

**Part B: Concrete Masonry and Segmental Concrete Paving Product EPD Requirements**

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| Version | Comments | History |
| **1.0**  | UL Environment with input from a committee | xxxx, 2020 |

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# Background Information and Acknowledgements

These sub-category Product Category Rules (PCR) were developed to address the rules for the creation of Environmental Product Declarations (EPD) for Manufactured Concrete Masonry and Segmental Concrete Paving Products (MCPs) and includes all commercially available concrete masonry units, segmental retaining wall units, articulating concrete block, concrete pavers, segmental concrete paving slabs, concrete grid paving units, and related units, collectively referenced throughout this PCR as “concrete products”. When used to self-reference this document, “PCR” refers to “sub-category PCR.” This PCR is intended for creation of business-to-business (B2B) EPDs.

This PCR is consistent with and conforms with the mandatory requirements contained within the following normative references:

* ISO 21930:2017 - Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
* EN 15804:2012+A1:2013 - Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products
* Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment (December 2018, version 3.2)
* ISO 14025: 2006, Environmental labeling and declarations – Type III environmental declarations – Principles and procedures.
* ISO 14044: 2006, Environmental management — Life cycle assessment —Requirements and guidelines.
* ISO 14040: 2006, Environmental management – Life cycle assessment –Principles and framework.

In addition to the above normative references, the following are noted guidance references used in the development of this PCR:

* Product Category Rules (PCR) for preparing an Environmental Product Declaration (EPD) for Manufactured Concrete and Concrete Masonry Products, UN CPC 3755. ASTM. December 2014.
* Product Category Rules (PCR) for preparing an Environmental Product Declaration (EPD) for Segmental Concrete Paving Products UN CPC 3755. ASTM. April 2015.
* PCR 2013:02 for Concrete (UN CPC 375), Version 2.2, International EPD system. Prepared by WBCSD (World Business Council for Sustainable Development) CSI (Cement Sustainability Initiative)
* Product Category Rules for Environmental Product Declarations. PCR for Concrete. NSF. February 2019.
* EN 16757:2017 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements.

Period of Validity

This PCR is valid for a period of five (5) years, set to expire in xxxxxx, 2025.

Interested Parties

This Part B has been prepared with input from the following stakeholders:

* The National Concrete Masonry Association and companies: Jandris Block, Anchor Block Company, Taylor Concrete Products, Big River Industries an Oldcastle Company, Nicolock, Brampton Brick, and Canada Masonry Design Centre.
* Interlocking Concrete Pavement Institute
* Concrete Masonry Association of California and Nevada
* Laurel McEwen, Climate Earth

Governance

There are a number of trade associations and representatives of concrete product manufacturers participating in the update of this Product Category Rule (“PCR”) for MCPs. These parties represent a majority of the companies within the manufactured concrete products industry. Moreover, the parties with a manufacturing interest participating in the PCR update represent the vast majority of the concrete products sold in North America. The very purpose and function of a trade association is to inform its members of important industry developments and to represent their interests in projects such as the update of a PCR affecting their products. This is important because it effectively demonstrates that a large percentage of the manufactured concrete product industries is represented in the effort to renew the PCR.

The role of participants is to establish requirements and procedures to be applied in the development of EPDs for MCPs. This is an update to an existing PCR, and therefore, this effort begins with vetting suggested changes in scope and structure. Where potential conflicts exist, ISO 14025:2006 and ISO 21930:2017 shall apply.

Involvement of Interested Parties

UL Environment is responsible for producing the PCR document by establishing an open consultation process that includes the involvement of interested parties and “reasonable efforts to achieve a consensus throughout the process” have been made (ISO 14027, Section 5.2).

UL Environment posted an open call for participation in this PCR October 2019 via its standards website, social media outlets, and outreach to original committee stakeholders.

Update Process

The PCR shall be revised five (5) years from the publication date. The PCR may be revised before the five year date if the following occurs in the industry (including but not limited to): major regulatory change that alters the requirements for MCPs; major shift in the markets such that a new material or system predominates that can no longer be characterized adequately by the definitions in this PCR, or if new LCI data becomes available. The process for updating a PCR shall follow the following procedure:

1. A stakeholder approaches the Program Operator about the need for a PCR revision.
2. The Program Operator shall communicate with the original committee and any new EPD participants to assess a consensus for a PCR update.
3. If the Program Operator determines a consensus exists, a new public call for interested parties is issued and a PCR committee shall be convened and engaged to make the necessary updates.
4. The Program Operator shall publish the updated PCR that addresses version history and changes implemented.

Review

The review process of this Part B PCR included a review through public consultation from xxxxxxx - xxxxxxx 2020 and a panel review.

This Part B was reviewed by the following panel:

|  |  |  |
| --- | --- | --- |
| TBD | TBD | TBD |

Public Consultation

Public consultation was utilized during the PCR review process. The public consultation of the completed draft PCR included a minimum 30-calendar-day period for comments to be submitted to UL Environment. After public comments were submitted, the PCR committee reviewed and developed responses for all comments. All comments from the review panel and public consultation were addressed and satisfactorily resolved by the PCR committee prior to the publication of this PCR.

# Terms and 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 and the following apply.

**Adhered Manufactured Stone Masonry Veneer**

A non-load bearing masonry unit that is produced by wet-cast blending of cementitious material, lightweight and other aggregates, pigments, and admixtures, designed to be applied with a cementitious mortar to a backing surface, complying with ASTM C1670/C1670M.

**Allocation**

Partitioning the environmental flows (input and output flows) of a process or a product system between the product system under study and one or more other product systems (adapted from ISO 14044).

**Ancillary Material**

Material input that is used by the unit process producing the product or during the construction or use stage but does not constitute part of the product (adapted from ISO 14044).

**Articulating Concrete Block (ACB)**

A dry-cast concrete unit manufactured for use in articulating concrete block revetment systems, where a matrix of interconnected concrete block are used for erosion protection, complying with ASTM D6684.

**Building Product**

Item used during the life cycle of a building or any other type of construction works (adapted from ISO 6707-1 and ISO 14021).

**Cast Stone**

An architectural precast concrete building unit intended to simulate natural cut stone, complying with ASTM C1364.

**Characterization Factor**

Factor derived from a characterization model which is applied to convert an assigned life-cycle inventory analysis (LCI) to the common unit of the impact category indicator (adapted from ISO 21930).

**Concrete Building Brick**

A concrete masonry unit, with a maximum width of four (4) inches and a weight that typically permits it to be lifted and placed with one hand, that is manufactured for general use in non-facing, utilitarian applications, complying with ASTM C55 or CSA A165.2.

**Concrete Facing Brick**

Concrete masonry unit, with a maximum width of four (4) inches and a weight that typically permits it to be lifted and placed with one hand, that is manufactured to be typically used in an application where one or more faces of the unit is intended to be exposed, complying with ASTM C1634.

**Concrete Grid Paving Units**

These are defined in ASTM C1319 as having a maximum length and width of 24 in. (600 mm); a minimum thickness of 3.125 in. (80 mm); and a maximum of 50% open area.

**Concrete Masonry Unit**

A manufactured masonry unit made of concrete in which the binder is a combination of water and cementitious materials. Product standards that apply to various concrete masonry units are as follows: ASTM C139, ASTM C90 or CSA A165.1, and ASTM C129, C55, C1634, and C1491.

**Concrete Masonry Unit for Catch Basins and Manholes**

Concrete masonry units manufactured for use in constructing catch basins and manholes, complying with ASTM C139.

**Concrete Masonry Unit, load-bearing**

A concrete masonry unit suitable for non-load-bearing and load-bearing applications, complying with ASTM C90 or CSA A165.1.

**Concrete Masonry Unit, non-loadbearing**

A concrete masonry unit suitable only for non-load-bearing application, complying with ASTM C129.

**Concrete Roof Paver**

A concrete masonry unit produced for use in roof ballast applications, complying with ASTM C1491.

**Cut-Off Criteria**

Specification of the amount of material or energy flow or the level of environmental significance associated with unit processes of a product system to be excluded from an LCA study (adapted from ISO 14044).

**Declared Unit**

Quantity of a building product for use as a reference unit, e.g. mass (kilogram), volume (cubic meter), for the expression of environmental information needed in information modules. Note: The declared unit is used in instances where the function and the reference scenario for the whole life cycle of an MCP cannot be stated (adapted from ISO 21930).

**Environmental Declaration/Label**

A claim that indicates the environmental impacts of a product (adapted from ISO 14020:2000).

**Feedstock energy**

Heat of combustion of a material input that is not used as an energy source to a product system, expressed in terms of lower heater value (net calorific value) (adapted from ISO 14044).

**Function**

Purpose for which a building product is designed, used or required to be used (adapted from ISO 15686-10).

**Functional Unit (FU)**

Quantified performance of a product system for a building or paving product for use as a reference unit (adapted from ISO 14044).

**Impact Category**

A class representing environmental impacts of concern to which life cycle inventory analysis results may be assigned (ISO 14044).

**Impact Category Indicator**

A quantifiable representation of an impact category (ISO 14044).

**Information Module**

Compilation of data to be used as a basis for an EPD covering a unit process or a combination of unit processes that are part of the life cycle of a product (ISO 21930).

**Interested Party**

An individual or group concerned with or affected by the environmental performance of a product system, or by the results of the life cycle assessment (ISO 14044).

**Interlocking Concrete Pavers**

In the US, these are defined in ASTM C936/C936M as units with an exposed face area ≤101 in.2 (0.065 m2), and their overall length divided by thickness ≤4. The minimum specified thickness is 2.36 in. (60 mm).

In Canada ,these are defined in CSA A231.2 Precast Concrete Pavers as having a surface area less than or equal to 139.5 in.2 (0.09 m2); overall length divided by its thickness ≤4 for pedestrian applications and ≤3 for vehicular applications; and a minimum nominal thickness of 2.36 in. (60 mm).

**Life Cycle**

Consecutive and interlinked stages related to a product, from raw material acquisition or generation from natural resources to end-of-life (adapted from ISO 14044).

**Life Cycle Assessment (LCA)**

Assessment aimed at compiling and evaluating the inputs, outputs and the potential environmental impacts of a product system throughout the life cycle of a product (adapted from ISO 14044).

**Life Cycle Inventory Analysis (LCI)**

Phase of LCA involving the compilation and quantification of input and output flows for a product throughout its life cycle (ISO 14044).

NOTE In the case of ‘input flows’, products and materials include raw materials, intermediate products and co-products, while in the case of ‘output flows’ it also includes releases (emissions to air and discharges to water and soil).

**Life Cycle Impact Assessment (LCIA)**

Phase of an LCA aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of a product (ISO 14044).

**Prefaced Concrete Masonry Unit**

A concrete masonry unit with the exposed-to-view-in-place surfaces covered at the point of manufacture with resin, resin and inert filler, or cement and inert filler to produce a smooth resinous tile facing, complying with ASTM C744.

**Product category**

Group of building products that can fulfill equivalent functions (adapted from ISO 14025).

**Product category rules (PCR)**

Set of specific rules, requirements and guidelines for developing of Type III environmental declarations for one or more product categories (ISO 14025).

**PCR review**

Verification of the PCR by a third-party panel (adapted from ISO 21930).

**Product system**

Collection of unit processes with elementary product flows (i.e., smallest element considered in the life cycle inventory analysis), performing one or more defined functions, and which models the life cycle of a product (adapted from ISO 14044).

**Recovered Material**

Material that would have otherwise been disposed 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)

**Segmental Concrete Paving Slabs**

In the US, these are defined in ASTM C1782 as having a surface area greater than 101 in.2 (0.065 m2); overall length divided by thickness >4; a minimum nominal thickness of 1.2 in. (30 mm); and a maximum overall length or width of 48 in. (1.22 m). Paving slabs are typically used in pedestrian at-grade and roof deck applications and in at-grade applications exposed to limited vehicular traffic.

In Canada, these are defined in CSA A231.1 Precast Concrete Paving Slabs as having a surface area greater than than 139.5 in.2 (0.09 m2); overall length divided by its thickness >4; a minimum nominal thickness of 1.2 in. (30 mm); and a maximum overall length or width of 39.4 in. (1 m).

**Segmental Retaining Wall Unit**

Unit manufactured of dry-cast concrete for the construction of dry-stacked earth retaining walls, complying with ASTM C1372.

**Type III environmental declaration/Environmental product declaration (EPD)**

Environmental declaration that provides quantified environmental data of a product, using predetermined parameters and, where relevant, additional environmental information (adapted from ISO 14025).

# Scope

This document contains the Product Category Rule (PCR) requirements for Manufactured Concrete and Concrete Masonry Product Environmental Product Declarations (EPDs) published in accordance with the ISO 21930 and EN 15804 standards. The requirements for the background Life Cycle Assessment (LCA) project report used to inform the EPD are contained in UL Environment’s Part A: Life Cycle Assessment Calculation Rules and Report Requirements. This Part B document, coupled with the Part A, conforms to the ISO 21930, EN 15804, and ISO 14025 European and international standards for EPD reporting.

General Guidance

The scope of this PCR applies to the product group “manufactured concrete masonry and paving products” and includes products produced using concrete manufacturing equipment and mechanical vibration and compaction to form individual units. Examples include (but are not limited to) concrete masonry units (CMU), segmental retaining wall (SRW) units, interlocking concrete pavers, segmental concrete paving slabs, and concrete grid paving units.

The applicable products are shown in Table 1; other applicable products are those similar to the products in Table 1 as well as secondary building products made from those products.

This PCR covers all commercially available manufactured concrete masonry and paving products according to the standards or technical approvals shown under Section 9.

Applicable Products

Table 1 describes the building products covered within the scope of this Part B, along with their relevant Construction Specification Institute (CSI) MasterFormat codes. This list is non-exhaustive, and the CSI codes provided reflect common applications, which can include multiple uses; other applications may exist. Applicable UNSPSC codes and UNCPC codes include:

|  |  |
| --- | --- |
| UNSPSC:* 30120000 Road and landscape
* 30121800 Landscape architecture materials
* 30131502 Concrete blocks
* 30131510 Concrete blocks for revetment
* 30131603 Concrete bricks
* 30151500 Roofing materials
 | UNCPC:* 3755
 |

**Table 1. Concrete Product Categories, CSI codes and descriptions**

|  |  |  |
| --- | --- | --- |
| **Building product** | **CSI code(s)[[1]](#footnote-1)** | **CSI descriptions** |
| **Adhered Manufactured Stone Masonry Veneer** (ASTM C1670/C1670M) | 04 43 13.16 | Adhered Stone Masonry Veneer |
| **Articulating Concrete Block (ACB)** (ASTM D6684) | 35 31 19.16 | Concrete Unit Masonry Revetments |
| **Cast Stone** (ASTM C1364) | **04 72 00** | **Cast Stone Masonry** |
| **Concrete Grid Paving Units** (ASTM C1319)**Interlocking Concrete Pavers** (ASTM C936/C936M, CSA A231.2)**Segmental Concrete Paving Slabs (**ASTM C1782, CSA A231.1) | 32 14 1332 14 13.13 32 14 13.1632 14 13.19  | Precast Concrete Unit PavingInterlocking Precast Concrete Unit PavingPrecast Concrete Unit Paving Slabs Porous Precast Concrete Unit Paving |
| **Concrete Masonry Unit** **Concrete Masonry Unit, load-bearing** (ASTM C90 or CSA A165.1)**Concrete Masonry Unit, non-loadbearing** (ASTM C129)**Concrete Building Brick** (ASTM C55 or CSA A165.2)**Concrete Facing Brick**  (ASTM C1634)**Concrete Roof Paver** (ASTM C1491) | **04 22 00** 04 22 00.1304 22 00.1604 22 1904 22 2304 22 23.1304 22 23.1604 22 23.1904 22 23.2604 22 23.2904 22 33 | **Concrete Unit Masonry**Concrete Unit Veneer MasonrySurface-Bonded Concrete Unit MasonryInsulated Concrete Unit MasonryArchitectural Concrete Unit MasonryExposed Aggregate Concrete Unit MasonryFluted Concrete Unit MasonryMolded-Face Concrete Unit MasonrySound-Absorbing Concrete Unit MasonrySplit-Face Concrete Unit MasonryInterlocking Concrete Unit Masonry |
| **Concrete Masonry Unit for Catch Basins and Manholes** (ASTM C139) | 02 70 5 | Manholes & Catch Basins  |
| **Prefaced Concrete Masonry Unit** (ASTM C744, CSA A165.3) | 04 22 23.23 | Prefaced Concrete Unit Masonry |
| **Segmental Retaining Wall Unit (**ASTM C1372) | 32 32 23.13 | [Segmental Concrete Unit Masonry Retaining Walls](https://www.arcat.com/divs/sec/sec323223.13.shtml) |

Non-Applicable Products

Products excluded from the scope of this PCR include:

* 30111500 Concrete and mortars
	+ Product Category Rules For Preparing An Environmental Product Declaration For Portland, Blended Hydraulic, Masonry, Mortar, And Plastic (Stucco) Cements. ASTM. Sept. 2014
	+ Product Category Rule for Environmental Product Declarations. PCR for Concrete. NSF. February 2019.
* 30103619 Precast concrete element
	+ Product Category Rules For Preparing An Environmental Product Declaration For Precast Concrete. ASTM. March 2015.
* Quarried stone

System Boundary

The system boundary for EPDs created using this PCR is either cradle to gate (modules A1-A3), cradle to gate with options (modules A1-A3, optional modules A4, A5, B2, and/or C1-C4), or cradle to grave (modules A1-C4). See Part A, Section 2.8 for further discussion of the required and optional information modules included in each EPD type. Module D is not a life cycle stage like the information modules A1 to C4 and is outside the system boundary of the studied product system and construction works system. Supplementary environmental information may be provided in Module D that addresses potential loads and benefits beyond the product system boundary.

At this time, there is no industry consensus for assumptions behind the reported scenarios for information modules A4, A5, B2, or C1 – C4 across each of the subcategories of concrete products included in this PCR.

The EPD requirements include:

* Requirements of the ISO 21930:2017 standard
* Requirements of the EN 15804 standard for consistency between declarations in Europe and the United States.
* The calculation rules for the Life Cycle Assessment and Requirements on the Project Report are specified in a separate document as Part A of the Product Category Rules, available at [https://ul.com/offerings/product-category-rules-pcrs](https://www.ul.com/offerings/product-category-rules-pcrs). At the time of writing this document, version 3.2 is the most current.

# Industry-Average EPD and Report Requirements

Industry-Average EPD Scope

The scope of products represented within a single industry-average EPD created using this PCR is limited to the material(s) defined in the standards in Section 9 that characterize the product in commerce.

Involvement of Interested Parties

A call for involvement of interested parties in the creation of an industry-average EPD shall be published in at least one industry trade publication. At a minimum, three (3) different manufacturing locations from no less than three (3) companies should be involved and represented in an industry-average EPD, unless fewer locations or companies exist in the current market. A production-weighted average shall be calculated. The method for determining representativeness shall be justified and described in the LCA and EPD per the requirements listed in Part A Section ‎2.5.1. The industry EPD shall report the percentage of market participation

Industry-Average EPD Participation

A manufacturer qualifies for participation in an industry-average EPD created using this PCR if they provide primary manufacturing data used in calculating the initial EPD average or demonstrate willingness in writing to provide primary manufacturing data during the LCA data collection process.

Retroactive participation

A manufacturer desiring retroactive inclusion in the industry average EPD shall provide the manufacturing and product data information consistent with information submitted in the original industry average EPD. The LCA practitioner will then recommend to the Program Operator a determination for inclusion in the industry average on the basis of results falling within a reasonable range for any impact category. The maximum and minimum should be reported in the LCA background report for each impact category based on the highest and lowest impact product or facility within the original industry-wide LCA.

When determining a manufacturer’s participation eligibility, the EPD Program Operator shall follow the recommendations of the primary sponsor(s) of the industry average EPD and participating manufacturers unless the Program Operator has information to the contrary, in which case the Program Operator, LCA practitioner, primary sponsor of the industry average EPD, and manufacturer shall confer in an effort to reach consensus.

## Governance

The primary sponsor(s), such as a trade association, shall inform all eligible industry participants through association meetings, newsletters, e-mail messages, and similar types of outreach, including public notices in the trade press publications. Confidential business information shall be collected by a third party. Data from the third party shall be aggregated with no trace to the original source of data.

The development of an industry-average EPD and/or update of such an EPD should involve a series of meetings and exchanges in which all participants are invited and kept apprised of the developments. Advance notices as well as the minutes of these meetings shall be shared with all eligible participants regardless of whether they actively participate. These notices and meeting minutes should be preserved as documentation of the process and due diligence observed in the creation or renewal of the EPD.

## Data Responsibility/Ownership

Primary sponsor(s) that leads the development of industry-average EPDs may need to collect confidential business information. This data can include proprietary chemical formulations and processes or other confidential information. In this case, a designated third-party entity such as an LCA practitioner may be commissioned as the “industry agent”. The industry agent shall be responsible for activities including collection, secure storage and analysis of such data needed for the EPD development and will preserve the privacy of individual company information while executing these duties.

Refer to ISO 21930 Section 5.4 for ownership and development responsibilities of the EPD.

The group of manufacturers responsible for developing an industry-average EPD shall be responsible for, including but not limited to, ensuring industry-average EPD updates are made based on the most recent LCA modeling software version and impact assessment version available.

Industry-Average EPD Updates

An update to the existing EPD, or new EPD, may need to be developed at the discretion of the primary sponsor(s) prior to the five validity period years if there are: 1) significant changes in the manufacturing process; 2) new industry participants; 3) significant changes or alterations in, or sourcing origins of, raw materials; 4) major regulatory changes that mandate or trigger changes to operational procedures; or 5) major technological changes would also justify the creation of an updated EPD.

Additional companies may be added to an existing industry-average EPD at the scheduled review by submitting data and having the industry average impacts recalculated.

# Content of the EPD

|  |  |
| --- | --- |
| EPD Program and Program Operator Name, Address, Logo, and Website | Program Operator Provided |
| General Program Instructions and Version Number | Program Operator Provided |
| Manufacturer Name and Address |  |
| Declaration Number | Program Operator Provided |
| Declared Product & Functional Unit or Declared Unit |  |
| Reference PCR and Version Number |  |
| Description of product’s intended application and use |  |
| Product RSL Description (if Appl.) |  |
| Markets of Applicability |  |
| Date of Issue | Program Operator Provided |
| Period of Validity | Program Operator Provided |
| EPD Type | [Industry-average or product-specific] |
| Dataset Variability | [Industry-average: range, median, mean] [Product-specific: range]  |
| EPD Scope | [Cradle to gate, cradle to gate with options (specify options), or cradle to grave] |
| Year(s) of reported manufacturer primary data |  |
| LCA Software & Version Number |  |
| LCI Database(s) & Version Number |  |
| LCIA Methodology & Version Number |  |
| The sub-category PCR review was conducted by: | Program Operator Provided |
| Program Operator Provided |
| Program Operator Provided |
| This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment “Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report,” v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) ☐ INTERNAL ☐ EXTERNAL |  |
| Program Operator Provided |
| This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: |  |
| Program Operator Provided |
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: |  |
| Program Operator Provided |
| LimitationsEnvironmental declarations from different programs (ISO 14025) may not be comparable. EPDs are comparable only if they use the same PCR (or sub-category PCR where applicable), include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 §5.5 are met. However, variations and deviations are possible. Example of variations: different LCA software and background LCI datasets may lead to different results for the life cycle stages declared. |

# General Information

The comprehensive requirements for EPD content are specified in Part A, Section 7 and ISO 21930:2017, Section 9.

## Description of Organization

* + 1. **Industry Average EPD**

The name of the sponsoring organization as well as participating manufacturers shall be provided.

* + 1. **Product Specific EPD**

The name of the manufacturing entity(ies) as well as the place(s) of production shall be provided. General information about the manufacturing entity(ies) may be provided, such as the existence of quality systems or environmental management systems, according to ISO 14001 or any other environmental management system in place.

## Product description

A narrative description of the product shall be provided that enables clear identification of the product. This description will include:

* + 1. **Product Identification**

The declared products shall be identified by brand name(s), by material type(s), by production code(s) (if applicable), and by simple visual representation, which may be by photograph or graphic illustration.

* + 1. **Product Specification**

Related products grouped and reported as an average product in the same EPD satisfying the variation criteria of Part A, Section 2.5.2 shall constitute an individual declared product. For each declared product, the physical characteristics required in Section ‎3 shall be reported. Other relevant product specification values may be provided here.

The appropriate CSA or ASTM product specification shall be provided, including additional pertinent physical properties and technical information.

* + 1. **Flow Diagram**

A graphical depiction of a flow diagram illustrating main production processes according to the scope of the declaration shall be included such as the examples in Figure 1.

 **Figure 1. Example Product Flow Diagram – Manufactured Concrete Products[[2]](#footnote-2)**

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## Product Average

* + 1. **Industry Average EPD**

The method for creating an industry-average EPD shall be described per Part A, Section 2.5.1

* + 1. **Product Specific EPD**

The method for creating a company specific individual product/product group EPD shall be described, including the method for determining a weighted average across products based on production volume as described in Part A, Section 2.5.2.

## Application

The designated applications for the referenced product(s) shall be specified. The applications of the declared product(s) shall be described.

## Material Composition

The material composition of MCPs shall be disclosed and will include components as percentages or ranges of percentages of total mass as required by product Safety Data Sheet (SDS) rules, if relevant.

Statements of material non-inclusion, such as “… is free of …” shall not be used.

All regulated hazardous substances and dangerous substances shall be reported per Part A, Section 4.11.

Note: This disclosure is intended to enable the user of the EPD to understand the composition of the product in delivery condition and support a safe and effective installation, use and disposal of the product. With appropriate justification, this requirement does not apply to confidential or proprietary information relating to materials and substances that apply due to a competitive business environment or covered by intellectual property rights or similar legal restrictions. It also might not be appropriate for information concerning intangible products.

## Technical Requirements

A listing of all standards required for the specification of the declared product shall be provided as shown in Section ‎9.

## Properties of Declared Product as Delivered

The dimensions/quantities of the declared product(s) as delivered to the site of installation/application shall be indicated.

# Methodological Framework

## Functional Unit

For EPDs covering the complete life cycle, a functional unit shall be defined based on the functional use or performance characteristics of the product integrated into a building, paving or other type of construction in the use phase. The functional unit shall be one of the following as appropriate and defined in Table 2: cubic meters of installed building or paving product, square meters of installed building or paving product (with a stated product thickness), square meters of constructed area using the building or paving product, or other unit as appropriate. Explanation of the selected functional unit shall be stated clearly, including the reference service life. The reference flow as an input to enable MCPs to meet the functional unit requirements shall include related accessories and other materials, unless the reason for the omission of these is explained.

## Declared Unit

For EPDs not covering the complete life cycle, e.g. leaving out the use stage, a declared unit is defined. A declared unit shall be applied if the precise function of the product is not stated or not known. Conversion factors (e.g. density, thickness, etc.) shall be provided in order to allow users to conduct further calculations (e.g. transport impacts, energy simulations).

Table 2 summarizes declared units and functional units that are applicable for MCPs.

**Table 2. Concrete Products Declared and Functional Units**

|  |  |  |
| --- | --- | --- |
| **Product** | **Declared unit** | **Functional unit** |
| Manufactured concrete products | Required: One cubic meter (m3) of concrete formed into manufactured concrete productsOptional (in addition to m3): One yd3  | Required: One square meter (m2) of installed productOptional (in addition to m2): One ft2  |

2 The conversion to cubic meter from a meter square (m2) and thickness basis shall be stated.

The functional or declared unit, mass, and thickness to achieve the functional or declared unit shall be indicated in Table 3 as declared.

Table 3. Functional or Declared Unit Properties

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Functional or Declared unit |  |
| Density |  | kg/m3 |
| Compressive Strength  |  | MPa |
| FlexuralStrength (slabs)  |  | MPa |
| Thickness (pavers, slabs and grids) |  | mm |

* 1. **System boundary**

The type of EPD shall be specified as cradle to gate, cradle to gate with options (end of life), or cradle to grave. The modules considered in the LCA shall be described in brief as per “System boundaries” outlined in Part A, Section 2.8. It should be apparent as to what processes are considered in what modules per the module descriptions in Part A, Section 2.8. Any relevant aspects or impacts not included in an information module shall be supported with relevant additional environmental information and omissions shall be justified. Module D shall be reported separately if included in the EPD.

The inclusion of capital goods and infrastructure flows shall conform with Part A, Section 2.9. If included, the LCA report should specify lifetimes of capital goods and infrastructure. The impact burden from capital goods and infrastructure shall be allocated to the product(s) in the LCA by either a) proportional to the specified lifetime of the asset, or b) proportional to the production output of the asset. Any deviation shall be explicitly specified and justified.

## Reference Service Life and Estimated Building service life

The product reference service life (RSL) and building estimated service life (ESL) shall be indicated according to Part A, Section 2.8.2. RSL is only required when reporting EPD system boundaries beyond cradle-to-gate.

For all structural manufactured concrete masonry products, a default value of 75 years shall be assumed for RSL unless otherwise justified.[[3]](#footnote-3)

For all segmental concrete paving products, a default value of 50 years shall be assumed for RSL unless otherwise justified.

For other products, the assumptions upon which the designated RSL is based and for which the RSL exclusively applies shall be provided.

If included, details on RSL shall be provided in Section ‎4, Table 6. Influences on ageing, when applied, shall be in accordance with the state of the art.

## Allocation

Part A, Section 3.3 shall be used as the basis for allocation decisions, and mass should be used as the primary basis for co-product allocation in this Part B. Allocation methods deemed more appropriate than on the basis of mass may be used but only when justified. The allocations of relevance for calculation (appropriation of impacts across various products) shall be indicated, at least:

* Allocation in the use of recycled and/or secondary raw materials
* Allocation of energy, ancillary and operating materials used for individual products in a factory

whereby reference shall be made to the modules in which the allocations are performed.

The following materials shall be considered recovered materials and not co-products: reclaimed supplementary cementitious materials (i.e. fly ash, blast furnace slag (as cement); and silica fume).

## Cut-off Rules

## Cut-off rules as specified per the Part A, Section 2.9 shall be used and documented. All known mass and energy flows shall be reported. No known flows should be deliberately excluded.

## Data Sources

Data sets shall be selected in accordance with the requirements in Appendix A.

Data sources shall be documented per Part A, Section 3.1 and shall be reported in the EPD including the date and version number. The EPD shall include the following statement, “This EPD recognizes fly ash, silica fume and slag as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment processes and transportation required for their use as concrete material inputs.”

## Data quality

An evaluation shall be provided regarding data quality, including temporal, geographical, technological representativeness, and completeness and shall follow the requirements outlined in Part A, Section 3.1.1.

## Period under review

The period under review and ensuing averages shall be documented.

## Carbonation and Calcination

Accounting for the reaction of atmospheric carbon dioxide with manufactured concrete products throughout the product life cycle shall be justified and follow Section 7.2.8 of ISO 21930:2017.

Calcination calculations shall use a default of 525 kg CO2/tonne clinker from the WBCSD Cement accounting standard[[4]](#footnote-4) unless specific primary data are available.

## Comparability and Benchmarking

Comparison of EPD results between non-competitive products may be included in this section per the requirements in Part A, Section 9.

## Estimates and assumptions

Key assumptions and estimates in this section should be included in the Life Cycle Assessment, provided that they are not dealt with in Section ‎4.

## Units

SI units are required for all LCA results. Other units commonly used in a regional market may be optionally included in addition to the required SI units.

# Technical Information and Scenarios

The following information shall be reported for declared modules. Irrelevant or non-applicable module rows may be excluded in the EPD; additional information may also be listed if necessary.

The following technical information is a basis for the declared modules or may be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

Results reported in Table 7 through Table 10 shall be reported over the entire building ESL.

* 1. **Manufacturing**

The manufacturing process and locations shall be described and illustrated using a simple flow-chart. If the EPD applies to several locations, the production processes for all locations shall be described and reference to quality management systems may be included.

* 1. **Packaging**

Information on product-specific packaging: type, composition and possible reuse of packaging materials (paper, strapping, pallets, foils, drums, etc.) shall be included in this Section. The EPD shall describe specific packaging scenario assumptions, including disposition pathways for each packaging material by re-use, recycling, or landfill disposal based on packaging type.

In the absence of specific primary data, the data assumptions from Part A, Section 2.8.5, Table 2 shall be used.

In the case of reusable packaging designed to last for multiple reuse cycles, one reuse shall be assumed in the absence of primary manufacturer data. At the end of its reuse cycle, reusable packaging shall be assumed to go to landfill.

* 1. **Transportation**

The following information should be provided to specify any transport after the manufacturing gate: type of transport, type of vehicle, distance, type and amount of energy carrier.

* A2 shall assume all long haul transport by bulk carriers (greater than 322 km (200 mi)) do not typically return empty and thus can use the US LCI dataset which includes 35% additional distance to account for this;
* A2 shall assume that all short haul transport (local trucks and dump trucks) return empty. Thus, one way transport distance shall be multiplied by (2/1.35) to reflect two way transport and eliminate the 35% additional distance included in the US LCI;
* A3 shall include transportation activities at the concrete manufacturing site;

Table 4. Transport to the building site (A4)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Fuel type |  |  |
| Liters of fuel |  | l/100km |
| Vehicle type |  |  |
| Transport distance |  | km |
| Capacity utilization (including empty runs, specify whether mass or volume based) |  | % |
| Gross density of products transported  |  | kg/m3 |
| Weight of products transported (if gross density not reported) |  | kg |
| Volume of products transported (if gross density not reported) |  | m3 |
| Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products) |  | - |

* 1. **Product Installation**

A description of the type of processing, machinery, tools, dust extraction equipment, ancillary materials, etc. to be used during installation and measures for reducing noise shall be included. Information on industrial and environmental protection may be included in this section.

Any waste treatment included within the system boundary of installation waste should be specified.

Table 5. Installation into the building or pavement (A5)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Ancillary materials |  | kg |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Other resources |  | kg |
| Electricity consumption |  | kWh |
| Other energy carriers |  | MJ |
| Product loss per functional unit |  | kg |
| Waste materials at the construction site before waste processing, generated by product installation |  | kg |
| Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal) |  | kg |
| Mass of packaging waste specified by type |  | kg |
| Biogenic carbon contained in packaging |  | kg CO2 |
| Direct emissions to ambient air, soil and water |  | kg |
| VOC emissions |  | μg/m3 |

The VOC emissions shall be determined in accordance to “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers- version 1.2” CA Specification 01350.

Table 6. Reference Service Life

A product’s RSL depends on the product properties and reference in-use conditions. These conditions shall be declared with an RSL and it shall be stated that the RSL only applies to these reference in-use conditions. The reference in-use conditions for achieving the declared technical and functional performance of the product and the declared RSL shall include the following, where relevant:

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| RSL |  | Years |
| Declared product properties (at the gate) and finishes, etc. |  | Units as appropriate |
| Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes) |  | Units as appropriate |
| An assumed quality of work, when installed in accordance with the manufacturer’s instructions |  | Units as appropriate |
| Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature, vehicle loads |  | Units as appropriate |
| Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure) |  | Units as appropriate |
| Use conditions, e.g. frequency of use, mechanical exposure. |  | Units as appropriate |
| Maintenance, e.g. required frequency, type and quality of replacement components |  | Units as appropriate |

* 1. **Use**

Any relevant information may be provided in this section regarding specific product use conditions and/or limitations relevant to product use, including a description of any maintenance, repair, replacement or refurbishment processes and/or a reference to where a description can be found.

Information on maintenance shall be provided based on the manufacturer’s recommendations. In the absence of primary data, assumptions (i.e. cleaning) shall be documented and reported in the EPD.

**Table 7. Maintenance (B2)**

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Maintenance process information (cite source in report) |  | - |
| Maintenance cycle |  | Cycles/ RSL |
| Maintenance cycle |  | Cycles/ ESL |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Ancillary materials specified by type (e.g. cleaning agent) |  | kg |
| Other resources |  | kg |
| Energy input, specified by activity, type and amount |  | kWh |
| Other energy carriers specified by type |  | kWh |
| Power output of equipment |  | kW |
| Waste materials from maintenance (specify materials) |  | kg |
| Direct emissions to ambient air, soil and water |  | kg |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants) |  |  |

Table 8. Repair (B3)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Repair process information (cite source in report) |  | - |
| Inspection process information (cite source in report) |  | - |
| Repair cycle |  | Cycles/ RSL |
| Repair cycle |  | Cycles/ ESL |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Ancillary materials specified by type (e.g. cleaning agent) |  | kg |
| Energy input, specified by activity, type and amount |  | kWh |
| Waste materials from repair (specify materials) |  | kg |
| Direct emissions to ambient air, soil and water |  | kg |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants); |  |  |

## Replacement (B4) / Refurbishment (B5)

The number of replacements of product expected during the building ESL of 75 years shall be declared and for paving, 50 years shall be declared. Required or expected maintenance are to be modelled according to manufacturer’s guidelines. Assumptions and key parameters shall be clearly stated and the manufacturer is to submit supporting documentation to justify the assumptions made.

If the RSL is less than the building’s ESL of 75 years, the number of replacements that will be necessary to fulfil the required performance and functionality over the building ESL shall be identified.

Replacements should be rounded-up to the nearest tenths of the ESL of the building; e.g., 1.47 rounded to 1.5.

Table 9. Replacement (B4)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| RSL |  | Years |
| Replacement cycle  |  | (ESL/RSL) - 1  |
| Energy input, specified by activity, type and amount |  | kWh |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Ancillary materials specified by type and amount (e.g. cleaning agent) |  | kg |
| Replacement of worn parts, specify parts/materials |  | kg |
| Direct emissions to ambient air, soil and water |  | kg |
| Further assumptions for scenario development, e.g. frequency and time period of use |  | As appropriate |

Table 10. Refurbishment (B5)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Refurbishment process description (cite source in report) |  |  |
| Replacement cycle  |  | Cycles/ RSL |
| Replacement cycle  |  | Cycles/ ESL |
| Energy input, specified by activity, type and amount |  | kWh |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Material input for refurbishment, including ancillary materials specified by type (e.g. cleaning agent) |  | kg |
| Waste material(s), specified by material  |  | kg |
| Direct emissions to ambient air, soil and water |  | kg |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants); |  |  |

Table 11. Operational energy use (B6) and Operational water use (B7)

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Net freshwater consumption specified by water source and fate (e.g., X m3 river water evaporated, X m3 city water disposed to sewer) |  | m3 |
| Ancillary materials |  | kg |
| Energy input, specified by activity, type and amount |  | kWh |
| Equipment power output  |  | kW |
| Characteristic performance (e.g. energy efficiency, variation of performance with capacity utilization) |  | Units as appropriate |
| Direct emissions to ambient air, soil and water |  | kg |
| Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants); |  | As appropriate |

* 1. **Disposal**

The possible disposal channels shall be indicated in accordance with disposal routes and waste classification referenced in Part A, Section 2.8.5 and 2.8.6. In the absence of specific primary data, the data assumptions from Part A, Section 2.8.5, Table 2 shall be used.

Table 12. End of life (C1-C4)

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** |  | **Value** | **Unit** |
| Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)  |  |  |  |
| Collection process (specified by type) | Collected separately |  | kg |
| Collected with mixed construction waste |  | kg |
| Recovery (specified by type) | Reuse |  | kg |
| Recycling |  | kg  |
| Landfill |  | kg |
| Incineration  |  | kg |
| Incineration with energy recovery  |  | kg |
| Energy conversion (specify efficiency rate) |  |  |
| Disposal (specified by type) | Product or material for final deposition |  | kg |
| Removals of biogenic carbon (excluding packaging)[[5]](#footnote-5) |  | kg CO2 |

* 1. **Re-use phase**

The possibilities of re-use, recycling and energy recovery shall be described.

Table 13. Reuse, recovery and/or recycling potentials (D), relevant scenario information

|  |  |  |
| --- | --- | --- |
| **Name** | **Value** | **Unit** |
| Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6) |  | MJ |
| Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6) |  | MJ |
| Net energy benefit from material flow declared in C3 for energy recovery |  | MJ |
| Process and conversion efficiencies |  |
| Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors); |  |

# Environmental Indicators Derived from LCA

* 1. **LCA Results from LCIA**

In Table 14, "Description of the system boundary," all declared modules shall be indicated with an "X”.

Modules A1, A2, and A3 shall not be declared as one aggregated module and shall be reported separately.

Industry average EPDs shall report information on the statistical distribution of results for all TRACI indicators, including range, median and mean. Additional statistical information may also be reported.

Product specific EPDs which include averaging shall report the range of results for all TRACI indicators for products included in the average.

Per Part A, life cycle impact assessment (LCIA) results shall be declared using scientific notation with three significant digits (e.g. 1.23E-5 = 0.0000123) for each module. Uniform formatting shall be used for all indicator values. GWP calculations shall include impacts from calcination, which shall also be reported separately in Section 5.2.

* North America (Part A, Section 4.7, Table 9, TRACI indicators)
* EU (Part A, Section 4.8, Table 10, CML indicators)
* Rest of World (Part A, Section 4.9, Table 11, indicators as provided)

Table 14. Description of the System Boundary Modules[[6]](#footnote-6)

##

## LCA Results from LCI

Results derived from the product LCI shall be reported as follows:

* Resource use indicators (Part A, Section 4.1, Table 6)
* Output flows and waste category indicators (Part A, Section 4.1.2, Table 7)
* Carbon emissions and removals (Part A, Section 4.6, Table 8)

Optional guidance on the calculation of LCI indicators is available in ACLCA ISO 21930 guidance.

# Interpretation

Interpretation requirements for the Project Report are provided in Part A, Section 5.

Interpretation requirements for the EPD are as follows:

1. An interpretation shall be provided in the EPD which discusses the assumptions and limitations associated with the interpretation of results as declared in the EPD, both methodology and data related.
2. This interpretation shall also include a description of the time frame and/or variance of the LCIA results if the EPD is valid for several products. An illustration of the results with figures is recommended in the EPD, e.g. for the dominance analysis, the distribution of impacts across the modules, etc. as appropriate for a reader's understanding of the environmental profile of the declared product.
3. In addition, the interpretation shall also include a variation calculation and statements as follows:
* “This EPD was calculated using industry average cement data. Cement LCIA impacts can vary depending upon manufacturing process, efficiency, and fuel source by as much as 50% for some environmental impact categories. Cement accounts for as much as <insert max %> of impact across the LCIA results of the concrete mixes included in this EPD and thus manufacturer-specific cement impacts could result in variation of as much as <insert max %>.”

Note: Calculation procedure

For this calculation, impacts shall be considered across all impact categories assessed in Section 5.1.

If the max percentage of impacts for any impact category for any mix reported in the EPD is 85%, then you multiply 85% by 50% to get a max variation of 42.5% and the statement would read: "Cement accounts for as much as 85% of the impacts of the concrete mixes included in this EPD and thus manufacturer specific cement impacts could result in variation of as much as 42.5%.

* “This EPD was calculated using manufacturer specific cement data that represents <insert %> of the total cement used in this mix.”
* ‘”This EPD was calculated using manufacturer specific cement data that represents an average of <insert %> of the total cement used in each mix included in this EPD.”

# Additional Environmental Information

## Environment and Health During Manufacturing

Measures relating to environmental and health protection during the product manufacturing process extending beyond national guidelines (of the production country) may be described, e.g. reference to a product safety data sheet (SDS), description of Environmental Management Systems or similar programs addressing air emissions, wastewater, noise, etc.

## Environment and health during installation

Information should be provided in this section on the relationship between the product, the environment and health, including any possible harmful substances or emissions e.g. reference to a product safety data sheet (SDS). Any recommendations concerning cleaning, maintenance, etc. of the declared product should be listed in Section 4 “Technical information on scenarios”.

## Delayed Emissions

Information related to delayed emissions (resulting from sequestered carbon or other processes) may be presented as a separate GWP indicator, including the reference methodology (e.g., approaches based on discounting or approaches based on time-dependent characterization factors within a pre-defined reference study period). See Part A, Section 4.4 for more information.

## Environmental Activities and Certifications

Other environmental activities, such as participation in recycling or recovery programs along with the details of these programs and contact information, may be provided.

For certifications applied to the product and listed in the EPD, a statement shall be included on where an interested party can find details of the certification program.

## Further Information

A reference source for additional information may be provided here, e.g. homepage, reference source for safety data sheet.

Additional environmental information may be provided here according to Part A, Section 4.10.

# Project Report and Supporting Documentation

The Project Report Content, Structure, and Accessibility requirements to support an EPD created using this document are provided in Part A, Section 2. Project Report elements include general information (Part A, Section 2.1), study goal (Part A, Section 2.2), study scope (Part A, Section 2.8), and the life cycle inventory analysis, impact assessment, and interpretation (Part A, Section 3, 4, and 5). Additionally, the Project Report shall include additional required supporting documentation specified in this sub-category Part B and according to Part A: Section 6.

If relevant to the scope of the declared product, or due to the product material composition, poviding sufficient supporting documentation in the EPD and Project Report is recommended. When providing documentation, testing protocols and other relevant information shall be indicated. If supporting documentation is not provided, the reasons shall be indicated in the EPD and Project Report.

As a general rule, all statements shall be documented with measured data (presented by the corresponding test certificates). In the case of non-verifiable substances, the limit of detection shall be included in the declaration. Interpreting statements such as “… free of …” or “… are entirely harmless …” are not permissible.

# References

The literature referred to in the Environmental Product Declaration shall be quoted in full from the following sources. Standards and standards relating to evidence and/or technical features already fully quoted in the EPD do not need to be listed here.

Sustainability Reporting Standards, PCRs and Guidance

ACLCA - ISO 21930 Guidance – <https://aclca.org/aclca-iso-21930-guidance/>

EN 15804:2012+A1:2013 - Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products

ISO 14025: 2006 - Environmental labels and declarations — Type III environmental declarations — Principles and procedures

ISO 14027:2017 - Environmental labels and declarations -- Development of product category rules

ISO 14040: 2006 - Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 - Environmental management – Life cycle assessment – Requirements and guidelines

ISO 14046:2013 - Environmental management- Water footprint- Principles, requirements and guidelines

ISO 21930: 2017 - Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services

Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment (December 2018, version 3.2)

USGBC and UL Environment. PCR Committee Process and Resources: Part B. July 2017.

World Business Council for Sustainable Development. Cement Sustainability Initiative Internet Manual. Version 3.0 May 2011. (<https://www.cement-co2-protocol.org/en/>)

**ASHRAE:**

ASHRAE 189.1 Standard for the Design of High-Performance Green Buildings

**ASTM:**

ASTM E2921-13, Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes and Rating Systems.

ASTM C55 Standard Specification for Concrete Building Brick

ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units

ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units

ASTM C139 Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes

ASTM C936/C936M Standard Specification for Solid Concrete Interlocking Paving Units

ASTM C744 Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units

ASTM C1232 Standard Terminology of Masonry

ASTM C1319 Standard Specification for Concrete Grid Paving Units

ASTM C1364 Standard Specification for Architectural Cast Stone

ASTM C1372 Standard Specification for Dry-Cast Segmental Retaining Wall Units

ASTM C1491 Standard Specification for Concrete Roof Pavers

ASTM C1634 Standard Specification for Concrete Facing Brick

ASTM C1670/C1670M Standard Specification for Adhered Manufactured Stone Masonry Veneer (AMSMV) Units

ASTM C1782/C1782M Standard Specification for Segmental Concrete Paving Slabs

ASTM D6684 Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems

**CSA:**

CAN/CSA-A165 SERIES - CSA Standards on Concrete Masonry Units

## CAN/CSA-A231.1/231.2 - Precast concrete paving slabs/Precast concrete pavers

Relevant Federal Standards

US EPA, ORD/NRMRL/Sustainable Technology Division, Systems Analysis Branch, SOP No. S-10637-OP-1-0- Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI), Software Name and Version Number: TRACI version 2.1, USER’S MANUAL, 24 July, 2012

# Appendix A

Data Selection and Data Quality Requirements

The requirements ISO 21930:2017 Section 7.1.9 (Table 3) shall be supplemented by Table A1 with additional detail on the upstream data to use in developing the EPD.

**Table A1: Application of data within Module A1**

|  |  |
| --- | --- |
|  | **Production of commodities, raw materials. Upstream Processes.** |
| **Process type**  | Upstream processes |
| **Preferred data**  | Use product specific EPD |
| **If preferred data doesn’t exist**  | Per Appendix A |

Default Data Sources

The default LCA/LCI data noted in Table A2 of this appendix shall be used unless manufacturer and product specific EPD results are available. Tables A3 and A4 shall be used for all applications unless an alternate standardized regional database is published as a clarification to this PCR to enable more accurate yet still standardized upstream LCA data. The data noted here shall be used even if more current data is published unless a revised version of Appendix A is issued as a clarification to the PCR.

In order to align with EN 16757 and provide greater clarity on developing methodology, the following characterization factors are defined in Table A5. Per EN 16757:2017 Annex C, “this is a conservative approach coming from the fact that it is difficult to analyze the chemical composition of sand or gravel. As characterization factor of calcium is zero, it uses the assumption that the material consists of silicon only.”

**Table A2: Material Data**

| **Material** | **Default LCA/LCI Data** | **Year****Region** | **PCR**  |
| --- | --- | --- | --- |
| **Cements** | Portland Cement | The default data sources below should only be used when a product specific EPD for cement doesn’t exist.When using cement produced in USA use:*U.S. EPD for Portland Cement by Portland Cement Association**[https://www.cement.org/docs/default-source/sustainabilty2/pca-portland-cement-epd-062716.pdf?sfvrsn=2 f](https://www.nrmca.org/sustainability/EPDProgram/Downloads/280EPD_for_Portland_Cements_from_PCA.pdf)*When using cement produced in Canada use:*Cement Association of Canada Industry Average EPD:* [*https://www.csaregistries.ca/files/projects/5357\_9431\_EPDReport\_20160321\_20210320.pdf*](https://www.csaregistries.ca/files/projects/5357_9431_EPDReport_20160321_20210320.pdf)When using cement produced anywhere else globally use:*U.S. EPD for Portland Cement by Portland Cement Association*[*https://www.nrmca.org/sustainability/EPDProgram/Downloads/280EPD\_for\_Portland\_Cements\_from\_PCA.pdf*](https://www.nrmca.org/sustainability/EPDProgram/Downloads/280EPD_for_Portland_Cements_from_PCA.pdf) | 2016USA2016 Canada | ASTM PCR for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements. September, 2014 to August, 2019 UN CPC 3744 – Cement |
| Blended Hydraulic Cements |
| Performance-based Hydraulic Cement  |
| Portland-limestone Cement |
| **Aggregates** | Fine Aggregate – Crushed | **Ecoinvent 3.4: “Gravel, crushed {RoW}| production | Alloc Rec”***[https://www.ecoinvent.org/database/database.htm](https://www.ecoinvent.org/database/database.html)*[l](https://www.ecoinvent.org/database/database.html) | 2001World | PCR for Construction Aggregates: Natural Aggregate, Crushed Concrete and Iron/Steel Furnace Slag.<https://www.astm.org/CERTIFICATION/DOCS/369.PCR_for_Construction_Aggregates_PCR.pdf>Note: When using Ecoinvent dataset, replace electricity with U.S. data and follow allocation approach outlined in Aggregate PCR. |
| Coarse Aggregate – Crushed |
| Fine Aggregate – natural sand | **Ecoinvent 3.4: “Gravel, round {RoW}| gravel and sand quarry operation | Alloc Rec”***https://www.ecoinvent.org/database/database.htm* | 2001World |
| Coarse Aggregate – natural gravel |
| Lightweight Aggregates | **Ecoinvent 3.4: “Expanded clay {RoW}| production | Alloc Rec”***https://www.ecoinvent.org/database/database.htm* | 2000World |
| **SCMs** | Supplementary Cementitious Materials (SCMs) – Fly Ash | **N/A****Recovered Material per PCR** | N/A | None |
| SCMs – Silica Fume | **N/A****Recovered Material per PCR** | N/A | None |
| SCMs – Ground Granulated Blast Furnace Slag Cement | **Slag Cement Association****EPD of Slag Cement**<https://www.astm.org/CERTIFICATION/DOCS/197.EPD_for_Slag_Cement_Association_Industry_Average_EPD_for_Slag_Cement.pdf> | 2015USA | ASTM International, PCR for Slag Cement. August 2014.<https://www.astm.org/CERTIFICATION/DOCS/197.EPD_for_Slag_Cement_Association_Industry_Average_EPD_for_Slag_Cement.pdf> |
| **Water** | Water | **Ecoinvent 3.4: Tap water {RoW} |market for | Cut-off adjusted for the electricity grid for the region of interest.***https://www.ecoinvent.org/database/database.htm*If water source includes significant fresh water created via desalination processes, the tap water LCI shall be supplemented with regionally specific LCI of water and the LCI source specified in the EPD. | N/A | None |
| **Admixtures** | Chemical Admixtures | **European Federation of Concrete Admixtures Associations (EFCA) EPDs**<http://www.efca.info/efca-publications/environmental/>Note:If EFCA EPD does not exist for a specific admixture, use the EPD results for water reducing admixture or a product specific EPD developed by the product manufacturer. | 2015Europe | IBU EPD for Admixtures. |
| Chemical Admixture – Plasticizer |
| Chemical Admixture – Coloring |
| Chemical Admixture – Corrosion Inhibitors |

**Table A3: Transportation Data**

| **Transportation Mode** | **Default LCI Data** | **Year****Region** | **Notes** |
| --- | --- | --- | --- |
| **Land** | Road:Combination Truck | “Transport, combination truck, long-haul, diesel powered/tkm/RNA”“Transport, combination truck, short-haul, diesel powered/tkm/RNA”“Transport, combination truck, short-haul, gasoline powered/tkm/RNA” | 2010USA |  |
| Road:Single Unit Truck  | “Transport, single unit truck, long-haul, diesel powered/tkm/RNA”“Transport, single unit truck, long-haul, gasoline powered/tkm/RNA”“Transport, single unit truck, short-haul, diesel powered/tkm/RNA”“Transport, single unit truck, short-haul, gasoline powered/tkm/RNA” | 2010USA |  |
| Rail | “Transport, train, diesel powered/tkm/US” | 2007USA |  |
| **Water** | Freighter | “Transport, ocean freighter, average fuel mix/tkm/US” | 2007USA |  |
| Barge | “Transport, barge, average fuel mix” | 2007USA |  |
| “Transport, barge, diesel powered” | 2003USA |  |
| “Transport, barge, residual fuel oil powered” | 2006USA |  |

**Table A4: Energy Data**

|  |  |  |  |
| --- | --- | --- | --- |
| **Energy Source** | **Default LCI Data** | **Year****Region** | **Notes** |
| Electricity Generation | **Ecoinvent 3.4 electricity processes by NERC Region.** | 2015USA |  |
| Site Energy | **US Life Cycle Inventory Database (NREL):**“Natural gas, combusted in industrial boiler/US”“Residual fuel oil, combusted in industrial boiler/US”“Diesel, combusted in industrial equipment/US”“Gasoline, combusted in equipment/US” | 2007USA |  |

**Table A5: Additional Characterization Factors for ADP**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Substance** | **Unit** | **Group** | **Initial emission or extraction** | **Characterization factor kg antimony eq.** | **Comment** |
| Clay | kg | Element | Resources | 1.4E-11 | Assimilated to silicon |
| Bentonite | kg | Element | Resources | 1.4E-11 | Assimilated to clay |
| Limestone | kg | Element | Resources | 0 | Assimilated to calcium |
| Gravel (unspecified) | kg | Element | Resources | 1.4E-11 | Assimilated to silicon |
| Silica (SiO2) | kg | Element | Resources | 1.4E-11 | Assimilated to silicon |
| Sand (unspecified) | kg | Element | Resources | 1.4E-11 | Assimilated to silicon |

1. Bold headings correspond with major CSI categories; non-bold are sub-categories. [↑](#footnote-ref-1)
2. This example flow diagram is for generic MCPs , specific product types covered in this PCR may differ. [↑](#footnote-ref-2)
3. Based on ASTM D2921. [↑](#footnote-ref-3)
4. Version 3.0 May 2011, <https://www.cement-co2-protocol.org/en/> [↑](#footnote-ref-4)
5. See ISO 21930 Section 7.2.7 [↑](#footnote-ref-5)
6. Adapted from ISO 21930:2017 [↑](#footnote-ref-6)