PRODUCT CATEGORY RULES FOR PREPARING
AN ENVIRONMENTAL PRODUCT DECLARATION
FOR CLAY BRICK, CLAY BRICK PAVERS, AND STRUCTURAL CLAY TILE

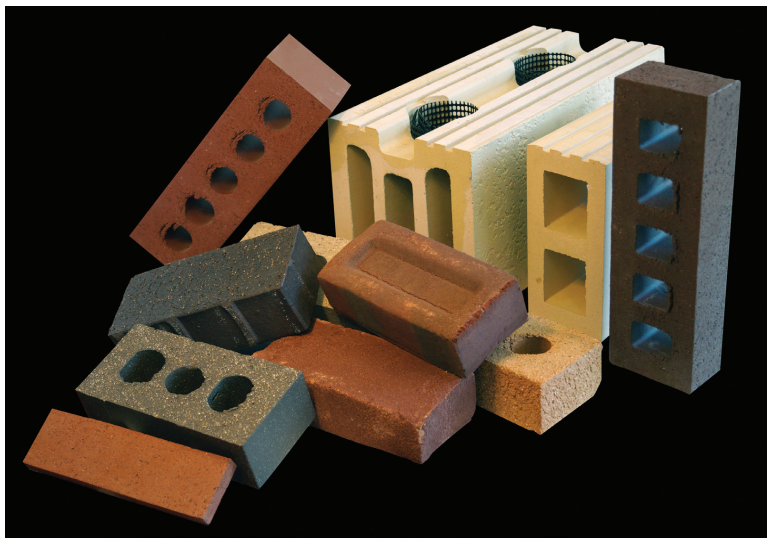
ASTM INTERNATIONAL

Program Operator - NSF International
Extended 12 months per PCRExt 2022-104 valid through June 30, 2023

PCR	VERSION ADOPTION	VALIDITY PERIOD
	JULY 2016	JUNE 2023

Clay Brick, Clay Brick Pavers, and Structural Clay Tile UNCPC 3731 and 3735

The product group includes manufactured masonry units made by forming and firing prepared mixtures of clay, shale and other materials. These are generically known as clay brick, clay brick pavers, and structural clay tile. Specific products are listed in Section 3.0 definitions and are given in Table 1.



NSF

Program Operator
NSF International
National Center for Sustainability Standards
ncss@nsf.org

Clay Brick, Clay Brick Pavers, and Structural Clay Tile

Referenced PCR

Institut Bauen und Umwelt (IBU), "PCR Guidance-Texts for Building-Related Products and Services, Part B: Requirements on the EPD for Bricks," version 1.1, published October 29, 2012.

Scope of Validity of these PCR

This product group includes clay brick, clay brick pavers, and structural clay tile. For specific products and applications, please see Section 5.2.

Program Operator

ASTM International

Interested Parties

Representatives of the following organizations participated in development of the PCR:

The Brick Industry Association (BIA) and companies: Acme Brick Company, The Belden Brick Company, Brampton Brick Inc., Endicott Clay Products, Forterra Brick, LLC, General Shale, Inc., and Glen-Gery Corporation.

Additional contributors: Martha G. VanGeem, P.E and Emily Lorenz, P.E.

The PCR was posted publicly for comment as well as directly e-mailed for comment solicitation to ASTM Technical Committee on Manufactured Masonry Units.

Review Panel

Christoph Koffler, PhD – thinkstep, Inc. (chairperson)

John P. Sanders, PhD, PE – The National Brick Research Center

Christine A. Subasic, PE – Consulting Architectural Engineer

The PCR peer review report is available upon request at: *cert@astm.org*

PCR VERSION HISTORY

Version Number	Amendments	Date Issued
1	X	08 / 01 / 16
2	X	07 / 30 / 21
3	X	06 / 22 / 22

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States.
No portion of this document may be copied or transmitted without the written permission of ASTM International.

Table of Contents

Page 5

1.0 | General Information

1.1 | Goal and Scope

Page 6

1.2 | EPD Ownership/Responsibility

2.0 | Period of Validity

Page 7

3.0 | Definitions

Page 8

4.0 | Informed Comparison

5.0 | Company/Organization, Product, and Product Category

5.1 | Description of Company/Organization

5.2 | Definition of Product Category

Page 10

5.3 | Description of Product

6.0 | Requirements for the Underlying LCA

6.1 | Functional and Declared Unit

Page 11

6.2 | System Boundaries

Page 13

7.0 | Life-Cycle Inventory Analysis

7.1 | Data Collection and Description of Data

Page 14

7.2 | Cutoff Rules

7.3 | Data Quality Requirements

Page 15

7.4 | Units

7.5 | Allocation Rules

Page 16
8.0 | Impact Categories and Characterization Factors

Page 17
9.0 | Additional Environmental Information

Page 18
10.0 | EPD Supporting Data

Page 19
11.0 | Content of the EPD

Page 20
12.0 | References

1.0 General Information

These product category rules (PCR) have been developed under the general program instructions for ASTM International's Environmental Product Declaration (EPD) Program. The PCR are intended for use in preparing EPDs by North American organizations and other interested parties that use the standards referenced in Section 5.2 for clay brick, clay brick pavers, and structural clay tile.

The referenced PCR are published by Institut Bauen und Umwelt (IBU), "PCR Guidance-Texts for Building-Related Products and Services, Part B: Requirements on the EPD for Bricks," version 1.1, published October 29, 2012. The following key aspects of the IBU PCR make them inappropriate for direct adaptation to the North American situation and for direct use as PCR for North American clay brick, clay brick pavers, and structural clay tile.

- The scope of the IBU PCR for brick states that the requirements are based on EN 15804:2012, which is the European core PCR. The standard used by ASTM is ISO 21930:2007.
- IBU PCR document lists and refers to European technical data and standards, such as DIN 4108-4 and EN 13501, that are not applicable to North America. North American clay brick, clay brick pavers and structural clay tile are specified and classified differently.
- IBU PCR document uses characterization factors from CML-IA[1] that result in different reporting units for photochemical ozone creation. ASTM PCR document specifies the use of EPA TRACI methodology as the primary reporting method.
- IBU PCR document requires the reporting of different environmental impact categories than in ISO 21930:2007, specifically abiotic depletion potential, per EN 15804:2012.
- IBU PCR document requires listing "measurement of the nuclide content in Bq/kg for Ra-226, Th-232, K-40."[2] Listing of substances pertaining to the European Commission is not standard practice in the North America.
- IBU PCR document requires listing "as a minimum, substances contained in the product that are listed in the 'Candidate List of Substances of Very High Concern (SVHC) for authorization' when their content exceeds the limits for registration with the European Chemicals Agency."[3] Listing of substances pertaining to the European Chemicals Agency is not standard practice in the North America. IBU PCR document states that the product description must include "the waste code in accordance with the European Waste Index." Listing of waste codes from European documents is not standard practice in the North America.

1.1 | GOAL AND SCOPE

This PCR document specifies rules, requirements, and guidelines for developing EPDs for clay brick, clay brick pavers, and structural clay tile, and underlying requirements for related life cycle assessments (LCAs). These PCR are valid for, and provide requirements for, cradle-to-gate Type III EPDs as referenced in Figure 1.

1 *http://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors*
2 Assessment can be performed on the basis of EU Commission "Radiation Protection 112" document, OENORM 5200, Nordic Countries' Recommendation 2000.
3 *http://echa.europa.eu/web/guest/candidate-list-table*

An EPD prepared under these PCR shall present results over the following phases of the life cycle:

- raw materials acquisition,
- transportation, and
- manufacturing.

These PCR are consistent with and comply with the mandatory requirements contained in the following standards:

- International Organization for Standardization (ISO) 21930:2007 S*ustainability in building construction — Environmental declaration of building products*.
- ISO 14025:2006 *Environmental labeling and declarations — Type III environmental declarations — Principles and procedures*.
- ISO 14040:2006 *Environmental management — Life cycle assessment — Principles and framework*.
- ISO 14044:2006 *Environmental management — Life cycle assessment — Requirements and guidelines*.

While not necessarily complying with the CEN EN15804 standard it is referenced in Section 12 and has been consulted with regard to selected requirements and presentation details that go beyond or expand on the above-noted ISO standards.

1.2 | EPD OWNERSHIP/RESPONSIBILITY

The producers or group of producers who develop an EPD following these PCR maintain sole ownership and have responsibility and liability for their EPD.

2.0 Period of Validity

This PCR document is effective for five (5) years from the latest date of publication. If after five years, relevant changes in the product category or other relevant factors have occurred (for example, LCA methodology), the document shall be revised. If no changes are necessary, the PCR shall be updated with a new date. Revisions may also be made to these PCR during the period of validity; however such changes do not have to be reflected in existing EPDs during their validity period unless the EPD owners choose to do so.

An EPD created under these PCR shall be valid for a five (5) year period from the date of issue. After five years, the EPD shall be reviewed. If relevant changes in the product category or other relevant factors have occurred that could alter the content and accuracy of the declaration (for example, changes in technology or LCA methodology), the EPD shall be revised and verified. If no changes are necessary, the EPD shall be updated with a new date. The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930:2007.

3.0 Definitions

For the purposes of this document, the definitions given in ISO 6707-1, ISO 14025, ISO 14044, ISO 14050, ISO 15686-1, ISO 21930:2007 and the following shall apply.

brick, n | a solid or hollow masonry unit of clay or shale, usually formed into a rectangular prism, then burned or fired in a kiln; brick is a ceramic product. (ASTM C1232)

brick, building, n | brick for load-resisting or other purposes where appearance properties such as texture or color are not important (formerly called common brick). (ASTM C1232)

brick, chemical-resistant, n | brick suitable for use in chemical environments where resistance to thermal shock may be a consideration, usually used in conjunction with chemical-resistant mortars. (ASTM C1232)

brick, facing, n | brick for general purposes where appearance properties such as color, texture, and chippage are important. (ASTM C1232)

brick, firebox, n | brick intended for use as the lining in the fireboxes of residential fireplaces.

brick, floor, n | brick with physical properties related to resistance to chemicals, thermal and mechanical shock, or absorption, or combinations of these, used as finished floor surfaces in industrial applications. (ASTM C1232)

brick, glazed, n | brick with a ceramic glaze finish fused to the body of the brick by firing.

brick, hollow, n | brick whose net cross-sectional area in any plane parallel to the surface containing cores, cells, or deep frogs is less than 75 % of its gross cross-sectional area measured in the same plane.

brick, paving, n | brick made to provide the wearing surface of highways, streets, driveways, walkways, patios, and similar applications. (ASTM C1232)

brick, sewer, n | low absorption, abrasive-resistant brick intended for use in drainage structures. (ASTM C1232)

brick, thin veneer, n | brick with a maximum thickness (width) of 1-¾ in. (45 mm) for use in adhered or fastened veneer applications.

clay, n | an earthy or stony mineral aggregate consisting essentially of hydrous silicates of alumina, plastic when sufficiently pulverized and wetted, rigid when dry, and vitreous when fired to a sufficiently high temperature. (ASTM C1232)

fire clay, n | a sedimentary clay of low flux content. (ASTM C1232)

recovered material, n | material that would have otherwise been disposed of as waste or used for energy recovery but has instead been collected and recovered as a material input, in lieu of new primary material, for a recycling or a manufacturing process. (ISO 14021)

shale, n | a thinly stratified, consolidated, sedimentary clay with well-marked cleavage parallel to the bedding. (ASTM C1232)

surface clay, n | an unconsolidated, unstratified clay, occurring on the surface. (ASTM C1232)

tile, loadbearing, n | tile for use in masonry constructions designed to carry superimposed loads. (ASTM C1232)

tile, nonloadbearing, n | tile for use in masonry constructions carrying no superimposed loads. (ASTM C1232)

tile, structural clay, n | hollow burned-clay masonry building units with parallel cells or cores or both (ASTM C1232)

tile, structural clay facing, n | tile designed for use in interior and exterior unplastered walls, partitions or columns. (ASTM C1232)

waste, n | substances or objects which the holder intends or is required to dispose of. (ISO 14040)

4.0 Informed Comparison

EPDs may enable comparison between products but do not themselves compare products, as stated in ISO 14025 Sections 4 and 6.7.2. It shall be stated in EPDs created using these PCR that only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, reference service life (RSL), quantified by the same functional unit, and meeting all the conditions in ISO 14025, Section 6.7.2 can be used to assist purchasers and end users in making informed comparisons between products. The basis of a comparison shall include the product application in accordance with ISO 21930:2007and clearly defined and justified scenarios for modules A4, A5, B1-B7 and C1-C4 (see Figure 1).

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

5.0 Company/Organization, Product, and Product Category

5.1 | DESCRIPTION OF COMPANY/ORGANIZATION

The name of the company/organization as well as the place(s) of production shall be provided in the EPD. The EPD may also include general information about the company/organization.

Information on quality systems, an environmental management system according to ISO 14001, or any other environmental management systems in place shall be listed as additional environmental information (see Section 9.0).

5.2 | DEFINITION OF PRODUCT CATEGORY

Table 1 lists the specific clay brick, clay brick pavers, and structural clay tile and the corresponding standards that provide detailed descriptions and specifications for each product or material addressed by these PCR.

TABLE 1 Clay Brick, Clay Brick Pavers or Structural Clay Tile Specifications

Product	Description/Specification
Facing Brick	ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) CSA A82 Fired masonry brick made from clay or shale
Hollow Brick	ASTM C652 Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale) CSA A82 Fired masonry brick made from clay or shale
Thin Veneer Brick	ASTM C1088 Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
Building Brick	ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale) CSA A82 Fired masonry brick made from clay or shale
Chemical-Resistant Brick	ASTM C279 Specification for Chemical-Resistant Masonry Units
Firebox Brick	ASTM C1261 Specification for Firebox Brick for Residential Fireplaces
Glazed Brick (Single Fired)	ASTM C1405 Specification for Glazed Brick (Single Fired, Brick Units)
Glazed Brick (Double Fired)	ASTM C126 Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
Industrial Chimney Lining Brick	ASTM C980 Standard Specification for Industrial Chimney Lining Brick
Industrial Floor Brick	ASTM C410 Specification for Industrial Floor Brick
Sewer Brick	ASTM C32 Specification for Sewer and Manhole Brick (Made From Clay or Shale)
Pedestrian and Light Traffic Paving Brick	ASTM C902 Standard Specification for Pedestrian and Light Traffic Paving Brick
Heavy Vehicular Paving Brick	ASTM C1272 Specification for Heavy Vehicular Paving Brick
Structural Clay Load-Bearing Wall Tile	ASTM C34 Standard Specification for Structural Clay Load-Bearing Wall Tile
Structural Clay Nonloadbearing Tile	ASTM C56 Standard Specification for Structural Clay Nonloadbearing Tile
Structural Clay Facing Tile	ASTM C212 Standard Specification for Structural Clay Facing Tile
Structural Glazed Facing Tile	ASTM C126 Specification for Ceramic Glazed Structural Facing Tile, Facing Brick, and Solid Masonry Units

5.3 | DESCRIPTION OF PRODUCT

The EPD shall provide a narrative description of the product that will enable the user to clearly and unambiguously identify the product. This description shall include, where relevant:

- Product identification by brand name (if applicable); material type, grade or application, or clay generic brick or paver name; and simple visual representation, which may be by photograph or graphic illustration;
- List of standards and other product specifications to which the products comply;
- Details regarding product sizes;
- Flow diagram illustrating main unit processes by life-cycle stage according to the scope of the declaration;
- Materials and substances to be declared; and
- Any additional information that will assist in identifying the product.

Material contents of the finished building product, including packaging, shall be declared in terms of the main components. Intentionally added substances officially classified as hazardous according to relevant national or international regulations shall be stated. Product specific data that is confidential because of the competitive business environment, intellectual property rights, or similar legal restrictions need not be declared except where such data involves regulated hazardous substances, which must always be disclosed.

6.0 Requirements for the Underlying LCA

The underlying LCA shall be conducted in accordance with ISO 14040 and ISO 14044.

6.1 | FUNCTIONAL AND DECLARED UNIT

The functional unit of a product provides the quantitative normalization for comparing products of equivalent function (functional unit) or equivalent specification. A functional unit is defined for EPDs covering the complete cradle-to grave life cycle or the cradle-to-gate life cycle with a use stage scenario.

A declared unit is defined for EPDs covering only the cradle-to-gate or cradle-to-gate plus end-of-life stages (see Section 6.2). If the intended use of the EPD is for comparison purposes between different building products, the entire life cycle shall be included, including the use and end-of-life stages. In such situations the functional unit shall be used as the reference unit, not the declared unit.

For clay brick, clay brick pavers, and structural clay tile, the declared unit shall be one cubic meter. Data may additionally be presented per cubic yard. A weighted average thickness or other applicable aspects of the product shall be stated when the EPD deals with a generic or representative product group with different thicknesses.

6.2 | SYSTEM BOUNDARIES

Figure 1 shows the life-cycle stages and individual modules that shall be included within the LCA system boundary, depending on whether the EPD is cradle-to-gate or cradle-to-grave.

FIGURE 1 Life-Cycle Stages and Modules

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4

Cradle-to-Gate or "Information Module" | The life-cycle activities and related processes shall include modules A1, A2, and A3—the production stage—as defined below, with scenarios for other life-cycle stages as appropriate.

Cradle-to-Grave | A complete cradle-to-grave LCA shall be developed for the product, including all life-cycle stages and modules, for a specified defined function and service life, inclusive of maintenance and replacement and end-of-life effects.

Any site-generated energy and purchased electricity shall be included in the system boundary. The extraction, processing, and delivery of purchased primary fuels, for example natural gas and primary fuels used to generate purchased electricity, shall also be included within the boundaries of the system. Regionally specific inventory data on electricity shall be based on subnational U.S. and Canadian consumption mixes that account for power trade between the regions. If such regional data are not available, production mixes of the three continental interconnections (East, West. Texas), as well as those of Hawaii and Alaska, may be used. A comparable approach shall be taken for electricity consumption in the case of materials or input products imported from outside the U.S. and Canada. The sources for electricity (calculation procedure) shall be documented.

In the case of EPDs based on these PCR, the following activities shall be taken into account for each life-cycle stage.

Modules A1-A3, the Production Stage:

- A1 - Extraction and processing of raw materials, including fuels used in extraction and transport within the process and any crushing or grinding required for transport. For clay brick, clay brick pavers, and structural clay tile production, this typically includes the mining of surface clays, shales, and fire clays;
- A2 - Average or specific transportation of raw materials (including recycled or recovered materials) from extraction site or source to manufacturing site and including empty backhauls and transportation to intermediate distribution centers or terminals;

- A3 - Manufacturing of the product. For clay brick, clay brick pavers, and structural clay tile production, this typically includes:
    - Crushing and grinding,
    - Screening,
    - Forming,
    - Coating or glazing, if applicable
    - Drying,
    - Firing and cooling,
    - Other processes specific to the properties of the clay, and
    - Other processes specific to the type of brick product;
    - Packaging, including transportation and waste disposal, to make product ready for shipment;
    - If packaging is purchased from multiple suppliers, then a weighted average of the transportation distances by mode from all suppliers shall be included in the LCA modeling;
    - Average or specific transportation from manufacturing site to recycling/reuse/landfill for pre-consumer wastes and unutilized by-products from manufacturing, including empty backhauls; and
    - Recycling/recovering/reuse/energy recovery of pre-consumer wastes and by-products from production.

Module A1, A2, and A3 may be declared as one aggregated module A1-3.

All assumptions from LCA shall be described in detail.

Any transportation data other than identified above shall be indicated.

Excluded from System Boundary | A summary of items that may be excluded in the primary product stages include:

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

7.0 Life-Cycle Inventory Analysis

7.1 | DATA COLLECTION AND DESCRIPTION OF DATA

The primary data shall be representative according to temporal, geographical, and technological requirements.

Temporal | The obtained information from the manufacturing process shall be annual values, preferably from the previous twelve-month period or calendar year, unless accompanied by a statement attesting to the validity of older data. The reference year of average background or secondary data shall not be older than ten years unless accompanied by a statement attesting to the validity of older data.

Geographical | The geographic region of the relevant life-cycle stages included in the calculation of representative data shall be documented.

Technological | Data shall represent specific technology or technology mix in use.

The following specific or proxy background data shall be documented with regard to data sources:

- Extraction and/or production of raw materials (specific or average background);
- Manufacturing of the product (specific);
- The fuel mix and calculation procedures for electricity generation;
- Hazardous waste according to applicable U.S. and/or Canadian federal or state/provincial regulations (or appropriate regulations if used outside North America);
- Proxies for upstream products where specific or generic data is not available; and
- Weighted averages based on volume or mass used to assign transport distance and mode if multiple suppliers are used for one material.

If specific upstream data is not available, national databases shall be used to the extent that they are applicable (for example, U.S. Life Cycle Inventory Database, *www.nrel.gov/lci*). If appropriate national data is not available, sources for similar technology adjusted for national boundary conditions (for example, energy mix) may be used. Data from other regions are acceptable if it is determined and justified that those data are the best available.

All data sources shall be specified, including database and year of publication (reference). Sources of data for transport models (including transport mode, distances, and quantities to be transported) and thermal energy production shall be documented. Where proxy data is used in the absence of specific data for other inputs, the source and justification for selection of the proxies shall be documented in the LCA report.

When preparing an average EPD for an identical product manufactured at multiple facilities, the life cycle inventory (LCI) data for each site shall be weighted to determine the average. Weighting shall be by annual product production. Data reported in the declarations shall be as production-weighted averages of multiple facilities.

The product content shall be described in the declaration. Product specific data that is confidential because of the competitive business environment, intellectual property rights, or similar legal restrictions need not be declared. In such cases, a notation that the information is confidential shall be made along with a description of the function of the component.

7.2 | CUTOFF RULES

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA and information modules and any additional information are intended to support an efficient calculation procedure. They shall not be applied in order to hide data. All inputs and outputs of a unit process for which data are reasonably available shall be included in the calculation. Any application of the criteria for the exclusion of inputs and outputs shall be documented. Data gaps may be filled by conservative assumptions with average or proxy data. Any assumptions for such choices shall be documented.

If data are not reasonably available, the cut-off criteria for flows to be considered within the system boundary shall be as follows.

Mass | If a flow is less than 1% of the cumulative mass of the system model, it may be excluded, provided its environmental relevance is minor.

Energy | If a flow is less than 1% of the cumulative energy of the system model, it may be excluded, provided its environmental relevance is minor.

Environmental relevance | Material and energy flows known to have the potential to cause environmentally relevant emissions into air, water, or soil related to the environmental indicators of these PCR shall be included unless justification for exclusion is documented.

At least 95% of the energy usage and mass flow shall be included and the life-cycle impact data shall contain at least 95% of all elementary flows that contribute to each of the declared category indicators.

All hazardous and toxic materials and substances shall be included in the inventory and the cutoff rules shall not apply to such substances.

7.3 | SECONDARY DATA QUALITY REQUIREMENTS

Any secondary data source used in the underlying life-cycle inventory analysis shall be as complete and representative as possible for the applicable North American region in terms of its geographic and technological coverage and of a recent reference year, which is typically less than ten years old. Any deviations from these requirements for secondary data shall be documented, and the following apply:

- The information obtained from the manufacturing process shall be annual average values.
- Average background data shall not be older than ten years for industry average data or five years for producer specific data, unless justification is provided.
- When the EPD owner is not the owner of all upstream processes, the EPD owner shall request primary data from its direct suppliers within the system boundary. If the suppliers do not supply data, the EPD owner shall use the best-available data based on data quality requirements of this PCR.
- Data shall be identified as direct (for example, measurements or purchasing records), indirect (based on calculations), estimated, or other.

7.4 | UNITS

SI units shall be used with conversions as shown in the table below as necessary. Power and energy units are as follows:

- kWh or MJ for electric energy
- kW or MW for power

TABLE 2 Conversion Factors to be Used if Reporting in IP Units (Imperial)

Convert from	To	Multiply by
Square meter (m^2)	Square foot (ft^2)	1.076E+01
Kilogram (kg)	Pound (lb)	2.204
Mega joule (MJ)	British Thermal Unit (BTU)	9.478E+02
Degree Celsius (°C)	Degree Fahrenheit (°F)	(°C * 9/5) +32
Cubic meter (m^3)	Cubic foot (ft^3)	3.531E+01
Meter (m)	Foot (ft)	3.281
m^2K/W	ft^2Fhr/BTU	5.678
Metric tonne	Ton	1.102

Source: NIST: *http://physics.nist.gov/Pubs/SP811/appenB9.html*; *http://www.nist.gov/pml/wmd/metric/temp.cfm*; *www.nist.gov/pml/wmd/pubs/upload/appc-13-hb44-final.pdf*

7.5 | ALLOCATION RULES

In a production process in which more than one type of product is generated, it is necessary to allocate the environmental flows (inputs and outputs) from the process to the different products to get product-based inventory data. Allocation, if required, shall follow the requirements and guidance of ISO 14044:2006, Clause 4.3.4.

Recycled and recovered materials shall be considered raw materials. Only the materials, water, energy, emissions and other elemental flows associated with reprocessing, handling, sorting, and transportation from the generating process to their use in the production process shall be considered. Any allocations before reprocessing shall be allocated to the original product. Recycled and recovered materials with fuel content and used as fuels, such as used tires, shall be considered alternative energy.

Allocation related to transport shall be based on the mass of transported product.

If different allocation options are relevant and a deviation of greater than 20% is a foreseen outcome, a sensitivity analysis shall be initiated. These different allocation approaches and data sets shall be documented and declared.

In cases where several similar products are produced by a site or company, these PCR permit similar products to be declared as a production-weighted average product in the same EPD provided that the difference between their environmental impacts is less than 5% for each environmental impact category. In cases where the difference is greater than 5%, it shall be permitted to include similar products in the

same EPD but they shall be reported individually (e.g., in separate columns in a table). If a single value is chosen for each impact category for all products, the value reported shall be the worst performance within the range of variation. It shall be permitted to show arithmetically weighted 'averaged data' in an EPD as supplementary information if found relevant.

8.0 Impact Categories and Characterization Factors

Life Cycle Impact Assessment (LCIA) and Life Cycle Inventory (LCI) measures to be declared in the EPD shall be based on Table 3 in accordance with ISO 21930:2007, Section 8.2 and ISO 14044:2006.

TABLE 3 LCIA Categories and Other Environmental Relevant Metrics to be Declared in the EPD

Impact Catogory	Unit
Global warming potential (GWP)	kg CO_2 equiv
Acidification potential	kg SO_2 equiv
Eutrophication potential	kg N equiv
Smog creation potential	kg O_3 equiv
Ozone depletion potential	kg CFC-11 equiv
Total primary energy consumption	
Nonrenewable fossil	MJ (HHV)
Nonrenewable nuclear	MJ (HHV)
Renewable (solar, wind, hydroelectric, and geothermal)	MJ (HHV)
Renewable (biomass)	MJ (HHV)
Material resources consumption	
Nonrenewable material resources	kg
Renewable material resources	kg
Net fresh water (inputs minus outputs)	L
Non-hazardous waste generated	kg
Hazardous waste generated	kg

Notes for Table 3:

1. Fresh water is naturally occurring water on the earth's surface and underground as groundwater in aquifers and underground streams. The term specifically excludes seawater and brackish water, but does include fresh water that has been treated to make it potable. Energy use and other impacts associated with fresh water treatment are not included.
2. Consumption of net fresh water includes fresh water entering the system being studied that is not returned to the same drainage basin that it originated from.
3. Recovered or recycled materials are neither nonrenewable nor renewable resources under ISO definitions. The use of such materials can be reported as additional environmental information as per clause 9.
4. Primary energy is an energy form found in nature that has not been subjected to any conversion or transformation process. Examples of primary fuels are coal, natural gas, etc.

5. Recycled and recovered materials with fuel content and used as fuels shall be considered alternative energy. Examples of such secondary fuels include but are not limited to solvents, tires, and animal fat. Emissions from secondary fuels shall be included in the calculation of the relevant environmental impacts.
6. Energy consumption shall be reported in Higher Heating Values (HHV) mega joules.

The impact categories of Life Cycle Impact Assessment (LCIA) shall be calculated using characterization factors specified in version 2.1 of US EPA TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). *https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci*

9.0 Additional Environmental Information

An EPD, shall include, where relevant, additional information, such as given in the points below, related to environmental issues, other than the environmental information derived from LCA, LCI, or information modules. This information shall be separated from the information described in ISO 21930:2007, Sections 8.2.2 and 8.2.3. Identification of significant environmental aspects should, as a minimum, take into consideration the following as per ISO 21930:2007:

- Information on environmental issues, such as
    - Impact(s) and potential impact(s) on biodiversity,
    - Toxicity related to human health or the environment or both, and
    - Geographical aspects relating to any stages of the life cycle (for example, a discussion on the relation between the potential environmental impact(s) and the location of the product system);
- Data on building product performance if environmentally significant;
- Organization's adherence to any environmental management system, with a statement on where an interested party can find details of the system;
- Any other environmental certification program applied to the product and a statement on where an interested party can find details of the certification program;
- Other environmental activities of the organization, such as participation in recycling or recovery programs or renewable energy credits (REC), provided details of these programs are readily available to the purchaser or user and contact information is provided;
- Information that is derived from LCA but not communicated in the typical LCI- or LCIA-based formats;
- Instructions and limits for efficient use;
- Hazard and risk assessment on human health and the environment;
- Information on absence or level of presence of a material in the product that is considered of environmental significance in certain areas (see ISO 14021, Sections 5.4 and 5.7);
- Preferred waste management option for used building products; and
- Potential for incidents that can have impact(s) on the environment, such as:
    - the end-of-life stage, from deconstruction, reuse, demolition, recycling and disposal;
    - energy, water-saving etc. and other improvements, such as acoustical improvements;
    - energy content of the building product for energy recovery in the end of life;

- recycled content or recycling rates.

Additional information shall only be related to environmental issues. Information and instructions on product safety unrelated to the environmental performance of the building product shall not be part of a Type III environmental declaration.

NOTE: Section 9.0, above, extracted from ISO 21930:2007 and ISO 14025:2006 with minor wording changes.

10.0 EPD Supporting Data

A project report shall be prepared in accordance with the requirements and guidance of ISO 14044:2006, Section 5, for third-party reports. This information shall document the LCA study and additional environmental information in a systematic, comprehensive way, and shall be made available to the verifier in order to demonstrate that the requirements of this PCR document and ISO 21930:2007 "Environmental declaration of building products" have been met. The project report shall include, where relevant:

- The name of the organization that commissioned the report, the contact information of the report author, and the date of the report;
- The input and output environmental data of the unit processes that are used for the LCA calculations;
- The documentation (measurements, calculations, estimates, sources, correspondence, traceable references to origin, and so forth) that provides the basis from which the process data for the LCA is formulated;
- The specification used to create the manufacturer's products;
- Energy consumption figures;
- Emission data to air, water, and soil;
- Waste production;
- Data that demonstrates that the information is complete – in specific cases, reference can be made to, for instance, standards or quality regulations;
- Referenced literature and databases from which data have been extracted;
- Data used to carry out sensitivity analyses;
- Documentation that demonstrates that the building products can fulfill the desired function(s) and performance;
- Documentation that demonstrates that the chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930:2007;
- Documentation and substantiation of the percentages and figures (number of cycles, prices, and so forth) used for the calculations in the allocation procedure;
- Information showing how averages of different reporting locations have been calculated to obtain generic data;
- Documentation used to substantiate any qualitative information in the additional environmental information;
- Procedures used to carry out the data collection (questionnaires, instructions, informative material, confidentiality agreements, and so forth);
- The characterization factors used;

- The criteria and substantiation used to determine the system limits and the selection of input and output flows;
- Documentation that demonstrates consistency when using information modules; and
- Documentation used to substantiate the other choices and assumptions.

NOTE: Section 10, above, includes material extracted from ISO 21930:2007, Section 7.3.

11.0 Content of the EPD

The following demonstration of verification shall be completed and included with the EPD. Note that while third-party verification is optional for Business-to-Business (BtoB) EPDs, ASTM International will always use third-party verification. Third-party verification is mandatory for Business-to-Consumer (BtoC) EPDs.

DEMONSTRATION OF VERIFICATION

PCR review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the programme operator >
Independent verification of the declaration and data, according to ISO 14025: internal external
(Where appropriate[4]) Third party verifier: <name of third party verifier>

As per ISO 21930:2007, Section 8, type III environmental declarations in a product category shall follow the format and include the parameters as identified in this PCR. The following general information shall be declared in the EPD:

- Name and address of the manufacturer(s);
- Product identification by name (including, for example, production code) and a simple visual representation of the product;
- Description of the building product's use and the functional or declared unit of the product to which the data relates;
- Description of the application (installation) of the building product where relevant;
- Detailed list of the substances, by weight, that make up the building product, taking into account cutoff rules and confidentiality;
- Data from LCA or LCI or information modules, as per ISO 14025, Section 7.2.2;
- Additional environmental information (see section 9);
- Statement that the EPD is cradle-to-gate;
- Statement that EPDs from different programs (using different PCR) may not be comparable;

4 Optional for business to business communication, mandatory for business to consumer communication.

- Statement that the EPD represents an average performance in cases where an EPD declares an average performance for a number of products, with information on the range of the product's performance with respect to the average stated;.
- Information on where explanatory material may be obtained;
- Diagram or description of the life-cycle stages included in the LCA subdivided into production, construction, use and end-of-life stages, and system boundaries;
- Name of the program and the program operator's address and, if relevant, the logo and website URL;
- Identification of the PCR document on which the EPD is based;
- Date the EPD was issued and period of validity;
- Site(s), manufacturer, or group of manufacturers or those representing them for whom the results of the LCA are representative;
- Name of PCR review panel chair;
- Whether the independent review of the EPD and data was conducted by an internal or external verifier (third-party verification is mandatory for BtoC EPDs); and
- Name, address, phone number, fax number, and e-mail of the third-party verifier and logo of the verification body, if applicable.

12.0 References

ASTM Standards:[5]

ASTM C32 Specification for Sewer and Manhole Brick (Made From Clay or Shale)

ASTM C34 Standard Specification for Structural Clay Load-Bearing Wall Tile

ASTM C56 Standard Specification for Structural Clay Nonloadbearing Tile

ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

ASTM C126 Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units

ASTM C212 Standard Specification for Structural Clay Facing Tile

ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)

ASTM C279 Specification for Chemical-Resistant Masonry Units

ASTM C410 Specification for Industrial Floor Brick

ASTM C652 Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)

ASTM C902 Standard Specification for Pedestrian and Light Traffic Paving Brick

ASTM C980 Standard Specification for Industrial Chimney Lining Brick

ASTM C1088 Standard Specification for Thin Veneer Brick Units Made from Clay or Shale

5 Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, *http://www.astm.org*.

ASTM C1232 Standard Terminology of Masonry

ASTM C1261 Specification for Firebox Brick for Residential Fireplaces

ASTM C1272 Specification for Heavy Vehicular Paving Brick

ASTM C1405 Specifications for Glazed Brick (Single Fired, Brick Units)

CSA Standards:[6]

CSA A82 Fired masonry brick made from clay or shale

ISO Standards:[7]

ISO 6707-1: 014 Buildings and Civil Engineering Works—Vocabulary—Part 1: General Terms

ISO 14021:1999 Environmental Labels and Declarations—Self-declared Environmental Claims (Type II Environmental Labeling)

ISO 14025:2006 Environmental Labels and Declarations—Type III Environmental Declarations—Principles and Procedures

ISO 14040:2006 Environmental Management—Life Cycle Assessment—Principles and Framework

ISO 14044:2006 Environmental Management—Life Cycle Assessment—Requirements and Guidelines

ISO 14050:2009 Environmental Management—Vocabulary

ISO 15686-1:2011 Buildings and Constructed Assets—Service life planning—Part 1: General Principles and Framework

ISO 21930:2007 Sustainability in Building Construction—Environmental Declaration of Building Products

Other References:

BS EN 15804 *Sustainability of construction works—Environmental product declarations—Core rules for the product category of construction products*[8]

The Brick Industry Association (BIA). "Manufacturing of Brick." Technical Notes of Brick Construction, No. 9. December 2006; BIA[9]

Institut Bauen und Umwelt (IBU), "PCR Guidance-Texts for Building-Related Products and Services, Part B: Requirements on the EPD for Bricks," version 1.1, published October 29, 2012[10]

6 Available from CSA Group, 178 Rexdale Boulevard, Toronto, ON Canada M9W 1R3, *http://www.csagroup.org*

7 Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, *http://www.iso.org*.

8 European Committee for Standardization (CEN), Avenue Marnix 17, B-1000 Brussels, Belgium, *www.cen.eu*

9 *http://www.gobrick.com/portals/25/docs/technical%20notes/tn9.pdf*

10 *http://construction-environment.com/hp478/Product-Category-Rules-PCR.htm*