

PRODUCT CATEGORY RULES FOR PREPARING
AN ENVIRONMENTAL PRODUCT DECLARATION
FOR SEGMENTAL CONCRETE PAVING PRODUCTS



PCR

VERSION ADOPTION
APR. 2015

VALIDITY PERIOD
MAR. 2020

Segmental Concrete Paving Products (UN CPC 3755)

The product group includes interlocking concrete pavers, segmental concrete paving slabs, and concrete grid paving units.

REFERENCED PCR:

PCR 2013:02 for Concrete (UN CPC 375), Version 1.0, International EPD system. Prepared by WBCSD (World Business Council for Sustainable Development) CSI (Cement Sustainability Initiative)





Segmental Concrete Paving Products

Scope of Validity of these PCR

This product group includes products manufactured using dry-cast, wet-cast, or hydraulically pressed concrete utilizing manufacturing equipment and mechanical vibration and compaction to form segmental paving units. Examples include (but are not limited to) interlocking concrete pavers, segmental concrete paving slabs, and concrete grid paving units.

Program Operator

ASTM International

Interested Parties

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

The Interlocking Concrete Pavement Institute, A. Jandris & Sons, Taylor Concrete Products, Big River Industries an Oldcastle Company, Concrete Masonry Association of California and Nevada, Anchor Block Company, Oaks Concrete Products, CalStar Products, Inc., the Canada Masonry Design Centre, the National Concrete Masonry Association, Martha G. VanGeem, P.E., and Emily Lorenz, P.E.

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PCR VERSION HISTORY

Version Number	Amendments	Date Issued
1	X	04 / 17 / 15

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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 by North American organizations and other interested parties for preparing EPDs for segmental concrete paving products.

The referenced PCR are WBCSD (World Business Council for Sustainable Development) Cement Sustainability Initiative, PCR 2013:02 for Concrete (UN CPC 375), Version 1.0, International EPD system. Although every effort was made to harmonize wherever possible, it was determined that there were regional process and government policy differences that warranted a PCR for manufactured segmental concrete paving products that are manufactured in North America. The following differences are noted:

- PCR 2013:02 lists and refers to European technical data and standards such as EN 206-1 that are not applicable to North America. North American segmental concrete paving and masonry products are specified and classified differently.
- PCR 2013:02 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."¹ Listing of substances pertaining to the European Chemicals Agency is not standard practice in North America.
- PCR 2013:02 requires GHG emissions and removals occurring due to direct land use change to be included in the LCI, if significant. ASTM PCR does not require accounting of GHG emissions and removals due to land use change because such measures are not yet sufficiently standardized.

In addition, the following related PCR were reviewed:

- ASTM International, Product Category Rules (PCR) for Preparing an Environmental Product Declaration for Manufactured Concrete and Concrete Masonry Products, December, 2014.
- ASTM International, Product Category Rules (PCR) for Preparing an Environmental Product Declaration for Precast Concrete, February, 2015.

The scopes for the above PCR do not cover applicable North American specifications for segmental concrete paving products such as interlocking concrete pavers, segmental concrete paving slabs, or concrete grid paving units. In addition, while dry-cast manufacturing processes for concrete masonry and segmental concrete paving products are very similar, the segmental concrete paving products group includes manufacturing processes not used by the concrete masonry industry. These include hydraulically pressing wet concrete paving slabs, as well as automated wet cast concrete paver and paving slab production plants.

1.1 | GOAL AND SCOPE

This PCR document specifies rules, requirements, and guidelines for developing EPDs for segmental concrete paving products and underlying requirements of related life-cycle assessments (LCAs). These PCR are valid for, and provide requirements for, Business-to-Business (BtoB) EPDs. A BtoB EPD covers the cradle-to-gate product stage with the product packaged and ready for shipment at the plant gate.

¹ <http://echa.europa.eu/web/guest/candidate-list-table>

An EPD prepared under these PCR shall present results for 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 Sustainability in building construction—Environmental declaration of building products.
- 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*.

While not necessarily complying with the CEN EN 15804 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 will be revised. 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 which it shall be reviewed and verified. An EPD shall be reassessed and updated after five years as necessary to reflect changes in technology or other circumstances that could alter the content and accuracy of the declaration. The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930.

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, and the following apply.

Specific product definitions include those found in the following product standards:

Interlocking concrete pavers | In the US, these are defined in ASTM C936/C936M as these units that shall have an exposed face area $\leq 101 \text{ in.}^2$ (0.065 m^2), and their overall length divided by thickness ≤ 4 . The minimum specified thickness is 2.36 in. (60 mm).

Interlocking concrete pavers | In Canada, these are defined in CSA A231.2 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).

Segmental concrete paving slabs | These are defined in CSA A231.1 as having a surface area greater than 139.5 in.² (0.09 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 40 in. (1 m).

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.

In addition, the following definition clarifies the use of recovered material in these PCR:

Recovered material | This is defined in ISO 14012 as 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.

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 users in making informed comparisons between products.

EPDs based on cradle-to-gate information modules shall not be used for comparisons unless using a functional unit and complying with all of the requirements set out in ISO 14025, Section 6.7.2, and ISO 21930, Section 5.6, when the product is used in buildings. EPDs based on a declared unit shall not be used for comparisons.

Since an EPD prepared using this PCR only covers BtoB, the following shall be stated in the EPD: This EPD covers only the cradle-to-gate impacts of segmental concrete paving products using a declared unit, and 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 such as the existence of quality systems, an environmental management system according to ISO 14001, or any other environmental management systems in place.

5.2 | DEFINITION OF PRODUCT CATEGORY

These PCR address the specific segmental concrete paving products shown in Table 1, which also shows the ASTM and CSA standards that provide detailed descriptions and specifications for each product.

TABLE 1: Segmental Concrete Paving Product Specifications

Material	Description/Specification
Interlocking concrete pavers	ASTM C936/C936M or CSA A231.2
Segmental concrete paving slabs	CSA A231.1
Concrete grid paving units	ASTM C1319

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, and simple example visual representation, which may be by photograph or graphic illustration;
- List of the standards and other product specifications to which the products comply;
- 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 paving 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 paving 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.

Since these PCR for segmental concrete paving products only cover the cradle-to-gate stages, a declared unit shall be used. The declared unit shall be 1 m³ of concrete formed into a paving product. Data may additionally be presented per 1 yd³ of concrete.

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 BtoB or BtoC.

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” (BtoB EPDs) | The life-cycle activities and related processes shall include modules A1, A2, and A3—the product stage—as defined below, with scenarios for other life-cycle stages as appropriate.

Cradle-to-Grave (mandatory for BtoC EPDs) | 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, modules A1 to A3 (highlighted in Figure 1) apply. The following factors are to be taken into account for the relevant life-cycle stage.

Modules A1-A3, the Product Stage:

- A1 - Extraction and processing of raw materials including generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- A2 - Average or specific transportation of raw materials (including recycled materials) from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process) and including empty backhauls;

- A3 - Manufacturing of the product including batching and mixing of the concrete; forming units with dry cast, wet cast, or hydraulic press production methods; curing of units; and applicable post-production finishing of units. This includes, but is not limited to:
 - 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-A3.

All assumptions from the LCA shall be described in detail.

Any transportation data other than identified above shall be indicated. If transportation information is included in other stages than indicated, or if no transportation information exists and assumptions are made, this should be noted.

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

Temporal | The obtained information from the manufacturing process should be annual values, preferably from the previous twelve-month period or calendar year. 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 technology in use.

The use of specific or generic background data shall be documented. As a rule, the following distribution will be applied:

- Extraction or production or both of raw materials (specific or average background or both);

- Manufacturing of the product (specific);
- Data sources and any calculation procedures for the fuel mix for electricity generation shall be documented;
- Hazardous waste shall be reported according to applicable U.S. and/or Canadian federal or state/provincial regulations (or appropriate regulations for materials imported from outside North America);
- If EPDs for upstream products are not available, data from the best available published literature shall be permitted to be used; and
- If multiple suppliers are used for one material, then a weighted average, based on volume or mass, shall be used to assign transport distance and mode.

For generic data, 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 are not available, sources for similar technology adjusted for national boundary conditions (for example, energy mix) may be used. Data from other regions is 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 chemicals or other inputs, the source and justification for selection of the proxies shall be documented in the LCA report.

When preparing a company-average EPD for an identical product manufactured at multiple facilities, the LCI data for each site shall be weighted to determine a company 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 will 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 (cutoff 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 generic data. Any assumptions for such choices shall be documented.

If data are not reasonably available, the cutoff 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 unit process, 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 or expected 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 do not apply to such substances.

7.3 | DATA QUALITY REQUIREMENTS

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

- All data shall be accurate and representative of the production process, current technology, and current measurement capability.
- 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 owner of the EPD is not the owner of all upstream processes, the owner shall contact its suppliers within the system boundary. If the suppliers do not supply data, the owner shall use the best-available data in the literature 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. Conversions to IP units shall be provided. Preferred 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)	1.076391E+01
Kilogram (kg)	Pound (lb)	2.204622
Mega joule (MJ)	British Thermal Unit (Btu)	9.478170E+02
Degree Celsius (°C)	Degree Fahrenheit (°F)	(°C * 9/5) +32
Cubic meter (m ³)	Cubic foot (ft ³)	3.531466E+01
Meter (m)	Foot (ft)	3.281
m ² K/W	ft ² Fhr/Btu	5.6783
Metric tonne	Ton	1.102

Source: NIST: <http://physics.nist.gov/Pubs/SP811/appenB9.html>; <http://www.nist.gov/pml/wmd/metric/temp.cfm>; and <http://www.nist.gov/pml/wmd/metric/common-conversion-b.cfm>

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, Section 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 point of the generating industrial process to their use in the production process need to be considered. Any allocations before reprocessing shall be allocated to the original product. PCR UN CPC 3744 (see Section 12) notes that in countries where slag is not considered a waste, economic allocation should be applied. However, PCR UN CPC 3744 also states that in Europe it has been shown that the contribution of slag to the overall revenue of the producing system is in the order of 1% or less and that allocation burdens can therefore be neglected.

Slag, fly ash and silica fume shall be considered recovered materials, not co-products. Note that EPA states in their Waste Reduction Model (WARM) document, “Because fly ash is a byproduct (waste) of the process of combusting coal for electricity, WARM considers that there are no manufacturing or combustion emissions associated with fly ash itself.” 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 material or product.

When a product’s original function is no longer needed or possible, the product can be processed further in a waste management system. For example, it can be recycled, reused, or energy recovered. Emissions from downstream recycling or combustion after the end-of-waste state will be allocated to the new downstream products, such as heat and electricity. In the case of incineration of wastes for energy production at the primary production site, the combustion emissions shall be allocated to the paving product unless the energy is exported.

Concrete recycling processes may be treated as closed-loop recycling when the recycled concrete is crushed and used as a substitute for aggregate for the production of segmental concrete paving products. In this case only the flows and impacts associated with recovery and crushing of the recycled concrete shall be taken into account and the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials.

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 (such as multiple mix designs with similar strength) are produced by a site or company, these PCR offer the possibility for similar products to be grouped as an 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 is still possible to include average products in the same EPD (for example, in separate columns in a table). If a single value is chosen for each impact category for all products, the value reported should be the worst performance within the range of variation. It is also permissible to show arithmetically weighted 'averaged data' in an EPD as supplementary information if found relevant.

8.0 Impact Categories and Characterization Factors

Environmental impact category indicators shall be taken from Table 3 for declaring environmental aspects in accordance with ISO 21930, Section 8.2 and ISO 14044.

TABLE 3: Declaration of Environmental Category Indicator Results, Use of Resources, and Generation of Waste

CATEGORY INDICATOR	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. 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 Section 9.
3. 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, biomass, etc.
4. Recycled and recovered materials with fuel content and used as fuels shall be considered alternative energy. Examples of such secondary fuels recovered from previous use or as waste are solvents, wood, tires, and animal fat. Emissions from secondary fuels shall be included in the calculation of the relevant environmental impacts.
5. Energy consumption shall be reported in Higher Heating Values (HHV) mega joules.
6. Where applicable, feedstock energy shall be declared and shown separately.

The impact categories of life-cycle impact assessment (LCIA) shall be calculated using characterization

factors specified in version 2.1 of TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). <http://www.epa.gov/nrmrl/std/traci/traci.html>

9.0 Additional Environmental Information

A Type III environmental declaration shall include, where relevant, additional information 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 14025, Section 7.2.2. Identification of significant environmental aspects should, as a minimum, take into consideration the following:

- 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 product performance, if environmentally significant;
- The organization's adherence to any environmental management system, with a statement on where an interested party may find details of the system;
- Any other environmental certification program applied to the product and a statement on where an interested party may 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 products; and
- Potential for incidents that can have impact(s) on the environment.

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

10.0 EPD Supporting Data

A project report shall be prepared in accordance with the requirements and guidance of ISO 14044, Section 6, 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 have been met. The project report shall include, where relevant:

- The commissioner of 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 chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930;
- 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.

11.0 Content of the EPD

The following demonstration of verification shall be completed and included with the EPD. Note that third-party verification is optional for BtoB EPDs, but mandatory for 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 program operator >
Independent verification of the declaration and data, according to ISO 14025: internal external
(Where appropriate ²) Third party verifier: <name of third party verifier>

All 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 product's use and the declared unit of the product to which the data relates;
- Description of the application (installation) of the product where relevant;
- List of the substances, by weight, that make up the 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;
- Statement that the EPD represents an average performance in cases where an EPD declares an average performance for a number of products;
- Information on where explanatory material may be obtained;
- Diagram or description of the life-cycle stages included in the LCA, 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;

² Optional for business to business communication, mandatory for business to consumer communication.

- 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.

Additionally, conversions between volume of concrete and commonly specific quantities of segmental concrete paving products may be declared in the EPD. Commonly used conversions include, but are not limited to:

- The volume of concrete that comprises 1 m² or 1 ft² of completed pavement surface; and/or
- The volume of concrete that comprises each or any unit covered by this EPD.

12.0 References

ASTM Standards:³

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

ASTM C1319 Standard Specification for Concrete Grid Paving Units

CSA Standards:⁴

CSA A231.1/A231.2 - Precast concrete paving slabs/Precast concrete pavers

ISO Standards:⁵

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

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:

ASTM International, Product Category Rules (PCR) for Preparing an Environmental Product Declaration for: Manufactured Concrete and Concrete Masonry Products, December, 2014⁶

ASTM International, Product Category Rules (PCR) for Preparing an Environmental Product Declaration for Precast Concrete, February, 2015⁶

CEN 15804 Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products⁷

Carbon Leadership Forum (CLF), *Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) of Concrete*, Revised Version 1.1 December 2013⁸

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

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

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

6 http://www.astm.org/CERTIFICATION/filtrexx40.cgi?-P+PROG+7+cert_detail.frm

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

8 Carbon Leadership Forum (CLF), www.carbonleadershipforum.org; <http://www.carbonleadershipforum.org/clf-pcr-v11-2013-12-04.pdf>

UN CPC 375 Concrete Product Category Rules, version 1.0, dated February 12, 2013, developed for the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative—global scope⁹

UN CPC 3744 Cement Product Category Rules, version 2.0, dated May 16, 2013, Centre for the Development of Product Sustainability in co-operation with AITEC,¹⁰

US EPA Waste Reduction Model (WARM) – Fly Ash Chapter: <http://epa.gov/climatechange/wycd/waste/downloads/fly-ash-chapter10-28-10.pdf>¹¹

⁹ Available from World Business Council for Sustainable Development (WBCSD), Maison de la Paix, Chemin Eugène- Rigot 2, CH-1211 Geneva, Switzerland. www.wbcscement.org; http://www.wbcscement.org/pdf/pcr1302_CPC_375_Concrete_1_0.pdf

¹⁰ Available from International EPD System, www.environdec.com; <http://www.environdec.com/en/PCR/Detail?Pcr=5942>

¹¹ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20004, <http://www.epa.gov>.