-off by classification databases (<http://www.ecoinvent.org/home>). The impact categories are calculated using characterization factors specified in version 2.1 of U.S. EPA TRACI (EPA 2012). The results are presented in Table 7.

Table 7. Life-cycle results for clay brick production

Metric	Cradle-to-gate total, per cubic meter of brick	Unit
Environmental impact		
Global Warming Potential	503	kg CO ₂ eq
Acidification Potential	1.52	kg SO ₂ eq
Eutrophication Potential	0.888	kg N eq
Smog Potential	15.6	kg O ₃ eq
Ozone Depletion Potential	0.0000629	kg CFC-11 eq
Total primary energy consumption		
Nonrenewable Fossil	8,210	MJ
Nonrenewable Nuclear	516	MJ
Renewable (Solar, Wind, Hydroelectric and Geothermal)	38.3	MJ
Renewable (Biomass)	140	MJ
Material resources consumption		
Nonrenewable Material Resources	2,280	kg
Renewable Material Resources	0.00298	kg
Net Fresh Water (Inputs Minus Outputs)	2,810	L
Total waste generation		
Non-Hazardous Waste Generated	2.56	kg
Hazardous Waste Generated	0.00674	kg

7. Additional environmental information

No additional environmental information is provided.

8. References

1. ASTM (2014) Product Category Rules for Preparing an Environmental Product Declaration for Clay Brick, Clay Brick Pavers and Structural Clay Tile. July 2016. <https://www.astm.org/CERTIFICATION/EpdAndPCRs.html>
2. ISO (2006a) Environmental management – life cycle assessment – principles and framework. ISO 14040:2006. Geneva, Switzerland
3. ISO (2006b) Environmental management – life cycle assessment – requirements and guidelines. ISO 14044:2006. Geneva, Switzerland
4. ISO (2006c) Environmental labels and declarations – Type III environmental declarations – Principles and procedures ISO/TR 14025:2006. Geneva, Switzerland
5. ISO (2007) Sustainability in building construction – Environmental declaration of building products. ISO 21930:2007. Geneva, Switzerland
6. Meridian Brick Canada Ltd (Meridian) (2020) Discussions between BIA and Meridian. September 2020