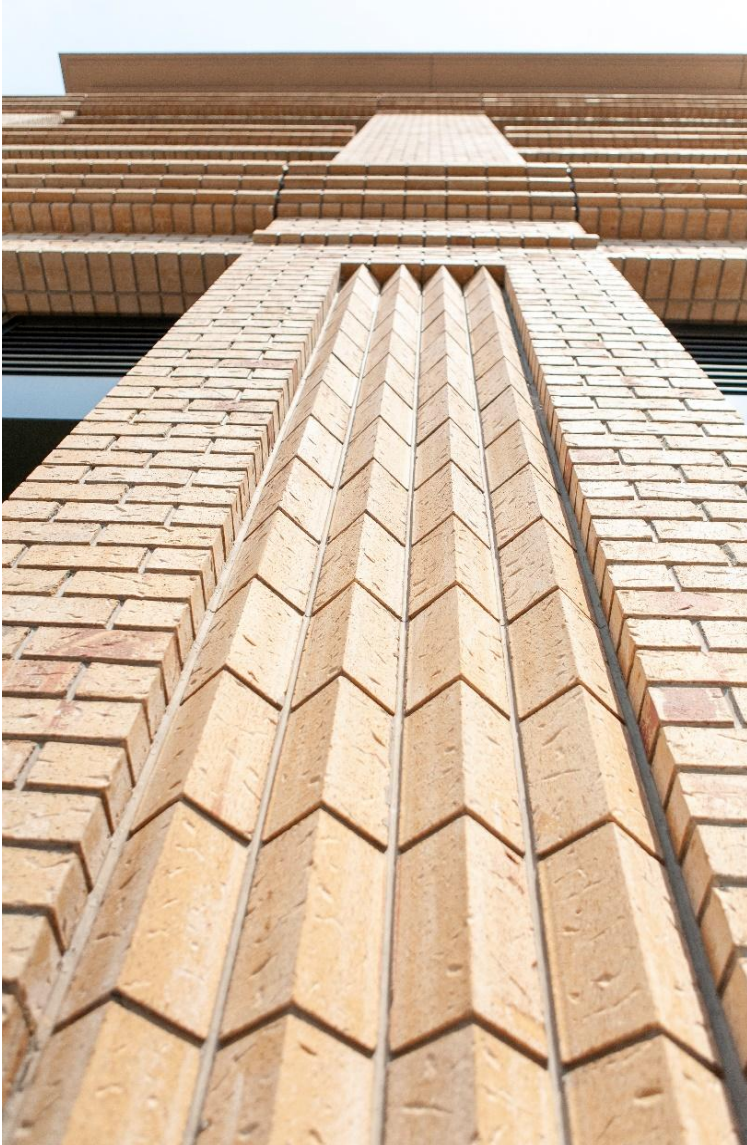


Environmental Product Declaration

Interstate[®] Brick - Sacramento - HC Muddox

Clay Masonry Products



Our clay products are manufactured by forming blended mixtures of clay, shale, and other natural additives that are then fired, or heated, to a high enough temperature to create a homogeneous amorphous material having passed through a vitreous (glassy) or ceramic bonding phase near the point of incipient fusion.



Interstate Brick is committed to providing products and services that are environmentally sound throughout the entire production process and the product lifecycle. We set the national standard for clean manufacturing long before LEED was developed, integrating sustainability into our business strategy. The employment of EPDs confirms our commitment to the design community to provide tools to assist them in selecting environmentally preferable brick materials.

Interstate Brick is Green. Furthermore, we are LEED[®]ers in energy and environmental design of brick. Brick from the Sacramento facility averages over 12% of pre-consumer recycled brick products, which are crushed and ground and used as filler in all of the clay mixes used to produce additional brick. Pallets are reused. No waste is taken to the landfill. In addition, most of our brick contain two good faces which reduces waste.



**Certified
Environmental
Product Declaration**

www.nsf.org

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox


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.

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, NSF Program Operator Rules (2015)	
MANUFACTURER NAME AND ADDRESS	Interstate® Brick 9780 South 5200 West, West Jordan, UT, 84081	
DECLARATION NUMBER	EPD11236	
DECLARED PRODUCT & FUNCTIONAL UNIT	Interstate® Brick - Sacramento - HC Muddox - Clay Masonry Products 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	3/5/2026	
REVISED DATE	5/12/2026	
PERIOD OF VALIDITY	5 years	
EPD TYPE	Facility-Specific Product-Specific	
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:	<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>This declaration was independently verified in accordance with ISO 14025: 2006. The NSF/ASTM Clay Masonry Products PCR</p> <p style="text-align: center;"> <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL </p> </div> <div style="flex: 1; text-align: center;"> <p>Jack Geibig - </p> </div> </div>	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:		

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

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



According to the following

ISO Standards: 14025,
14027, 14040, 14044,
21930:2017

General Information

Description of Company/Organization

HC Muddox (Muddox) traces its history back to 1878 when it was founded as the H. C. Muddox Company in Sacramento, CA. In the beginning Muddox produced pottery and sewer pipe. As time progressed the product line expanded to include chimney flues, face brick, thin brick, structural brick, pavers, and fire brick (light duty/residential duty refractory brick). Some of these products are shipped all over the United States and Canada, and even to Europe. In 1980 the facility was purchased by Pacific Coast Building Products and has become part of the 'clay group' which now includes Gladding McBean and Interstate Brick. Muddox will continue our efforts to protect the environment and health of our customers/end users and will utilize the EPD as one means to document these efforts.

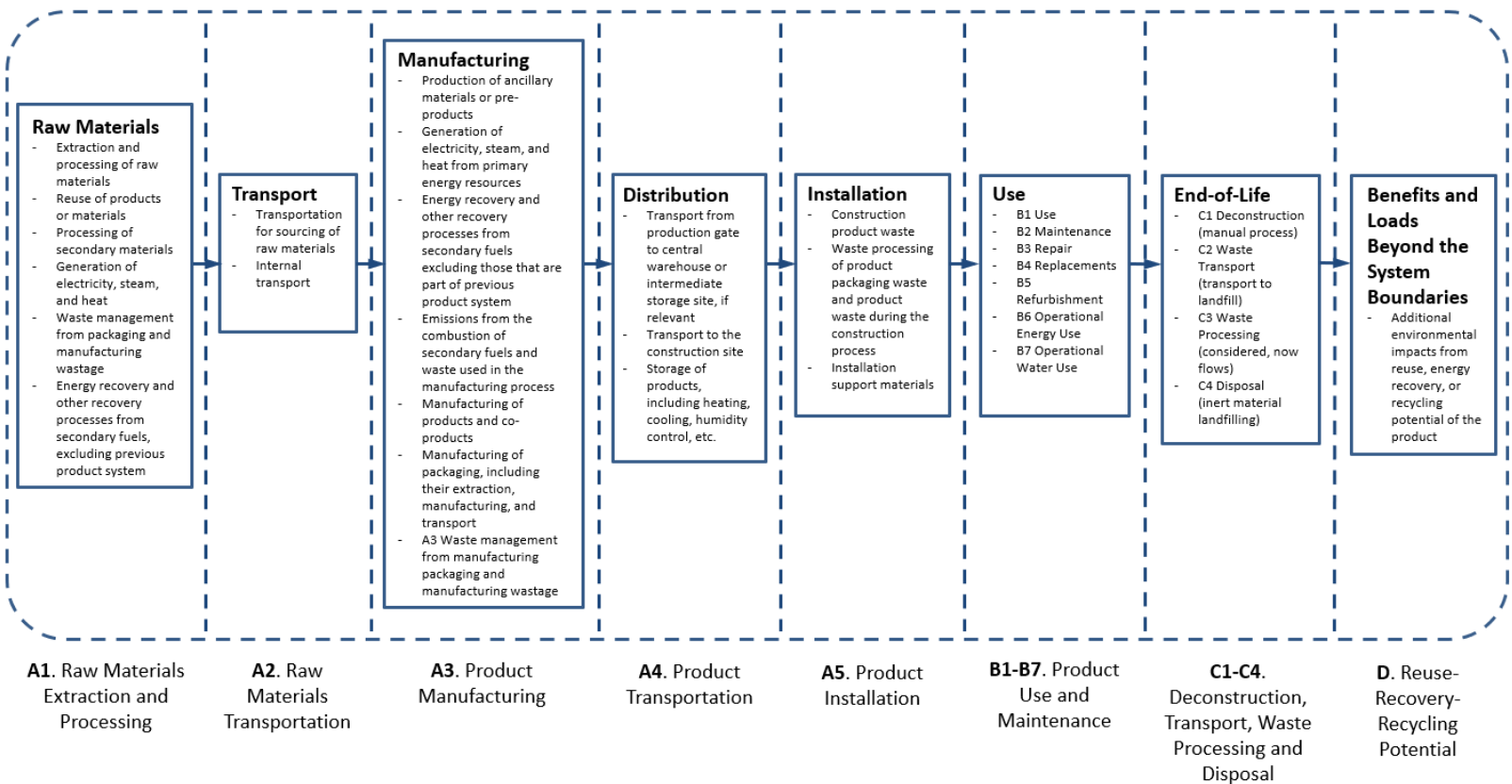
Product Description

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

- * ASTM C216.....Facing Brick
- * ASTM C652.....Hollow Clay Brick (Structural Brick)
- * ASTM C902.....Pedestrian and Light Traffic Paving Brick
- * ASTM C1088.....Thin Veneer Brick
- * ASTM C1272.....Heavy Vehicular Paving Brick

This EPD represents brick products from the HC Muddox Interstate Brick facility in Sacramento, CA.

Flow Diagram



Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



According to the following

ISO Standards: 14025,
14027, 14040, 14044,
21930:2017

Manufacturer Specific EPD

This product-specific 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 company personnel. When company-specific data were not available for a given process input, the BIA Industry Average LCA value was used as a proxy. For any product group EPDs, an impact assessment was completed for each product and the highest impacts were reported as conservative representations of the product group. Product grouping was considered appropriate if the individual product impacts differed by no more than $\pm 10\%$ in any impact category.

Application

Clay masonry products are versatile and ideal for a wide range of applications both exterior and interior. Facing brick is one of the most durable and longest lasting facade materials available. Hollow clay units, or structural brick, provide the aesthetics of brick while also providing the strength and capacity to resist all environmental loads, such as wind, seismic and gravity loads making it ideal for the primary structural system for buildings. Structural brick can lower the cost of brick construction by eliminating other products, reducing structural costs, lowering energy costs, reducing construction labor, eliminating construction trades, and reducing time of construction. Pavers come in several sizes and thicknesses to respond to varying aesthetic design concepts and various loading requirements from light pedestrian traffic to heavy multi-axle trucks and emergency vehicles. Thin brick provides the beauty of brick without the added weight impact of full bed depth facing brick or structural brick.

Material Composition

The primary product components and/or materials must be indicated as a percentage of 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 Brick Assemblies
Mined Clay and Shale	99.78%
Primary Pigments	0.21%
Body Additives	0.01%
Sand	0.01%
Total	100%

Properties of Declared Product as Shipped

Facing brick and pavers are packaged in cubes or on pallets, and bound with plastic strapping. Long facing brick and hollow brick are packaged on pallets bound with plastic strapping. Thin brick is packaged in boxes that are placed on pallets bound with plastic strapping. All brick packages are heat-shrink wrapped to protect from dirt and debris, and to reduce damage by chipping or cracking during transport.

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



According to the following

ISO Standards: 14025,
14027, 14040, 14044,
21930:2017

Methodological Framework

Functional Unit

This EPD defines the functional unit (FU) for clay brick, structural clay brick, clay pavers, and clay thin brick as 1 m² 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 Brick	1 m ² of vertically installed clay brick (or structural clay brick) using 0.95 cm (3/8") nominal mortar joints for the estimated life of the building	156.73 kg per m ²	0.0064
Clay Brick Paver	1 m ² of horizontally installed clay brick paver using 3.2 mm (1/8") nominal sand joints for the estimated life of the installed surface.	62.92 kg per m ²	0.0159
Clay Thin Brick	1 m ² of vertically installed thin brick using 0.95 cm (3/8") nominal mortar joints for the estimated life of the building	21.91 kg per m ²	0.0456

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)

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products

INTERSTATE BRICK



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

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 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 of the considered impact categories. For that, a documented assumption 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

Primary data were collected for every process in the product system under the control of Interstate. Secondary data from theecoinvent and USLCI 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 were 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. The processes modeled represent the specific situations in the clay brick assembly life cycle. System boundaries and exclusions are clearly defined in the sections above, and no other data gaps were identified.

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.

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products

INTERSTATE BRICK



According to the following
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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. 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

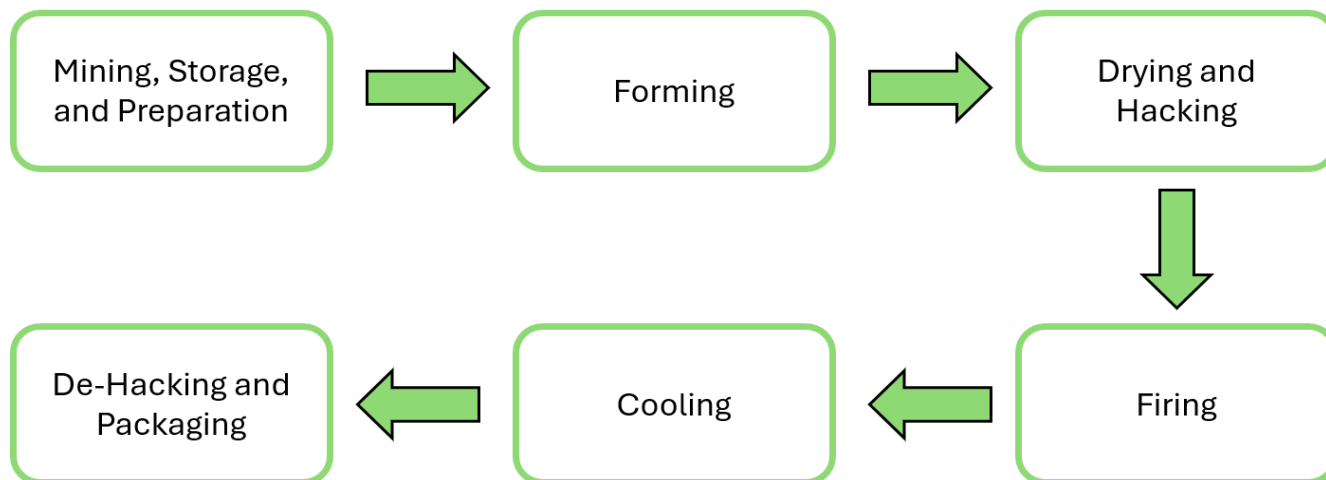
Background data

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). Drying and Hacking; 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. Mining occurs off-site for this facility.



Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



According to the following

ISO Standards: 14025,
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21930:2017

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 Brick - 1.333 kg per functional unit

Clay Brick Paver - 0.535 kg per functional unit

Clay Thin Brick - 1.04 kg per functional unit

Material	Quantity (% By Weight)
Plastic Straps	53.73%
Steel Straps	0.00%
Paper Dividers	21.48%
Wood Dividers	2.84%
Wood Pallets	21.95%
Total	100%

Transportation

Transport to Building Site (A4)				
Name	Clay Brick and Structural Clay Brick	Clay Brick Paver	Clay 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	1670.0	1670.0	1670.0	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			-

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products

INTERSTATE BRICK



According to the following
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14027, 14040, 14044,
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Product Installation

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

Products installed with sand: A 0.32 cm (1/8") (nominal) 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 and Structural Clay Brick	Clay Brick Paver	Clay Thin Brick	Unit
Auxiliary materials	Mortar	27.31	0.00	8.63	kg
	Water	5.46	0.00	1.73	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		7.84	3.15	1.10	kg
Waste materials at construction site		15.79	6.34	2.21	kg
Output substance (recycle)		1.02	0.41	0.14	kg
Output substance (landfill)		6.82	2.74	0.95	kg
Output substance (incineration)		0.00	0.00	0.00	kg
Packaging waste (recycle)		2.9665	1.1909	0.4146	kg
Packaging waste (landfill)		2.7917	1.1207	0.3902	kg
Packaging waste (incineration)		2.1966	0.8818	0.3070	kg
Biogenic carbon contained in packaging		0.0198	0.0079	0.0028	kg
VOC emissions		0.00	0.00	0.00	kg

*CO2 emissions to air from disposal of packaging

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

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 and Structural Clay Brick	Clay Brick Paver	Clay 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	kg/m ²
	Water	0.0	2.17E-01	kg/m ²

Disposal

Clay Brick, Structural Clay Brick, Clay Brick Pavers, and Clay Thin Brick 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 and Structural Clay Brick	Clay Brick Paver	Clay Thin Brick	Unit
Collected separately	156.73	62.92	21.91	kg
Collected as mixed construction waste	0.00	0.00	0.00	kg
Recycling	18.81	7.55	2.63	kg
Landfilling	137.92	55.37	19.28	kg
Incineration with energy recovery	0.00	0.00	0.00	kg

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



According to the following
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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. 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 and Structural Clay Brick	Clay Brick Paver	Clay 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.	18.81	7.55	2.63	kg

Clay Brick, Structural Clay 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 reported below are for the MOD Solid product which serves as the baseline product evaluated. Specification for the baseline brick are identified in Conversion Factor Table for Clay Brick, Structural Clay tile.

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.	7.04E+01	5.92E+00	4.12E+00	8.25E+00	0.00E+00	1.90E+00	2.93E+00	-8.51E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	2.44E-08	2.24E-10	4.24E-09	3.72E-08	0.00E+00	7.96E-11	5.93E-08	-8.76E-10
AP Air	Acidification potential for air emissions	kg SO ₂ -Eq.	6.86E-01	3.54E-02	3.82E-02	2.62E-02	0.00E+00	2.51E-02	1.63E-02	-5.16E-04
FEP	Freshwater eutrophication potential	kg P-Eq.	4.24E-04	6.68E-06	1.91E-04	8.50E-04	0.00E+00	2.38E-06	1.73E-04	-1.57E-05
MEP	Marine eutrophication potential	kg N-Eq.	2.27E-02	8.06E-03	2.14E-03	4.46E-03	0.00E+00	6.64E-03	3.81E-03	-9.96E-05
SP	Smog formation potential	kg O ₃ -Eq.	2.84E+00	9.68E-01	2.46E-01	5.02E-01	0.00E+00	6.44E-01	4.50E-01	-1.11E-02

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

The additional results shown below were calculated using the CML 4.1 (2001 - April 2013) Methodology.

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
ADPF	Abiotic depletion potential for fossil resources	MJ	1.02E+03	7.61E+01	5.65E+01	2.17E+01	0.00E+00	2.73E+01	3.89E+00	-3.67E-01

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

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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Statement on EPD results

A) Results in the above table and the ones that follow 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

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	1.04E+00	0.00E+00	8.18E-02	6.74E+00	0.00E+00	0.00E+00	5.84E-01	-8.62E-02
RPR _M	Renewable primary energy resources as material utilization	MJ	8.5E+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	1.02E+03	7.61E+01	5.65E+01	2.42E+01	0.00E+00	2.73E+01	4.49E+00	-4.62E-01
NRPR _M	Nonrenewable primary energy as material utilization	MJ	3.17E+02	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	0.00E+00	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	1.03E-03	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	-1.00E-02	0.00E+00	4.88E-04	4.44E-02	0.00E+00	0.00E+00	2.52E-02	-2.86E-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	3.77E-05	0.00E+00	1.88E-05	2.18E-04	0.00E+00	0.00E+00	3.33E-04	-5.53E-06
NHWD	Non-hazardous waste disposed	kg	2.88E-01	0.00E+00	6.99E+00	9.57E-01	0.00E+00	0.00E+00	1.38E+02	-9.78E-03
HLRW	High-level radioactive waste	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
ILLRW	Intermediate- and low-level radioactive waste	kg	1.85E-05	0.00E+00	1.37E-06	3.75E-05	0.00E+00	0.00E+00	8.58E-06	-1.43E-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	3.99E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+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.

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

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	8.63E-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	8.63E-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	4.19E-05	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	7.14E+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.

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products

INTERSTATE BRICK

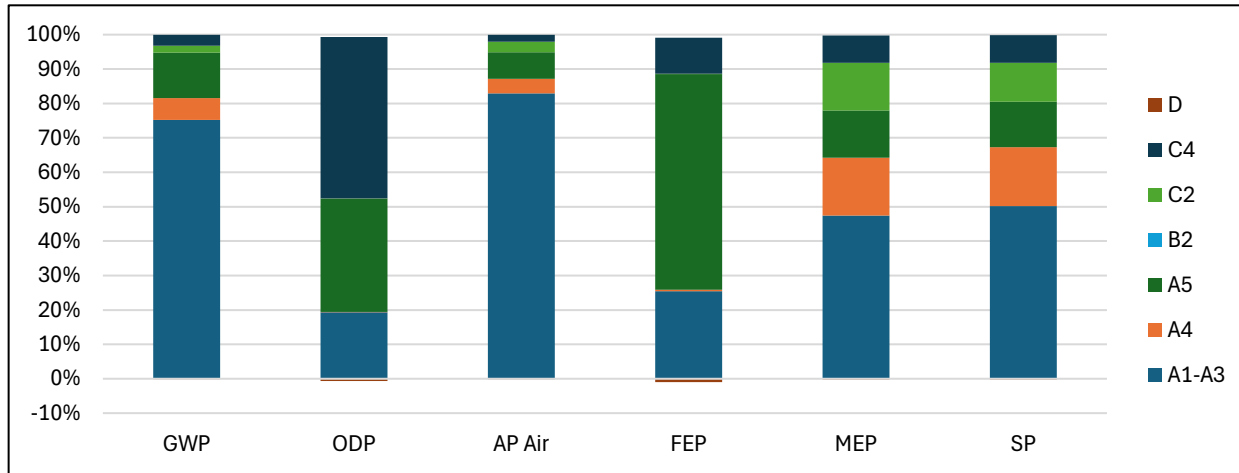


According to the following

ISO Standards: 14025,
14027, 14040, 14044,
21930:2017

Clay Brick, Structural Clay 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 affected by the weight of the product, except for the mortar used in installation.



Below is a photo of a structural brick product:



Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

Clay Brick, Structural Clay 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, multiply 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 'MOD cored', multiply the above impact (7.04E+01) by the Brick Conversion Factor (0.821) for a result of 5.78E+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
MOD solid (Baseline)	C216	3.625 x 2.25 x 7.625	9.2 x 5.7 x 19.4	0.0%	2.12	73.81	---	32.77	1.000
MOD cored	C216	3.625 x 2.25 x 7.625	9.2 x 5.7 x 19.4	18.0%	1.74	73.81	0.821	32.77	1.000
Utility cored	C216	3.625 x 3.625 x 11.625	9.2 x 9.2 x 29.5	17.0%	4.33	32.29	0.892	21.85	0.667
Fire Brick solid	C216	4.5 x 2.5 x 9	11.4 x 6.4 x 22.9	0.0%	3.46	57.51	1.269	36.72	1.121
5 x 3 x 10	C652	4.625 x 2.75 x 9.625	11.7 x 7 x 24.4	60.0%	1.67	49.60	0.528	34.95	1.066
6 x 4 x 12	C216	5.5 x 3.5 x 11.5	14 x 8.9 x 29.2	33.0%	5.06	33.68	1.088	34.03	1.039
8 x 4 x 12	C216	7.5 x 3.5 x 11.5	19.1 x 8.9 x 29.2	41.0%	6.08	33.68	1.307	46.41	1.416
14.25" Kiln Block	C216	7 x 9.125 x 14.25	17.8 x 23.2 x 36.2	35.3%	20.10	11.16	1.431	22.16	0.676
Calif Roman	C216	3.5 x 1.25 x 11.5	8.9 x 3.2 x 29.2	0.0%	1.72	80.32	0.881	44.09	1.345
3.5 x 2.5 x 11.5	C216	3.5 x 2.5 x 11.5	8.9 x 6.4 x 29.2	0.0%	3.43	45.40	0.995	27.29	0.833
3.5 x 2.5 x 7.5 solid	C216	3.5 x 2.5 x 7.5	8.9 x 6.4 x 19.1	0.0%	2.24	68.46	0.979	29.70	0.906
3.5 x 2.5 x 7.5 x cored	C216	3.5 x 2.5 x 7.5	8.9 x 6.4 x 19.1	16.0%	1.88	68.46	0.822	29.70	0.906
STD solid	C216	3.75 x 2.5 x 8	9.5 x 6.4 x 20.3	0.0%	2.56	64.37	1.051	31.37	0.957
STD cored	C216	3.75 x 2.5 x 8	9.5 x 6.4 x 20.3	17.0%	2.12	64.37	0.872	31.37	0.957
1.25" MOD solid	C216	3.625 x 1.25 x 7.625	9.2 x 3.2 x 19.4	0.0%	1.18	119.23	0.897	47.77	1.458
3" x 2.5" x 11.5" Solid	C216	3 x 2.5 x 11.5	7.6 x 6.4 x 29.2	0.0%	2.94	45.40	0.853	23.39	0.714
King cored	C216	3 x 2.625 x 9.625	7.6 x 6.7 x 24.4	17.0%	2.15	51.67	0.707	23.38	0.714
3 x 3.5 x 11.5 solid	C216	3 x 3.5 x 11.5	7.6 x 8.9 x 29.2	0.0%	4.12	33.68	0.885	18.56	0.567
3 x 3.5 x 11.5 cored	C216	3 x 3.5 x 11.5	7.6 x 8.9 x 29.2	17.0%	3.42	33.68	0.735	18.56	0.567

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

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.	2.83E+01	2.38E+00	1.65E+00	1.63E+00	7.63E-01	1.18E+00	-3.42E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	9.78E-09	8.99E-11	1.70E-09	1.54E-07	3.20E-11	2.38E-08	-3.52E-10
AP Air	Acidification potential for air emissions	kg SO ₂ -Eq.	2.76E-01	1.42E-02	1.53E-02	1.07E-02	1.01E-02	6.55E-03	-2.07E-04
FEP	Freshwater eutrophication potential	kg P-Eq.	1.70E-04	2.68E-06	7.68E-05	2.94E-04	9.54E-07	6.94E-05	-6.28E-06
MEP	Marine eutrophication potential	kg N-Eq.	9.11E-03	3.24E-03	8.60E-04	1.89E-03	2.67E-03	1.53E-03	-4.00E-05
SP	Smog formation potential	kg O ₃ -Eq.	1.14E+00	3.89E-01	9.88E-02	2.36E-01	2.59E-01	1.80E-01	-4.47E-03

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

The additional results shown below were calculated using the CML 4.1 (2001 - April 2013) Methodology.

Parameter	Parameter	Unit	A1-A3	A4	A5	B2	C2	C4	D
ADPF	Abiotic depletion potential for fossil resources	MJ	4.10E+02	3.06E+01	2.27E+01	1.31E+01	1.09E+01	1.56E+00	-1.47E-01

*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	4.17E-01	0.00E+00	3.29E-02	1.51E+00	0.00E+00	2.34E-01	-3.46E-02
RPR _M	Renewable primary energy resources as material utilization	MJ	3.40E+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	4.10E+02	3.06E+01	2.27E+01	1.46E+01	1.09E+01	1.80E+00	-1.85E-01
NRPR _M	Nonrenewable primary energy as material utilization	MJ	1.27E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Use of secondary material	kg	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	4.13E-04	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	-4.02E-03	0.00E+00	1.96E-04	1.83E-01	0.00E+00	1.01E-02	-1.15E-02

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

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

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	1.51E-05	0.00E+00	7.54E-06	4.47E-04	0.00E+00	1.34E-04	-2.22E-06
NHWD	Non-hazardous waste disposed	kg	1.16E-01	0.00E+00	2.81E+00	9.77E-02	0.00E+00	5.53E+01	-3.93E-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	7.44E-06	0.00E+00	5.49E-07	2.33E-05	0.00E+00	3.44E-06	-5.76E-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	1.60E+00	0.00E+00	0.00E+00	7.55E+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
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	3.46E-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	0.0E+00	0.0E+00	3.5E-01	0.00E+00	0.0E+00	0.0E+00	0.0E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO ₂	1.68E-05	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	2.9E+00	0.0E+00	0.0E+00	0.00E+00	0.0E+00	0.0E+00	0.0E+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.

Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products

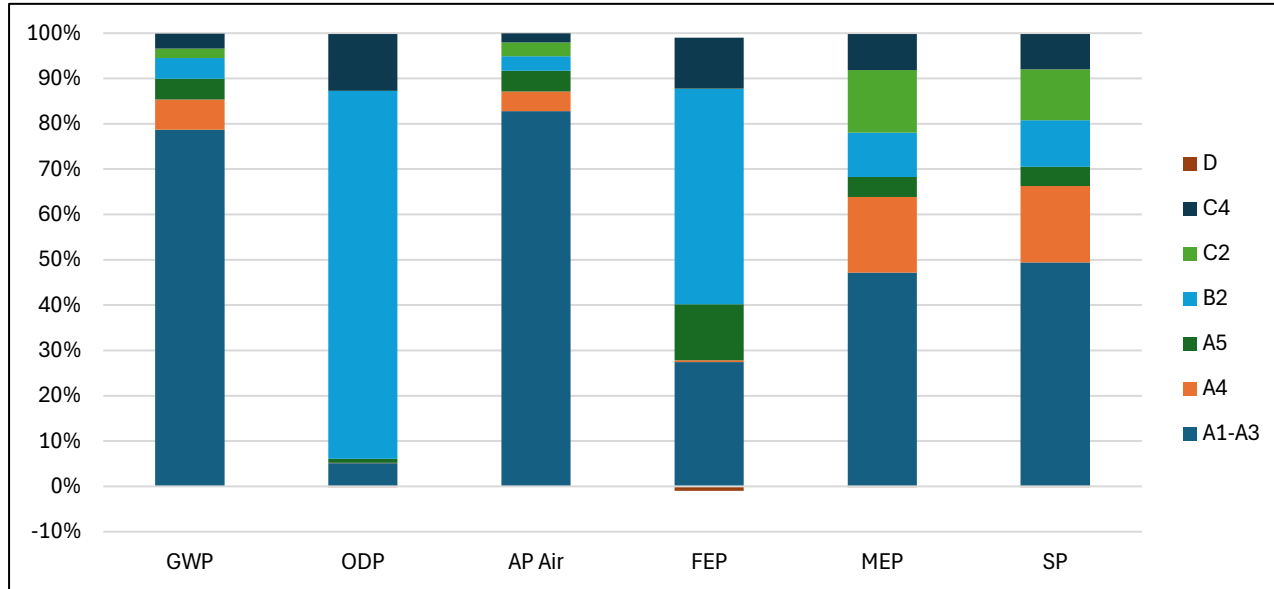


According to the following

ISO Standards: 14025,
14027, 14040, 14044,
21930:2017

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 affected by the weight of the product, except for the washing required in the use stage.



Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

Clay Brick Paver - Scaling 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, multiply the impact by that product's 'Brick Conversion Factor'.

For example: To determine the A1-A3 TRACI GWP impact for 'Utility split paver', multiply the above impact (2.83E+01) by the Brick Conversion Factor (1.005) for a result of 2.84E+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
<i>Modular split paver (Baseline)</i>	C902	3.625 x 1.25 x 7.625	9.2 x 3.2 x 19.4	0.0%	1.18	53.33	---
<i>Utility split paver</i>	C902	3.5 x 1.25 x 11.5	8.9 x 3.2 x 29.2	0.0%	1.72	36.78	1.005
<i>10" DBL BN Paver</i>	C902	3.625 x 2.25 x 9.5	9.2 x 5.7 x 24.1	10.0%	2.38	42.94	1.626
<i>2" MOD paver</i>	C902	3.625 x 2 x 7.625	9.2 x 5.1 x 19.4	0.0%	1.89	53.33	1.600
<i>12" BN paver</i>	C902	3.625 x 2.25 x 11.25	9.2 x 5.7 x 28.6	9.0%	2.85	36.34	1.646
<i>MOD paver</i>	C902	3.625 x 2.25 x 7.625	9.2 x 5.7 x 19.4	0.0%	2.12	53.33	1.800
<i>9" BN paver</i>	C902	3.625 x 2.25 x 8.75	9.2 x 5.7 x 22.2	11.5%	2.16	46.57	1.595
<i>True paver</i>	C902	4 x 2.25 x 8	10.2 x 5.7 x 20.3	0.0%	2.46	46.25	1.808
<i>Fire Brick split paver</i>	C902	4.5 x 1.25 x 9	11.4 x 3.2 x 22.9	0.0%	1.73	36.73	1.009

Below is a photo of a paver product:



Environmental Product Declaration

Interstate® Brick - Sacramento - HC Muddox

Clay Masonry Products



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

Clay 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.	5.49E+01	8.28E-01	5.76E-01	2.61E+00	0.00E+00	2.66E-01	4.10E-01	-1.19E-02
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.90E-08	3.13E-11	5.93E-10	1.18E-08	0.00E+00	1.11E-11	8.28E-09	-1.22E-10
AP Air	Acidification potential for air emissions	kg SO ₂ -Eq.	5.36E-01	4.94E-03	5.34E-03	8.27E-03	0.00E+00	3.51E-03	2.28E-03	-7.22E-05
FEP	Freshwater eutrophication potential	kg P-Eq.	3.31E-04	9.34E-07	2.68E-05	2.68E-04	0.00E+00	3.32E-07	2.42E-05	-2.19E-06
MEP	Marine eutrophication potential	kg N-Eq.	1.77E-02	1.13E-03	2.99E-04	1.41E-03	0.00E+00	9.29E-04	5.32E-04	-1.39E-05
SP	Smog formation potential	kg O ₃ -Eq.	2.22E+00	1.35E-01	3.44E-02	1.59E-01	0.00E+00	9.00E-02	6.28E-02	-1.55E-03

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

The additional results shown below were calculated using the CML 4.1 (2001 - April 2013) Methodology.

Parameter	Parameter	Unit	A1-A3	A4	A5		B2	C2	C4	D
					Brick Impacts	Mortar Impacts				
ADPF	Abiotic depletion potential for fossil resources	MJ	7.97E+02	1.06E+01	7.89E+00	6.84E+00	0.00E+00	3.81E+00	5.44E-01	-5.13E-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 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	8.10E-01	0.00E+00	1.14E-02	2.13E+00	0.00E+00	0.00E+00	8.16E-02	-1.20E-02
RPR _M	Renewable primary energy resources as material utilization	MJ	6.61E+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	7.98E+02	1.06E+01	7.90E+00	7.64E+00	0.00E+00	3.81E+00	6.28E-01	-6.45E-02
NRPR _M	Nonrenewable primary energy as material utilization	MJ	2.47E+02	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	0.00E+00	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	8.04E-04	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	-7.81E-03	0.00E+00	6.82E-05	1.40E-02	0.00E+00	0.00E+00	3.52E-03	-4.00E-03

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

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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	2.94E-05	0.00E+00	2.62E-06	6.90E-05	0.00E+00	0.00E+00	4.65E-05	-7.73E-07
NHWD	Non-hazardous waste disposed	kg	2.25E-01	0.00E+00	9.77E-01	3.02E-01	0.00E+00	0.00E+00	1.93E+01	-1.37E-03
HLRW	High-level radioactive waste	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
ILLRW	Intermediate- and low-level radioactive waste	kg	1.45E-05	0.00E+00	1.91E-07	1.19E-05	0.00E+00	0.00E+00	1.20E-06	-2.00E-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	5.57E-01	0.00E+00	0.00E+00	0.00E+00	2.63E+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	6.73E-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	6.73E-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	5.86E-06	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	5.57E+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.

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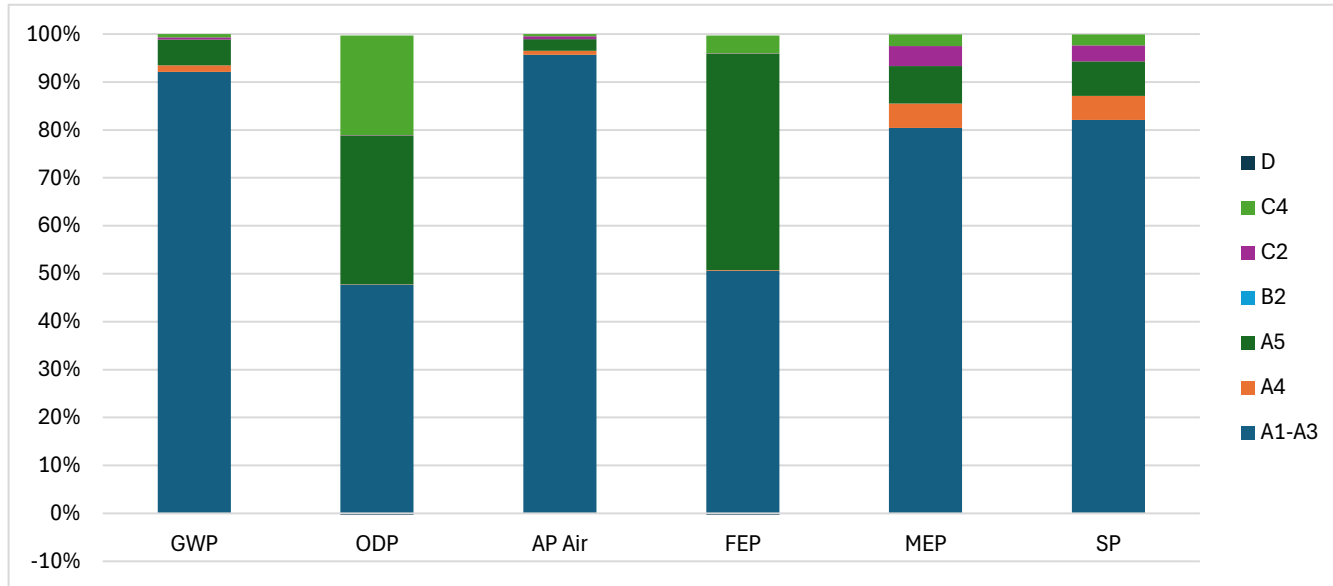


According to the following

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14027, 14040, 14044,
21930:2017

Clay 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 affected by the weight of the product, except for the mortar used in installation.



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Clay Thin Brick - Scaling 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, multiply 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 '1/2" STD Corner TB', multiply the above impact (5.49E+01) by the Brick Conversion Factor (1.373) for a result of 7.54E+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
1/2" STD TB (Baseline)	C1088	0.5 x 2.5 x 8	1.3 x 6.4 x 20.3	0.34	64.37	---	10.356	1.000
1/2" STD Corner TB	C1088	0.5 x 2.5 x 8	1.3 x 6.4 x 20.3	0.47	64.37	1.373	10.356	1.000
1/2" x 11.625" NOR TB	C1088	0.5 x 2.25 x 11.625	1.3 x 5.7 x 29.5	0.44	49.21	0.999	10.363	1.001
1/2" x 11.625" NOR Corner TB	C1088	0.5 x 2.25 x 11.625	1.3 x 5.7 x 29.5	0.56	49.21	1.264	10.363	1.001
1/2" MOD TB	C1088	0.5 x 2.25 x 7.625	1.3 x 5.7 x 19.4	0.29	73.81	0.994	10.693	1.033
1/2" MOD Corner TB	C1088	0.5 x 2.25 x 7.625	1.3 x 5.7 x 19.4	0.41	73.81	1.376	10.693	1.033
1/2" KING TB	C1088	0.5 x 2.625 x 9.625	1.3 x 6.7 x 24.4	0.43	51.67	1.017	10.070	0.972
1/2" KING Corner TB	C1088	0.5 x 2.625 x 9.625	1.3 x 6.7 x 24.4	0.59	51.67	1.402	10.070	0.972
1/2" UTIL TB	C1088	0.5 x 3.5 x 11.5	1.3 x 8.9 x 29.2	0.69	33.68	1.053	9.268	0.895
1/2" UTIL Corner TB	C1088	0.5 x 3.5 x 11.5	1.3 x 8.9 x 29.2	0.90	33.68	1.388	9.268	0.895
1/2" UTIL Lintel TB	C1088	0.5 x 3.5 x 11.5	1.3 x 8.9 x 29.2	0.87	33.68	1.333	9.268	0.895
1/2" x 3.625" MOD TB	C1088	0.5 x 3.625 x 7.625	1.3 x 9.2 x 19.4	0.47	48.44	1.043	9.538	0.921
1/2" x 3.625" MOD Corner TB	C1088	0.5 x 3.625 x 7.625	1.3 x 9.2 x 19.4	0.69	48.44	1.535	9.538	0.921
3/4" x 11.5" NOR TB	C1088	0.75 x 2.5 x 11.5	1.9 x 6.4 x 29.2	0.74	45.40	1.523	12.022	1.161
3/4" STD TB	C1088	0.75 x 2.5 x 8	1.9 x 6.4 x 20.3	0.51	64.37	1.507	12.447	1.202
3/4" STD Corner TB	C1088	0.75 x 2.5 x 8	1.9 x 6.4 x 20.3	0.69	64.37	2.027	12.447	1.202
3/4" x 11.625" NOR TB	C1088	0.75 x 2.25 x 11.625	1.9 x 5.7 x 29.5	0.67	49.21	1.508	12.457	1.203
3/4" x 11.625" NOR Corner TB	C1088	0.75 x 2.25 x 11.625	1.9 x 5.7 x 29.5	0.90	49.21	2.018	12.457	1.203
3/4" MOD TB	C1088	0.75 x 2.25 x 7.625	1.9 x 5.7 x 19.4	0.44	73.81	1.483	12.953	1.251
3/4" MOD Corner TB	C1088	0.75 x 2.25 x 7.625	1.9 x 5.7 x 19.4	0.60	73.81	2.018	12.953	1.251

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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
3/4" MOD Lintel TB	C1088	0.75 x 2.25 x 7.625	1.9 x 5.7 x 19.4	0.60	73.81	2.018	12.953	1.251
3/4" x 2.25" STD TB	C1088	0.75 x 2.25 x 8	1.9 x 5.7 x 20.3	0.46	70.50	1.490	12.887	1.244
3/4" x 2.25" STD Corner TB	C1088	0.75 x 2.25 x 8	1.9 x 5.7 x 20.3	0.62	70.50	1.986	12.887	1.244
3/4" x 3.625" MOD TB	C1088	0.75 x 3.625 x 7.625	1.9 x 9.2 x 19.4	0.71	48.44	1.565	11.220	1.083
3/4" x 3.625" MOD Corner TB	C1088	0.75 x 3.625 x 7.625	1.9 x 9.2 x 19.4	0.96	48.44	2.127	11.220	1.083
5/8" x 2.5" x 11.5" TB	C1088	0.625 x 2.5 x 11.5	1.6 x 6.4 x 29.2	0.61	45.40	1.269	11.047	1.067
5/8" x 2.5" x 11.5" Corner TB	C1088	0.625 x 2.5 x 11.5	1.6 x 6.4 x 29.2	0.77	45.40	1.589	11.047	1.067
5/8" STD TB	C1088	0.625 x 2.5 x 8	1.6 x 6.4 x 20.3	0.43	64.37	1.253	11.401	1.101
5/8" STD Corner	C1088	0.625 x 2.5 x 8	1.6 x 6.4 x 20.3	0.58	64.37	1.707	11.401	1.101
5/8" MOD Corner	C1088	0.625 x 2.25 x 7.625	1.6 x 5.7 x 19.4	0.50	73.81	1.697	11.823	1.142
5/8" x 3.5" x 11.5" NOR TB	C1088	0.625 x 3.5 x 11.5	1.6 x 8.9 x 29.2	0.86	33.68	1.319	10.041	0.970
5/8" x 3.5" x 11.5" NOR Corner TB	C1088	0.625 x 3.5 x 11.5	1.6 x 8.9 x 29.2	1.08	33.68	1.654	10.041	0.970
5/8" x Closure Corner TB	C1088	0.625 x 3.625 x 7.625	1.6 x 9.2 x 19.4	0.81	48.44	1.796	10.379	1.002
1" STD TB	C1088	1 x 2.5 x 8	2.5 x 6.4 x 20.3	0.68	64.37	2.000	14.538	1.404
1" MOD TB	C1088	1 x 2.25 x 7.625	2.5 x 5.7 x 19.4	0.59	73.81	1.972	15.213	1.469

Below is a photo of a thin brick product:



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Additional Environmental Information

Environmental and Health During Manufacturing

Interstate Brick® has well-established Environmental, Health, and Safety (EHS) protocols which help to enforce proper evaluation and monitoring of additives that are used to manufacture products. Their programs ensure that all environmental and OSHA requirements are met or exceeded to ensure the health and safety of all employees and contractors.

Environmental and Health During Installation

Handling of fired clay brick materials is generally considered to be similar to handling inert materials. Since they do not contain organic compounds, they do not perpetuate mold growth. Certain entities and agencies have created documents related to exposure to some of the constituent materials as follows:

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/>

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Extraordinary Effects

Fire

Brick is a noncombustible material. It doesn't burn or contribute to flame spread. It doesn't off-gas and emits zero volatile organic compounds (VOCs). For rated fire resistance of other brick materials and assemblies reference the International Building Code Table 721.1 (2) and Table 722.4.1 (1). Refer to BIA 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. Fired clay brick has less porosity and less water migration potential than other non-clay manufactured structural masonry materials.

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

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References

- PCR Part B NSF/ASTM Clay Masonry Products PCR.
- SimaPro 9.6 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.

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