



Product Category Rule for Environmental Product Declarations

PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements



Program Operator

NSF International

National Center for Sustainability Standards

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ncss@nsf.org

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PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements

PRODUCT CATEGORY RULES REVIEW PANEL

Program Operator

NSF International

Recommended for adoption by

The PCR Committee for Portland Cement

No participation fees were charged by NSF to interested parties. NSF International ensured that reasonable balance among the members of the PCR committee were achieved and potential conflicts of interest were resolved prior to commencing this PCR development.

Review Panel

Dr. Thomas P. Gloria, PhD
Industrial Ecology Consultants
35 Bracebridge Road
Newton, MA 02459-1728
t.gloria@industrial-ecology.com

Mr. Bill Stough
Sustainable Research Group
PO Box 1684
Grand Rapids, MI 49501-1684
bstough@sustainableresearchgroup.com

Mr. Jack Geibig
EcoForm
2624 Abelia Way, Suite 611
Knoxville, TN 37931
jgeibig@ecoform.com

PCR review panel comments may be obtained by contacting NSF International's National Center for Sustainability Standards at ncss@nsf.org.

NSF International shall ensure that reasonable balance among the members of a PCR committee is achieved and potential conflicts of interest are identified. No participation fees will be charged by NSF International to interested parties for participation on PCR Development Committees, for attendance at PCR Development Committee meetings, or for commenting on a draft PCR document.



PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements

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PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements

GENERAL INFORMATION

Product Category Rule for Environmental Product Declaration:

PCR for PORTLAND, BLENDED, MASONRY, MORTAR, and PLASTIC (STUCCO) CEMENTS

PCR DEVELOPMENT AND STAKEHOLDER CONSULTATION

This product category rule for “cement” is Version 2.0 of the Product Category Rules (PCR) for ISO 14025:2006 Type III Environmental Product Declarations (EPDs) of portland cement, blended cement, masonry cement, mortar cement, and plastic (stucco) cement updating Version 1.0 dated September 2014, published by ASTM. The following change has been included in this document:

- Compliance with ISO 21930:2017

A committee outlined in Appendix A provided review and input to the revisions. After consideration of existing North American PCR for cement (hosted at ASTM), the USGBC PCR Guidance Document, European PCR for cement, and ISO 21930:2017 (see references) the technical committee decided to use ISO 21930:2017 as the ‘core PCR’ and adapt the ASTM cement PCR to be a ‘subcategory PCR’.

ISO 21930:2017 provides the core rules for construction products and services and must be read in tandem with this document.

For information about PCR development and stakeholder consultations, see Appendix A.

No participation fees were charged by NSF to interested parties. NSF International ensured that reasonable balance among the members of the PCR committee were achieved and potential conflicts of interest were resolved prior to commencing this PCR development.

The development of this PCR was supported by the Portland Cement Association www.cement.org and its members.

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ABOUT NSF'S NATIONAL CENTER FOR SUSTAINABILITY STANDARDS (NCSS)

Through the National Center for Sustainability Standards, NSF develops life-cycle based, multi-attribute sustainability standards, protocols, and PCRs for various industries including building products and materials, furniture, carpet and flooring, fabrics, wallcoverings, roofing membranes, green chemicals, and water and wastewater.

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To initiate your LCA, receive your EPD verification, or have questions on where to start, contact NSF Sustainability at sustainability@nsf.org or 734-476-2543.



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1 SCOPE

Per ISO 21930:2017 Section 1, with the following additions:

This subproduct category rule (PCR) addresses UN CPC Group 3744-Cement and enables the development of EPDs associated with the production of the product from cradle-to-gate for life cycle stage Modules A1 to A3. This PCR was developed specifically for use where applicants use the standards in Table 1.

**Table 1
Specifications for Hydraulic Cements**

Product	Description / Specification
Portland cement	ASTM C150, ASTM C1157, AASHTO M 85, or CSA A3001
Blended hydraulic cement	ASTM C595, ASTM C1157, AASHTO M 240, or CSA A3001
Portland-limestone cement	ASTM C595, ASTM C1157, AASHTO M 240, or CSA A3001
Performance based hydraulic cements	ASTM C1157
Masonry cement	ASTM C91 or CSA A3002
Mortar cement	ASTM C1329 or CSA A3002
Plastic (stucco) cement	ASM C1328 or CSA A3002



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An additional PCR is required for cement-based products to outline the additional LCA stages such as producing concrete.

2 **NORMATIVE REFERENCES**

The following documents are referred to in the text. For undated references, the latest edition of the referenced document (including any amendments) applies:

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

AASHTO M 85, *Standard Specification for Portland Cement*

AASHSTO M 240, *Standard Specification for Blended Hydraulic Cement*

ASTM C91, *Standard Specification for Masonry Cement*

ASTM C150/C150M, *Standard Specification for Portland Cement*

ASTM C219, *Standard Terminology Relating to Hydraulic Cement*

ASTM C595/C595M, *Standard Specification for Blended Hydraulic Cements*

ASTM C1157/C1157M, *Performance Specification for Hydraulic Cement*

ASTM C1328/C1328M, *Standard Specification for Plastic (Stucco) Cement*

ASTM C1329/C1329M, *Standard Specification for Mortar Cement*

CSA A3001, *Cementitious Materials for Use in Concrete*



CSA A3002 *Masonry and Mortar Cement*

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

3 TERMS AND DEFINITIONS

While this PCR will likely be used primarily in North America, it may be used in other regions where program operators deem it appropriate. Per ISO 21930:2017 Section 3, with the following additions:

cement, blended hydraulic: a hydraulic cement consisting of two or more inorganic constituents (at least one of which is not portland cement or portland cement clinker) which separately or in combination contribute to the strength gaining properties of the cement, (made with or without other constituents, processing additions and functional additions, by intergrinding or other blending). (ASTM C219)

cement, masonry: a hydraulic cement manufactured for use in mortars for masonry construction or in plasters, or both, which contains a plasticizing material and, possibly, other performance-enhancing addition(s). (ASTM C219)

cement, mortar: a hydraulic cement manufactured for use in masonry mortar designed for specific bond and air content criteria. (ASTM C219)

cement, plastic: a hydraulic cement, primarily used in portland cement-based plastering construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone or hydrated or hydraulic lime), together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability. (ASTM C1328)

cement, portland: a hydraulic cement produced by pulverizing clinker, consisting essentially of crystalline hydraulic calcium silicates, and usually containing one or more of the following: water, calcium sulfate, up to 5% limestone, and processing additions. (ASTM C219)



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cement, portland-limestone: a hydraulic cement consisting of an intimate and uniform blend of portland cement and limestone produced by intergrinding portland cement clinker and limestone; by blending portland cement and finely divided limestone; or by a combination of intergrinding and blending, in which the amount of the limestone constituent is within specified limits. (ASTM C219)

metric tonne: 1000 kilograms.

short ton: 2000 pounds.

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

product specific EPD: EPD results for a specific product or group of cements, categorized by performance and developed by a manufacturer for a specific manufacturing facility location(s).

industry-wide average EPD: EPD results for a specific product or group of cements categorized by performance for a specified region and/or group of manufacturers.

hazardous waste: Waste identified as hazardous according to regulations applicable in the market for which the EPD is valid. For the US market, wastes are hazardous if they are regulated under the Resource Conservation and Recovery Act www.epa.gov/rcra, see also 40 CFR 261.33 www.govinfo.gov/content/pkg/CFR-2011-title40-vol26/pdf/CFR-2011-title40-vol26-sec261-33.pdf. For the Canadian market wastes are hazardous if they are regulated under the Canadian Environmental Protection Act, 1999 Regulations www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/permit-hazardous-wastes-recyclables/management.html.

NOTE — hazardous waste does not include radioactive waste, see ISO 21930:2017 Section 7.2.14.

nonhazardous waste: Commercial / industrial waste that is not hazardous: dust, spoil, or other waste from raw material extraction; waste in municipal disposal scheme, and leftover or waste cement.



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4 ABBREVIATED TERMS

Per ISO 21930:2017 Section 4, with the following additions:

LEED: Leadership in Energy and Environmental Design

USGBC: US Green Building Council

5 GENERAL ASPECTS

5.1 Objectives of this PCR

Per ISO 21930:2017 Section 5.1, with the following additions:

The primary objective of this subcategory PCR is to provide common rules specific to cement for the application of ISO 21930:2017 for building and civil engineering works.

Additional objectives include to:

- describe which stages of a product's life cycle are considered in the EPD and which processes are to be included in the life cycle stages;
- encourage cement producers to quantify, report, better understand and reduce the environmental impacts of cement;
- promote transparency and incentivize manufacturer specific upstream data;
- represent cement appropriately following international standards for building materials and products;
- specify the data quality to be attained in cement EPDs;



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- support the use and guidance of EPDs in sustainable design construction programs and rating systems;
- address requirements for creating an industry-wide average EPD; and
- enable consistent and comparable reporting of LCA results related to cement production.

5.2 Life cycle stages

Per ISO 21930:2017 Section 5.2, with the following clarifications:

This PCR enables reporting of a cradle-to-gate EPD as outlined in ISO 21930 Section 5.2.2.

5.3 Average EPDs for groups of similar products

Per ISO 21930:2017 Section 5.3 with the following clarifications and additions:

- A. Examples of average EPD groupings for cement products include ASTM, AASHTO, or CSA specification; or cement type.
- B. If any environmental indicators for products included in the average differ by more than $\pm 10\%$, the minimum and maximum of the population or dataset shall be reported. Alternately, if a single value is chosen for each impact category for all products, the value reported should be the highest impact within the range of variation, therefore the EPD would report the highest single value for each impact category amongst all of the products or plants included in the average EPD analysis.
- C. Manufacturers seeking to align their individual Type III EPDs against an industry-wide average EPD shall have participated in the industry-wide average EPD. Alternatively, for manufacturers not included in the initial industry-wide average EPD, to be included retroactively in the industry-wide average EPD, the Program Operator, LCA practitioner, primary sponsor of the initial industry-wide average EPD, and manufacturer shall confer in an effort to reach consensus on how to proceed. The effect of the additional EPD on the industry-wide average shall be estimated.



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NOTE — Type III EPD is defined in ISO 21930 Section 3.1.1 and is not to be confused with ASTM C150 Type III cement.

D. For greater transparency, product specific EPDs are encouraged.

5.4 Use of EPDs for construction products

Per ISO 21930:2017 Section 5.4 with the following clarifications and additions:

This PCR is intended to be used to create EPDs for use in business-to-business (B2B) communication.

5.5 Comparability of EPDs for construction products

Per ISO 21930:2017 Section 5.5, with the following clarifications:

EPDs based on cradle-to-gate information modules shall not be used for comparisons.

EPDs based on a declared unit shall not be used for comparisons. If cement EPDs are used to compare two different cements, the functional units must be the same. Additional elements of EPDs and their respective LCA beyond those presented in Section 5.5 of ISO 21930:2017 that will assist purchasers and users in making informed comparisons between products include the following, for product specific EPD comparisons, results for transportation must be represented by actual transportation distances. Also, comparison based on LCA A1-A3 data shall be made only if the same secondary data sets and overall data contained within the LCA database and version are the same, and all subsequent life cycle stages are equivalent for both EPDs.

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, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products.

5.6 Documentation

Per ISO 21930:2017 Section 5.6.



6 PCR DEVELOPMENT AND USE

Per ISO 21930:2017 Section 6, with the following additions:

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, evolution of LCA methodology in ISO 21930:2017), the document will be revised. See Section 5.5 for comparability.

7 PCR FOR LCA

7.1 Methodological framework

7.1.1 LCA Modeling and calculation

Per ISO 21930:2017 Sections 7.1.1, and 7.2.3 through 7.2.6.

7.1.2 Functional unit

Per ISO 21930:2017 Section 7.1.2, with the following clarifications and additions:

No functional unit is defined in this PCR. However, performance characteristics of cement shall be reported including:

- UNSPC Product code and CSI Specification number,
- ASTM, AASHTO, or CSA specification, and
- cement type(s).

The performance is based on the specification and cement type. In addition, the following may also be provided: applicable plant process such as dry with preheater and precalciner, dry with preheater, long dry, semi-dry with precalciner, or wet.



7.1.3 Declared unit

Per ISO 21930:2017 Section 7.1.3 with the following clarifications:

Since this PCR only covers Module A (manufacturing), a declared unit shall be used. The declared unit shall be one metric tonne of portland cement, blended cement, masonry cement, mortar cement, or plastic (stucco) cement. Data may additionally be presented per short ton (US imperial units).

7.1.4 Reference service life (RSL)

Per ISO 21930:2017 Section 7.1.3, with the following clarifications:

As this PCR does not address module B (Use), the reference service life (RSL) of cement is not addressed.

7.1.5 System boundary with nature

Per ISO 21930:2017 Section 7.1.5.

7.1.6 System boundary between products systems

Per ISO 21930:2017 Section 7.1.6.

7.1.7 System boundaries and technical information for scenarios

Per ISO 21930:2017 Section 7.1.7, with the following additions:

Figure 1 shows the life-cycle stages. This PCR covers production of cement from cradle-to-gate for life cycle stage Modules A1 to A3.



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Construction works assessment information														
Construction works life cycle information within the system boundary											Optional supplementary information beyond the system boundary			
A1 - A3 PRODUCTION Stage (Mandatory)			A4 - A5 CONSTRUCTION Stage		B1 - B7 USE Stage					C1 - C4 END-OF-LIFE Stage			D	
A1	A2	A3	A4	A5	B1	B2	B3	B4 ^a	B5	C1	C2	C3		C4
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance (incl. production, transport and disposal of necessary materials)	Repair (incl. production, transport and disposal of necessary materials)	Replacement (incl. production, transport and disposal of necessary materials)	Refurbishment (incl. production, transport and disposal of necessary materials)	De-construction / Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste	Potential net benefits from reuse, recycling and/or energy recovery beyond the system boundary
			Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	
					B6 Operational energy use									
					B7 Operational water use									

^a Replacement information module (B4) not applicable at the product level.

Figure 1
Common four life cycle stages and their information modules [Source: 21930:2017]

Items that may be excluded from the system boundary 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.

7.1.7.1 General

Per ISO 21930:2017 Section 7.1.7.1.



7.1.7.2 A1 to A3, production stage

Per ISO 21930:2017 Section 7.1.7.2, with the following addition:

Transport shall include empty backhauls (bulk carriers that return empty).

7.1.7.3 A4 to A5, construction stage

Per ISO 21930:2017 Section 7.1.7.3, with the following additions:

As this PCR does not address modules A4 to A5, this section of ISO 21930:2017 does not apply.

7.1.7.4 Use stage

Per ISO 21930:2017 Section 7.1.7.4, with the following additions:

This section of ISO 21930:2017 does not apply.

7.1.7.5 End-of-life stage

Per ISO 21930:2017 Section 7.1.7.5, with the following additions:

This section of ISO 21930:2017 does not apply.

7.1.7.6 Benefits and loads beyond the system boundary

Per ISO 21930:2017 Section 7.1.7.6:

This section of ISO 21930:2017 does not apply.

7.1.8 Criteria for the inclusion and exclusion of inputs and outputs

Per ISO 21930:2017 Section 7.1.8.



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7.1.9 Selection of data and data quality requirements

Per ISO 21930:2017 Section 7.1.9, with the following additions:

Purchased electrical energy data shall use NERC regions or similar data to represent electrical energy production for the US and Canada. Preference shall be given to datasets that include transmission and distribution losses.

For regions other than the US and Canada, country or region-specific processes shall be used for the manufacturing stage provided they are representative. The sources for electricity and the calculation procedure shall be documented.

Credit may not be applied to LCA baseline when “green” power certificates are used, but certificates may be reported in the Additional Environmental Information section. Green power certificates must be available and provided to the program operator for the entire period of EPD validity.

NOTE — NSF Concrete PCR v2 requires Ecoinvent 3.4 by NERC region as default data.

7.1.10 Units

Per ISO 21930:2017 Section 7.1.10, with the following additions:

As noted in ISO 21930:2017 SI units shall be used. Optionally, EPDs may provide both US imperial and SI units using the following conversion factors from NIST.



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**Table 2
Conversion Factors**

Convert from:	Convert to:	Multiply by:
Cubic yard (yd ³)	Cubic meter (m ³)	7.645 549 E-01
Square foot (ft ²)	Square meter (m ²)	9.290 304 E-02
Foot (ft)	Meter (m)	3.048 E-01
British Thermal Unit (BTU)	Megajoule (MJ)	1.055 056 E-03
Pound (lb)	Kilogram (kg)	4.535 924 E-01
Short ton	Metric tonne	9.071 848 E-01

Source: NIST: www.nist.gov/pml/special-publication-811

7.2 Inventory analysis

Per ISO 21930:2017 Section 7.2, with additional guidance as follows:

The following materials shall be considered recovered materials and not co-products as is consistent with version 1 of the ASTM Cement PCR and the version 2 of the NSF Concrete PCR:

- fly ash;
- granulated blast furnace slag;
- silica fume;
- cement kiln dust;
- flue gas desulfurization (FGD) gypsum; and
- postconsumer gypsum.



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Only the materials, water, energy, emissions, and other elementary flows associated with reprocessing, handling, sorting, and transportation from the point of the generating industrial process to their use in the cement plant need to be considered for recycled or recovered materials.

Recycled and recovered materials with fuel content and used as fuels, such as scrap tires, shall be considered renewable or nonrenewable secondary fuels. Only the materials, water, energy, emissions, and other elementary 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. All emissions from combustion at the point of use shall be taken into account.

Cement recycling processes may be treated as closed loop recycling when the recycled cement is used as a substitute for material in the kiln. In this case, only the flows and impacts associated with recovery of the recycled cement 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.

For transparency, the indicators on the emissions and uptake of CO₂ due to calcination and carbonation shall be separately reported, where available, in the relevant module in the quantification of the GWP (ISO 21930 Sections 7.2.8, 7.2.12, and 9.5.2).

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 the EPD.

The impacts of water desalination, if applicable, shall be included.

7.3 Impact assessment indicators describing main environmental impacts derived from LCA

Per ISO 21930:2017 Section 7.3.

Of note, ISO 21930:2017 greatly expands the indicators required to be reported. Often the best currently available data such as industry-wide average EPDs for upstream processes do not yet align with ISO 21930:2017.



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8 ADDITIONAL ENVIRONMENTAL INFORMATION

Per ISO 21930:2017 Section 8.



9 CONTENT OF AN EPD

9.1 General

Per ISO 21930:2017 Section 9.1.

9.2 Declaration of general information

Per ISO 21930:2017 Section 9.2, with the following clarifications:

- A. A simple visual representation of the cement is not relevant and not required.
- B. The percentage of material components should be reported. However, if the percentage of material components is considered proprietary information, alternatively, the list of materials can be reported in order of greatest mass and/or aggregated by type to protect confidential information.
- C. Include the following table in lieu of ISO 21930:2017, Figure 3:



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<p>ISO 21930:2017 Sustainability in Building Construction — Environmental Declaration of Building Products: serves as the core PCR</p>
<p>NSF PCR for PORTLAND, BLENDED ,MASONRY, MORTAR, and PLASTIC (STUCCO) CEMENTS V2 serves as the subcategory PCR</p>
<p>Subcategory PCR review was conducted by: <Insert name and organization of the panel chair and their contact information></p>
<p>Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025: 2006 <input type="checkbox"/> internal <input type="checkbox"/> external</p>
<p>Third-party verifier: <name and contact information of third-party verifier></p>
<p>For additional explanatory material: <name and email of manufacturer's representative></p>
<p><name and version of EPD software tool (if applicable)></p>

9.3 Declaration of methodological framework

Per ISO 21930:2017 Section 9.3, with the following additions and clarifications:

For cradle-to-gate EPDs, scenarios are not required to be reported.

The EPD shall include the following:

A. The statement:

“This subcategory PCR recognizes fly ash, silica fume, granulated blast furnace slag, cement kiln dust, flue gas desulfurization (FGD) gypsum, and post-consumer gypsum as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a cement material input.”



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NOTE — This statement should include any other materials that were considered recovered in the preparation of the EPD. This may include, for example, spent pot liners and foundry sand.

B. A table summarizing the life cycle stages included in the EPD:

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

NOTE — MND = module not declared; X = module included.

Figure 2

Life cycle stage modules to be included in the EPD (Source: 21930:2017)

- C. A table outlining the primary sources of data used to complete the upstream material LCI background data including the date or version number.
- D. For industry-wide average EPDs, include the date and source of industry data survey including a list of all companies who participated in the EPD data.



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9.4 Declaration of technical information and scenarios

ISO 21930:2017 Section 9.4 does not apply for cradle-to-gate EPDs.

9.5 Declaration of environmental indicators derived from LCA

Per ISO 21930:2017 Section 9.5, with the following additions:

The following clarifications shall be applied and notes added:

- A. Many of the impacts and inventory items included in ISO 21930:2017 are emerging and have high levels of uncertainty. This shall be recognized within the EPD with the following note:

“The following LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories.”

(The following list of impact categories and inventory items shall be listed as shown below or identified by a note.)

- renewable primary energy resources as energy (fuel), (RPR_E);
- renewable primary resources as material, (RPR_M);
- nonrenewable primary resources as energy (fuel) ,(NRPR_E);
- nonrenewable primary resources as material (NRPR_M);
- secondary materials (SM);
- renewable secondary fuels (RSF);
- nonrenewable secondary fuels (NRSF);
- recovered energy (RE);
- abiotic depletion potential for nonfossil mineral resources (ADPelements);
- land use related impacts, for example on biodiversity and/or soil fertility;
- toxicological aspects;
- emissions from land use change (GWP 100 [land-use change]);



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- hazardous waste¹ disposed;
- nonhazardous waste disposed;
- high-level radioactive waste;
- intermediate and low-level radioactive waste;
- components for reuse;
- materials for recycling;
- materials for energy recovery; and
- recovered energy exported from the product system.

B. When upstream data (either specified in the PCR or from other sources) are missing values for select impact categories or inventory items that are required to be reported in the EPD, the impact categories or inventory items shall be reported as an 'x' or '-' and not zero and be qualified with the footnote:

“Not all LCA datasets for upstream materials include these impact categories and thus results may be incomplete. Use caution when interpreting data in these categories.”

9.6 Declaration of additional environmental information

Per ISO 21930:2017 Section 9.6, with the following additions:

The following references shall be provided at a minimum in the EPD:

- ISO 21930:2017, *Sustainability in Building Construction — Environmental Declaration of Building Products*



10 PROJECT REPORT

Per ISO 21930:2017 Section 10.

¹ As defined by RCRA under 40 CFR 261.33. www.govinfo.gov/content/pkg/CFR-2011-title40-vol26/pdf/CFR-2011-title40-vol26-sec261-33.pdf



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11 VERIFICATION AND VALIDITY OF AN EPD

Per ISO 21930:2017 Section 11, with the following additions:

- A. EPD calculations completed by software systems are permitted provided the software has been verified per similar procedures as verifying an EPD. The process used to verify the software calculations should be publicly accessible and referenced from the EPD.
- B. When a product specific EPD is aligned with an industry-wide average EPD, the following additional item is required:

In order to evaluate the consistency of results between product specific EPDs and industry-wide average EPDs either:

- the same LCA modeling software and version, background data set, and characterization model shall be used to create the EPD; or
- the LCA modeling software and version shall test representative samples of the regionally specific industry-wide average data and include in the EPD a report of the maximum percent difference for environmental impact categories: global warming potential, acidification potential, ozone depletion potential and smog creation potential. If a different LCA data set, tool, or characterization model is selected, it shall be used to calculate environmental indicators for a sample of representative cements taken from the published industry-wide average LCA report. The variation of results produced by the selected LCA modeling software and version, compared to the published environmental indicators in the industry-wide EPD shall be reported as a maximum percent variation for GWP 100, AP, EP or POCP. This is to provide transparency on the variability of results that stem from background data and models.



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12 REFERENCES

The development of this PCR included consideration and reference to the following PCRs:

AASHTO Standards²

AASHTO M 85, *Standard Specification for Portland Cement*

AASHTO M 240, *Standard Specification for Blended Hydraulic Cement*

ASTM Standards³

ASTM C91, *Standard Specification for Masonry Cement*

ASTM C150/C150M, *Standard Specification for Portland Cement*

ASTM C219, *Standard Terminology Relating to Hydraulic Cement*

ASTM C595/C595M, *Standard Specification for Blended Hydraulic Cements*

ASTM C1157/C1157M, *Performance Specification for Hydraulic Cement*

ASTM C1328/C1328M, *Standard Specification for Plastic (Stucco) Cement*

ASTM C1329/C1329M, *Standard Specification for Mortar Cement*

CSA Standards⁴

CSA A3001, *Cementitious Materials for Use in Concrete*

² American Association of State and Highway Transportation Officials. 555 12th Street NW, Suite 1000, Washington, DC 20001. www.transportation.org

³ ASTM International. 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. www.astm.org

⁴ CSA Group. 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada. www.csagroup.org



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CSA A3002, Masonry and Mortar Cement

ISO Standards⁵

ISO 6707-1:2014, Buildings and Civil Engineering Works – Vocabulary – Part 1: General Terms

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

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

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

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

ISO 14067:2018, Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification

ISO 14050:2009, Environmental Management – Vocabulary

ISO 21930:2017, Sustainability in Building Construction – Environmental Declaration of Building Products

EN Standards⁶

EN 15804, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, January 2012

⁵ International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. www.iso.org

⁶ European Committee for Standardization. Rue de la Science 23, B-1040 Brussels, Belgium. www.cen.eu



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Other References

ASTM Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, version 1. Sept. 2, 2014. www.astm.org³

NERC: www.nerc.com/AboutNERC/keyplayers/Pages/default.aspx⁷

NSF Product Category Rule for Environmental Product Declarations, PCR for Concrete. February 22, 2019. www.nsf.org

UN CPC 3744 Cement, 2010:09 Version 2.0, Centre for the Development of Product Sustainability⁸

US EPA *Waste Reduction Model (WARM)* – Fly Ash Chapter: www.epa.gov/warm/versions-waste-reduction-model-warm#15⁹

USGBC LEED v4 for Building Design and Construction, 11 Jan 2019. www.usgbc.org/resources/leed-v4-building-design-and-construction-current-version¹⁰

USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017. www.usgbc.org/resources/pcr-committee-process-resources-part-b¹⁰

⁷ North American Electric Reliability Corporation. 3353 Peachtree Road NE, Suite 600 North Tower, Atlanta, GA 30326. www.nerc.com

⁸ Available from The International EPD System. www.environdec.com

⁹ US Environmental Protection Agency. 1200 Pennsylvania Avenue NW, Washington, DC 20004.. www.epa.gov

¹⁰ US Green Building Council. 2101 L Street, NW, Suite 500, Washington, DC 20037. www.usgbc.org



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APPENDIX A: TECHNICAL REVIEW COMMITTEE

The following individuals participated in the review committee from June 2019 through March 2020.

Manufacturers

- Hamid Farzam, Cemex
- Shawn Kalyn, Votorantim / St. Marys Cement LLC
- Kirk McDonald, CalPortland
- Adam Swercheck, Heidelberg Technology Center
- Cheng Qi, Ash Grove Cement / CRH

Trade Associations

- Adam Auer, Cement Association of Canada
- Jamie Farny, Portland Cement Association

Users

- James Bogdan, National Ready Mixed Concrete Association
- David Green, BASF Corp.
- Emily Lorenz, Precast / Prestressed Concrete Institute
- Martha VanGeem, Consultant

LCA Expertise

- Jamie Meil, ATHENA Sustainable Materials Institute
- Eric Masanet, Northwestern University

NSF

- Andrea Burr



THE HOPE OF MANKIND rests in the ability of man to define and seek out the environment which will permit him to live with fellow creatures of the earth, in health, in peace, and in mutual respect.