Environmental Product Declaration

Clay Masonry Products Industry Average EPD

Clay Masonry Products

The brick industry recognizes that the stewardship of our planet lies in the hands of our generation. Our goal is to continually seek out innovative, environmentally friendly opportunities in the manufacturing process and for the end use of clay brick products. As demonstrated over time, we are committed to manufacturing products that provide exceptional energy efficiency, durability, recyclability, and low maintenance with minimal impact on the environment from which they originate. We will ensure that our facilities meet or exceed state and federal environmental regulations, and we will continue to partner with building professionals to help them in using our products to create environmentally responsible living and working spaces for today's and future generations.

Products Description

Clay brick, clay brick pavers, and structural clay tile are manufactured masonry units made by forming and firing prepared mixtures of clay, shale, and other materials to a high enough temperature to create amorphous material in a vitreous (glassy) or ceramic bonding phase.

Certified Environmental Product Declaration

www.nsf.org

Environmental Product Declaration

Clay Masonry Products Industry Average EPD

Clay Masonry Products

According to the following ISO Standards: 14025, 14027, 14040, 14044, 21930:2017

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.
In 2024, BIA inquired all members of their interest in joining this study. Companies interested in participating were included, and informed that their participation in the study would be documented.

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	NSF International 789 N. Dixboro Road, Ann Arbor, MI 48105, USA https://www.nsf.org/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	NSF/ASTM Clay Masonry Products PCR
MANUFACTURER NAME AND ADDRESS	Brick Industry Association (BIA) 12007 Sunrise Valley Drive, Suite 430, Reston, Virginia 20191
DECLARATION NUMBER	EPD11101
DECLARED PRODUCT & FUNCTIONAL UNIT	Clay Masonry Products Industry Average Functional Unit = 1 square meter of installed clay brick product over 75 year building lifetime (See section "Functional Unit" for full description per product category)
REFERENCE PCR AND VERSION NUMBER	NSF/ASTM Clay Masonry Products PCR
DESCRIPTION OF PRODUCT(S) APPLICATION/USE	Clay masonry products fulfill multiple functions in wall and paving applications, including but not limited to, serving as a cladding, structural wall, or solid base for pedestrian and vehicular traffic.
PRODUCT RSL DESCRIPTION	150 years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	11/07/2025
PERIOD OF VALIDITY	5 years
EPD TYPE	Industry-Average EPD
DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-Grave
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	SimaPro v9.6
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.11 & USLCI v2.0
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.2

The sub-category PCR review was conducted by: Jack Geibig	
This declaration was independently verified in accordance with ISO 14025: 2006. The NSF/ASTM Clay Masonry Products PCR ☐ INTERNAL ☒ EXTERNAL	Jack Geibig - Jack Geibig
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig - Jack Geibig

The EPD Owner has sole ownership, responsibility, and liability for the content of this EPD

General Information

Description of Company/Organization

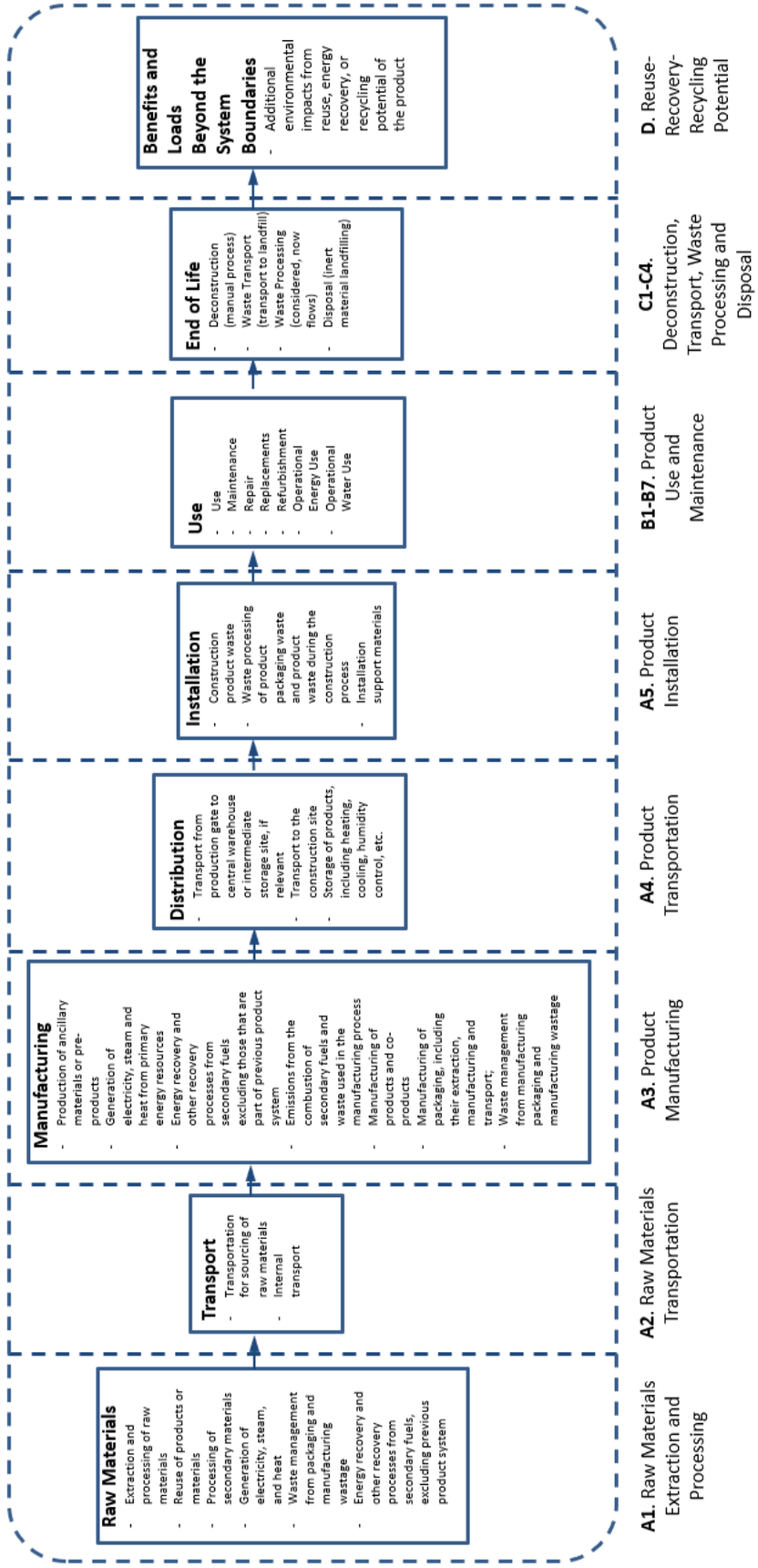
The Brick Industry Association (BIA) is the national trade association representing manufacturers and distributors of clay brick and suppliers of related products and services. Since its founding in 1934, the association has been the nationally recognized authority on clay brick construction.

Product Description

Products, as the industry describes them, are manufactured to meet the respective specifications noted:

* ASTM C32.....Sewer Brick
* ASTM C34, C56, C126, C212.....Structural Clay Tile
* ASTM C62.....Building Brick
* ASTM C126.....Glazed Brick (Double Fired)
* ASTM C216.....Facing Brick
* ASTM C279.....Chemical Resistant Brick
* ASTM C410.....Industrial Floor Brick
* ASTM C652.....Hollow Clay Brick
* ASTM C902.....Pedestrian and Light Traffic Paving Brick
* ASTM C980.....Industrial Chimney Lining Brick
* ASTM C1088.....Thin Veneer Brick
* ASTM C1272.....Heavy Vehicular Paving Brick
* ASTM C1405.....Glazed Brick (Single Fired)

Flow Diagram



Industry Average EPD - Product Average

This average EPD was developed based on a Cradle-to-Grave Life Cycle Assessment. The EPD accounts for raw material extraction and processing, transport, product manufacturing, distribution, installation, maintenance, disposal, and potential benefits and loads following the end of life disposal. Manufacturing data were gathered directly from participating company personnel. When a facility's datum was not available for a given process input, its absence did not influence the industry average value. The results presented for clay brick, clay brick pavers, and structural clay tile products are averaged by production volume of all participating companies' facilities.

There is variation in the compositions and generation of the products produced at each facility represented in this EPD. However, the products stated have similar compositions and manufacturing techniques, and the impacts do not exceed +/-10% per product.

This Business-to-Consumer (B2C) Industry Average EPD contains primary data from 29 facilities representing a wide range of brick manufacturers, totaling 39.3% coverage of the total U.S. brick production in 2023. Each has submitted data from at least one facility, chosen to be the most representative of their production. More than 99% of the production covered in this EPD is from the United States, and employs data from small and large operations, utilizing a variety of production techniques.

Application

Clay masonry products are versatile and ideal for a wide range of applications. These products are commonly used to construct interior and exterior walls in both structural and veneer applications, interior and exterior paving applications, and other assemblies.

Material Composition

The primary product components and/or materials must be indicated as a percentage mass to enable the user of the EPD to understand the composition of the product in delivery status. No regulated hazardous or toxic substances that pose a concern to human health and/or the environment are present in the products described in this study.

The average composition of the brick products are as follows:

Material	Clay Masonry Products
Mined Clay and Shale	98.52%
External Grog	0.23%
Primary Pigments	0.56%
Body additives	0.23%
Sand	0.46%
Total	**100%**

Properties of Declared Product as Shipped

Clay masonry products are most often packaged and shipped by pallet. To protect the load, dividers of paper or wood may be used, and the packaged is secured with plastic or steel straps.

Methodological Framework

Functional Unit

This EPD defines the functional unit (FU) for clay brick, clay brick pavers, and structural clay tile products as 1 m^2 of product installed as per Table 2 of the PCR. Depending upon the application, other characteristics of clay masonry products should be considered when making comparisons. Fire rating, thermal properties, and acoustic performance may be important in characterizing the performance of clay masonry assemblies.
The clay masonry products listed below are baseline products. Results for all products can be found utilizing the conversion factor tables found in this EPD. Baseline products are listed in the conversion factor tables on the first line.

Name	Functional Unit Description	Mass of brick product in functional unit	Conversion of FU to 1 kilogram of the product
Clay Brick, Structural Clay Tile	1 m^2 of vertically installed clay brick (or structural clay tile) using 0.95 cm (3/8”) mortar joints for the estimated life of the building	112.18 kg per m2	0.0089
Thin Brick	1 m^2 of vertically installed thin brick using 0.95 cm (3/8”) mortar joints for the estimated life of the building	20.09 kg per m2	0.0498
Clay Brick Paver	1 m^2 of horizontally installed clay brick paver using 3.2 mm (1/8”) sand joints for the estimated life of the installed surface.	104.92 kg per m2	0.0095

System Boundary

This is a Cradle-to-Grave Environmental Product Declaration. The following life cycle phases were considered:

Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundaries
Raw material supply	Transport	Manufacturing	Transport from gate to the site	Construction/ installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Description of the System Boundary Stages Corresponding to the PCR

(X = Included; MND = Module Not Declared)

Reference Service Life

The reference service life of a properly installed brick is 150 years. The building estimated service life is 75 years.

Allocation

Allocation was determined on a per kilogram basis for primary data using the guidance of ISO 21930. Since the majority of energy is used in the firing of brick products, the inputs were allocated evenly over the fired brick weight production. Energy usage did not depend on brick specifications (such as pigment usage or shape) so the allocation over mass is not expected to introduce error. For secondary data, cut-off methodology was used.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass, energy, and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass or energy of the considered impact categories. A documented assumption as a basis is admissible.

For Hazardous Substances the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

Data from the Brick Industry Association Clay Brick & Structural Clay Tiles, Clay Brick Pavers, and Thin Brick Life Cycle Assessment (2025) study were used to generate this EPD. Primary data were collected for every process in the product system under the control of the participating BIA member companies. See Page 26 for a list of addresses and websites of the participating companies.
Secondary data from the Ecoinvent 3.11 and USLCI 2.0 databases were utilized. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of the brick product category.

Data Quality

The data sources used are complete and representative of the study's geographic and technological coverage and are a recent vintage. The data used for primary data are based on direct information sources of the manufacturer. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty.

Period Under Review

The period under review is the full calendar year of 2023.

Treatment of Biogenic Carbon

The uptake and release of biogenic carbon throughout the product life cycle follows ISO 21930 Section 7.2.7.

Comparability and Benchmarking

EPDs are only comparable if they comply with ISO 21930, this sub-category PCR, include all relevant information modules and are based on equivalent scenarios with respect to the construction works context.
Environmental declarations from different programs may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building or construction works level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of the life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background datasets may lead to differences in the results upstream or downstream of the life cycle stages declared.

Units

The LCA results within this EPD are reported in SI units.

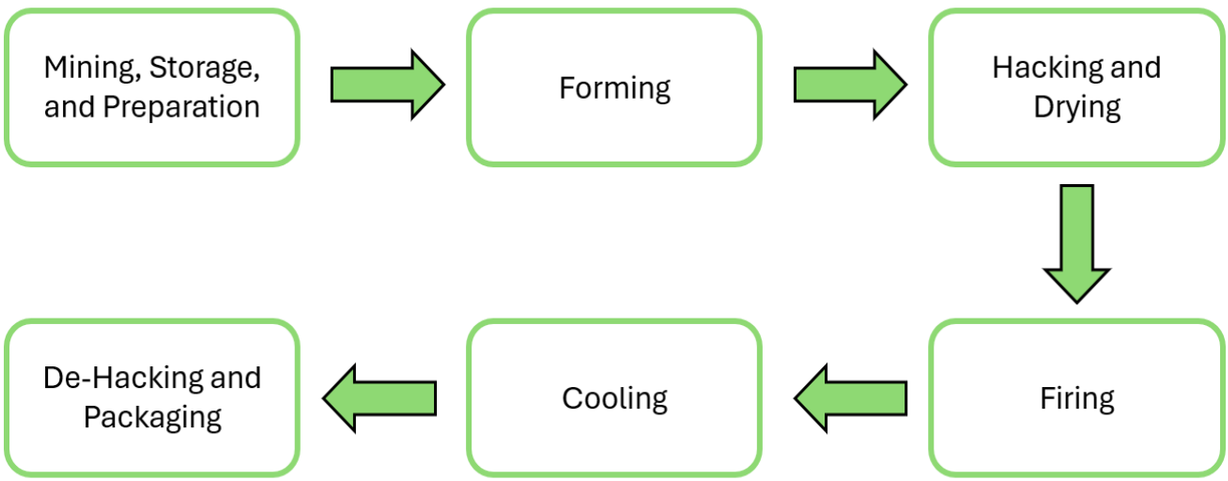
Additional Environmental Information

Background data

For life cycle modeling of the considered products, SimaPro by PRe Sustainability is used. The Ecoinvent 3.11 and USLCI 2.0 databases contain consistent and documented datasets which can be found online. To ensure comparability of results in the LCA, the basic data of the SimaPro databases were used for energy, transportation and auxiliary materials.

Manufacturing

The brick manufacturing process follows the following general steps: 1). Mining, storage, and raw material preparation; 2). Forming; 3). Hacking and Drying; 4). Firing; 5). Cooling; 6). De-hacking and Packaging.
The firing stage consumes the majority of energy required for brick production and can be powered by a variety of fuel sources. Depending on the facility, mining may occur on-site or the clay material may be transported from off-site.



Packaging

Packaging is recyclable depending on material type and national statistics. The packaging material consists of cardboard, polypropylene, steel, and wood. Total mass of packaging per functional unit:
Clay Brick, Structural Clay Tile - 0.530 kg per functional unit
Clay Brick Paver - 0.496 kg per functional unit
Thin Brick - 0.473 kg per functional unit

Packaging Material	Quantity (% By Weight)
Plastic Straps	58.08%
Steel Straps	0.07%
Paper Dividers	35.88%
Wood Dividers	2.77%
Wood Pallets	3.19%
Total	**100%**

Transportation

Transport to Building Site (A4)				
Name	**Clay Brick, Structural Clay Tile**	**Clay Brick Paver**	**Thin Brick**	**Unit**
Fuel type	Diesel	Diesel	Diesel	-
Liters of fuel (for freight (combination) truck with a 32t payload)	2.72E-03	2.72E-03	2.72E-03	L / 100km-kg
Vehicle Type	Combination Truck	Combination Truck	Combination Truck	-
Transport distance	407	407	407	km
Capacity utilization (including empty runs)	49.9	49.9	49.9	%
Gross density of products transported	1253	1670	1670	kg/m^3
Weight of products transported (if gross density not reported)	-			kg
Volume of products transported (if gross density not reported)	-			m^3
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	<1			-

Product Installation

Products installed with mortar: Mortar creates a 3/8 inch (0.95 cm) wide joint between bricks in the square meter functional unit. Mixing energy was excluded from installation, per the PCR. For thin brick products, a 1/8 inch (0.32 cm) layer of bonding mortar is included on the bed side of the square meter.

Products installed with sand: A 1/8 inch (0.32 cm) wide joint was included between paver bricks. These joints are filled with sand, however, per the PCR, sand for this installation was excluded.

Installation into the building (A5)					
Name		**Clay Brick, Structural Clay Tile**	**Clay Brick Paver**	**Thin Brick**	**Unit**
Auxiliary materials	Mortar	27.31	0.00	8.91	kg
	Water	5.46	0.00	1.78	kg
Water consumption		0.00	0.00	0.00	m^3
Electricity consumption		0.00	0.00	0.00	kWh
Product loss per functional unit		5.61	5.25	1.00	kg
Waste materials at construction site		5.91	5.53	1.06	kg
Output substance (recycle)		0.73	0.68	0.13	kg
Output substance (landfill)		4.88	4.56	0.87	kg
Output substance (incineration)		0.00	0.00	0.00	kg
Packaging waste (recycle)		0.1499	0.1402	0.0268	kg
Packaging waste (landfill)		0.0899	0.0840	0.0161	kg
Packaging waste (incineration)		0.0606	0.0567	0.0109	kg
Biogenic carbon contained in packaging		0.0568	0.0531	0.0102	kg
VOC emissions		-	-	-	kg

*CO2 emissions to air from disposal of packaging

Product Use

Once installed, clay masonry products last the life of a building, and they can be salvaged, reclaimed, or recycled for future construction after a building is demolished. The RSL for clay masonry established by this PCR is 150 years, but masonry products can and do last longer. While the impacts presented in this EPD are calculated for an ESL of 75 years, the cradle-to-grave impacts reported would be identical for a building life up to 150 years or more.

Maintenance of Clay Pavers was modeled per the PCR using water from a pressure washer (average 13hp) and a cleaning solution applied to the target area.

Reference Service Life		
Name	**Value**	**Unit**
Reference Service Life	150	years
Estimated Building Service Life	75	years
Number of Replacements	0.0	replacements

Maintenance Stage (B2)					
Name		**Clay Brick, Structural Clay Tile**	**Clay Brick Paver**	**Thin Brick**	**Unit**
Maintenance cycle		0.0	37.5	0.0	Number/ RSL
Maintenance cycle		0.0	18.8	0.0	Number/ ESL
Water consumption (from tap, to sewer)		0.0	9.46E-03	0.0	m^3
Electricity consumption		0.0	0.0808	0.0	kWh
Ancillary materials	Cleaning agent	0.0	6.23E-02	0.0	kg/m^2
	Water	0.0	2.17E-01	0.0	kg/m^2

Disposal

Clay Brick, Clay Brick Pavers, and Structural Clay Tiles are collected separately from mixed construction waste in the demolition stage. Demolition and collection require no additional considerations from normal demolition; therefore, demolition impacts are de minimis. Upon collection, 12% of the product (by mass) is reused in the form of bulk aggregate to offset virgin material in other product life cycles, with the remaining 88% being landfilled.

End of life (C1-C4)				
Name	**Clay Brick, Structural Clay Tile**	**Clay Brick Paver**	**Thin Brick**	**Unit**
Collected separately	112.18	104.92	20.09	kg
Collected as mixed construction waste	0.00	0.00	0.00	kg
Reuse as aggregate	13.46	12.59	2.41	kg
Landfilling	97.60	91.28	17.48	kg
Incineration with energy recovery	0.00	0.00	0.00	kg

Re-use Phase

Part of the product can be reused in construction outside of the current system boundary. Currently, there are companies that salvage brick and sell reclaimed brick to be used in new construction or in the repair of existing construction. However, due to limited data available on the number of reclaimed brick units that are reused, a value of 0% is assumed. Per the PCR, a value of 12% of brick are reused as aggregate gravel. The following table provides values on the extent of brick reused.

Re-Use, recovery, And/Or Recycling Potential (D)				
Name	**Clay Brick, Structural Clay Tile**	**Clay Brick Paver**	**Thin Brick**	**Unit**
Scenario of benefits and loads after the system boundary	Brick product collected for reuse is used as construction aggregate. It is assumed to displace gravel on a kilogram per kilogram basis.			-
Aggregate gravel displaced from partial reuse of collected brick product.	13.46	12.59	2.41	kg

Clay Brick, Structural Clay Tile - Results per Functional Unit Over the Building Lifetime of 75 Years

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Results shown below were calculated using TRACI 2.2 Methodology.

TRACI 2.2 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
GWP	Global warming	kg CO_2-Eq.	3.18E+01	4.24E+00	2.08E+00	8.25E+00	0.00E+00	1.36E+00	2.10E+00	-6.09E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	6.39E-08	1.46E-10	5.40E-09	3.72E-08	0.00E+00	5.18E-11	4.24E-08	-6.27E-10
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	3.68E-01	2.53E-02	2.12E-02	2.62E-02	0.00E+00	1.80E-02	1.17E-02	-3.70E-04
FEP	Freshwater eutrophication potential	kg P-Eq.	8.02E-04	4.79E-06	3.30E-04	8.50E-04	0.00E+00	1.70E-06	1.24E-04	-1.12E-05
MEP	Marine eutrophication potential	kg N-Eq.	2.31E-02	5.78E-03	1.96E-03	4.46E-03	0.00E+00	4.76E-03	2.72E-03	-7.13E-05
SP	Smog formation potential	kg O3-Eq.	2.73E+00	6.94E-01	2.12E-01	5.02E-01	0.00E+00	4.61E-01	3.22E-01	-7.96E-03

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the resource use throughout the life cycle of the product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
RPR_E	Renewable primary energy as energy carrier	MJ	2.58E+00	0.00E+00	1.51E-01	6.74E+00	0.00E+00	0.00E+00	4.18E-01	-6.17E-02
RPR_M	Renewable primary energy resources as material utilization	MJ	5.2E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	4.17E+02	5.46E+01	2.48E+01	2.42E+01	0.00E+00	1.95E+01	3.22E+00	-3.31E-01
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	7.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Use of secondary material	kg	3.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ	1.88E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	3.87E-02	0.00E+00	2.37E-03	4.44E-02	0.00E+00	0.00E+00	1.81E-02	-2.05E-02

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
HWD	Hazardous waste disposed	kg	9.53E-05	0.00E+00	1.71E-05	2.18E-04	0.00E+00	0.00E+00	2.38E-04	-3.96E-06
NHWD	Non-hazardous waste disposed	kg	6.26E-01	0.00E+00	5.11E+00	9.57E-01	0.00E+00	0.00E+00	9.86E+01	-7.00E-03
HLRW	High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ILLRW	Intermediate- and low-level radioactive waste	kg or m^3	4.25E-05	0.00E+00	2.45E-06	3.75E-05	0.00E+00	0.00E+00	6.14E-06	-1.03E-06
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	Materials for recycling	kg	0.00E+00	0.00E+00	8.79E-01	0.00E+00	0.00E+00	0.00E+00	1.35E+01	0.00E+00
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	Recovered energy exported from system	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

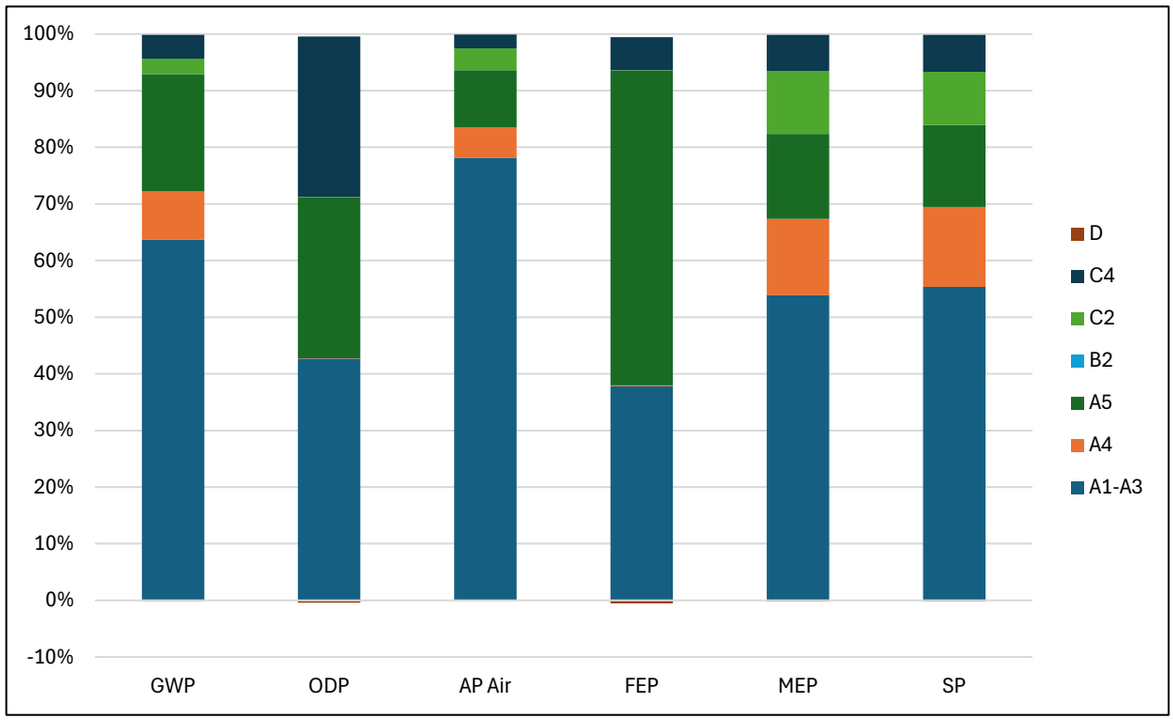
Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
BCRP	Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	5.31E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.00E+00	0.00E+00	5.31E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2	7.66E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2	3.85E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Clay Brick, Structural Clay Tile - LCA Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories. This is due to the upstream production of materials used in the product, along with electricity and natural gas use in the manufacturing of the product. Downstream stages are effected by the weight of the product, except for the mortar used in installation.



Clay Brick, Structural Clay Tile - Conversion Factors for Results

The following table can be used to scale the impacts given above to any of the products listed below by using the appropriate factors.

To calculate an impact for a given product, mutiply the impact by that products conversion factor. For impacts in the 'A5 - Mortar Impacts' column, use the 'Mortar Conversion Factor' below. Otherwise, use the 'Brick Conversion Factor' column.

For example: To determine the A1-A3 TRACI GWP impact for 'Ambassador', multiply the above impact (3.18E+01) by the Brick Conversion Factor (1.314) for a result of 4.17E+01.

To determine impact over the entire lifecycle, multiply the impact for each stage by the correct conversion factor and summate.

Unit Size Designation	ASTM Specification	Dimensions (inch) (W x H x L)	Dimensions (cm) (W x H x L)	Void Space (%)	Mass of Masonry unit (kg/unit)	No. of Units/m^2 (0.95 cm joint)	Brick Conversion Factor	Mortar Mass (kg/m^2)	Mortar Conversion Factor
Modular	*C216, C652*	*3.625 x 2.25 x 7.625*	*9.2 x 5.7 x 19.4*	*25.0%*	*1.52*	*73.81*	*1.000*	*32.77*	*1.000*
Ambassador	*C216 ,C652*	*3.625 x 2.25 x 15.625*	*9.2 x 5.7 x 39.7*	*24.0%*	*3.99*	*36.90*	*1.314*	*29.17*	*0.890*
Builders Special	*C652*	*3 x 2.813 x 8.625*	*7.6 x 7.1 x 21.9*	*28.5%*	*2.00*	*54.03*	*0.962*	*22.88*	*0.698*
Utility Closure	*C216*	*3.625 x 3.625 x 7.625*	*9.2 x 9.2 x 19.4*	*21.0%*	*2.50*	*48.44*	*1.077*	*24.39*	*0.744*
Econo	*C216*	*3.625 x 3.625 x 7.625*	*9.2 x 9.2 x 19.4*	*24.0%*	*2.86*	*48.44*	*1.234*	*24.39*	*0.744*
Emperor	*C216*	*3.625 x 2.25 x 15.625*	*9.2 x 5.7 x 39.7*	*28.8%*	*2.96*	*36.90*	*0.973*	*29.17*	*0.890*
Engineer	*C216*	*3.563 x 2.75 x 7.625*	*9 x 7 x 19.4*	*20.6%*	*2.13*	*62.00*	*1.179*	*28.37*	*0.866*
Estate	*C652*	*2.75 x 3.625 x 9.625*	*7 x 9.2 x 24.4*	*30.0%*	*2.18*	*38.75*	*0.752*	*17.35*	*0.529*
Jumbo Standard	*C216*	*3.625 x 2.75 x 8*	*9.2 x 7 x 20.3*	*22.3%*	*2.84*	*59.22*	*1.499*	*28.54*	*0.871*
Eastern King	*C652*	*3 x 2.75 x 9.625*	*7.6 x 7 x 24.4*	*28.0%*	*1.91*	*49.60*	*0.843*	*22.67*	*0.692*
Western King	*C652*	*2.75 x 2.625 x 9.625*	*7 x 6.7 x 24.4*	*29.0%*	*1.67*	*51.67*	*0.767*	*21.43*	*0.654*
Non Standard	*C216*	*3.625 x 2.25 x 7.625*	*9.2 x 5.7 x 19.4*	*0.0%*	*2.70*	*73.81*	*1.776*	*32.77*	*1.000*
Norman	*C216*	*3.625 x 2.25 x 11.625*	*9.2 x 5.7 x 29.5*	*25.0%*	*2.32*	*49.21*	*1.016*	*30.37*	*0.927*
Norman	*C652*	*3.625 x 2.25 x 13.5*	*9.2 x 5.7 x 34.3*	*27.0%*	*2.62*	*42.56*	*0.994*	*29.72*	*0.907*
Oversize	*C216*	*3.5 x 2.75 x 7.625*	*8.9 x 7 x 19.4*	*22.0%*	*1.98*	*62.00*	*1.093*	*27.87*	*0.851*
Queen	*C652*	*2.75 x 2.75 x 7.625*	*7 x 7 x 19.4*	*26.3%*	*1.43*	*62.00*	*0.790*	*21.90*	*0.668*
Roman	*C216*	*3.625 x 1.625 x 11.625*	*9.2 x 4.1 x 29.5*	*25.0%*	*2.00*	*64.58*	*1.149*	*38.11*	*1.163*
Standard	*C216*	*3.625 x 2.25 x 8*	*9.2 x 5.7 x 20.3*	*22.5%*	*1.95*	*70.50*	*1.226*	*32.45*	*0.990*
Utility	*C652*	*3.625 x 3.625 x 11.625*	*9.2 x 9.2 x 29.5*	*25.7%*	*4.40*	*32.29*	*1.267*	*21.85*	*0.667*
Utility	*C216*	*3.625 x 3.625 x 11.625*	*9.2 x 9.2 x 29.5*	*24.0%*	*4.16*	*32.29*	*1.197*	*21.85*	*0.667*

Clay Brick Paver - Results per Functional Unit Over the Building Lifetime of 75 Years

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Results shown below were calculated using TRACI 2.2 Methodology.

TRACI 2.2 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5	B2	C2	C4	D
GWP	Global warming	kg CO_2-Eq.	2.97E+01	3.97E+00	1.95E+00	1.63E+00	1.27E+00	1.96E+00	-5.70E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	5.98E-08	1.37E-10	5.05E-09	1.54E-07	4.84E-11	3.97E-08	-5.86E-10
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	3.44E-01	2.37E-02	1.98E-02	1.07E-02	1.68E-02	1.09E-02	-3.46E-04
FEP	Freshwater eutrophication potential	kg P-Eq.	7.50E-04	4.48E-06	3.09E-04	2.94E-04	1.59E-06	1.16E-04	-1.05E-05
MEP	Marine eutrophication potential	kg N-Eq.	2.16E-02	5.40E-03	1.83E-03	1.89E-03	4.45E-03	2.55E-03	-6.67E-05
SP	Smog formation potential	kg O3-Eq.	2.55E+00	6.49E-01	1.98E-01	2.36E-01	4.31E-01	3.01E-01	-7.45E-03

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the resource use throughout the life cycle of the product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5	B2	C2	C4	D
RPR_E	Renewable primary energy as energy carrier	MJ	2.41E+00	0.00E+00	1.41E-01	1.51E+00	0.00E+00	3.91E-01	-5.77E-02
RPR_M	Renewable primary energy resources as material utilization	MJ	4.88E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	3.90E+02	5.10E+01	2.32E+01	1.46E+01	1.83E+01	3.01E+00	-3.09E-01
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	6.64E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Use of secondary material	kg	3.09E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ	1.76E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	3.62E-02	0.00E+00	2.22E-03	1.83E-01	0.00E+00	1.69E-02	-1.92E-02

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories									
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C4**	**D**
HWD	Hazardous waste disposed	kg	8.92E-05	0.00E+00	1.60E-05	4.47E-04	0.00E+00	2.23E-04	-3.70E-06
NHWD	Non-hazardous waste disposed	kg	5.85E-01	0.00E+00	4.78E+00	9.77E-02	0.00E+00	9.22E+01	-6.55E-03
HLRW	High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ILLRW	Intermediate- and low-level radioactive waste	kg or m^3	3.97E-05	0.00E+00	2.29E-06	2.33E-05	0.00E+00	5.74E-06	-9.60E-07
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	Materials for recycling	kg	0.00E+00	0.00E+00	8.22E-01	0.00E+00	0.00E+00	1.26E+01	0.00E+00
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	Recovered energy exported from system	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

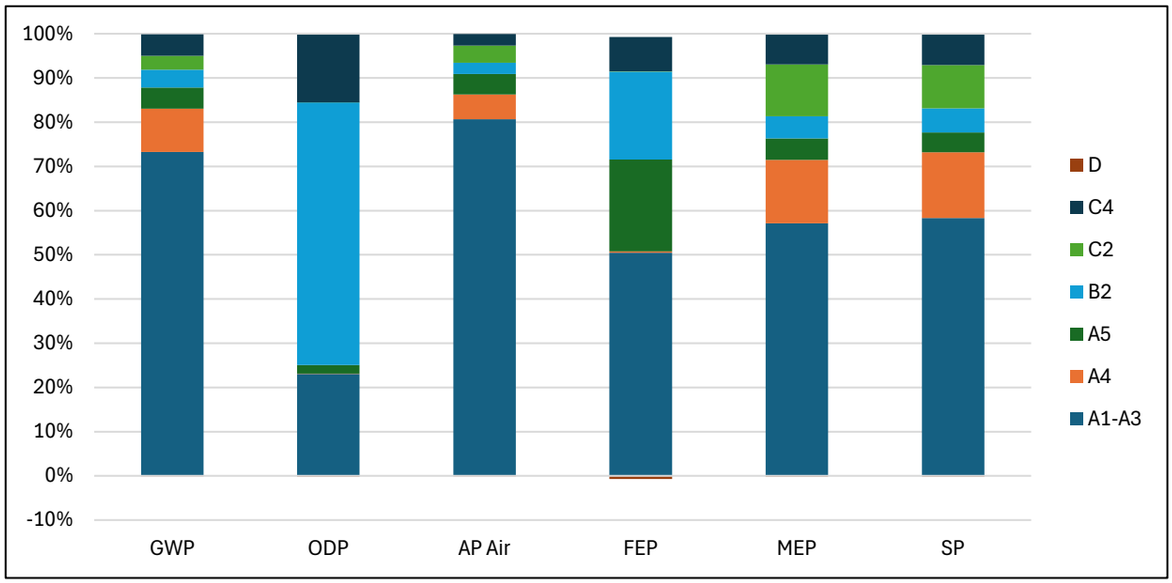
Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the

Resource Use									
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B2**	**C2**	**C4**	**D**
BCRP	Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	4.97E-01	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.00E+00	0.00E+00	4.97E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2	7.16E-01	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00
CCE	Calcination Carbon Emissions	kg CO_2	3.60E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2	0.00E+00	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.00E+00	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Clay Brick Paver - LCA Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories. This is due to the upstream production of materials used in the product, along with electricity and natural gas use in the manufacturing of the product. Downstream stages are effected by the weight of the product, except for the washing required in the use stage.



Clay Brick Paver - Conversion Factors for Results

The following table can be used to scale the impacts given above to any of the products listed below by using the appropriate factors.
To calculate an impact for a given product, mutiply the impact by that product's 'Paver Conversion Factor'.

For example: To determine the A1-A3 TRACI GWP impact for 'Standard Lugged', multiply the above impact (2.97E+01) by the Paver Conversion Factor (1.150) for a result of 3.42E+01.

To determine impact over the entire lifecycle, multiply the impact for each stage by the correct conversion factor and summate.

Paver Designation	ASTM Specification	Dimensions (inch) (W x H x L)	Dimensions (cm) (W x H x L)	Void Space (%)	Mass of Paver (kg/unit)	No. of Units/m^2 (0.32 cm joint)	Paver Conversion Factor
Standard	*C902*	*4 x 2.25 x 8*	*10.2 x 5.7 x 20.3*	*0.0%*	*2.27*	*46.25*	*1.000*
Standard Lugged	*C902*	*4 x 2.25 x 8*	*10.2 x 5.7 x 20.3*	*0.0%*	*2.61*	*46.25*	*1.150*
Standard (1.375 Bed	*C902*	*4 x 1.375 x 8*	*10.2 x 3.5 x 20.3*	*0.0%*	*1.52*	*46.25*	*0.670*
Standard (C1272)	*C1272*	*4 x 2.75 x 8*	*10.2 x 7 x 20.3*	*0.0%*	*3.27*	*46.25*	*1.440*
ADA Dome	*C902*	*4 x 2.25 x 8*	*10.2 x 5.7 x 20.3*	*0.0%*	*2.35*	*46.25*	*1.038*
Standard Permeable	*C902*	*4 x 2.25 x 8*	*10.2 x 5.7 x 20.3*	*10.0%*	*2.61*	*46.25*	*1.150*
Standard Lugged (C1272)	*C1272*	*4 x 2.625 x 8*	*10.2 x 6.7 x 20.3*	*0.0%*	*3.04*	*46.25*	*1.340*
Split Standard	*C902*	*4 x 1.25 x 8*	*10.2 x 3.2 x 20.3*	*0.0%*	*1.27*	*46.25*	*0.560*

Thin Brick - Results per Functional Unit Over the Building Lifetime of 75 Years

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Results shown below were calculated using TRACI 2.2 Methodology.

TRACI 2.2 Impact Assessment

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
GWP	Global warming	kg CO_2-Eq.	2.84E+01	7.67E-01	1.59E+00	2.69E+00	0.00E+00	2.44E-01	3.76E-01	-1.09E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	5.70E-08	2.65E-11	3.30E-09	1.21E-08	0.00E+00	9.28E-12	7.60E-09	-1.12E-10
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	3.29E-01	4.58E-03	1.70E-02	8.54E-03	0.00E+00	3.22E-03	2.09E-03	-6.62E-05
FEP	Freshwater eutrophication potential	kg P-Eq.	7.14E-04	8.66E-07	2.91E-04	2.77E-04	0.00E+00	3.05E-07	2.22E-05	-2.01E-06
MEP	Marine eutrophication potential	kg N-Eq.	2.06E-02	1.04E-03	1.28E-03	1.46E-03	0.00E+00	8.52E-04	4.88E-04	-1.28E-05
SP	Smog formation potential	kg O3-Eq.	2.44E+00	1.25E-01	1.37E-01	1.64E-01	0.00E+00	8.26E-02	5.76E-02	-1.43E-03

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the resource use throughout the life cycle of the product.

Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
RPR_E	Renewable primary energy as energy carrier	MJ	2.30E+00	0.00E+00	1.20E-01	2.20E+00	0.00E+00	0.00E+00	7.49E-02	-1.10E-02
RPR_M	Renewable primary energy resources as material utilization	MJ	4.66E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	3.73E+02	9.87E+00	1.94E+01	7.88E+00	0.00E+00	3.50E+00	5.76E-01	-5.92E-02
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	6.34E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Use of secondary material	kg	2.94E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ	1.68E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	3.45E-02	0.00E+00	1.47E-03	1.45E-02	0.00E+00	0.00E+00	3.23E-03	-3.67E-03

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
HWD	Hazardous waste disposed	kg	8.50E-05	0.00E+00	6.78E-06	7.12E-05	0.00E+00	0.00E+00	4.27E-05	-7.09E-07
NHWD	Non-hazardous waste disposed	kg	5.57E-01	0.00E+00	1.04E+00	3.12E-01	0.00E+00	0.00E+00	1.77E+01	-1.25E-03
HLRW	High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ILLRW	Intermediate- and low-level radioactive waste	kg or m^3	3.79E-05	0.00E+00	1.97E-06	1.22E-05	0.00E+00	0.00E+00	1.10E-06	-1.84E-07
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	Materials for recycling	kg	0.00E+00	0.00E+00	1.57E-01	0.00E+00	0.00E+00	0.00E+00	2.41E+00	0.00E+00
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	Recovered energy exported from system	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

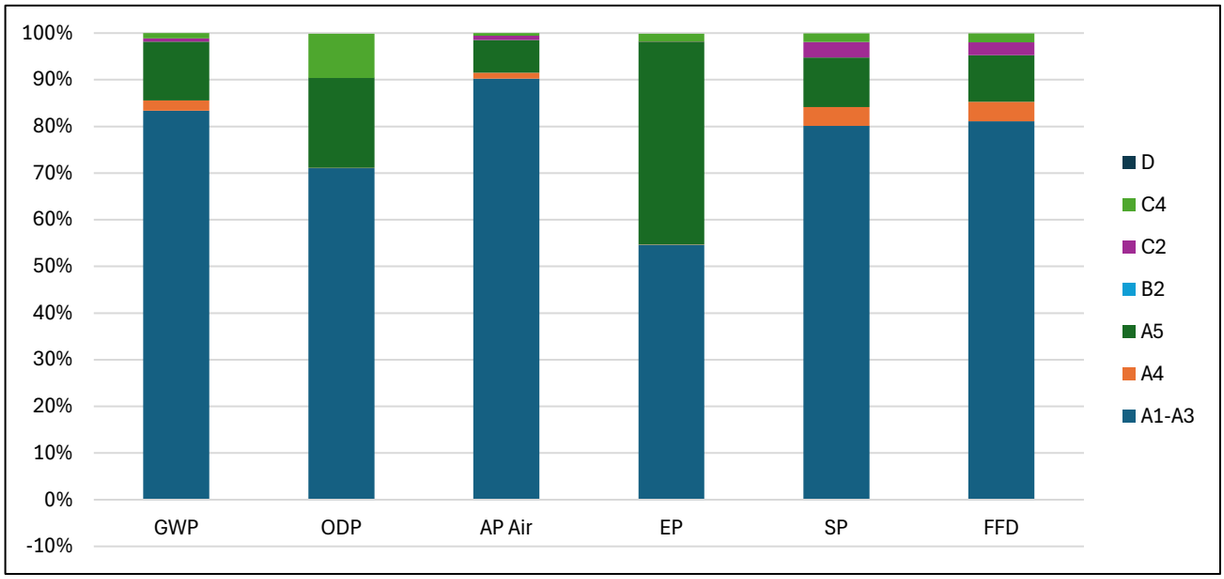
Resource Use

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
BCRP	Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	4.74E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.00E+00	0.00E+00	4.74E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2	1.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2	3.44E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**B1, B3, B4, B5, B6, B7, C1, and C3 are included in this study and have values of zero in all impact categories.*

Thin Brick - LCA Interpretation

The production life cycle stage (A1-A3) dominates the impacts across all impact categories. This is due to the upstream production of materials used in the product, along with electricity and natural gas use in the manufacturing of the product. Downstream stages are effected by the weight of the product, except for the mortar used in installation.



Thin Brick - Conversion Factors for Results

The following table can be used to scale the impacts given above to any of the products listed below by using the appropriate factors.
To calculate an impact for a given product, mutiply the impact by that products conversion factor. For impacts in the 'A5 - Mortar Impacts' column, use the 'Mortar Conversion Factor' below. Otherwise, use the 'Thin Brick Conversion Factor' column.

For example: To determine the A1-A3 TRACI GWP impact for 'Modular .625', multiply the above impact (2.84E+01) by the Thin Brick Conversion Factor (1.250) for a result of 3.55E+01.

To determine impact over the entire lifecycle, multiply the impact for each stage by the correct conversion factor and summate.

Unit Size Designation	ASTM Specification	Dimensions (inch) (W x H x L)	Dimensions (cm) (W x H x L)	Mass of Thin Brick (kg/unit)	No. of Units/m^2 (0.95 cm joint)	Thin Brick Conversion Factor	Mortar Mass (kg/m^2)	Mortar Conversion Factor
Modular .500	*C1088*	*0.5 x 2.25 x 7.625*	*1.3 x 5.7 x 19.4*	*0.27*	*73.81*	*1.000*	*10.693*	*1.000*
Modular .625	*C1088*	*0.625 x 2.25 x 7.625*	*1.6 x 5.7 x 19.4*	*0.34*	*73.81*	*1.250*	*11.823*	*1.106*
Modular .875	*C1088*	*0.875 x 2.25 x 7.625*	*2.2 x 5.7 x 19.4*	*0.49*	*73.81*	*1.797*	*14.083*	*1.317*
King .375	*C1088*	*0.39 x 2.8 x 9.45*	*1 x 7.1 x 24*	*0.40*	*49.69*	*0.980*	*9.097*	*0.851*
King .550	*C1088*	*0.55 x 2.8 x 9.45*	*1.4 x 7.1 x 24*	*0.51*	*49.69*	*1.264*	*10.296*	*0.963*
King .625	*C1088*	*0.625 x 2.625 x 9.625*	*1.6 x 6.7 x 24.4*	*0.51*	*51.67*	*1.323*	*11.045*	*1.033*
2.750 Oversize Modular .625	*C1088*	*0.625 x 2.75 x 7.625*	*1.6 x 7 x 19.4*	*0.39*	*62.00*	*1.204*	*11.151*	*1.043*
3.625 Oversize Modular .625	*C1088*	*0.625 x 3.625 x 7.625*	*1.6 x 9.2 x 19.4*	*0.56*	*48.44*	*1.357*	*10.379*	*0.971*
2.250 Norman .550	*C1088*	*0.55 x 2.25 x 11.63*	*1.4 x 5.7 x 29.5*	*0.52*	*49.19*	*1.261*	*10.781*	*1.008*
2.250 Norman .625	*C1088*	*0.625 x 2.25 x 11.625*	*1.6 x 5.7 x 29.5*	*0.53*	*49.21*	*1.304*	*11.410*	*1.067*
2.250 Norman .875	*C1088*	*0.875 x 2.25 x 11.625*	*2.2 x 5.7 x 29.5*	*0.75*	*49.21*	*1.826*	*13.504*	*1.263*
3.500 Norman .625	*C1088*	*0.625 x 3.625 x 11.625*	*1.6 x 9.2 x 29.5*	*0.86*	*32.29*	*1.379*	*9.941*	*0.930*
3.500 Norman .875	*C1088*	*0.875 x 3.625 x 11.625*	*2.2 x 9.2 x 29.5*	*1.20*	*32.29*	*1.931*	*11.449*	*1.071*
2.250 Emperor .625	*C1088*	*0.625 x 2.25 x 15.625*	*1.6 x 5.7 x 39.7*	*0.72*	*36.90*	*1.315*	*11.203*	*1.048*
2.250 Emperor .875	*C1088*	*0.875 x 2.25 x 15.625*	*2.2 x 5.7 x 39.7*	*1.00*	*36.90*	*1.841*	*13.215*	*1.236*
3.500 Emperor .625	*C1088*	*0.625 x 3.625 x 15.625*	*1.6 x 9.2 x 39.7*	*1.15*	*24.22*	*1.390*	*9.723*	*0.909*
Imperial .550	*C1088*	*0.55 x 2.25 x 19.63*	*1.4 x 5.7 x 49.9*	*0.89*	*29.52*	*1.302*	*10.490*	*0.981*
Modular, Corner .625	*C1088*	*0.625 x 2.25 x 7.625*	*1.6 x 5.7 x 19.4*	*0.52*	*73.81*	*1.894*	*11.823*	*1.106*
Modular, Corner .875	*C1088*	*0.875 x 2.25 x 7.625*	*2.2 x 5.7 x 19.4*	*0.72*	*73.81*	*2.651*	*14.083*	*1.317*

Unit Size Designation	ASTM Specification	Dimensions (inches) (W x H x L)	Dimensions (cm) (W x H x L)	Mass of Brick/Tile (kg/unit)	No. of Units/m^2 (1 cm joint)	Brick Conversion Factor	Mortar Mass (kg/m^2)	Mortar Conversion Factor
2.750 Oversize Modular, Corner .625	*C1088*	*0.625 x 2.75 x 7.625*	*1.6 x 7 x 19.4*	*0.63*	*62.00*	*1.944*	*11.151*	*1.043*
3.625 Oversize Modular, Corner .625	*C1088*	*0.625 x 3.625 x 7.625*	*1.6 x 9.2 x 19.4*	*0.83*	*48.44*	*2.002*	*10.379*	*0.971*
3.625 Oversize Modular, Corner .875	*C1089*	*0.875 x 3.625 x 7.625*	*2.2 x 9.2 x 19.4*	*1.16*	*48.44*	*2.803*	*12.061*	*1.128*
2.250 Norman, Corner .625	*C1088*	*0.625 x 2.25 x 11.625*	*1.6 x 5.7 x 29.5*	*0.70*	*49.21*	*1.711*	*11.410*	*1.067*
3.500 Norman, Corner .625	*C1088*	*0.625 x 3.625 x 11.625*	*1.6 x 9.2 x 29.5*	*1.13*	*32.29*	*1.809*	*9.941*	*0.930*
3.500 Norman, Corner .875	*C1088*	*0.875 x 3.625 x 11.625*	*2.2 x 9.2 x 29.5*	*1.58*	*32.29*	*2.533*	*11.449*	*1.071*
2.250 Emperor, Corner .625	*C1088*	*0.625 x 2.25 x 15.625*	*1.6 x 5.7 x 39.7*	*0.88*	*36.90*	*1.620*	*11.203*	*1.048*
2.250 Emperor, Corner .875	*C1088*	*0.875 x 2.25 x 15.625*	*2.2 x 5.7 x 39.7*	*1.23*	*36.90*	*2.268*	*13.215*	*1.236*
3.500 Emperor, Corner .625	*C1088*	*0.625 x 3.625 x 15.625*	*1.6 x 9.2 x 39.7*	*1.42*	*24.22*	*1.713*	*9.723*	*0.909*
5.875 Oversize Modular, Edge Cap .500	*C1088*	*0.5 x 7.625 x 5.875*	*1.3 x 19.4 x 14.9*	*0.77*	*31.00*	*1.190*	*8.743*	*0.818*

Statement on EPD results

A) Results in the above tables for modules A1-A3 and A4 reflect the manufacture and transportation to the job site of the clay masonry product only. Beginning with module A5 installation, the remaining columns reflect the impacts of the masonry product within the construction works, and thus consider the presence of mortar, etc.

B) Results in the impact tables reflect the life cycle impacts associated with the baseline product only. Impacts for other products in the EPD can be determined using a conversion factor. To determine the results for another product simply multiply the impacts for the baseline product by the appropriate conversion factor as follows:

1) Where applicable, multiply the results from the mortar column (under A5) by the mortar conversion factor.

2) Multiply all non-mortar column results by the applicable clay masonry product conversion factor for that product

Additional Environmental Information

Environmental and Health During Manufacturing

As each production facility is different, all workers follow their company-specific health and safety programs regarding personal protective equipment (PPE) and proper procedures during the manufacturing process of clay masonry products.

Environmental and Health During Installation

Resources for health and safety of workers during the installation of clay masonry products:
Clay Masonry Units:
https://www.osha.gov/silica-crystalline
https://www.cdc.gov/niosh/silica

Mortar:
https://www.cement.org/advocacy/occupational-health-and-safety/

Extraordinary Effects

Fire

Brick is a noncombustible material, emitting zero volatile organic compounds (VOCs). For rated fire resistance of brick walls, reference International Building Code Table 721.1 (2). Refer to *Technical Note 16 - Fire Resistance of Brick* available at https://www.gobrick.com/resources/technical-notes for additional information.

Water

There are no negative impacts from the product due to its contact with water.

Mechanical Destruction

Resources for health and safety of workers during the mechanical destruction of clay masonry products:
Clay Masonry Units:
https://www.osha.gov/silica-crystalline
https://www.cdc.gov/niosh/silica

Delayed Emissions

Global warming potential is calculated using the TRACI 2.2 impact assessment methodology. Delayed emissions are not considered.

Environmental Activities and Certifications

For BIA product sustainability information, see *Technical Note 48 Sustainability and Brick* available at https://www.gobrick.com/resources/technical-notes.

Further Information

Brick Industry Association: Engineering & Research Department at brickinfo@bia.org

References

- PCR Part B — NSF/ASTM Clay Masonry Products PCR
- SimaPro 9.4 — PRe Sustainability. SimaPro Life Cycle Assessment version 9 (software).
- ISO 14025 — ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14040 — ISO 14040:2009-11, Environmental management — Life cycle assessment — Principles and framework.
- ISO 14044 — ISO 14044:2006-10, Environmental management — Life cycle assessment — Requirements and guidelines.
- ISO 21930 — ISO 21930:2017, Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
- NSF GPI — NSF Program Operator Rules (2015)
- Characterization Method — IPCC. 2014. Climate Change 2013. The Physical Science Basis. Cambridge University Press. (http://www.ipcc.ch/report/ar5/wg1/).
- Characterization Method — Hauschild M.Z., & Wenzel H. Environmental Assessment of Products. Springer, US, Vol. 2, 1998.
- Characterization Method — Jenkin M.E., & Hayman G.D. Photochemical ozone creation potentials for oxygenated volatile organic compounds: sensitivity to variations in kinetic and mechanistic parameters. Atmospheric Environment. 1999, 33 (8) pp. 1275-1293.
- Characterization Method — WMO. 1999. Scientific Assessment of Ozone Depletion: 1998, World Meteorological Organization Global Ozone Research and Monitoring Project - Report No. 44, WMO, Geneva.
- Characterization Method — Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers- version 1.2, January 2017.

Contact Information

Study Commissioner

LCA Practitioner

Sustainable Solutions Corporation
155 Railroad Plaza, Suite 203
Royersford, PA 19468 USA
(+1) 610 569-1047
info@sustainablesolutionscorporation.com
www.sustainablesolutionscorporation.com

Participating Companies - Contact information

Name	Address	City State	Website
Acme Brick Company	3024 Acme Brick Plaza	Fort Worth, TX 76109	brick.com
Belden Brick Company	700 W. Tuscarawas Street	Canton, OH 44702	beldenbrick.com
Bowerston Shale Company	515 Main Street	Bowerston, OH 44695	bowerstonshale.com
Endicott Clay Products Co.	57120 707th Road	Endicott, NE 68350	endicott.com
General Shale Brick	3015 Bristol Hwy.	Johnson City, TN 37601	generalshale.com
Glen-Gery Corporation	1166 Spring Street	Wyomissing, PA 19610-6001	glengery.com
Hebron Brick Company	3280 Veterans Blvd. S Suite 320	Fargo, ND 58104	hebronbrick.com
H.C. Muddox	4875 Bradshaw Road	Sacramento, CA 95827	hcmuddox.com
Interstate Brick	9780 South 5200 West	West Jordan, UT 84081-5625	interstatebrick.com
King Klinker Thin Brick	USA Headquarters 300 Sherry Lynn Lane	Sparta, WI 54656	kingklinker-america.com
McAvoy Brick Co.	75 McAvoy Lane	Phoenixville, PA 19460	mcavoybrick.com
Morin Brick Company	130 Morin Brick Road	Auburn, ME 04210	morinbrick.com
Pacific Clay Products, Inc.	14741 Lake St.	Lake Elsinore, CA 92530	pacificclay.com
Pine Hall Brick Company	2701 Shorefair Drive	Winston-Salem, NC 27105	pinehallbrick.com
Statesville Brick Company	391 Brick Yard Road	Statesville, NC 28677	statesvillebrick.com
Stiles and Hart Brick Company	127 Cook Street	Bridgewater, MA 02324	stilesandhart.com
Summit Brick Company	601 East 13th Street	Pueblo, Colorado 81001	summitbrick.com
Triangle Brick Company	6523 NC Highway 55	Durham, NC 27713	trianglebrick.com
Whitacre Greer	1400 S. Mahoning Ave	Alliance, OH 44601	wgpaver.com
Yankee Hill Brick	3705 S Coddington Ave	Lincoln, NE 68522	yankeehillbrick.com