

Environmental Product Declaration

Glen-Gery Brick

Clay Masonry Products

Mid-Atlantic facility. Shoemakersville, PA



The primary materials used in brick production are clay, shale, and sand. These materials are carefully sourced to ensure consistency and quality in the final product. The preparation process includes selecting the best materials, removing impurities, and blending them in precise proportions. These blended materials are then carefully shaped by various methods of molding or extruding and cutting. The resulting pre-finished products are then dried in controlled chamber environments and fired at specific temperatures in a kiln to achieve desired hardness and color qualities of structural brick. Final products are subjected to rigorous quality standards to ensure strength, durability, and color consistency.



At Glen-Gery, we recognize that environmental stewardship is a responsibility we carry forward for future generations. Our commitment is to continuously pursue innovative, sustainable practices throughout our manufacturing operations and in the long-term performance of our clay brick products. We take pride in producing materials that offer superior energy efficiency, durability, recyclability, and low maintenance—while minimizing impact on the natural resources from which they are sourced. Our facilities are held to rigorous environmental standards, consistently meeting or exceeding state and federal regulations. We remain dedicated to supporting architects, builders, and developers in creating environmentally responsible spaces that stand the test of time.



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Environmental
Product Declaration**

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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 | Glen-Gery Brickworks North America (Glen-Gery) Corporate Office / 1166 Spring St, Wyomissing, PA 19610 | |
| DECLARATION NUMBER | EPD11243 | |
| DECLARED PRODUCT & FUNCTIONAL UNIT | Glen-Gery Brick - 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 | |
| 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: | | |
| This declaration was independently verified in accordance with ISO 14025: 2006. The NSF/ASTM Clay Masonry Products PCR | Jack Geibig - | |
| <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL | | |
| This Life Cycle Assessment was independently verified in accordance with ISO 14044 and the reference PCR by: | Jack Geibig - | |

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

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

General Information

Description of Company/Organization

Glen-Gery, part of Brickworks Limited of Australia, is one of the largest brick manufacturers in North America. Since 1890, Glen-Gery has built a reputation for its superior service and high-quality building products that meet both demanding design challenges and construction specifications for commercial and residential projects alike. Through technological advancements and product innovations, Glen-Gery offers a diverse, premium portfolio of more than 500 products, which are crafted locally and sourced globally, catering to the high-style needs of today's architects, designers, and homeowners.

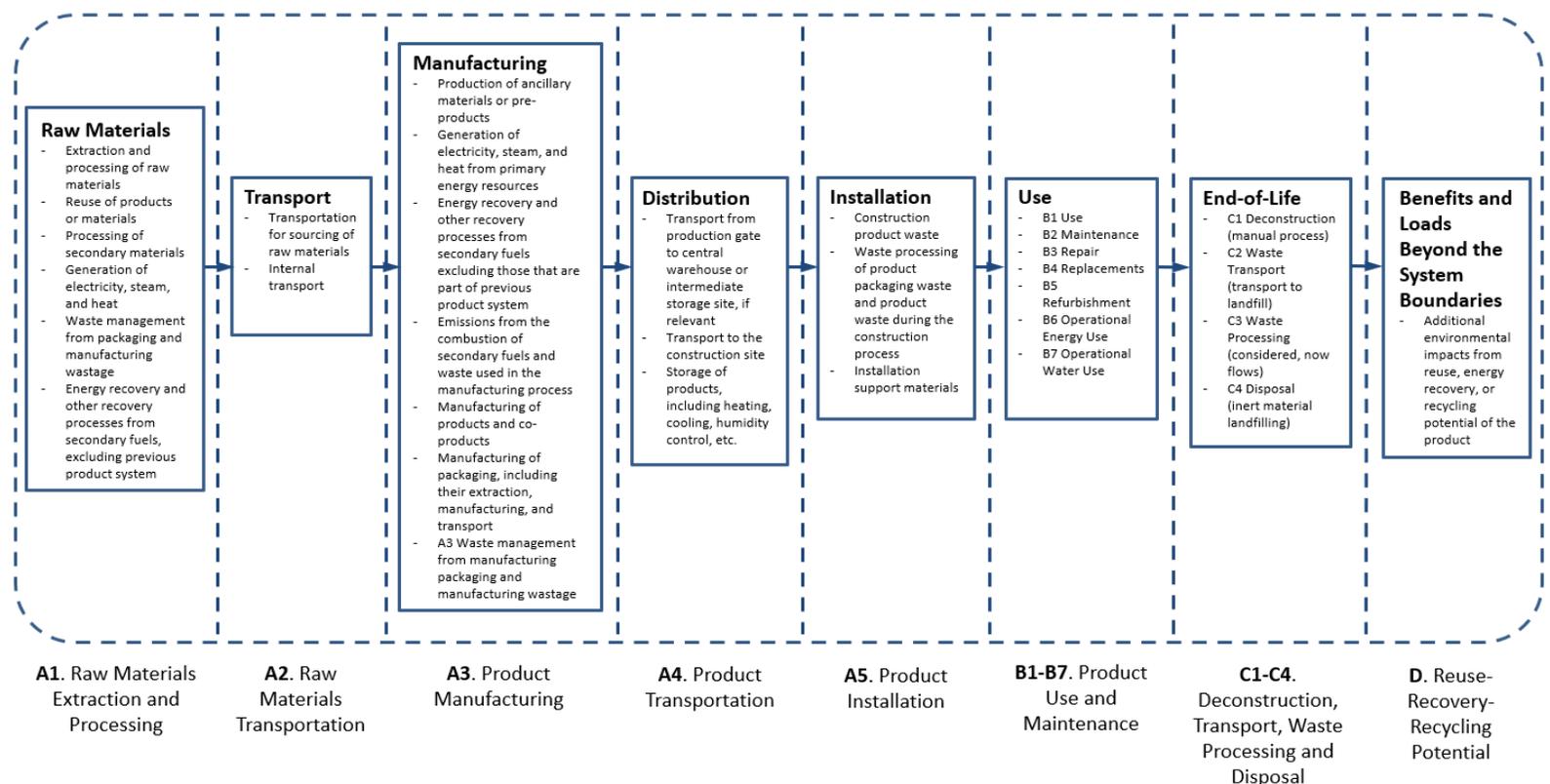
Product Description

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)

This EPD represents brick products from the following Glen-Gery facility: Mid-Atlantic facility. Shoemakersville, PA

Flow Diagram



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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

Brick remains a preferred choice among architects and designers for its exceptional design versatility, structural integrity, and ability to deliver refined, detailed aesthetics. With an expansive palette of hundreds of colors and a wide range of finishes—from sleek, glossy, and modern to rustic and natural textures—brick offers endless possibilities for creative expression. Our brick products are engineered for compatibility with a variety of interior and exterior wall systems, supporting both structural and veneer applications. Additionally, they are well-suited for paving applications across residential and commercial buildings, enhancing both functionality and visual appeal. Whether used to create bold architectural statements or subtle, timeless designs, brick continues to elevate spaces with durability and distinction.

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 Brick Assemblies |
|----------------------|-----------------------|
| Mined Clay and Shale | 98.62% |
| External Grog | 0.00% |
| Primary Pigments | 1.34% |
| Body additives | 0.05% |
| Sand | 0.00% |
| Total | 100% |

Properties of Declared Product as Shipped

Brick products are carefully sorted in arrangements with paper or wood dividers until being securely packaged with high plastic strapping. Brick products can also be shrink wrapped with thick plastic film packaging materials creating a tight tamper-evident seal. Shipping of final products may be by pallet in certain smaller assemblies or veneer applications.

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Methodological Framework

Functional Unit

This EPD defines the functional unit (FU) for clay brick, clay brick pavers, and structural clay tile products 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 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 | 150.48 kg per m ² | 0.0066 |
| 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. | 119.6 kg per m ² | 0.0084 |

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.

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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 Glen-Gery. 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 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. 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.

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.

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Additional Environmental Information

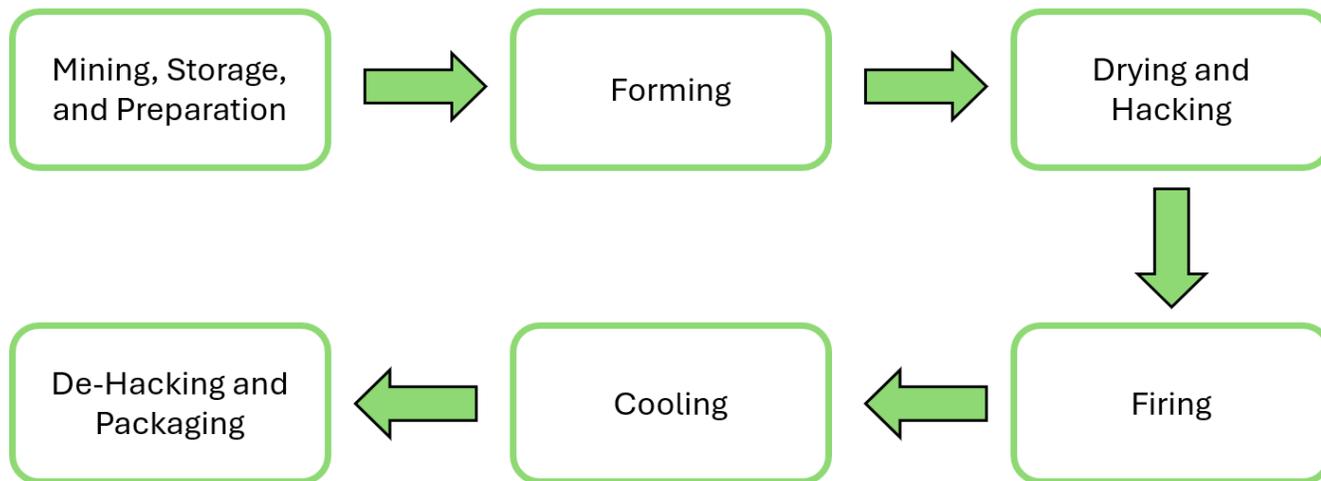
Background data

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 and storage; 2). Raw material preparation; 3). Forming; 4). Drying; 5). Hacking; 6). Firing; 7). Cooling; 8). De-hacking.

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 - 0.863 kg per functional unit

Clay Brick Paver - 0.686 kg per functional unit

| Material | Quantity (% By Weight) |
|----------------|------------------------|
| Plastic Straps | 74.57% |
| Steel Straps | 0.00% |
| Paper Dividers | 5.05% |
| Wood Dividers | 11.09% |
| Wood Pallets | 9.30% |
| Total | 100% |

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Transportation

| Transport to Building Site (A4) | | | |
|--|-----------------------|-------------------|-------------------|
| Name | Structural Clay Brick | Clay Brick Paver | Unit |
| Fuel type | Diesel | Diesel | - |
| Liters of fuel (for freight (combination) truck with a 32t payload) | 2.72E-03 | 2.72E-03 | L / 100km-kg |
| Vehicle Type | Combination Truck | Combination Truck | - |
| Transport distance | 407 | 407 | km |
| Capacity utilization (including empty runs) | 49.9 | 49.9 | % |
| Gross density of products transported | 1987.9 | 1987.9 | 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.

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 | | Structural Clay Brick | Clay Brick Paver | Unit |
| Auxiliary materials | Mortar | 23.78 | 0.00 | kg |
| | Water | 4.76 | 0.00 | kg |
| Water consumption | | 0.00 | 0.00 | m ³ |
| Electricity consumption | | 0.00 | 0.00 | kWh |
| Product loss per functional unit | | 7.52 | 5.98 | kg |
| Waste materials at construction site | | 32.34 | 0.00 | kg |
| Output substance (recycle) | | 0.98 | 0.78 | kg |
| Output substance (landfill) | | 6.55 | 5.20 | kg |
| Output substance (incineration) | | 0.00 | 0.00 | kg |
| Packaging waste (recycle) | | 9.20 | 7.3111 | kg |
| Packaging waste (landfill) | | 8.71 | 6.9221 | kg |
| Packaging waste (incineration) | | 6.90 | 5.4883 | kg |
| Biogenic carbon contained in packaging | | 0.01 | 0.0080 | kg |
| VOC emissions | | - | - | kg |

*CO₂ emissions to air from disposal of packaging

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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 | Structural Clay Brick | Clay Brick Paver | Unit |
| Maintenance cycle | 0.0 | 37.5 | Number/ RSL |
| Maintenance cycle | 0.0 | 18.8 | Number/ ESL |
| Water consumption (from tap, to sewer) | 0.0 | 9.46E-03 | m ³ |
| Electricity consumption | 0.0 | 0.0808 | 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, 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 | Structural Clay Brick | Clay Brick Paver | Unit |
| Collected separately | 150.48 | 119.60 | kg |
| Collected as mixed construction waste | 0.00 | 0.00 | kg |
| Recycling | 18.06 | 14.35 | kg |
| Landfilling | 132.42 | 105.25 | kg |
| Incineration with energy recovery | 0.00 | 0.00 | kg |

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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. 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 | Structural Clay Brick | Clay Brick Paver | 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. | 18.06 | 14.35 | kg |

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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 reported below are for the 70S (Molded) clay brick 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. | 4.76E+01 | 5.68E+00 | 2.95E+00 | 7.19E+00 | 0.00E+00 | 1.82E+00 | 2.82E+00 | -8.17E-02 |
| ODP | Depletion potential of the stratospheric ozone layer | kg CFC-11 Eq. | 4.68E-08 | 2.15E-10 | 5.24E-09 | 3.24E-08 | 0.00E+00 | 7.64E-11 | 5.69E-08 | -8.41E-10 |
| AP Air | Acidification potential for air emissions | kg SO ₂ -Eq. | 4.36E-01 | 3.39E-02 | 2.55E-02 | 2.28E-02 | 0.00E+00 | 2.41E-02 | 1.57E-02 | -4.96E-04 |
| FEP | Freshwater eutrophication potential | kg P-Eq. | 1.45E-03 | 6.42E-06 | 2.39E-04 | 7.40E-04 | 0.00E+00 | 2.28E-06 | 1.66E-04 | -1.50E-05 |
| MEP | Marine eutrophication potential | kg N-Eq. | 1.87E-02 | 7.74E-03 | 1.91E-03 | 3.89E-03 | 0.00E+00 | 6.38E-03 | 3.65E-03 | -9.56E-05 |
| SP | Smog formation potential | kg O ₃ -Eq. | 2.26E+00 | 9.29E-01 | 2.13E-01 | 4.37E-01 | 0.00E+00 | 6.18E-01 | 4.32E-01 | -1.07E-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 | 6.13E+02 | 7.31E+01 | 3.58E+01 | 1.89E+01 | 0.00E+00 | 2.62E+01 | 3.74E+00 | -3.52E-01 |

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

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.

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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 | 6.48E+00 | 0.00E+00 | 3.53E-01 | 5.87E+00 | 0.00E+00 | 0.00E+00 | 5.61E-01 | -8.27E-02 |
| RPR _M | Renewable primary energy resources as material utilization | MJ | 4.3E+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 | 6.21E+02 | 7.31E+01 | 3.62E+01 | 2.10E+01 | 0.00E+00 | 2.62E+01 | 4.32E+00 | -4.43E-01 |
| NRPR _M | Nonrenewable primary energy as material utilization | MJ | 1.00E+03 | 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 | 3.76E-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 | 6.53E-02 | 0.00E+00 | 4.23E-03 | 3.87E-02 | 0.00E+00 | 0.00E+00 | 2.42E-02 | -2.75E-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 | 2.33E-04 | 0.00E+00 | 2.79E-05 | 1.90E-04 | 0.00E+00 | 0.00E+00 | 3.19E-04 | -5.31E-06 |
| NHWD | Non-hazardous waste disposed | kg | 1.18E+00 | 0.00E+00 | 6.75E+00 | 8.33E-01 | 0.00E+00 | 0.00E+00 | 1.32E+02 | -9.39E-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 | 1.16E-04 | 0.00E+00 | 6.22E-06 | 3.27E-05 | 0.00E+00 | 0.00E+00 | 8.23E-06 | -1.38E-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 | 1.02E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.81E+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

Glen-Gery Brick

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 | 4.39E-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 | 4.39E-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 | 1.53E-04 | 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 | 6.86E+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

Glen-Gery Brick

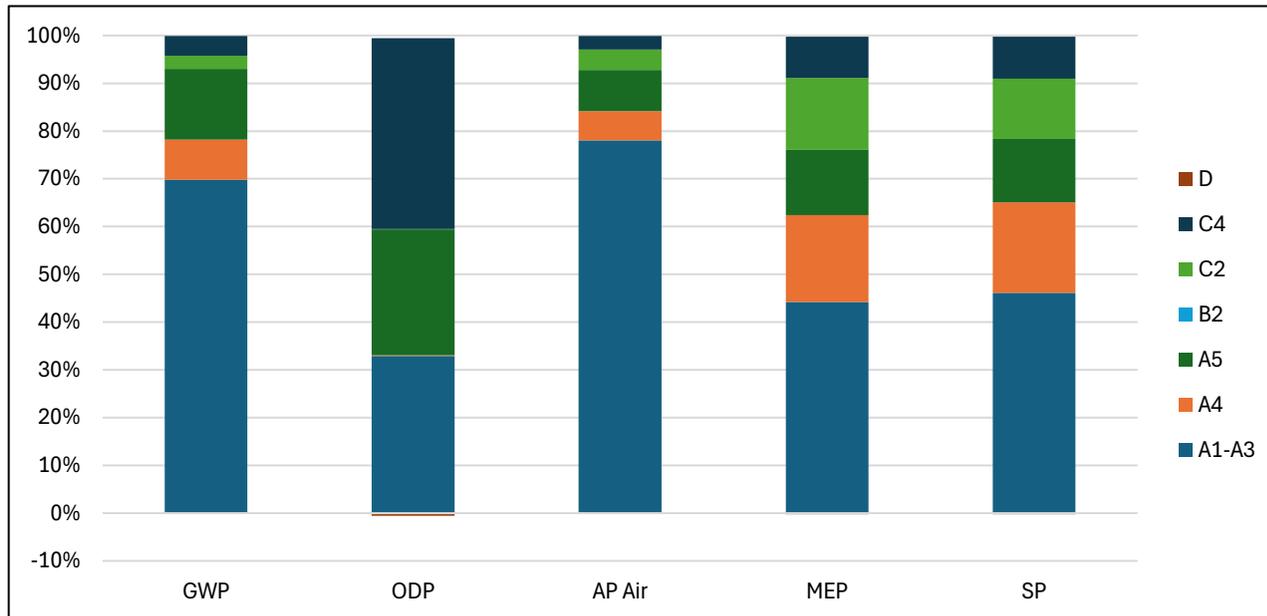
Clay Masonry Products



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

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



Environmental Product Declaration

Glen-Gery Brick

Clay Masonry Products



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

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, 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 'Engineer (Molded)', multiply the above impact (4.76E+01) by the Brick Conversion Factor (1.000) for a result of 4.76E+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 |
|-------------------------|--------------------|-------------------------------|-----------------------------|----------------|--------------------------------|---|-------------------------|----------------------------------|--------------------------|
| 70S (Molded) (Baseline) | C216 | 3.625 x 2.75 x 8 | 9.2 x 7 x 20.3 | 4.0% | 2.54 | 59.22 | --- | 28.54 | 1.000 |
| Engineer (Molded) | C216 | 3.625 x 2.75 x 8 | 9.2 x 7 x 20.3 | 4.0% | 2.54 | 59.22 | 1.000 | 28.54 | 1.000 |
| Modular (Molded) | C216 | 3.625 x 2.25 x 7.625 | 9.2 x 5.7 x 19.4 | 0.0% | 2.13 | 73.81 | 1.046 | 32.77 | 1.148 |
| Non Standard (Molded) | C216 | 3.625 x 2.25 x 7.625 | 9.2 x 5.7 x 19.4 | 0.0% | 2.70 | 73.81 | 1.324 | 32.77 | 1.148 |
| Oversize (Handmade) | C216 | 4 x 2.75 x 8.5 | 10.2 x 7 x 21.6 | 0.0% | 2.90 | 55.89 | 1.078 | 31.05 | 1.088 |
| Standard (Molded) | C216 | 3.625 x 2.25 x 8 | 9.2 x 5.7 x 20.3 | 0.0% | 2.22 | 70.50 | 1.042 | 32.45 | 1.137 |
| Trillium (Molded) | C216 | 3.625 x 2.25 x 8 | 9.2 x 5.7 x 20.3 | 4.0% | 2.54 | 70.50 | 1.190 | 32.45 | 1.137 |
| 70S (Extruded) | C216 | 3.625 x 2.75 x 8 | 9.2 x 7 x 20.3 | 13.6% | 2.45 | 59.22 | 0.964 | 28.54 | 1.000 |
| Modular (Extruded) | C216 | 3.625 x 2.25 x 7.625 | 9.2 x 5.7 x 19.4 | 15.8% | 1.95 | 73.81 | 0.957 | 32.77 | 1.148 |
| Standard (Extruded) | C216 | 3.625 x 2.25 x 8 | 9.2 x 5.7 x 20.3 | 14.8% | 2.09 | 70.50 | 0.978 | 32.45 | 1.137 |

The following photo depicts a clay brick product.



Environmental Product Declaration

Glen-Gery Brick

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. | 3.78E+01 | 4.52E+00 | 2.34E+00 | 1.63E+00 | 1.45E+00 | 2.24E+00 | -6.49E-02 |
| ODP | Depletion potential of the stratospheric ozone layer | kg CFC-11 Eq. | 3.72E-08 | 1.71E-10 | 4.17E-09 | 1.54E-07 | 6.07E-11 | 4.52E-08 | -6.69E-10 |
| AP Air | Acidification potential for air emissions | kg SO ₂ -Eq. | 3.47E-01 | 2.70E-02 | 2.03E-02 | 1.07E-02 | 1.92E-02 | 1.25E-02 | -3.94E-04 |
| FEP | Freshwater eutrophication potential | kg P-Eq. | 1.15E-03 | 5.10E-06 | 1.90E-04 | 2.94E-04 | 1.81E-06 | 1.32E-04 | -1.19E-05 |
| MEP | Marine eutrophication potential | kg N-Eq. | 1.49E-02 | 6.15E-03 | 1.52E-03 | 1.89E-03 | 5.07E-03 | 2.90E-03 | -7.60E-05 |
| SP | Smog formation potential | kg O ₃ -Eq. | 1.80E+00 | 7.38E-01 | 1.69E-01 | 2.36E-01 | 4.91E-01 | 3.43E-01 | -8.49E-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 | 4.87E+02 | 5.81E+01 | 2.85E+01 | 1.31E+01 | 2.08E+01 | 2.97E+00 | -2.80E-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 | 5.15E+00 | 0.00E+00 | 2.80E-01 | 1.51E+00 | 0.00E+00 | 4.46E-01 | -6.57E-02 |
| RPR _M | Renewable primary energy resources as material utilization | MJ | 3.43E+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 | 4.93E+02 | 5.81E+01 | 2.88E+01 | 1.46E+01 | 2.08E+01 | 3.43E+00 | -3.52E-01 |
| NRPR _M | Nonrenewable primary energy as material utilization | MJ | 7.96E+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 |
| RSF | Use of renewable secondary fuels | MJ | 2.99E-03 | 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 |
| RE | Energy recovered from disposed waste | MJ | 0.00E+00 |
| FW | Use of net fresh water | m ³ | 5.19E-02 | 0.00E+00 | 3.36E-03 | 1.83E-01 | 0.00E+00 | 1.92E-02 | -2.18E-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

Glen-Gery Brick

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 | 1.86E-04 | 0.00E+00 | 2.22E-05 | 4.47E-04 | 0.00E+00 | 2.54E-04 | -4.22E-06 |
| NHWD | Non-hazardous waste disposed | kg | 9.37E-01 | 0.00E+00 | 5.37E+00 | 9.77E-02 | 0.00E+00 | 1.05E+02 | -7.46E-03 |
| HLRW | High-level radioactive waste | kg or m ³ | 0.00E+00 |
| ILLRW | Intermediate- and low-level radioactive waste | kg or m ³ | 9.21E-05 | 0.00E+00 | 4.94E-06 | 2.33E-05 | 0.00E+00 | 6.54E-06 | -1.09E-06 |
| CRU | Components for re-use | kg | 0.00E+00 |
| MR | Materials for recycling | kg | 0.00E+00 | 0.00E+00 | 8.09E+00 | 0.00E+00 | 0.00E+00 | 1.44E+01 | 0.00E+00 |
| MER | Materials for energy recovery | kg | 0.00E+00 |
| EE | Recovered energy exported from system | MJ | 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 | 3.49E-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 | 1.22E-04 | 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 | 5.5E+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

Glen-Gery Brick

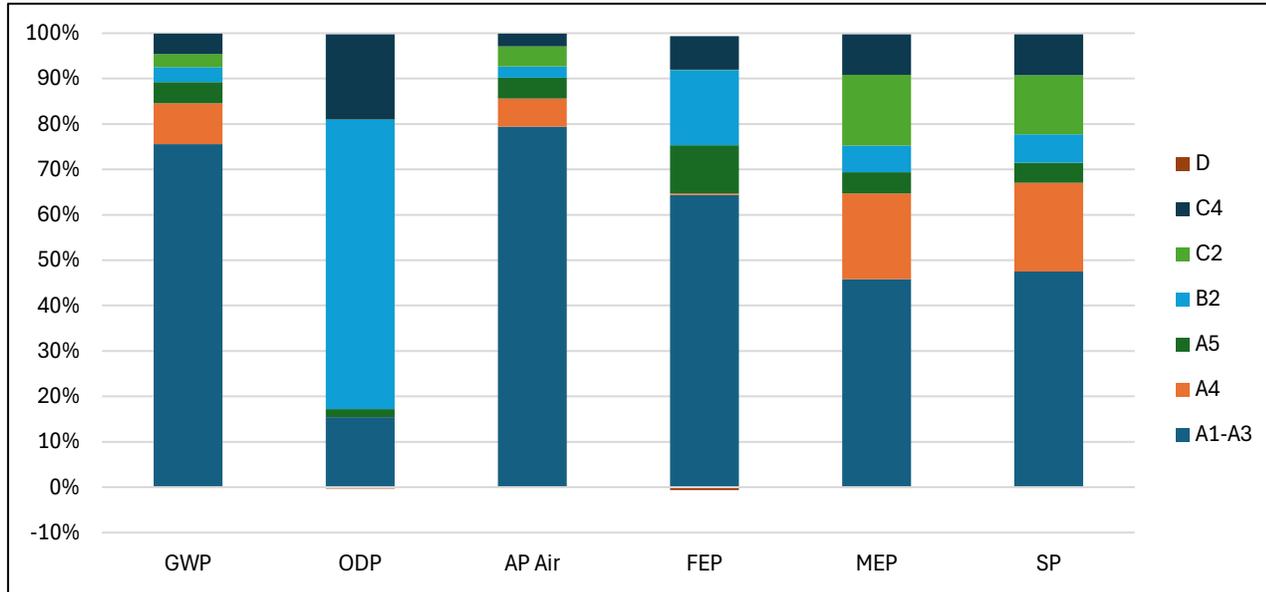
Clay Masonry Products



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.



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'.

Note: In this case there is only one product within this category

For example: To determine the A1-A3 TRACI GWP impact for 'Paver', multiply the above impact (3.78E+01) by the Brick Conversion Factor (1.000) for a result of 3.78E+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 |
|-------------------|--------------------|-------------------------------|-----------------------------|----------------|-------------------------|---|-------------------------|
| Paver | C902 | 4 x 2.25 x 8 | 10.2 x 5.7 x 20.3 | 0.0% | 2.59 | 46.25 | 1.000 |

The following photo depicts a paver brick product.



Environmental Product Declaration

Glen-Gery Brick

Clay Masonry Products



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

Additional Environmental Information

Environmental and Health During Manufacturing

Glen-Gery focuses on environmental health and safety (EHS) through compliance with EPA, OSHA, and MSHA regulations, previously achieving OSHA VPP Star Status for exemplary safety at its plant facilities, and ensuring workplace safety with programs and safety guidelines created through Glen-Gery's internal Safety, Health, & Environmental Management System (SHEMS). Glen-Gery ensures that our facilities meet or exceed state and federal environmental regulations, and continue to partner with building professionals to create environmentally responsible living and working spaces for today's and future generations.

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 fire resistant building material because it is non-combustible. Brick effectively contains heat, slows the spread of flames, and provides a significant fire-resistance rating. Reference International Building Code Table 721.1 (2).

Water

Brick products are resistant to water contact related effects with no negative impacts in normal circumstances.

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>

Environmental Product Declaration

Glen-Gery Brick

Clay Masonry Products



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14027, 14040, 14044,
21930:2017

Delayed Emissions

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

Environmental Activities and Certifications

Glen-Gery maintains an internal Environmental Management System (EMS) adhering to ISO:14001 compliant standards and principles. Opportunities are continuously explored to reduce waste, allocate resources more efficiently, and reduce environmental risks. Glen-Gery incorporates recycled content by way of reclaimed process wastes helping builders achieve LEED certification in certain brick products.

Further Information

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Environmental Product Declaration

Glen-Gery Brick

Clay Masonry Products



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

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